

THE MECOPTERA OF INDO-CHINA^{1, 2}

By George W. Byers

Abstract: The number of species of Mecoptera of the Indo-Chinese area is raised from about 8 to over 20 with the description of 12 new species. The species treated include 18 *Neopanorpa*, 1 *Leptopanorpa* and 1 *Bittacus*. Details are presented on the collecting localities of the sources of the new material.

Insects of the order Mecoptera from the southeastern Asiatic mainland have rarely been mentioned in entomological literature. To judge from the diversity of species among the small number of specimens known, however, this is due more to their having been overlooked by collectors than to their being actually uncommon. In contrast to the approximately 20 species and subspecies of *Leptopanorpa* and *Neopanorpa* known from the nearby islands of Java and Sumatra, only 8 have been reported from the vast peninsular area east of India and south of China², and of these I regard 1 as a synonym and 2 others as almost surely erroneous records, as explained under their respective species headings, below. To these might be added, as occurring in adjacent areas and possibly entering the peninsular region, 3 species of *Neopanorpa* from Assam and one of *Bittacus* from eastern India: *Neopanorpa cornuta* Esben-Petersen (1915); *N. fenestrata* (Needham) and *sordida* (Need.) (1909), and *Bittacus indicus* Walker (1853), originally recorded as being from "East Indies."

Twelve previously unknown species are described in this report, yet I believe that we are only beginning to know the diversity of the Indo-Chinese fauna. In addition to the species mentioned, I have already seen specimens of undescribed species from Thailand, Vietnam and Laos that I have not included because only females are at present available.

Three collections of Mecoptera from Thailand, Vietnam and Malaya have recently been made available to me for study. These are from the Entomology Section of the Department of Agriculture, Bangkok, Thailand, loaned by Dr Boonsom Meksongsee, from the collection of Bishop Museum, Honolulu, loaned by Dr J. L. Gressitt, and from the California Academy of Sciences, San Francisco, loaned by Dr E. S. Ross. I am indebted to these gentlemen and their institutions for the privilege of examining these specimens. The collections total 173 specimens (108 from Thailand, 61 from Vietnam and 4 from Malaya). In addition, I acknowledge with thanks the loan of two specimens of an undescribed species from Tonkin by Dr Francisco Español of the Museo de Zoología, Barcelona, Spain. I wish also to express thanks to Mr D. E. Kimmins and Mr Peter H. Ward of the British Museum (Nat. Hist.) for assistance in the study of the types of *Neopanorpa in-*

1. Contribution No. 1223 from the Department of Entomology, The University of Kansas, Lawrence, Kansas. Support for part of this study by grant GB-1429 from the National Science Foundation is gratefully acknowledged.
2. Indo-China, as used here, includes the entire peninsula: Thailand, Vietnam, Malaya, southern Burma, Laos and Cambodia.

fuscata and for the loan of several Malayan specimens of *N. angustipennis*; to Dr M. W. R. deV. Graham of the University Museum, Oxford, for the generous loan of Westwood's holotype of *N. angustipennis*; to Dr F. Y. Cheng for the loan of a paratype of his *N. baviensis*; to Mlle Simone Kelner-Pillault of the Museum National d'Histoire Naturelle, Paris, and Dr Delfa Guiglia of the Museo Civico di Storia Naturale Giacomo Doria, Genoa, for permission to examine types in their care; and to Mr Anuwat Wattanapongsiri, who arranged the initial loan of specimens from Bangkok.

Holotypes, allotypes and most paratypes of species described here have been returned to the lending institutions (two hereinafter abbreviated "Department of Agriculture, Bangkok" and "BISHOP"). When possible, representative paratypes have been retained by exchange in the Snow Entomological Museum, The University of Kansas, Lawrence, Kansas (abbreviated "Snow Museum").

Examination of all the Indo-Chinese species of *Neopanorpa* has shown certain characters that vary so much within species or are so similar among species that they can be better dealt with once in an introductory paragraph than repeated in every description. These are in addition to generic characters enumerated by earlier authors:

1. Eye color varies from dark plum through brownish to black, depending on the method of preservation, age of specimen, etc.; and within each species, ocelli vary from clear amber to semi-opaque amber colored.

2. Tips of maxillary and usually of labial palps are darkened to brown or blackish brown in all species.

3. Flagellar segments of antennae, beyond the first, are brownish black to black, short-cylindrical, each covered with fine pubescence and provided with a subapical whorl of 4-6 short, erect hairs.

4. Pleural thoracic sclerites are sparsely covered with short hairs; longer more densely arranged hairs occur on anterior surfaces of coxae.

5. Claws of pretarsus have 5 pectinations, including apical one, the middle tooth largest, usually both longest and widest.

6. Veins at first fork of media are pale, enclosed in a small pale spot (thyridium).

7. Distal plate of ♀ genital plates is produced caudad as 2 spatulate, yellowish blades, the bases of which are darker and slightly twisted near the junction with axial portion of plates.

Measurement of body length is only approximate, since the position in which the body dries is highly variable, and has been recorded only to the nearest whole millimeter. I have adopted the term "dorsum of head" to include the occiput, vertex and that part of the frons between the median ocellus and the antennal sockets. Abdominal terga, sterna, or segments as a whole are designated by numerals. I have adopted a slightly more morphological nomenclature for the aedeagus than that used by some authors, notably Isiki (1933: 332, ff.).

Nine of the species of *Neopanorpa* dealt with here form a fairly compact group, based upon several taxonomic characters in both sexes. I have called these the *siamensis* group, after the commonest included species. They are: *siamensis* n. sp., *baviensis*, *annamensis* n. sp., *infuscata*, *gestroi*, *tuberosa* n. sp., *nielsenii* n. sp., *panda* n. sp. and *thai* n. sp.

A very clear pattern of seasonal distribution emerges from a compilation of dates of

collection of Indo-Chinese species. In the area north of the Malay Peninsula, there is a peak flight period in April and May and another in September and October. All the known Indo-Chinese species are on the wing in spring, and several apparently have 2 generations per year. Collectors in this region should be particularly alert for Mecoptera during the peak seasons indicated, although there are records for every month except January, February and November.

Comparison of the Mecoptera of the Indo-Chinese peninsula with those of China and India shows a distinct faunal separation in each case. Since this does not conform to established zoogeographical patterns, it may merely reflect our present incomplete knowledge of the order. One striking fact, however, is that no species of *Panorpa* has turned up in the peninsular fauna, although this genus is well represented in China, even in some southern provinces, such as Yunnan.

Neopanorpa angustipennis (Westwood) Figs. 1-6.

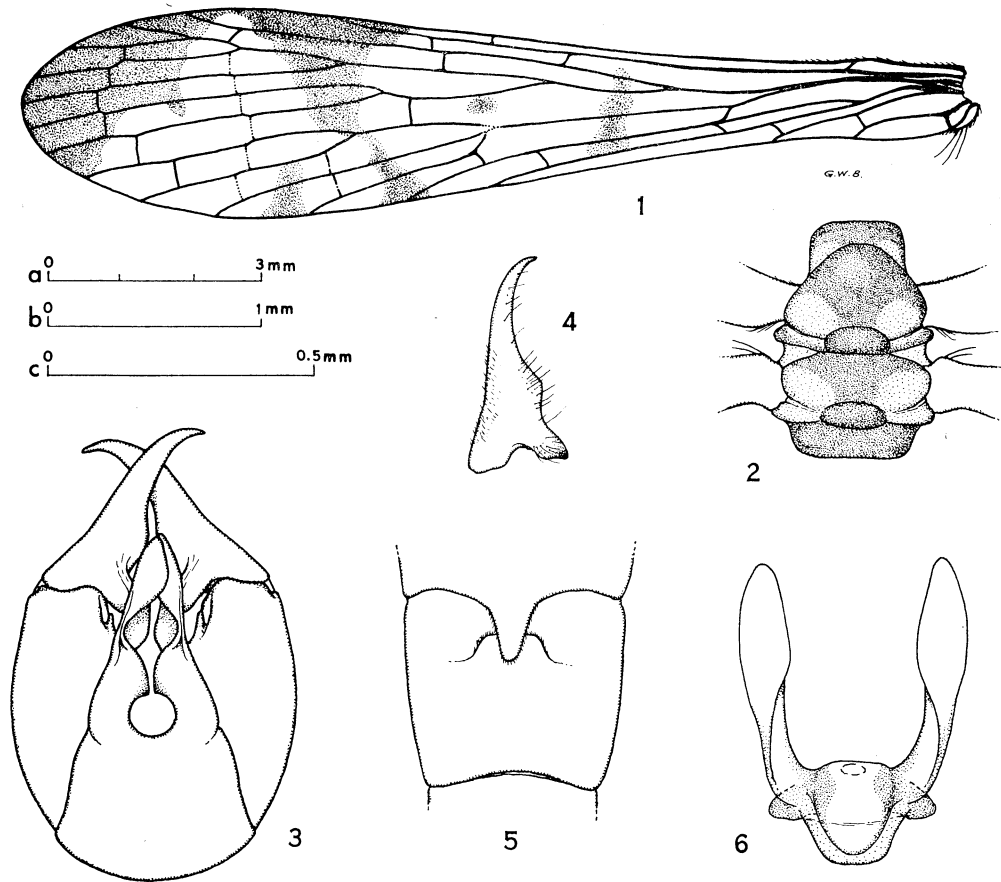
Panorpa angustipennis Westwood, 1842: 299.

Westwood's original, summary description gave the type locality of *angustipennis* as the island of Java or Tenasserim (peninsular Burma, then India), with no explanation of the source of doubt. The ♀ holotype is glued to a small card on the edge of which is penned "Java." By the 1846 publication of his revision of *Panorpa*, however, Westwood had (perhaps significantly) reversed the order of possible type localities ("Tenasserim, India, vel Java").

This species has been recorded several times by various authors as occurring in Java and Sumatra but only once again from Burma and once from the Malay Peninsula, as noted below. The Javanese form has been described by Van der Weele (1909: 5-6), who illustrated the genital bulb of the ♂, and by Esben-Petersen (1921: 74), who included a photograph of the wings. Banks (1931) found markedly different ♂♂ associated with the ♀♀ he identified as *angustipennis* and noted certain discrepancies between Westwood's description of the species and those of Van der Weele and Esben-Petersen, neither of whom had made any mention of the conspicuous dorsal thoracic markings. I have examined several Javanese specimens identified as *angustipennis*, and it is clear that there are 2 species involved, the one in Java and Sumatra and the other on the mainland, and the evidence is strong that *angustipennis* does not occur in both these regions.

Examination of the holotype of *angustipennis* showed that the thoracic markings (which resemble those of several Indo-Chinese species) are very distinct, the fore wings³ patterned as illustrated in figure 1, and the genital plates (fig 6) of a shape not greatly unlike those of some other Indo-Chinese species but with the axial portion recognizably different. Several Malayan specimens in the British Museum (Nat. Hist.) resemble the holotype, and of these I have dissected 2♀♀, one of which (now labelled "compared with type") agrees very closely with the type. On the basis of these comparisons, I judge that the Malayan ♀ specimens and the ♂♂ associated with them are conspecific with the holotype and that the type probably is from Tenasserim, not Java, although it remains to be seen,

3. A reference by Banks (1931: 391) to "Westwood's figure" of the wing probably pertains to an illustration by Van der Weele (1909).



Figs. 1-6. *Neopanorpa angustipennis* (Westwood). 1, left fore wing, holotype; 2, thoracic dorsum, holotype; 3, genital bulb, ♂, ventral (posterior) aspect; 4, left dististyle, ventral aspect; 5, abdominal terga 3 & 4, ♂, dorsal aspect; 6, genital plates of ♀ (holotype), ventral aspect. Scale a—figs. 1-2; b—figs. 3-5; c—fig. 6.

of course, whether any Javanese specimens identified as *angustipennis* are in agreement with the holotype.

To earlier descriptions of *angustipennis*, which deal fairly adequately with its general aspect and coloration, the following may be added:

Head: Antennae comprising pale scape and pedicel and 41 blackish flagellar segments.
Thorax: Notae of all 3 segments blackened anteriorly and medially, as shown in fig 2; fore wings marked as in fig 1. **Abdomen of ♂:** Posterior process of tergum 3 narrowly triangular, extending somewhat less than halfway across 4 (fig 5). Hypoalves of sternum 9 separated basally by a subcircular space, their inner edges broadly and deeply emarginate near mid-length, overlapped in apical 1/3, each produced dorsally just above basal aperture as a small, darkened, flattened lobe, concealed in ventral view; hypoalves angularly bent longitudinally, forming lateral portions, outer edges of which are strongly turned mesally,

partially visible in ventral aspect (fig 3). Tergum 9 narrowed near apex, apical margin truncate to very shallowly emarginate. Dististyles with an inner basal lobe bearing pale hairs and a mesal, blackened point and a more dorsal (anterior) blunt projection not readily seen in ventral aspect; a few long, pale setae among shorter hairs along inner margins of dististyles. *Abdomen of ♀*: Arms of distal genital plate pale apically, darkened slightly in basal 1/2; axial portion broader at apex than at base, with small lateral extensions, as shown in figure 6.

This species was recorded from peninsular Thailand by Banks (1931: 391, as *angustipennis*), from the vicinity of Nakon Sri Tamarat (Nakhon Si Thammarat; see map), on Khao Luang, at an elevation of 600 m. He also listed Malayan specimens from Lubok Tamang, 1050 m, in Pahang, from Batang Padang district, 550 m, in Perak, from Gombak Valley, Selangor, and from Tioman Island (off east coast), taken in February, March, June and October. Those from Tioman Island I regard as a distinct form, which is being dealt with in another paper. I have seen, in addition, Malayan specimens from Cameron Highlands, Pahang, 1200-1600 m, 10, 18, 29.VI.1935, 1200-1300 m, 9.III.1963, and 800 m, 20.VI.1962; Fraser's Hill, Pahang, 1260 m, 19.VII.1936, and 17.VI.1962; Larut Hills, Perak, 1100-1200 m, 9.II.1932 and 1350-1410 m, 19.II.1932; and Kedah Peak, Kedah, 1000-1220 m, 28.IV.1962. Navás (1929: 385) reported *angustipennis* from the Karen Hills in Burma, but these specimens belong to a quite different species, described below as *Neopanorpa burmana*.

***Neopanorpa baviensis* Cheng** Figs. 7-10.

Neopanorpa baviensis Cheng, 1953: 120.

This species, discovered in Tonkin (N. Vietnam), is still known only from the two males upon which the description was based. It is clearly a very close relative of *N. annamensis* and *N. siamensis* and has many similarities to the other members of the *siamensis* group. It may be differentiated from the other species in that group by the fact that the long hypoalves of the male are broader in the apical 1/2 than in the basal 1/2. Cheng also called attention to the narrowed apex of the fore wing, which he illustrated with a photograph.

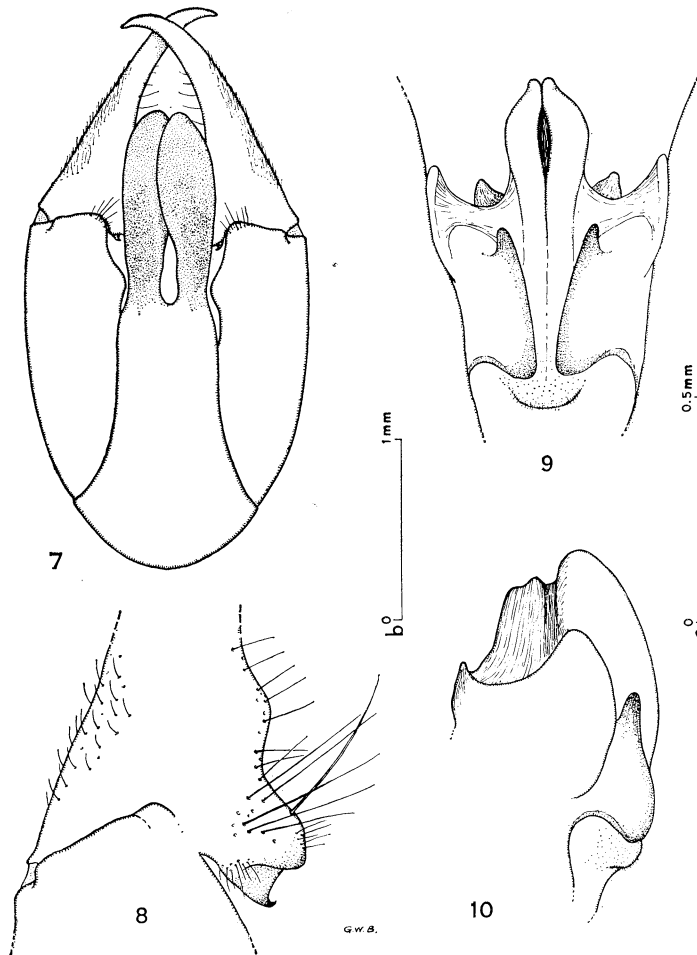
Dr Cheng kindly sent me the dissected genital bulb of the ♂ paratype of *baviensis* for comparison with that of *annamensis*. While his description and illustrations of *baviensis* are in general quite adequate, I have included some drawings of details of segment 9 here (figs 8-10) for comparison with similar structures in closely related species. The described "row of short black hairs" along the outer margin of the dististyle is apparently based upon a backlighted profile view of the usual short hairs found more widely distributed on the dististyle. It should also be mentioned that the "small, tooth-like process" on the dorsal edge of the basal lobe of the dististyle is distinctly hooked at its apex (fig 8). Considerable taxonomic use can be made of the detailed structure of the aedeagus (figs 9, 10), and even though much of it cannot be easily examined in undissected specimens its ventral margin can usually be seen.

The species is known only from Mt Bavi, Tonkin (see map), 800-1000 m, VII.1941.

***Neopanorpa cavaleriesi* (Navás)**

Panorpa Cavaleriesi Navás, 1908: 417.

Neopanorpa Cavaleriesi: Navás, 1930a: 13.



Figs. 7-10. *Neopanorpa baviensis* Cheng. 7, genital bulb, ♂ paratype, ventral (posterior) aspect; 8, left dististyle, ventral aspect; 9, aedeagus, ventral aspect; 10, aedeagus, left lateral aspect. Scale b—fig. 7; c—figs. 8-10.

Originally described from a ♂ collected at Kweiyang, Kweichow, China, this species was subsequently reported by Navás from Tibet, on the basis of a ♀, and still later (1930) from the vicinity of Hoa-Binh, Tonkin (N. Vietnam), about 680 km S of the type locality. Navás indicated neither the sex of the specimen from Tonkin nor how he determined its identity. The specimen is a ♀, in the same collection as the holotype, in Paris; it was probably identified on the basis of its size and general wing characters, although its wing pattern does not closely resemble that of the type of *cavaleriei*. This ♀ specimen may belong to the species described as *Neopanorpa nielsenii*, below. Accordingly, I am tentatively discounting the reported occurrence of *N. cavaleriei* in N. Vietnam.

