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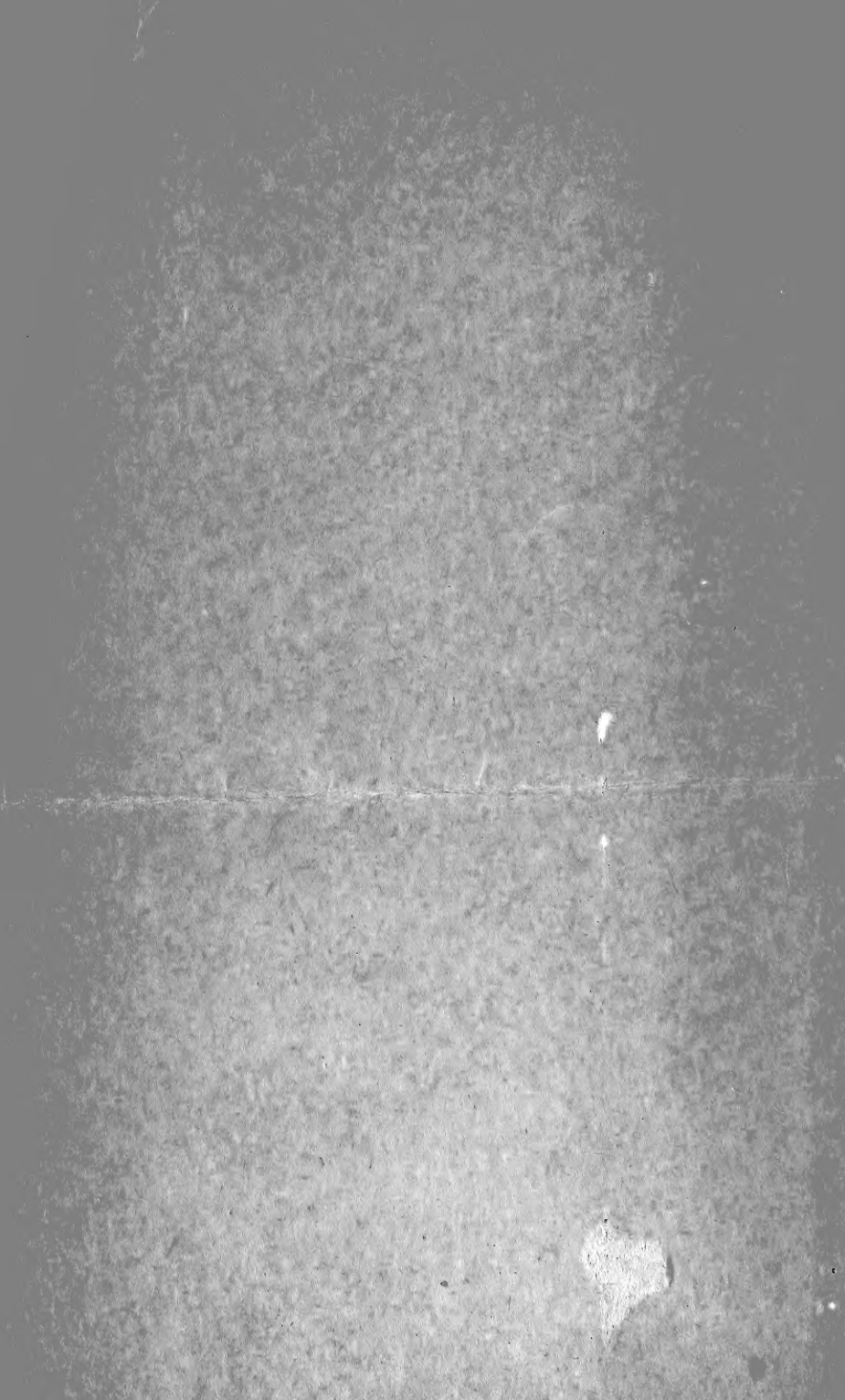
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Aflevering 1 verscheen 15 juni 1971
Afleveringen 2—4 verschenen 27 september „
„ 5—8 „ 29 december „

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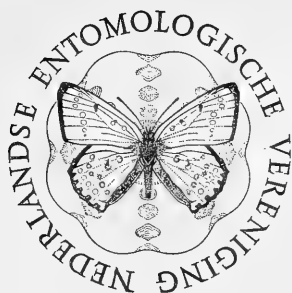
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INHOUD

M. A. LIEFTINCK. Studies in Oriental Corduliidae (Odonata) I, p. 1—63, Fig. 1—50.

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TIJDSCHRIFT VOOR ENTOMOLOGIE

Redactie (Editorial Board)	Pater Chrysanthus, A. Diakonoff, P. J. van Helsing, C. A. W. Jeekel, R. de Jong, J. Krikken, M. A. Lieftinck.
Address	<i>Rijksmuseum van Natuurlijke Historie, Raamsteeg 2, Leiden.</i>

The Journal serves the publication of papers on Insecta, Myriapoda and Arachnoidea. It appears in separate issues, forming an annual volume of 350—400 pages.

Subscription rate: D.Fl. 62.50 per volume.

MONOGRAFIEEN VAN DE NEDERLANDSE ENTOMOLOGISCHE VERENIGING

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STUDIES IN ORIENTAL CORDULIIDAE (ODONATA) I

by

M. A. LIEFTINCK
Rhenen, Netherlands

ABSTRACT

An attempt is made to prove the incongruity of attributing family rank to the *Macromia* alliance and the classification of Corduliinae as a subfamily of Libellulidae. Instead of this, arguments are put forward in favour of restoring and maintaining the group as a subfamily of Corduliidae. Idionychidae and Synthemistidae are regarded as groups so closely affiliated with Macromiinae that their family status is called in question. Contrasting characters are tabulated of *Idiophaea*, *Idionyx* and *Macromidia*. The male of *Idionyx philippa* Ris and both sexes of *I. murcia* spec. nov. (Sumbawa) are described and a key is constructed for the S. E. Asiatic species, followed by a description and figures of the larva of *I. montana* Karsch. Some taxa in *Macromidia* are re-characterized and *M. asabinai* spec. nov. (Palawan) is added to the list. In *Macromia* several species are discussed and the list of Malaysian taxa is made up to date; new species are *M. dione* (Sumatra), and in the Papuan group *M. lachesis* (Bismarcks) and *M. astarte* (S. E. New Guinea). Lastly, a review is given of *Synthemis* in New Caledonia, with definitions of *S. campioni* spec. nov., the females of *S. fenella* Campion and *S. montaguei* Campion hitherto unknown, and a key to all insular species. Descriptions and illustrations of two New Caledonian *Synthemis* larvae lead to comments on the acquisition of adaptive structural features during larval development.

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I. REMARKS ON THE SUBFAMILY MACROMIINAE

In a historical survey of the "*Macromia* Group" of genera, a new family name, Macromiidae, was proposed by Mrs. L. K. Gloyd (1959). The diagnosis was based primarily on three genera, *Macromia*, *Didymops* and *Epophthalmia*, but the author added that the venational characteristics, at least, seemed to apply to *Macromidia* also. It was admitted that the features enumerated were not fully checked for species in all these genera, while the author also felt that her diagnosis and the composition of Macromiidae might require revision with further study. It is not the purpose of the present paper to

attempt any definitions of suprageneric taxa within the Corduliidae; but I merely wish to point out that the removal of the *Macromia* group from the Corduliidae and its elevation to family rank is based on the forsaken conception that "Corduliinae and Libellulinae are so closely related that they belong in one family, the Libellulidae", to quote Mrs. Gloyd's own words. I am unable to share this view, adhering instead to the well-considered arguments put forward by St. Quentin (1939)¹), in whose publication the reader will find substantial evidence in support of the view that Corduliidae and Libellulidae are different families, each with well-founded and unmistakable characters. In fact only few of the basic characters separating the extremely diversified Corduliidae from the Libellulidae were mentioned by Gloyd; she apparently failed to observe that her diagnosis, apart from the *Macromia* group, applies equally well to many (other) corduliid genera. Under these circumstances it is only natural that the author's family diagnosis includes but few characters serving to distinguish the *Macromia* group from its nearest relatives, i.e. the remainder and major part of the corduliids. Genera like *Macromidia* and *Synthemis* are mentioned only in passing, and the reader is left in doubt as to which of the rest of the corduliid genera the author prefers to leave in her Libellulidae ("including the Corduliinae, or Corduliidae of some authors") and which are considered "Macromiidae". In any case it would seem to me to be irrelevant to construct a family diagnosis upon characters incompatible with the morphology of the remotely allied Libellulidae, an independent family which, in its restricted sense as accepted by most present-day authors, omits the Macromiinae and all the rest of the Corduliidae. As to the morphology and anatomy of the corduliid larvae, I believe to have shown earlier (Lieftinck, 1950, 1952) that the remarkable diversity of structure, notably in tropical species of *Macromia*, is unmistakably correlated with a particular mode of life, many instances being known of larvae having modified their entire organization to adapt themselves to some peculiar environment. In the case of *Macromia* this is especially striking as whole sets of morphological adaptations go hand in hand with varying environmental conditions. Thus larval features like the development of posterolateral tubercles at the head, shape of labial ligula, gizzard armature, as well as palpal and mandibular dentition, are to a large extent so variable within the limits of each genus, that they can at best be used as group characters, certainly not as a means of subfamily division or even generic separation.

II. NOTES ON THE *Idionyx* - *Macromidia* ALLIANCE, WITH AN ACCOUNT OF THE LARVA OF *Idionyx* HAGEN

Idiophya Fraser, 1934

Idiophya was proposed by Fraser (1934: 553—554, fig. 1, wings ♀) for a single enigmatic corduliid, first described as *Phyllomacromia nilgiriensis* Fraser (1918: 383—384), and known only from seven females, all collected at the Burliyar river in the Nilgiri Hills (South India). The author subsequently (1957) expressed doubt as to the validity of a monobasic genus comprising a species of which the male had never been discovered, the more so because *Idiophya* was stated to differ from *Idionyx* only by

¹) With many other judicious publications of fundamental importance simply ignored in the revised edition of F. C. Fraser's "Reclassification of the Order Odonata" (1957).

having the costal side of the discoidal triangle of the fore wing fractured, "although this feature is not always present" (Fraser, loc. cit., 1957: 111). Indeed, the excellent wing photograph of *I. nilgiriensis* in Fraser's 1934 publication shows a venation so similar to that of *Idionyx* that *Idiophya* could easily be regarded as a slightly aberrant member, were it not that a second species had been recorded from Luzon I. (Philippine Is.). This is *I. salva* Needham & Gyger (1937: 57—58, pl. 1 fig. 16, ♀ genit. & pl. 3 fig. 58, ♀ wings), once again described after a single female and for that reason placed doubtfully in *Idiophya*. Through the kindness of Dr. Pechuman I have been able to examine this immature specimen (CUI). Owing to the fact that it was preserved in poor alcohol, the body has fallen to pieces, lost all colours and become practically unrecognizable. There are a pair of wings on a slide, evidently the same as those reproduced on pl. 3 fig. 58 in Needham's publication.

Needham (loc. cit.: 58) refers to two characters that would serve to distinguish his *Idiophya salva* from *Idionyx philippa*. In the former the single row of cells beyond the 4-sided triangle of the fore wing continues beyond the level of the nodus, whereas in *I. philippa* beyond a 3-sided triangle the cell-row is doubled well before the level of the nodus. This is true only for the right fore wing of *philippa* (the one figured by Ris), the double row of cells on the left wing beginning only a single cell-breadth before that level. The second character refers to the course of the veins Cu_1 and Cu_2 on the fore wing, which in *I. salva* diverge to the wing margin while in *I. philippa* they converge. In the left pair of wings of the type of *I. philippa* (not photographed by Ris), these two veins run parallel to each other up to a point two cells before reaching the anal margin, at which point Cu_2 gives off two weak branches, one running parallel to Cu_1 , the other curving away from it and meeting the anal margin at a right angle. This is obviously also a variable character, for not one of the other examples of *philippa* is exactly alike in this respect.

Yet it is impossible to associate *Idionyx philippa* Ris with this dragonfly. The venation is very similar, but the wings of *I. salva* appear more broadened midway their length and more pointed than in *I. philippa*, the type of which possesses a normal fore wing triangle. The yellow spots at the sides of the thorax seem to be arranged differently in the two species, *philippa* having no "long triangle pointing downward covering a good part of the metepimeron"; the femora of the latter are black, not pale "thrice faintly ringed with brown", as described for *I. salva*. It would appear, therefore, that *salva* and *philippa* are specifically distinct, although the remaining venational differences between the two, enumerated by Needham at the end of his description, are nonapparent (see under *I. philippa*).

It would be interesting to know more of the morphology of the occipital region and genital organs of the females of *Idiophya* since little information has been given about these structures in the existing descriptions. As to *I. nilgiriensis*, Fraser only says that the vulvar scale is "small, triangular, not visible in profile", while the sketch of the subgenital plate of *I. salva*, accompanying Needham's account, suggests *Idionyx*.

Considering the above, it remains impossible to establish the generic status of the two species described in *Idiophya*. All the same, for each of them we may expect a male resembling *Idionyx* more closely than any other genus, because the venation in nearly all respects corresponds with this, not with *Macromidia*.

Idionyx Hagen, 1867

This genus was first placed in a subfamily of its own, viz. Idionychinae, by Tillyard & Fraser (1940), only the aberrant *Idiophya* Fraser (see above) also forming part of it. The characters employed to distinguish Idionychinae from Macromiinae (= Epophthalmiinae Fraser et auct.) are such that they can be applied only to a limited number of representatives of either group, and then only when the extremes of both are taken into account. The differences between some of the larger species of *Idionyx*, i.e. those which are at home in continental south-east Asia, and the smaller-sized and slenderly built members of *Macromia* inhabiting the Oriental tropics, are certainly of no greater importance than those separating the latter from the sturdily built members of *Epophthalmia*, which no one would exclude from the *Macromia* assemblage. These characters in the writer's opinion are of generic rather than subfamilial or even tribal value. I do not hesitate, therefore, to discard Idionychinae and follow the example set by de Selys Longchamps (1878), who included *Idionyx* in the *Macromia* group of genera; if de Selys had also known *Macromidia*, he would certainly have added this genus too. In point of fact *Macromidia*, as we will see, neatly bridges the gap between *Macromia* and *Idionyx*, so that nothing can be gained by placing the last-mentioned genera in two separate subfamilies.

The larva of *Idionyx*, described below, shows many characters found also in other macromiines and bears a close resemblance to that of some sand-dwelling species of *Macromia* (Fig. 5).

In the Malaysian Subregion and 'Wallacea' the genus is represented only by a limited number of species, grouped around *I. yolanda* Selys, 1871, the type-species, first described after a female from Singapore. As has been pointed out by Lieftinck (1939), *I. dohrni* Krueger, 1899, from Sumatra, and its "subspecies" *I. dohrni borneensis* Laidlaw, 1913, from Borneo, are both synonyms of *I. yolanda* Selys. A second member of the group is *I. montana* Karsch, 1891, originally described from Java but subsequently discovered also in Sumatra and the Mentawai Is. A third species, *I. philippa* Ris, 1912, was described from the Philippines; this was known only from a single female but a characterization of both sexes will now be found in the next pages. A fourth regional species is *I. orchestra* Lieftinck, 1953b, which was reported from Sumba I. (Lesser Sunda Is.). Lastly, a species new to science, *I. murcia* spec. nov., from the island of Sumbawa, can be added to the list. Leaving aside the nondescript *Idiophya salva*, discussed before, this brings the number of southeastern *Idionyx* up to five.¹⁾

The distribution of these species, so far as at present known, is as follows:

I. yolanda Selys (= *dohrni* Krueger) — Malay Peninsula (terr. typ.); Sumatra; Biliton; Borneo; Basilan I. (Philippine Is.); Hongkong.

I. montana Karsch — Java (terr. typ.); Sumatra; Mentawai Is.; Malay Peninsula (?).

I. orchestra Lieftinck — Sumba I. (Lesser Sunda Is.).

I. murcia spec. nov. — Sumbawa I. (Lesser Sunda Is.).

I. philippa Ris — Mindoro, Leyte and Mindanao Is. (Philippine Is.).

These species have the following characters in common:

Head large, considerably broader than thorax; eyes globular, broadly contiguous, median eye-line longer than occipital triangle. This triangular area raised perpendicularly

¹⁾ I agree with Fraser (1936a) that *I. laidlawi* Fraser, known only from the solitary female collected in Pahang (Malay Peninsula), belongs to a different species group, viz. that of *I. optata* Selys.

above level of eyes, finely pointed anterad with sharply acute side margins; smooth dorsal surface clothed with long erect hairs and vertical surface also with fringe of very long hairs behind rounded posterior margin. Vertex low and broad, evenly convex and of simple structure in both sexes. Labrum and anteclypeus at least partly chrome. Synthorax with or without incomplete yellow mesepisternal (juxtahumeral) spot, with yellow lateral spots or stripe at level of metaspiracle, and with variable spots or complete stripe on posterior portion of metepimeron. Legs at least with hind tibia partly yellow; all tibiae with membranous distal keel on flexor surface, the one at mid tibia very short; tarsal claws acute, bifid, the inferior tooth stronger and usually slightly longer than the apex (Fig. 12).

Wing venuration open. Nodus placed far distad, space between nodus and pterostigma on fore wing only half as long or less than that between nodus and wing base. Antenodal complex between C and R + M complete: no distinct primary (thickened) antenodals. Fork of M_{1-2} — M_3 strongly asymmetrical in fore and hind wing. Only the first, or first two, postnodal nervures of second series missing in all wings. Fore wing triangle placed far beyond arculus, distinctly smaller than that of hind wing, equilateral but costal side very rarely slightly fractured (5-sided) in one of the wings; hind wing triangle also distal to arculus, but distance separating it from arculus invariably shorter than its proximal (shortest) side. Subtriangle (*ti*) in fore wing nearly always irregular, its proximal side (distal *Cux*) very oblique, forming a 4- or 5-sided cell with proximal side of triangle, hence only 1 transverse *Cux* in fore wing (very rarely an additional cross-vein present in one of the wings); 2 transverse *Cux* in hind wing. Discoidal field of fore wing subparallel-sided, with single row of cells as far as level of nodus, or even further, thereafter frequently slightly expanded. *Rsp1* present, its course mostly slightly fractured. Anal loop of hind wing elongate, fully twice longer than broad without toe-like prolongation, midrib slightly zigzagged, apex obtuse, not extending beyond level at apex of triangle. Proximal side of anal triangle of male hind wing strongly sinuous; cross-vein in triangle placed well beyond midway its length; anal angle rounded. Pterostigma small, less than 2 mm long but usually overlying two cross-veins. Membranula large, in male extending as far as apex of triangle or a little beyond.

Abdomen slender, slightly spindle-shaped; colour black with metallic gloss on proximal tergites. Yellow markings reduced to lateral and lateroventral spots and streaks on tergites 1—3 and 7—9 only. Male superior anal appendages long and slender, longer than segm. 9 + 10; appendix inferior subequal to or slightly shorter than superior pair. Branches of posterior genital hamulus subequally long, outer branch thick and strong, the inner branch a slender sickle-shaped hook. Female with apex of 8th sternite decidedly prominent in lateral view, longitudinally carinate, not projecting beyond apex of 8th tergite; 9th sternite long and likewise carinate; styli tubercular; supra-anal plate declivous and tapered; anal appendages shorter than 10th segment, conical.

It must be stressed that the above diagnosis applies only to the Malaysian species-group, the great length of the male appendages, for instance, being no peculiarity of all: on the contrary, several continental Asiatic species exhibit appendages distinctly approximating to the type found in *Macromia*. See also Laidlaw (1912) in his discussion of *Metaphya* Laidlaw.

Apart from the fact that *Idionyx* and *Macromidia* have several characters in common, it should not be forgotten that interspecific variation is considerable in both, a circum-

stance impeding their distinction from *Macromia*, which itself is far from homogeneous in character. To demonstrate the existing difficulty to construct an all-embracing diagnosis for each of these three genera, it is only necessary to consult Fraser's "Revision of genus *Idionyx*" (1934). In that paper not less than six definite groups are recognised, and from a consultation of the group characters employed it is obvious that corresponding characters can be used to split up the large genus *Macromia*. This indicates, in my opinion, that the two genera are genuinely related. Another peculiarity pointing in the same direction is found in the structure of the tarsal claws, which in all regional *Idionyx* are shaped similarly to those in certain groups of *Macromia* (see under that genus).

The five species presently included can be distinguished from each other by means of the following

Key to the males of *Idionyx*

1. Front of synthorax (mesepisterna) on either side with sharply defined, oval yellow juxtahumeral spot equal in size to and confluent with adjacent mesinfraepisternal yellow spot. Postclypeus bright yellow in middle. Sup. anal apps. in dorsal view at first slightly outbent, then gradually incurved, each bearing a minute subapical internal tooth followed by a shallow emargination, the apex somewhat swollen and downcurved, with small external fringe of longish, erect, golden brown hairs. Inf. app. with lateral prominence situated at about $\frac{2}{3}$ length from base, its terminal portion broadened towards apex, which bears a deep V-shaped emargination, the branches being upturned and pointed (Fig. 4). Dorsum of 10th abdominal segment with distinct, though low, median carina on each side of a depression, but lacking a triangular boss. Main body of posterior genital hamule swollen, its outer border in side view distinctly convex proximal to the hook-like inner branch (Fig. 3). Apicoventral border of abdominal tergite 7 slightly protuberant, end portions of 7 and 8 as well as sternite 8 sparsely clothed with soft erect yellowish pubescence. A complete, broad, almost parallel-sided yellow stripe at thoracic sides crossing the spiracle, continuous ventrally over metinfraepisternum; a similar, though slightly broader stripe, widest at middle, upon posterior portion of metepimeron. Larger species: abd. + app. 31.7 mm, hind wing 30.0 mm. Hab.: Sumbawa . . murcia
- Front of synthorax either entirely metallic green or lower lateral area non-metallic and filled out diffusely with reddish-brown. Postclypeus wholly brown or black . 2
2. Inferior appendix very slender, simply tapered or with vestige only of a marginal tubercle placed slightly beyond halfway its length; apex gently upcurved, tip flattened dorsally, terminating abruptly in a short bluntly triangular point. Sup. anal apps. shaped much as in *I. murcia* but subapical internal prominence barely indicated and followed by a shallower emargination, the knob-like apex of each bearing a conspicuous external tuft of long golden brown hairs. Dorsum of 10th abdominal tergite raised, the middorsal carina replaced by a low triangular boss. Main body of posterior genital hamule in side view with straight outer border, but with tubercular swelling at base of hook-like inner branch. Apicoventral border of 7th abdominal tergite swollen and markedly projecting ventrad, clothed with conspicuous tuft of long erect golden hairs. Yellow stripes at thoracic sides complete, though narrower than in *I. murcia*, the spiracular stripe slightly more undulated. Larger species: abd.

- + app. 31.0—33.0 mm, hind wing 29.0—31.7 mm. Hab.: West Malaysia **montana**
- Inferior appendix broader, less strongly tapered and bearing a distinct marginal prominence or conspicuous tooth placed on either side beyond halfway its length. Erect pubescence at ventral borders of 7th abdominal tergite and apices of sup. anal apps. more or less developed, but hairs shorter and less closely set than in *I. montana* 3
3. Sup. anal apps. widest at base, but lacking a subbasal external angulation, then gradually incurved, each bearing a tiny subapical internal prominence followed by a shallow emargination, the apex slightly swollen, curved inward and downward, its extremity subtruncated or bluntly rounded. Inf. app. with distinct tooth-like lateral projection a little beyond halfway its length, the terminal portion slightly expanded before the upturned apex, which is bifid, the points shorter and more closely approximated than in *I. murcia* and separated by a crescentic emargination. Genitalia much as described for *I. murcia*. Middorsal crest of 10th abdominal segment as described for *I. murcia*. Abdomen shorter: abd. + app. 29.0—30.5, hind wing 29.0—31.5 mm. Hab.: Sumba **orchestra**
- Sup. anal apps. in dorsal view widest at base, their outer border weakly angulated at about $\frac{1}{4}$ the length from base, then straight and parallel-sided and finally abruptly and obliquely bent inward with knob-like external protuberance at the angulation, tips compressed and bluntly pointed. Apex of inf. app. gradually narrowed, hollowed out above and with pointed tip; lateral projections strong, subtriangular, placed well beyond midway length of appendix 4
4. Sides of synthorax with two complete broad yellow stripes, the spiracular stripe somewhat narrowed above but reaching upper margin of meso-metapleurae, the metepimeral stripe often somewhat undulated or irregular but never interrupted. Main body of posterior genital hamule greatly swollen, outer border in side view strongly convex proximal to the hook-like inner branch. Middorsal crest of 10th abdominal segment obtuse, forming a low, bluntly triangular boss. Size smaller: abd. + app. 28.0—29.0 mm, hind wing 27.5—28.0 mm. Malaysia, Basilan (P.I.) and Hongkong **yolanda**
- Yellow spiracular stripe at thoracic sides narrower, widest at and below the spiracle but frequently constricted or interrupted at about halfway its length, the dorsal portion not quite reaching upper margin of meso-metapleurae; yellow stripe on posterior portion of metepimeron also obliterated, consisting of a large oval anterior (lower) and a smaller subtriangular posterior (upper) spot. Sup. anal apps. almost straight in side view, apex shorter, less abruptly inbent, external subbasal angulation barely indicated and subterminal protuberance likewise less pronounced than in *I. yolanda* (Fig. 2). Main body of genital hamule less bulging, outer border in side view but slightly convex proximal to the hook-like inner branch (Fig. 1). Middorsal crest of 10th abdominal segment more strongly raised, forming an acuminate ridge which slopes down steeply posteriorly. Size larger: abd. + app. 31.0—32.0 mm, hind wing 30.0—30.3 mm. Hab.: ? Luzon; Mindoro; Leyte; Mindanao (P.I.) **philippa**

Idionyx philippa Ris

Fig. 1—2

1912. Ris, Suppl. Entom. 1: 80 (♀ key), 81—82, fig. 16 (♀ right wings, ventral side), ♀ Naujan, Mindoro I., P.I. — ? 1937. Needham & Gyger, Philipp. J. Sci. 63: 57 (key *Idiophya* and *Idionyx*), 58—59, ♀ Luzon, Los Baños.

Material. — Philippine Is.: 1 ♀ (adult), Naujan (recte Naujan), Mindoro, Phil. Rolle 1910, phot. (in Ris's writing), with red label typus, holotype *I. philippa* Ris (SMF). 1 ♂ 1 ♀ (adult), Mindanao I., Misamis Or., Bal-ason, 2.IV.1960 (♂) and Mt. Emgagatao, 13.IV.1961 (♀), H. Torrevillas; 1 ♀ (adult), Mindanao I., Cotabato, Parang, 23.III.1953, Henry Townes; 1 ♂ 1 ♀ (adult), Leyte I., So. Leyte, Anahawan, Mainit Spring, 31.V.1970, Cristobal Plateros.

Previously known only from the type, *I. philippa* has remained a somewhat puzzling insect ever since it was described. Dr. H. Schröder has been kind enough to send me on loan Ris's female for comparison with recently acquired specimens of Philippine *Idionyx*, and this enabled me to decide upon its proper status. There are some discrepancies in the original description which need clarification. Thus the occipital triangle of the type is said to be "flach" and to have no "frontalwärts verlängerte Leiste der *I. claudia* ♀", a rather misleading statement since the whole structure, though indeed smaller and less protruding than in *I. claudia*, is raised well above level of compound eyes, the slightly convex upper surface being marked off from the steeply sloping sides by an acute carina, i.e. a shape quite similar to that seen in the remaining species dealt with in this paper. The tibiae, stated by Ris to be "trüb rötlichbraun" are, indeed, much obscured, yet the hinder pair are distinctly yellowish externally, as they are in all other regional species. Ris's description of the coloured spots at the thoracic sides is incomplete: the yellow metaspiracular stripe is broadest at the spiracle and, though tapering to a point and leaving off a short way above it, continues upward as a lanceolate streak placed in line upon the first suture; the much larger mark on the metepimeron is oval, not "fast kreisrund", thus conforming to the shape it has in the other individuals.

The specimens from Leyte and Mindanao listed above are undoubtedly conspecific with *I. philippa*. However, they differ among themselves, showing not only considerable variation in the extent of yellow thoracic markings but also in their dimensions and wing venation, no two specimens of either sex being exactly alike. As pointed out before, under *Idiophya salva*, even the left and right pair of wings in a single individual (e.g. the type of *I. philippa*) may show differences in the venation. This may go hand in hand with dense venation, the wings of the type being somewhat more closely reticulated than in the other females, the anal loop containing no less than 4 + 6 cells (see below).

The following descriptions and figures are based on the pair from Misamis Or. (Mindanao), which are rather larger than the remaining specimens.

Male. — Labium with the median lobe and basal one-third of the lateral lobes outwardly chrome, for the rest dark chestnut, except a narrow line bordering the free margin of the lateral lobes, which is black; marginal fringe of golden yellow bristles. Base of mandibles black, distal portion dark brown. Labrum deep black with a large bright ochreous bilobate marking, broadly connected with the base and occupying most of the

surface. Anteclypeus blackish with a subtriangular pale yellow dot placed in the middle. Postclypeus deep black, the lateral lobes with slight metallic green lustre basally. Frons anteriorly black with brilliant emerald green reflex on either side of the smooth deep black sulcus, the metallic colour changing to deep purplish-blue above; surface irregularly wrinkled by large superficial punctures. Vertex low, surface convex, barely impressed medially and more finely punctate. Occipital triangle somewhat raised and acutely ridged above level of compound eyes, surface smooth, black; rear of the head glossy black.

Prothorax brownish-black, anterior border and a spot low down upon the sides, yellow. Synthorax metallic green marked with ochreous, as follows. Posterior half of mesinfraepisternum; an adjoining indistinctly brownish-yellow whiff ventrally on the mesepisterna; an almost complete, slightly irregular, though barely constricted, stripe at the first lateral suture crossing the spiracle, widest at and below the latter and continued downward upon whole posterior half of metinfraepisternite; a large oval twin-spot placed in the long axis of the body and occupying the latero-ventral surface of the metepimeron. Ventral surface purplish black, with a yellow J-shaped stripe at the median and lateral dividing lines of the basal parts of the poststernum; yellow are also the metapostepimera and apical portion of the poststernum. Ante-alar triangles dull black.

Coxae and trochanters of fore and middle legs yellow, but outer surface of mid trochanter brown; those of the hind legs brownish black, the coxa with small yellow postero-basal spot. All femora brownish black, the tibiae yellowish with definite obscuration towards base and apex; keels light yellow, extending along more than distal one-third on fore tibia (36 : 100), about one-tenth on mid tibia and along more than seven-tenths (76 : 100) on hinder pair.

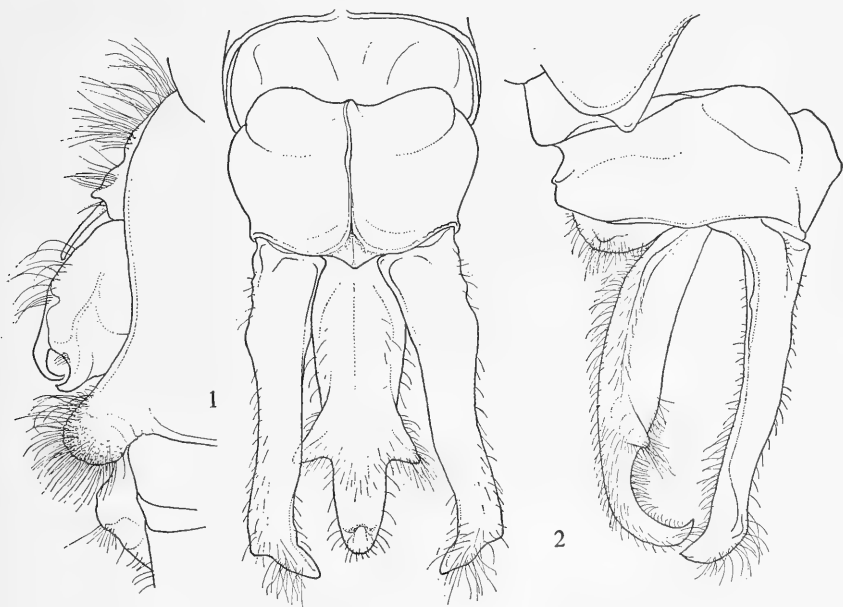


Fig. 1—2. *Idionyx philippa* Ris, ♂ from Mindanao. 1, genitalia; 2, anal appendages, dorsal, and left side view

Wings unspotted, membrane slightly tinged with greyish-yellow, especially towards the tips. Antenodals 12-13 on fore wings, 8 on hind wings; postnodals 6 and 9, respectively. Pterostigma unbraced, short, covering about $1\frac{1}{2}$ cells, deep black. *Arc* at Ax_2 , sectors originating low down at a point scarcely removed from $Cu + A$, fused together almost as far as first cross-vein beyond *Arc*. Only 1 cross-vein in *bt* and 2 *Cux* on all wings (inclusive of the 4- or 5-sided "internal triangles"); discoidal field of fore wing parallel-sided, with a single row of 13-14 cells followed by 3-4 double cells well beyond level of nodus, and 4-5 marginal cells; the same of hind wing with single row of 6 cells as far as level of nodus, then expanded, with 7 marginal cells; 2-3 *Bxs* on fore as well as hind wings. Anal loop of hind wing elongate, made up of 7 cells. Anal triangle two-celled, the angle after a distinct concavity rounded; only one basal cell between loop and anal triangle and two rows between triangle and anal margin of hind wing. Membranula about equal in width to the triangle midway its length, extending all along the strongly undulated marginal vein; colour grey, growing paler (almost white) towards base.

Abdomen slender, spindle-shaped, basal segments but slightly expanded, from base to apex of 7 widened, thereafter almost parallel-sided as far as end of 9, then again a little narrowed. Colour deep black, tergites 2-3 smooth and shiny, progressively less so posteriorly; 7-10 almost lustreless. Segm. 1 with tiny yellow lateral spot, 2 with complete broad yellow band bordering ventral margin but excluding the auricles; the colour also occupies the basal portion of the lobus posterior; a similar, though much narrower, stripe along basal half of lower margin of tergite 3, the distal half of 7 ventrally, and whole lengths of 8 and 9, likewise on their ventral surfaces (widest at end of 8). No dorsal yellow markings save for tiny transverse yellowish streaks on the intersegmental rings of segments 3-5. Genital organs mainly black, plate-shaped anterior lamina with crescent-shaped apical emargination; anterior hamulus with distinct conical apex; posterior hamulus with its outer branch yellow on each side of the black rim (Fig. 1). Suberect marginal pubescence fringing ventral surfaces of tergites 7 and 8 and sternite of 8 only little more conspicuous or longer than elsewhere, golden yellow, all hairs being directed obliquely mesiad and caudad. Segment 10 strongly raised and forming an acute middorsal crest, whose basal portion is convexly rounded in lateral view.

Anal appendages black, shaped as in Fig. 2; bristly pubescence neither very dense nor tufty, yellowish brown.

Female. — Resembling the male in most respects, even in the shape of the vertex and occipital structure. Differs slightly in that the bipartite yellow marking upon the posterior portion of the metepimeron is divided into two spots, one more or less oval, the hindermost spot rather more triangular in outline. Femora somewhat lighter brown, the outer faces of the first two pairs of tibiae also brown. Wings a little broader than in male. Membrane hyaline, except the bases as far out as Ax_2 and *Arc*, diffusely and not deeply saffronated. Neuration very similar to male. Antenodals 13 on fore wings, 8-9 on hind wings; postnodals 6-7 and 7-8, respectively. *Arc* slightly distal to Ax_2 on all wings; $\frac{bt}{1.1}$; $\frac{Cux}{2.2}$; $\frac{Bxs}{4.3}$. Discoidal field of fore and hind wings as in male, with single row of 12-14 cells to beyond nodus in fore wing and 6-7 as far as level of nodus in hind wing. Anal loop consisting of 8 or 9 cells; three cell-rows between loop and anal

margin of hind wing. Membranula a little longer than first marginal cell, coloured as in male.

Abdomen of the usual cylindrical shape, nature and colour of tergal integument as described for the male. Yellow markings reduced to a point at the sides of 1, a stripe along tergal margins of 2 and 3 (widest basally on 2) and a fine yellow line bordering the lower margin of tergites 4—8, the 8th in addition having a small postmedian spot near ventral margin. Valvula vulvae not projecting beyond apical border of 8th tergite, apparently shaped similarly to that described and figured for *I. yolanda* Selys by Lieftinck (1939, Fig. 2), although the terminal segments are rather compressed, preventing appropriate comparisons.

Measurements: ♂ abdomen + app. 32.0 mm, hind wing 30.3 mm, pt. fore wing 1.2 mm; ♀ 32.0, 34.0, 1.8 mm, respectively.

Male (Leyte). — Differs from the former only in being a little smaller and in that the yellow metaspiracular stripe is so much constricted as to become almost interrupted at its middle. Wings entirely hyaline. Nodal index $\frac{6.12.12. 6}{8. 9. 8.10}$; $bt \frac{1.2}{1.1}$; $Cux \frac{2.2}{2.2}$; discoidal

field of fore and hind wings as in the Mindanao example; $Bxs \frac{2.2}{3.2}$; anal loop with 4 + 5 and 3 + 5 cells. Genitalia and anal appendages as in the previous male.

Measurements: abd. + app. 31.0 mm, hind wing 30.0 mm, pt. fore wing 1.5 mm.