A general description of *N. cavaleriei* can be found in Cheng's monograph of the Me-

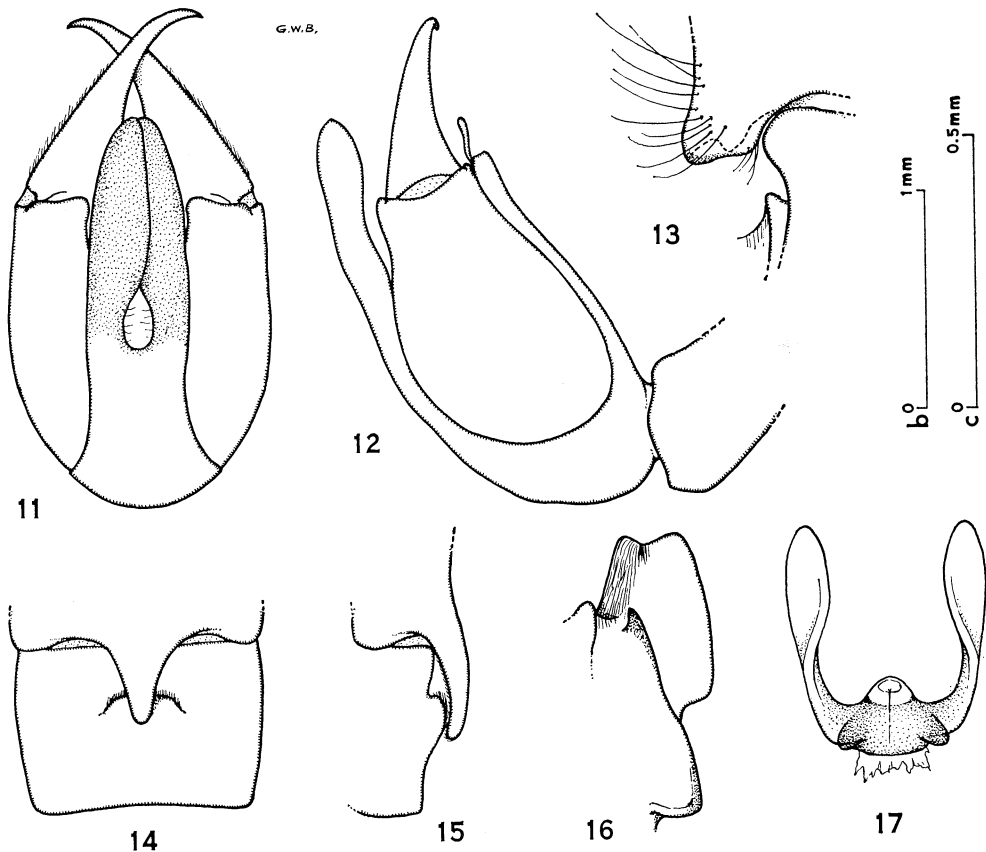
coptera of China (Cheng 1957: 83). I am illustrating and discussing the holotype in a paper on some Chinese species, in preparation. This is probably the species intended by Banks' *nomen nudum* at the end of his discussion of *N. angustipennis* (Banks 1931: 391).

***Neopanorpa gestroi* Navás**

Neopanorpa Gestroi Navás, 1929: 385, fig. 18.

One ♂ and 1 ♀ in the Museo di Storia Naturale Giacomo Doria, in Genoa, Italy, are labelled as types, as are also one of each sex in Navás' collection in the Museo de Ciencias Naturales, in Barcelona, Spain. To eliminate possible confusion, I hereby designate as lectotype the ♂ in Genoa, labelled "Palon (Pegu), L. Fea, VIII-IX-87" and "Typus" (on a pink label).

Although *gestroi* is structurally very similar to several other regional species (the *siamensis* group), it may be easily differentiated from them by the striking coloration of the thoracic



Figs. 11-17. *Neopanorpa gestroi* Navás. 11, genital bulb, ♂ lectotype, ventral aspect; 12, same, right lateral aspect; 13, basal lobe of right dististyle, ventral aspect; 14, abdominal terga 3 & 4, ♂, dorsal aspect; 15, same, left lateral aspect; 16, aedeagus, left lateral aspect (reconstruction); 17, genital plates, ♀ syntype, ventral aspect. Scale b—figs. 11-12, 14-15; c—figs. 13, 16-17.

pleura. While most of the pleural surface is sordid yellowish brown, approximately the anterior 1/2 of each mesepisternum and metepisternum is contrastingly dark brown. Similarly, the anterior surfaces of the middle coxae are darkened, though somewhat less intensely than the episterna, and there is a lateral brown stripe running the length of each hind coxa. The color pattern of the thoracic dorsum is similar to that of most peninsular species.

In fore wing, apical band entire or may include a small clear spot, pterostigmal band is entire and forked posteriorly, marginal spot present, basal band entire and not constricted near its mid-length, and a more proximal dark spot is found between veins M and Cu. Some structural details are illustrated in figs 11-17. Posterior process of abdominal tergum 3 of ♂ is narrowly triangular, arched slightly dorsad, and extends only about halfway across tergum 4. The length of the fore wing was recorded as 11 mm in ♂, 11.4 in ♀, but two larger individuals with wings 11.5 and 13.2 mm were mentioned. The hypovalves are less acutely tipped than illustrated by Navás and are overlapped medially for most of their length. The basal lobe of the dististyle bluntly rounded (fig 13) and bears a short blunt dorsal tooth, usually concealed in ventral aspect and indicated in the figure by a broken line. Ventral lobes of aedeagus slightly longer than dorsal lobes, appressed to form a long, blade-like structure, and flanked by subacutely tipped ventral parameres (fig 16). Axial portion of genital plates of ♀ is broadly triangular, with a wide shallow impression in the clear apex, and with inconspicuous, rounded lateral lobes.

In addition to the lectotype, I have seen the following specimens, all collected in southern Burma by Leonardo Fea: 1♂, 3♀♀ (including ♀ type), Carin Chebá, 900-1100 m, VI.1888; 2♀♀, same locality but V-XII.1888; 1♀, Palon (Pegu District), VIII-IX.1888; 1♀, Rangoon, III.1887; all in the Museo di Storia Naturale, Genoa; also 1♂ from Palon, VIII-IX. 1888, and 1♀, Carin Chebá, V-XII.1888, in the Museo de Ciencias Naturales, Barcelona.

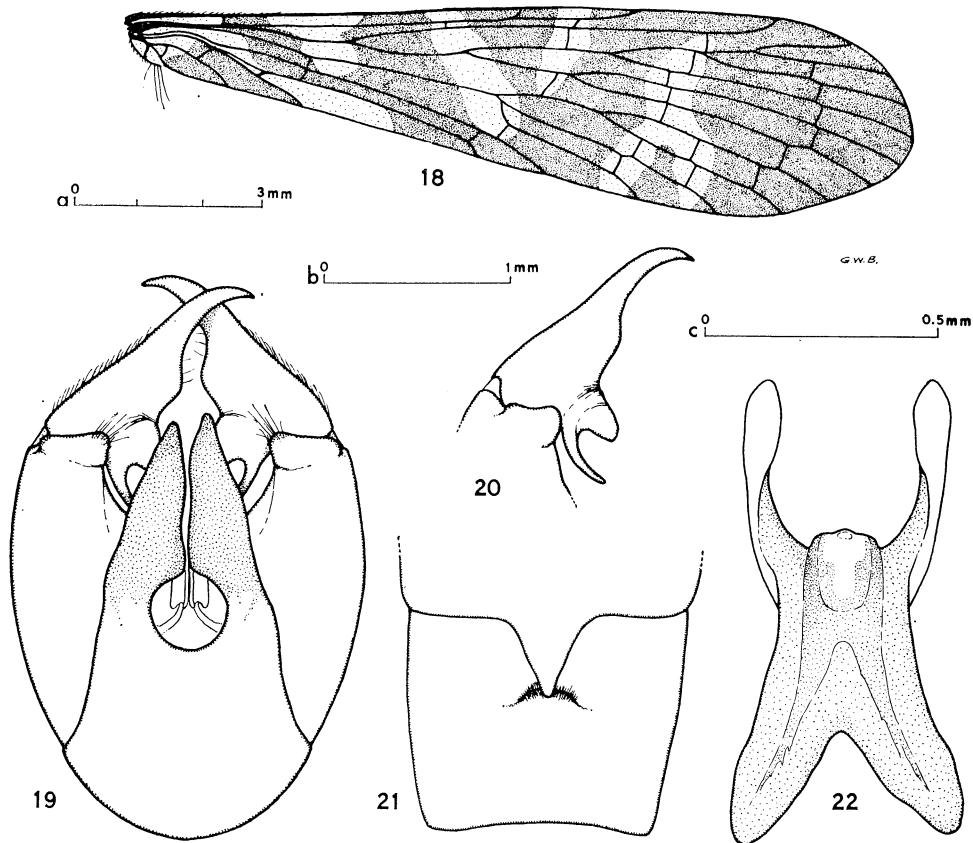
Neopanorpa harmandi (Navás) Figs. 18-22.

Panorpa Harmandi Navás, 1908: 416.

Neopanorpa Harmandi var. *conjuncta* Navás, 1930b: 416-417. **New synonymy.**

The original description, based on a specimen without abdomen from "Conchinchina, Mont. de Chandoc" (a misspelling of Chaudoc, Cochinchina), dealt chiefly with the wing markings. In the description of *conjuncta*, however, Navás not only illustrated a variation in wing pattern (again only one specimen, from Dalat, Annam) but also mentioned the dark, triangular hypovalves, the large circular space between their bases, and the short, slender process of abdominal tergum 3. Since neither description is very detailed, I have briefly redescribed the species (on the basis of the holotypes of both *harmandi* and *harmandi conjuncta* and 3 additional ♂♂ and 4♀♀), as follows:

Head: Rostrum and frons yellowish brown; vertex dark brown grading into black on occiput; ocellar prominence glossy brownish black. Antennal scape and pedicel yellowish brown, grading into brownish black on basal flagellar segment; flagellum with 47 segments. **Thorax:** Pronotum, anterior 1/2 of mesonotum and broad median stripe on posterior mesonotum and full length of metanotum blackish brown; remaining dorsal surfaces yellowish brown. Anterior margin of pronotum with only weak bristles or without any. Pleural



Figs. 18-22. *Neopanorpa harmandi* Navás. 18, fore wing, ♂ (Doi Pang, Thailand); 19, genital bulb, ♂ (Fang, Thailand), ventral aspect; 20, left dististyle, ventral aspect; 21, abdominal terga 3 & 4, ♂, dorsal aspect; 22, genital plates, ♀ (Thailand), ventral aspect. Scale a—fig. 18; b—figs. 19-21; c—fig. 22.

areas mostly dark brown, paler along sutures. Legs and basitarsi sordid yellowish brown; subsequent tarsal segments brown. *Wings* tinged with light brown, broadly banded with brown to dark smoky brown (intensity of color variable). Apical band entire, often apparently including a posterior clear spot, as a result of junction with remaining portion of distal fork of pterostigmal band. Pterostigmal band entire, diagonal, joined anteriorly to apical band and often narrowly connected to triangular intermediate spot (*conjuncta* form, as fig 18). Basal band very broad, joined posteriorly to pterostigmal band, with dark coloration continuing between Cu_1 and Cu_2 to more proximal spots of variable extent. *Abdomen of ♂*: Terga 2-4 mostly dark brown, terga 5-6 and sterna 2-6 sordid yellowish brown; segments 7-9 yellowish brown, except for darkened hypovalves. Posterior process of tergum 3 narrowly triangular (fig 21). Genital bulb large, compared to overall body size. Hypoalves subtriangular in ventral aspect (fig 19), outer edges strongly infolded dorsally, with a basal enlargement visible laterally; inner margins rolled dorsally, or not

rolled and slightly overlapped. Tergum 9 constricted near mid-length, expanded subapically, with broadly rounded apex shallowly emarginate medially. Dististyles strongly sclerotized at tip; basal lobe cup-like, with an elongate, slender, curved appendage directed downward and inward (fig 20). Ventral valves of aedeagus laminate, closely appressed; ventral margins divergent below (cephalad), produced ventrad as pale ridges, each giving rise to a spatulate lobe (ventral paramere) beneath tip of appendage of dististyle. *Abdomen of ♀*: Terga 2-5 dark brown; remaining terga and corresponding sterna sordid yellowish brown. Subgenital plate notched apically, without any large bristles. Genital plates large (fig 22), axial portion somewhat elongate, thickened, with stout anterior apodemes.

Body length, ♂, about 12-13 mm; ♀, about 10-11 mm. Length of fore wing, ♂, 12-14 mm; ♀, 11-12 mm.

This species appears to be most closely related to *N. pendulifera*, n. sp., among the Indo-Chinese forms, otherwise to *N. caveata* Cheng of China. These relationships are discussed under *pendulifera*.

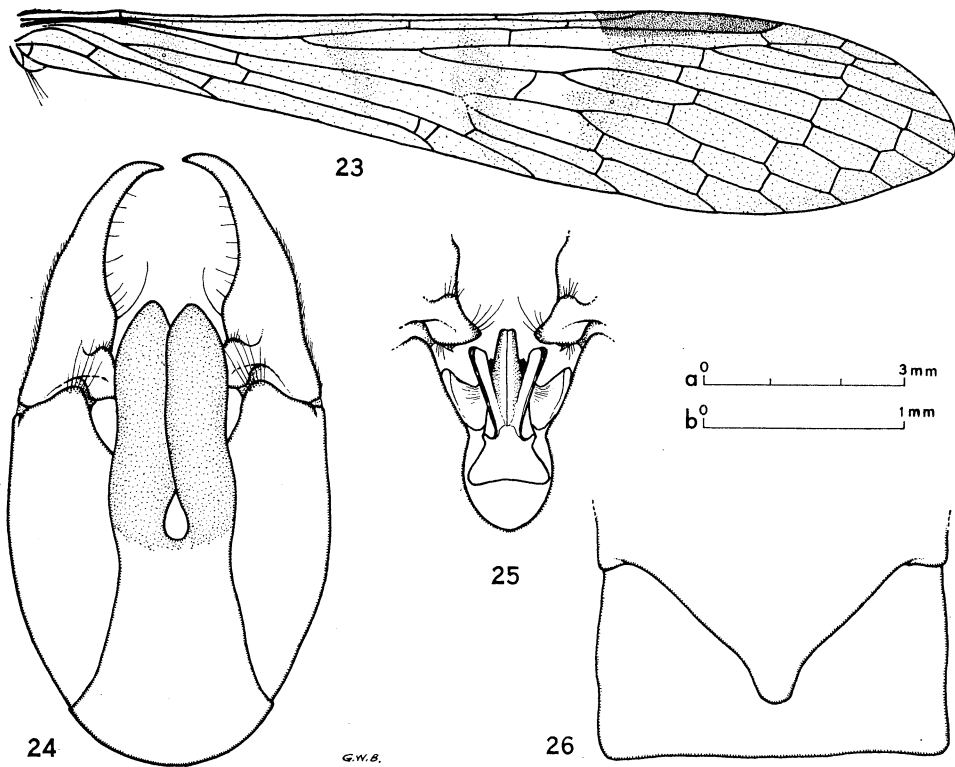
In addition to the holotypes of *harmandi* (in the Museum National d'Histoire Naturelle, Paris) and *harmandi conjuncta* (Museo de Zoologia, Barcelona), I have seen the following specimens of *harmandi*, all from Thailand: 2♂♂, 1♀, Fang, Chiangmai Prov., elevation 540 m, 28.IV.1958; 1♀, Doi-Pang (mountain), Phrae Prov., 8.VI.1938; 1♂, Chonburi, 28.IX.1959; 1♀, Nakhon Ratchasima, 480 m, 10.VII.1954; 1♀, Chanthaburi, 14.VIII.1941; 1♀, 16 km N of Sara Buri, 100 m, 28.VII.1962, 3♂♂, 1♀, 13 km SE Sara Buri, 100 m, 28.VII.1962. Date of collection of type of *conjuncta*, 17.III.1924; of type of *harmandi*, unknown, in 1877. There is a ♀ in British Museum (Nat. Hist.) labelled "Chaut", collected by M. Mouhot, from the Saunders collection.

Neopanorpa infuscata Banks Figs. 23-26.

Neopanorpa infuscata Banks, 1931: 390, fig. 26a.

It is uncertain just how many specimens Banks used as the basis of his description of this species. He indicated both sexes were included and listed 3 localities and 4 dates. The ♂ holotype and a ♀ paratype, both from Malaya and both in good repair, and a badly damaged ♂ paratype from peninsular Thailand are all that remained among the collections transferred from the Perak Museum to the British Museum (Nat. Hist.) after the second World War. Some sketches of the holotype and ♂ paratype are offered here for comparison with the other regional species.

The combination of elongate hypovalves and dorsal tooth on the basal lobe of the dististyle indicates that *infuscata* belongs to the *siamensis* group. Species recognition in both sexes should not prove difficult because of the unusual wing markings, which include an unusually long, dark brown stigma and the membrane infumed with smoky yellowish brown throughout, except for a diffuse pale spot behind the stigma, a slight darkening at the wing apex and near the radial sector, etc. (fig 23). The "extra", outermost rank of cross-veins may also be a constant character of the species, but the double cross-vein between Cu_1 and Cu_2 in the holotype is an individual variation. The thorax has pale posterior shoulders on mesoscutum and metascutum, and the dorsum, except for the yellowish brown segments 7-9, is otherwise blackish — the color pattern seen in most Indo-Chinese species. The posterior process of abdominal tergum 3 in the ♂ is broadly triangular, its base wider than its length (fig 26).



Figs. 23-26. *Neopanorpa infuscata* Banks. 23, right fore wing, holotype; 24, genital bulb, ♂ holotype, ventral aspect; 25, aedeagus and basal lobes of dististyles, ventral aspect; 26, abdominal terga 3 & 4, ♂ paratype, dorsal aspect. Scale a—fig. 23; b—figs. 24-26.

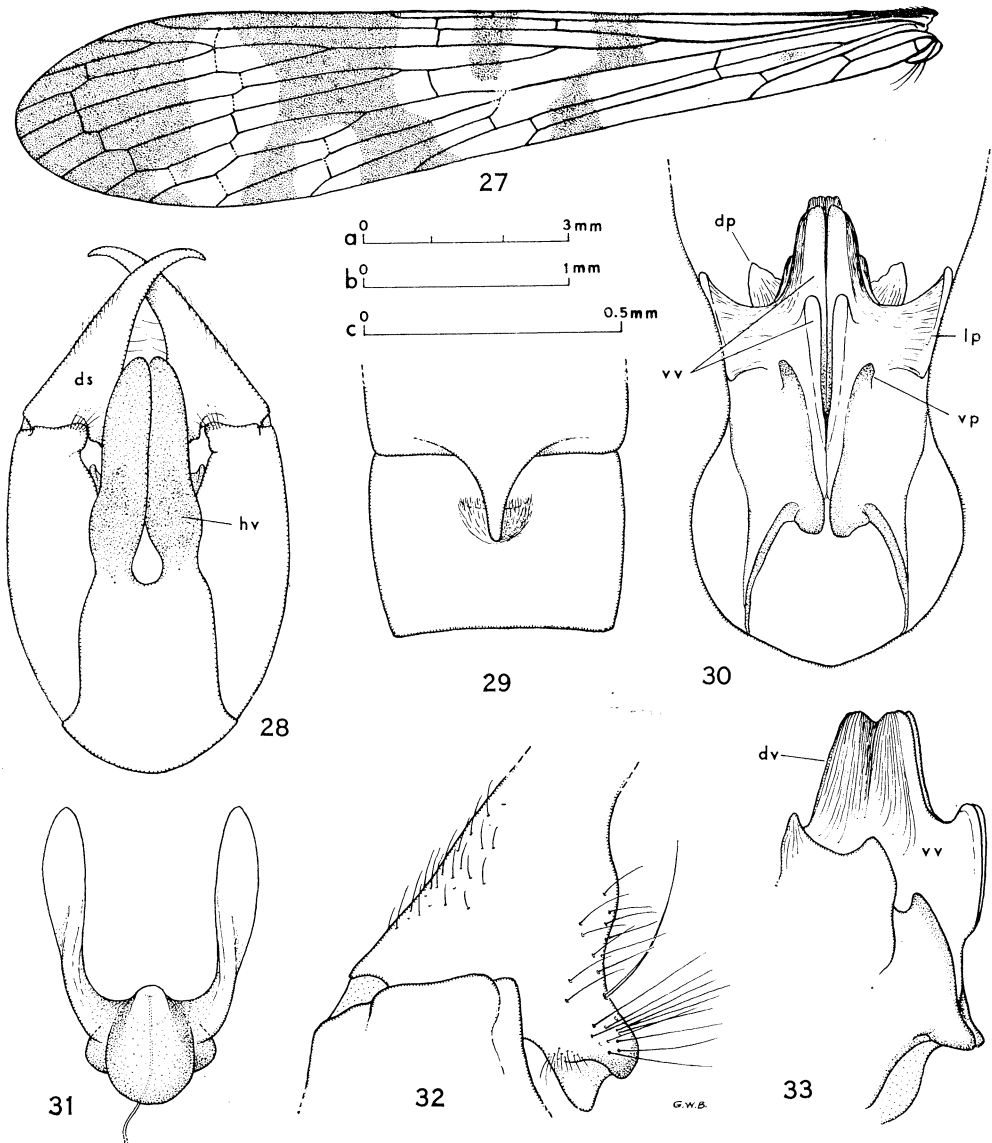
This species is known from Malaya and adjacent peninsular Thailand, the dates and specific localities (see map) as follows: Jor Camp, Batang Padang district, Perak, Malaya, 540 m, V-VI; Lubok Tamang, Pahang, Malaya, 1050 m, VI; and Khao Luang (mountain), nr Nakhon Si Thammarat, S. peninsular Thailand, 3000 ft (from pin label; published as 2000 feet by Banks), III.

***Neopanorpa annamensis* Byers, n. sp.** Figs. 27-33.

Description based on 10 ♂♂ and 16 ♀♀ pinned.

Head: Dorsum of head black medially, including ocellar prominence, dark yellowish brown along edges of eyes; rostrum yellowish brown. Antennal scape yellowish brown, pedicel brown, flagellum (incomplete in holotype) black, with 46 segments. **Thorax:** Pronotum black medially, grading through brown to light brown laterally; 2 or 3 setae at each side on anterior margin (missing in holotype). Mesonotum black on anterior 1/2, with a broad median black stripe continuing backward across scutellum and metanotum; remaining notal surfaces sordid yellowish brown (holotype) to pale yellowish brown. Pleural areas yellowish brown. Legs and basitarsi sordid yellowish brown; succeeding

tarsal segments brown. *Wings* faintly tinged with brown, palest between apical and pre-stigmal bands, where cross-veins are whitish; markings dark smoky brown. Apical band slightly (holotype, fig 27) to extensively indented posteriorly, or entire (3 speci-



Figs. 27-33. *Neopanorpa annamensis* n. sp. 27, left fore wing, holotype; 28, genital bulb, ♂ holotype, ventral aspect (ds-dististyle, hv-hypovalve of sternum 9); 29, abdominal terga 3 & 4, holotype, dorsal aspect; 30, aedeagus, holotype, ventral aspect; (dp-dorsal paramere, lp-lateral process, vp-ventral paramere, vv-ventral valve); 31, genital plates, ♀, ventral aspect; 32, left dististyle, ventral aspect; 33, aedeagus, nearly left lateral aspect; (dv-dorsal valve, vv-ventral valve). Scale a-fig. 27; b-figs. 28-29; c-figs. 30-33.

mens). Pterostigmal band broad, entire, forked posteriorly. Basal band entire and narrowly constricted near media (holotype and 4 paratypes), broken near its mid-length (1 ♂), or not constricted. Marginal spot present; small spot in cell 1st Cu_1 in some specimens, rarely extending into cell 1st M. *Abdomen of ♂*: Terga 2-5 blackish brown; corresponding sterna tan; segment 6 mostly blackish brown, paler apically; segments 7-9 dark yellowish brown except hypovalves of sternum 9 brown. Posterior process of tergum 3 very narrowly triangular (fig 29), extending about halfway across tergum 4. Hypovalves elongate (fig 28), widest in basal 1/2, slightly overlapping mesally, outer edges infolded. Sides of tergum 9 subparallel in apical 1/2, tip broadly rounded. Dististyles long, with dense, short hairs on outer basal 2/3, fewer, longer hairs on ventral portion of basal lobes and along mesal margins; basal lobe produced dorsally as a blunt, smooth tooth (fig 32). Aedeagus elongate, ventral valves with a conspicuous ventral projection (fig 33); ventral parameres ending in blunt blades, subappressed to lower sides of ventral valves; dorsal parameres (concealed in undissected specimen) pale, pointed at apex, subtriangular, divergent. *Abdomen of ♀*: Terga 2-6 black; corresponding sterna sordid yellowish brown; segments 7-10 light brown, cerci black. Subgenital plate of sternum 8 deeply notched apically, with a group of bristles on each posterior lobe and 4 or 5 bristles evenly spaced on apical 2/3 of lateral margins. Axial portion of genital plates thick, oval, with rounded anterolateral lobes; caudal apex subhyaline, aperture very small, subterminal, the duct sclerotized, clearly visible in all (4) ♀♀ dissected (fig 31); arms of plate spatulate, yellowish.

Body length, ♂, about 12-14 mm (holotype 14 mm); ♀, about 11-15 mm (allotype 12.5 mm). Length of fore wing, ♂, 12.8-13.8 mm (holotype 13.5 mm); ♀, 13.0-14.6 mm (allotype 13.8 mm).

Holotype ♂ (BISHOP 6677), Dak Song, 76 km SW of Ban Me Thuot, Vietnam (see map), 870 m, 19-21.V.1960, L. W. Quate. Allotype ♀, and 1 ♀ paratype, same data as holotype. Other paratypes, all from Vietnam: 2 ♀♀, Ban Me Thuot, 500 m, 16-18.V.1960; 1 ♀, Ban Me Thuot, 500 m, 20-24.XII.1960; 4 ♀♀, Blao (Balao), 500 m, 14-21.X.1960; 1 ♂, 3 ♀♀, Dilinh (Djiring), 920-1200 m, 22-28.IV.1960; 1 ♂, Ap Hung-Lam, 21 km, NW of Dilinh, 1100 m, 29.IX-5.X.1960, L. W. & S. Quate & C. M. Yoshimoto; 7 ♂♂, 3 ♀♀, Fyan, 900-1000 m, 11.VII-9.VIII.1961, N. R. Spencer; 1 ♀, Fyan, same dates but 1200 m. Holotype, allotype and most paratypes in Bishop Museum; 3 ♂ and 3 ♀ paratypes in Snow Museum.

This species very closely resembles *N. baviensis* Cheng in wing markings and many structural details, and I had tentatively identified it as the latter until Dr Cheng generously sent me the dissected genital bulb of ♂ paratype of *baviensis*. Dorsal tooth of basal lobe of dististyle in *baviensis* (fig 8) is sharp pointed and somewhat hooked or curved at the tip, whereas it is blunt and thick in *annamensis*. In *baviensis*, the hypovalves are widest in the apical 1/2, but they are widest in the basal 1/2 in *annamensis*. The aedeagus (compare figs 9, 10 and 30, 33) shows a number of structural differences in both ventral and lateral aspect, notably the longer, thicker ventral valves in *baviensis*. To judge from comparison of these two male types, *annamensis* is a somewhat smaller and less darkly colored species than *baviensis*, but such differences could be due to individual variation. Among the series of specimens of *annamensis*, the most extensive wing markings are found in the 3 ♀♀ from Ban Me Thuot, in which the apical band is entire and so wide that it nearly joins the pterostigmal band posteriorly. The genital plates, however, suggest that these individuals are conspecific with those less darkly marked. The 2 re-

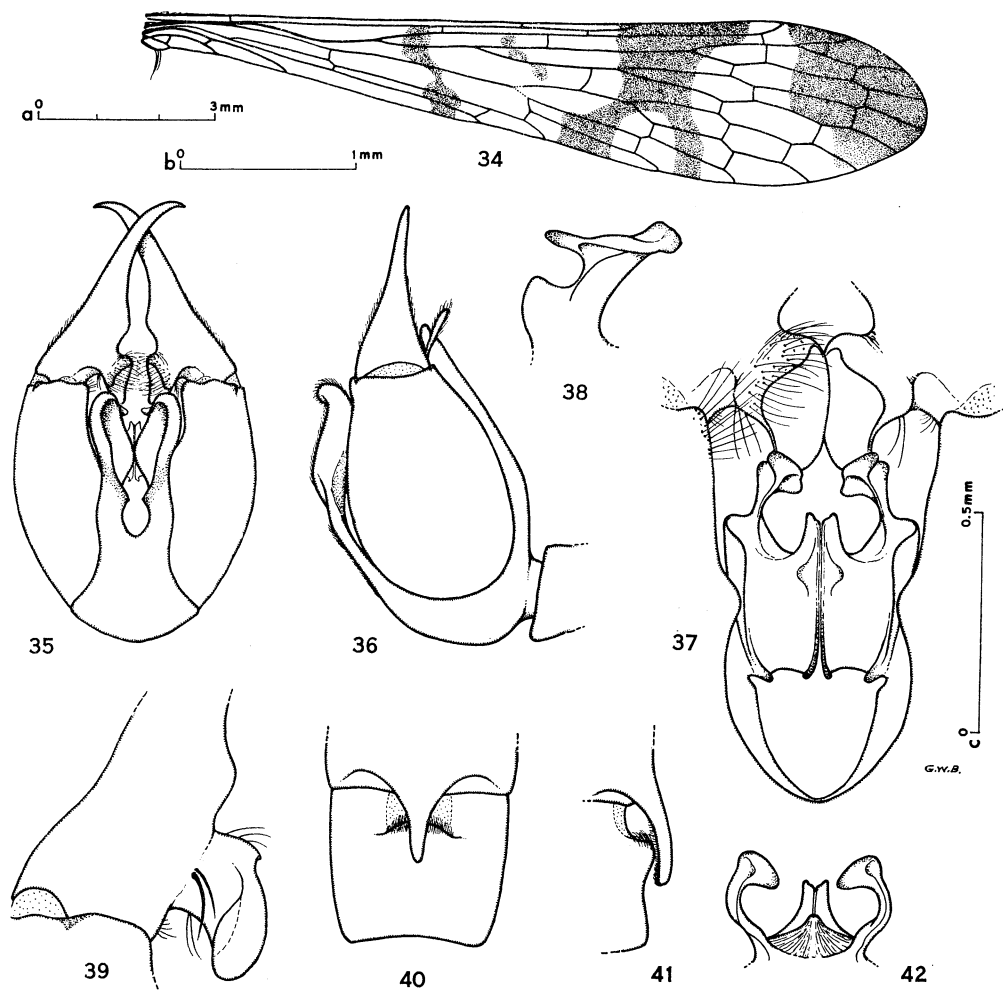
maining ♀♀, taken at 920 and 1200 m, have wings less broadly marked than ♀♀ collected at lower elevations. The most restricted wing markings are found in 2♂ paratypes, which agree with the holotype in genitalic structure. They were collected at 1100 and 1200 m, respectively, while all but 2 of the others were taken at 500 to 870 m. Furthermore, the wings of the ♂ holotype are not as broadly marked as those of ♀♀ taken at the same elevation, as in the case of the ♂ and ♀ taken at 1200 m. It appears, therefore, that extent of wing pattern is correlated with sex and with elevation. In the Museo de Zoologia, Barcelona, Spain, there is a ♀ apparently of this species, labelled "Tonquin, 1917."

Neopanorpa burmana Byers, n. sp. Figs 34-42.

Description based on 2 ♂♂, pinned.

Head: Dorsum of head down to antennal sockets black to blackish, brown, darkest around ocelli; rostrum dark yellowish brown. Antennal scape pale yellowish brown, pedicel brown, flagellum dark brown with 43-44 segments (holotype 43). *Thorax*: Pronotum brownish black, darkest medially, without spines on anterior margin. Mesonotum black on anterior 1/2 and along mid-line as a broad band extending back over scutellum; posterolateral surfaces of scutum dull yellowish brown. Color pattern of metanotum similar to that of mesonotum in holotype, only a broad median blackish stripe in paratype. Pleural areas yellowish brown, unmarked. Femora yellowish brown; tibiae sordid yellowish brown; tarsi brown, palest basally, not blackened apically. *Wings* (fig 34) tinged with yellowish brown, marked with brown. Apical band incomplete posteriorly, fading abruptly behind R₅ and disappearing in anterior medial field. Pterostigmal band entire, distinctly separated from apical band at costal edge of wing, forked posteriorly, with distal fork narrower and less densely colored than proximal fork. Marginal spot present (in fore wings only and somewhat fragmented in holotype, as illustrated), elongate, diagonal, not attaining costal margin. Basal band not touching anterior wing margin, constricted near mid-length, reduced to small spot in cubital area in hind wings. No basal spot. *Abdomen of ♂*: terga 2-5 dark brown to blackish brown; corresponding sterna yellowish brown. Segment 6 blackish brown anteriorly, yellowish brown in posterior 1/4. Segments 7-9 yellowish brown. Posterior process of tergum 3 triangular in basal 1/2, slender in apical half (fig 40), paling to brown at tip, extending 1/2-2/3 length of tergum 4; tergum 4 depressed anterodorsally, with median yellow spot beneath base of process of tergum 3. Hypovalves (fig 35) convex laterally, concave mesally, with sinuate, basally toothed ventromesal margins, outer margins strongly infolded dorsally, apices curved inward. Tergum 9 narrow, widened slightly at level of tips of basistyles, with nearly truncate apical margin. Dististyles long, slender in apical 1/2, with outer margins broadly and shallowly concave (fig 35). Basal lobe of dististyle flared dorsally and medially (figs 35, 37), the expansion somewhat pendulous (fig 39). Ventral valves of aedeagus much longer than dorsal valves (fig 42); ventral parameres not evident, perhaps represented by small projections on ventral surface of aedeagus; lateral process and dorsal paramere at each side joined to form a complex projection extending to just beneath basal lobe of dististyle (figs 37, 38, 42).

Body length, ♂, about 12-13 mm (holotype about 13 mm). Length of fore wing 12.0-13.6 mm (holotype 13.6 mm).



Figs. 34-42. *Neopanorpa burmana* n. sp. 34, right fore wing, holotype; 35, genital bulb, ♂ holotype, ventral aspect; 36, same, right lateral aspect; 37, aedeagus and basal lobes of dististyles, holotype, ventral aspect (most hairs omitted from right dististyle); 38, aedeagal projection formed by fusion of lateral process and dorsal paramere, mesal aspect, ventral side at left (reconstruction); 39, basal portion of right dististyle, dorsal aspect; 40, abdominal terga 3 & 4, ♂, dorsal aspect; 41, same, left lateral aspect; 42, apex of aedeagus, dorsal aspect. Scale a—fig. 34; b—figs. 35-36, 40-41; c—figs. 37-39, 42.

Holotype ♂, Carin Chebá (Karen Hills), S. Burma (see map), V-XII.1888, 900-1100 m, Leonardo Fea; in the Museo Civico di Storia Naturale Giacomo Doria, Genoa, Italy. One ♂ paratype, same data as holotype, in the Navás collection, Museo de Zoología, Barcelona, Spain.

In general appearance and in certain structures, notably the hypovalves of sternum 9, this species most closely resembles *N. angustipennis*, and both specimens were identified

as that species by Navás (yet almost certainly on the basis of wing pattern only). It differs from *angustipennis* in several details of ♂ genitalia, including the structure of the basal lobe of the dististyles and the peculiar projections formed by fusion of the dorsal parameres and lateral processes of the aedeagus. The wing membrane in *burmana* is more distinctly colored than that of *angustipennis*, and the markings are less intense, which characters should aid in the differentiation of ♀♀ as well as ♂♂. The name of the species is taken from that of its native country, Burma.

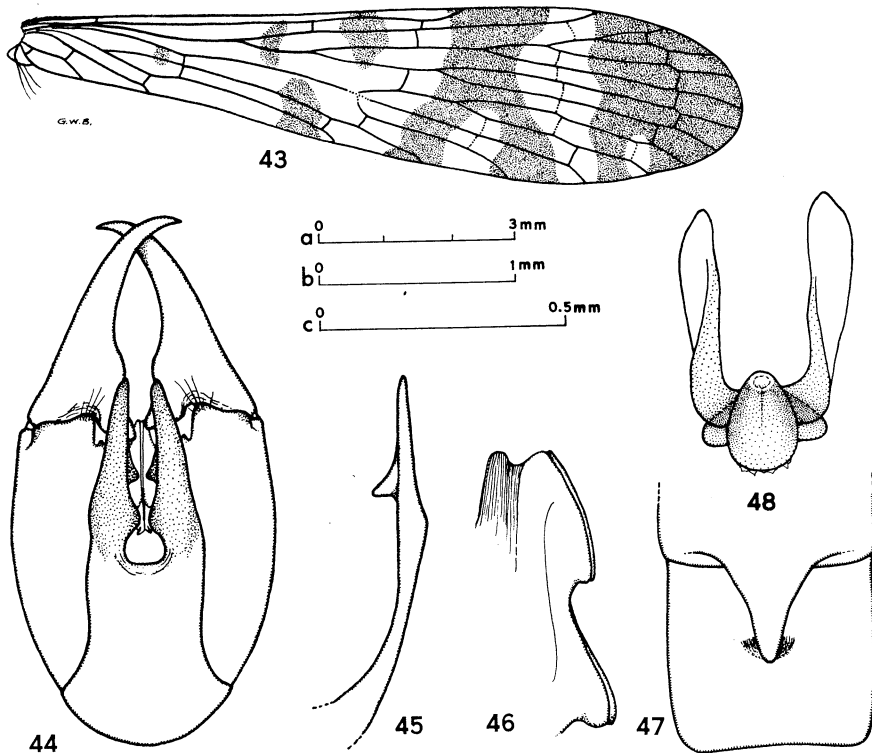
***Neopanorpa cuspidata* Byers, n. sp.** Figs. 43-48.

Description based on 5 ♂♂ and 13 ♀♀, pinned.

Head: Dorsum of head shining black; rostrum yellowish brown, palps and apical margin of labrum brown. Antennal scape yellowish, pedicel brown; flagellar segments 40-41 in number, brownish black. **Thorax:** Pronotum black, with 2 or 3 black bristles on each side on anterior margin. Mesonotum black on anterior 1/2 and backward along mid-line as a broad stripe including scutellum, leaving pale yellowish brown areas posterolaterally near wing bases. Metanotum light yellowish brown laterally, with median band of brownish black continuing over scutellum. Pleural and ventral surfaces pale yellowish brown. Femora yellowish brown, tibiae sordid yellowish brown, tarsi darkening from brown at base to black at apex. **Wings** (fig 43) very lightly tinged with yellowish brown, bands and spots dark smoky brown. Apical band broad, entire (holotype) or with an included small, round pale spot at posterior edge. Pterostigmal band entire, forked posteriorly. Marginal spot opposite first fork of media. Basal band extending diagonally from costa across Rs to apex of cell Cu₂, narrowly constricted near mid-length, or divided. A small basal spot between bases of veins M and Cu₁ and slight darkening along anal margin of fore wings in allotype and a few paratypes. **Abdomen of ♂:** Terga 2-5 brownish black with narrow, light yellowish brown posterior margins; corresponding sterna yellowish brown. Segment 6 mostly brownish black, paler in apical 1/4; segments 7-9 yellowish brown, except for darkened hypovalves of sternum 9. Posterior process of tergum 3 broad at base, slender in apical 1/2, extending only about half-way across tergum 4 (fig 47). Hypovalves slender, subparallel, not overlapped, their apices pointed (fig 44); a broad, somewhat flattened lobe, near mid-length of each hypovalve, directed dorsally and medially (fig 45). Tergum 9 narrow, truncate at apex. Dististyles long, slender, with a blunt median basal lobe. Aedeagus slender, extending upward between bases of dististyles. **Abdomen of ♀:** Terga 2-7 black; corresponding sterna yellowish brown; segments 8-10 brownish; cerci black. Subgenital plate of sternum 8 notched apically, bearing a small cluster of stout hairs on each posterior lobe. Axis of genital plates oval in ventral aspect (fig 48), with rounded lateral extensions.