Female (Leyte). — Generally similar to the male. First pleural thoracic stripe completely divided into two portions, as described for the type, but separate spots are a little larger. Wing membrane coloured similarly to the type, the basal spots equally extensive but not so deeply stained. Nodal index $\frac{7.13.13. 6}{10. 8. 8. 9}$; $bt \frac{2.2}{1.1}$; $Cux \frac{2.2}{2.2}$; discoidal

field of fore wing with single row of cells up to level of nodus; $Bxs \frac{2.2}{3.3}$; anal loop with 3 + 5 cells in both hind wings.

Measurements: abdomen 30.0 mm, hind wing 32.2 mm.

Female (Cotabato, Mindanao). — A small-sized specimen with rather broad and uninterrupted first lateral thoracic stripe but with the metepimeral spots similar to those of the others. Wings deeply saffronated, basal spots as in the type. Nodal index $\frac{6.12.12. 6}{8. 8. 8. 8}$; $bt \frac{1.1}{1.1}$; $Cux \frac{2.2}{2.2}$; discoidal field as in the Leyte specimen; $Bxs \frac{2.2}{2.1}$; anal loop 4 + 5, 4 + 5.

Measurements: abdomen 30.5 mm, hind wing 30.0.

The three females recorded from the island of Luzon by Needham & Gyger (loc. cit.), are referred here with some misgivings because the synthorax is described to bear "a row of four yellow spots low on the sides, the first above the middle coxa, the second on the spiracle, the other two on the metepimeron". This would mean that the metaspiracular stripe is devoid of its upward prolongation, which in all other specimens examined by me is present, either in the form of a more or less isolated streak or fused together with the spot at the spiracle.

***Idionyx murcia* spec. nov.**

Fig. 3—4

Material. — Lesser Sunda Is.: 1 ♂ 2 ♀ (1 ♀ immature), Sumbawa I., Central Sumbawa, Semongkat-atas, 21.IV.1961 (♂), Semongkat, 300 m, 27.IV.1961 (♀), and Route Batu dulang, 600 m, 10.IV. 1961 (♀ juv.), all P. Jauffret & R. Pujol, ex coll. A. Heymer. The ♂ is the holotype.

The characterization of this new species is the result of a direct comparison with *I. philippa* Ris, described in the previous pages.

Male. — Lateral lobes of labium with angulated yellow extero-basal spot, the remaining parts of labium brownish-black. Labrum entirely chrome, narrowly bordered anteriorly with black. Anteclypeus likewise chrome, only the somewhat impressed side-angles obscured. Postclypeus dark metallic green with conspicuous chrome spot in the middle, the latter shaped like a broad triangle whose apex is transversely cut off. Frons emerald green changing to blue-green above; anterior surface less protuberant, more closely and deeply corrugated on either side of the black sulcus and also less shiny, than in *I. philippa*, but occipital triangle and vertex much as in that species. Rear of the head glossy black.

Wings unspotted, membrane slightly tinged with brownish-yellow. Neuration much as described for *I. philippa* and *I. orchestra* Lieft. (from Sumba I.), except for the following slight differences. Antenodals 12—13 on fore wings, 8 on hind wings; postnodals 6—7 and 9, respectively. Pterostigma covering little more than the underlying cell, dark brown. One cross-vein in *ht* and 2 *Cux* on all wings (inclusive of the 4- or 5-sided *ti*); discoidal field of fore wing with a single row of 11—12 cells to a little beyond level of nodus, followed by 3—4 double (or triple) cells and 5 marginal cells; the same of hind wing with single row of 6 cells to level of nodus and with 6 marginal cells; 1 *Bxs* on fore, 2 on hind wings. Shape of anal triangle, angulation and membranula exactly as in *I. philippa*.

Anterior lobe of prothorax clear yellow, pleurae largely yellow, posterior lobe brown. Synthorax brilliant metallic green, extensively marked with bright ochreous, as follows. A sharply defined, elongate-oval juxtahumeral band that occupies also the posterior two-thirds or more of the mesinfraepisternum, extending two-fifths up the dorsum; a similarly coloured, broad and almost parallel-sided stripe (ca. 0.7 mm broad) crossing the spiracle and extending from just below the dorsal crest right down onto the posterior part of the hind coxa, on which it is much narrower; a still broader, somewhat curved, metepimeral band covering only little less than its posterior half. Ventrally these metepimeral bands are confluent across metapostepimera and apical portions of the post-sternum, forming together a U-shaped marking which itself encloses a metallic blue-black spot of the same form, the central area of the ventral surface remaining largely yellow. Ante-alar triangles black.

Legs coloured as described for *I. philippa*; tibial keels yellow, those on fore tibia occupying their apical two-fifths (40: 100), on mid tibia about one-eleventh and on hinder pair about seven-tenths (71: 100).

Abdomen with the terminal segments less expanded than in *I. orchestra* and *philippa* but for the rest very similar in shape and colouring, lacking metallic reflections. Segm. 1

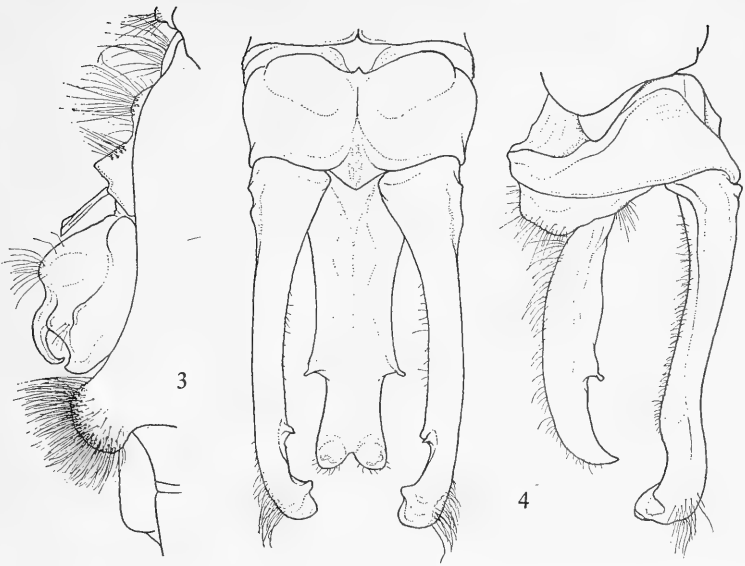


Fig. 3—4. *Idionyx murcia* spec. nov., ♂ holotype from Sumbawa. 3, genitalia; 4, anal appendages, dorsal and left side view

with large cuneiform yellow lateral spot; 2 with complete very broad band running along ventral margin not covering the auricles but occupying also the lobus posterior, which is obscured only at its apex; a similar though narrower stripe, tapered posteriorly along basal one-third of lower margin of tergite 3; broader stripes along whole lengths of tergites 7, 8 and 9 on their ventral surfaces. No dorsal pale markings. Genital organs shaped and coloured much as in the allied species but anterior hamulus triangular; lobus posterior rounded, with dense fringe of long radiating golden yellow bristles (Fig. 3). Marginal pubescence on ventral surface of tergites 7 and 8 and of sternite 8 erect, rather long but not very dense, all hairs brown and directed ventrad. Segment 10 impressed on either side of a small and rather low (though acute) middorsal crest, which is barely visible in lateral view.

Anal appendages black, shaped as in Fig. 4; pubescence short and inconspicuous, except a subapical fringe of much longer light brown hairs at the outer faces of the superior pair.

Female. — Differs from the male only in having all yellow markings on thorax and abdominal tergites a little more expanded; also in that only the hind tibiae (save the bases and apices) are bright yellow. Wings broader, bases bright orange-yellow as far distally as Ax_3 , the arculus and base of discoidal triangles in *cu*; membrane otherwise either entirely hyaline (immature ♀) or smoky yellowish-brown (adult ♀). Antennodals 12—14 on fore wings, 8—9 on hind wings; postnodals 6—7 and 8, respectively. *Arc* at or a little proximal to Ax_2 ; bt $\frac{2.1}{1.1}$ and $\frac{1.1}{1.1}$; Cux $\frac{1.1}{2.2}$; Bx_5 $\frac{2.1}{2.2}$ and $\frac{1.1}{2.3}$. Discoidal field

as in male, with single rows of 12—13 cells in fore wings and 5—6 in hind wings. Anal loop made up of 8—9 cells; three cell rows between loop and anal margin of hind wing. Pterostigma black. Membranula a little longer than first marginal cell, coloured as in male.

Abdomen cylindrical; yellow lateral spots and bands of 1—3 and 7—8 (absent on 9) more conspicuous, especially the one on 2, which is widest at extreme base. Valvula vulvae indistinguishable from that of *I. yolanda* Selys (see description of *I. philippa* Ris).

Measurements: ♂ abdomen + app. 31.7 mm, hind wing 30.0 mm, pt. fore wing 1.0 mm; ♀ (adult) 30.5, 33.0, 1.8 mm, respectively; ♀ (juv.) —, 31.5, 1.7 mm, respectively.

The larva of *Idionyx* does not seem to have been described with absolute certainty. Fraser (1936) only says that it is "distinctly Libelluline in character". In their work on the Odonata of the Philippines, Needham & Gyger (1939: 59—60, pl. 8 figs. 93—95) published an account of a larva from Luzon which they ascribed to "*Idionyx spec.?*" Although it was stated that the venation in the wings was well preserved and generic determination positive, there remains doubt as to the correct identification of this specimen. This is evident not only from the size, Needham's example measuring 19—20 mm, i.e. much too large for regional *Idionyx*, but also from the description and figures, which suggest some other genus. This Philippine larva is peculiar in that the crenulated labial palpus bears only "six coarse teeth on the terminal border (five only being shown in the figure!)", the three large middle teeth wider than high, obliquely rounded, each armed with about a dozen spinules in double array longer and shorter". Lateral abdominal spines are present on 8 and 9, and there are no dorsal hooks, features applying to *Idionyx*. Other details in the description do not fit any other regional corduliid genus, although the facies is reminiscent of *Hemicordulia* and *Procordulia*. However, the larvae of *Procordulia sambawana* Foerster and *artemis* Liefstinck possess seven rounded teeth at the distal border of the palpus (inclusive of the divided outermost tooth) and dorsal abdominal hooks are present on segm. 4—8 in *sambawana* but absent in *artemis* (Liefstinck, 1933: figs. 9—10). The larva of *Hemicordulia mumfordi* Needham also has seven palpal teeth while middorsal hooks on the abdominal segments are wanting (Needham, 1932, fig. 34). *Hemicordulia australiae* (Ramb.) is similar but possesses middorsal hooks on 3—9 or 4—9 (Watson, 1962: 14). It is evident, therefore, that it remains impossible to express any definite opinion on the identity of Needham's larva from Luzon. For a description of *Macromidia donaldi* Fraser (1936), see under that genus.

The following authenticated material of *Idionyx* larvae has been studied by the present author.

Idionyx yolanda Selys. — Malay Peninsula: 1 ♂ (with exuviae), Central Perak, 10 mi. N. of Ipoh, Sungai Chepor, 6.III.1963, M. A. Liefstinck; 1 ♀ (with exuviae), Selangor, 6 mi. Bukit Tiga-Subang Rd., Klang distr., Sungai Pelumut, 5.VI.1963, emerged Kuala Lumpur, 15.VIII.1963, J. I. Furtado.

Idionyx spec. indet. — Malay Peninsula: 3 ex. ult, 1 ex. penult, Perak, Sungai Yum, 15.III.1933, M. W. F. Tweedie. A number of other unidentified specimens, collected by J. I. Furtado and the author during their explorations of streams in various provinces of the Malay Peninsula (1963—64), are not now available for comparison.

Idionyx montana Karsch. — Central W. Sumatra: 1 ♂ 1 ♀ ult (reared from larvae), Benkulen, S.W. slope of Mt. Dempo, 300 m, received 24.X.1941, from W. C. Verboom;



Fig. 5—7. *Idionyx montana* Karsch. 5, ultimate instar larva from Mt. Dempo (Sumatra), live specimen; 6, inner view of exuvial labium; 7, left palpus, more enlarged

emerged in Buitenzorg laboratory, 15.XII.1941 (♀), and 23.XII.1941 (♂). West Java: 1 ♂ ult, Djasinga, Tjibarembang (stream), ca. 150 m, sifted from algal growth on bottom of tiny rivulet, 31.VIII.1937, M. A. Lieftinck; died in captivity at Buitenzorg (Bogor), 10.X.1937.

The above larvae resemble each other so much in outward appearance and structure, that I have abstained from making a careful study of all. The illustration of the whole larva (Fig. 5) was made from one of the Sumatran specimens shortly after its penultimate ecdysis.

Description of full grown larva of *I. montana* Karsch from Sumatra (Fig. 5—7)

Body compact, sparsely pubescent dorsally. Head large, directed obliquely upwards during life so as to expose part of the labium (Fig. 5); eyes knob-like and distinctly protuberant when looked at from above with mask concealed from view. Upper surface of frontal plate concave, its anterior border evenly convex. Postocular lobes evenly rounded, surface set with short, thick spicules, which are crowded together posterolaterally. Labium of large size, postmentum (hinge) reaching back to about halfway between mid and hind coxae. Median lobe (ligula) rather short, forming a low triangle, with a row of 11—13 short spiniform setae on each side and a small bunch of these at the apex. Premental setae 5 + 5, placed in a curve. Labial palpus with 6—7 deep triangular crenations and 7—8 rounded dentations, the outermost of the latter divided and all carrying about 8 spiniform marginal setae at the apex; palpal setae long, 5 on either side, outer margin of palpus with minute spiniform setae; movable hook rather short and only slightly curved. Antenna short, seven-segmented. Propleural lobes of thorax almost as broad as the transverse diameter of head, slanting forward, borders fringed with very long hair. Wings widely divaricate, hind wing rudiments reaching as far as halfway length of segm. 6. Legs long and slender, sparsely clothed with long soft hair; claws simple. Abdomen oval, rather depressed, greatest width 5.0 mm at end of 6th segment; all segments fringed laterally with long hair. Dorsal hooks absent. Lateral spines acute, present only at segm. 8 and 9 and of small size. Segment 10 very short and annular. Anal appendages short, epiproct and paraprocts straight, triangular, acuminate, the latter only a trifle longer than epiproct; cercoids shorter than either, incurved with convex outer border, tips acute.

Ground colour of body pale yellowish green, the coxae almost white; pattern distinct, varicoloured grey-brown to dark brown, the abdominal mottling lighter than colour of wings; two distinct broad dark bands on all femora, as shown in Fig. 5.

Measurements. Total length 13.7 mm; width of head behind eyes 4.5 mm; hind femur 4.5 mm; hind tibia 4.7 mm; width of abdomen at end of 6th segment 5.0 mm.

Macromidia Martin, 1907

Syn.: *Indomacromia* Fraser, type-species *I. donaldi* Fraser, 1924.

In current classifications, *Macromidia* figures as a member of the Macromiinae (= Epophthalmiinae of Fraser, 1957). More recently still, this was done, with some misgivings, also by Gloyd (1959), who gave Macromiinae family rank. *Idionyx*, on the other hand, which Needham (1937) still left in the Corduliinae, was removed therefrom by Tillyard & Fraser (1940), who erected a new subfamily, Idionychinae, to hold it. Their arguments were the long fusion of the arculus sectors, the shape of the anal loop, the distal position of the nodus on the fore wing, the incompletely recessed discoidal triangle on the hind wing; and, coupled with these venational characteristics, the large head, weak sclerotization of the body, and the highly organized and intricate anal appendages of the male (often correlated with a peculiar form of the vertex in the female).

Taken on the whole, the venation of *Macromidia* resembles that of *Macromia* more closely than *Idionyx*. Yet *Macromidia* differs strikingly from the majority of *Macromia*

in its more rounded wings and the less markedly sinuous primary veins, two characters which it shares with *Idionyx*. Almost all venational characteristics that served Fraser to define his *Idionychinae* are equally applicable to *Macromidia*. Concerning the morphology of other body parts, with their manifold appendages, it is impossible to find a set of clear-cut characters that would guarantee every species to be put into its proper genus.

In view of the fact that *Macromidia* shares so many characters with both *Idionyx* and *Macromia* — not to mention the problematical *Idiophya!* — there can be no doubt about their affinity, *Macromidia* taking rather an intermediate position between *Idionychinae* and *Macromiinae* but lying closest to *Idionyx*. This will inevitably lead to a reevaluation of subfamily characters. Seeing how many corduliid genera are still insufficiently characterized, it seems best therefore to attempt first a summary of the principal generic characters serving to distinguish between *Idionyx* and *Macromidia* and to leave in abeyance Fraser's subfamily divisions proposed in the "Reclassification" (1957).

These characters can be recapitulated in tabular form, as follows:

Idionyx

Fore wing triangle equilateral, smaller than that of hind wing; fore wing *ti* irregularly trapezium-shaped, 4- to 5-sided and placed in the long axis, i.e., *Cu + A* almost in line with anal side of *ti*. No distinct intercalated supplementary sectors in discoidal field of fore wing, which is parallel-sided for a long distance. Anal loop of hind wing elongate (sausage-shaped), more than two times longer than broad, traversed lengthwise by a bisector. Proximal (inner) side of anal triangle of male hind wing strongly sinuous. Pterostigma small, less than 2 mm long. Nodus placed far distad: postnodal space (distance between nodus and pterostigma) at most half as long as antenodal. Only 1 (fore wing) or 2 (hind wing) proximal postnodal crossveins discontinuous into adjacent space between *R* and M_1 .

Apical keel on mid tibia present though vestigial. Tarsal claws with robust inferior tooth longer and stronger than the apical tooth (Fig. 12).

Outer branch of male posterior genital hamule thick and equal in length to sickle-shaped inner branch.

Macromidia

Fore and hind wing triangles of equal size, the distal side on fore wing longest; fore wing *ti* 4- or even 5-sided, but placed more transversely, i.e., *Cu + A* reaching anal angle of triangle after being strongly deflected around inner angles of *ti*. Discoidal field of fore wing more evenly widened distad, with distinct and rather long intercalated supplementaries (including *Mspl*). Anal loop of hind wing short and more rounded, less than two times as long as broad and lacking a bisector. Proximal (inner) side of anal triangle of male hind wing not markedly sinuous. Pterostigma larger, over 2 mm long. Nodus usually placed more proximad, antenodal space only twice as long as postnodal, or less. Usually 3 or 4 proximal postnodal crossveins not continued into adjacent space between *R* and M_1 in all wings.

Keel on mid tibia extending along its distal half. Tarsal claws with inferior tooth distinctly shorter and less acute than apical tooth, both about equally strong (Fig. 13).

Outer branch of male posterior genital hamule longer, thinner and incurved, projecting much beyond hook-shaped inner branch.

Male anal apps. long and slender, longer than segm. 9 + 10.

Apical portion of female 8th sternite abbreviated but prominent in side view and scoop-shaped, not at all emarginate and lacking leaf-like lobes.

Male anal apps. of normal length, shorter than segm. 9 + 10.

Valvula vulvae of female well marked off, extending caudad almost or fully half the length of 9th segment, deeply emarginate forming two pointed lobes.

From this table it will be clear that there is no evidence whatsoever that would justify a classification of *Idionyx* and *Macromidia* in separate subfamilies, as has been done in the past. An interesting feature which the two genera share alike with *Macromia* is the characteristic shape of the occipital triangle, with its acute-angulate lateral borders, a character perhaps found also in other allied genera of doubtful position. For instance, in the present context it should be emphasized that this part of the occiput is shaped similarly in most, if not all, species of *Synthemis*, and I have observed the same structural feature in the Australian *Micromidia* Fraser.

The genus now includes the following species:

M. rapida Martin, 1907, type-species. — ♂ ♀ Tonkin.

M. fulva Laidlaw, 1915. — ♂ N. Borneo; ♀ Sarawak (Laidlaw, 1920).

M. g. genialis Laidlaw, 1923. — ♂ Malay Peninsula; ♀ unknown.

M. g. erratica Lieftinck, 1948, stat. nov. — ♂ ♀ S. Sumatra; ♂ S. Java.

M. donaldi (Fraser, 1924). — ♂ ♀ Peninsular W. India.

M. shanensis Fraser, 1927. — ♂ ♀ Upper Burma.

M. atrovirens Lieftinck, 1935. — ♀ S.W. Sumatra; ♂ unknown.

M. samal Needham & Gyger, 1937. — ♀ Mindanao (P.I.); ♂ unknown.

M. asabinai spec. nov. — ♂ Palawan (P.I.).

Brief diagnoses of six of these have been given by Lieftinck (1935: 195—196). The species are more diversified in their venation and markings than *Idionyx*. Two of them, *M. rapida* and *fulva* have more densely veined wings than the rest, the discoidal field in both fore and hind wings commencing with two rows of cells, whereas in all others only a single row extends outwards from a point varying between 3—4 cells proximal to *Nod* to about as far as that level on the fore wings, and to 3—5 cells beyond *t* in the hinder pair. *M. samal* (♂ unknown) is intermediate in this respect inasmuch as the field in the fore wing expands to two cell-rows already midway between *t* and *Nod*, there being only two undivided cells distal to *t* in the hind wing. *M. rapida*, *donaldi* and *fulva* also differ from the other species in that the body is metallic black with well defined middorsal yellow spots on segm. 3—7 (*rapida* and *donaldi*), or marked with light brown rings (*fulva*). *M. samal* seems to come nearest *shanensis* from Burma; the female genital organs of the latter have recently been figured by Asahina (1970). *M. atrovirens* is a large and very dark-coloured species with no near allies. The rediscovery of the much smaller *M. genialis* in the island of Penang, off the westcoast of Malaya, leads me to point out some features separating it from *M. erratica*, which I now consider to be only a subspecies of the former. Lastly, one new species from Palawan can be added to the list. Asahina (1968) supposed this to be the undescribed male of *Idionyx philippa* Ris, but it is a true *Macromidia*, which I have renamed *M. asabinai* spec. nov.

The larva of *Macromidia donaldi* (Fraser) was briefly described and figured by Fraser (1936b: 208, fig. 48A, A', whole larva and labial mask). The following characters are taken from the description.

Eyes rather prominent (more strongly so than in *Idionyx*, according to Fraser's sketch); head across the eyes only little less broad than the thorax. Midlobe of labium produced slightly; 13 mental setae in a curved row on each side; palpi bordered with 7 crenulate spined teeth, the last one duplicated, and with 8 marginal lateral setae; movable hook strong. Abdomen broadly fusiform, rather strongly carinated middorsally but lacking dorsal spines; a robust apical spine on each side of segments 8 and 9. Legs of moderate length, almost naked, and with two broad dark brown annules on all femora. Total length 15 mm, head 6 mm wide, abdomen 9 mm long and 5 mm in width.

Macromidia genialis Laidlaw

Fig. 13

1923. Laidlaw, J. Mal. Br., Roy. Asiatic Soc. 1: 231—232, pl. 5 (♂ wings, genit. & apps.), ♂ Malaya.

Material. — Malay Peninsula: ♂ (holotype), Pahang, Gunong Tahan, 10.XII.1921, *M. genialis* ♂ Type, det. F. F. Laidlaw (BM); ♂ (adult), Penang Island [off Prov. Wellesley], W. Malaya, stream in Catchment area near Batu Feringgi, 1.III.1963, M. A. Lieftinck.

The wing venation of the type is well shown in Laidlaw's photograph of the right pair. To his description may be added that the labium is bright orange-yellow. Wings unspotted; discoidal field in fore wing with a single row of eight-nine cells to about two cells proximal to level of nodus, in hind wing with four and five single cells following the triangle. Cross-veins in $cu \frac{2.2}{3.3}$ inclusive of the 4-sided "internal triangle"; $bt \frac{2.2}{1.1}$.

The rather brief description can be further emended by a number of characters taken from the second specimen, which is a little larger than the type.

Male (Penang). — Labium orange-yellow; mandible-bases blackish, surface shiny; labrum black, sides faintly metallic blue with a pair of slightly impressed areas on either side of the middle; anteclypeus yellowish brown, postclypeus metallic blue, frontoclypeal groove black. Frons and vertex brilliant metallic blue-green, rather densely punctate; frons short, hardly projecting beyond the vertex when viewed laterally, its surface flattened anteriorly, pubescence black; vertex broader than long, surface evenly and strongly convex and clothed densely with long erect dark hair. Occipital triangle raised above level of compound eyes, shorter than median eye-line with sharply acute sides, its shape exactly as described for the regional species of *Idionyx*. Prothorax entirely chrome. Synthorax brilliant metallic green; dorsum with a bright yellow spot between the axillaries of the fore wings and the metallic ante-alar triangles. Outer half of each mesepisternum with well-defined, broadly oval, brown spot continued ventrad on to the mesinfraepisternum and extending dorsad for about half the length of the dorsal surface. Metinfraepisternum yellow, its anteroventral two-fifths metallic green; metepisternum with slightly oblique, yellow, lanceolate stripe, pointed at either end, situated well behind the spiracle, incomplete above and extending about as far upward as 1 mm before the

base of fore wing. Metepimeron ventrolaterally with short upward extension from the yellow colour underneath and with the metapostepimeron also yellow. Ventral surface mainly yellow but anterior portions of metepimera (except medially) metallic green and posterior belt of metasternum with transverse streak of metallic purple.

Coxae of fore legs yellow, the remainder grey-brown; legs brownish black or black; tibial keels yellow, those on fore tibia occupying about the apical two-fifths (40: 100), on mid tibia slightly less than one-half (44: 100) and on hind tibia about the apical two-thirds (70: 100).

Wings clear; nodal index $\frac{7.15.16.8}{10.10.10.10}$; *Arc* slightly distal to Ax_2 on all wings; *Cux* $\frac{2.2}{3.4}$; *bt* $\frac{3.2}{1.1}$; *Bxs* $\frac{2.3}{2.4}$; anal loop of hind wing with 8.7 cells. A single row of 6—7 cells in discoidal field of fore wing up to level of fork $M_{1,3}$ — M_4 , only 3 or 4 continuous cross-veins in that of hinder pair. Proximal side of anal triangle only slightly sinuous; anal angle bluntly angulated, rounded.¹⁾ Pterostigma brownish-black surmounting $2\frac{1}{2}$ or even 3 cells. Membranula extending as far as the cross-vein in anal triangle, light grey at base, growing darker apically.

Abdomen deep black, dorsum and part of the sides of segm. 2 metallic green. Yellow are: the auricles; a continuous stripe and fine lines along lateroventral margins of tergites 2—3 (including whole lobus posterior) and 4—6, respectively; a fine middorsal line on 2 and basal one-third of 3; a narrow but sharply defined longitudinal lance-shaped median spot on posterior three-fourths of segm. 6; and complete stripes bordering lateral margins of tergites 7 and 8, ventrally. Innermost portions of the ventral surfaces of these latter tergites clothed rather densely with short dark hairs, which are directed obliquely mesiad and caudad.

Genitalia and anal appendages shaped much as described and figured for *M. erratica* Lieft. (loc. cit.), the outer branches of the hamuli bright yellow.

Measurements: abd. + app. 33.0 mm, hind wing 29.0 mm, pt. fore wing 2.7 mm.

The specimen from Penang was taken by chance in dense jungle, flying rapidly low over a trickle in a leafy tunnel formed by overhanging shrubs.

Macromidia genialis erratica Lieftinck, 1948, stat. nov.

1948. Lieftinck, *Treubia* 19: 274—278 (as species), figs. 18—19 (δ ♀ genit. structures), δ S. Java. 1954. Lieftinck, *Treubia* 22 Suppl.: 121.

This dragonfly resembles *M. genialis* Laidlaw so much in the majority of its characters that I am of the opinion that *erratica* can hardly be maintained as a full species. It is, therefore, classified more appropriately as a subspecies of *genialis*. The Javan example is a freshly emerged male, but all *erratica* from Sumatra differ from the two Malayan individuals in having the lower half of the thoracic dorsum entirely metallic, lacking the sharply delimited oval brown patch of *genialis*. They are also distinguished from *genialis* by the design of the abdomen: the dorsal carina of abdominal segments 3—7, as well as the tergal margins of 3—8 ventrally, are lined finely with citron-yellow, whereas

¹⁾ The strong angulation shown in the photograph of the type is exaggerated and caused by the wing-base having been damaged.

in *genialis* these lines are unapparent on the dorsum of 4—5 but broadened to form a definite lanceolate spot on the 6th. Lastly, the superior anal appendages of *erratica* are slightly but distinctly more expanded after their middle than they are in typical *genialis*.

I took both sexes of *M. g. erratica* over a small stream in a jungly habitat resembling greatly the one which yielded the example of *M. g. genialis* in the island of Penang. The Sumatran insects flew in company with males of *Chlorogomphus magnificus* Selys, which I first mistook for some of the larger *Macromia*.

Macromidia asahinai spec. nov.

1968. Asahina, Jap. Jour. Zool. 15: 357—358, pl. 2 fig. 11 & figs. 5—10 (♂ wings, head & thorax, and abd. structures), ♂ Palawan I. (sub *Idionyx philippa* Ris). Holotype in B. P. Bishop Museum, Honolulu.

This little species has been so well described and figured by Asahina that it will suffice to summarize its principal characters, which are taken from the description. The insect was misidentified by its author, who thought it to be the underscribed male of the puzzling *I. philippa* Ris, a species now definitely placed in *Idionyx*.

Male. — Anteclypeus yellow, labrum and postclypeus blackish-brown. Synthorax with four yellow spots low down on the sides: one mesinfraepisternal posterior spot; a second, metinfraepisternal, coalescent with a smaller, triangular metepisternal spot terminating just above (and including) the spiracle; a third elliptical stripe traversing obliquely the middle of the metepimeron; and a much smaller, triangular mark in the posterior corner of the metepimeron and metapostepimeron. Tibial armature not described.

Wing neuration typical for the genus. Nodal index (partly of right pair only) $\frac{—14.14. 7}{—10. 9.10}$; $bt \frac{—2}{—2}$; $Cux \frac{—1}{—3}$; $Bxs \frac{—3}{—3}$. Discoidal field commencing with 8 single cells as far as about 3 cells proximal to nodus on right fore wing, and 3 undivided cells beyond *t* on right hind wing. Anal loop comprising 7—8 cells. Pterostigma relatively long, as for genus.

Abdomen brown, broadened at segments 7—8, with narrow middorsal line on 2—4, a lateroventral marginal stripe running from the auricles to as far as tergite 9 (very narrow on 4—9), and a pair of conspicuous, closely approximated, circular spots of yellow just before the middle on the dorsum of 7. Genital organs and anal appendages shaped much as in the other members of the genus. Superior pair sub-parallel, somewhat sinuous in dorsal view with acute incurved tips, which are a little upturned in lateral view; no subapical inferior ventral projection.

Measurements: abdomen + app. 29 mm, hind wing 27 mm.

This is the smallest known species of *Macromidia*, which I have much pleasure in naming after my colleague, Dr. S. Asahina, who first described it.

III. SOME MALAYSIAN SPECIES OF *Macromia* RAMBUR*Macromia gerstaeckeri* Krueger

1954. Liefstinck, Treubia 22 Suppl.: 118 (full references).

Since last discussing this species and its immature stages (Liefstinck, 1950), more material of both adults and larvae have come under my notice. In 1963, during our joint investigation of the Malayan Odonate fauna, Dr. J. I. Furtado and I found *gerstaeckeri* to be widely-spread at forest streams in the Malay Peninsula; but owing to their rapid flight and remarkable inconspicuousness, only few imagines (mostly ovipositing females) were obtained, the remainder having been reared from larvae.

Additional material. — **Malay Peninsula**: 1 ♀ (adult), Selangor, Ulu Langat area, Dusun Tua, 2—500 m, 9.IV.1963, M. A. Liefstinck; 2 ♀ (id.), Selangor, Sungai Gombak, 11½ mi. Kuala Lumpur-Bentong Rd., 22.V and 27.XI.1963, J. I. Furtado; 1 ♂ (juv., with exuviae), Selangor, same locality, 16.III.1963, J. I. Furtado & M. A. Liefstinck, emerged at Kuala Lumpur, 30.III.1963; 1 ♀ (adult), Perak, 8 mi. E. of Sungai Siput, kp. Talong, Sungai Korbu, 9.IV.1964, J. I. Furtado; 1 ♂ (juv., with exuviae), Pahang, 29½ mi. Kuala Lumpur-Bentong Rd., Sungai Tangli, 13.V.1963, emerged at Kuala Lumpur, 5.VI.1963, J. I. Furtado. **Borneo**: 1 ♀ (adult), North Borneo, Keningan, 1000—1500 m, 24.XII.1962, Y. Hirashima (BISH).

A detailed characterization is to be found in the writer's 1950 publication. Were it not for the distinctive form of its posterior hamule, the male of *gerstaeckeri* would be easily mistaken for *M. callisto* or *erato*, which are otherwise closely similar and may occur together in one locality. This proved to be so with *callisto* and *gerstaeckeri* in Malaya, where we captured both indiscriminately.

Female (Malaya). — Labium dark chestnut to brownish-black, except the median lobe which carries a pair of transverse citron-yellow spots at base; a circular spot of the same colour at the mandible-bases. Anteclypeus dark brown; postclypeus either entirely yellow or rather intermingled with brown on the anterior part, the yellow being restricted to an ill-defined undulated basal stripe, the side portions for the greater part also remaining yellow. Thorax beneath brownish-black, slightly metallic, lateroventral ridge of metepimeron and all sutures sharply outlined in yellow.

Neuration open. Nodal indices and other details of 4 adults: $\frac{6.15.15.6}{9.10.10.8}$; $\frac{6.15.15.5}{9.10.11.9}$, $\frac{6.15.16.6}{9.10.11.9}$ and $\frac{5.15.15.5}{7.9.10.8}$; *bt* $\frac{4.3}{2.2}$, $\frac{4.4}{2.2}$, $\frac{3.3}{2.3}$ and $\frac{4.3}{2.2}$; *Cux* $\frac{4.5}{4.4}$, $\frac{5.6}{4.4}$, $\frac{6.6}{4.4}$ and $\frac{4.5}{4.5}$; cells in anal loop 9.10, 6.7, 9.10 and 8.8, all except the second including 1 (rarely 2) central cells. Costa black with fine posterior yellow line from base about half-way up to nodus. Pterostigma black. Membranula ashy grey, almost black.

Abdomen sparsely marked with yellow: 2 with transverse lanceolate streak, widest at middle and tapering on either end, upon middorsum and a large, oblique, slightly irregular and constricted patch at the sides not attaining the jugal suture; 3 and 4 each with a pair of very small, oval middorsal spots placed immediately in front of the jugal suture, those on 4 vestigial; sides of 3 moreover with longitudinal stripe along ventral margin but lacking a transverse streak at its base; 7 with large prejugal dorsolateral mark, widest at base, rounded off laterally and slightly indented by black from behind at the

crest, occupying from one-fifth to one-fourth of the segment's length; in one specimen this basal marking is much smaller and finely interrupted in the median line. Terminal segments unmarked. Valvula vulvae undeveloped: apical border in ventral view somewhat swollen, very slightly undulated, the receding part of the sternite sloping down abruptly (dorsad) and forming a pair of parallel swollen ridges fitting closely against the body wall. Anal appendages awl-shaped with finely acuminate tips.

Female (discoloured). — Similar to Malayan individuals but median lobe of labium and basal edges of palpi entirely ochreous. Yellow areas of postclypeus darker and invaded by brown on either side of middle. Nodal index $\frac{6.14.14.6}{8.11.11.8}$; $bt \frac{3.3}{2.2}$; $Cux \frac{5.5}{4.4}$; anal loop with 9—10 cells inclusive of a central cell. Genitalia and appendages as described.

Measurements: ♀ abdomen 38.3—40.0 mm, hind wing 34.7—36.0 mm, pt. fore wing 2.0 mm (Malaya); 40.0, 36.0, 2.0 mm, respectively (Borneo).

The females from Malaya differ somewhat from the allotype described from Java and also from the one taken at Jor Camp in Perak, figured in my previous paper (1950, fig. 7). In them the sides of the 3rd abdominal segment are unmarked at base, while minute paired dorsal spots are present on 3—4. I am unable to say whether or not these differences are due to individual variation.

Macromia callisto Laidlaw

Fig. 10—11, 14

1954. Lieftinck, *Treubia* 22 Suppl.: 116 (full references).

Material. — Malay Peninsula: 1 ♂, 1 ♀ (ovipositing, both adult), Selangor, 11½ mi. Kuala Lumpur-Bentong Rd., Sungai Gombak, 12.VI.1963, J. I. Furtado; 1 ♀ (adult), Central Perak, 10 mi. N. of Ipoh, Sungai Chepor, 6.III.1963, M. A. Lieftinck.

These specimens are undoubtedly conspecific with the immature type described by Laidlaw. Similar to *M. erato* but smaller, the male with slenderer and more spindle-shaped abdomen. Immediately distinguished by the darker clypeus and other details of coloration but resembling *erato* in the shape of the male genital organs and anal appendages.

Male (adult, Malaya). — Labium and mandibles as described for *gerstaeckeri* and *erato*. Labrum black, its extreme base on each side of the impressions chestnut. Anteclypeus dark brown; postclypeus likewise brown but diffuse dark yellow areas are clearly discernible in the middle, in the depressions and at base of the lateral divisions. Frons black with slight metallic gloss, shape and surface sculpture of the tubercles as in *erato*.

Ground colour of thorax deep black, dorsally with steely blue, laterally with purplish and blue reflections; all yellow markings a little narrower and more restricted than in *erato*. Legs as in that species, length of hind femur 8.0 mm; keel on fore tibia a little shorter, 37.5 : 100 (*erato*: 44 : 100).

Wings clear, nervures black, only the costa finely yellow posteriorly for about half the distance from base to nodus on fore wing. Neuration open. Nodal index $\frac{5.14.14.6}{9.10. 9.8}$; bt

$\frac{3.3}{2.2}$; $Cux \frac{5.4}{3.3}$. Two cell-rows in discoidal field of fore wing; only a single cross-vein running directly from M_4 to Cu_1 in hind wing. Anal loop made up of 6 or 7 cells. Whole anal area of hind wing, including the triangle and rounded angle, shaped similarly to *erato*. Pterostigma black. Membranula dark grey, slightly lighter basally, extending to a little beyond the transverse cross-vein in anal triangle, as in *erato*.

Abdomen with the basal and terminal inflated segments much as in *erato*, but intermediate segments distinctly narrower; from the base as far as the apex of 7 markedly expanded in lateral dimension, the next segments diminishing in breadth from the base of 8 as far as the end of 9, the 10th being narrower than 9 (*erato*: end segments expanded gradually and widest across segm. 10). Middorsal carina of 10th segment acute, extending caudad as far as about half-way length of segment but becoming indistinct posteriorly. Markings of proximal segments much as in *gerstaeckeri*, hence much more reduced than in *erato*: transverse middorsal yellow mark of 2 isolated, constricted in the median line, lateral patch including the auricles narrowly detached from it; 3 with very narrow latero-ventral line and lacking a transverse lateral stripe at base; middorsal antejugal paired spots small and present only on 3, the succeeding segments unmarked; basal spot of 7 small, cordiform, not quite touching base or jugal suture, bluntly pointed caudad at the median crest; 8 with vermiform latero-ventral spot extending from the base obliquely upward and backward, terminating about half-way the segment's length. Remainder of abdomen, inclusive of the sternites, black.

Genitalia and lobus posterior practically identical in shape to those of *erato* (Fig. 10). Anal appendages, superior pair a little shorter and broader than in *erato* but otherwise very similar, the subterminal tooth perhaps a trifle less strong than in that species.

Male (ad., Borneo; in fragments). — Agrees with the above description in almost every respect. Differs in that the labium is of a lighter brown, and in that the incomplete antehumeral thoracic stripe extends only half-way up the dorsum, tapering to a point.

Wing membrane strongly tinged brownish-yellow. Nodal index $\frac{6.15.16.7}{9.10.10.8}$; $bt \frac{3.4}{2.2}$; $Cux \frac{5.5}{4.4}$; 6 cells in the anal loop, no central cell.

Anal appendages and genital organs not differing from those of the Malayan example (Fig. 11).

Female (Malaya). — Labium brown, the median lobe with a pair of suboval lemon-yellow spots coalescent at extreme base. Mandibles brown, main body with yellow external dot. Labrum black, with crescentic brown median spot at its base. Anteclypeus brownish-black, postclypeus dirty ochreous, save for a cloudy brown spot placed on each side of the impressed areas. Frons, vertex and rear of the head deep black, not metallic. Yellow markings of thorax and abdomen as in the male; the orange prejugal patch at the base of the 7th abdominal segment is broader than long, placed transversely, somewhat narrowed posteriorly and rounded off at the sides in one example, occupying slightly less than one-third of the segment's length; latero-ventral border of same tergite finely lined with yellow and traces of yellow also basally at the lower margin on the 8th.

Wing membrane in one old specimen strongly dark flavescent, in the second example hyaline. Nodal indices $\frac{6.14.15.6}{8.10.11.8}$ and $\frac{6.14.15.5}{6.9.9.8}$; $bt \frac{4.4}{2.2} \frac{3.3}{2.2}$; $Cux \frac{5.4}{4.4} \frac{5.5}{4.4}$. Anal loop with 8.8 or 9.9 cells, without or including 1 or 2 central cells.

Valvula vulvae at 8th sternite scarcely developed, not reaching apex of the corresponding tergite; the lower margin (i.e. the upper, when looked at from below) bears a distinct V-shaped median incision, instead of being straight or slightly undulated, the rest of the thickened sternite being directed upwards to fit against the body wall as a pair of rounded parallel-ridges, similar in form to that in the allied species.

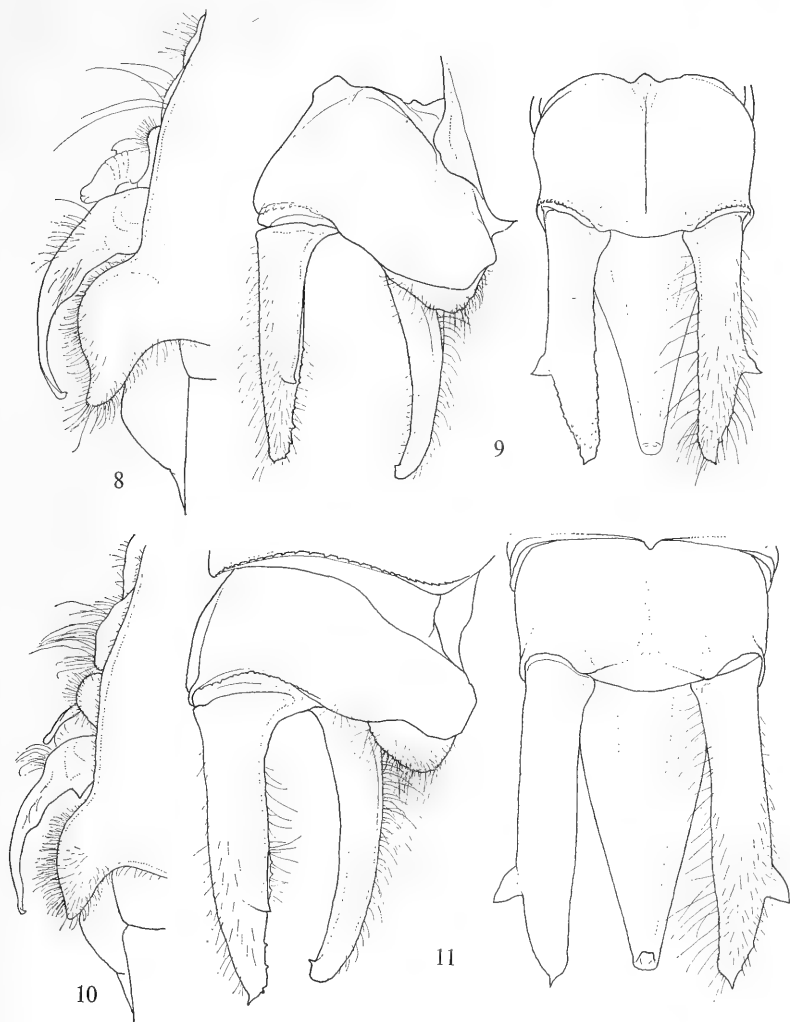


Fig. 8—9. *Macromia dione* spec. nov. ♂ holotype from N. E. Sumatra. 8, genitalia; 9, anal appendages, right lateral and dorsal view. — Fig. 10—11. *Macromia callisto* Laidlaw, ♂ genitalia; 10, from Malaya; 11, anal appendages of ♂ from Borneo

Measurements: ♂ abd. + app. 41.0 mm, hind wing 33.8 mm, pt. fore wing 2.0 mm (Malaya), 41.5, 32.5, 2.0 mm, respectively (Borneo); ♀ 37.0—38.8, 34.0—36.0, 2.0 mm, respectively.

Except for the dissimilar shape of the vulvar lamina, it was found impossible to separate the female of *callisto* from that of *gerstaeckeri*. The individual differences in the venation of each have been given merely to demonstrate the existing variation and are evidently of no importance specifically.

Structurally, *M. callisto* is most nearly related to *erato*. The female of the latter has the postclypeus entirely bright yellow, the paired dorsal spots upon the segments 3 and 4 more enlarged, with an additional pair on 5, and differs further from *callisto* in that the ventro-apical margin of the valvula vulvae is not excised.

Macromia dione spec. nov.

Fig. 8—9

Material. — N. E. S u m a t r a: 1 ♂ (adult), labelled 6594/Deli, Sumatra, L. Martin G. (print), *Macromia ? westwoodi* Selys (unknown writing) (MNB).

Of the *M. septima* Martin group.

Male (holotype). — Labium dark chestnut, the basal portion of the broad midlobe pale yellow forming a complete transverse band which in the middle is narrowed and invaded by brown from the distal border. Mandibles glossy brown with large external yellow patch, centred with dark brown, placed upon its swollen basal portion. Labrum and clypeus dark brown, the anteclypeus with a tiny light brown median spot at extreme base; sides of postclypeus lighter brown, the median area with a pair of vestigial brownish-yellow spots filling out the impressions on either side of the middle. Frons and vertex black with low metallic blue lustre, pyramidal processes of frons not flattened or framed anteriorly, surface superficially and rugosely striato-punctate, sides smooth, almost impunctate; vertex in frontal view with raised tubercles more widely distant than in *M. septima* and even more so than in *erato* (fig. 1 and 5 in Lieftinck, 1950). Raised occipital triangle and rear of the head glossy black.

Synthorax metallic green. Incomplete yellow antehumeral bands, ante-alar triangles and lateral thoracic bands as described for *M. erato*, the dorsal bands extending about three-fifths up the mesepisterna with slightly incurved and rounded apices; metaspiracular band broad, widest at the spiracle (1.2 mm) and almost twice as broad as this; posterior metepimeral band perfectly straight, parallel-sided, and only little narrower than the latter; ventral surface of thorax as described for *M. erato*.

Legs long and slender, black; all coxae bright yellow posteriorly; hind femur 7.3 mm long. Fore legs for the greater part missing; tibial keel absent on mid tibia but occupying full length of hind tibia, though not extending quite to its base. Tarsal claw with inner ramus longer and more robust than apex.

Wings unspotted, membrane faintly suffused with greyish-yellow all over, especially toward the tips. Costa with fine interior yellow line extending outwards from base almost as far as the nodus. Neuration open, nodal index $\frac{4.13.13.5}{6.10. 9.6}$; *bt* $\frac{3.3}{2.2}$; *Cux* $\frac{4.4}{4.3}$.

Two or only a single cross-vein running directly from M_4 to Cu_1 in hind wing. Only one large basal cell between anal triangle and anal loop of hind wing, the latter with only 6 cells, without central cell. Two cell-rows between loop and posterior border of hind wing. Distal side of anal triangle almost straight from base to tornal angle, which is rounded; margin of hind wing between membranula and anal angle concave. Pterostigma black. Membranula dark grey with distinct, almost pure white spot at extreme base.

Abdomen slender, slightly spindle-shaped, rather longer relatively than in the allied species; basal segments, as well as 7 from base to apex, broadened in both dimensions, then parallel-sided as far as the end of 8 and finally again slightly narrowed from base to apex of 9. Dull black, sides of 1—3 slightly shiny and with faint dark bronze-green lustre in certain lights. Yellow markings greatly reduced, much as in *M. gerstaeckeri* and the Bornean *M. corycia*, as follows. Anterior half of segm. 2 with large oblique lateral patch, broadly attached to base of segment and including the auricles; this mark well distant from a pair of closely approximated, transverse oval spots placed dorsally in front of the jugal suture; there is, besides, a tiny spot situated just dorsal to the lobus posterior, which itself is black. Segm. 3 with vestige of a yellow lateral streak at the basal margin, a yellow line terminating at the jugal suture bordering the ventral margin of the tergite, and a pair of barely visible middorsal specks, one on either side of the median carina, placed also in front of the transverse suture; 4—6 unmarked; 7 with transverse orange marking, narrowly detached from base, longest at the median carina and with its pointed apex directed caudad; it extends back for about one-fourth the segment's length, i.e. as far as the jugal suture; laterally, the same spot descends to about one-half the height of the tergite, at which level it is well rounded off. Segm. 8 with conspicuous orange latero-ventral mark attaining exactly half the segment's length from base, the apex of the spot subtruncated and about three times broader than its width at base; 9—10 black. Segm. 10 strongly longitudinally carinate, this dorsal crest in side view gradually more strongly raised towards the base so as to form a rather blunt, though distinctly elevated ridge (Fig. 11).

Genitalia shaped much as in *M. callisto* and *erato*, especially the pear-shaped lobus posterior of 2nd segment; posterior hamuli more strongly convex in profile view, with the narrow and very slender distal portion a little shorter, and each of them at the same time more definitely outcurved, than in these species (Fig. 8).

Anal appendages black, shorter than in the allied species, apices of superior pair only slightly and gradually incurved in dorsal view, the distal portion, beyond the strong transversely placed tooth, longer than in any of the other Malaysian species of the same group; bristles strong, of great length and rather numerous, especially at the blunt tips. Inferior appendage subequal in length to the superior pair, apex carrying two minute dorsal denticles (Fig. 9).

Measurements: abdomen + app. 39.0 mm, hind wing 32.0 mm, pt. fore wing 2.0 mm.

Female unknown.

A very distinct species that runs out into couplet 12 of my key (1950: 681), to near *M. callisto* and *erato*, with which it shares the slender form of the posterior genital hamulus and the pear-shaped lobus posterior. It differs from both in the more proximal position of the external tooth at the superior appendage, the presence of an elevated

middorsal crest on the 10th abdominal segment, as well as in details of coloration. The open neuration and the relatively great length of the abdomen are additional specific characters.

Macromia arachnomima Liefstinck

1953. Liefstinck, *Treubia* 22: 395—406, figs. 4—7, ♂ struct., whole larva and larval struct. (♂ S. Borneo); 1954. Liefstinck, *Treubia* 22 Suppl.: 116; 1955. Liefstinck, *Zool. Meded.* 33: 263—266, fig. 14, ult larva (♀ S. Borneo); 1969. Liefstinck, *De Lev. Natuur* 72: 103—109, figs. 2—3, whole larva & struct., ecol. notes (Borneo). — 1969. Furtado, *Verh. Intern. Verein. Limnol.* 17: 881.

Additional material. — Malay Peninsula: 1 ♂ (ad.), Central Perak, Plus river area, Sungai Chior, low country, 7.III.1963, M. A. Liefstinck. — Borneo: 1 ♀ (juv.), W. Borneo, Singkawang, stream at Montrado Rd., 24.III.1932, L. Coomans de Ruiter; 2 ♀ (ad.), Central E. Borneo, Samarinda distr., 250 m inland, 125 m, Tabang, Sungai Bengen (trib. of Belajan river), 4.IX and 15.X.1956, A. M. R. Wegner.

The Malay Peninsula is a new record for this extraordinary species. The types, male and female, were described after specimens reared from larvae collected in southern Borneo (loc. cit., 1953, 1955). A second immature female from western Borneo, collected as early as 1932, had to be left unnamed by the absence of a male; this can now be recorded also. The discovery of the perfect dragonfly in the Malay Peninsula definitely confirms previous determinations of a number of larvae extracted from submerged rootlets and collected by Messrs. D. S. Johnson and J. I. Furtado (1969: 881) from various lowland streams (not specified here) in Selangor and Johore.

The following notes are based on the first mature examples of either sex.

Male (ad., Malaya). — Conforms to the type, except for the following colour differences and other details. Mouth-parts brown, a cloudy yellowish patch at the mandible-bases. Clypeus uniform dark brown. Wings hyaline; rusty blackish-brown spots at extreme base vestigial in *c-sc* and *cu* on fore wings, slightly larger (though smaller than in the type) on the hinder pair. Nodal index $\frac{5.14.13.5}{8. 9. 9.8}$; cross-veins in *ht* $\frac{2.3}{1.1}$; *Cux* $\frac{6.6}{3.3}$; cells in anal loop 6.6 without central cell. Anal triangle wider at base than in most other species; membranula almost pure white. Pterostigma black.

Abdomen of normal length, segments parallel-sided from base of 4 almost as far as end of 6, thereafter gradually broadened and widest at apex of 7, then again a little narrowed to the end of 8; 9—10 parallel. Segment 9 of normal shape, its dorsal crest acute. Abdominal markings bright yellow on a deep black ground; no metallic reflections. Undulated middorsal band across segm. 2 subinterrupted in the median line, otherwise all abdominal markings as described for the type, except that the prejugal annular spot on segm. 7 is rather obscured basally, and there is no yellow colouring on 9—10 ventrally.

Female. — All specimens differ conspicuously from the other sex in that the dark spots at the bases of all wings are much more extensive: deep rusty brown in the immature female and extending to beyond Ax_1 in fore wing and as far as Ax_{2-3} in the hinder pair, all surrounded by a golden yellow areola covering the entire anal area; in the adult females the dark spots occupy a little less of the basal cell surfaces and lack

the golden areolae. The rest of the wings in the mature examples is hyaline, except in one female, which has the apices cloudy yellow. Venation denser than in the males but indices variable; there are from 12 to 15 cells in the anal loop of the hind wing, which invariably includes 1—2 central cells. Head in front uniform dark brown including the mandibles; upper portion of frons anteriorly and above, as well as the vertex, metallic blue-black. Yellow juxtahumeral thoracic bands obsolete. Abdominal markings greatly enlarged on segm. 2, though varying in extent, occupying almost the entire anterior (prejugal) part of the dorsum and sides in the juvenile specimen, indented by black posteriorly or obliterated middorsally, in the adulti. Basal spot of segm. 7 larger than in male, covering basal two-fifth of segment, otherwise as in the opposite sex.

Measurements: ♂ (Malaya) abd. + app. 43 mm, hind wing 37.7 mm, pt. fore wing 2.1 mm; ♀ 45.2, 43.5, 3.0 mm (W. Borneo) and 42.5—43.5, 40.0—40.5, 2.2 mm, respectively (E. Borneo).

Possibly widely distributed in the lowlands of Malaysia but so far known only from Borneo and the Malay Peninsula.

GEOGRAPHICAL DISTRIBUTION OF *Macromia* IN MALAYSIA

It was foreseen at the end of an earlier summary (loc. cit., 1950: 676—677) that explorations in Malaysia during the next 20 years would result in the discovery of some more species and a better knowledge of the distribution of those already described. The following table gives an idea of the present state of our knowledge. Of the 15 species listed there are still eight which are known only from one of the six geographical "provinces" of Malaysia here included (all, except one, insular). Endemic species are marked with an asterisk *

Species	Malay Peninsula	Sumatra	Java	Borneo	Bangka	Billiton	Further range
<i>arachnomima</i>	+			+			
<i>callisto</i> *	+						
<i>cincta</i>	+	+	+	+	+	+	Palawan
<i>corycia</i> *				+			
<i>cydippe</i>	+	+	+	+	+	+	
<i>dione</i> *		+					
<i>erato</i> *			+				
<i>euterpe</i> *				+			
<i>gerstaeckeri</i>	+	+	+	+			?Philippines
<i>jucunda</i> *			+				
<i>mnemosyne</i> *				+			
<i>moorei fumata</i>	+	+	+				Celebes
<i>polyhymnia</i> *		+					
<i>septima</i>			+				Tonkin
<i>westwoodi</i>	+	+	+	+			
Total	7	7	8	8	2	2	

IV. THE PAPUASIAN GROUP OF *Macromia* RAMBUR

Since the last revision of the Papuasian representatives of this genus (Lieftinck, 1952) several fresh captures of these impressive insects from all over the Papuan Region have come into my hands. Besides a fair number of additional specimens pertaining to earlier described forms, these collections yielded three (and possibly more) species new to science. One of these was described only few years afterwards (Lieftinck, 1955), but the rest still awaited closer examination. It is the purpose of this chapter to characterize the novelties, to give further information, where necessary, on related species, and to supply new locality records for the species already known.

All regional species are very much alike and obviously closely interrelated; I have, therefore, merely accumulated comparative notes and, in one instance, also a key, to facilitate their recognition, a more elaborate descriptive table for eight of the then known taxa being found in my 1952 paper (loc. cit.: 438—444). The present survey deals with eight species known to inhabit those islands and land masses of the Indo-Australian archipelago which are situated east of the Philippines and Celebes.

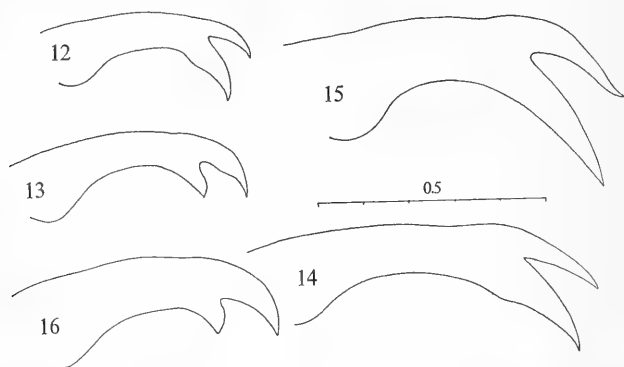


Fig. 12—16. Metatarsal claws of ♂. 12, *Idionyx montana* Karsch, from Java; 13, *Macromidia genialis erratica* Lieft., from Java; 14, *Macromia callisto* Laidlaw, from Malaya; 15, *Macromia celaeno* Lieft., from New Guinea; 16, *Synthemis miranda* Selys, from New Caledonia

The Australo-Papuan members of *Macromia* form a distinct section of the genus. All agree in being of large size and by having most of the body brilliant metallic green (except the more terminal segments of abdomen), yellow markings being much reduced: a single orangish patch at the base of the 7th tergite being the only conspicuously coloured area ornamenting the abdomen dorsally. All are characterized by the exceedingly small pterostigmata and the remarkably diminutive size of the discoidal triangle of the hinder wing. Special attention must be paid to the extraordinary form of the tarsal claws in this and probably several other sections of *Macromia*¹⁾. The claws are deeply

¹⁾ Up to now only few other species were examined upon this character, i.e. all members of the Malaysian section of *M. septima* Martin, which appear to be similar in this respect; the Palaearctic *M. splendens* Pictet, however, possesses normally shaped claws.

cleft; but whereas in most other corduliids the inner ramus (or inferior tooth) is usually shorter and slenderer than the outer (main) branch, in them the inner branch follows the strong main curve, being at the same time the most robust and longest of the two, whilst the outer is finer, branching off slightly asymmetrically (Fig. 15). Distinctive characters common to all males are the slender and very narrow genital hamule and the sharply pronounced acute anal angle of the hind wing. Like the majority of Corduliidae useful criteria for the recognition of species are most evident in the males. In this sex the shape and armature of the 10th abdominal segment, the accessory genital organs and anal appendages, are quite distinctive.

The distribution centre is New Guinea, only three species occurring outside the continent including its satellite islands, viz. one on Halmahera and Batjan in the northern Moluccas, a second in New Britain and New Ireland (Bismarck Archipelago), while a third, the rather enigmatic *M. viridescens* Till., from the Cape York peninsula in northern Australia, is known only from a single female.

The regional section can be split up conveniently into three groups based on colour characters shared by both sexes; these do not, however, appear to reflect relationships.

Group I of *M. terpsichore* Foerster

Postclypeus with conspicuous transverse yellow band, or at least spotted with yellow on either side of the middle. Dorsum of thorax (mesepisterna) with a pair of clearly defined yellow antehumeral bands extending at least half-way up the dorsum.

The species are:

M. amygone Lieft., 1952 (W. and S.W. New Guinea)

M. celaeno Lieft., 1955 (E. New Guinea; d'Entrecasteaux and Louisiade Arch.)

M. eurynome Lieft., 1942 (S. New Guinea)

M. hermione Lieft., 1952 (Misool I.)

M. lachesis spec. nov. (Bismarck Arch.)

M. sophrosyne Lieft., 1952 (Waigeu I.)

M. terpsichore Foerster, 1900 (N. and N.E. New Guinea)

M. viridescens Tillyard, 1911 (Cape York, N. Australia).

Group II of *M. melpomene* Ris

Postclypeus reddish- to dark brown or almost black, agreeing in colour with that of the rest of the head anteriorly. Dorsum of thorax metallic green lacking well defined antehumeral bands, but lower part of mesepisterna frequently reddish brown, dorsally acquiring a metallic green lustre.

The species are:

M. astarte spec. nov. (S.E. New Guinea)

M. euphrosyne Lieft., 1952 (Waigeu I.)

M. melpomene Ris, 1913 (New Guinea, universal ?)

M. spec. indet. (d'Entrecasteaux Is.).

Group III of *M. chalciope* Lief tinck

Postclypeus as in Group II. Dorsum of thorax with a pair of short, lanceolate, orange or yellow antehumeral bands tapering dorsally to a blunt point.

There is only one species:

M. chalciope Lief t., 1952 (N. Moluccas), with one subspecies (?) off N.W. New Guinea (Schouten Is.).

It is of interest to note that the structural characters separating the members of each of the two main groups are allotted analogously, so that if these group characters were lacking, specific recognition would become much more difficult.

Macromia anymone Lief tinck

1952. Lief tinck, *Treubia* 21: 444 (♂ key), 446—449, 465—467, figs. 2, 6, 19—21 (♂ genit. & apps.; head & labium of larva), and 448—449 (remarks on supposed synonymy), ♂ ♀ W. New Guinea (Vogelkop, Sorong). — 1915. Campion, *Trans. zool. Soc. Lond.* 20: 488, ♂ S. New Guinea, Utkwa River (*M. terpsichore* Foerst.).

Further material. — S. New Guinea: 2 ♂ 1 ♀ (adult), Utkwa River, Feb. 1913, A. F. R. Wollaston Exped., over drawer-label *M. terpsichore* Foerst., probably named by H. Campion (BM). 3 ♂ (adult), S. New Guinea, Fly River, Kiunga, 6, 14 and 21.X.1957, W. W. Brandt (1 ♂ BISH); 1 ♀ (adult), Papua, Western Div., same area, Fly River, 5 mi. below Palmer Junction, 20.V.1936, coll.? previously named *M. terpsichore* Foerst., by the present writer.

When describing this species in 1952, I believed Campion's examples of "*M. terpsichore* Foerst." to be wrongly associated with that species and to belong to *M. anymone* instead. Since re-examining them in the British Museum collection this supposition proved to be correct, as the males do agree with *anymone* by possessing the peculiar tuft of long hairs at the apex of the superior appendages and tallying with the description also in other characters. Now the discovery of this species at Kiunga (low country, 6° 07' S lat., 141° 17' E long.), extends its range even further eastwards so that the species is at present known to occur from Sorong at the western extremity of the continent probably all along the southcoast as far as the Fly River area.

Male (Kiunga). — Conforming with the description and figures. Postclypeus with broad, uninterrupted orange band. The very broad and almost parallel-sided yellow stripes crossing the spiracle at the thoracic sides extend upward almost to the dorsal crest of the metepisternum. The orange band at the base of the 7th abdominal segment encircles the whole tergite and is intersected laterally only by a blackish line at the jugal suture, thus occupying only little less than one-half the segment's length and on the ventral surface reaching even further caudad. Other specific features worth attention are the unusually prolonged and very acute anal angles of the hinder wings and the spindle-shaped abdomen, the breadth at the junction of the 7th and 8th segments measuring about 4 mm.

Female (Palmer Junction). — Except for its much smaller size (the specimen from Sorong measuring 48.7, 49.5, 1.8—1.9 mm, respectively), the two females agree in all essential characters; the present specimen is a very mature one, the wing membrane being strongly coloured, brownish yellow all over, with the bases more deeply and diffusely stained with orangish.

Measurements: ♂ abd. + app. 49.2—49.5 mm, hind wing 47.0—47.2 mm, pt. 1.2 mm; ♀ abdomen 45.0 mm, hind wing 43.8 mm, pt. fore wing 1.2 mm.

Macromia eurynome Lieftinck

1942. Lieftinck, *Treubia* 18: 563-564 (nom. nov. pro *M. terpsichore* Ris nec Foerster; descr. notes & supposed synonymy), ♂ Kloof-bivak, Lorentz River; 1952, Lieftinck, *Treubia* 21: 443 (key ♂), 445, Ris's ♀ allotype, Lorentz River. — 1913. Ris, *Nova Guinea* 9 Zool. 3: 494—495, fig. 13 (♀ wings), ♀ Bivak-Insel, sub *M. terpsichore* Foerster.; 1915. Ris, *Nova Guinea* 13 Zool. 2: 84—85, figs. 2—3 (genit. & apps.), ♂ Lorentz River, sub *M. terpsichore* Foerster.

Material. — S. New Guinea: ♂ (lectotype by present designation), Lorentz River, Kloof-bivak, 17.XI.1912, G. M. Versteeg, Lorentz Exp., *M. terpsichore* Foerster., det. F. Ris, ex SMF IV.1970 (MA).

This is the male discussed by me in 1942, at that time erroneously called "allotype" and stated to be lodged in the Amsterdam Museum. In fact, this example was shown to me in 1929 by the late Dr. Ris at his home in Rheinau, from where it was finally returned to the Amsterdam Museum via the Natur-Museum Senckenberg at Frankfurt a/M.

The species is immediately distinguished from other Papuan *Macromia* by the characteristic shape of the genital organs. Another peculiarity not mentioned before is the presence of a small tubercular swelling at the lower border of the second abdominal segment, which is beset with radiating stiff light brown bristles. An indication of this tiny tubercle is perceivable also in some individuals of *M. melpomene* and *M. celaeno* (Fig. 19 and 22).

The lectotype and the female first described by Ris (1913) are the only specimens of *M. eurynome* so far known.

Macromia chalciope Lieftinck subsp.?

Fig. 17—18

1952. Lieftinck, *Treubia* 21: 438—439 (key ♂), 456—460, fig. 5, 10 (♂ genit. & apps.), ♂ ♀ Halmahera I. (N. Moluccas).

Further material. — N.W. New Guinea: 1 ♂ (slightly immature), 3 ♀ (adult), Schouten Is., Biak I., Base, 29.XII.1954 (♂ ♀), and Sorido, 28.XII.1954 (2 ♀), all L. B. Holthuis.

Very similar in most respects to our series from Halmahera (and an additional ♂ from Batjan I.), but a direct comparison with typical *M. chalciope* reveals the following slight differences.

Male. — Lateral yellow stripe crossing the spiracle at the sides of thorax a little narrower and more distinctly constricted at some distance above the spiracle, the latter being, however, completely surrounded by yellow. Orange basal spot on dorsum of 7th abdominal segment distinctly larger and, though still detached from basal margin of segment and also more or less diamond-shaped, prolonged triangularly about half-way down the tergite, the spot being widest at the transverse suture; posteriorly it projects a little beyond the suture so as to form a tiny, arrow-shaped off-shoot, the middorsal length of the spot taking approximately $3/8$ of the whole length: hence distinctly larger than in any of the 19 Moluccan examples compared. The "penis" is exerted but unfortunately

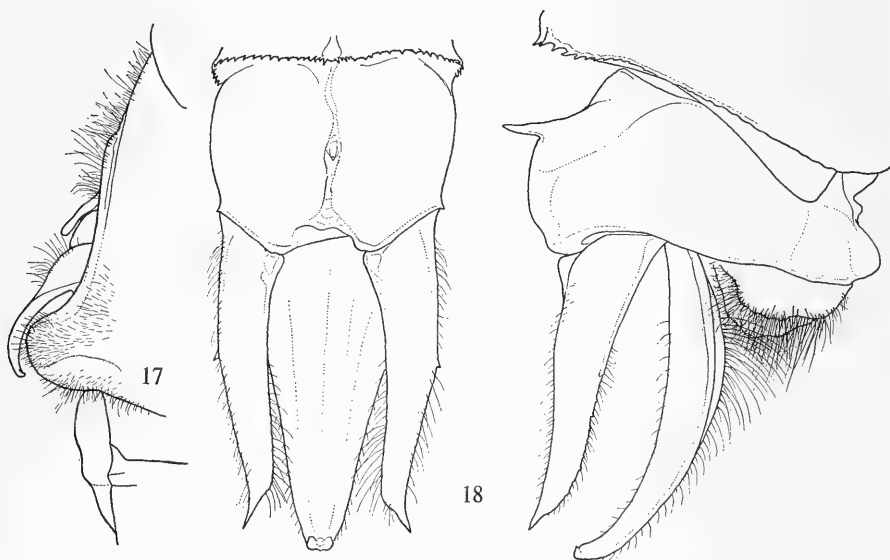


Fig. 17—18. *Macromia chalciope* Lieft. subsp., ♂ from Biak I. 17, genitalia; 18, anal appendages, dorsal and right lateral view

damaged at the apex of the terminal segment; otherwise the accessory genitalia are shaped similarly to those of typical *chalciope*, even the lobus posterior having the same blunt form (Fig. 17). Anal appendages also resembling greatly those of the Moluccan insect, yet the superior pair are more slender, especially the distal portion when viewed obliquely from within, each furnished with a minute exterior tooth at about half-way their length (lacking in typical *chalciope*!); also the tips are slightly more upturned in the Biak specimen and do not project beyond the apex of the appendix inferior, which in Moluccan *chalciope* is somewhat longer and appears to be less strongly upcurved (Fig. 18). The slender middorsal spine on the 10th segment is equally well developed and situated at the same place of the tergite.

Female. — All three individuals are nearly identical morphologically with the Halmahera examples, the first three abdominal segments showing the same brilliant metallic lustre. Diamond-shaped orange spot on dorsum of 7 about twice as large as in typical

chalciope, attached to the basal margin and not constricted directly beyond the suture (as in the male) but projecting posteriorly well beyond it and extending caudad to nearly half the segment's entire length. Valvula vulvae shaped as described earlier, the almost circular lobes being equally characteristic.

Measurements: ♂ abdomen + app. 48.4 mm, hind wing 44.0 mm; ♀ abdomen 46.2—48.3 mm, hind wing 47.5—49.0 mm; pterostigma as in typical *chalciope*.

In spite of the above differences, the present individuals are determined, with some reserve, as *M. chalciope*. More material, especially of the male, will be necessary to establish its proper identity, — most likely as a subspecies of the better known Moluccan dragonfly. This seems at present the best surmise in view of the widely different habitats and discontinuous distribution of the insects.

Macromia celaeno Lieftinck

1955. Lieftinck, Zool. Meded. Leiden, 33: 274—277, figs. 27—28 (♂ genit. & apps.), ♂ ♀ NE New Guinea. — 1900. Foerster, Termész. Füzetek 23: 86—88 (pars, excl. fig.), ♂ Kaiser Wilhelm-Land, Bongu (*M. terpsichore* n.sp., partim). — 1942, Lieftinck, Treubia 18: 563 (note on Foerster's males of *M. terpsichore* Foerst.).

Further material. — N. E. N e w G u i n e a: ♂, Astrolabe Bay, labelled "Im Urwald bei Bongu bei Constantinshafen, D. Neuguinea 10—12/1898", and "Macromia Terpsichore Foerster Type" (UMMZ); 1 ♂, Madang distr., Saidor subdistr., Finisterre Range, Kiambavi, 5000 ft., 22.VII.1958, W. W. Brandt. 2 ♂, Papua, 75 km W. of Pt. Moresby, Doa Estate, 2.IX and 14.X.1962, R. Straatman (1 ♂ BISH); 1 ♀, Papua, 60 mi. W. of Pt. Moresby, 17.IX.1961, R. Straatman; 2 ♂, Papua, Sogeri, N. of Pt. Moresby, 500 m, 27—28.X.1969, R. Straatman; 1 ♀ (juv.), Papua, Kokoda, 25—29.VII.1964, R. Zweifel & K. Sluder, 7th Archbold Exped. (AMNH). 1 ♂, d'Entrecasteaux Is., Fergusson I., Agamoia, 200 m, 21.VI.1956, L. J. Brass, 5th Archbold Exped. 2 ♂, Louisiade Archip., Sudest I., Mt. Riu, west slopes, Camp 10, 250—350 m, 26 & 29.VIII.1956, L. J. Brass, 5th Archbold Exped.

The 10 males presently available for comparison are not quite alike. They were collected in a variety of habitats all over the eastern part of the mainland and in more or less isolated island groups far beyond. The structural differences observed are slight and possibly due to clinal variation; yet it would be unwise to ignore them.