Body length ♂, about 11-12 mm (holotype 12 mm); ♀, about 12-13 mm (allotype 12 mm). Length of fore wing, ♂, 11.8-13.1 mm (holotype 13.1 mm); ♀, 13.0-13.2 mm (allotype 13.1 mm).

Holotype ♂, Tak, Thailand (see map), 860 m, 20.VIII.1961, Prachueb, Lot number 2783. Allotype ♀, 1 ♂ and 3 ♀ paratypes, same data as holotype. Additional paratypes, all from Thailand: 1 ♂, 4 ♀♀, Kanchanaburi, 750 m, 31.V.1962, Phol, Aroon and Cheun, Lot 2824; 2 ♂♂, 3 ♀♀, Chanthaburi, 22.VII.1962, Phol, Lot 2834; 1 ♀, Chiengtai, 330 m, 15.V.1942, Swart, Lot 910; 1 ♀, Chiangdao, Chiangmai Prov., 6.IV.1958, Phol, Lot 2409. Holo-



Figs. 43-48. *Neopanorpa cuspidata* n. sp. 43, right fore wing, ♂ paratype (Kanchanaburi, Thailand); 44, genital bulb, ♂ holotype, ventral aspect; 45, left hypovalve, left lateral aspect; 46, aedeagus, nearly left lateral aspect (partially reconstructed); 47, abdominal terga 3 & 4, ♂ paratype, dorsal aspect; 48, genital plates, ♀ allotype, ventral aspect. Scale a—fig. 43; b—figs. 44-45, 47; c—figs. 46, 48.

type, allotype and most paratypes in collection of Department of Agriculture, Bangkok; 1 ♂ paratype from Tak and 1 ♂ and 1 ♀ from Kanchanaburi in Snow Museum.

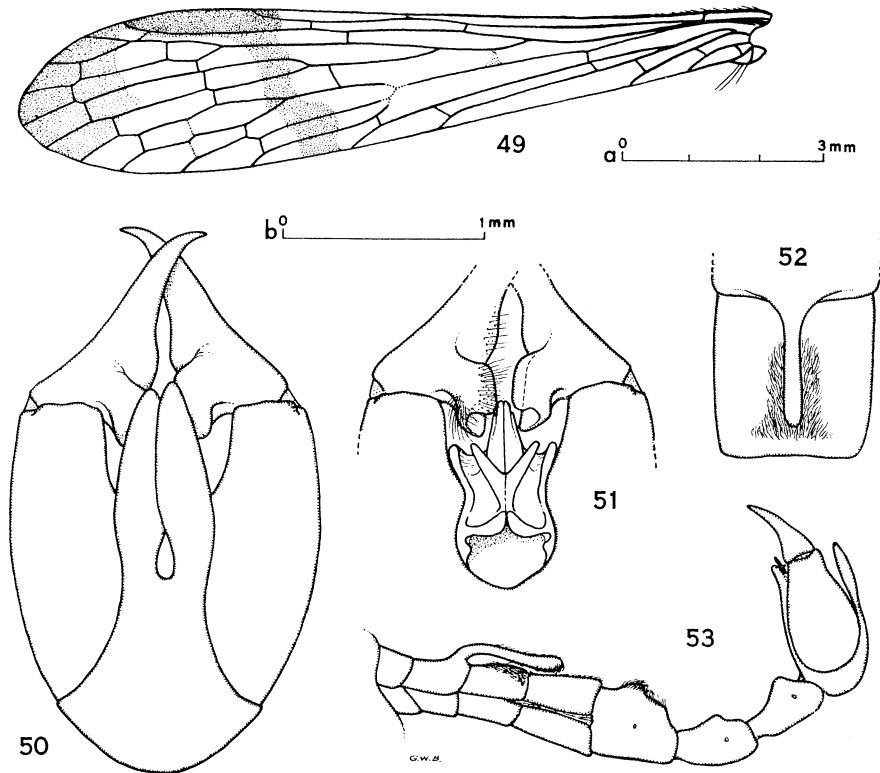
In many respects, this species appears closely akin to *Neopanorpa angustipennis*, from which it may be distinguished by the peculiar shape of the hypovalves of ♂. These structures in most species of *Neopanorpa* are wide, and even when relatively slender, as in *angustipennis*, they usually have the medial margins overlapped in the apical 1/2, or so. The specific name (Latin *cuspidata*=pointed) refers to the rather acuminate, non-overlapping hypovalves. The ♀ differs from other species in the ovoid shape of the axial portion of the genital plates.

***Neopanorpa dorsalis* Byers, n. sp. Figs. 49-53.**

Description based on 2 ♂♂ and 1 ♀, pinned.

Head: Dorsum of head glossy brownish black, frons below antennal sockets brown in ♀; rostrum reddish brown. Antennal scape yellowish brown, pedicel brown, flagellum black, incomplete in all specimens but having at least 39 segments. **Thorax:** Pronotum dark brown

grading into tan laterally, with 3 (holotype) or 4 short setae at each side on anterior margin. Mesonotum black on anterior 1/2, the color continuing backward as a broad median stripe, fading to brown on scutellum; posterolateral areas of scutum dark yellowish brown. Color pattern of metanotum as in mesonotum but less distinct and not as dark. Pleural surfaces yellowish brown. Legs and tarsi dull yellowish brown, apices of tibiae and basitarsi faintly darkened; apical tarsal segments dark. *Wings* (fig 49) faintly tinted with gray, the markings light to dark brown. Stigmal area dark brown; diagonal pterostigmal band brown, complete; apical band light brown, incomplete posteriorly (distal cell M_1 clear); a small transverse spot between Rs and M, except in ♂ paratype, which also has more slender pterostigmal band. *Abdomen of ♂*; Terga 2-5 mottled brown and yellowish brown, darkest toward thorax; corresponding sterna tan. Posterior process of tergum 3 elongate, more or less cylindrical, extending nearly to posterior margin of tergum 4 (holotype, fig 52) or slightly beyond it. Segment 6 mottled light brown and yellowish brown, thick dorsoventrally, with a median dorsal protuberance (fig 53) bearing stiff black hairs



Figs. 49-53. *Neopanorpa dorsalis* n. sp. 49, left fore wing, holotype; 50, genital bulb, ♂ holotype, ventral aspect; 51, aedeagus and basal portions of dististyles, ♂ paratype, ventral aspect (hairs omitted, right dististyle); 52, abdominal terga 3 & 4, holotype, dorsal aspect; 53, abdomen, ♂ paratype, left lateral aspect. Scale a—figs. 49, 53; b—figs. 50-52.

directed caudad, and along dorsal mid-line between protuberance and posterior margin of segment a group of stiff, erect hairs with tips bent cephalad. Segments 7-8 unusually short, yellowish brown. Hypovalves of sternum 9 lanceolate, flattened, their margins not infolded and only slightly overlapping medially (fig 50). Tergum 9 narrow, squarely truncate at apex. Dististyles slightly concave on outer surfaces, their basal lobes, seen from below, subquadrate (fig 51) but each with a broad, nearly vertical, plate-like extension directed dorsad and slightly mesad, the large, shallowly concave surfaces thus produced facing each other. Aedeagus long, slender, projecting up between bases of dististyles, ventral parameres produced into thin, almost transparent blades forming a V-shape (fig 51) in ventral aspect. *Abdomen of ♀*: The single ♀ specimen has been badly damaged, apparently by psocids, and of the abdomen only the first 3 terga remain. These have a brown color.

Body length, ♂, about 10-11 mm (holotype 10 mm). Length of fore wing, ♂, 11.2-11.8 mm (holotype 11.2 mm); ♀, 12.7 mm

Holotype ♂ (BISHOP 6678), Dalat, Vietnam (see map), 1500 m, 26-27.IX.1960, J. L. Gressitt. Paratypes: 1♂, 17 km E of Dilinh, Vietnam, 1300 m, 6-13.X.1960, C. M. Yoshimoto; 1♀, Dalat, 1500 m, 29.IV-4.V.1960, L. W. Quate. The ♀ has not been made allotype since because of its poor condition it lends little to an understanding of the species. Holotype and ♀ paratype in the Bishop Museum; ♂ paratype in the Snow Museum.

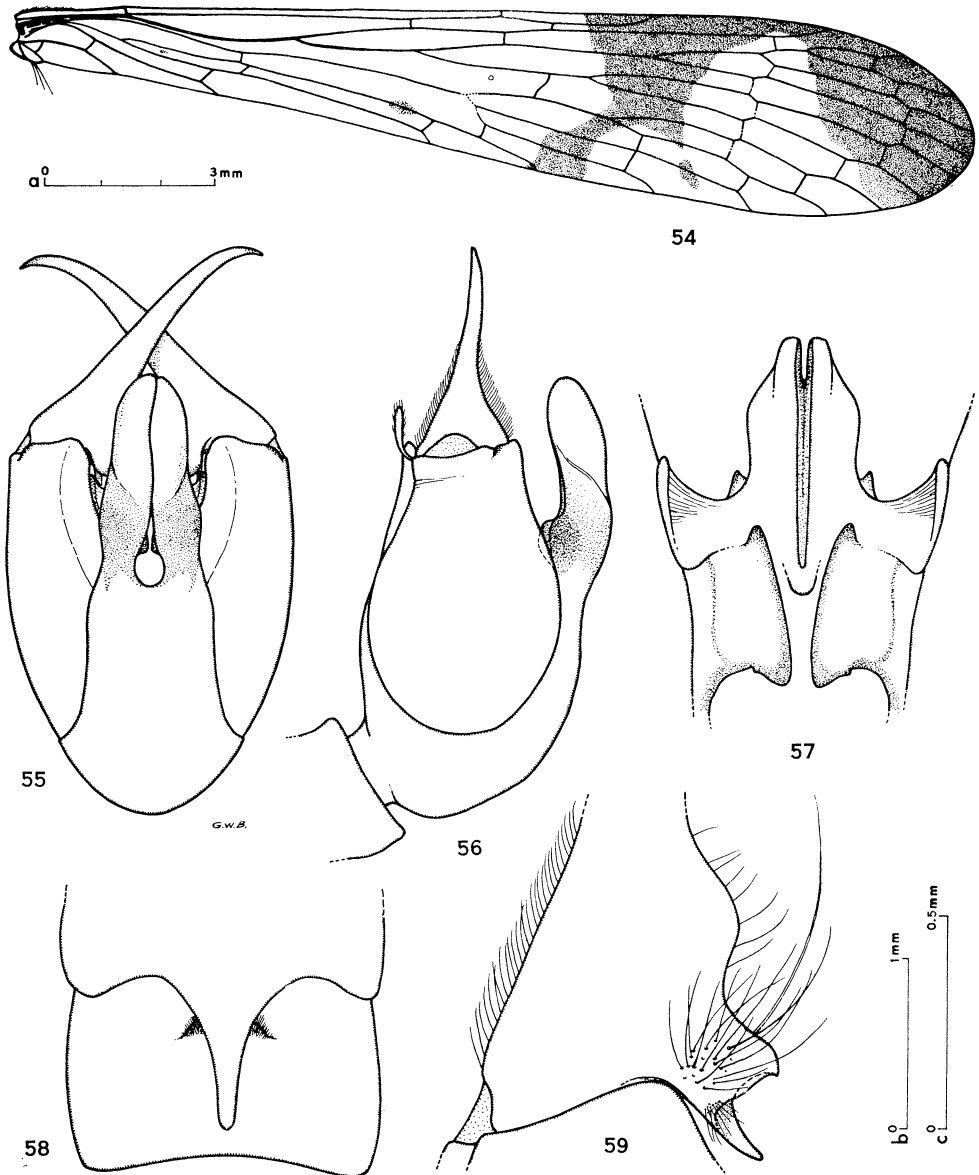
This species somewhat resembles *N. heii* Cheng from Sikang, China (Cheng, 1957: 80, fig 293), in the markings of the fore wings and the ventral aspect of ♂ dististyles. However, it differs from that species in having a long process on abdominal tergum 3, in the peculiar segment 6, the short segments 7 & 8, the shape of the hypovalves, marking of the hind wings and aedeagal structure. These characters will also differentiate *dorsalis* from all Indo-Chinese species of *Neopanorpa*, the modifications of terga 3 & 6 being particularly conspicuous and suggesting the specific name (Latin *dorsalis*=pertaining to the back). Even though the genital plates are unknown, it appears that ♀♀ may be recognized among species of the region on the basis of wing markings alone.

***Neopanorpa nielseni* Byers, n. sp. Figs. 54-59.**

Description based on 2 ♂♂, pinned.

Head: Dorsum of head shining black, paling to dark brown on frons just below and around edges of antennal sockets; rostrum dark amber brown with yellowish brown median stripe and lateral margins. Antennal scape light yellowish brown at base, brownish at apex, pedicel brown, flagellum blackish brown with 48 segments. *Thorax*: Pronotum unevenly brownish black, with 2 stout bristles at each side on anterior margin. Mesonotum black anteriorly and medially, including all of scutellum, sordid yellowish brown on posterolateral corners of scutum. Metanotal color pattern same as that of mesonotum. Pleural areas sordid yellowish brown. Legs only slightly darker than pleura, apices of tibiae brown; tarsi brown grading into dark brown on segments 4 & 5. *Wings* (fig 54) very faintly tinged with grayish brown, banded with smoky brown. Apical band broad, paling posteriorly near vein R₅ and ending before M₁, its inner margin fairly smooth in holotype but with short pointed projection in paratype. Pterostigmal band entire, broad anteriorly and narrowly connected along costal margin to apical band, with slender prox-

imal and faint distal branches posteriorly. In fore wings, small spots cross Rs near its mid-length (absent in right wing of holotype) and Cu_1 at level of first branch of Rs; also, in paratype only, a small spot in distal 1/2 of cell 1st R_1 at level of first branching of



Figs. 54-59. *Neopanorpa nielsenii* n. sp. 54, right fore wing, holotype; 55, genital bulb, ♂ holotype, ventral aspect; 56, same, left lateral aspect; 57, aedeagus, holotype, ventral aspect; 58, abdominal terga 3 & 4, holotype, dorsal aspect; 59, basal portion of dististyle, holotype, ventral aspect. Scale a—fig. 54; b—figs. 55-56, 58; c—figs. 57, 59.

M. *Abdomen of ♂*: Terga 2-4 black; sterna 2-5 pale dull yellowish brown (discolored in paratype); tergum 5 and all segment 6 dark blackish brown; segments 7-9 yellowish brown, except hypovalves of sternum 9 dark brown. Posterior process of tergum 3 (fig 58) broad basally, slender apically, nearly crossing tergum 4; median elevation of tergum 4 nearly concealed in dorsal aspect. Sternum 9 shallowly furrowed below hypovalves. Hypoalves elongate, with subparallel sides (fig 55), broadly overlapped medially for most of their length, with outer margins strongly infolded dorsally. Tergum 9 truncate at apex. Dististyles long, slender, evenly curved, with a slightly pointed, pendulous basal lobe bearing a setiferous ventral prominence and an elongate, incurved dorsal tooth (fig 59). Ventral valves of aedeagus thickened, slightly divergent at apex, projecting a little beyond slender, ventrally curved dorsal valves. Ventral parameres short, inconspicuous; dorsal parameres short points at corners of quadrate projection, sides of which are continuous with upper margins of lateral processes.

Body length, ♂, about 15-16 mm (holotype 16 mm). Length of fore wing 16.9-17.0 mm (holotype 17.0 mm).

Holotype ♂, Tonkin (N. Vietnam; labelled "Tonquin"), 1917 (without day or month). One ♂ paratype, Nam Long, Tonkin (see map), 28.IV.1918. The holotype is in the Museo de Zoología, Barcelona, Spain, and the paratype is in the Snow Museum. Although it has less complete data, the holotype was selected because of its much better state of preservation; its genital bulb has been removed, dissected, and placed in glycerin in a vial on the pin with the remainder of the specimen.

This species is the largest known of its genus in the fauna of Indo-China, approached in size only by *N. baviensis* Cheng, also a Tonkinese species. The ♀ from near Hoa Binh, Tonkin (in the Museum National d'Histoire Naturelle, Paris), referred to *N. cavaleriei* by Navás, may well belong to this species. Both ♂♂ of *N. nielsenii*, incidentally, were identified by Padre Navás as *N. angustipennis* and bear his determination label. I was able to make detailed comparison of this species with the type of *N. cavaleriei* at the Paris Museum. The two are very similar in size and general appearance yet differ in the shape of the genital bulb (that of *nielsenii* being more slender) and in details of the dististyles, aedeagus and hypoalves. The dististyles in *cavaleriei* are thicker than those of *nielsenii* and have a much shorter dorsal tooth on the basal lobe. The sides of the ventral aedeagal valves in *cavaleriei* are more rounded than in *nielsenii*, and the ventral parameres are in contact mesally, below the ventral valves. In the holotype of *cavaleriei*, a pair of rounded membranous structures protrudes from beneath (anterior to) the aedeagus, but I suspect this may be an individual, post-mortem effect, as this part of the genital bulb usually recedes dorsad, in dried specimens, forming a hollow, as in *N. nielsenii*.

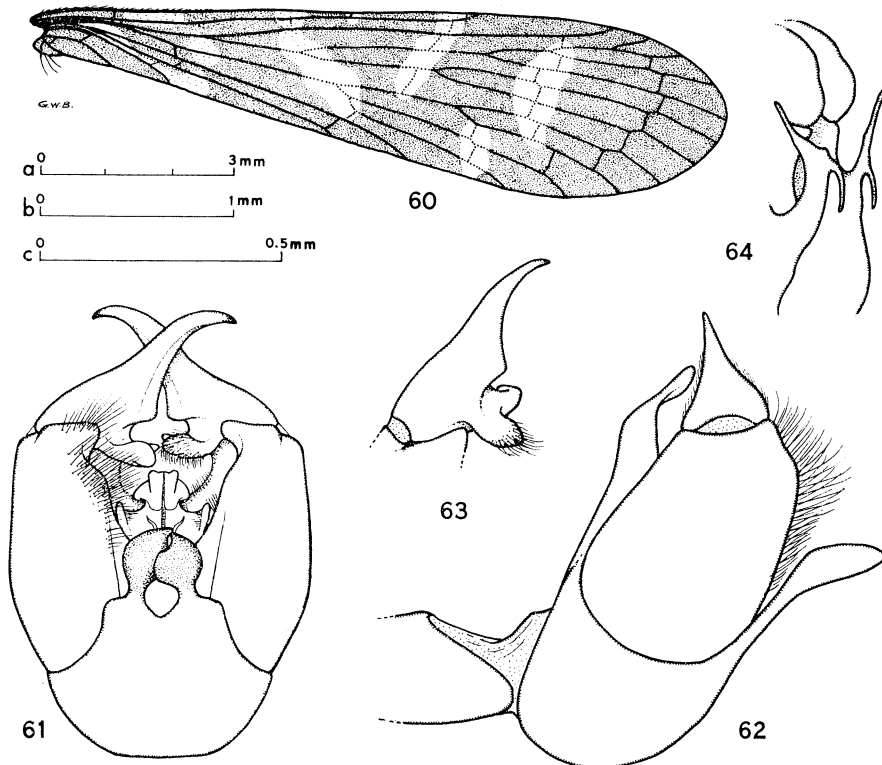
This species is named in honor of my good friend, Peder Nielsen, of Silkeborg, Denmark, who early encouraged my studies of Mecoptera by presenting me with a copy of a monograph on the order by his late friend and fellow townsman, P. Esben-Petersen.

Neopanorpa ornata Byers, n. sp. Figs. 60-64.

Description based on 1♂, pinned.