The original description of *M. terpsichore* Foerster was based on two males originating from the same locality. Since it became evident that these specimens were not conspecific (see Lieftinck, 1942: 562—563), I decided in 1957 to write to Dr. E. Kormondy, who at that time studied the Foerster collection in the Michigan Museum, Ann Arbor. He kindly complied with my request by sending me one of Foerster's males for comparison with allied species, and this example proved, indeed, to be quite distinct from *M. terpsichore* auct. We then agreed that a selection of a lectotype of *M. terpsichore* should be made. This was done by Kormondy, who wrote (August 21, 1957): "The lectotype, here designated, lacks the spine [on the 10th segment of abdomen] but has the protuberances on the 10th segment, as described by Foerster; the genitalia and anal appendages of the

lectotype agree with those figured by Lieftinck in 1942. The paratype [syntype] here designated, bears the spine, as described by Foerster; it also differs from the lectotype by bearing on each superior anal appendage a pronounced laterally directed angle at one-half the distance to the tip". Meantime, a new species, *M. celaeno* Lieft., had been described from the N.E. Division of Papua (Kwagira River). As this turned out to be conspecific with Foerster's *terpsichore*, from the eastern part of the Astrolabe Bay, no new name is required for the latter. It corresponds closely with the holotype of *M. celaeno*, this being only slightly larger. The latter also has the yellow thoracic markings and the spot on the 7th abdominal segment a little more reduced; otherwise the two are very similar. Unfortunately, the type of *M. celaeno*, and Foerster's Bongu male as well, are the sole individuals known from their respective localities. They differ from all others in the relatively great length of the inferior appendage, which in the males from the Madang district (N.E. New Guinea) and those from the islands of Fergusson and Sudest, are only little longer than the superior pair. The type also differs from the rest by having a more parallel-sided and broadly rounded lobus posterior (genital lobe),

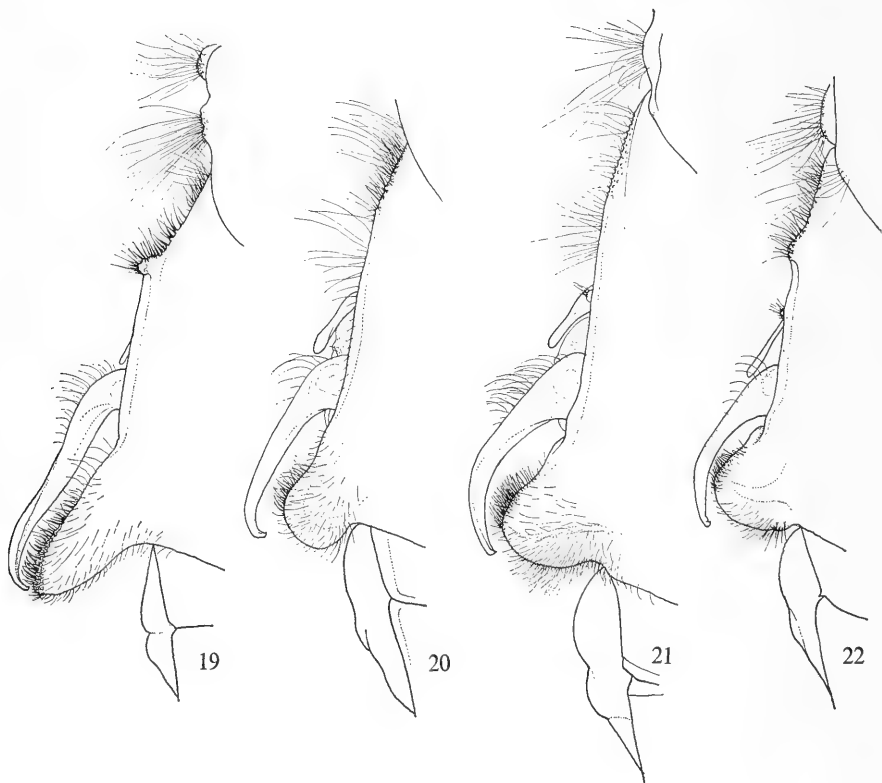


Fig. 19—22. Genitalia of ♂ *Macromia*. 19, *M. celaeno* Lieft., from Pt. Moresby; 20, *M. lachesis* spec. nov., from New Britain; 21, *M. astarte* spec. nov., from Kokoda trail; 22, *M. melpomene* Ris, from Upper Jimmi

which in all others appears more drawn out and tapering towards a narrower apex (Fig. 19).

Our males from the environs of Pt. Moresby (Doa Estate and Sogeri) are smaller in size and decidedly more slenderly built than the remaining specimens. They were first thought to represent a distinct species on account of the short inferior appendage, and based also on the fact that the external tooth at the superior pair is situated just a little more proximad than in most others, including the type. However, since we know little still about the amount of individual variation existing with regard to the above characters, I hesitate to lay too much stress on them as specific criteria. To take an other example: the presence or absence of a bristled tubercle at the base of the ventral border of the 2nd abdominal tergite, figured for one of these southern males (Fig. 19), does not seem to be a reliable character either: it is present in all of them, but barely indicated in the type and some other males.

Summarizing the above, it seems best for the present to consider *M. celaeno* a polytypic species that can, perhaps, be split up later into a number of geographical races.

Female. — A full description of the topotypical specimen is found in the original description. The female from the Pt. Moresby area, though being a good deal smaller, agrees with it in all essential characters and so does the Kokoda specimen, which is rather immature; as to its dimensions the latter nearly corresponds with the allotype. Wings hyaline; bases diffusely yellow about as far out as Ax_1 ; tips of fore wings deep golden yellow from a little beyond nodus as far as the apex. Anal loop of hind wing enclosing 14—16 (Pt. Moresby) or 18—21 cells (Kokoda).

In the fully adult Pt. Moresby specimen the leaf-like blades of the genital valve are a little broader than in the allotype and extend back about three-fourths the length of the 9th tergite, measured along the middorsal crest; they are directed obliquely ventrad and caudad, each blade being hollowed out with upcurved tip. Anal appendages hairy, distinctly outcurved; tips slender, acuminate.

Measurements (in mm)

	abd. + app.	hind wing	pterostigma
♂ Kwagira River (holotype)	49.8	44.4	1.4—1.5
♂ Madang	48.4	44.0	1.3—1.4
♂ Bongu (syntype <i>terpsichore</i>)	47.8	43.0	1.3
♂ Fergusson I.	50.0	45.0	1.9
♂ Sudest I.	48.0	45.2	1.3
♂ Sudest I.	48.0	46.0	1.4
♂ Papua (Sogeri)	45.8	42.9	1.2
♂ Papua (Sogeri)	45.5	42.7	1.3—1.4
♂ Papua (Pt. Moresby)	45.8	41.8	1.2
♂ Papua (Pt. Moresby)	44.3	41.3	1.2
♀ Kwagira River (allotype)	51.0	49.3	1.5
♀ Papua (Kokoda, juv.)	50.0	50.0	1.0—1.2
♀ Papua (Pt. Moresby)	45.5	46.0	1.2

Macromia lachesis spec. nov.

Fig. 20, 25—26

1942. Lief tinck, Treubia 18: 562—563, pars: ♀ Herbertshöh, New Britain, sub *M. terpsichore* Foerst.; 1949. Lief tinck, Treubia 20: 361, no descr., sub *M. terpsichore* Foerst.

Material. — Bismarck Archipelago: 7 ♂ (one imperfect) 1 ♀, New Britain, Gaulim, 130—160 m, 20—28.X.1962 (2 ♂ 1 ♀) and Illugi, 8—15.XII.1962 (5 ♂), all J. Sedlacek. Holotype ♂, New Britain, Illugi, 8.XII.1962, J. Sedlacek; paratypes ♂ and ♀ (BISH), from the above localities. 2 ♂, New Britain, Yalom, 1000 m, 15.V.1962, Noona Dan Exped. 1961—62 (MC); 1 ♂, New Britain, 15 km SE of Kokopo, 10.VII.1962, Noona Dan Exped. 1961—62. 1 ♀, New Ireland, Danu, Kalili Bay, 29.IV.1962, Noona Dan Exped. 1961—62 (MC).

Very similar to *M. celaeno* Lieft. and obviously nearly related with it.

Male (ad., holotype). — Head a little smaller than in *celaeno*, width across the eyes 8.9 mm; shape, texture and colour of face, frons and vertex not differing from that species. Labium brown, generally darker than in *celaeno*. Labrum and mandibles deep black, surface shiny. Anteclypeus dark brown with an indistinct greyish-yellow spot upon middle. Postclypeus blackish-brown marked with a pair of large, bright chrome lateral spots, each of which occupies the whole of the side portions save the anterior border narrowly, the latter remaining black; these transverse spots are more sharply defined than in *celaeno*, each tapering to a point inward, the distance separating them subequal to, or a little less than, their own breadth. Frons and vertex brilliant metallic green. Occipital triangle black, raised slightly above level of compound eyes, the lateral margins acute, as in the allied species; rear of the head glossy black.

Thorax brilliant metallic green; yellow markings as in *celaeno*, median crest, ante-alar triangles (except black anterior rims) as well as a transverse lanceolate spot on each side in front of the latter, chrome; metaspicular stripe moderately broad, a little shorter than in *celaeno*, leaving off fully 1 mm before reaching dorsal margin of metepisternum; latero-ventral border of metepimeron more narrowly yellowish but ventral surfaces coloured as in that species.

Legs a little shorter than in *celaeno*, coloured as described for that species; hind femur (incl. troch.) 10.0 mm long, not reaching beyond apex of lobus posterior of genitalia. Keel on flexor side of fore tibia extending less than half (41%) the total length, i.e. a little shorter than in *celaeno*, armature otherwise similar, the inner ramus of the tarsal claws equally robust and longer than the apex itself.

Shape and neuration of wings, including the anal area and excavated angle, hardly differing from the allied species (see description of *M. celaeno*), but as compared with the latter the venation is somewhat denser and the membranula is of a darker grey.

Nodal index $\frac{8.16.17.8}{12.10.11.12}$; cross-veins in *ht* $\frac{4.4}{1.1}$; *Cux* $\frac{5.6}{4.4}$; anal loop with 11 and 9 cells, with or without central cell. Pterostigma brownish-black, almost black.

Abdomen relatively shorter than in *celaeno*, with the intermediate segments less constricted and the terminal ones more gradually expanded: in *celaeno* the greatest breadth of the abdomen is attained at the apex of the 9th segment, whereas in *lachesis* it is widest at the end of the 7th, the 8th being almost parallel-sided while the apical

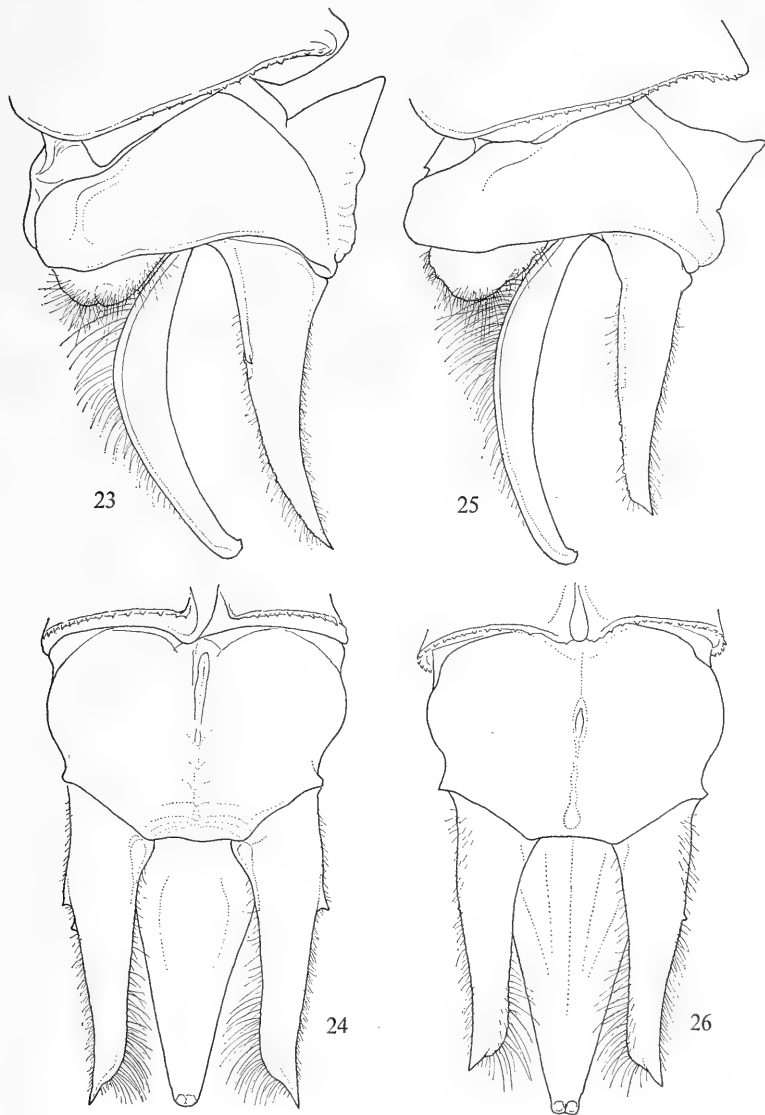


Fig. 23—24. *Macromia celaeno* Lieft., from Pt. Moresby, ♂ anal appendages. 23, left side; 24, dorsal view. — Fig. 25—26. *Macromia lachesis* spec. nov., from New Britain, ♂ anal appendages. 25, left side; 26, dorsal view

segments again diminish gradually in width toward the end. Moreover, the segments 8, 9 and 10 are markedly less highly crested when viewed from the side, 8 and 9 being less protuberant posteriorly. Colour and markings not different, except that the yellow spots

on 2—3 and those on the ventral surface of 8 are even more restricted; 9 and 10 entirely black. Orange spot a base of 7th tergite occupying roughly the upper two-thirds in lateral view, its lower border convex; posteriorly, the spot is narrowed, projecting apicad beyond the jugal suture as a low triangle, the coloured area extending back for about two-fifth of the segment's length. Strong, short, reddish brown bristles are present and directed ventrad along basal one-fourth of lower margin of 2nd tergite, but there is no small marginal tubercle, as is seen in the majority of *celaeno*. Segm. 10 dull black, not metallic, lacking the shine of *celaeno*; middorsal carina running from base to apex, strong, acute and abruptly produced beyond half-way its length into a laterally compressed triangular boss ending in a short spine, the whole prominency distinctly smaller than in *celaeno* (Fig. 25). Genitalia as figured for one of the paratypes (Fig. 20); posterior lobe markedly shorter and more bluntly rounded than in any *celaeno*, even including the type, shorter than its width at base. Hamulus similar in form to that of the type of *celaeno* though straighter than in most other individuals referred to that species, one of which is here figured (Fig. 19). Anal appendages relatively small, superior pair straighter and less outcurved apically than in *celaeno* and with indication only of a minute external tooth a little before half-way its length; internal fringe of subapical hairs of normal length and density. Appendix inferior somewhat longer than the superiors, less strongly upcurved than in *celaeno* (Fig. 25—26).

Female (New Britain). — Similar to male except for the following differences. Anteclypeus wholly black; postclypeal spots more closely approximated mesiad, reddish-brown area separating inward extensions about 1.5 mm broad. Yellow lateral thoracic stripe broader, almost parallel-sided, barely attenuated above the spiracle. Wings clear hyaline, bases of all strongly saffronated as far as midway between *Arc* and *ti* in all wings but not entering anal loop in hind wing, this colour disappearing gradually outwards. Neuration closer than in male, nodal index $\frac{9.18.18.10}{13.11.11.11}$; cross-veins in *ht* $\frac{5.5}{2.3}$;

Cux $\frac{6.7}{4.3}$; anal loop comprising 18 and 18 cells.

Valvula vulvae shaped exactly as described for *celaeno*, though the blades appear to be a trifle broader with bluntly pointed apices. Anal appendages very small, acuminate.

Measurements: ♂ (holotype) abd. + app. 47.7 mm, hind wing 43.2 mm, pt. fore wing 1.0 mm; ♂ (paratypes) 44.0—50.8, 41.0—47.8, 1.1—1.3 mm, respectively; ♀ (New Britain) abd. 44.3, hind wing 46.8, pt. fore wing 1.4 mm; ♀ (New Ireland) 45.5, 47.5, 1.8 mm, respectively. The dimensions of the ♀ from Herbertshöh cannot now be given.

A fairly homogeneous series showing little variation except as regards the dimensions. In the female from New Ireland the dorsal spot at the base of the 7th abdominal segment is oval, widest at its middle and placed in the long axis of the body; it occupies only the upper one-fourth of the tergite in lateral aspect. Unlike *M. celaeno*, this sex shows no sign of a postnodal golden yellow area on the fore wings. *M. lachesis*, along with *celaeno*, runs out in my key (1952: 441) to near *sophrosyne* from Waigeu Island. The males of these three species can be held apart most satisfactorily by a comparison of their anal appendages and accessory genital organs, illustrations of the parts being now available for all. Here again, the differences are slight and should be evaluated in conjunction with other characters, such as body form and markings.

Macromia viridescens Tillyard

1911. Tillyard, Proc. Linn. Soc. N.S. Wales 36: 380—381, pl. 10 fig. 11 (pterostigma) ♀ Cape York; 1913. Tillyard, *ibid.* 37 (1912): 584, sub *M. terpsichore* Foerst. — 1942. Lieftinck, *Treubia* 18: 563—564, note = ? *M. eurynome* Lieft.; 1952. Lieftinck, *ibid.* 21: 444—445, holotype redescribed. — 1960. Fraser, *Handb. Drag. Austr.*: 49, sub *M. terpsichore* Foerst. — 1968. Kimmins, *Bull. Brit. Mus. nat. Hist. (Ent.)* 22: 301, note on holotype (♂ *err. pro* ♀).

Apparently known only from the type.

Although it would appear from Fraser's key (*loc. cit.* 1960) that he had seen more Australian specimens of this dragonfly to justify his opinion that *viridescens* is only a synonym of *terpsichore*, there is no proof that Fraser had actually seen the insect. Most likely *M. viridescens* is specifically distinct from the known Papuan members of the genus.

Macromia melpomene Ris

Fig. 22, 29—30

1913. Ris, *Nova Guinea* 9 *Zool.* 3: 496—499, figs. 14—17 (♂ *genit. & apps.*, ♂ ♀ wings), Lorentz River territ., S. New Guinea; 1915, Ris, *ibid.* 13 *Zool.* 2: 85 (no descr.), Beaufort River, same area. — 1929, Lieftinck, *Tijdschr. v. Ent.* 72: 63 (key), 68—69; 1942, Lieftinck, *Treubia* 18: 564—565 (addit. descr., variation & habits), ♂ ♀ N. & Central W. New Guinea; 1952, Lieftinck, *ibid.* 21: 441 (descr. key), 461 (key) & 464—465, figs. 14—15, 17 (descr. & larval struct.).

Additional and re-examined material. — New Guinea: ♂ (holotype), Nova Guinea Exp. Lorentz, Bivak No. 3 [= Heuvelbivak, between Beaufort and Lorentz Rivers in Went Mts.], 700—750 m, 12.XI (rect. X) 1909, *M. melpomene* n. sp. Ris Type ♂, det. F. Ris (MA); ♀ (allotype) with same labels, 13. XI (rect. X) 1909, det. F. Ris (MA); 1 ♂ 1 ♀, same region, Beaufort River, 12.XII and 8.XII.1912, Lorentz Exp., *M. melpomene* Ris, det. F. Ris, ex SMF IV.1970. Series ♂ ♀, N. New Guinea, Cycloop Mts. and localities in Humboldt Bay area, sea level to 1100 m, various dates, 1931—1938, W. Stüber & L. J. Toxopeus; 1 ♂, Central W. New Guinea, Idenburg River valley, Rattan Camp, 1150 m, 10.II.1939, and 8 ♂, Araucaria Camp & River, 800 m, III—IV.1939, L. J. Toxopeus (ML & AMNH). N.E. New Guinea: 2 ♂, Central region, Upper Jimmi Valley, Tsenga, 1200 m, 14.VII.1955, J. L. Gressitt (BISH & ML); 1 ♀, Western Highlands, Adalbert Mts., W. of Madang, Wanuma, 750—1050 m, 25—29.X.1958, J. L. Gressitt (BISH).

As I have pointed out earlier (1942: 565), this species varies somewhat in respect of dimensions and in the development of a minute extero-lateral denticle at the male superior appendage, which latter occasionally may be obsolete. Variation also exists in the extent of the basal mark upon the 7th abdominal segment. This occupies almost the basal half of the dorsum in both male and female from the typical locality but is much smaller in northern individuals and in those from the Upper Jimmi valley in the east, where the spot barely projects beyond the jugal suture. These eastern specimens differ from the others also in that the lateral thoracic stripe is much narrower, being hardly 0.5 mm broad at its upper portion. In them the posterior hamule is not so strongly

curved as in the type, and in one the dorsal process of the 10th segment is less compressed, approaching the form it has in *M. astarte* spec. nov.; this is, however, a smaller and more obscurely coloured insect.

I must confess not to feel sure about the correctness of the identification of the insects from north-central and eastern localities in New Guinea, reported above. Unless *M. melpomene*, like some others, varies individually all over the continent and even within a restricted area, all of them may prove ultimately to represent geographical subspecies, each with a limited range, or even belong to distinct species intimately allied with it.

The measurements of the examples from N.E. New Guinea are: ♂ abd. + app. 49.0—50.0 mm, hind wing 47.0—47.5 mm, pt. fore wing 1.1—1.2 mm; ♀ 48.5, 49.0 and 1.3 mm, respectively. The genital organs and anal appendages of a Tsenga male are here figured (Fig. 22, 29—30).

Macromia spec. indet.

Material. — D'Entrecasteaux Is.: 2 ♀ (ad.), Goodenough I., 900 m Camp, East slopes, 25 & 26.X.1953, K. M. Wynn & L. J. Brass. 1 ♀ (ad.), Normanby I., Mt. Pabinama, 820 m, 10.V.1956, L. J. Brass.

This is another near ally of *M. melpomene*, collected by members of the 4th and 5th Archbold Expeditions in the islands east of the Papuan mainland and received by courtesy of the American Museum of Natural History, New York. The specimen from Normanby is an aged individual having the entire wing membrane coloured a smoky brown. The two females taken on Goodenough have hyaline wings with a cloudy yellow spot occupying most of the postnodal portion of the fore wings. They are darker than the allotype female of *M. melpomene* and even superior in size to the latter, differing also by having an almost black pterostigma.

By the absence of a male I prefer to leave these examples without a name. Their proportions are: abd. 49.0—50.0, hw. 49.0—51.0, pt. fore wing 1.2 mm (Goodenough), 50.0, 49.0, 1.2 mm, respectively (Normanby).

Macromia astarte spec. nov.

Fig. 21, 27—28

Material. — S.E. New Guinea: 4 ♂ (adult), Papua, Kokoda trail, 700 m, 14.X.1969 (1 ♂) and 4—7.XI.1969 (3 ♂), R. Straatman; 1 ♀ (semi adult), Papua, Sogeri, N. of Pt. Moresby, 500 m, 3.XI.1969, R. Straatman. Holotype ♂, Kokoda trail, 5.XI.1969, R. Straatman. Paratypes: 3 ♂ from Kokoda trail (BISH and ML); ♀ from Sogeri.

As compared with the two males (type and paratype) of *M. melpomene* that are known from the hill-country of southwest New Guinea, this new species is readily distinguished by its smaller size, slenderer forms, much narrower metepisternal stripe, and reduced orange marking at the base of the 7th abdominal tergite. The structure of the facial parts, leg armature, wing venation and body colour, are all so much alike in the two species that there is no need for descriptions. The principal features by which the two can be held apart are summarised below and are best appreciated by a comparison of the existing illustrations, including those given by Ris (1913).

M. astarte. — Smaller, ♂ abdomen + app. not exceeding 46 mm, hind wing 43—44

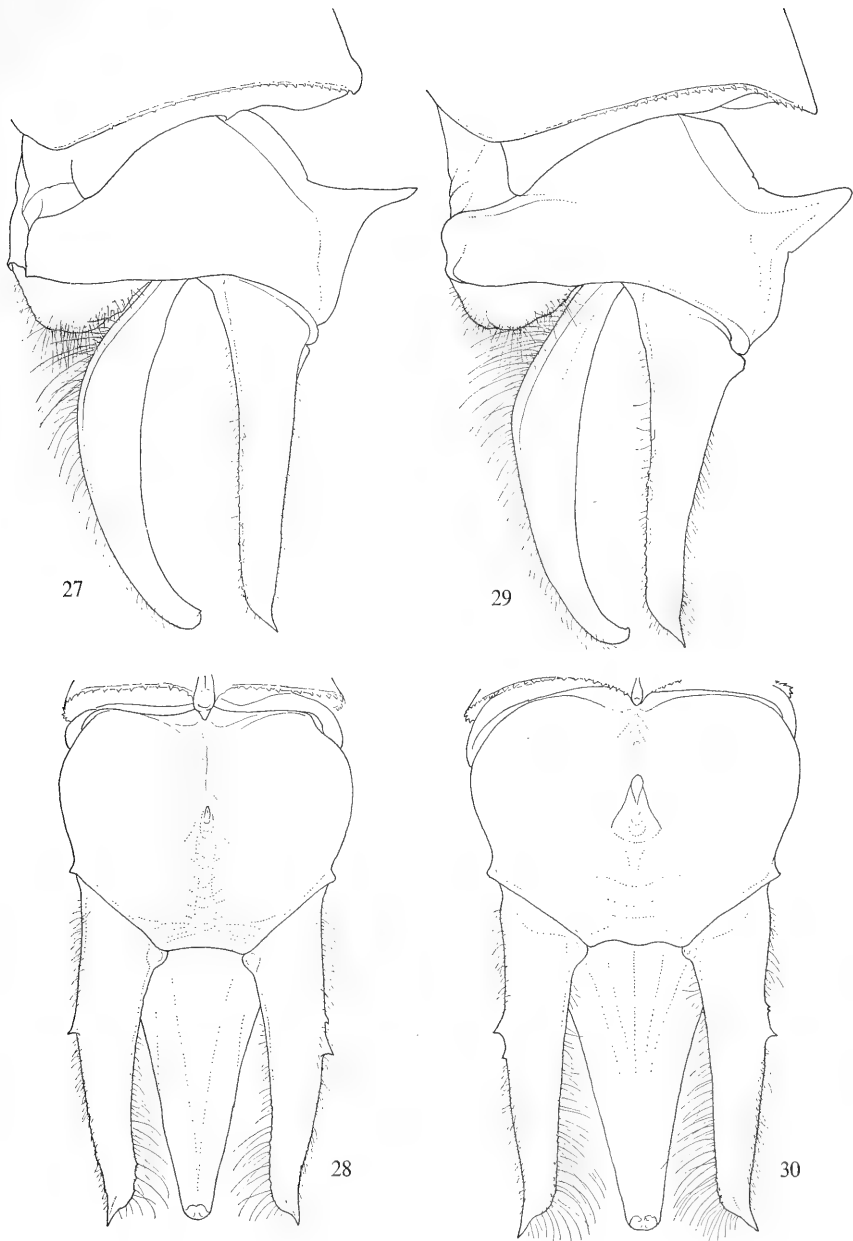


Fig. 27—28. *Macromia astarte* spec. nov., from Kokoda trail, ♂ anal appendages. 27, left side; 28, dorsal view. — Fig. 29—30. *Macromia melpomene* Ris, from Upper Jimmi, ♂ anal appendages. 29, left side; 30, dorsal view

mm. Metepisternal yellow stripe crossing metaspiracle linear, 0.2—0.4 mm, widest at and not broader than the greatest diameter of the spiracle, tapering on either end and separated from upper margin by a space twice broader than its own width. Posterior hamuli slightly twisted lengthwise, converging from base to apex, tips more nearly parallel, not outcurved (Fig. 21). Basal half of 10th segment deeply impressed on either side of median carina, which turns up abruptly to form a slender spine which is compressed only at its base. Orange basodorsal mark of segm. 7 small, irregular in shape, whole spot occupying about two-seventh of the segment's length. Sup. anal apps. perfectly straight in side view, external tooth vestigial or absent, extremities a little upcurved and only slightly outbent, internal bristly hairs not much longer than breadth of apex (Fig. 27—28). Pterostigma generally brownish-black or black; membranula dark grey.

M. melpomene. — Larger, ♂ abdomen + app. 49—52.5, hind wing 44—49 mm. Metepisternal yellow stripe broader and more nearly parallel-sided, 0.4—0.8 mm, broader than greatest diameter of metaspiracle, separated from upper margin by a space subequal to its own width. Posterior hamuli still more slender, not twisted, usually converging from base as far as about three-fourths their length, then frequently a little diverging with slightly outcurved tips (Fig. 22). Basal half of 10th segment as before but median carina more pinched and gradually raised to form a compressed triangular boss of variable shape and height. Orange basodorsal mark of segm. 7 very variable but usually larger and more regular, whole spot in the type almost reaching half the segment's length middorsally. Sup. anal apps. very similar to *astarte* but tips a little more upcurved and distinctly more outbent at the extremities, internal bristly hairs more conspicuous and longer than breadth of apex (Fig. 29—30). Pterostigma generally light to dark reddish-brown; membranula lighter, greyish white.

The nodal indices are: $\frac{7.15.16.8}{10.10.9.11}$ (♂ holotype), $\frac{7.16.16.6}{8.11.10.10}$, $\frac{8.16.16.8}{11.9.9.11}$ and $\frac{7.15.15.7}{10.9.10.10}$ (♂ paratypes); $\frac{6.17.16.8}{9.10.10.10}$ (♀).

The only, slightly immature, female has a narrow lateral metaspiracular stripe that widens a little at level of spiracle but otherwise is scarcely broader than the greatest diameter of the latter. Wings hyaline with small, diffuse, golden yellow spots barely reaching Ax_1 at base, and with a conspicuous apical patch of the same colour filling out the apex of the fore wings as far inward as Px_2 . The anal loop of the hind wings comprises 16 and 15 cells, each including 3 central cells. Yellow lateral spot at jugal suture of 2nd abdominal tergite shaped like an inverted comma; orange dorsal mark of the 7th broadly attached to base of segment, then widening gradually as far as the jugal suture and beyond the latter tapering abruptly to a pointed triangle. The rounded leaf-shaped blades of the valvula vulvae are very broad, attaining a little over one-third the length of 9th sternite, and are separated by a deep V-shaped cleft almost reaching the base.

Measurements: ♂ (holotype) abd. + app. 45.0 mm, hind wing 43.0 mm, pt. fore wing 1.0 mm; ♂ (paratypes) 43.2—46.0, 43.8—44.0, 1.2 mm, respectively; ♀ abd. 47.0, hind wing 47.0, pt. fw. 1.2 mm.

As explained before, populations of *M. melpomene* from geographically remote habitations show slight differences in one way or other; but considering all characters of both, there can be no doubt that *astarte* should be regarded as a distinct species.

V. REMARKS ON THE SUBFAMILY SYNTHEMISTINAE¹⁾

Following Tillyard's classification in the "Biology of Dragonflies" (1917), the much discussed and very diversified *Synthemis* group is here segregated from the Corduliidae (or Corduliinae of Tillyard) and placed next to the Macromiinae (or Macromiini of Tillyard) in the subfamily Synthemistinae (or Synthemini of Tillyard). In an attempt to unravel the phylogeny of the Corduliidae, Tillyard (1910) had already placed the *Synthemis* group at the base of the macromian assemblage, with which there exist undeniable affinity. The above units are thus merely given subfamily instead of tribal rank. As regards venation, its members present a mixture of very archaic and secondarily developed characters. For example, the alternate strength of veins in the antenodal complex, incomplete basal antenodal cross-nerve and constant presence of cross-veins in the median space of the wings are without counterpart among associated genera. Several authors have emphasized the remarkable similarity between the larvae of *Synthemis* (sens. lat.) and Chlorogomphinae among the cordulegasterids, and the great phylogenetic importance of this.

As with *Macromia*, considerable differences exist between tropical species of *Synthemis* and those living in the subtropical or temperate climatic zones. This clearly finds expression in corresponding differences in colour pattern, mode of flight, habitat selection and general behaviour. The larvae are as variable morphologically as are the mature dragonflies but relationships among the various specific groups are equally difficult to interpret.

Publications of special interest dealing in particular with *Synthemis* and allied genera (or subgenera), subsequent to Tillyard's monograph (1910), are those given by Fraser (1960), Lieftinck (1935b, 1953a) and Watson (1962, 1967). The last-mentioned papers also contain valuable information on the immature stages of the species occurring in South-west Australia, including good pictures of whole larvae and details of their structure.

VI. NOTES ON *Synthemis* SELYS FROM NEW CALEDONIA, WITH AN ACCOUNT OF THEIR LARVAE

The last general information on the Odonata of New Caledonia is contained in a synopsis published by Campion (1921), who on the same occasion revised the other Corduliidae then known to occur in this Oceanic island. Campion was the first to describe the male of *Synthemis miranda* Selys and re-characterized both its sexes. In the same paper he supplied descriptions of three additional species, all of them new to science. These descriptions are accompanied by good figures and beautiful wing-photographs of all New Caledonian taxa, although the females of two of the novelties had to remain unknown.

¹⁾ It has been pointed out by Cowley (1942: 63) that the names of all suprageneric taxa based on generic names ending in *-themis* should be emended. The present writer has accepted Cowley's suggestion to adopt *themist-* as being the Homeric form which occurs in names like Themistocles, instead of regarding the stem to which the group-ending is added as *them-*, the former selection being the more correct one.

In the following pages some more data can be supplied concerning the imagines of New Caledonian *Synthemis*, with descriptions of the females of two species already dealt with by Champion and both sexes of one previously unknown. I have taken the present opportunity also to give an account of the highly peculiar larvae of two different species, with drawings of their most remarkable morphological parts. Champion (loc. cit.) had already given a brief diagnosis of an unidentified *Synthemis* larva, the first of its kind found in New Caledonia. This larva was like that of the Australian

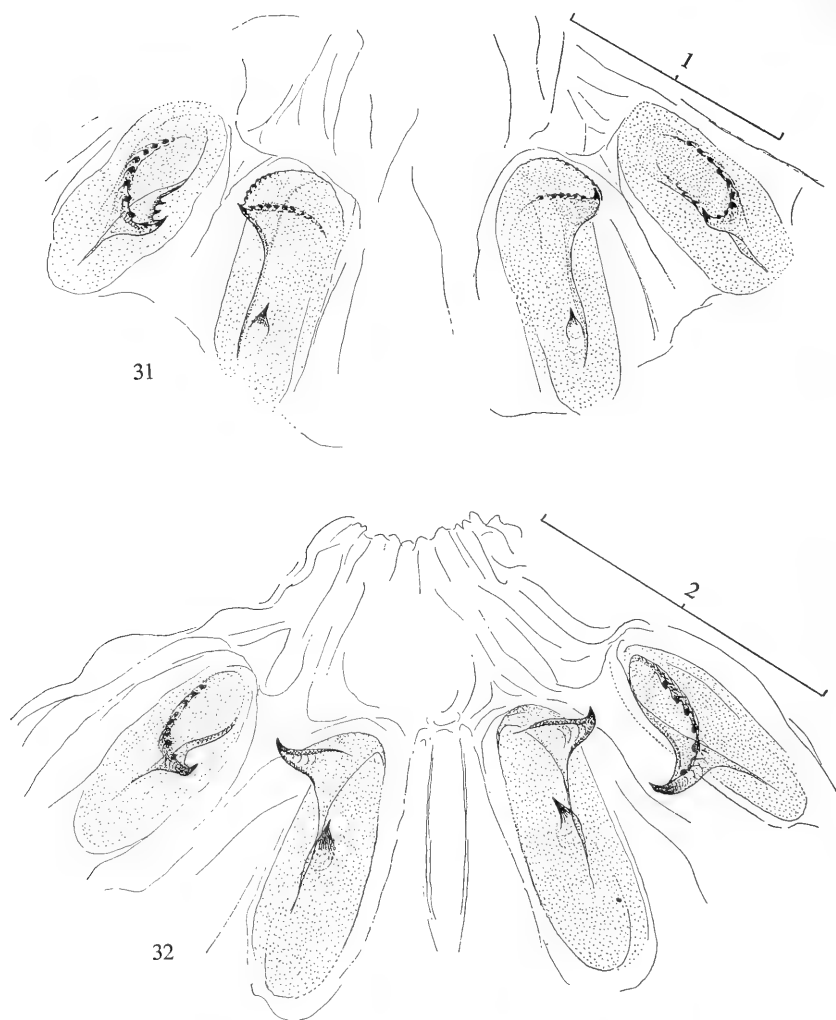


Fig. 31—32. Proventriculi of ultimate instar larvae of New Caledonian species. 31, *Synthemis fenella* Champion (supposition); 32, *S. miranda* Selys (supposition), showing dentition of dorsal and ventral plates from within

Eusynthemis guttata in having the median lobe of the labium produced anteriorly and a conspicuous semicircular plate projecting from the frons. In other ways, however, it failed to agree with that of any other known species in the subfamily, especially on account of its smooth body and scantiness of setae at the labial palpus. These features are manifest also in the two kinds presently discussed, but all three are easily distinguished from one another and obviously belong to three distinct species. At the same time they can be distinguished from most, if not all, other congeners from outside New Caledonia.

The proventriculus (gizzard) of the two available species was cut open longitudinally and spread out, showing from within the set of four teeth-bearing folds arranged in bilateral symmetry. The armature of the plates is much alike in the two species described (Fig. 31—32) and needs no further explanation, except that their shape conforms in almost every detail to that shown by a host of other Corduliidae and Libellulidae, inclusive of *Macromia* and *Idionyx* among members of the first family.

Synthemis miranda Selys

Fig. 16, 32

1871. Selys, Bull. Acad. Belg. (2) 31: 557—558 (121—122 sep.), ♀ Nouvelle Calédonie. — 1921, Campion, Ann. Mag. Nat. Hist. (9) 8: 34, 47—55, figs. 6—8 (♂ and ♀ app. & ovip.), pl. 8 fig. 12 (♂ wings.).

Besides a number of specimens which had been examined at an earlier date and returned to the Bishop Museum (Honolulu), the following are still before me.

Material. — New Caledonia: 2 ♂, Bourai-Houailou Rd., III.1959, N. & L. H. Krauss; 1 ♀, La Foa, 17.III.1961, J. Sedlacek; 1 ♀, La Crouen, 16.III.1961, J. Sedlacek; 1 ♀, Forêt de Thi, 550 m, 6.III.1960, J. L. Gressitt; 1 ♂, Mt. Mou, 11.II.1962, N. & L. H. Krauss; 1 ♂, Col de Pirogue, 13.II.1962, N. & L. H. Krauss; 1 ♂, Nakety, 400 m, 23.XII.1963, R. Straatman; 1 ♂, Col de Rousettes, 550 m, 6.II.1963, J. L. Gressitt; 1 ♀, Mt. des Sources, 550 m, 30.XII.1963, R. Straatman; 1 ♀, Canala, 23.XII.1963, R. Straatman; 2 ♀, Pouébo, 12.I.1964, R. Straatman. (All in BISH & ML).