Head: Dorsum of head shining black, a median, dark brown spot on frons just below antennal sockets; rostrum clear yellowish brown; antennal scape yellowish brown, pedicel brownish, flagellum brownish black, with 43 segments. *Thorax*: Pronotum black, without

conspicuous bristles on anterior margin. Mesonotal scutum black on anterior 1/2 and backward along mid-line onto scutellum; posterolateral areas of scutum and extreme lateral edges of scutellum yellowish brown. Color pattern of metanotum like that of mesonotum except darker areas brownish black, fading to brown on anterolateral shoulders of scutum. Pleural areas with vertically banded appearance, brown on episterna and anterior surfaces of coxae, light yellowish brown on epimera, posterior surfaces of coxae, and mera. Femora, tibiae and basitarsi sordid yellowish brown, tips of tibiae and basitarsi narrowly darkened, succeeding tarsal segments darkening to blackish at apex. *Wings* broadly banded with smoky brown, the apical, pterostigmal and basal bands, intermediate and basal spots all broadly connected (fig 60). Veins in clear areas pale. *Abdomen of ♂*: Terga 2-5 brown, narrowly bordered posteriorly with pale yellowish brown; corresponding sterna light brown; segments 6-9 yellowish brown. No trace of posterior process on tergum 3, either in dorsal or lateral view; tergum 4 also unmodified. Hypovalves of sternum 9 small, oblong, slender at base, with lateral margins only slightly rolled inward



Figs. 60-64. *Neopanorpa ornata* n. sp. 60, right fore wing, holotype; 61, genital bulb, ♂ holotype, ventral aspect (most hairs omitted from right basistyle and from basal lobe of left dististyle); 62, same, left lateral aspect; 63, left dististyle, posterodorsal aspect, to show division of basal lobe; 64, aedeagus, ventrolateral (posterolateral) aspect. Scale a—fig. 60; b—figs. 61-63; c—fig. 64.

dorsally, only moderately darkened. Tergum 9 unusually long (fig 62), slightly narrowed, bent backward (downward) and medially depressed near apex. Inner (posteroventral) margins of basistyles very hairy; smaller patches of short, stiff black hairs also beside aedeagus and on inner dorsal margins of basistyles (fig 61). Dististyles short, deeply indented above basal lobes, which are somewhat flattened and mesally cleft (figs 61, 63), the posterior (ventral) portion hairy, anterior portion without hairs. Aedeagus thickened apically, with short, stout lateral processes, ventral parameres produced into slender blades with divergent filaments (fig 64).

♀ unknown.

Body length, ♂, about 12 mm. Length of fore wing 10.7 mm.

Holotype ♂ (BISHOP 6679), Ban Me Thuot, Vietnam (see map), 500 m, 16-18.V.1960, S. and L. W. Quate.

The specific name (Latin *ornata*=handsome, ornamented, or adorned) refers both to the attractive wing pattern and the complicated genitalial structures.

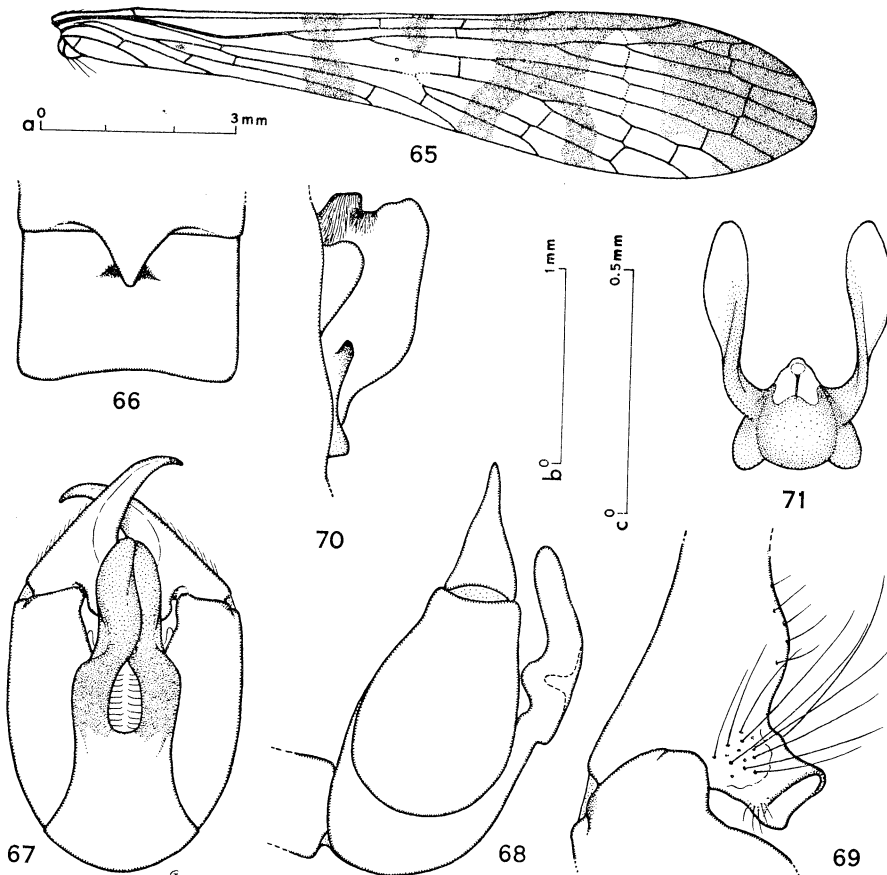
On the basis of the wing markings, this species appears most closely related to *N. harmandi*, but I do not see any further indications of such a kinship. The complete absence of a posterior process of abdominal tergum 3 and correlated modification of tergum 4 sets this species quite apart from all other *Neopanorpa* known to me. Few species of *Neopanorpa* have extremely hairy basistyles (cf. *N. ovata* Cheng from China), and among those of SE Asia nearly all have hypovalves much longer than those of *ornata*. The peculiar dististyles, the long tergum 9, and the aedeagal structure will also serve to distinguish his species from others in the genus. When ♀ of *ornata* is discovered, the genital plates will no doubt provide some further evidence of the species' relationships. If the thoracic coloration described for ♂ occurs also in ♀, it ought to permit species recognition, should the wing markings alone not suffice. I anticipate a degree of variation in wing pattern in *ornata* comparable to that seen in *N. harmandi*.

***Neopanorpa panda* Byers, n. sp. Figs. 65-71.**

Description based on 9♂♂ and 18♀♀, pinned.

Head: Dorsum of head glossy black; lower part of frons brown; rostrum reddish brown. Antennal scape yellowish brown, pedicel brown, flagellum (both flagella absent in holotype and ♂ paratype) black, with 43 (allotype) to 46 segments. **Thorax:** Pronotum black with 2 stout black setae at each side on anterior margin. Mesonotum black on anterior 1/2 and backward as wide band along scutal mid-line and covering scutellum. Metanotum with a broad black median band widened anteriorly and covering scutellum posteriorly. Pleural areas sordid yellowish brown. Legs and tarsi dark yellowish brown, tarsal segments narrowly darkened at apex. **Wings** (fig 65) very faintly tinged with gray, markings smoky brown. Apical band including small posterior pale spot (allotype) or incomplete posteriorly (all other specimens). Pterostigmal band entire (except in 1♂ from Fyan, Vietnam), forked posteriorly, connected to apical band along costal margin in holotype, allotype and some paratypes. Basal band entire (except in 3♂♂, 1♀ from Fyan), of variable width. Marginal spot present. **Abdomen of ♂:** Terga 2-3 black; terga 4-5 brownish black, their median posterior margins dark yellowish brown; corresponding sterna sordid yellowish brown. Segment 6 mostly brown grading into yellowish brown at apex; seg-

ments 7-9 yellowish brown, except hypovalves of sternum 9 brown. Posterior process of tergum 3 broadly triangular, short, extending less than halfway across tergum 4. Hypovalves (fig 67) dark brown at base to brown at tip, conspicuously bent together near mid-length; separated basal portions bearing stiff, black hairs projecting inward along inner margins; outer edges strongly infolded, inner edges not infolded, broadly overlapping, with a stout dorsal projection near mid-length (fig 68). Tergum 9 only slightly narrowed in distal 1/2, very broadly rounded to truncate at tip. Dististyles slender, with dark hairs on outer surfaces, longer, yellowish hairs on inner surfaces, longest on roughened protuberance on basal lobe; basal lobe slightly pendulous, cupped, with only a low, broad tooth on dorsal margin (fig 69). Ventral valves of aedeagus extend slightly beyond dorsal valves (fig 70); ventral parameres short, ending in flattened blades subappressed to ventral



Figs. 65-71. *Neopanorpa panda* n. sp. 65, right fore wing, holotype; 66, abdominal terga 3 & 4, ♂ holotype, dorsal aspect; 67, genital bulb, holotype, ventral (posterior) aspect; 68, same, left lateral aspect; 69, basal portion of left dististyle, ♂ paratype, ventral aspect; 70, aedeagus, left lateral aspect (partially reconstructed); 71, genital plates, ♀ allotype, ventral aspect. Scale a—fig. 65; b—figs. 66-68; c—figs. 69-71.

valves; dorsal parameres acutely pointed. *Abdomen of ♀*: Terga 2-5 black, tergum 6 dark brown; corresponding sterna sordid yellowish brown; segments 7-10 brown; cerci black. Subgenital plate of eighth sternum notched apically, with 5 or 6 stout setae on each apical lobe; peripheral setae shorter, more slender. Axial portion of genital plates bearing 2 large, rounded, lateral lobes, giving structure somewhat triangular outline (fig 71); arms of distal plate broadly spatulate, the flattened blade abruptly wider than basal portion.

Body length, ♂, about 11-13 mm (holotype 11 mm); ♀, about 10-12 mm (allotype 10 mm). Length of fore wing, ♂, 11.8-12.1 mm (holotype 11.8 mm); ♀, 11.8-12.5 mm (allotype 12.0 mm).

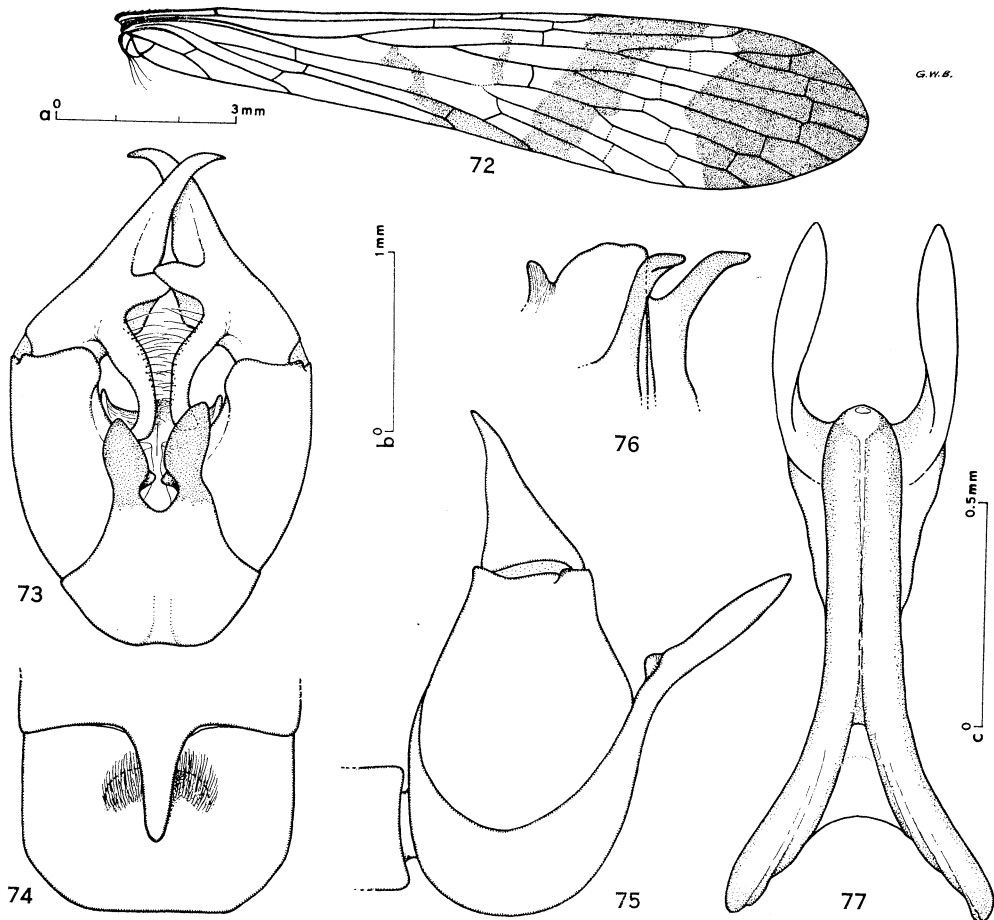
Holotype ♂ (BISHOP 6680), Ap Hung-Lam, 21 km NW of Dilinh, Vietnam (see map), 1100 m, 29.IX-5.X.1960, C. M. Yoshimoto. Allotype ♀, same data as holotype. Paratypes, all from Vietnam: 1 ♂, 17 km S of Dilinh, 1300 m, 6-12.X.1960, C. M. Yoshimoto; 3 ♀♀, Dilinh (Djiring), 920-1200 m, 22-28.IV.1960, S. and L. W. Quate; 1 ♀, 20 km SW of Dilinh (Djiring), 22-28.IV.1960, S. Quate; 1 ♂, 62 km S of Dalat, 1400-1500 m, 9.VI-7.VII.1961, N. R. Spencer; 6 ♂♂, 13 ♀♀, Fyan, 900-1000 m, 11.VII-9.VIII.1961, N. R. Spencer; 1 ♂, Fyan, 1200 m, 11.VII-9.VIII.1961, N. R. Spencer. Holotype, allotype and most paratypes in collection of the Bishop Museum; 4 ♂, 2 ♀ paratypes in the Snow Museum.

This species belongs to the *siamensis* group, as indicated by the structure of the dististyles and aedeagus in ♂ and the genital plates in ♀. The dististyles are nearest those of *N. annamensis*, yet different, and the aedeagus is most like that of *baviensis*. The peculiar form of the hypoalves, however, should make ♂♂ of this species readily recognizable. The specific name (Latin *panda*=bent or crooked) refers to this outstanding characteristic. In wing pattern, *panda* most closely resembles *annamensis* and *siamensis* but has the apical band more extensively interrupted posteriorly. It is also a smaller species than either of these two. The abrupt widening of the genital plates seems to be constant and together with the large lateral lobes of the axis of the plates should allow identification of ♀♀ of *N. panda*.

***Neopanorpa pendulifera* Byers, n. sp.** Figs. 72-77.

Description based on 4 ♂♂ and 6 ♀♀, pinned.

Head: Dorsum of head and frons just below antennal bases shining black; rostrum amber-brown. Antennal scape yellowish brown, pedicel yellowish brown at base, brown at apex, flagellum black, with 45 segments in both sexes. *Thorax*: Pronotum black, with 1 or 2 stout bristles at each side on anterior margin. Mesonotum black except for sub-circular areas of pale yellowish brown on posterolateral corners of scutum. Metanotum with same color pattern as mesonotum. Pleural areas pale yellowish brown. Femora sordid yellowish brown; tibiae brown, slightly darkened at apex; tarsi brown, grading into black on ultimate segment, with apices of segments darkened. *Wings* tinged with light grayish yellow, banded with dark brown (fig 72). Apical band broad, entire, rounded proximally; pterostigmal band entire, diagonal, adjoining a slender, darkened area between Cu_1 and Cu_2 that extends from posterior wing margin diagonally almost to fork of Rs; a slender, transverse spot near thyridium in most specimens (faint in holotype, absent in 1 ♂ paratype). Four ♀♀ show a small spot near posterior margin between apical and pterostigmal bands, and one has some color at first m-cu cross-vein. *Abdomen of ♂*: Terga 2-4 black, 4th with a pale posterior border; tergum 5 dark brown in basal 2/3, remainder dark yellowish brown; sterna 2-5 tan; segments 6-9 dark yellowish brown.



Figs. 72-77. *Neopanorpa pendulifera* n. sp. 72, right fore wing, ♂ paratype (Kanchanaburi, Thailand); 73, genital bulb, ♂ holotype, ventral aspect (hypoalves foreshortened; cf. fig. 75); 74, abdominal terga 3 & 4, holotype, dorsal aspect; 75, genital bulb, holotype, left lateral aspect; 76, aedeagus, ventrolateral (posterolateral) aspect (partially reconstructed); 77, genital plates, ♀ allotype, ventral aspect. Scale a—fig. 72; b—figs. 73-75; c—figs. 76-77.

Posterior process of tergum 3 narrow, elongate, extending more than half-way across tergum 4; median elevation of tergum 4 thickly set with black hairs directed forward (fig 74). Sternum 9 with a shallow median furrow. Hypoalves elongate, darkened, with both edges infolded; basal portion of inner margin with rounded, pale lobe deflected mesally, edges of lobes visible between hypoalves in ventral aspect (fig 73). Hypoalves directed sharply ventrad (fig 75), usually not overlapped medially. Tergum 9 slightly expanded and notched apically. Dististyles long, with smooth, darkened tips; basal lobe divided (fig 73) into an upper, cup-like portion and a large, pendulous, finger-like lower appendage bearing long, medially-directed hairs. Ventral parameres of aedeagus (fig 76) thickened, produced ventrad (posteriorly) in form of spatulate lobes terminating close

beneath tips of pendulous projections of dististyles; lateral processes of aedeagus large, flattened, wing-like. *Abdomen of ♀*: Terga 1-6 black, 5th and 6th narrowly bordered with yellowish brown; terga 7-10 and all sterna yellowish brown. Subgenital plate notched apically, setae more or less uniformly distributed. Genital plates large, axial portion long, stout, with widely divergent anterior apodemes (fig 77).

Body length, ♂, about 12.5-13.5 mm (holotype 13 mm); ♀, 12-12.7 mm (allotype 12.7 mm). Length of fore wing, ♂, 13-13.8 mm (holotype 13.8 mm); ♀, 14-14.2 mm (allotype 14.2 mm).

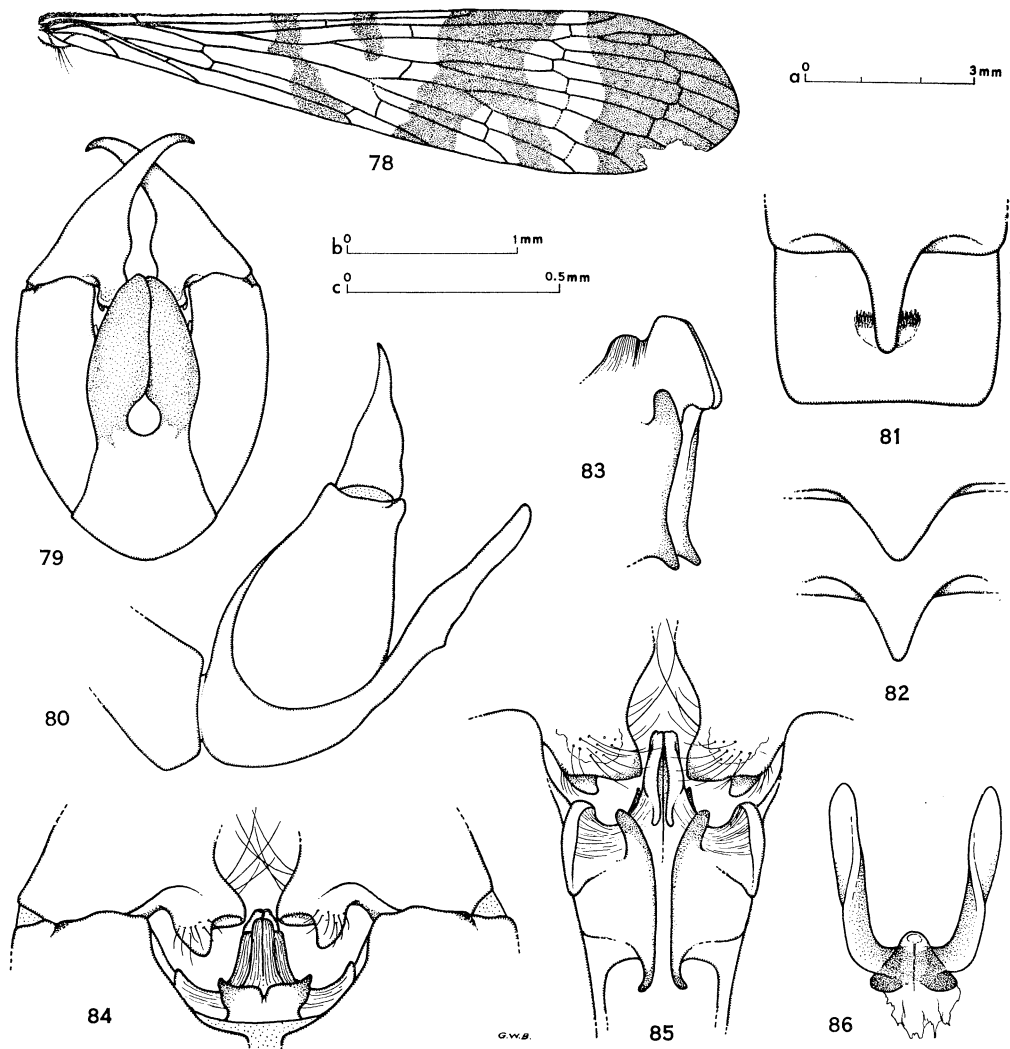
Holotype ♂, Kanchanaburi, Thailand (see map), 750 m, 31.V.1962, Phol, Lot number 2824. Allotype ♀, same data as for holotype except elevation 770 m. Additional paratypes, all from Thailand: 2♂♂, 5♀♀, type locality, 31.V.1962, Phol, Aroon, Cheun and Anant; 1♂, Chanthaburi, 22.VII.1962, Phol, Lot number 2834. Holotype, allotype, 2♂ and 3♀ paratypes in collection of Department of Agriculture, Bangkok; 1♂ and 2♀ paratypes in Snow Museum.

There is no other *Neopanorpa*, as far as I am aware, in which the dististyles bear such large ventral appendages. The specific name (Latin *pendulifera* = bearing a hanging part) refers to this remarkable structure. The only other species having dististyles of a sort similar to those of *N. pendulifera* is *N. harmandi*, in which the lower appendage is quite slender and comparatively short. Also the aedeagal structure is not similar to that of any other regional *Neopanorpa* except *harmandi*. A relationship of *pendulifera* with *harmandi* is still further suggested by the structure of the ♀ genital plates. Other *Neopanorpa* of the Indo-Chinese peninsula have the axial portion of the plates greatly reduced, but a similar structure of this so-called "internal skeleton" is found in *N. caveata* Cheng (Cheng, 1957: 68, fig 204) from Fukien, China, and some other Chinese species, which, however, show no close similarities in the ♂ dististyles. The wing pattern in *pendulifera* will allow immediate separation of the species from *harmandi*, as well as from other regional species.

***Neopanorpa siamensis* Byers, n. sp.** Figs. 78-86.

Description based on 6♂♂ and 11♀♀, pinned.

Head: Dorsum of head brownish black; rostrum yellowish brown, mouthparts darker brown. Antennae long (about 10.5 mm); scape light yellowish brown, pedicel brown, flagellar segments 42 (type) to 46 in number, blackish brown. *Thorax*: Pronotum very dark brown, with 2 thick spines at each side on anterior margin. Mesonotum blackish brown on anterior 1/2, this color continued backward as a broad, median band including scutellum, leaving pale, dull yellowish brown areas adjacent to wing bases. Metanotum with broad blackish brown median stripe, lateral portions dull yellowish brown. Pleural areas yellowish brown (much darker in one teneral ♂ paratype showing dark discoloration on other parts of body as well). Legs yellowish brown; tarsi darker brown, terminal segment darkest. *Wings* (fig 78) very faintly tinged with grayish brown, bands and spots smoky brown. Apical band in fore wing broad, including a small clear spot near posterior proximal corner; or more rarely indented in this corner (holotype), or entire. Pterostigmal band entire, forked posteriorly. Marginal spot present. Basal band entire, constricted or rarely interrupted near mid-length. *Abdomen of ♂*: Terga 2-5 dark brown, darkest along posterior margin of tergum 3; corresponding sterna pale tan; segment 6 mostly dark brown, yellowish brown apically; segments 7-9 yellowish brown except for darkened hypovalves



Figs. 78-86. *Neopanorpa siamensis* n. sp. 78, right fore wing, holotype; 79, genital bulb, ♂ holotype, ventral (posterior) aspect, 80, same, left lateral aspect; 81, abdominal terga 3 & 4, holotype, dorsal aspect; 82, posterior process of abdominal tergum 3: variant forms in ♂ paratypes; 83, aedeagus, holotype, ventrolateral (posterolateral) aspect (partially reconstructed); 84, apex of aedeagus and bases of dististyles, ♂ paratype (Chiangdao, Thailand), dorsal aspect; 85, aedeagus and basal lobes of dististyles, holotype, ventral aspect; 86, genital plates, ♀ allotype, ventral aspect. Scale a—fig. 78; b—figs. 79-82; c—figs. 83-86.

of sternum 9. Posterior process of tergum 3 narrowly (holotype, fig 81) to broadly triangular (fig 82), extending half-way or slightly farther across tergum 4. Hypovalues broad, with lateral margins strongly infolded dorsally, resulting in doubled structures of apparent-

ly oblong shape (fig 79); hairs on dorsal (infolded ventral) surface longer than those on ventral side. Tergum 9 narrow, not conspicuously tapered near apex, with apical margin truncate; lateral margins near apex extended slightly around segment 10. Outer margins of dististyles slightly convex (holotype) or evenly curved, covered with short, yellowish brown hairs; basal lobe thick, slightly pendulous, with a low, irregular ventral prominence bearing yellowish, incurved hairs, and a blunt tooth-like projection dorsally, often concealed in ventral aspect (figs 79, 85). Ventral valves of aedeagus blade-like, appressed, projecting a little beyond dorsal valves (fig 83); ventral parameres spatulate, closely applied to sides of ventral valves, tips free; dorsal parameres wide with mucronate tips (fig 84). *Abdomen of ♀*: Terga 2-6 blackish brown; sterna sordid yellowish brown; segments 7-10 brown; cerci black. Subgenital plate of sternum 8 deeply incised apically; a small cluster of setae on each apical lobe, peripheral setae widely spaced. Axis of genital plates broadly conical (fig 86); arms of distal plate spatulate, thin and pale in apical 1/2, thicker and darker basally, twisted near mid-length.

Body length, ♂, about 10-12 mm (holotype 12 mm); ♀, about 9-12 mm (allotype 11 mm). Length of fore wing, ♂, 11.6-13.0 mm (holotype 12.0 mm); ♀, 11.6-14.5 mm (allotype 12.5 mm).

Holotype ♂, Fang, Chiangmai Prov., Thailand (see map), 540 m, 18.IV.1958, Aroon, Lot number 2411. Allotype and 1 ♀ paratype, same data as holotype. Additional paratypes, all from Thailand: 1 ♂, 1 ♀, Chiangdao, Chiangmai Prov., 6.IV.1958, Phol, Lot 2409; 2 ♀♀, Pukhadung (mountain), Loei Prov., 1260 m, Chainarong, Lot 1430; 2 ♂♂, 2 ♀♀, Fang, Chiangmai Prov., 500 m, 12-19.IV.1958, T. C. Maa, Lot 358; 1 ♂, 3 ♀♀, Chiangdao, Chiangmai Prov., 450 m, 5-11.IV.1958, T. C. Maa, Lots 314, 325, and 330; 1 ♂, 1 ♀, Doi Sutep (mountain), Chiangmai, 900 m, 4-10.V.1952, D. and E. Thurman, Lot 653. Holotype, allotype, 1 ♂ & 3 ♀ paratypes in collection of Department of Agriculture, Bangkok; 2 ♂ & 5 ♀ paratypes (Maa) in Bishop Museum; 1 ♂ (Lot 358) & 1 ♀ (Lot 2411) paratypes retained in Snow Museum. The 2 paratypes from Doi Sutep are in the United States National Museum, Washington, D. C.

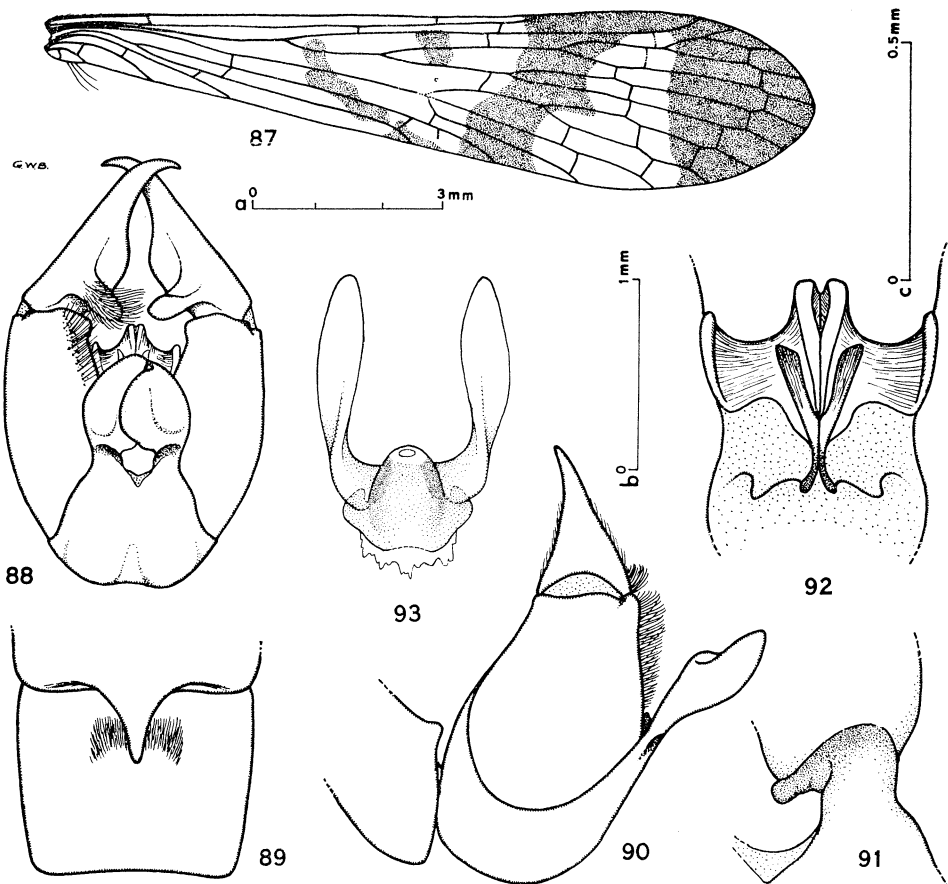
This species resembles several of the Indo-Chinese species in general appearance but seems most closely related to *N. thai*, n. sp., *N. baviensis* Cheng and *N. annamensis*, n. sp. It differs from these 3 species in details of the dististyles and aedeagus of ♂ and from *annamensis* and *thai* in the genital plates of ♀ (♀ of *baviensis* is unknown). *N. siamensis* also appears to be close to *N. gestroi* Navás but may be distinguished from that species by lacking the basal spot in the fore wing and by having pale, unmarked thoracic pleural areas; also, the hypovalves in *siamensis* are broadly overlapped, not sublanceolate and scarcely overlapped as figured for *gestroi* (Navás, 1929: 386).

***Neopanorpa spatulata* Byers, n. sp. Figs. 87-93.**

Description based on 2 ♂♂ and 3 ♀♀, pinned.

Head: Dorsum of head shining black; rostrum yellowish brown. Antennal scape yellowish brown, pedicel brown; flagellum long, black, with 50-52 (holotype) segments. *Thorax*: Pronotum black, with 3 setae at each side on anterior margin. Anterior 1/2 of mesoscutum black, a broad median black band continuing backward, covering scutellum; posterolateral shoulders of scutum dull, pale yellowish brown. Metanotum with similar

color pattern. Pleural areas dull yellowish brown. Legs sordid yellowish brown, tarsi brown, darkened on apices of first 3 segments and on distal 2 segments. *Wings* tinged with yellowish gray, bands and spots smoky brown. Apical band entire (holotype and some others) or diffuse posteriorly (2 paratypes). Pterostigmal band entire, with slender distal branch interrupted in most specimens, only vestigial in holotype (fig 87). Marginal spot attaining costal margin in ♀♀ but not in ♂♂. Basal band slender, incomplete, deflected so as to join or nearly join (holotype) pterostigmal band at posterior wing margin. *Abdomen of ♂*: Terga 2-3 black, terga 4-5 dark brown; corresponding sterna pale yellowish brown; segment 6 mottled brown and dark yellowish brown, palest at apex; segments 7-9 yellowish brown except hypovalves of sternum 9 brown. Posterior process of



Figs. 87-93. *Neopanorpa spatulata* n. sp. 87, right fore wing, holotype; 88, genital bulb, ♂ holotype, ventral (posterior) aspect (hairs omitted on right basistyle and dististyle); 89, abdominal terga 3 & 4, holotype, dorsal aspect; 90, genital bulb, holotype, left lateral aspect; 91, detail of base of right hypovalve, ventral aspect; 92, aedeagus, holotype, ventral aspect (partially reconstructed); 93, genital plates, ♀ allotype, ventral aspect. Scale a—fig. 87; b—figs. 88-90; c—figs. 91-93.

tergum 3 narrowly triangular, short, extending across only about 1/3 of tergum 4 (fig 89). Hypovalves (figs 88, 90, 91) short, broad, roughly oval in outline, with lateral edges strongly infolded, mesal edges not folded and broadly overlapped; basal petiole of each hypovalve with a strongly sclerotized distal margin continued mesally and dorsally as a short, thick lobe, visible in posterodorsal aspect. Tergum 9 approximately parallel-sided in apical 1/2, tip irregularly truncate. A longitudinal patch of long, black hairs on posteroventral surface of each basistyle. Outer surfaces of dististyles sparsely covered with short, brownish hairs, ventral and inner surfaces bearing longer, yellowish hairs, longest on prominent ventral portion of basal lobe (fig 88); smooth, dorsal, tooth-like portion of basal lobe concealed in ventral aspect. Ventral valves of aedeagus project beyond dorsal valves; ventral parameres (fig 92) long, divergent, blade-like; dorsal parameres slender, pointed. *Abdomen of ♀*: Terga 2-6 blackish brown, 6th yellowish brown apically; corresponding sterna sordid yellowish brown; segments 7-10 yellowish brown, cerci black. Subgenital plate of sternum 8 shallowly cleft apically, with a group of setae on each lobe and 3 or 4 long setae along each lateral margin. Axial portion of genital plates rounded at apex, indistinctly bilobed at base (fig 93).

Body length, ♂, about 11-12 mm (holotype 11 mm); ♀, about 10-11 mm (allotype 11 mm). Length of fore wing, ♂, 12.0-13.3 mm (holotype 12 mm); ♀, 13.0-13.6 mm (allotype 13.6 mm).

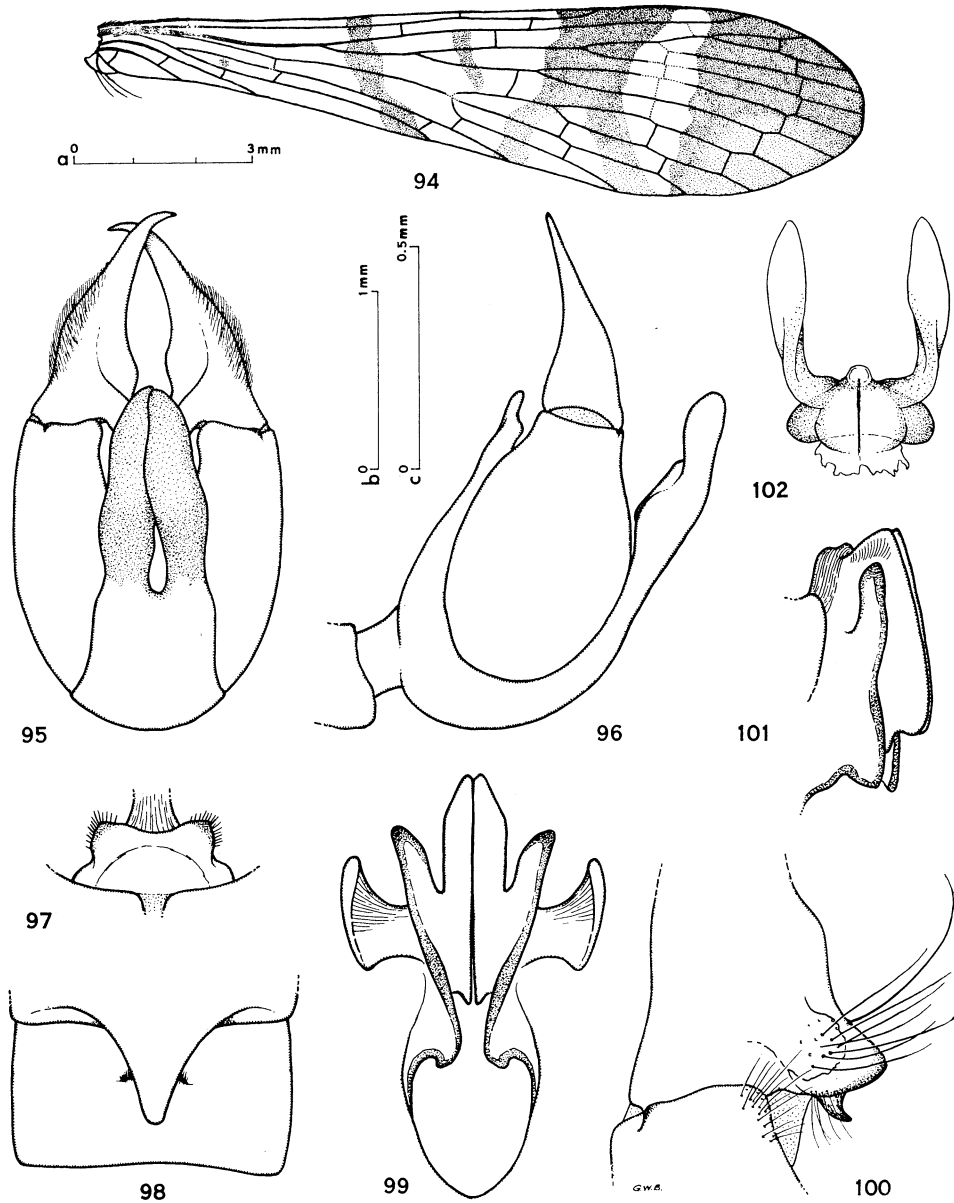
Holotype ♂, Fang, Chiangmai Prov., Thailand (see map), 540 m, 28.IV.1958, Aroon, Lot number 2411. Allotype ♀, and 1♂ & 2♀ paratypes, same data as holotype. Holotype, allotype and 1♀ paratype in collection of Department of Agriculture, Bangkok; 1♂ & 1♀ paratypes in Snow Museum.

In having short, oval hypovalves, areas of long hairs on the ventral surfaces of the basistyles, and a large, hairy ventral portion of the basal lobe of the dististyle, this species somewhat resembles *N. ornata*, n. sp.; and the wing pattern suggests that of *N. pendulifera*, n. sp. But the structure of the aedeagus of ♂ and of the genital plates of ♀ indicates a closer affinity of *spatulata* with the *siamensis* group. Characters of the genital bulb, particularly the short, broad hypovalves, should suffice to distinguish ♂♂ of *spatulata* from all other species; the specific name refers to the shape of the hypovalves and is derived from Latin *spatula*, meaning a broad spoon or any broad blade. In ♀, the rounded apex and thick, bilobed base of the axis of the genital plates should confirm identification suggested by the wing markings, which, of course, will aid in recognition of both ♂♂ and ♀♀.