Both sexes of this extremely handsome dragonfly have been discussed at some length by Campion, who gave good figures of the terminalia of either sex as well as a wing-photograph of the male. The same author commented upon the variation in extent and depth of the coloured areas on the wings of the female. I have examined good series of this species from various localities in New Caledonia and it seems that *S. miranda* is the least rare of its large-sized congeners inhabiting the island. From the present series it would appear that there are two main colour forms of the female, which differ markedly from one another as far as the wing colour is concerned, evidently quite independent from the age of the individual, intermediates occurring at the same time, though apparently more rarely.

Following Campion's notes, some additional characteristics can now be given, which are based on five males and seven females.

Male. — Agreeing with Campion's description of the allotype but for the following details. Anteclypeus dirty yellow, postclypeus in the middle likewise, but lateral divisions

wholly cream-coloured. Frons metallic blue-black with a pair of small creamy oval spots, one on either side towards the eye-margin, and often also a very small, slightly impressed yellow spot on each of the frontal tubercles anteriorly. Creamy yellow bands at the thoracic sides complete, the one at the first suture leaving off shortly before reaching the dorsal crest, the metepimeral stripe slightly curved and complete. Legs black, the coxae and trochanters somewhat more brownish; fore tibia with yellow-green interior stripe, incomplete basally. Tibial keels whitish, extending along about distal one-half on fore and mid tibiae, along distal 7/9 on hind tibia. Pterostigma deep black.

Abdominal segment 1 usually with two small yellow dots low down at the sides, 2 with a broad subinterrupted yellow stripe bordering lower margin of tergite, and 5 occasionally with additional tiny yellow spot on either side at extreme base. Genital organs black; hamulus strongly protuberant, thick and subcylindrical for its basal three-fourth, then rather abruptly narrowed, directed caudad and tapered, with slender out-curved tip.

Female. — All specimens are fully coloured. Three of these differ from the type in respect that the deep golden area in the wings in no case extends beyond the level of the arculus, though in all of them brown rays are present also in *sc*, fading away at about the same level. In three other females the wing membrane is as conspicuously coloured as in the holotype: in them not only the bases of fore and hind wings are deeply stained with golden yellow as far as the arculus and rich brown in *sc* to beyond the nodus, but there are also broad oblique brown bands which extend as far out as about midway between base and nodus. One specimen (from Pouébo) in this respect is exactly intermediate between the extremes just mentioned.

The shape of the ovipositor valves corresponds with the description given by Campion, inasmuch as the paired outer and inner processes, although fused together for their whole length on each side of a narrow V-shaped emargination, are still recognizable by a longitudinal furrow separating them.

Measurements. — ♂ abdomen + app. 48.0—51.0 mm, hind wing 39.0—42.0 mm, pt. fore wing 2.5—2.8 mm; ♀ abdomen 50.0—53.0 + 1.5—1.7 mm, hind wing 46.0—47.5 mm, pt. fore wing 3.0 mm.

Synthemis campioni spec. nov.

Fig. 33—35

Material. — New Caledonia: ♂ (adult, holotype), N.E.-side, Pouébo, 200 m, 24.I.1964, R. Straatman; ♂ (subadult), Mt. Mou, 11.II.1962, N. & L. H. Krauss (BISH); ♀, La Crouen, 16.III.1961, J. Sedlacek; 2 ♀ (adult), N.E.-side, Pouébo, ca. 250 m, near mountain stream, 23.I.1964, R. Straatman (1 ex. BISH).

Very near *S. montaguei* Campion and of the same slender build.

Male (holotype). — Labrum ochraceous-orange, broadly bordered with black; low median longitudinal ridge also blackish anteriorly. Clypeus olivaceous-brown, the post-clypeus with oval pale greenish-yellow spot on either side. Frons anteriorly and round about the prominent tubercles blackish brown, marked each side with a squarish pale greenish-yellow spot towards margin of compound eye; anterior surface of tubercles red-brown. Vertex brownish-black. (In *S. montaguei* the light areas of labrum, post-

clypeus as well as those upon summit and sides of frons are definitely larger, more sharply delimited and bright greenish-yellow in colour; the roundish spots on top of frontal tubercles are well marked off posteriorly from a thick bluish-black band at the base of frons).

Pro- and synthorax metallic brown, less obscured than in *S. montaguei* and with metallic green reflections less evident on mesepisternum and posterior to first lateral suture. No yellow markings at spiracle and first lateral suture (*S. montaguei*: an undulated yellowish stripe dividing mesepimerum and metepisternum, separated from a yellow spot placed a little more ventrad at the spiracle).

Legs lighter brown than in *S. montaguei*, femora less obscured apically. Tibial keels as in that species, extending along distal one-half on fore and middle pair and a little more than distal three-fourths on hind tibia.

Wings hyaline with rusty brown spots, ill-defined distally, in *c-sc* as far as the basal postcostal nervure, and traces of similarly coloured spots in *m* and *cu*. Shape of wings very similar to *S. montaguei*; neurulation dense. Fore wings with 22 *Ax* of first series and 13—15 *Px*, hind wings with 15—16 *Ax* and 17 *Px*. Triangle with 2 cross-veins in fore wing, only 1 (or *t* 3-celled!) in hind wing; *ti* 3-celled in fore wing; *bt* with 3 cross-veins in fore wings, 2 in hinder pair; *m* with 5 in fore wings, 4 in hind wings; *cu* with 8—9 in fore wings, 7—8 in hinder pair. Bridge cross-veins 7—8 in fore as well as in hind wings. Discoidal field of fore wings commencing with 4 cells, then expanded and followed by double cells up to a point one cell distal to the separation of M_{1-2} ; 15—18 marginal cells. Primary (distal) anal loop consisting of 6—7 cells without central cell, the secondary (proximal) enclosure with 4—5 cells. Pterostigma a little longer than in *S. montaguei*, without brace vein; colour dark brown. Membranula white (smoky grey to black in adult *S. montaguei*), extending as far as the cross-vein in anal triangle.

Shape and markings of abdomen much as in *S. montaguei* but all light spots a little smaller, less sharply defined and of a darker yellow tint. Bases of segm. 2—5 unmarked, lacking the paired transverse yellow streaks, interrupted in the median line, of *S. montaguei*; paired middorsal subcircular spot at the jugal sutures of 2—8 present and similar to that species, except that they are more roundish anteriorly, projecting markedly beyond the suture; middorsal spots on 8 subtriangular and a little smaller. Segm. 9—10 blackish brown. Genitalia (Fig. 33) prominent; basal two-thirds of hamulus straighter and more inflated at extreme base than in *S. montaguei*, undulated in profile view, the apical portion weakly S-shaped with curled, outbent tips; shiny dark brown, the slender distal part reddish brown. Posterior division of vesicle in caudal view circular and hollowed out deeply so as to form a tiny yellowish brown crater-like pit (similar to that of *S. montaguei*). Anal appendages very long; superior pair distinctly longer than segm. 9 + 10 (ratio ca. 36 : 26) and also longer than in *S. montaguei* (ratio ca. 32 : 27); in dorsal view the superiors are shaped similarly in the two species but in profile those of *S. campioni* are straighter, neither upcurved nor flattened, and depressed in distal half, but rather sinuous and swollen towards apex; colour uniform brown (not yellow in distal two-thirds!) with slight darkening at extreme base and a blackish obscuration all along inner border from a point slightly beyond half-way their length to apex; bristles black. Appendix inferior less upcurved than in *S. montaguei*; colour brown (Fig. 34).

Female (adult). — Very similar to the male but differing from it in the following respects. Pale areas of labrum ochraceous-orange, the free margin less broadly black; clypeus and base of frons brown, the lateral pale spots dirty ochreous; swollen tubercles

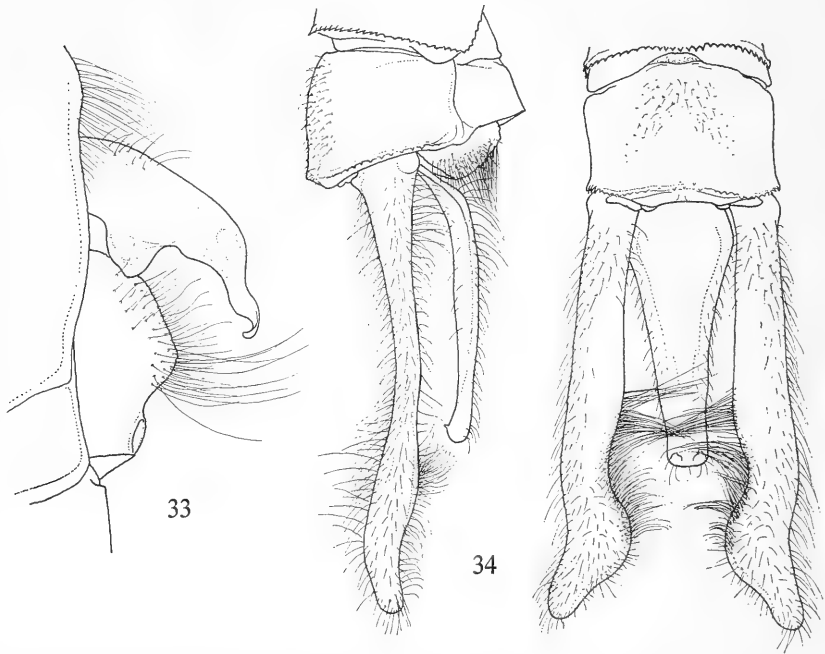


Fig. 33—34. *Synthemis campioni* spec. nov., ♂ from New Caledonia. 33, genitalia, right side; 34, anal appendages, right side and dorsal view

of frons orangish, turning darker with distinct metallic blue reflections posteriorly and in the sulcus. Vertex metallic blue-black. Occipital triangle brown, its side margins raised above level of compound eyes but dorsal surface and posterior division convex.

Pro- and synthorax as well as the legs as in male, except that there are no tibial keels. Wing membrane hyaline. In one specimen the extreme bases of both fore and hind wings are strongly spotted with dark rusty brown in *c-sc*, *m* and *cu*, these spots being ill-defined outwards and in *sc* extending from base as far as the first complete *Ax*, in the other spaces only about half-way into the basal cells. In the second female the basal spots are greatly enlarged, in *c-sc* reaching as far as *Ax*₇ in fore wing and *Ax*₆ in hind wing, in *m* as far as *Arc* and in *cu* to about *Cux*₃₋₄; there is, in addition, a cloudy post-nodal spot of brown extending from the nodus outwards for about 5—6 cells (fore wing) and 2 cells (hind wing) between *C* and *M*₁. Venation denser than in male (e.g. 23 *Ax* in fore and 15 *Ax* in hinder wings, 14—15 *Px* in fore and 15—17 *Px* in hinder pair). All *t* at least with 1 cross-vein and all *ti* of fore wing 3-celled. Anal loop consisting of three enclosures, the two proximal ones containing 4—7 cells, the distal (primary) loop made up of 11—13 cells with 2—3 central cells. Pterostigma light brown between black nervures. Membranula pure white, extending to the end of the two basal cells.

Abdomen (compressed) long, slender and cylindrical, the basal segments only slightly, the terminal ones not at all inflated. Colour uniform brown, only the dorsal parts of the intersegmental rings deep black. Pale spots on 2—7 yellowish, quite distinct, arranged

as in the male but considerably reduced in size and in the form of tiny transverse streaks placed at the jugal sutures on either side of the dorsal crest; 8—10 dark reddish-brown, mixed in places with cloudy brown areas.

Genital valve short, directed almost straight backward; much swollen basally and at some distance from base deeply divided to form a pair of slightly less inflated triangular processes; median processes of ovipositor arising from the 9th sternite short, black, finger-like and subparallel, directed obliquely ventrocaudad, concealed in ventral view by the genital valve. Anal appendages long, lanceolate, depressed, unicoloured light brown with black pubescence; tuberculum supra-anale subtriangular, not strongly protuberant in dorsal view, directed ventrad between the appendages almost at a right angle (Fig. 35).

Measurements: ♂ (holotype) abdomen + app. 50.5 mm, hind wing 40.5 mm, pt. fore wing 3.2 mm; ♂ paratype 50.3, 41.3, 3.5 mm, respectively; ♀ abdomen 44.8—47.5 + 4.0 mm, hind wing 40.5—44.0 mm, pt. fore wing 3.5—3.7 mm.

Synthemis montaguei Campion

Fig. 36

1921. Campion, Ann. Mag. Nat. Hist. (9) 8: 55—57, textfig. 9 (♂ app.), pl. 8 fig. 13 (♂ wings), ♂ Mt. Mou, New Caledonia.

Material. — New Caledonia: 2 ♂ (1 immature) 2 ♀, N.E.-side, 10 km S. of Pouébo, 400 m, 24.I.1964 (♂), 15 km S. of Pouébo, 480 m, 22.I.1964 (♂), Pouébo, 200—250 m, 19 & 21.I.1964 (2 ♀), all R. Straatman; ♂ (adult), Col d'Anuén, 550 m, 3.III.1960, J. L. Gressitt; ♂ (adult), St. Louis Valley, 24.III.1945, H. E. Milliron. (All in BISH and ML).

This is undoubtedly the same insect as the one characterized by Campion, the male only being known so far. All of our males are fully coloured but apparently slightly less mature than the holotype, with which Mr. Kimmins has been kind enough to compare a well preserved specimen from Pouébo. He tells me in a letter that owing, perhaps, to inferior optical apparatus, Campion erred a little in his description. The sides of the thorax of the type in a good light show obscure pale spots and stripes in the same places as in fresh examples, while the markings on the frons, though more obscure, are similar. In the type the pale area on the superior appendage is dull yellowish and does not extend so far basally; the pterostigma also is blacker, as is the dark ground of the abdomen. These are, however, evidently characters varying with the age of the individual, as is evident from the present specimens. The genital hamule is of the same shape in all individuals, not at all undulated as in *S. campioni*.

Female (hitherto undescribed). — Similar to male and differing but slightly, as follows.

Labrum still more broadly bordered with black, the ochreous spots subinterrupted by brown in the median line. Frons yellow only on summit of tubercles, which are otherwise reddish-brown anteriorly and dark metallic greenish-black posteriorly. Entire thorax dark brown with violet and bronze reflections; pale yellow stripe at first lateral suture in one specimen as in male, in the second broader and of even width but similarly leaving off

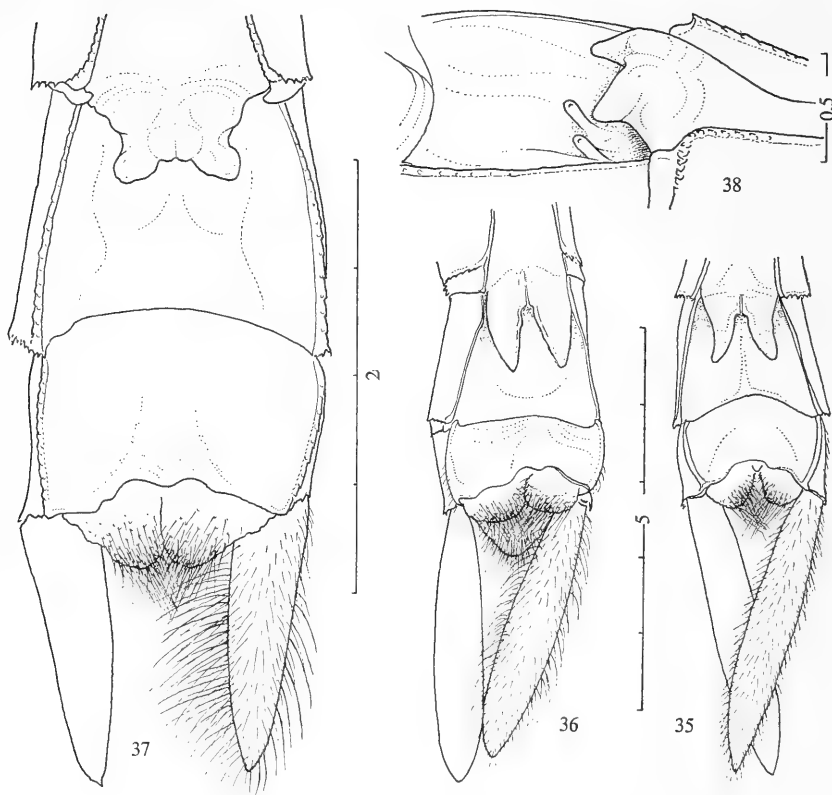


Fig. 35—38. Ventral view of ♀ terminal abdominal segments of New Caledonian species. 35, *Synthemis campioni* spec. nov.; 36, *S. montaguei* Campion; 37—38, *S. fenella* Campion

ventrad almost 1 mm above the spiracle, which also carries a tiny yellow spot. Membrane of wings in adult female subhyaline, distal portion gradually acquiring a pale yellowish-brown tint from nodus as far as the apex. Anal area of hind wing posterior to triangle with three loop enclosures, the two secondary (basal) ones made up of 4—5 cells, the largest (distal) enclosure consisting of 7—9 cells with or without central cell. Pterostigma brown. Membranula dark grey-brown.

Transverse yellow lines at extreme bases of abdominal segments 2—5 or 2—6 distinct though linear; central spots also narrower and placed more transversely than in male. Sexual organs as in Fig. 36; branches of genital valve similar to those of *campioni* but not outcurved. Anal appendages a little longer than segm. 9—10, depressed, lanceolate, slightly broader and more swollen than in *campioni*; colour light yellow, with the bases for about 0.5 mm dark brown and the extremities also finely obscured; pubescence black.

Measurements: ♂ abdomen + app. 51.0—53.0 mm, hind wing 42.0—42.6 mm, pt. fore wing 3.0 mm; ♀ abdomen 45.0—45.5 + 3.8 mm, hind wing 44.0—44.5 mm, pt. fore wing 3.0—3.2 mm.

Synthemis fenella Campion

Fig. 31, 37—38, 44—50

1921. Campion, Ann. Mag. Nat. Hist. (9) 8: 61—62, textfig. 11 (♂ app.), pl. 9 fig. 16 (♂ wings), ♂ Mt. Mou, New Caledonia.

Material. — New Caledonia: 2 ♂ (adult, 1 imperfect) 2 ♀ (adult), Forêt de Thi, 100—300 m, 9.III.1961 (♂) and 28—29.III.1961, J. Sedlacek; 2 ♂ 1 ♀, N.E.-side, Pouébo, 500 m, 12.I.1964 (♂), 10 and 15 km S. of Pouébo, 400—480 m, 22—24.I.1964 (♂ ♀), R. Straatman (1 ♂ 1 ♀ BISH).

Much smaller than the other four New Caledonian species. Only a single male has been described. Our specimens correspond with the existing description so far as it goes; the following emendations can now be supplied.

Coxae of legs blackish anteriorly, yellowish posteriorly; for the rest the legs are black except that the inner faces of the fore femora are light green as far as about 0.7 mm before the apex. Tibial keels also yellow, extending along distal one-half on fore tibia, almost three-fifths on mid tibia, and from near base as far as the apex on hind tibia.

Wings either entirely colourless or slightly tinged yellowish all over, the proximal area to the arculus in one male more deeply so, especially at the bases. Neuration open. All triangles and *ti* free (left hind wing *t* with transverse cross-vein in one male); *bt* with a single cross-vein. *Ax* coincident in *c-sc* but basal subcostal cross-vein present on all wings. Cross-veins in *m*, *cu* and bridge space slightly variable though not appreciably differing in number from those of the type as shown in Campion's photograph.

Abdomen deep black marked with bright yellow as described for the type. Genital organs not very prominent, vesicle of penis shaped as in the other species; hamulus shiny black, thick at base, evenly downcurved, and carrying a triangular inferior off-shoot at the basal portion, which is very similar to that seen in the allied species. Anal appendages deep black, shaped as described and figured by Campion, except that in one specimen the appendix superior after the subapical constriction is a little shorter, more swollen and distinctly rounded apically, the internal prominence being best visible in lateral view.

Female (adult; hitherto undescribed). — Resembles the male in almost every respect. Clear yellow reniform patches on either side on top of frons a little larger and more approximated. Yellow band crossing the spiracle at the thoracic sides broader, widest dorsally but similarly curving back along upper margin of metepisternum, only little narrower than the blue-black area separating it from the metepimeral band. Wing membrane more strongly flavescent, especially at the bases, which are deeply stained with golden yellow about as far as level of triangles. Neuration as described for the male, save that in one specimen the internal triangle in one fore wing possesses a single cross-vein. Basal portion of hind wing broader and more densely veined: primary (distal) loop of large size, comprising 11—12 cells with 1—2 central cells; the much smaller basal loop 6-celled.

Abdomen subcylindrical, basal and terminal segments 8—9 a little inflated. Deep black, yellow markings sharply outlined, slightly larger than in male, the transverse basal streaks broader and all paired central spots subcircular, surpassing the jugal sutures anteriorly. Genital organs black, shaped as in Fig. 37—38. Anal appendages only 1.3

mm long, subequal in length to segm. 9, straight and cylindrical, gradually tapered, tips acuminate.

Measurements: ♂ abdomen + app. 28.5—29.0 mm, hind wing 25.5—26.5 mm, pt. fore wing 1.2—1.3 mm; ♀ abdomen (incl. app.) 29.0—31.2, hind wing 28.0—30.0 mm, pt. fore wing 1.3—1.6 mm.

Despite the fact that no fresh examples of *S. flexicauda* have come to our knowledge, the five New Caledonian species at present known can be easily held apart by the following

KEY TO THE NEW CALEDONIAN SPECIES OF *Synthemis*

1. Large insects, ♂ and ♀ abdomen (incl. apps.) measuring 42—55 mm, hind wing 37—47.5 mm 2
- Smaller species, ♂ and ♀ abdomen (incl. apps.) 28.5—31 mm, hind wing 25.5—30 mm. A pair of clear yellow mesepisternal (antehumeral) stripes present on thoracic dorsum. Frons anteriorly with pair of large, curved chrome yellow patches. Both sexes with anal appendages black, superior pair of ♂ not exceeding 2 mm in length. Triangles and internal triangles normally without cross-veins and hypertriangle once traversed. Pterostigma small, black, about 1.5 mm long. Terminal segments and ovipositor valve of ♀ as in Fig. 37—38 **fenella**
2. No yellow mesepisternal (antehumeral) stripes present on dorsum of thorax. Wings more densely reticulated: triangles and internal triangles traversed by cross-veins, at least so in fore wings, and hypertriangles with more than one cross-vein in fore wing. Pterostigma much longer and not quite black. Anal appendages in both sexes brown, or partly yellow, the superior pair in ♂ about 3 mm long or more . . . 3
3. Male abdomen with large, erect, pointed black spine on dorsum of segm. 10. Sup. anal apps. 4 mm long; in dorsal view broad, almost straight, with acute internal black spine at about mid-length, followed first by an emargination, then by a dilatation; colour black as far as the emargination, pale yellow beyond. Genital hamule in profile view evenly downcurved, with strongly convex outer margin. Body dark, almost black, including the legs. Yellow lateral thoracic band present at level of spiracle as well as paired basal yellow spots on abdominal tergites 3—4 or 3—5. Wings at least with the extreme bases spotted with golden yellow, in ♀ more extensively so and often with brown rays also extending as far as the arculus. Genital valve of ♀ short, but outer and inner ovipositor valves, though fused together, still discernible by a longitudinal furrow. Female appendages short, upcurved, mainly yellow **miranda**
- No robust black spine on dorsum of ♂ abdominal segm. 10. Combined characters not as above 4
4. Male sup. anal apps. and ♀ appendages at least partly yellow or whitish. Segm. 3—4 of abdomen with pair of yellow spots forming more or less part of a ring at extreme base. Sides of thorax at least with traces of a yellow stripe and/or spot at level of first suture and the spiracle 5
- Male sup. anal apps. and ♀ appendages unicoloured brown, shaped as in Fig. 33—34 and 35. Segm. 2—4 or 2—5 lacking pale-coloured spots at extreme base. Sides

of thorax without any trace of yellow colour at first suture and spiracle. Male genital hamule distinctly sinuous apically (Fig. 33). Genital valve of ♀ as in fig. 35

- **campioni**
5. Male sup. anal apps. about 4 mm long, subequal in length and shaped similarly to those of *S. campioni* in dorsal view, though slightly dilated internally before the middle (not at middle), then emarginate, and dilated just before the rather obtuse apex. Appendix inferior about $\frac{2}{3}$ as long as the superior pair. Thoracic sides with narrow yellowish line at the first suture separated from a pale spot at the spiracle. Genital valve of ♀ as in Fig. 36 **montaguei**
- Male sup. anal apps. over 5 mm long, in dorsal view slightly divergent in basal half, then more sharply convergent, and ending by the tips becoming dilated, parallel, and almost in contact with one another; in lateral view depressed and dilated ventrally in the middle. Appendix inferior about half as long as superior pair, almost straight, abruptly reduced in breadth at some distance from apex, which is pointed. Thoracic sides with two broad uninterrupted creamy stripes or bands, one at the first suture enclosing spiracle, and a second crossing the metepimeron. Shape of ♀ genital valve not known **flexicauda**

Discussion and illustrations of the immature stages of some New Caledonian
Synthemis

Synthemis miranda Selys (supposition)

Fig. 32, 39—43

Material. — ♂ larva (ult), New Caledonia: Bondé region, coastal area, middle course of Diahot river, near village Ouénia (chapelle de Saint-Joseph), 70 m, 16.IX.1965, F. Starmühlner et al., coll. no. FNK 105/1. The specimen is unique and in good condition.

Principal features.

Measurements: total length 22.5 mm; greatest width of head across eyes 5.7 mm; posterior femur 5.2 mm; length of abdomen 13.7 mm, its breadth at apex of segm. 4 6.5 mm, highest point 4.0 mm.

Facies of *S. macrostigma* Selys (Watson, 1962, pl. 9 fig. 49). Body moderately hairy.

Labium with postmentum reaching backwards to about midway between meso- and metacoxae. Prementum broad, gradually widened anterad, deeply concave dorsally; median lobe low, not prominent but projecting markedly ventrad, its thickened margin minutely and bluntly serrulate, lacking setae; ligula subtriangular, abruptly projecting anterad; premental setae clearly differentiated into major and minor sets, i.e. 4 + 8—7 + 4, the former rather short, the latter minute. Labial palpus strongly, deeply cupped, its borders strengthened and transversely wrinkled, outer border with row of rounded tubercles bearing longish fine setae; apical border with 4 large crenations, the last (outermost) divided, distal margin of each microscopically serrulate, lacking setae; palpal setae 4—4, lacking basal spiniform setulae; movable hook short and strong. Frontal plate between antennae porrect, transverse, only about one-fourth as broad as greatest width of head across eyes and twice broader than long, its borders rounded; surface flat, wholly and densely covered with minute swollen papillae, the marginal ones longest and inter-

mixed with few long setae. Antenna setiferous, 6-segmented, the second segment longest (Fig. 43). Head widest across anterior part of eyes, the latter moderately prominent, sides behind the eyes only slightly converging, postorbital lobes broadly rounded, covered rather densely with microscopical setiferous warts.

Prothorax transverse, upper pronotal lobes well marked off from the lower parts, their surface flat with evenly rounded, slightly raised, almost acute, side margins, which are beset with numerous minute setiferous warts. Wing sheaths strongly divergent, reaching caudad as far as end of segment 5. Legs relatively short, unmodified and hairy.

Abdomen elongate-oval, moderately flattened, pubescence especially long and dense at side margins, still longer and tufty at posterolateral angles of segments. Middorsal hooks conspicuous and in the form of raised bluntly rounded tubercles, those on 2—3 minute and knob-like, the next ones progressively higher and longest on 6 and 7, the terminal ones directed slightly caudad. Lateral spines wanting, replaced by dense tufts of longish hair. Anal pyramid pointed; processes sharply acute, subequal in length, but cerci shortest and epiproct a little shorter than the slender paraprocts.

Integument brown, darkest on head and pronotum; lighter brown are the coxae,

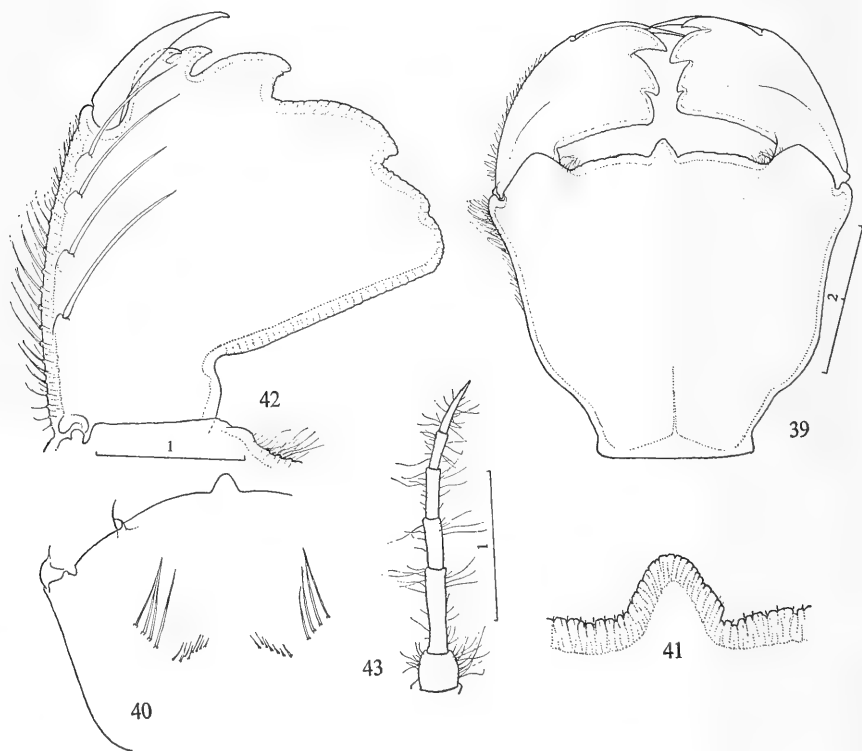


Fig. 39—43. Larval structures (ult instar) of *Syntemis miranda* Selys (supposition) from New Caledonia; 39, external view of labium; 40, partial internal view of prementum, showing setae; 41, ligula of same, more enlarged; 42, internal view of left labial palp; 43, antenna

trochanters, tibiae towards the end, tarsi, and basal segments of abdomen. Thoracic pleurae and terminal segments of abdomen mottled with blackish-brown forming a distinct pattern on the abdomen, the dark areas centred with, or surrounded by, light brown of the ground colour.

The present larva exhibits some unusual features by which it differs markedly from other species including the two other New Caledonian forms. It is placed in this species by supposition only, based on the evidence of the fully developed venation, the body size being also in agreement with this assumption. On that basis it might be, however, one of the other large-sized species quite as well. It differs from Campion's larva in many respects and is unique in that the penultimate abdominal segments are furnished with conspicuous, almost finger-shaped "nodding" tubercles middorsally. Campion's example agrees with Australian species like *S. eustalacta* or *leachi* by having the two basal joints of the 7-segmented antennae short and rather rounded, those of the supposed *miranda* have 6 segments, only the basal one being short and rounded (Fig. 43). Also, Campion's *Synthemis* is less hairy, has distinct postero-lateral spines at segments 2—9 and no dorsal abdominal hooks; lastly, it is said to have more palpal teeth and a greater number of submental setae.

Synthemis fenella Campion (supposition)

Fig. 31, 44—49

Material. — Many larvae, all stages, New Caledonia: 4 larvae (ult) and one specimen (probably 4th instar) more closely investigated, dissected and measured. Localities: W.-coast, Poya-Nekliai region, right tributary of river Nekliai, 2 km above Catholic Mission, 36 m, 10.VIII.1965, coll. no. FNK 63 (1 very young larva); S.W.-coast, right tributary of river Dumbéa, 117 m, 15.VII.1965, coll. no. FNK 9 (1 ♀); S.-part, Mont des Sources, near Ouénarou, tributary of river Bleue, primeval forest, 250 m, 17.VII.1965, coll. no. FNK 15 (1 ex.); same area, streamlet at tributary of river Blanche, near forest bridge, 160 m, 21.VII.1965, coll. no. FNK 26 (1 ex.); E-coast, Hienghène area, 8 km N., 3 km S. of Ouaième Bay, waterfall stream, ca. 130 m, 7.IX.1965, coll. no. FNK 97 (1 ♀); all F. Starmühlner et al.

Principal features of mature larva.

Resembles the preceding species but can be easily distinguished by much smaller size, almost hairless and lighter coloured body, 5-segmented antennae, absence of dorsal abdominal protuberances and details of labial structure.

Measurements: total length 15.0—16.0 mm; greatest width of head across eyes 3.8—4.0 mm; posterior femur 3.4—3.5 mm; length of abdomen 9.4—10.0 mm, its breadth at apex of segm. 4 4.2—4.6 mm, highest point 4.5 mm.

Postmentum of labium reaching backwards to the base of metacoxae. Prementum distinctly narrower, still more deeply cupped with abruptly downbent midlobe, and more heavily sclerotized, than in the former species; asetose margins similar but apical border on either side at base of palpus prolonged to form a broadly tongue-shaped lobe whose free margin is entire; premental setae reduced to a pair of inconspicuous short setae (occasionally only one!) on either side, the placement of these indicated in Fig. 45 by two dots. Labial palpus strongly hollowed out, solid and hard, subtriangular in outline,

outer border with row of rounded tubercles bearing short spinulose setae; apical border entire with strengthened margin and lacking setulae; palpal setae relatively short, 2—2 only; movable hook long and markedly curved. Frontal plate between antennae projecting anterad but distinctly sloping down, longer than in the previous species and about one-third (34 : 100) as wide as the greatest breadth of head across eyes; surface somewhat hollowed out with upturned rounded margins, densely covered with minute swollen papillae but lacking setae. Antenna short, almost bare, only 5-segmented, the second segment longest (Fig. 49). Prothorax (Fig. 44) shaped much as described for the previous species, anterolateral angles of pronotum almost pointed. Integument of all thoracic segments and legs covered with minute warts. Wing-sheaths strongly divergent, reaching caudad as far as a little beyond apical margin of segment 4 (fore wing) or midway between 4 and 5 (hind wing). Legs relatively short, unmodified, lacking long setae or hairs but all tibiae with outer row of minute spinulose setae.

Abdomen elongate-oval, narrower and also higher than in the former species, practically hairless. Middorsal hooks wanting, replaced by very low and faintly indicated apical tuberculae. Lateral spines likewise absent, though indicated by a vestigial tooth-like projection at posterior angle of segment 9, which is devoid of hairs. Anal pyramid pointed; processes sharply acute, cerci only half as long as epiproct, which is broadly triangular in outline and only little shorter than the paraprocts.

Integument light brown, darkest on the wing-buds and femora, the latter being decidedly lighter apically; the pale yellowish-brown tibiae ringed with dark brown at their bases. Abdominal segments 4—9 with a row of rather closely approximated dark brown dots placed lengthwise on either side of the dorsal line slightly in advance of the middle of segments.

This is by far the most aberrant *Synthemis* larva so far known. By its almost naked body and elongate, rather flattened forms, it bears a 'prima facie' resemblance to certain gomphid larvae. Its most outstanding characters are best understood from the outline drawings (Fig. 44—49). Head, thoracic segments and divergent wing buds are almost exactly similar in shape to the other two regional species. It also resembles the latter in the shape of the frontal plate and advanced median lobe of the labium. The strongly spoon-shaped labium with its extraordinary hook-like palpus lacking crenations at its distal border is, however, surprisingly different from anything so far observed in *Synthemis*. Another peculiarity is the reduced 5-segmented antenna with its single short basal joint, present in all individuals examined. Both specimens whose fully developed wing venation could be studied in detail, proved to be females. On comparing the neural characters with those of the adult dragonfly, I found full agreement in all essential respects. There are 12 or 13 cells in the anal loop of the hind wings and the nodal indices are those typical of *S. fenella*. The only discrepancies are (1) all triangles with 1 cross-vein; (2) discoidal field of both fore and hind wings commencing with 2 cell-rows; (3) 2 rows of cells also at the beginning of the field Cu_1 - Cu_2 of hind wing. These irregularities in the venation may be due either to a certain amount of variation existing in the female wings — so much in evidence throughout the *Synthemis* group — or else, may point to some undescribed species closely allied to *fenella*, the last possibility being unlikely considering the great number of larvae collected. This is out of proportion to the few adult dragonflies captured and may be due to the diminutive size and dark colours of the latter, causing it to be an insect much less conspicuous than its larger congeners in the island.

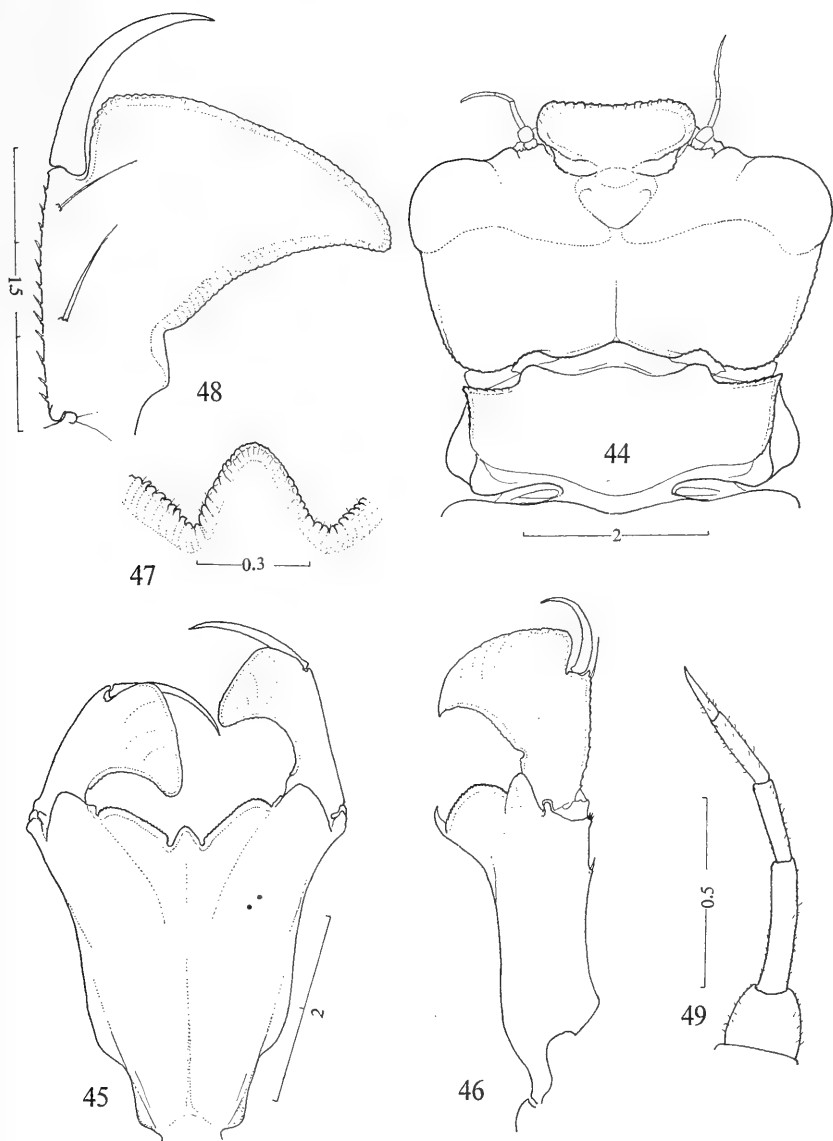


Fig. 44—49. Larval structures (ult instar) of *Synthemis fenella* Campion (supposition) from New Caledonia. 44, dorsal view of head and prothorax; 45, external view of labium; 46, left side view of same; 47, ligula of submentum, more enlarged; 48, internal view of left labial palpus; 49, antenna

The early instar larva of *S. fenella* (Fig. 50)

The smallest and youngest individual present in Dr. Starmühlner's collection is presumably a 4th instar larva, measuring only 3.1 mm total length. The body is pale brownish-yellow, the thorax and legs bearing few fine longish hairs. The frontal plate is well developed, flat, but shaped similarly to that of the mature larva. The antennae are 5-segmented. Fore and mid tarsi consist of a single segment, the hinder pair are 2-segmented, the basal one being the shortest. The labium is of large size, already markedly hollowed out and sclerotized, reaching back to the end of the mesocoxae, shaped and armed as in Fig. 50. Wing-buds are still undeveloped and there are no traces of dorsal abdominal hooks or lateral spines.

Judging by the form of the palpus and the complete lack of dorsal abdominal

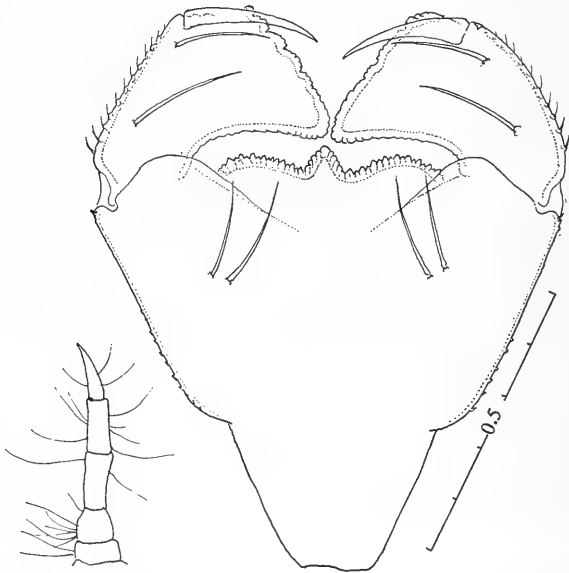


Fig. 50. *Synthemis fenella* Campion (supposition) from New Caledonia.
Antenna and internal view of labium of 4th instar larva

prominences, this specimen is almost certainly conspecific, yet differs less from the full-grown individuals than might have been expected with such a young creature. As shown in the figures, the ligula of the submental midlobe is very similar while crenations at the distal border of the labial palpus, though feebly indicated, are non-apparent. One may well ask if well-developed teeth exist at all in the earliest instar larva? On the other hand, the two premental and two palpal setae are relatively longer than in the mature larva, and the antenna — though already 5-segmented — has two instead of only one small basal segments.

In Oriental larvae of *Macromia* we have met with a variety of characters developed independently in species living under different circumstances, habitat and behaviour varying correspondingly from species to species. In our *Synthemis* larvae the specific

differences are even more striking and less easy to explain. Here we meet with the simultaneous development of deeply fissured and straight-bordered labial palpi coupled with well developed or non-existent dorsal abdominal hooks and variously segmented antennae. It would appear that the firm toothless border of the labial palpus of *S. fenella* with its claw-like movable hook has arisen as a secondary modification of the indented form retained by its congeners and generally regarded as a more primitive type. Hence we obviously observe combinations of archaic and recently acquired characters resulting in reductions as well as specializations allotted differently in species which are nevertheless closely interrelated. Exaggerated modifications like those of the *S. fenella* larva are presumably purely adaptive, in any case have no phylogenetic counterpart in the adult evolution.

It is my hope before long to investigate more fully the whole collection of *Synthemis* larvae made in 1965 by members of the Oesterreichische Neukaledonien Expedition, the same source as the one from which the present notes were derived.

VII. MATERIAL AND ACKNOWLEDGEMENTS

Most of the Corduliidae reported upon in the present paper have been obtained in recent years by various expeditions, field parties and private collectors throughout the Indo-Australian Archipelago. Besides the invaluable help and hospitality I have received in 1963 from my friends J. I. Furtado and H. T. Pagden, during our joint field trips in Malaya and Penang, many other colleagues have generously supplied me with material from different sources and/or given access to specimens of Odonata in various museum collections. In the accumulation of material I have enjoyed the kind co-operation of the following persons, to whom it is a pleasant duty to acknowledge my gratitude for the assistance they have rendered. It goes to J. L. Gressitt and Miss S. Nakata, of the Bishop Museum, Honolulu (BISH), for the loan and gift of many specimens particularly from the Papuan Region; to K. K. Günther of the Museum f. Naturkunde, Humboldt Universität, Berlin (MNB), and D. E. Kimmins of the British Museum (Nat. Hist.), London (BM); to H. Schröder, of the Natur-Museum Senckenberg, Frankfurt a.M. (SMF), for the loan of the type of *Idionyx philippa*; to L. L. Pechuman, of the Dept. of Entomology, Cornell University, Ithaca (CUI), for the loan of several of the late J. G. Needham types of Odonata from the Philippines; to L. Coomans de Ruiter (Hilversum), M. W. F. Tweedie (Rye, Sussex), R. Straatman (Pt. Moresby, Papua), and C. Plateros, of the University of San Carlos, Cebu City, P.I., for valuable material of dragonflies and their larvae from all over the Archipelago ever since 1933; to J. G. Rozen, of the American Museum of Natural History, New York (AMNH), for the privilege of studying all Odonata brought home by members of the successive Archbold New Guinea expeditions; to A. Heymer, of the Museum National d'Histoire Naturelle, Brunoy, for the partial gift of Odonata collected recently in the Lesser Sunda Islands; to Børge Petersen, of the Universitetets Zoologiske Museum, Kopenhagen (MC), for specimens obtained during 1962 by the Danish Noona Dan expedition in the Bismarcks; and lastly, to D. St. Quentin and F. Starmühlner (Vienna), for arranging the loan of an important collection of larvae made in 1965 by the Oesterreichische Neukaledonien Expedition.

Unless indicated otherwise, i.e. by means of the above symbols denoting institutions

and museums abroad, the specimens dealt with in this paper are lodged in the Rijksmuseum van Natuurlijke Historie, Leiden (ML).

The writer gratefully acknowledges his thanks to the Uyttenboogaart-Eliassen Stichting and the Netherlands Organization for Pure Scientific Research (Z.W.O.), for supplying a travel grant in connection with entomological investigations carried out by him during 1963 in the Malay Peninsula.

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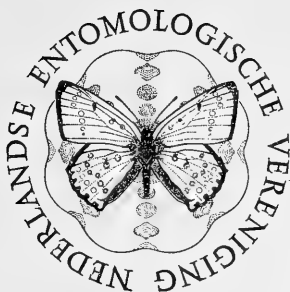
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M. A. LIEFTINCK. — A catalogue of the type-specimens of Odonata preserved in the Netherlands, with a supplementary list of the Odonata types described by Dutch scientists deposited in foreign institutional collections, p. 65—139, Pl. 1—7.

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A CATALOGUE OF THE TYPE-SPECIMENS OF ODONATA PRESERVED IN THE NETHERLANDS

With a supplementary list of the Odonata types described by Dutch
scientists deposited in foreign institutional collections

by

M. A. LIEFTINCK¹⁾

Rhenen

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I. INTRODUCTION

Following the example set by D. E. Kimmins, who before his retirement published four lists of the type-specimens of Odonata lodged in the collections of the British Museum (Natural History)²⁾, the purpose of the present paper is to offer somewhat similar lists of Odonata types to be found in other museum collections. The publication of type catalogues is advocated by the International Commission on Zoological Nomenclature (Recomm. 72 D4), and consultation of such lists has proved to be both convenient and interesting.

The present catalogue consists of three parts: in the first two parts are enumerated the types of all species-group taxa of Odonata deposited in institutional collections in the Netherlands, i.e. the Instituut voor taxonomische Zoölogie (formerly Zoölogisch Museum), afdeling Entomologie, Zeeburgerdijk 21, Amsterdam (ZMA) and the Rijksmuseum van Natuurlijke Historie, Raamsteeg 2, Leiden (ML). Similarly, the third part comprises a list of primary types of the dragonflies presently found in museum collections outside the Netherlands, notably only those which have originally been described by Dutch authors. As to this supplementary catalogue, it may be considered pretentious that such a selection should have been made. After due consideration, however, the preparation of it seemed justified and rewarding for the following reasons. Firstly, it was the only way to list all nominal taxa so far proposed by the few specialists of Dutch nationality, and by accumulating these the

¹⁾ The author's address: Nieuwe Veenendaalseweg 224, Rhenen (U.), Netherlands.

²⁾ Bull. Brit. Mus. (Nat. Hist.) Ent. 18 (1966), 22 (1968), 23 (1969) and 24 (1970).

writer could arrive at some sort of individual completeness not only with respect to his own work. In the second place, publication of this list may prove advantageous to future students inasmuch as paratypes, syntypes or duplicates of the new taxa listed are, in the great majority of cases, also available for study in the collection of the Rijksmuseum van Natuurlijke Historie at Leiden. I must confess that the main reason for having prepared these catalogues is because many authors, including myself, did not always mention or indicate a type-specimen in their earlier works. In point of fact they frequently preferred to define a new taxon from the total, or average, of all characters observed — provided that good series of specimens were available — rather than describe it from a single individual.

In all categories the names of taxa in the species-group are listed alphabetically. Only the names of Holotypes and Lectotypes are printed in clarendon (**bold**) type, all other names in *italics*. Perhaps more than in any other insect order, odonatologists are concerned about the sex of their specimens. In the majority of species, male and female are very different morphologically, and it is only too well known that the identification of females often meets with considerable difficulty. In view of this, the catalogue includes not only the taxa represented by holotypes and lectotypes of either sex but also a reference for the first described example(s) of the opposite sex. However, despite common usage among entomologists of the term Allotype, to denote the other sex of the described taxon, this term has been avoided as depending too much on the individual point of view; besides, this subjective qualification is not entitled to have the status of a primary type and *ipso facto* has no validity in nomenclature. The term in question is, therefore, replaced by "First described female" (or male), except when the sexes were actually found pairing ("in cop."). Consequently, all described allotypes occurring in the literature, whether designated by the author of the nominal species-group, or selected subsequently by others, are entered in the lists by the afore-mentioned indication, followed by all necessary data concerning its whereabouts. When only the so-called allotype of some earlier described taxon is represented in the collection, then the writer has contented himself with mentioning the taxon's name, its first describer, original generic combination and year of publication; full information then follows on the opposite sex, as for a primary type.

In the lists of primary types deposited in the Amsterdam and Leiden museums, the first described examples of the opposite sex which are found in foreign institutional collections, are incorporated simultaneously and provided with the appropriate depository symbols listed on page 120. The names of these "allotypic" individuals are not repeated in the third list just mentioned.

Each entry begins with the specific or subspecific name, the author of the genus in which it was described, and the reference by year, page and illustrations, if any. The status of the type is followed by the data on the labels and those found in the original description. In several instances the latter will be found to differ somewhat in arrangement from the original. For example, the spelling (or paraphrasing) of locality names are occasionally slightly altered or amplified in order to facilitate the location of places in modern as well as old atlases. On the other hand no attempt has been made to keep pace with the exertions of political advisers to change well-established geographical names of whole continents or parts of islands, such as Borneo, Celebes and New Guinea, into disputable terms like Kalimantan, Sulawesi and Irian, respectively. The changes involved are slight and always remain recognizable by comparing the dates of capture

with those given in the original or marked on the labels. In some exceptional cases it was considered advisable to transcribe the original labels parenthetically in full. The label data are followed by the family name, comments concerning the present status of the taxon, its generic assignment where differing from the original combination, and additional information if considered helpful.

Needless to say that, wherever in original descriptions unique specimens of either sex bear no indication as to their status of type, they are considered Holotypes and referred to as such in the corresponding reference. Similarly, in all cases where holotypes have been selected and indicated as such in the original or subsequent publications by the author of the taxon, they are also referred to in the lists as Holotypes. In those cases where in the original description, or in any other subsequent article published by the same author, a specimen was marked as "Type" (e.g., "Type in coll. Ris"), this is considered equivalent to a designation of Lectotype. No difference has been made in this catalogue between lectotypes already designated as such by the author (either originally or on a later occasion) and those presently selected by the writer. The new lectotype designations perhaps outnumber those recorded previously, because the concept of lectotype was not known until comparatively recently.

Besides types representing taxonomically available species and actually present in the collections as of 1971, the valid names of taxa whose types were stated to be found in museums but now are lost or destroyed, are included also, but enclosed in square brackets.

Types of secondary status, such as paratypes (and equivalents) or plesiotypes, etc., have not been included in the catalogue¹.

To enliven the dry subject, portraits are added of 23 Zygoptera and 18 Anisoptera whose types are found in the collections mentioned in this catalogue. These pictures are arranged in Plates 1—7, and for briefness' sake provided only with the species-group name printed beside each picture. Full information on these specimens is to be found in the original publications cited. These references are given at the end of the paper for all primary types.

This catalogue was completed July 31, 1971.

II. ANNOTATED LIST OF TYPE-SPECIMENS IN THE
INSTITUUT VOOR TAXONOMISCHE ZOÖLOGIE
(FORMERLY ZOÖLOGISCH MUSEUM), AMSTERDAM

albardae Selys (*Macrogomphus*), 1878a: 416—417. Lectotype ♂ and first described ♀. Bangka I., labelled by H. Albarda "*Macrogomphus Albardae* Selys. ♂. Banka" (♂), and [E. Sumatra] "*Macrogomphus Albardae* Selys. ♀. Sumatra (Lahat)" (♀). — Gomphidae.

Now *M. parallelogramma albardae* Selys.

albula Ris (*Teinobasis*), 1915b: 83, fig. 1. Holotype ♂. S.W. New Guinea, Lorentz River, 22.IX.1912, G. M. Versteeg, H. A. Lorentz Exped. — Coenagrionidae.

¹) In his "Was versteht man unter einem Typus", Heinicke (1959, Mitt. Insektenkde 3: 136—139) has rather confused the significance of the type concept by the re-introduction of the term "Typoid" and its derivatives. This irrelevant quibble has found its admirers among cataloguers on the European continent and led to ludicrous terms like "Metatypoid", "Paratypoid" and other absurdities, which are, of course, not to be taken seriously.

buruensis Lieftinck (*Nannophlebia*), 1926: 284—286, fig. 7—8. Lectotype ♂ (very immature) and first described ♀. Buru I. (S. Moluccas), Fakal, 30.VIII.1921, L. J. Toxopeus, labelled by M. A. L. androtype and gynetype, respectively. — Libellulidae. Plate 6.

A second pair, also from Buru, were collected at Mnges'wain, 875 m, 12-14.IV. 1921, by the same collector, the adult ♂ in better condition having been described and figured by Lieftinck (1930a: 308—309, fig. 2) (ML).

ciliata Ris (*Nesobasis*), 1913: 485—487, fig. 6. Holotype ♂ (semiad.). S.W. New Guinea, Lorentz River, Bivak Eiland, no date [IX.1909], H. A. Lorentz Exped. — Coenagrionidae.

First described ♀. S. New Guinea, Digul River, Mappi Post, IV.1938, J. M. van Ravenswaay Claasen (ML).

Type-species of *Plagnibasis* Lieftinck, 1949a: 176—178.

convergens Lieftinck (*Argiolestes*), 1949a: 47—48, fig. 13, 24. Lectotype ♂. N.W. New Guinea, Berau Peninsula (Vogelkop), Manokwari, 9.V.1903, Nieuw Guinea Exped.; with additional labels: Wahnesia sp. (unknown hand) and *Argiolestes* (*Wahnesia*) *obscura* Selys, det. Dr. F. Ris. — Megapodagrionidae.

dives Ris (subsp. of *Tetrathemis cladophila* Tillyard), 1913: 505—506. Lectotype ♂ and first described ♀. S.W. New Guinea, Lorentz River, Bivak Eiland, IX.1909, H. A. Lorentz Exped. — Libellulidae.

eurynome Lieftinck (*Macromia*), 1942: 563—564 (nom. nov.). Lectotype ♂. S.W. New Guinea, Lorentz River territ., Kloofbivak, ca. 700 m, 17.XI.1912, G. M. Versteeg, H. A. Lorentz Exped. — Corduliidae.

New name proposed for misidentified examples of either sex described and figured by Ris (1915b: 84—85, fig. 2—3) as *M. terpsichore* Foerster. The lectotype ♂ here selected was wrongly stated to be the allotype (Lieftinck, 1942: 564), the topotypical ♀ having been treated as such more appropriately on a later occasion (Lieftinck, 1952a: 445). A description and wing photograph of the latter (from Bivak Eiland, IX.1909, Lorentz Exped.) were published also by Ris (1913: 494—495, fig. 13, sub *M. terpsichore* Foerster).

[*forcipata* Morton (*Ischnura*), 1907 (♂). First described ♀ (juv., heterochrom.). N. India, W. Himalaya, Sutlej River valley, Sholtu, 2300 m, 4 miles from Kilba, 1.VII.1926, W. G. N. van der Sleen; destroyed. See Lieftinck, 1927: 91—92. — Coenagrionidae.]

fumosus Hagen (*Anax*), 1867: 43—44. Lectotype ♂. Ternate I. (N. Moluccas), with two labels in H. A. Hagen's writing: Ternate/*fumosus* Hagen. — Aeshnidae.

Selected by Lieftinck, 1942: 585, 594—595, fig. 2 and pl. 40 fig. 147. Specimens of this and many other species of Odonata were collected in the island by H. A. Bernstein, either in Dec. 1860, April-June 1861, or October 1861 (see Bernstein, 1865, Ned. Tijdschr. Dierk. 2: 329 q.v.).

First described ♀. Buru I. (S. Moluccas), various locs., V—VI.1921, L. J. Toxopeus (ML). See Lieftinck, 1926: 277—279.

Now *A. fumosus fumosus* Hagen.

hirundo Ris (*Lyriothemis*), 1913: 509—510. Holotype ♀. S.W. New Guinea, Lorentz River, Bivak Eiland, IX.1909, H. A. Lorentz Exped., with identification label: *L. hirundo* n. sp., det. Dr. F. Ris. — Libellulidae.

First described ♂. N. New Guinea, Humboldt Bay area, Hollandia, I—II.1931,

W. Stüber (ML), see Lieftinck, 1933d: 59—62, fig. 34.

hypsochila Lieftinck (**Huonia**), 1963c: 775—777, fig. 33—37. Holotype ♂ and first described ♀. S.W. New Guinea, Lorentz River basin, Bivak no. 3, 700—750 m, 16.XI.1909 (♂) and 8.XI.1909 (♀), H. A. Lorentz Exped. — Libellulidae.

Described and figured also by Ris (1912b: 743—744, fig. 422), sub *H. epinephela* Foerster.

lorentzi Ris (**Oreagrion**), 1913: 480—482, fig. 4a. Holotype ♀ (in fragments). Central W. New Guinea, Snow Mountain (Nassau) Range, Wichmann Mts., 3000 m, XI.1909, H. A. Lorentz Exped. Redescribed and figured by Lieftinck, 1949a: 205—206, fig. 244, 247. — Coenagrionidae.

Type-species of *Oreagrion* Ris (op. cit.).

macrostylis Ris (**Argiolestes**), 1913: 475. Holotype ♂ (immature). S.W. New Guinea, Lorentz River, Bivak Island, 14—28.IX.1909, H. A. Lorentz Exped. — Megapodagrionidae.

melpomene Ris (**Macromia**), 1913: 496—497, fig. 14—17. Holotype ♂ and first described ♀. S.W. New Guinea, Lorentz River territ., Bivak no. 3 (= Heuvelbivak), Went Mts., between Northwest (Beaufort) River and Lorentz River, 700—750 m, 12.X.1909 (♂) and 13.X.1909 (♀), H. A. Lorentz Exped. — Corduliidae.

nigrifrons Ris (**Caconeura**), 1913: 479. Holotype ♂ (terminal abd.-segments missing). S.W. New Guinea, Lorentz River, Bivak Eiland, I.1910, H. A. Lorentz Exped., with F. Ris's identification and type label: *Caconeura nigrifrons* n. sp. Type. — Protoneuridae.

Currently known as *Notoneura nigrifrons* (Ris).

nitescens Lieftinck (**Teinobasis**), 1935c: 253, 262—263, fig. 27. Holotype ♂ and first described ♀. S.W. New Guinea, Lorentz River, Bivak Eiland, I.1910 (♂) and Lorentz River, IX.1909 (♀), H. A. Lorentz Exped. — Coenagrionidae.

Nom. nov. pro *T. metallica metallica* Ris (1913: 487, fig. 8), nec *T. metallica* Foerster.

paula Ris (**Diplacina**), 1915b: 114. Lectotype ♂ (abd.-segments 5—10 missing). S.W. New Guinea, Lorentz River, Bivak Eiland, 1909, H. A. Lorentz Exped., *Diplacina fulgens* ♂, det. F. Ris (see Ris, 1913: 508—509, ♂ sub *D. fulgens* Ris). See Lieftinck, 1933d: 44, fig. 26. — Libellulidae.

First described complete ♂ and ♀. S. New Guinea, Digul River basin, Mappi Post, near Ederat, II.1939, J. M. van Ravenswaay Claasen (♂) and S.W. New Guinea, Sungei Arja (E. tributary of Umar River) W. of Uta, 26.VI.1941, E. Lundqvist (♀) (ML). See Lieftinck, 1953d: 159—161, fig. 1.

Now *D. paula paula* Ris.

petaurina Lieftinck (**Microtrigonia**), 1949a: 8. Holotype ♀. S.W. New Guinea, Lorentz River territ., Bivak no. 3, 700 m, 6.XI.1909, H. A. Lorentz Exped. — Libellulidae.

Nom. nov. pro *M. marsupialis* Ris, 1913: 506, and 1919: 1049—1050, fig. 609, nec *M. marsupialis* Foerster, 1903.

pseudexul Ris (**Caconeura**), 1913: 478—479, fig. 3. Lectotype ♂ (immature) and first described ♀. S.W. New Guinea, Lorentz River, Bivak Eiland (no date, ♂) and Rivier Eiland (= Bivak Eiland) (no date, ♀), H. A. Lorentz Exped. Identified on envelopes by F. Ris with: *Caconeura* spec. n. *e*, *pseudexul*, Type ♂ and ♀. — Protoneuridae.

Currently placed as *Notoneura pseudexul* (Ris).

reductum Ris (*Papuagrion*), 1913: 483, 484—485. Holotype ♂ (immature), S.W. New Guinea, Lorentz River, Bivak Eiland, no date, H. A. Lorentz Exped. Identified on envelope by F. Ris with: *Stenobasis?* spec. C ♂ juv., *Papuagrion* (n.g.) *reductum* ♂ nov. spec. Type, einziges Expl. — *Coenagrionidae*.

signiferum Lieftinck (*Orthetrum*), 1926: 288—290, fig. 12—14. Lectotype ♂ and first described ♀. Buru I. (S. Moluccas), Nal'Besi, 11.V.1921 (♂) and 5.VII.1921 (♀), L. J. Toxopeus. — *Libellulidae*.

A second pair, also from Buru, were taken by the same collector at Wai Eno, beginning of IV.1921, ♂ with pinned slide preparation of penile organ by K. F. Buchholz (ML).

silvarum Ris (*Hemicordulia*), 1913: 500, 504—505, fig. 24—26. Lectotype ♂ and first described ♀. S.W. New Guinea, Lorentz River territ., Bivak no. 3, 700—750 m, 8.XI.1909 (♂) and 12.XI.1909 (♀), H. A. Lorentz Exped. — *Corduliidae*.

tillyardi Ris (*Metaphya*) 1913: 497—499, fig. 18—19. Holotype ♀. S.W. New Guinea, Lorentz River, Bivak Eiland, IX.1909, H. A. Lorentz Exped. — *Corduliidae*.

First described ♂, see *Anacordulia stueberi* Lieft. (ML).

III. ANNOTATED LIST OF TYPE-SPECIMENS IN THE RIJKSMUSEUM VAN NATUURLIJKE HISTORIE, LEIDEN

abbreviata Lieftinck (*Prodasineura*), 1951a: 76—80, 83, fig. 1, 2, 5, 6, 10—13.

Holotype ♂ and first described ♀. S.E. Borneo, Kandangan distr., Ampah, 0—20 m, IV—V.1948, Liem Swie Liong. — *Protoneuridae*.

aciculare Lieftinck (*Aciagrion*), 1929b: 117—121, fig. 10—11. Holotype ♂ and first described ♀. W. Java, Batavia, XI.1907 (♂) and X.1907 (♀), Edw. Jacobson. — *Coenagrionidae*.

acuta Lieftinck (*Plattycantha*), 1937a: 70—72, fig. 38, 41, 43—45. Lectotype ♂ and first described ♀. N. New Guinea, Humboldt Bay area, southern slopes of Mt. Cycloop, ca. 1000 m, 7.X.1932 (♂) and IV.1935 (♀), W. Stüber. — *Aeshnidae*. Plate 5.

cuticauda Lieftinck (*Ischnura*), 1959b: 222—225, fig. 5—6. Holotype ♂ and first described ♀. N.E. New Guinea, Upper Chimbu Valley, Mt. Wilhelm, above Keglsugl, 2700 m, 4.VIII.1955, J. L. Gressitt. — *Coenagrionidae*. Plate 2.

adami Fraser (*Libellago*), 1939 (♂). First described ♀. Ceylon, Central Prov., Hara-gama, 500 m, Mahaweliganga River, 18.IX.1938 (in cop.), M. A. Lieftinck. See Lieftinck, 1940a: 84—88, sub *L. miae* Lieft. — *Chlorocyphidae*.

adceres Lieftinck (*Agriocnemis*), 1932b: 597, 598—601, fig. 67. Lectotype ♂. N. New Guinea, Humboldt Bay area, Hollandia, 27.VIII—4.IX.1930, W. Stüber. First described ♀, same loc., I—II.1931, W. Stüber. — *Coenagrionidae*.

adonira Lieftinck (*Nannophlebia*), 1938: 118—119, fig. 48—49. Holotype ♂ and first described ♀. N. New Guinea, upper course of Tami River, Bewani Hills, 300—500 m, Arso, 11.IV.1937, W. Stüber. — *Libellulidae*.

adusta Lieftinck (subsp. of *Rhinocypha tincta* Ramb.), 1949b: 332—334, fig. 1. Holotype ♂. Solomon Is., Shortland Is., Hisiai River, 22.X.1936, R. A. Lever. — *Chlorocyphidae*.

- aemulus** Lieftinck (*Onychogomphus*), 1937b: 115—119, fig. 31—32. Holotype ♂. S. Sumatra, Lampong distr., Terbanggi-hilir near Menggala, 18.VIII.1936, M. Bartels Jr. — Gomphidae.
- aerostiba** Lieftinck (*Nannophlebia*), 1955d: 305—309, 312, fig. 1, 8—9. Holotype ♂ and first described ♀. Ambon I. (S. Moluccas), Soja di Atas, 400 m, 11.X.1949, M. A. Lieftinck. — Libellulidae.
- agalma** Lieftinck (*Nannophlebia*), 1963c: 755—757, fig. 5—7. Holotype ♂ and first described ♀. Papua, Central Province, 75 km W. of Pt. Moresby, Doa Estate, 20.X.1962 (♂) and 24.IX.1961 (♀), R. Straatman. — Libellulidae.
- aglaia** Lieftinck (*Nannophlebia*), 1948a: 239—243, fig. 5, 8. Holotype ♂ and first described ♀. S. Celebes, Bantimurung near Maros (Makassar distr.), 22.V.1941 (♂) and 8.VI.1941 (♀), L. Coomans de Ruiter. — Libellulidae.
- aglaia** Lieftinck (*Selysioneura*), 1953b: 646—647, 657, fig. 6, 10. Holotype ♂. Morotai I. (off Halmahera I.), SW-part, 10 m, V.1949, A. J. Kostermans. — Isostictidae. Plate 1.
- [**albardae** Selys (*Sieboldius*), 1886: CLXXXI—CLXXXII. Holotype ♂. "Pékin"; lost. — Gomphidae.]
- The type was neither recovered in de Selys' collection (IRSN) nor in the Leiden Museum.
- albinensis** Belle (*Aphylla*), 1970: 47—50, fig. 77—80, pl. 8a-b, 9b. Holotype ♂ and first described ♀. Surinam, Albina, 6.IV.1964 (♂) and 7.IV.1964 (♀), J. Belle. — Gomphidae.
- alcedo** Lieftinck (*Palaiargia*), 1949a: 115, 119—123, fig. 153—155. Lectotype ♂ and first described ♀. Central N. New Guinea, Sahuwari River basin, Araucaria River, 700 m, 22.III.1939 (♂), and above Bernhard Camp, 750 m, 27.III.1939 (♀), L. J. Toxopeus (3rd Archbold Exped.) — Coenagrionidae.
- allecto** Lieftinck (*Synthemis*), 1953a: 72, 74, 84—88, fig. 12—14. Holotype ♂ and first described ♀. Halmahera I. (N. Moluccas), Mt. Sembilan, 600 m, 8.X.1951 (♂) and Mt. Siu, 600—700 m, 28.IX.1951 (♀), Sundanese collectors. — Corduliidae.
- alexia** Lieftinck (*Nannophlebia*), 1933d: 14, 15, 23—24, fig. 14—15. Lectotype ♂ and first described ♀. N. New Guinea, Humboldt Bay area, Hollandia, 26.VIII.1932, W. Stüber. — Libellulidae. Plate 6.
- alfurus** Lieftinck (*Argiolestes*), 1956b: 66, 72—75, fig. 1—2. Holotype ♂ and first described ♀. Batjan I. (N. Moluccas), Salawaku River, 50—150 m, 12—13.VI.1953, A. M. R. Wegner et al. — Megapodagrionidae.
- alfurus** Lieftinck (*Lestes*, sg. *Indolestes*), 1960c: 143—147, pl. 2 fig. 2, fig. 11, 18—20. Holotype ♂ and first described ♀. Halmahera I. (N. Moluccas), Mt. Sembilan, 600 m, 30.IX.1951, A. M. R. Wegner. — Lestidae.
- alia** Calvert (*Aphylla*), 1948 (♂). First described ♀. Venezuela, Guanoco, Sucre, 25.VIII.1951, J. Racénis. See Belle, 1970: 60—61, fig. 93. — Gomphidae.
- aliena** Selys (*Urothemis*), 1878b: 294—305 (holotype ♀, New Guinea). First described ♂. N. New Guinea, Humboldt Bay area, Hollandia, 0—400 m, XI—XII.1930, W. Stüber (see Lieftinck, 1942: 541—542, pl. 38 fig. 126). — Libellulidae.
- Currently placed as *U. signata aliena* Selys.
- alternans** Lieftinck (*Teinobasis*), 1935c: 251, 260—262, fig. 26. Lectotype ♂ and first described ♀. N. New Guinea, Humboldt Bay area, Tami River plain, Nafri

- Road, 14.II.1933, W. Stüber. — *Coenagrionidae*.
- amabilis* Lieftinck (*Amphicnemis*), 1940b: 363, 366, 368—370, fig. 15, pl. 15 fig. 2. Holotype ♂ and first described ♀. E. Borneo, N. Kutai, Sangkulirang distr., Kariorang, IV.1937, M. E. Walsh. — *Coenagrionidae*.
- amabilis* Lieftinck (*Vestalis*), 1965b: 337, 349, fig. 4, 5, 9. Holotype ♂ and first described ♀. N.W. Borneo, Sabah-Sarawak boundary, Brunei Bay area, Dent Province, Mt. Marapok, coll. G., ♂ labelled "Vestalis amoena ♂" by R. Martin. — *Calopterygidae*.
- amanda* Lieftinck (subsp. of *Rhinocypha tincta* Ramb.), 1938: 68—69, fig. 1, 3 D-G, 4 L-M, 5 E. Holotype ♂ and first described ♀. N. New Guinea, Humboldt Bay area, Hollandia, V. 1930, W. Stüber. — *Chlorocyphidae*.
- amaryllis* Lieftinck (*Nannophlebia*), 1955d: 316—318, fig. 13—14. Holotype ♂. N. New Guinea, Humboldt Bay area, Bewani River territ., ca. 500 m, Fumb River, 26.IV.1937, W. Stüber. — *Libellulidae*.
- amaryllis* Lieftinck (*Vestalis*), 1965b: 338, 345—348, fig. 2, 4, 6, 9a. Holotype ♂ and first described ♀. N.W. Borneo, W. Sarawak, slope of Mt. Santubong near Kuching, 30.IX.1950, M. A. Lieftinck. — *Calopterygidae*.
- amethystina* Lieftinck (*Vestalis*), 1965b: 338, 343—345, fig. 3, 6, 9. Holotype ♂ and first described ♀. S. Sumatra, Lampong distr., S-slope of Mt. Tanggamus, Giesting, 400 m, 24.XII.1934, M. A. Lieftinck. — *Calopterygidae*.
- annicola* Lieftinck (*Vestalis*), 1965b: 338, 349—351, fig. 4, 7, 9. Holotype ♂. N. Borneo, Sabah, Mt. Kina Balu, coll. Staudinger, acq. 1903, labelled *Vestalis amoena* Selys, by R. Martin. — *Calopterygidae*.
- amosia* Lieftinck (*Nannophlebia*), 1955d: 313—315, fig. 10—12. Holotype ♂ and first described ♀. W. New Guinea, western extremity, Sorong, near Remu, ca. 8 mi. inland, 24—31.X.1948, M. A. Lieftinck. — *Libellulidae*.
- amoena* Lieftinck (subsp. of *Diplacina phoebe* Ris), 1953d: 158, 180, fig. 9. Holotype ♂ and first described ♀, Halmahera I. (N. Moluccas), Tugauer-Tasoa, 100—150 m, 23.IX.1951, Sundanese collectors. — *Libellulidae*.
- amphicyllis* Lieftinck (*Nannophlebia*), 1933d: 15, 25—27, fig. 16—17. Lectotype ♂ and allotype ♀ (in cop.). N. New Guinea, Humboldt Bay area, Cycloop Mts., southern slopes, 1000 m, 9.IX.1932, W. Stüber. — *Libellulidae*.
Central N. New Guinea, Idenburg River basin, above Bernhard Camp, 700—750 m, 1.III.1939, L. J. Toxopeus (3rd Archbold Exped.). — *Megapodagrionidae*.
- amphidactylis* Lieftinck (*Arrhenocnemis*), 1949a: 92—93, fig. 99, 111—112, 128. Holotype ♂. Central N. New Guinea, Sahuweri River basin, Rattan Camp, 1200 m, 1.III.1939, L. J. Toxopeus (3rd Archbold Exped.). — *Megapodagrionidae*.
- amphistylus* Lieftinck (*Argiolestes*), 1949a: 41—42, fig. 22, 34, 35. Holotype ♂. Central N. New Guinea, Idenburg River basin, above Bernhard Camp, 700—750 m, 29.III.1939, L. J. Toxopeus (3rd Archbold Exped.). — *Megapodagrionidae*.
- ampycteria* Lieftinck (*Nannophlebia*), 1933d: 15, 22—23, fig. 13. Lectotype ♀. N. New Guinea, Humboldt Bay area, Hollandia, 17.IV.1931, W. Stüber. First described ♂. N. New Guinea, Upper course of Korimé River, Nonno (Japu) Hills, ca. 15 km S. of Bougainville Range, 400 m, 7—21.III.1936, W. Stüber (see Lieftinck, 1942: 455—456, pl. 25 fig. 29—31). — *Libellulidae*.
- amymone* Lieftinck (*Macromia*), 1952a: 444, 446—449, 461, 465—467, fig. 2, 6,

- 19—21. Holotype ♂ and first described ♀. W. New Guinea, western extremity, Remu, S. E. of Sorong, ca. 50 m, 28.VIII.1948 (♂) and 26.X.1948 (♀), M. A. Lieftinck. — Corduliidae.
- anacharis** Lieftinck (*Nannophlebia*), 1955d: 309—311, 313, fig. 5—7. Holotype ♂ and first described ♀. Halmahera I. (N. Moluccas), Tolewang, 50 m, 13.X.1951 (♂) and Mt. Sembilan, 600 m, 8.X.1951 (♀), A. M. R. Wegner. — Libellulidae.
- anacolsa** Lieftinck (*Vestalis*), 1965b: 336, 353—354, fig. 2, 4, 7, 9. Holotype ♂. N. Borneo, Sabah, E.-slope of Mt. Kinabalu, 10 mi. N. of Ranau, 1570 ft., Paring, 9.X.1958, T. C. Maa. — Calopterygidae.
- anatyia** Lieftinck (*Nannophlebia*), 1933d: 14, 18—19, fig. 9—10. Holotype ♂. N. New Guinea, Humboldt Bay area, Hollandia, plain country, IV—VI.1931, "Augen grün" (W.S.), W. Stüber. — Libellulidae.
- andromeda** Selys (*Cyclophylla*), 1869b (♀). First described ♂. Surinam, Sipaliwini River, 4.II.1961, D. C. Geijskes. See Belle, 1970: 145—150, fig. 237—247, 256 (♂ ♀ and larva), pl. 19b, 20a, 21c (sub *Negomphoides*). — Gomphidae.
- anna** Lieftinck (*Amphicnemis*), 1940b: 365, 367, 370—371, pl. 15 fig. 4, pl. 16 fig. 4. Holotype ♂ and first described ♀. W. Borneo, Singkawang, forest marsh near Tjapkala, 16.I.1934, L. Coomans de Ruiter. — Coenagrionidae.
- annulata** Fraser (*Protosticta*), 1926: 492. Holotype ♂ (juv., terminal abd.-segments lost). N. Celebes, Manado, labelled "Mohari" [= collector's name!], with F. C. Fraser's identification, marked "Type". — Platystictidae.
Syn. of *Protosticta simplicinervis* Selys, 1885. — Syn. nov.
- annulipes** Lieftinck (*Argiolestes*), 1956b: 72, 102—105, fig. 39. Holotype ♂ and first described ♀ (both immature). Goodenough I. (d'Entrecasteaux Archip.), 900 m Camp, 27.X.1953, K. M. Wynn & L. J. Brass (4th Archbold Exped.). — Megapodagrionidae.
- anthaxia** Lieftinck (subsp. of *Diplacina phoebe* Ris), 1933d: 43, 49—52, fig. 29. Lectotype ♂ and first described ♀. N. New Guinea, Humboldt Bay area, 120 km E. of Hollandia, Kressi, 300 m, I.1932, W. Stüber. — Libellulidae.
Now *N. anthaxia* Lieft.
- antiacantha** Lieftinck (*Nannophlebia*), 1963c: 752—755, fig. 1—4. Holotype ♂ and first described ♀. N.E. New Guinea, Eastern Highlands, Kratke Mts., Lae-Goroka Rd., Kassam, 1370 m, 26—29.IX.1959, L. J. Brass (6th Archbold Exped.). — Libellulidae.
- antigone** Lieftinck (*Diplacina*), 1933d: 42, 45—47, fig. 27. Lectotype ♂ and first described ♀. N. New Guinea, Humboldt Bay area, Kressi (up to 120 km S.W. of Hollandia), ca. 300 m, I.1932, W. Stüber. — Libellulidae.
- appiculatum** Lieftinck (*Mortonagrion*), 1937b: 102—104, fig. 24. Lectotype ♂ and first described ♀. Billiton I., Tandjong Pandan, 6—17.I.1937, F. J. Kuiper. — Coenagrionidae.
- approximatus** Belle (*Progomphus*), 1966a: 25—28, fig. 46—50. Holotype ♂ and first described ♀. Surinam, Mooi Wanna (Weyneweg), 3.I.1964 (♂) and 4.I.1964 (♀), J. Belle. — Gomphidae.
- aquila** Lieftinck (*Tramea*), 1942: 526, 530, pl. 33 fig. 95, pl. 34 fig. 101. Holotype ♂ and first described ♀. N. New Guinea, southern Bewani Hills, upper course

of Tami River (5 days' march S. of Hollandia), Ampas distr., Pauwasi River, 200—300 m, 7.VI.1939, W. Stüber. — Libellulidae.