Neopanorpa thai Byers, n. sp. Figs. 94-102.

Description based on 5♂♂ and 7♀♀, pinned.

Head: Dorsum of head shining black; rostrum dark yellowish brown. Antennal scape yellowish brown, pedicel brown, flagellum (both incomplete in holotype) with 44-46 segments. *Thorax*: Pronotum black, with 2 or 3 spines at each side on anterior margin. Mesonotum black on anterior half and along mid-line as a broad band extending back over scutellum; posterolateral shoulders of scutum pale, dull yellowish brown. Metanotal pattern similar to that of mesonotum. Pleural areas pale yellowish brown. Femora and tibiae sordid yellowish brown, tarsi beyond mid-length of basitarsi brown, darkening to blackish on terminal segment. *Wings* (fig 94) faintly tinged with brown, marked with dark



Figs. 94-102. *Neopanorpa thai* n. sp. 94, right fore wing, holotype; 95, genital bulb, ♂ holotype, ventral (posterior) aspect; 96, same, left lateral aspect; 97, dorsal parameres and part of dorsal valves of aedeagus, dorsal aspect; 98, abdominal terga 3 & 4, holotype, dorsal aspect; 99, aedeagus, ♂ paratype (Kanchanaburi, Thailand), ventral aspect; 100, basal portion, left dististyle, ♂ paratype, ventral aspect; 101, aedeagus, ♂ paratype, nearly left lateral aspect; 102, genital plates, ♀ allotype, ventral aspect. Scale a—fig. 94; b—figs. 95-96, 98; c—figs. 97, 99-102.

smoky brown. Apical band entire, but pigmentation diluted posteriorly. Pterostigmal band entire, forked posteriorly; distal fork, in ♀♀, broadly connected to apical band along hind margin of wing. Membrane between apical and pterostigmal bands white; radial cross-veins within this area pale. Marginal spot present but not attaining costal margin in most ♂♂ and 1 ♀. Basal band entire, not constricted near mid-length. Basal spot (before basal band) present between veins R and Cu₁ opposite cu-a cross-vein, in ♀♀, more restricted in ♂♂, usually only a dot in cell 1st Cu₁ (fig 94). *Abdomen of ♂*: Terga 2-3 black; terga 4-5 blackish basally grading through brown to yellowish brown on posterior margins; corresponding sterna sordid yellowish brown. Segment 6 blackish brown basally, yellowish brown apically. Segments 7-9 yellowish brown, except hypovalves of sternum 9 dark brown. Posterior process of tergum 3 triangular (fig 98), extending across about 2/3 length of tergum 4. Hypovalves elongate, roughly oblong, with lateral margins strongly infolded, hairy, with longer hairs on dorsal (infolded ventral) surfaces. Tergum 9 narrow, slightly tapered toward apex, apical margin broadly rounded to nearly truncate. Outer margins of dististyles noticeably convex along mid-length (fig 95), densely set with brownish hairs, which increase appearance of convexity; basal lobe of dististyle with an irregularly rounded, hairy, ventral prominence and a smooth, rounded, more dorsal portion bearing a slender, curved tooth on its dorsal margin (fig 100). Ventral valves of aedeagus elongate, projecting beyond dorsal valves; ventral parameres curved, spatulate, nearly as long as ventral valves and diverging from them apically (fig 101); dorsal parameres rounded, flattened, bearing minute setae (fig 97). *Abdomen of ♀*: Terga 2-5 black, tergum 6 blackish brown basally, yellowish brown apically; corresponding sterna sordid yellowish brown; segments 7-10 light brown; cerci black. Subgenital plate of eighth sternum with a V-shaped apical notch and 4 to 6 setae on lobe at each side of notch, shorter setae along sides. Axis of genital plates broadly triangular in ventral aspect, with large, rounded, lateral lobes (fig 102); arms of distal plate stout, twisted near base.

Body length, ♂, about 10-14 mm (holotype 14 mm); ♀, about 9-12 mm (allotype 11 mm). Length of fore wing, ♂, 10.8-13.0 mm (holotype 13.0 mm); ♀, 11.8-14.2 mm (allotype 13.0 mm).

Holotype ♂, Kanchanaburi, Thailand (see map), 750 m, 31.V.1962, Anant, Lot number 2824. Allotype ♀, same data as holotype, Phol Coll. Paratypes: 4♂♂, 5♀♀, same data as holotype, except 750 and 770 m, Phol, Cheun and Anant; 1♀, Nakhon Ratchasima, Thailand, 480 m, 19.V.1961, Phol, Lot 2754. Holotype, allotype, 2♂ & 4♀ paratypes in collection of Department of Agriculture, Bangkok; 2♂ & 1♀ paratypes in Snow Museum.

This species is very closely akin to *N. siamensis* n. sp., *N. nielsenii* n. sp., and apparently also to *N. gestroi* Navás. It may be distinguished from all of these species by the aedeagal structure (especially the length of the ventral parameres and ventral valves) and details of the basal lobe of the dististyle, in the male, and from the last two by the broad lateral lobes of the genital plates, in ♀ (and from *gestroi* by its pale, unicolorous thoracic pleura). The structural characters mentioned will also distinguish *Neopanorpa thai* from other species in the *siamensis* group. The specific name, used here as a noun, is that of the Siamese people and of their country (Muang Thai), which means "free."

***Neopanorpa tuberosa* Byers, n. sp.** Figs. 103-110, Photo 1.

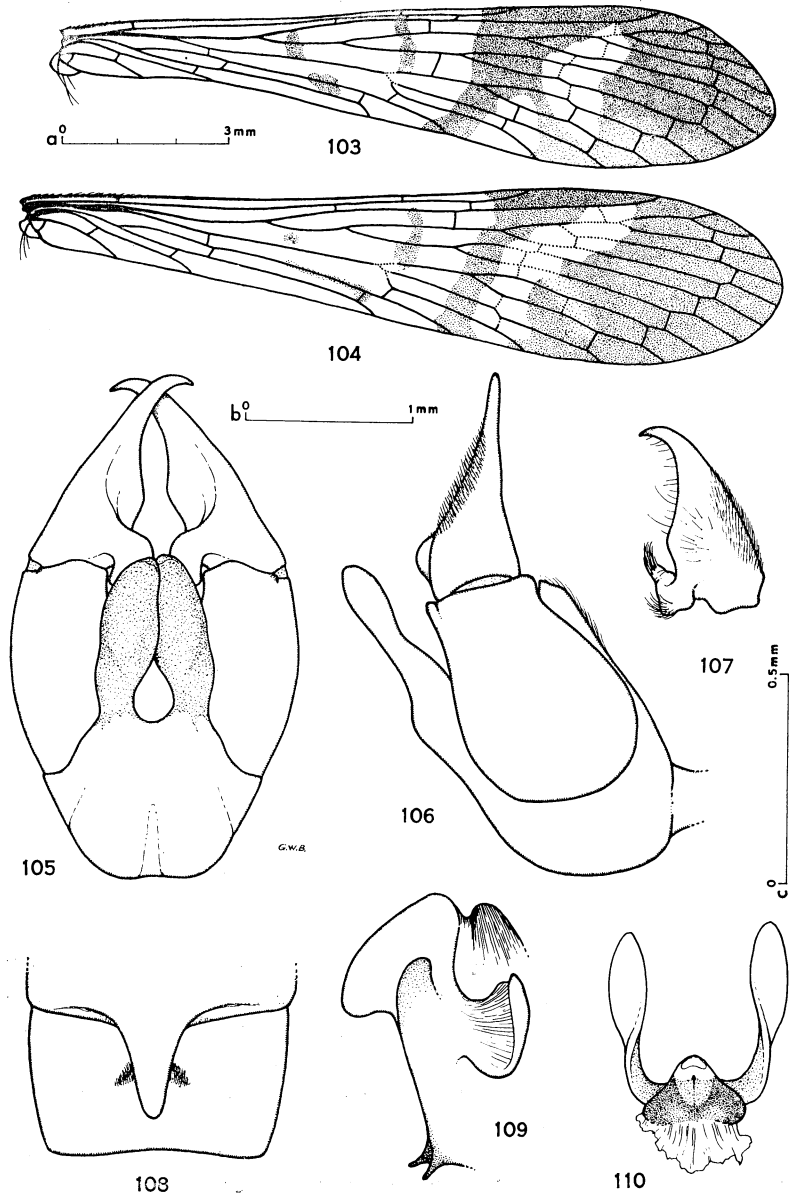
Description based on 12♂♂ and 19♀♀, pinned.

Head: Dorsum of head shining black; rostrum dark yellowish brown; maxillary palps yellowish brown, darkened at apex. Antennal scape light yellowish brown, pedicel and base of first flagellar segment reddish brown; flagellum dark brown to black, with 42-46 segments (holotype 42). *Thorax*: Pronotum black, with 2 or (usually) 3 long setae at each side on anterior margin. Mesonotum black on anterior 1/2 and backward along mid-line as a broad stripe covering scutellum; posterolateral shoulders of scutum dull yellowish brown. A broad black median stripe on metanotum, somewhat extended laterally on anterior 1/2 of scutum. Pleura sordid yellowish brown to reddish brown, episterna and epimera darkened in some individuals (apparently a post-mortem effect). Coxae, femora and tibiae sordid yellowish brown, tarsi slightly darker, terminal segment brown. *Wings* (figs 103, 104) tinged with yellowish brown, marked with brown to dark brown, stigmal area darkest. Apical band broad, darkest anteriorly, bordering pale area in which veins are whitish, more diffuse posteriorly, in some specimens including a pale brown area. Pterostigmal band entire, darkest anteriorly, forked posteriorly in holotype, allotype and 21 paratypes, but with distal branch of fork interrupted or absent in others. A small transverse spot adjoining thyridium at first fork of media; small spots also crossing radial sector and along anterior cubitus. *Abdomen of ♂*: Terga 2-3 brownish black, grading into brown on terga 4-5; corresponding sterna yellowish brown. Segments 6-9 sordid yellowish brown, except hypovalves of sternum 9 dark brown to blackish brown. Posterior process of tergum 3 narrowly triangular in dorsal aspect (fig 108), lobe on tergum 4 inconspicuous from above. Hypovalves oblong, with outer margins sharply infolded dorsally, inner margins not infolded, overlapped medially. Tergum 9 with sides tapering rather evenly toward truncate apex. Dististyles slightly convex on outer surfaces near base, with dense patch of short, dark hairs on convexity (fig 106); basal lobe large, rounded, knob-like in ventral aspect, usually protruding enough ventrally to be visible from side (fig 106), with sparse hairs. Dorsal (anterior) prolongation of basal lobe of dististyle narrow, blunt-tipped, bearing several long hairs (fig 107). Ventral valves of aedeagus appressed, slightly thickened, strongly curved and almost hamate (fig 109); ventral parameres ending caudally in small, outwardly curving blades on sides of aedeagus and diverging basally as slender projections; lateral processes thickened apically. *Abdomen of ♀*: Terga 2-5 black, corresponding sterna sordid light brown; segments 6-10 brown, cerci black. Subgenital plate strongly notched apically, with group of bristles on each posterior lobe and 2 or 3 bristles on apical 1/2 of each side, along lateral margins. Axial portion of genital plates small, subtriangular, with prominent depression in subhyaline apex; duct well sclerotized, readily visible (fig 110); arms spatulate, yellowish, twisted near mid-length.

Body length, ♂, about 12-14 mm (holotype 13 mm); ♀, about 10-13 mm (allotype 11 mm). Length of fore wing, ♀, 13.0-14.3 mm (holotype 13.3 mm); ♀, 12.8-15.1 mm (allotype 14.2 mm).

Holotype ♂, Khao-Yai National Park (about 96 km due E of Sara Buri), Thailand (see map), 750 m, 26.VII.1962, E. S. Ross and D. Cavagnaro; in the collection of the California Academy of Sciences, San Francisco, California. Allotype ♀, same data as for holotype. Paratypes, 10♂♂, 18♀♀, same data as for holotype (except 2♂♂, 2♀♀ are in Snow Museum); and 1♂, Chanthaburi, Thailand (see map), 4.IV.1959, Aroon, Lot number 2506, in collection of Department of Agriculture, Bangkok.

This species shows many structural similarities to *N. siamensis* and *N. thai*, n. sp., in-



Figs. 103-110. *Neopanorpa tuberosa* n. sp. 103, right fore wing, holotype; 104, right fore wing, ♂ paratype (Chanthaburi, Thailand); 105, genital bulb, ♂ holotype, ventral (posterior) aspect; 106, same, right lateral aspect; 107, right dististyle, holotype, posterodorsal aspect, to show shape of basal lobe; 108, abdominal terga 3 & 4, holotype, dorsal aspect; 109, aedeagus, holotype, nearly right lateral aspect (partially reconstructed); 110, genital plates, ♀ allotype, ventral aspect. Scale a—figs. 103-104; b—figs. 105-108; c—figs. 109-110.

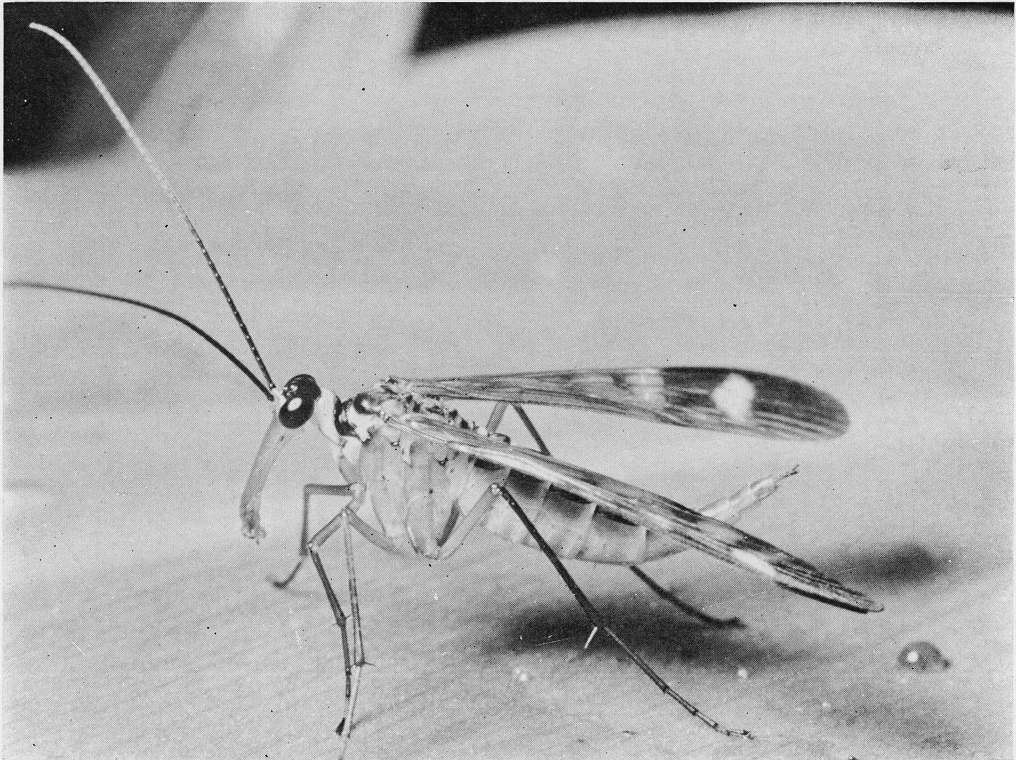


Photo 1. Female of *Neopanorpa tuberosa* n. sp. Photograph taken at Khao-Yai National Park, Thailand, 26.VII.1962, by Dr Edward S. Ross.

cluding general characteristics of the hypovalves, dististyles and aedeagus of ♂ and shape of the genital plates of ♀. The shape of the basal lobe of the dististyle suggests an affinity with *N. cuspidata*, n. sp. Details of the aedeagal structure, particularly the strongly arched ventral lobes and the divergent basal tips of the ventral parameres, will serve to distinguish ♂♂ of this species from all others in the *siamensis* group. The basal lobes of the dististyles especially are characteristic because of their large size, ventral expansion, and dorsal prolongation bearing a tuft of hairs. This last feature may be concealed if the dististyles are drawn together but is readily seen if they are spread slightly apart. The specific name derives from the conspicuous basal lobes of the dististyles (from Latin *tuber* = a knob). The axial portion of the genital plates, in ♀♀ of *tuberosa*, is somewhat broader than in *siamensis* or *thai*, and the arms are more slender basally than in those species. In the discal portion of the wing, the cells are noticeably elongated (especially in the paratype from Chanthaburi, fig 104), and the apical band, mostly covering these cells, is correspondingly widened.

Leptopanorpa javanica (Westwood)

Panorpa javanica Westwood, 1842 : 299.

Leptopanorpa javanica : Esben-Petersen, 1921 : 89.

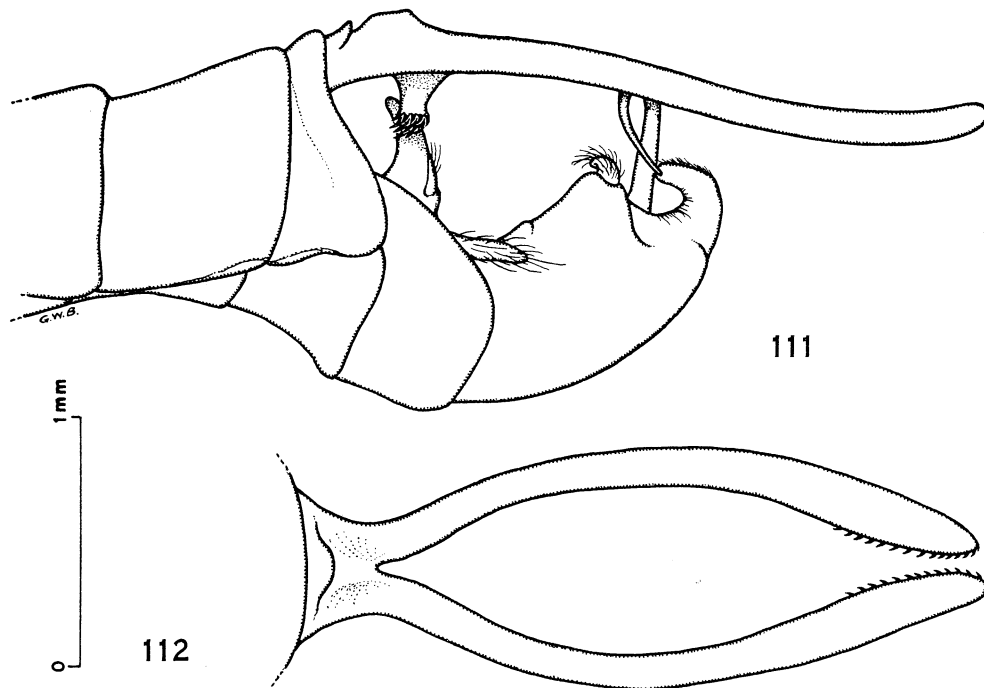
This Indonesian species was recorded, with some doubt, from Burma and Hainan Island by Esben-Petersen (1921: 90). I have examined most of the specimens upon which his records were based (all ♀♀), and although I did not dissect them I feel virtually certain that all represent species of *Neopanorpa*. Probably all were identified as *L. javanica* on the basis of wing pattern. However, the collection of the Department of Agriculture in Bangkok contains 1 damaged ♂ and 1 ♀ from the high mountains of Loei Prov., Thailand, which may belong to *Leptopanorpa*. The wing markings of these 2 specimens are very like those of *L. javanica* (but also like some *Neopanorpa siamensis*). In ♂, the fore wing measures 15.2 mm, more than ten per cent longer than in any other species of *Neopanorpa* seen from Thailand; and although the apical segments of the abdomen are missing, the ♂ measures 12.6 mm to the end of segment 6, only 1.4 mm less than the overall length of the largest ♂ *Neopanorpa* in the Siamese collections examined. This part of Thailand, of course, is not too distant from Tonkin, where 2 large *Neopanorpas*, *baviensis* and *nielsenii*, are found.