Now placed as *Trapezostigma aquila* (Lieft.), Hagen's earlier proposed generic name having priority.

arachne Ris (*Planiplax*), 1912b (♂). First described ♀. Surinam, Coropina Creek at Republiek, 15.III.1959 (♂ ♀), J. Belle. See Geijskes, 1964: 43—45, fig. 21. — Libellulidae.

arachnomima Lieftinck (*Macromia*), 1953f: 395—406, fig. 4—7. Holotype ♂ (reared from larva: with exuviae). S. Borneo, Sampit distr., ca. 50 m, Pemantan, 150 km inland, 26.VII.1953, forest brook, M. A. Lieftinck (larva ult); transformed at Bogor (Java), 2—3.IX.1953. — First described ♀ (reared from larva; with exuviae). Same data with holotype; transformed at Bogor (Java), 4.XI.1953. See Lieftinck, 1955c: 263—266, fig. 14. — Corduliidae.

arboricola Lieftinck (*Selysioneura*), 1959a: 286—288, fig. 4, 9, 17—18. Holotype ♂. Fergusson I. (d'Entrecasteaux Archip.), mountain camp between Agamoia and Ailuluai, southcoast, 900 m, 14.VI.1956, L. J. Brass (5th Archbold Exped.). — Isostictidae. Plate 1.

arborophila Lieftinck (*Huonia*), 1942: 487—488. Lectotype ♂ and first described ♀. N. New Guinea, Humboldt Bay area, 120 km E. of Hollandia, Kressi, 300 m, I. 1932, W. Stüber. — Libellulidae. Plate 6.

See also Lieftinck, 1935c: 277—279 (partim), fig. 36C, 38—39 (sub *H. thalassophila* Foerster).

Now classified as *H. arborophila arborophila* Lieft. (1963c: 777—778).

arcuata Lieftinck (*Drepanosticta*), 1934d: 469—470, 471, pl. 10 fig. 1, 2, 4. Lectotype ♂ and first described ♀. S.W. Sumatra, Lampong distr., Waitebu near Talangpadang, 500 m, 24.VI.1934 (♂) and same area, Wailalään, 250 m, 22.VI.1934 (♀), L. J. Toxopeus. — Platystictidae.

arcuata Lieftinck (*Coeliccia*), 1940b: 353—355, fig. 7—8. Holotype ♂ and first described ♀. E. Borneo, N. Kutai, Sangkulirang distr., Batu Besi, V—VI.1934, M. E. Walsh. — Platycnemididae.

arethusia Lieftinck (*Nannophlebia*), 1948a: 237—239, 243, fig. 5, 7. Holotype ♂ and first described ♀. S. Moluccas, Ambon I., 20.XI.1921, L. J. Toxopeus (♂) and Ambon, Sungei Waitumu, 23.IV.1941, Sundanese collector Manis (♀). — Libellulidae. Plate 6.

The holotype was first described and figured by the same author in 1926, sub *N. lorquini lorquini* Selys (see Lieftinck, 1926: 284, fig. 5—6).

argiocnemis Lieftinck (*Teinobasis*), 1949a: 165—167, fig. 210—211. Holotype ♂ and first described ♀. N. Central New Guinea, Idenburg River, Bernhard Camp B, 100 m, 11.IV.1939 (♂) and Bernhard Camp, 50 m, 7.II.1939 (♀), L. J. Toxopeus (3rd Archbold Exped.). — Coenagrionidae.

ariel Lieftinck (*Ischnura*), 1949a: 223—225, fig. 276, 279—280, 285—286. Holotype ♂ and first described ♀. West Central New Guinea, Wissel Lakes group, Lake Paniai, 1740 m, 21.VIII.1939, H. Boschma (Le Roux Exped.). — Coenagrionidae. Plate 2.

armenicum Lieftinck (*Oreagrion*), 1949a: 211—216, fig. 248, 254—255, 258—259, 267, 271—272. Holotype ♂ and first described ♀. Central W. New Guinea, Snow Mountain (Nassau) Range, Lake Habbema, 3250 m, 1—4.IX.1938, L. J.

Toxopeus (3rd Archbold Exped.). — Coenagrionidae. Plate 3.

armeniacus Lieftinck (*Argiolestes*), 1956b: 70, 90—93, fig. 25—27. Holotype ♂ and first described ♀. Goodenough I. (d'Entrecasteaux Archip.), 900 m Camp, east slopes, 26—27.X.1953, K. M. Wynn & L. J. Brass (4th Archbold Exped.). — Megapodagrionidae.

arses Lieftinck (*Palaiargia*), 1957: 54—58, fig. 14. Holotype ♂ and first described ♀. W. New Guinea, Berau Peninsula (Vogelkop), Beraur River area, Klamono oilfields (50 km from westcoast inland), 50 m, 22—24.VIII.1948, M. A. Lieftinck. — Coenagrionidae.

arsinoe Lieftinck (*Gynacantha*), 1948c: 422—424, 426—427, fig. 3. Holotype ♂. Talaud Is. (off N.E. Celebes), Salebabu I., "Salibaboe, coll. Staudinger, acq. 1903", and "Gynacantha basiguttata", in R. Martin's handwriting. — First described ♀: with label "Gynacantha n. sp.! Salibaboe" (unknown hand) (NRS), see Lieftinck, 1948c: 422—427. — Aeshnidae.

artemis Lieftinck (*Procordulia*), 1930b: 159—162, 164, fig. 23—25. Lectotype ♂ and first described ♀ (ovipositing). W. Java, Priangan, old crater-lake at Kawah Kamodjan near Garut, 1650 m, 19.IV.1930, M. A. Lieftinck. — Corduliidae.

arthuri Lieftinck (*Burmagomphus*), 1953e: 251—252, fig. 7. Holotype ♀. S.E. Borneo, Kutai, Balikpapan, Sungai Mentawir, sea-level, 6.X.1950, A. M. R. Wegner. — Gomphidae.

In Lieftinck, 1954: 88, for ♂ read ♀.

arthuri Lieftinck (*Gynacantha*), 1953c: 177—179, fig. 46. Holotype ♂ and allotype ♀ (in cop.), W. Sumba I. (Lesser Sunda Is.), Waimangura, Matakori, 436 m, 21.VIII.1949, A. M. R. Wegner (Sumba Exped.). — Aeshnidae.

aruana Lieftinck (*Huonia*), 1942: 491, 492, pl. 26 fig. 38—39. Holotype ♂. Aru Is., Dobo, V.1932, native coll., M. E. Walsh ded. — Libellulidae.

assidua Lieftinck [subsp. of *Cratilla lineata* (Brauer)], 1953c: 202—206, fig. 71. Holotype ♂ and first described ♀. Central Java, Banjumas, Mt. Slamet, Baturaden, 800 m, 25.IV.1929, F. C. Drescher. — Libellulidae.

assimilis Selys (*Hemicordulia*?), 1871: 251—252 (17—18 sep.). Holotype ♀ (immature). N. Celebes: Rosenberg Celebes (print), Limbotto (written), 6 Hag. 65 (written, yellow label), over drawer-label *Hemicordulia assimilis* Hagen. — Corduliidae.

Three males bear identical locality labels, one adult ♂ carrying a label *Hemicordulia assimilis* Hagen, in de Selys' handwriting.

Correctly placed in *Hemicordulia*.

astarte Lieftinck (*Macromia*), 1971b: 42—44, fig. 21, 27—28. Holotype ♂ and first described ♀. Papua, Kokoda Trail, 700 m, 5.XI.1969 (♂) and Papua, Sogeri, N. of Pt. Moresby, 500 m, 3.XI.1969 (♀ semiad.), both R. Straatman. — Corduliidae.

asthenes Lieftinck (*Phaenandrogomphus*), 1964b: 6—14, fig. 1—13. Holotype ♂. Malay Peninsula, Selangor, Templer Park, 12—13 mi. from Kuala Lumpur, roadside stream, 26.III.1963, M. A. Lieftinck. — Gomphidae.

First described ♀ (op. cit.). Malay Peninsula, "Wasserscheide zwischen Perak u. Pahang, Inner Malakka, Camp Jor, Albert Grubauer 1901", ex coll. F. Förster (UMMZ).

Type-species of *Phaenandrogomphus* Lieftinck (op. cit.).

astridae Lieftinck (*Procordulia*), 1935a: 189—190. Lectotype ♀ (semiadult) and

first described ♂ (immature, in fragments). N. New Guinea, Humboldt Bay area, Cycloop Mts., 1000 m, 19.V.1932 (♀) and 14.IV.1935 (♂), W. Stüber. — Corduliidae.

Although this insect, upon the discovery of a topotypical ♂, was recognized as a species distinct from *P. sylvia* Lieft., I have selected the ♀ as lectotype (mentioned as "type" in my later account, 1942: 559), the ♂ being in poor condition. The terminalia of fully adult topotypical ♂ and ♀ were figured in the paper last mentioned (1942, pl. 37 fig. 120—122).

- atlanticus** Belle (**Negomphoides**), 1970: 133—136, fig. 218—222, pl. 20b. Holotype ♂. Surinam, Coppename river, Raleigh Falls, forest 1 km from river, 21.VIII.1957, D. C. Geijskes. — Gomphidae.
- atomarius** Lieftinck (**Podolestes**), 1950c: 40—44, fig. 1—2. Holotype ♂ and first described ♀. S.E. Borneo, Kandangan distr., Ampah, 0—20 m, IV—V.1948, Liem Swie Liong. — Megapodagrionidae.
- atrovirens** Lieftinck (**Macromidia**), 1935a: 194—196. Holotype ♀. S. Sumatra, Benkulen distr., Bukit Itam, 6—700 m, 11—15.VI.1935, M. E. Walsh. — Corduliidae.
- attala** Lieftinck (**Drepanosticta**), 1934d: 472—474, fig. 2—3. Holotype ♂ and first described ♀. W. Borneo, Singkawang-Bengkajang Rd., forest brook near Serukan, hill country, 16.IV.1934 (♂) and 28.I.1934 (♀), L. Coomans de Ruiter. — Platystictidae.
- audax** Lieftinck (subsp. of **Gomphidia abbotti** Williamson), 1948a: 263—264, 266, fig. 13—15. Lectotype ♂. S. Sumatra, Lampong distr., Terbanggi-hilir near Menggala, 19.VIII.1936, M. Bartels Jr. — Gomphidae.
- aulicus** Lieftinck (**Argiolestes**), 1949a: 43—44, fig. 23. Holotype ♀. Central W. New Guinea, Bernhard Camp B, 150 m, "waterfall", 13.IV.1939, J. Olthof (3rd Archbold Exped.). — Megapodagrionidae.
- aurantiaca** Lieftinck (**Notoneura**), 1938: 94—95, fig. 29—30. Lectotype ♂ and first described ♀. W. New Guinea, Onin Peninsula (western extremity), Fak Fak, 28—29.XII.1912, H. Elgner. Both misidentified with *Caconeura plagiata*: Ris, 1915b: 90—91, fig. 10; nec *Alloneura plagiata* Selys, 1886 (♂ Misool I.). — Protoneturidae.
- aurea** Lieftinck (**Teinobasis**), 1932b: 585—587, fig. 63. Lectotype ♂ and first described ♀. N. New Guinea, Humboldt Bay area, Pim River, near Hollandia, 200 m, 30.V.1931, W. Stüber. — Coenagrionidae.
- aurea** Lieftinck (**Pachycypha**), 1950a: 631—638, fig. 1—3. Holotype ♂ and first described ♀. S.E. Borneo, Kandangan distr., 7 km N.E. of Ampah, near Ranamun, 19.V.1948 (♂) and 22.V.1948 (♀), Liem Swie Liong. — Chlorocyphidae.
- Type-species of *Pachycypha* Lieftinck (op. cit.).
- aureofrons** Lieftinck (**Cyanocnemis**), 1949a: 107—112, fig. 104, 114, 117—119, 125—127. Holotype ♂ and first described ♀. Central W. New Guinea, Sahuweri River valley, Araucaria Camp, 800 m, 17.III.1939, L. J. Toxopeus (3rd Archbold Exped.). — Platycnemididae.
- Type-species of *Cyanocnemis* Lieftinck (op. cit.).
- auriculatum** Lieftinck (**Papuagrion**), 1937a: 27, 39—41, fig. 27—28. Holotype ♂ and first described ♀. N. New Guinea, Humboldt Bay area, southern slope of Mt. Cycloop, 1000 m, 2.IX.1933 (♂) and 20.IX.1934 (♀), W. Stüber. — Coenagrionidae.

- auripennis** Geijskes (*Aeschnosoma*), 1970: 27—28, fig. 26—27, pl. 2a. Holotype ♀. Surinam, upper Coropina creek near Zanderij, 6.II.1946, D. C. Geijskes. — Corduliidae.
- austeni** Lieftinck (*Drepanosticta*), 1940a: 89—91, fig. 2. Lectotype ♂ and first described ♂. Waigeu I., off West New Guinea, labelled "Waigeo, Bernstein"¹. — Platystictidae.
- australis** Guérin-Ménéville (*Agrion*), 1832: 196 (holotype ♀ Offak, Waigeu I.). First described ♂. Waigeu I., off West New Guinea, labelled "Waigeo, Bernstein"¹. One of two males redescribed, figured and selected as allotype by Lieftinck, 1938: 70—73, fig. 6, 7a, 8. — Megapodagrionidae.
Type-species of *Argiolestes* Selys, 1862.
- australis** Hagen (*Epophthalmia*), 1867: 61—62. Holotype ♂. "Celebes [N. Celebes, Minahasa], Limbotto, Rosenberg" (print) and "7 Hag. 65" (written, orange label). Designated by Lieftinck, 1931: 64. — Corduliidae.
- austrosundanus** Lieftinck (subsp. of *Burmagomphus williamsoni* Foerster), 1964b: 25—26. Holotype ♂ and first described ♀. E. Sumba I. (Lesser Sunda Is.), Laluku, 4.VII.1949 (♂) and Wai Lekabe, 28.VI.1949 (♀), A. M. R. Wegner et al. (Sumba Exped.). — Gomphidae.
- axiagasta** Lieftinck (*Nannophlebia*), 1933d: 14, 15, 16—17, fig. 7—8. Lectotype ♂ and first described ♀. N. New Guinea, Humboldt Bay area, Hollandia, III.1931 (♂) and IV—VI.1931 (♀), W. Stüber. — Libellulidae.
- balteatum** Lieftinck (*Orthetrum*), 1933d: 63—66, fig. 35. Lectotype ♂ and first described ♀. N. New Guinea, Humboldt Bay area, Hollandia, plain country, III.1931, W. Stüber. — Libellulidae.
- banteng** Lieftinck (*Onychogomphus*), 1929b: 133—136, fig. 25—27. Holotype ♂. W. Java, Djampang, Pandan Arum [Estate on slope of Mt. Salak], 1000 m, VI.1916, native coll., ex coll. W. Roepke. — Gomphidae.
- barbatula** Lieftinck (*Drepanosticta*), 1940b: 351—353, fig. 6. Holotype ♂. E. Borneo, N. Kutai, Sangkulirang distr., Batu Besi, VI.1937, M. E. Walsh. — Platystictidae.
- bartelsi** Lieftinck (*Drepanosticta*), 1937b: 70—72, fig. 8. Holotype ♂ and first described ♀. S.W. Java, Tjidamar near Tjitoë, ca. 40 m, 13.IX.1935, M. Bartels Jr. — Platystictidae.
- bartelsi** Lieftinck (*Heliaeschna*), 1940b: 386—390. Holotype ♂ and first described ♀. W. Borneo, Singkawang distr., near Bakuan, 9—10.IV.1934, L. Coomans de Ruiter. — Aeshnidae.
- basilanensis** Laidlaw (subsp. of *Devadatta podolestoides* Laidlaw), 1934: 102—103. Lectotype ♂ and first described ♀. Philippine Is., Basilan I., Maloong, XII.1932, K. Kuwasima. — Amphipterygidae.
- basitincta** Lieftinck [subsp. of *Amphiaeschna ampla* (Rambur)], 1940b: 385—386. Holotype ♂ and first described ♀. S.W. Sumatra, Benkulen distr., Tandjong Sakti near Pagaralam, 600 m, 27.V.1935 (♂) and Muara Tenam, 250 m, 16—23.VI.1935 (♀), M. E. Walsh. — Aeshnidae.
- batjanum** Asahina (*Ceriagrion*), 1967: 267—269, 321, fig. 32—37. Holotype ♂

¹) H. A. Bernstein collected in the island of Waigeu from about mid March till the 13th May, 1863.

- and first described ♀. Batjan I. (N. Moluccas), Wajaua, Birabiraketjil, 19.VI.1953, A. M. R. Wegner et al. — Coenagrionidae.
- beatricis** Lieftinck [subsp. of *Rhyothemis phyllis* (Sulzer)], 1942: 506, 509—510, pl. 28 fig. 50—53, pl. 29 fig. 54—56. Holotype ♂ and first described ♀. N. New Guinea, Humboldt Bay area, Hollandia, 27.VIII—4.IX.1930, W. Stüber. — Libellulidae.
- beatrice** Lieftinck (*Notoneura*), 1949a: 63—64, fig. 67—70, 85—86. Holotype ♂ and first described ♀. Central N. New Guinea, Idenburg River valley, Bernhard Camp, 50 m, 31.VII.1938 (♂) and 26.IX.1938 (♀), J. Olthof (3rd Archbold Exped.). — Protoneuridae.
- bellicosa** Lieftinck [subsp. of *Epophthalmia vittigera* (Ramb.)], 1948e: 19—21. Holotype ♂. Burma, Thaton distr., Mokpalin, 16.V.1923, J. Elton Bott, ex coll. T. B. Fletcher. — First described ♀. S. Burma, Tenasserim, Mergui, 1922, J. Elton Bott, ex coll. T. B. Fletcher. — Corduliidae.
- billitonis** Lieftinck (*Amphicnemis*), 1940b: 365, 367, 374, pl. 15 fig. 4, pl. 16 fig. 1. Holotype ♂ and first described ♀. Billiton I. (west), Tjerutjuk, 24.XII.1935, F. J. Kuiper. — Coenagrionidae.
- biroi* Foerster (*Tetrathemis*), 1900 (♂, not ♀). First described ♀ (in cop.). N. New Guinea, Humboldt Bay area, Cycloop Mts., 400 m, I—II.1931, W. Stüber. See Lieftinck, 1933d: 19—21, fig. 11. — Libellulidae.
- Now *Nannophlebia biroi* (Foerster).
- borneensis** Lieftinck (*Heliogomphus*), 1964a: 90—93, fig. 3—5. Holotype ♂. E. Borneo, Kutai, Nunukan, I.1953, forest stream, L. Hentig. — First described ♀. E. Borneo, Kutai, Samarinda distr., ca. 100 km upstream Tabang River, kali Bengen, ca. 100 m, 17.IX.1956, A. M. R. Wegner. — Gomphidae.
- brachycnemis* Needham (*Progomphus*), 1944 (♀). First described ♂. Surinam, Upper Para River, 25.III.1962, J. Belle. See Belle, 1966a: 2—7 (♂ ♀ and larva), fig. 1—12, pl. 1. — Gomphidae.
- brasiliensis** Belle (*Aphylla*), 1970: 51—52, fig. 81—82. Holotype ♂ and allotype ♀ (in cop.). Brazil, Mato Grosso, Barre do Tapirapé, forest edge, 11.I.1963, B. Malkin. — Gomphidae.
- buettikoferi** Ris (*Eleuthemis*), 1910: 382—384, fig. 231—232. Lectotype ♂. Liberia, labelled "Bavia v/d Prul [?] Liberia feb. 1880", under drawer-label büttikoferi Ris. — Libellulidae.
- Type-species of *Eleuthemis* Ris (op. cit.).
- buwaldai** Lieftinck (*Podolestes*), 1940b: 347—348, fig. 4b. Holotype ♂. E. Sumatra, Riouw distr., Rengat, Pangkalan kasai, 2.IV.1939, P. Buwalda. — Megapodagrionidae.
- buwaldai** Lieftinck (*Teinobasis*), 1949a: 171—172, fig. 214—216. Lectotype ♂ and first described ♀. Aru Is., Wokam I., Dosi Wamalau, 18.V.1938, P. Buwalda. — Coenagrionidae.
- calamineum** Lieftinck (*Ceriagrion*), 1951c: 185—186, 189—193, fig. 2. Holotype ♂ and first described ♀. W. Java, Bogor, Botanic Garden, 250 m, 23.VIII.1930, M. A. Lieftinck. — Coenagrionidae.
- See Asahina (1967: 272—274, figs.).
- callisphaena** Lieftinck (*Notoneura*), 1937a: 16—18, fig. 10—11. Lectotype ♂ and

- first described ♀. N. New Guinea, Humboldt Bay area, Nonno Hills, 400 m, 15—20.XI.1935, W. Stüber. — Protoneuridae.
- callisto* Laidlaw (*Macromia*), 1922 (♂). First described ♀. Malay Peninsula, Selangor, 11½ mi. Kuala Lumpur-Bentong Rd., Sungai Gombak, 12.VI.1963, J. I. Furtado. See Lieftinck (1971b: 23—26). — Corduliidae.
- calosomum* Lieftinck (*Pseudagrion*), 1936a: 124—126, fig. 8, 9, 11. Lectotype ♂. Sumba I. (Lesser Sunda Is.), E. Sumba, Kananggar, 700 m, V.1925, K. W. Dammerman. — First described ♀. E. Sumba, Baing, 100—200 m, 21.VI.—3.VII.1949 (Sumba Exped. 1949, NMB).
- calverti* Geijskes (*Misagria*), 1951: 71—74, 76, fig. A—F. Holotype ♂ and first described ♀. Surinam, Brownsberg, 14.IX.1938 (♂) and 19.IX.1938 (♀), D. C. Geijskes. — Libellulidae.
- campioni* Lieftinck (*Synthemis*), 1971b: 48—51, fig. 33—35. Holotype ♂ and first described ♀. New Caledonia, N.E.-side, Pouébo, 200 m, 24.I.1964 (♂) and same loc., 250 m, near mountain stream, 23.I.1964 (♀), both R. Straatman. — Corduliidae.
- capillaris* Lieftinck (*Tanymecosticta*), 1959a: 294—295, fig. 11, 29—32. Holotype ♂. Tanimbar Is. (Timorlaut), Jamdena I., IV.1938, P. Buwalda. — Isostictidae.
- capreola* Lieftinck (*Selysioneura*), 1932b: 542, 545—547, fig. 40—41. Lectotype ♂ and first described ♀. N. New Guinea, Humboldt Bay area, Hollandia, I—II.1931, W. Stüber. — Isostictidae.
- carnifex* Lieftinck (*Palaiargia*), 1932b: 559, 563—565, fig. 53. Lectotype ♂ and first described ♀. N. New Guinea, Humboldt Bay area, Hollandia, 27.VIII—4.IX.1930. W. Stüber. — Coenagrionidae.
- casuarina* Lieftinck (*Podopteryx*), 1949a: 39—41, fig. 21, 33. Holotype ♂. Central W. New Guinea, Idenburg River basin, above Bernhard Camp, ca. 400 m, “in heavy jungle far away from water”, 11.II.1939, L. J. Toxopeus (3rd Archbold Exped.). — Megapodagrionidae.
- celaeno* Lieftinck (*Macromia*), 1955c: 274—277, fig. 27—28. Holotype ♂ and first described ♀. N.E. New Guinea, Papua, Kwagira River, Peria Creek, 50 m, 3 and 2.IX.1953, respectively, G. M. Tate (4th Archbold Exped.). — Corduliidae.
- celebense* Lieftinck (subsp. of *Anax fumosus* Hagen), 1942: 581, 586, 595—597, pl. 40 fig. 144, 149, pl. 41 fig. 152. Holotype ♂ and first described ♀. Central Celebes, Palu distr., S. Kulawi, Kalamanta, 1000 m, 10.X.1940 (♂) and Kulawi, 550 m, 15.I.1941 (♀), P. M. Felix. — Aeshnidae.
- celebense* Lieftinck (*Pseudagrion*), 1937b: 90—92, fig. 18c, 19. Holotype ♂ and first described ♀. N.W. Celebes, Palu, I.1937, R. Awibowo (♂) and Centr. E. Celebes, Kali Tominanga, 22.VIII.1932, Prof. Dr. R. Woltereck (♀). — Coenagrionidae.
- cerinomelas* Lieftinck (*Ceriagrion*), 1927: 88—91, fig. 4. Holotype ♂ and allotype ♀ (in cop.). N. India, W. Himalaya, Sutlej valley, Sholtu, 2300 m, 4 miles from Kilba, 1.VII.1926, W. G. N. van der Sleen. — Coenagrionidae.
- Currently placed as a subspecies of *C. fallax* Ris (see Asahina, 1967: 284—286, 321, fig. 100—106).
- cervula* Lieftinck (*Synthemis*), 1938: 119—122, fig. 50. Holotype ♂ and first described ♀. N. New Guinea, Bewani Hills, upper course of Tami River, 300—500 m, Josko, 22—30.XI.1936. W. Stüber. — Corduliidae.
- ceyx* Lieftinck (*Palaiargia*), 1949a: 115, 123—125, fig. 135, 156—157. Holotype ♂

and first described ♀. Central N. New Guinea, Idenburg River valley, above Bernhard Camp, 700 m, 27—29.III.1939, L. J. Toxopeus (3rd Archbold Exped.). — Coenagrionidae.

Now *P. ceyx ceyx* Lieft. (1949a).

chalciops Lieftinck (**Macromia**), 1952a: 439, 456—460, fig. 5, 10. Lectotype ♂ and first described ♀. Halmahera I. (N. Moluccas), Mt. Sembilan, 600 m, 27.IX.-6.X. 1951, Sundanese collectors. — Corduliidae.

chalcociton Ris [subsp. of **Agrioptera insignis** (Rambur)], 1915a: 15—16. Lectotype ♂ and first described ♀ (androchrom.). Simalur I. (off N.W. Sumatra), Pulu Babi, IV.1913, E. Jacobson, with Ris's identification labels. — Libellulidae.

chalcosoma Lieftinck (**Nannophyopsis**), 1935a: 183—188, fig. 4—6. Holotype ♂ and first described ♀. Billiton I. (east), Gantung, 17.IX.1935 (♂) and 13.X.1935 (♀), F. J. Kuiper. — Libellulidae. Plate 7.

Type-species of *Nannophyopsis* Lieftinck (op. cit.).

chalybeostoma Lieftinck (**Notoneura**), 1932b: 521, 525, 528—529, fig. 20—22. Lectotype ♂ and allotype ♀ (in cop.). N. New Guinea, Humboldt Bay area, Hollandia, I—II.1931, W. Stüber. — Protoneuridae.

charmosyna Lieftinck (**Palaiargia**), 1932b: 559, 560—563, fig. 52. Lectotype ♂ and first described ♀. N. New Guinea, Humboldt Bay area, Hollandia, 400 m, IX.1930, W. Stüber. — Coenagrionidae.

Now *P. charmosyna charmosyna* Lieft. (1949a).

chloropleura Lieftinck (**Idiocnemis**), 1932b: 502—503, fig. 6. Lectotype ♂ and first described ♀. N. New Guinea, Humboldt Bay area, Hollandia, IV—VI.1931, W. Stüber. Selected by Lieftinck, 1958: 267. — Platycnemididae.

civicum Lieftinck (**Pseudagrion**), 1932b: 568, 570—572, fig. 55. Lectotype ♂ and allotype ♀ (in cop.). N. New Guinea, Humboldt Bay area, Hollandia, 27.VIII—4.IX.1930, W. Stüber. — Coenagrionidae.

claaseni Lieftinck (**Drepanosticta**), 1938: 80—81, 87, fig. 17, 19a. Holotype ♂. N.W. New Guinea, Berau Peninsula (Vogelkop), Jenau near Aja Maru, 350 m, XII.1937, J. M. van Ravenswaay Claasen. — Platystictidae.

clavata Lieftinck (**Drepanosticta**), 1932b: 515—517, fig. 18. Lectotype ♂ and first described ♀. N. New Guinea, Humboldt Bay area, Hollandia, plain forest, 400 m, IX.1930, W. Stüber. — Platystictidae.

clymene Lieftinck (**Diplacina**), 1963c: 767—768, fig. 20—23. Holotype ♂. Fergusson I. (d'Entrecasteaux Archip.), Agamoia, 200 m, 20.VI.1956, L. J. Brass (5th Archbold Exped.). — Libellulidae.

coarctatum Lieftinck (**Pseudagrion**), 1932b: 567, 578—579, fig. 57, 60. Holotype ♂. N. New Guinea, Humboldt Bay area, Hollandia, IX—XII.1930, W. Stüber. First recorded ♀. Same area, Lake Sentani, 2—17.XII.1932 (in cop.), same collector. — Coenagrionidae.

coccinea Lieftinck (**Onychothemis**), 1953e: 264—266. Holotype ♂ and first described ♀. S.E. Borneo, Kutai, Balikpapan, Sungai Mentawir, sea-level, 23.X.1950, A. M. R. Wegner. — Libellulidae.

conchinus Williamson (**Cyanogomphus**), 1916 (♂). — First described ♀. Surinam, Upper Para River, 1.IV.1962, J. Belle. See Belle, 1966b: 52—56 (♂ ♀), fig. 83—90, pl. 8 (sub *Ebegomphus*). — Gomphidae.

Later, Belle (1970) placed *Ebegomphus* Needham in the synonymy of *Cyanogomphus* Selys.