It should be mentioned here that since *Leptopanorpa* is known to occur in the Himalayan region (Nepal, Sikkim) as well as in Indonesia (Java, Sumatra) its presence in the intervening areas may not unreasonably be expected.

***Bittacus leptocaudus* Byers, n. sp.** Figs. 111-112.

Description based on 1♂, pinned.

Head: Eyes yellowish brown; vertex, occiput and rostrum sordid amber-brown, narrowly blackish brown around ocelli; maxillary palps brown, labial palps yellowish brown. Antennae (right flagellum missing) brown, scape cylindrical, pedicel subspherical, flagellum short (about 5 mm), slender, apparently comprising 18 segments; all hairs on flagellum short. **Thorax:** Dorsum, pleural and ventral surfaces sordid brown throughout; no prominent, blackened setae on pronotum but a few short, pale bristles present among short, yellowish hairs. Legs yellowish brown, tips of femora and tibiae narrowly darkened; tarsi brown; hind femora not incrassate. Right front and left front and mid legs missing from holotype. **Wings** tinged with yellowish brown throughout, stigma brown, continuous with clouding of brown extending around apical margin to about vein M_2 . No apical cross-vein between $1A$ and Cu_2 ; only 1 pterostigmal cross-vein; subcostal cross-vein very slightly distad of level of first fork of R_s and about $6\times$ its length from end of Sc in C ; cell R_2 short, bordered posteriorly by only 1 complete cell and part of another. One more cross-vein in area R_5 in right fore wing than in left, in holotype. **Abdomen:** Coloration brown; no lateral spines on basal terga. A short, sharp transverse ridge at base of ninth tergum, with a rounded median longitudinal ridge extending backward to bifurcation of tergum. Branches of ninth tergum long and slender, more than ten times as long as their greatest width (fig 111), divergent at base, somewhat flattened and convergent in apical $1/3$, with short, black recurved spines along inner surfaces near tip (fig 112); a conspicuous projection from lower, inner surface of each branch, near base, terminating in a cluster of black, claw-like spines. Basistyles elongate, fused basally, prolonged backward into a recurved, median structure shallowly excavated and pubescent on upper (morphologically ventral) surface and slightly notched at tip, which abuts against aedeagus near its base. Aedeagus stout and unmodified at base, short and simply curved. Proctiger not conspicuously branched. Dististyles and cerci short.



Figs. 111-112. *Bittacus leptocaudus* n. sp. 111, terminal abdominal segments, ♂ holotype, left lateral aspect; 112, abdominal tergum 9, dorsal aspect, to show shape and curvature of appendages (branches). Scale: both figures.

Body length about 15.5 mm; fore wing 17.3 mm.

Holotype ♂, Sara Buri, Thailand (see map), 26.V.1938, Ekasakdi, Lot number 545; in collection of Department of Agriculture, Bangkok.

Males of this species may be recognized by the very long branches of abdominal tergum 9, to which the specific name refers (Latin *leptocaudus*=long+tail, or appendage). If ♀ resembles ♂ in wing venation, both sexes may be distinguished from *Bittacus indicus*, the only other bittacid recorded from southeastern Asia, by the fact that in the fore wings of *indicus* the subcostal cross-vein is far before the first fork of Rs, cell R₂ is bordered posteriorly by 2 complete cells, and vein 1A extends to the level of the first fork of M and the branching of Rs, whereas in *leptocaudus* 1A is much shorter. On the basis of wing shape, genitalial structure (particularly of the aedeagus), and general aspect, *leptocaudus* appears not to be very closely allied to the species of *Bittacus* from China.

KEY TO MALES OF NEOPANORPA IN INDO-CHINA

1. Basal lobe of dististyle divided into cup-like upper portion and elongate lower portion projecting downward between basistyles..... 2
- Basal lobe of dististyle not clearly divided, with no downward projecting appendage..... 3

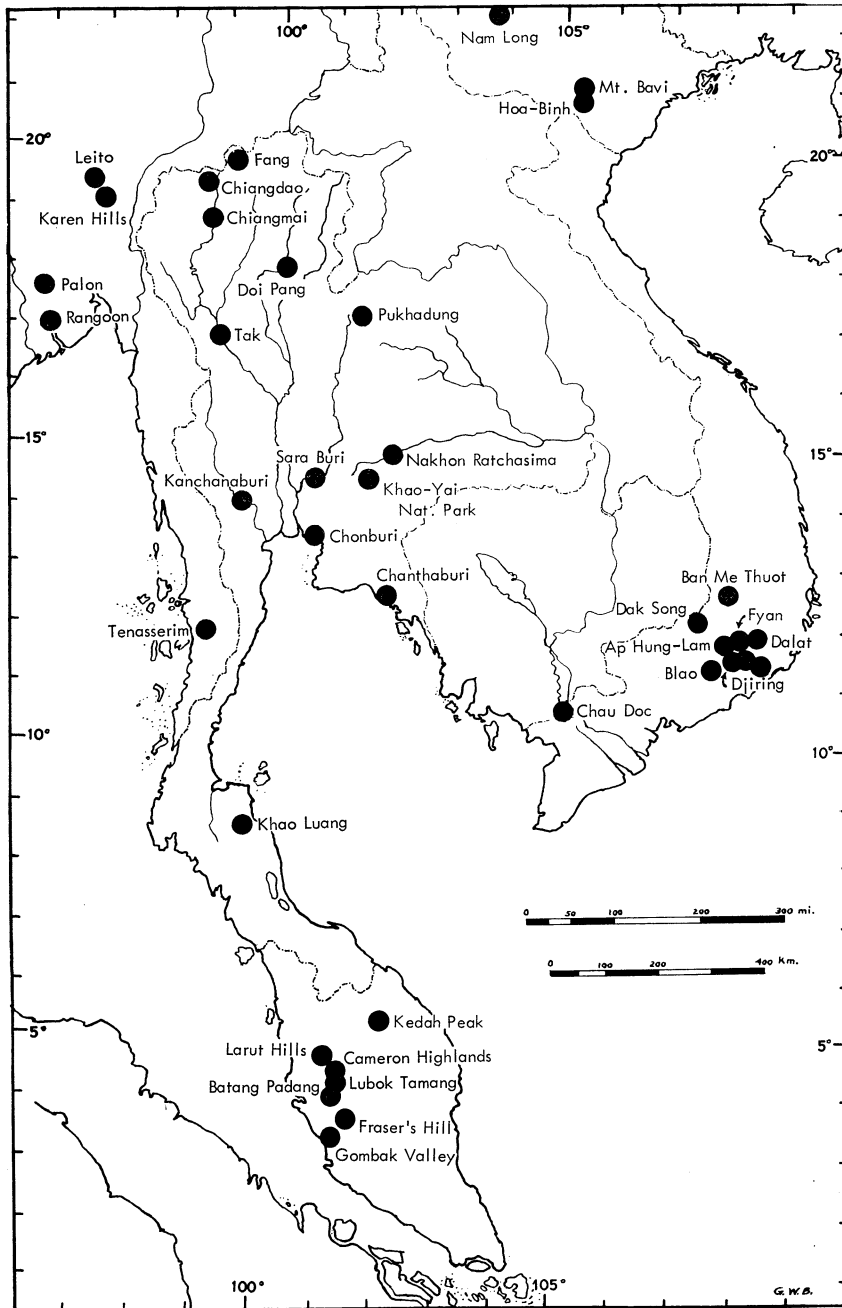


Fig. 113. Map of Indo-China. Black circles indicate localities where Mecoptera have been collected. See accompanying list for details.

- 2 (1). Wings broadly banded throughout with dark brown; lower appendage of dististyle tapering to acute tip **harmandi**
 Wings mostly clear in basal 1/2, with only apical and pterostigmal bands entire; lower appendage of dististyle thick, blunt-tipped..... **pendulifera**
- 3 (1). Posterior process of abdominal tergum 3 either long and slender or absent, not triangular 4
 Posterior process of abdominal tergum 3 triangular in outline, much wider in basal 1/2 than in apical 1/2, extending across 1/3-3/4 length of tergum 4 ... 5
- 4 (3). Posterior process of abdominal tergum 3 long and slender; median dorsal protuberance and group of stiff hairs on segment 6 of abdomen; wings mostly clear in basal 1/2..... **dorsalis**
 No posterior process on abdominal tergum 3; wings broadly banded throughout with dark brown **ornata**
- 5 (3). Mesal edges of hypovalves deeply emarginate near mid-length, tips overlapped, basal separation nearly circular **angustipennis**
 Mesal edges of hypovalves not conspicuously emarginate..... 6
- 6 (5). Hypoalves separated, their mesal edges not overlapped 7
 Hypoalves overlapped along mesal edges..... 8
- 7 (6). Hypoalves slender, with pointed apices..... **cuspidata**
 Hypoalves wide, concave mesally, with rounded apices..... **burmana**
- 8 (6). Wings infumed with smoky yellowish brown, without distinct darker pattern, except for elongate stigmal areas **infuscata**
 Wings patterned with brown to dark brown bands and spots; membrane otherwise clear or only lightly tinted 9
- 9 (8). Hypoalves conspicuously bent inward (mesally) near mid-length, outer edges sinuate **panda**
 Hypoalves not bent together, outer edges smoothly curved..... 10
- 10 (9). Hypoalves short, broad, extending only approximately to bases of dististyles **spatulata**
 Hypoalves elongate, more than 2× as long as broad, extending beyond bases of dististyles (when appressed to genital bulb)..... 11
- 11 (10). Thoracic pleura conspicuously variegated or banded.....**gestroi**
 Thoracic pleura not variegated or banded, more or less unicolorous..... 12
- 12 (11). Ventral lobes of aedeagus strongly arched, often projecting from genital chamber and narrowly rounded ventrally; basal lobe of dististyle enlarged ventrally **tuberosa**
 Ventral lobes of aedeagus not strongly arched or projecting from genital chamber, not narrowly rounded ventrally; basal lobe of dististyle not conspicuously enlarged ventrally 13
- 13 (12). Dorsal tooth of basal lobe of dististyle with acute tip.....14
 Dorsal tooth of basal lobe of dististyle with bluntly or narrowly rounded tip...15
- 14 (13). Dorsal tooth of basal lobe of dististyle recurved; ventral parameres much shorter than ventral lobes of aedeagus **baviensis**
 Dorsal tooth of basal lobe of dististyle evenly curved; ventral parameres nearly as long as ventral lobes of aedeagus..... **thai**
- 15 (13). Dorsal tooth of basal lobe of dististyle more than 2× as long as width at

- mid-length..... **nielseni**
 Dorsal tooth of basal lobe of dististyle only about as long as, or slightly longer than width at mid-length..... 16
 16 (15). Ventral lobes of aedeagus shorter than dorsal lobes, with deep, rounded posteroventral indentation..... **annamensis**
 Ventral lobes of aedeagus projecting beyond dorsal lobes, without posteroventral indentation..... **siamensis**

KEY TO FEMALES OF NEOPANORPA IN INDO-CHINA

(females of *baviensis*, *burmana*, *dorsalis*, *nielseni* and *ornata* are unknown)

1. Axial portion of genital plates stout, longer than lateral arms of distal plate ... 2
 Axial portion of genital plates shorter than lateral arms, not much longer than wide 3
- 2 (1). Wings broadly banded throughout with dark brown **harmandi**
 Wings mostly clear in basal 1/2..... **pendulifera**
- 3 (1). Wings infused with smoky yellowish brown, without darker pattern, except for elongate stigmal areas..... **infusata**
 Wings patterned with brown to dark brown bands and spots; membrane otherwise clear or only lightly tinted 4
- 4 (3). Thoracic pleura variegated or banded **gestroi**
 Thoracic pleura not variegated or banded, more or less unicolorous..... 5
- 5 (4). Axial portion of genital plates wider at apex (posterior end) than at base **angustipennis**
 Axial portion of genital plates narrower at apex than at base 6
- 6 (5). Axial portion of genital plates acutely rounded at apex, broad at base, together with lateral lobes producing a subtriangular outline in ventral aspect..... 7
 Axial portion of genital plates protruding cephalad at base, together with lateral lobes not subtriangular in outline 9
- 7 (6). Lateral lobes of genital plates clearly differentiated from axial portion **panda**
 Lateral lobes not clearly differentiated from axial portion 8
- 8 (7). Arms of genital plate not abruptly widened near mid-length..... **siamensis**
 Arms of genital plate abruptly widened near mid-length..... **tuberosa**
- 9 (6). Axial portion of genital plates indistinctly bilobed at base, broadly rounded at apex..... **spatulata**
 Axial portion of genital plates evenly rounded at base, more narrowly rounded at apex..... 10
- 10 (9). Portion of duct traversing axis of genital plates plainly visible in transmitted light..... 11
 Duct not clearly visible..... **cuspidata**
- 11 (10). Distal fork of pterostigmal band broadly connected to apical band along hind margin of wing..... **thai**
 Distal fork of pterostigmal band not joined to apical band along hind wing margin..... **annamensis**

LOCALITIES AND HABITATS

Since detailed information about collecting sites mentioned above pertain in most instances to more than one species, the data are summarized here to avoid repetition. Previously published locality information relating to Indo-Chinese Mecoptera has often consisted of place name only, with the elevation sometimes included. To this I have added geographic coordinates and occasionally other details. Collection localities are listed alphabetically, and the pertinent data appear in the following sequence:

1. Name of locality as recorded on or transliterated from pin label.
2. Variant spellings of name, or synonymous names, in parentheses.
3. General region in which locality is situated.
4. Geographic coordinates, or reference to another locality for which coordinates are given.
5. Elevation *where collection was made*, if recorded. Note: most collections are from areas of high relief, so elevation at collection site may vary considerably from that at a nearby named place.
6. Brief description of habitat *where Mecoptera were found*, if recorded; if only general environment is known, this is indicated.
7. Reference for locality data, if previously published.

Ap Hung-Lam; 21 km NW of Djiring, South Vietnam; 1100 m; in lush growth of herbaceous plants in moist ravines in a mixed forest of broad-leaved trees with a few pines.

Ban Me Thuot (Banmethuot), South Vietnam; 12°40' N, 108°03' E; elevation not recorded; in sparse undergrowth along small streams at edge of tall forest, 2 km S of town.

Batang Padang district, Perak, Malaya; about 4°07' N, 101° 23' E; 540 m (Banks 1931). Bavi, Mt (Mt Ba Vi), Tonkin (N. Vietnam); about 21°05' N, 105°17' E.; 800-1000 m (Cheng 1953).

Blaio (Balao); 36 km WSW of Djiring, S. Vietnam; 600-700 m; in sparse underbrush in moist primary forest.

Cameron Highlands, Pahang, Malaya; 4°28' N, 101°23' E; 1200-1500 m (Banks 1931).

Carin Chebá, Monte Carin—see Karen Hills.

Chau Doc (Chau Phu), Cochin China (S. Vietnam); 10°42' N, 105°06' E ("Mont de Chau Doc," may be Nui Sam, a small, isolated summit just west of the city).

Chanthaburi, SE Thailand; about 12°35' N, 102°05' E; elevation not recorded; from low brush near intermittent stream in forested area.

Chiangdao (Chiang Dao), N. Thailand; about 19°22' N, 98°58' E; 540 m; on low plants near a stream in a humid, forested area.

Chiangmai (Chiang Mai, Chiengmai), N. Thailand; 18°48' N, 98°59' E; 330 m; area in general is forested.

Chonburi (Bang Pla Soi, Changwat Chonburi), S. Thailand; 13°20' N, 101°00' E; near sea level; from vegetation beside stream on a low hill.

Dak Song, 76 km SW of Ban Me Thuot, S. Vietnam; 12°19' N, 107°35' E.

Dalat (Da Lat), Annam (South Vietnam); 11°56' N, 108°25' E; 1500 m; from low plants along stream and on sides of ravines in mixed broad-leaved and coniferous forest. (This is also the type locality of *Neopanorpa harmandi* var. *conjuncta* Navás, 1930b.)

Di Linh (See Djiring). Specimens taken 17 km E of Di Linh were collected from moist underbrush along road through primary broad-leaved forest.

Djiring (Di Linh), S. Vietnam; 11°35' N, 108°04' E; 1000 m; from plants in areas of water seepage in high, mixed forest of broad-leaved trees with some conifers.

Doi Pang (hill), Phrae Prov., N. Thailand; about 18°10' N, 100°05' E; formerly a dense forest, now open forest.

Doi Sutep (mountain) (Doi Suthep), Thailand, just W of Chiangmai; elevation at summit 1700 m, at collection site 920 m; forested.

Fang (Muang Fang, Fuang), N. Thailand; about 19°55' N, 99°13' E; 540 m; near a stream in humid hill forest.

Fraser's Hill, Pahang Malaya; 3°43' N, 101°44' E; 1300 m (Banks 1931).

Fyan, S. Vietnam; 11°53' N, 108°12' E; mountainous region.

Gombak Valley, Selangor, Malaya; along Gombak River, about 3°12-21' N, 101°42-46' E (Banks 1931).

Hoa-Binh, Tonkin (N. Vietnam); 20°56' N, 105°58' E (Navás 1930a).

Kanchanaburi, S. Thailand; about 14°00' N, 99°30' E; 750 and 765 m; from vegetation along a stream in dense forest, during rainy weather.

Karen Hills (Monte Carin, Carin Chebá), in Thandaung Reserved Forest, Toungoo District, S. Burma; about 19°04' N, 96°41' E; 900-1100 m (Navás, 1930b).

Kedah Peak, Kelantan, N. Malaya; a 575 m summit 12 km WSW of Kuala Krai; 5°29' N, 102°06' E.

Khao Luang (mountain), peninsular Thailand; about 8°30' N, 99°45' E; elevation on labels 3000 ft, recorded as 2000 feet by Banks (1931). (Note: ten mountains named Khao Luang are listed in the gazetteer of Thailand used.)

Khao-Yai National Park, S. Thailand, a recently established park, approximately 100 km E of Sara Buri; about 14°30' N, 101°50' E; a forested, mountainous region; collection made at 750 m.

Larut Hills (forest reserve), Perak, Malaya; 4°51' N, 100°49' E; 1110-1410 m (Banks 1931).

Leito (Leiktho), Karen State, southern Burma; 19°13' N, 96°35' E (Navás, 1930b).

Lubok Tamang (Lubok Temang), Pahang, Malaya; 4°26' N, 101°23' E; 1050 m (Banks 1931).

Nakhon Ratchasima (Nakhonrajchasisima, Khorat), S. Thailand; about 15°00' N, 102°05' E; 480 m; near a stream in a teak forest.

Nam Long, N. Vietnam, a name applied to six populated places in N. Tonkin near border of China, four of them in the vicinity of Lao Kay, NW of Hanoi; about 22°24' N, 103°58' E.

Palon, Pegu Distr., S. Burma; 17°26' N, 95°54' E; no elevation recorded (Navás, 1930b).

Pukhadung (mountain), Loei Province, N. Thailand; about 17°00' N, 101°35' E; 1260 m: mountaintop forest, near stream.

Rangoon, S. Burma; 16°47' N, 96°10' E; elevation of collection site not recorded but must be near sea level.

Sara Buri (Saraburi), S. Thailand; 14°32' N, 100°55' E; elevation not recorded, but hills near town are 300-390 m high; near stream in area of forests and grassy meadows.

Tak (Rahaeng), W. Thailand; about 16°53' N, 99°08' E; hills nearest town reach only about 540 m, but collection was made at 840 m; dense forest habitat, weather foggy, humid and windy at time of collection.

Tenasserim, city and region of peninsular southern Burma, the city at 12°05' N, 99°01' E,

the region one of fairly high relief.

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