- conjectus** Belle (*Progomphus*), 1966a: 17—20, fig. 32, 44, pl. 4. Holotype ♀. Surinam, Coppename River, 10.X.1901, H. A. Boon. — Gomphidae.
- connectens** Lieftinck (*Argiolestes*), 1956b: 69, 79—81, fig. 8—9, 12—13. Lectotype ♂ and first described ♀. W. New Guinea, western extremity, Sorong, ca. 100 m, 24.X.1948 (♂) and 30.X.1948 (♀), M. A. Lieftinck. — Megapodagrionidae.
- coomansi** Laidlaw (*Leptogomphus*), 1936: 267—269, fig. 1. Holotype ♂ and first described ♀. W. Borneo, Mampawah near Singkawang, forest between Pakmiongtheo and Pandjaoa, 3.IV.1932 (♂) and Sungei Bagak (G. Raja-complex), 10.VI.1933 (♀), L. Coomans de Ruiter. — Gomphidae.
- coomansi** Lieftinck (*Pseudagrion*), 1937b: 86—90, fig. 17—18. Holotype ♂ and first described ♀. W. Borneo, Singkawang, Montrado, 22.X.1931 (♂) and Patengah Road, 18.II.1932 (♀), L. Coomans de Ruiter. — Coenagrionidae.
- coomansi** Lieftinck (*Coeliccia*), 1940b: 355—356, fig. 9—10. Holotype ♂ and first described ♀. W. Borneo, Singkawang, Mt. Poteng, 400 m, 31.I.1932, L. Coomans de Ruiter. — Platycnemididae.
- coomansi** Lieftinck (*Elattonaura*), 1937b: 79—80, fig. 13. Lectotype ♂ and first described ♀. W. Borneo, Singkawang area, Mt. Ambawang, 13.III.1931 (♂), and Singkawang, forest marsh near Bakuan (Selakau River), 20.VII.1932 (♀), L. Coomans de Ruiter. — Protoneuridae.
- coomansi** Lieftinck (*Podolestes*), 1940b: 348—350, fig. 4c, 5. Holotype ♂ and first described ♀. S.E. Sumatra, Palembang, 25.IX.1939, L. Coomans de Ruiter. — Megapodagrionidae.
- cornelia** Selys (*Calopteryx*), 1853 : 15. Holotype ♂ (adult). With printed label "v. Siebold, Japan", under old drawer-label "Cornelia". First described ♀ (ad., legs missing), labelled "Burger, Japan" (white disk, unknown handwriting), and a second ♀ (ad., intact), with rectangular label "Japonia Agrion?" (as before). — Calopterygidae.
- The ♀ was first recorded in the *Monographie* (1854 : 48), as follows: "♀. Je crois me rappeler que la femelle que j'ai vu à Leyde, porte un faux ptérostigma blanc", an observation evidently made after studying the above specimens. The first full description is found in Selys (1869a: 648).
- Type-species of *Anaciagrion* Kennedy, 1920.
- cornelia** Lieftinck (*Selysionaura*), 1953b: 647—651, 656, 658—668, fig. 2, 7, 11, 13, 15—26. Holotype ♂ and first described ♀. W. New Guinea, western extremity, Sorong, 50 m, 30.X.1948, M. A. Lieftinck. — Isostictidae. Plate 1.
- cornelii** Lieftinck [subsp. of *Rhinocypha fenestrata* (Bur.)], 1947: 218—220, pl. 2 fig. 1. Holotype ♂. S.W. Bali I. (Lesser Sunda Is.), Pulkan forest-reserve, ca. 200 m, 3.IV.1936, C. G. G. J. van Steenis. — First described ♀. Central S. Bali I., Mt. Batukau, ca. 700 m, Wonggaja-gede, 13.II.1940, Walter Spies. — Chlorocyphidae.
- corniculatum** Lieftinck (subsp. of *Papuagrion pesechem* Lieft.), 1949a: 152—153, fig. 194, 200. Lectotype ♂ and first described ♀. Central N. New Guinea, Sahuwari River valley, Rattan Camp, 1150 m, 12.II.1939, L. J. Toxopeus (3rd Archbold Exped.). — Coenagrionidae.
- cornuta** Foerster (*Karschia*), 1900 (♀). First described ♂. N. New Guinea, Humboldt Bay area, S. Cycloop Mts., 700—1000 m, IX.1932, 1933 & 1934; II, IV & IX.1935,

- W. Stüber. See Lieftinck, 1937a: 66—70, fig. 44. — Aeshnidae.
 Type-species of *Karschia* Foerster, 1900 (nom. praecoc.).
 Now *Plattycantha cornuta* Foerster, 1908, isogenotypic.
- coropinae* Geijskes (*Micrathyria*), 1963: 78—81, fig. 17. Holotype ♂ and first described ♀. Surinam, Coropina Creek, near Vier Kinderen, 26.I.1947, D. C. Geijskes. — Libellulidae.
- corruptum* Lieftinck (*Papuagrion*), 1938: 105—107, fig. 40. Lectotype ♂ and first described ♀. N. New Guinea, Bewani Hills, upper course of Tami River, 5 days' journey S.E. of Hollandia, Sawia, 200 m, 10.X.1936, W. Stüber. — Coenagrionidae.
- corvina* Lieftinck (*Caconeura*), 1930b: 138—141, 151, fig. 1—4. Holotype ♂ and allotype ♀ (in cop.). Java mer., res. Banjumas, Djeruklegi, 7.I.1929, F. C. Drescher. — Protoneuridae.
 Syn. of *Prodasineura autumnalis* (Fraser), see Lieftinck (1934e: 390).
- crenitis* Lieftinck (*Drepanosticta*), 1933a: 288—292, 296, fig. 3. Holotype ♂ and first described ♀. W. Borneo, Singkawang, G. Poteng, 325 m, forest brook, 28.II.1932, L. Coomans de Ruiter. — Platystictidae.
- cristatus* Needham (*Gomphoides*), 1944 (♂). First described ♀ (in cop.). Surinam, Para River, 4.I.1959, J. Belle. See Belle, 1970: 126—130, fig. 202—210 (♂ ♀ and larva), pl. 17b, 18a, 21a (sub *Negomphoides*). — Gomphidae.
- crucigera* Lieftinck (*Archibasis*), 1949a: 185, 192—193, fig. 176, 177, 226, 227, 239. Holotype ♂ and first described ♀. N. New Guinea, Humboldt Bay area, Tami River valley, 25—31.I.1933, W. Stüber. — Coenagrionidae.
- cruentata* Lieftinck (*Notoneura*), 1932b: 522, 540—541, 601, fig. 38. Holotype ♂. N. New Guinea, Humboldt Bay area, near Lake Sentani, 9.III.1931, W. Stüber. First described ♀, topotypical, XI.1931 & III.1932, same collector. — Protoneuridae.
 Now *N. rosea cruentata* Lieft.
- cyanura* Lieftinck (*Notoneura*), 1932b: 521, 529—530, 601—602, fig. 23. Holotype ♂. N. New Guinea, Humboldt Bay area, Hollandia, I—II.1931, W. Stüber. — First described ♀. N. New Guinea, Humboldt Bay area, 400 km S. of Hollandia, 300 m, 25.III.1932, W. Stüber. See also Lieftinck, 1937a: 11—12, fig. 5. — Protoneuridae.
- cyclopica* Ris (*Lanthanusa*), 1912b: 746—747, fig. 424. Holotype ♀. N. New Guinea, Humboldt Bay area, "N. Guinea Exp., Cycloop Gebergte, 14 April 1903" (two written labels), Mus. Leiden (print), Orthetrum? (unknown hand), "nov. gen. nov. spec. ♀", det. Dr. F. Ris. — Libellulidae.
 Type-species of *Lanthanusa* Ris (op. cit.).
- cyclopica* Lieftinck (subsp. of *Palaiargia charmosyna* Lieft.), 1949a: 118. Holotype ♂ and first described ♀. N. New Guinea, Humboldt Bay area, Cycloop Mts., southern slopes, 900 m, 26.VI.1938, J. Olthof (3rd Archbold Exped.). — Coenagrionidae.
- cyclopica* Lieftinck (*Hemicordulia*), 1942: 546—548, pl. 35 fig. 108—109. Holotype ♂. N. New Guinea, Humboldt Bay area, Cycloop Mts., 1000 m, 8.VIII.1935, W. Stüber. — Corduliidae.
- cydippe* Laidlaw (*Macromia*), 1922 (♂). First described ♀. W. Java, Djasinga, Tjibarembang River, 150 m, 1.XII.1935, M. A. Lieftinck. See Lieftinck, 1950b: 680, 704—705. — Corduliidae.
- cynthiae* Lieftinck [subsp. of *Agrionoptera insignis* (Ramb.)], 1942: 472—473, pl. 24 fig. 19. Holotype ♂ and first described ♀. Tanimbar Is. (Timorlaut), P. Jamdena, IV.1938, P. Buwalda. — Libellulidae.

- cyrene** Lieftinck (*Diplacina*), 1953d: 155, 164—169, fig. 3—4. Lectotype ♂. W. New Guinea, Berau Peninsula (Vogelkop), Beraur distr., Klamono Oilfields, 40 km inland, ca. 50 m, 19.VIII.1948, M. A. Lieftinck. — First described ♀. Misool I. (off W. New Guinea), Fakal, ca. 50 m, 23.IX.1948, M. A. Lieftinck. — Libellulidae.
- dactylogastra** Lieftinck (*Celebophlebia*), 1936b: 401—403, fig. 1—2. Holotype ♂. Central S.W. Celebes, northeastern slopes of Quarles Mts., Todjambu, 1000 m, 17.VII.1936, L. J. Toxopeus. — Libellulidae.
- Type-species of *Celebophlebia* Lieftinck (op. cit.).
- dactylostyla** Lieftinck (*Amphicnemis*), 1953f: 386—388, fig. 2. Holotype ♂ and first described ♀. S. Borneo, Sampit distr., 50—100 m, Pemantan, 150 km inland, 26.VII.1953, forest marshes, M. A. Lieftinck. — Coenagrionidae.
- dagnyae** Lieftinck (*Idiocnemis*), 1958: 258—260, 279, fig. 22—26. Holotype ♂ and first described ♀. W. New Guinea, western extremity, Malano, 15 km inland of Sorong, 27.VIII.1948 (♂), and Remu near Sorong, 28.VIII.1948 (♀), M. A. Lieftinck. — Platycnemididae.
- daphne** Lieftinck (*Huonia*), 1953d: 186, 198—200, fig. 10B, 11, 12, 15, 17. Holotype ♂ and first described ♀. Halmahera I. (N. Moluccas), Mumar River, 200—300 m, 25.IX.1951 (♂), and Mt. Sembilan, 600 m, 8.X.1951 (♀), Sundanese collectors. — Libellulidae.
- debeauforti** Lieftinck (*Teinobasis*), 1938: 107—109, 113, fig. 41—43. Holotype ♂ and first described ♀. N.-coast of New Guinea, estuary of Sermowai River, Moaif, 26.VI—4.VII.1903, L. F. de Beaufort & H. A. Lorentz. Identified by H. W. van der Weele with "Telebasis spec. no. 1". — Coenagrionidae.
- debeauxi** Lieftinck (*Teinobasis*), 1938: 113—114, fig. 45—46. Holotype ♂. Papua, Fiume Purari [Purari River], 4.I.1894, Lamberto Loria. — Coenagrionidae.
- Erroneously recorded in the original description as from "Astrolabe Range".
- declaratum** Lieftinck [subsp. of *Pseudagrion pilidorsum* (Brauer)], 1936a: 130, 132—134, fig. 13a-b. Lectotype ♂ and first described ♀. W. Flores I. (Lesser Sunda Is.), Labuan Badjo, 100 m, XI.1937, J. K. de Jong. — Coenagrionidae.
- deflexum** Lieftinck [subsp. of *Pseudagrion pilidorsum* (Brauer)], 1936a: 130, 134, fig. 13c. Lectotype ♂. S. Timor I. (Lesser Sunda Is.), Amarasi, XII.1931—I.1932, Ed. Handschin. — Coenagrionidae.
- degeneratum** Lieftinck (*Papagrion*), 1937a: 34—35. Holotype ♀. N. New Guinea, Humboldt Bay area, Korimé River plain, Ajiep, I. 1931, W. Stüber. — First described ♂. Same area, southern Bewani Hills, 300—500 m, Arso, 2.III.1937, W. Stüber (see Lieftinck, 1949a: 162, fig. 207—208). — Coenagrionidae.
- The ♀ was first described sub *P. magnanimum* (Selys), but later recognized as a distinct species (see Lieftinck, 1935c: 245, fig. 19, 247).
- delicatula** Lieftinck (*Caconeura*), 1930b: 141—143, 151, fig. 5—8. Holotype ♂ and first described ♀. Java mer., res. Banjumas, Djeruklegi, 11.VIII and 20.X.1929, respectively, F. C. Drescher. — Protoneuridae.
- Now *Prodasineura delicatula* (Lieft.).
- demerarae** Selys (*Cyanogomphus*), 1894 (♂ incomplete). First described ♀ in good condition. Surinam, Zanderij, Troelinde Creek, 1.VIII.1959, J. Belle. See Belle, 1966b: 46—52 (♂ ♀), fig. 72—82, pl. 7 (sub *Ebegomphus*). — Gomphidae.

- Later, Belle (1970) placed *Ebegomphus* Needham in the synonymy of *Cyanogomphus* Selys, and *E. strumens* Needham, 1944, as a synonym of *C. demerarae* Selys.
- dentata** Geijskes (*Coryphaeschna*), 1943: 64—71, fig. 1 & 2 (larva). Holotype ♂. Surinam, Palumeu River near Indian village Julu, 3.I.1941, L. Schmidt. — Aeshnidae. Currently placed in *Triacanthbagyna* Selys.
- diadesma** Lieftinck (*Notoneura*), 1936a: 120—121, fig. 5, 7. Holotype ♂ (teneral). E. Sumba I. (Lesser Sunda Is.), Kananggar, 700 m, V.1925, K. W. Dammerman. — First described ♀. E. Sumba, Mau Marru, 500 m, 18—23.VII.1949 (Sumba Exped. 1949, NMB), see Lieftinck, 1953c: 152—154, fig. 7—9. Adults of both sexes from same locality also in ML. — Protoneuridae.
- dictatrix** Lieftinck (*Oreaeschna*), 1937a: 77—81, fig. 46—47. Holotype ♂ and first described ♀. N. New Guinea, Humboldt Bay area, southern slopes of Mt. Cycloop, 3700 ft., 2.IX.1933 (♂) and id., 1000 m, 2.IX.1935 (♀), W. Stüber. — Aeshnidae. Plate 5. Type-species of *Oreaeschna* Lieftinck (op. cit.).
- digitiferum** Lieftinck (*Papuagrion*), 1949a: 155—156, fig. 196—198, 202. Holotype ♂ and first described ♀. Central N. New Guinea, Sahuweri River basin, Sigi Camp, 1500 m, 20.II.1939 (♂) and Mist Camp, 1800 m, 9.I.1939 (♀), L. J. Toxopeus (3rd Archbold Exped.). — Coenagrionidae.
- dimidiata** Selys (*Dysphaea*), 1853 (♂). First described ♀ (semiad.), Sumatra, Central Sumatra, labelled "Silago tot 12/7 77", "Sumatra Exp.", and "Dysphaea dimidiata Sel. ♀", in H. Albarda's writing. See Albarda, 1881: 6, pl. 2 fig. 2. — Euphaeidae. Type-species of *Dysphaea* Selys (op. cit.).
- diminuta** Lieftinck (subsp. of *Huonia arborophila* Lieft.), 1963c: 778, fig. 38. Holotype ♂. Misima I. (St. Aignan, Louisiade Archip.), north slopes, Sisa, 350 m, 19.VII.1956, L. J. Brass (5th Archbold Exped.). — Libellulidae.
- dioxippe** Lieftinck (*Diplacina*), 1963c: 764—765, fig. 16—19. Lectotype ♂ and first described ♀. Central W. New Guinea, Central Range, Sterren Mts., Ok Temna, 1500 m, 19.V.1959 (Neth. New Guinea Exped.). — Libellulidae.
- dissoluta** Lieftinck (subsp. of *Agrionoptera longitudinalis* Selys), 1963c: 771—772. Holotype ♂ and first described ♀. New Ireland (Bismarck Archip.), Kandan, 25.XII.1959, W. W. Brandt. — Libellulidae.
- divaricatus** Lieftinck (*Burmagomphus*), 1964b: 16, 26—29, fig. 29—35. Holotype ♂ and first described ♀. Malay Peninsula, Kelantan, Ulu Kelantan, Sungai Nengiri, Fort Brooke, 700 m, 31.VII.1963, J. I. Furtado (♂) and Selangor, 11½ mi. Kuala Lumpur-Bentong Rd., Sungai Gombak, 16.III.1963, J. I. Furtado & M. A. Lieftinck (♀, reared from larva, emerged at Kuala Lumpur). — Gomphidae.
- dohrni** Krueger (*Idionyx*), 1899: 326—330. Lectotype ♂ (head gone) and first described ♀, [N.E.] Sumatra [Deli] Soekaranda Dohrn (print), *Idionyx dohrni* Krüger, L. Krüger, ♂ und ♀, determ. 1927 (written), ex Mus Stettin. — Corduliidae. Synonymous with *I. yolanda* Selys.
- dominula** Lieftinck (*Teinobasis*), 1937a: 46—47, fig. 32. Holotype ♂ and first described ♀. N. New Guinea, Upper course of Korimé River, Tarafia, ca. 600 m, 10.V.1935, W. Stüber. — Coenagrionidae.
- dorcadion** Lieftinck (*Drepanosticta*), 1949a: 59—61, fig. 32, 45—49, 52. Holotype ♂ and first described ♀. Central W. New Guinea, Sahuweri River valley, Rattan

- Camp*, 1150 m, 12.II.1939, L. J. Toxopeus (3rd Archbold Exped.). — Platystictidae.
dorsocyana Lieftinck (*Libellago*), 1937b: 56—57, fig. 1. Holotype ♂. S. Borneo, Sampit area, Kota Waringin River, Riamtiwata, XII.1935, J. J. Menden. — Chlorocyphidae.
- dorsosanguinea* Lieftinck (*Rhinocypha*), 1961a: 124—125. Holotype ♂. S. Philippine Is., Basilan I., Maloong, 25.IX.1935, K. Kuwasima. — Chlorocyphidae.
- dravida* Lieftinck (*Gynacantha*), 1960a: 252—253. Holotype ♂ and first described ♀. S.W. Peninsular India, Coorg, Hallery near Mercara, 4000 ft., 20.V.1922 (♂), and Coorg, Fraserpet, 2000 ft., 25.IX.1923, "brook emptying in Lotus-tank" (♀), F. C. Fraser, both misidentified by F. C. Fraser as *G. hyalina* Selys. — Aeshnidae.
- drescheri* Lieftinck (*Heliogomphus*), 1929b: 121—123, fig. 12—13. Holotype ♂ and first described ♀. Central Java, Banjumas, G. Slamet, Baturraden, 2500 ft., 27 and 28.VII.1928, respectively, F. C. Drescher. — Gomphidae. Plate 4.
- drusilla* Lieftinck (*Drepanosticta*), 1934d: 474—476, fig. 4—5. Holotype ♂ and first described ♀. W. Borneo, Singkawang-Bengkajang Rd., forest brook near Serukan, hill-country, 30.VIII.1932 (♂) and same district, Sungai Bagak (Mt. Raja complex), hill country, 7.IX.1932 (♀), L. Coomans de Ruiter. — Platystictidae.
- drymobia* Lieftinck (*Selysioneura*), 1959a: 284—286, fig. 3, 8, 15—16. Holotype ♂. Misima I. (St. Aignan I., Louisiade Archip.), Sisa, north slopes, 350 m, 22.VII.1956, L. J. Brass (5th Archbold Exped.). — Isostictidae. Plate 1.
- dupophila* Lieftinck (*Drepanosticta*), 1933a: 286—288, 296, fig. 2. Holotype ♂. W. Borneo, Singkawang, swampy forest near Pandjoa, 3.IV.1932, L. Coomans de Ruiter. — Platystictidae.
- eclecta* Lieftinck (*Palaiargia*), 1949a: 114, 127—131, fig. 149—152. Holotype ♂ and first described ♀. West Central New Guinea, Wissel Lakes group, Arabu Bivouac, 10 mi. N.E. of Lake Paniai, ca. 1800 m, 15.X.1939 (♂) and 23.X.1939 (♀), H. Boschma (Le Roux Exped.). — Coenagrionidae.
- efasciata* Lieftinck (subsp. of *Notoneura erythrura* Lieft.), 1949a: 73. Holotype ♂. Central N. New Guinea, Idenburg River valley, Bernhard Camp, 50 m, 23.VIII.1938, J. Olthof (3rd Archbold Exped.). — Protoneuridae.
- egregia* Lieftinck (*Notoneura*), 1937a: 24, fig. 17. Holotype ♂ and first described ♀. Boeroe (Buru I.), S. Moluccas, Bah'lalé, 600 m, 10.V.1921 (♂, abdomen missing) and 22.I.1922 (♀), L. J. Toxopeus. — Protoneuridae.
- Nom. nov. pro *Caconeura eburnea*: Ris, 1929: 144, fig. 3—4, ♂ ♀ Buru I., nec *C. eburnea* Foerster, ♂ ♀ Kei Is., a congeneric species.
- ekari* Lieftinck (*Papuagrion*), 1949a: 148—150, fig. 182—185, 191. Holotype ♂ and first described ♀. West Central New Guinea, Wissel Lakes group, Arabu Bivouac, 10 mi. N.E. of Lake Paniai, ca. 1800 m, 25.X.1939 (♂) and 15.X.1939 (♀), H. Boschma (Le Roux Exped.). — Coenagrionidae.
- elegans* Selys (*Aeschnosoma*), 1871 (♀). First described ♂. Surinam, Nassau Mts., bush creek 2 km from Marowijne River, 17.II.1949, D. C. Geijskes. See Geijskes, 1970: 19—22 (♂ ♀), fig. 7, 11, 14—16, 20—23, pl. 1b. — Corduliidae.
- elegans* Belle (*Aphylla*), 1970: 58—60, fig. 90—92. Holotype ♂. Venezuela, Apure, 2.II.1937. — Gomphidae.
- elegans* Lieftinck (*Leptogomphus*), 1948a: 254—258, fig. 12 & pl. 8. Holotype ♂ and first described ♀. E. China, Prov. Fu Kien, Kuatun, 2300 m, 7.VII. 1938 (♂) and 1.VII.1938 (♀), J. Klapperich. — Gomphidae.

- elliotti** Lieftinck (*Lokia*), 1969c: 15—16. Holotype ♂. Zambia, Upper Zambezi Region, North Mwinilunga, Ikelenge distr., Zambezi Rapids, 21.I.1965, E. C. G. Pinhey. — Libellulidae.
- emarginata** Lieftinck (*Teinobasis*), 1949b: 344—345, fig. 6. Holotype ♀. Solomon Is., Shortland I., Hisiai River, 22.X.1936, R. A. Lever. — Coenagrionidae.
- emphyla** Lieftinck (*Notoneura*), 1936a: 118—120, fig. 5—6. Holotype ♂ (teneral). Centr. Flores I. (Lesser Sunda Is.), Badjawa, 1200 m, XII.1931, Ed. Handschin. First described ♀ (and adult ♂). Flores I., Soa, 22—25.VII.1950, G. Kramer (Lieftinck, 1953c: 151—152). — Protoneuridae.
- enganoense** Lieftinck [subsp. of *Pseudagrion pilidorsum* (Brauer)], 1948b: 290—291, fig. 6. Lectotype ♂ and first described ♀. Engano I. (off S.W. Sumatra), Buahbuah, 30.V.1936 (♂) and Kiojoh, 13.VI.1936 (♀), J. K. de Jong et al. — Coenagrionidae.
- ensifera** Lieftinck (*Argiocnemis*), 1932b: 588, 589—591, fig. 64. Lectotype ♂ and first described ♀. N. New Guinea, Humboldt Bay area, Hollandia, 27.VIII—4.IX. 1930, W. Stüber. — Coenagrionidae.
- eos** Lieftinck (*Palaiargia*), 1938: 95—96, fig. 31—32. Holotype ♂. N.W. New Guinea, Berau Peninsula (Vogelkop), Vengatap near Aja Maru, 500 m, XII.1937, J. M. van Ravenswaay Claasen. — Coenagrionidae.
- ephippiata** Lieftinck (*Drepanosticta*), 1937b: 72—74, fig. 9. Lectotype ♂. N. Celebes, Tondano near Manado, IV.1935, C. van Braekel, acq. 11.VI.1935. — Platystictidae.
- erato** Lieftinck (*Macromia*), 1950b: 673—676, 689, 693—699, fig. 4, 5, 14, 15, 23, 31, 38, 45—47. Holotype ♂. W. Java, Bogor (Buitenzorg, olim), 250 m, Botanic Garden, 17.II.1945, native collector. First described ♀. W. Java, Djasinga, Tjibarang-bang River, 150 m, 4.XII.1938, M. A. Lieftinck. — Corduliidae.
- ericae** Belle (*Ischnogomphus*), 1966b: 39—44, fig. 61—67 & 68—71 (larva, supposition), pl. VIa-b. Holotype ♂ and first described ♀. Surinam, Upper Para River, 8.IX.1962 (♂) and 10.VIII.1960 (♀), J. Belle. — Gomphidae.
- ericetorum** Lieftinck (*Hemicordulia*), 1942: 556—558, pl. 36 fig. 112—113, pl. 37 fig. 118—119. Holotype ♂ and first described ♀. Central N. New Guinea, Baliem River valley, nr. Baliem Camp, 1650 m, 14.XII.1938, L. J. Toxopeus (3rd Archbold Exped.). — Corduliidae.
- erigone** Lieftinck (*Diplacina*), 1953d: 157, 177—179, fig. 3—4. Holotype ♂ and first described ♀. Misool I. (off W. New Guinea), Fakal, ca. 150 m, 4.X.1948, M. A. Lieftinck. — Libellulidae.
- erminea** Lieftinck (*Amphicnemis*), 1953e: 247—251, fig. 6c-e. Holotype ♂ and first described ♀. S.E. Borneo, Kandangan distr., Ampah, 0—20 m, IV—V. 1948, Liem Swie Liong. — Coenagrionidae.
- errans** Lieftinck (subsp. of *Zygonyx iris* Selys), 1953e: 266—268. Holotype ♂ and first described ♀. W. Borneo, Singkawang, Mt. Poteng, 400 m, X.1932, L. Coomans de Ruiter. — Libellulidae.
- erratica** Lieftinck (*Macromidia*), 1948: 274—278, fig. 18—19. Holotype ♂ and first described ♀. S. Sumatra, Lampong distr., Giesting near Talangpadang, Wai Tebu, ca. 500 m, 19—31.III.1940, M. A. Lieftinck. — Corduliidae.

Now classified as a subspecies of *M. genialis* Laidlaw (see Lieftinck, 1971b: 20—21).

erythromma Lieftinck (*Elatoneura*), 1953f: 383—385, fig. 1a-e. Holotype ♂ and first described ♀. S. Borneo, Sampit distr., 0—50 m, near Sampit, about 50 km inland, 21.VII.1953, M. A. Lieftinck, with collector's note: "Very dull, except brilliant cherry-red eyes". — Protoneuridae.

erythro stigma Lieftinck (*Paramecocnemis*), 1932b: 504—508, fig. 9—13. Lectotype ♂ and allotype ♀ (in cop.). N. New Guinea, Humboldt Bay area, Hollandia, ca. 300 m, IV—VI.1931, W. Stüber. — Platycnemididae.

Type-species of *Paramecocnemis* Lieft. (op. cit.).

erythrura Lieftinck (*Notoneura*), 1932b: 522, 525, 530—532, fig. 24—26. Lectotype ♂ and allotype ♀ (in cop.). N. New Guinea, Humboldt Bay area, Hollandia, I—II.1931, W. Stüber. — Protoneuridae.

Now *N. erythrura erythrura* Lieft.

esuriens Lieftinck (*Argiolestes*), 1956b: 71, 93—94, fig. 28—29. Holotype ♂. Papua, Maneau Range, N. slopes of Mt. Dayman, 1550 m, 6.VII.1953, G. M. Tate (4th Archbold Exped.). — Megapodagrionidae.

eucera Lieftinck (*Drepanosticta*), 1949a: 56—57, fig. 30, 41—44, 50. Holotype ♂ and first described ♀. Central W. New Guinea, Idenburg River basin, above Bernhard Camp, 700 m, 27—29.III.1939, L. J. Toxopeus (3rd Archbold Exped.). — Platystictidae.

euglena Lieftinck (*Teinobasis*), 1934a: 8—11, fig. 3. Holotype ♂ and first described ♀. Mid Java, South Banjumas, Djeruklegi, 7.II.1931, F. C. Drescher. — Coenagrionidae.

excelsa Lieftinck [subsp. of *Neurothemis intermedia* (Ramb.)], 1934c: 269—270. Holotype ♂. East [rect. Central N.] Java, Rembang, Kedangan, 40 m, 2.XII.1937, F. Th. Verbeek. — First described ♀. Java, Kangean I. (Java Sea) and Sumba; not specified (see Lieftinck, 1953c: 213—214). — Libellulidae.

exoleta Lieftinck (*Drepanosticta*), 1932b: 515, 517—519, fig. 19. Lectotype ♂ and first described ♀. N. New Guinea, Humboldt Bay area, Hollandia, IV—VI.1931, W. Stüber. — Platystictidae.

exul Selys (*Alloneura*), 1878 (♂). First described ♀. Halmahera I. (N. Moluccas), labelled "Bernstein, Noord Halmahera" (print), and old drawer-label "exul Hagen" in H. A. Hagen's writing. Collected in the years 1861 or 1862. See Lieftinck, 1938: 89—90. — Protoneuridae.

Currently placed as *Notoneura exul* (Selys).

falcatum Lieftinck (*Mortonagrion*), 1934a: 12—15, fig. 5. Lectotype ♂ and first described ♀. Karimon Djawa Is. (Java Sea), P. Karimondjawa, mangrove-swamps near debouchment of small brook Todjero, 28.XI.1930, M. A. Lieftinck. — Coenagrionidae.

farinicolle Lieftinck (*Pseudagrion*), 1932b: 568, 572—573, fig. 56. Lectotype ♂ and allotype ♀ (in cop.). N. New Guinea, Humboldt Bay area, Hollandia, XI—XII. 1930, W. Stüber. — Coenagrionidae.

fasciculare Lieftinck (*Aciagrion*), 1934a: 15—17, fig. 6—7. Holotype ♂. W. Java, South Preanger, Djampang, ca. 800 m, near Sukanegara, 24.XII.1931, M. A. Lieftinck. — Coenagrionidae.

fenella Campion (*Synthemis*), 1921 (♂). First described ♀. New Caledonia, Forêt de

- Thi*, 100—300 m, 28—29.III.1961, J. Sedlacek. See Lieftinck (1971b: 53—54, fig. 37—38). — Corduliidae.
- ferentina* Lieftinck (*Huonia*), 1953d: 189, 205—207, fig. 17—18. Holotype ♂. Halmahera I. (N. Moluccas), Mt. Sembilan, 600 m, 14.X.1951, Sundanese collector.
- † — Libellulidae.
- feronia* Lieftinck (*Protosticta*), 1933a: 281—285, fig. 1. Holotype ♂ and allotype ♀ (in cop.). W. Borneo, Singkawang, G. Poteng, 325 m, forest brook, 1.XI.1932, L. Coomans de Ruiter. — Platystictidae.
- feronia* Lieftinck (*Synthemis*), 1938: 122—124, fig. 51. Holotype ♂ and first described ♀. N. New Guinea, Bewani Hills, upper course of Tami River, 300—500 m, Josko, 22—30.XI.1936, W. Stüber. — Corduliidae.
- feuerborni* Schmidt (*Aciagrion*), 1934: 344—346, fig. 43—46. Lectotype ♂ and first described ♀. N.E. Central Sumatra, Lake Toba area, Huta Gindjang, 3.IV.1929 (Deutsch. limnol. Sunda-Exped. 1928—29). Selected by E. Schmidt and presented to author in 1935. — Coenagrionidae.
- filicornis* Lieftinck (*Torrenticnemis*), 1949a: 104—107, fig. 101, 113, 129—130, 137—138. Holotype ♂ and allotype ♀ (in cop.). Central W. New Guinea, Sahuwari River basin, Sigi Camp, 1500 m, 15.II.1939, L. J. Toxopeus (3rd Archbold Exped.). — Platycnemididae.
- Type-species of *Torrenticnemis* Lieft. (op. cit.).
- filostyla* Martin (*Heliaeschna*), 1907b: 221—222. Holotype ♂ (slightly immature, head missing). Rosenberg, Celebes (printed), and "*Heliaeschna filostyla* Martin ♀ /Type au Musée de Leyden", in R. Martin's handwriting. First described ♀ (immature). Same locality label with additional Panybie (written), and *Heliaeschna filostyla* ♀ Type, in R. Martin's writing. — Aeshnidae.
- (See also Martin, 1909b: 165—167, fig. 167—168, incl. *H. gladiostyla* Martin, ♂ Celebes. — Syn. nov.).
- fissicollis* Lieftinck (*Stenosticta*), 1932b: 551—557, fig. 48—51. Lectotype ♂ and allotype ♀ (in cop.). N. New Guinea, Humboldt Bay area, Hollandia, Pim River, ca. 200 m, III.1931, W. Stüber. — Isostictidae.
- Type-species of *Stenosticta* Lieftinck, nom. praeocc. (op. cit.).
- Now *Tanymecosticta fissicollis* (Lieft.).
- fissidens* Lieftinck (*Idiocnemis*), 1958: 260—261, 281, fig. 1—5. Holotype ♂ and first described ♀. Waigeu I., off N.W. New Guinea, labelled "*Waigeoe* [H. A.] Bernstein". — Platycnemididae.
- flammula* Lieftinck (*Prodasineura*), 1948a: 227—231, fig. 1, 3. Holotype ♂. E. Borneo, Kutai, Batau Besi, near Sangkulirang, VI.1937, M. E. Walsh. — Protoneturidae.
- flammula* Lieftinck (subsp. of *Palaiargia ceyx* Lieft.), 1949a: 115, 125—126, fig. 136. Holotype ♂ and first described ♀. Central N. New Guinea, Sahuwari River valley, Sigi Camp, 1500 m, 17.II.1939 (♂) and 20.II.1939 (♀), L. J. Toxopeus (3rd Archbold Exped.). — Coenagrionidae.
- flavipedum* Lieftinck (*Papuagrion*), 1949a: 156—157, fig. 186—187. Lectotype ♂. W. New Guinea, Onin Peninsula, Fak Fak, sea-level, VII.1939, R. G. Wind. — Coenagrionidae.
- floresianus* Lieftinck (*Lestes*, sg. *Indolestes*), 1960c: 141—143, pl. 2 fig. 1, fig.

- 16, 17. Holotype ♂. Flores I. (Lesser Sunda Is.), Rana Mese, W. Flores, 1200 m, 5.IV.1958, A. M. R. Wegner. — Lestidae.
- fluviatilis** Lieftinck (*Chalybeothemis*), 1933b: 132—137, pl. 13 fig. 1, pl. 14 fig. 2, pl. 15 fig. 3. Lectotype ♂ and first described ♀. W. Borneo, Pontianak, Peniti River, 24.II.1931, L. Coomans de Ruiter. — Libellulidae.
- Type-species of *Chalybeothemis* Lieftinck (op. cit.).
- foliacea** Lieftinck (*Oligoaeschna*), 1968a: 149, 153, 169—171, fig. 4, 6, 7. Holotype ♂ and first described ♀. W. Borneo, Singkawang area, Mt. Poteng, 400 m, 15.IV.1934 (♂) and Patengahan-Bakuan road, 20.VII.1931 (♀), L. Coomans de Ruiter. — Aeshnidae.
- foliosa** Navás (*Platycnemis*), 1932: 9—10, fig. 21a-c. Holotype ♂. E. China, Shanghai: Zô-sè (China) 13.V.30, and *Platycnemis foliosa* ♂ Nav., P. Navás S. J. det., both labels in L. Navás' writing; with pink label Typus (id.). Ex coll. L. Navás, pres. 1934. — Platycnemididae.
- fonticola** Lieftinck (*Notoneura*), 1932b: 524, 528, 533—535, fig. 29—31. Lectotype ♂ and allotype ♀ (in cop.). N. New Guinea, Humboldt Bay area, Hollandia, III.1931, W. Stüber. — Protoneuridae.
- fontinalis** Lieftinck (*Argiolestes*), 1956b: 69, 84—85, fig. 11, 16; 109—110, fig. 49—52. Holotype ♂ and first described ♀. W. New Guinea, Berau Peninsula (Vogelkop), Beraur River area, Klamono oilfields (50 km from westcoast inland), 50 m, 20—24.VIII.1948, M. A. Lieftinck. — Megapodagrionidae.
- forficulatum** Lieftinck (*Mortonagrion*), 1953f: 392—395, fig. 3, 3a. Holotype ♂ and first described ♀. S. Borneo, Sampit distr., 50—100 m, Pemantan, 150 km inland, 27.VII.1953, M. A. Lieftinck. — Coenagrionidae.
- fraterculum** Lieftinck (*Papuagrion*), 1937a: 26, 41—43, fig. 29—30. Lectotype ♂ and allotype ♀ (in cop.). N. New Guinea, southern slope of Mt. Cycloop, 1000 m, 18—23.IX.1935, W. Stüber. — Coenagrionidae.
- fraterna** Albarda (*Trithemis*), 1881: 4. Holotype ♂. Central Sumatra, Sungei Abu, labelled "v[an] Soeng[ei] aboe n[aar] Moea[ra] Lab[oe] 3—10.10.1877", Sumatra Exp., "Trithemis fraterna Albarda ♂", in H. Albarda's writing, coll. Albarda acq. 1892 (print). With Ris's identification label: *Trithemis aurora* Bm., det. Dr. F. Ris. — Libellulidae.
- Currently placed as a synonym of *T. aurora* (Burm.), see Ris (1912b: 778), who considers it an individual variation. It is, however, possibly a distinct subspecies, or even a good species.
- Preoccupied by *T. fraterna* (Hagen, 1873) Kirby, 1890, a synonym of *Erythrodiplax c. connata* (Burm.); and, if Albarda's insect proves to be distinct taxonomically, it would require a new name.
- frubstorferi** Krueger (*Alloneura*), 1898 (♂). First described ♀. Central Java, Banjumas, Mt. Slamet, Baturraden, 760 m, 16.IV.1928, F. C. Drescher. See Lieftinck, 1930b: 147—151, fig. 13—16. — Protoneuridae.
- Currently known as *Notoneura insignis* (Selys).
- fulgens** Ris (*Diplacina*), 1898: 323—324 (incomplete ♂ and ♀ New Britain). First described complete ♂. New Britain (Bismarck Arch.), Vanubakan, near Kerawa, 11—20.XI.1959, J. L. Gressitt. See Lieftinck, 1963c: 768—769, fig. 24—27. — Libellulidae.
- Holotype ♂ (incomplete), New Britain (MNB).

fulgens Lieftinck (*Teinobasis*), 1949a: 172—174, fig. 220—221. Holotype ♂. S.W. New Guinea, Sungei Arja near Umar, W. of Uta (southcoast), 26.VI.1941, E. Lundqvist (Negumy Exped.). — Coenagrionidae.

fulvia Fraser (*Gynacantha*), 1926: 477—478. Holotype ♀. S. New Guinea, Frederik Hendrik Eiland [Marind Anim, south of Digul River debouchment], III.1910, coll. unknown. — Aeshnidae.

Syn. of *Gynacantha kirbyi* Krueger. — Syn. nov.

funereum Lieftinck (*Thaumatagrion*), 1932b: 508—514, fig. 14—17. Lectotype ♂ and first described ♀. N. New Guinea, Humboldt Bay area, Pim River, 200 m, III. 1931, W. Stüber. — Platyznemididae.

Type-species of *Thaumatagrion* Lieftinck (op. cit.).

furcifer Lieftinck (*Podolestes*), 1950c: 40, 44—47, fig. 3—4. Holotype ♂. S. Borneo, Sampit, 0—50 m, II.1950, W. Buyn. — Megapodagrionidae.

gazella Lieftinck (*Drepanosticta*), 1929b: 110—112, 115, fig. 1—3. Holotype ♂ and first described ♀. Central Java, Banjumas, Mt. Slamet, Baturraden, 2500 ft., 13.VI. 1928 (♂) and 9.VI.1928 (♀), F. C. Drescher. — Platystictidae.

geijskesi Needham (*Progomphus*), 1944 (♀). First described ♂. Surinam, Suriname River, Arosobanja Falls, 27.V.1959, J. Belle. See Belle, 1966a: 7—11, fig. 13—20, pl. 2. — Gomphidae.

geijskesi Belle (*Rhodopygia*), 1964b: 48—54, fig. 22—25. Holotype ♂ and first described ♀. Surinam, Republiek, 26.XII.1961 (♂) and Zanderij (Bos Bivak), 1.XII.1962 (♀), J. Belle. — Libellulidae.

geminata Fraser [subsp. of *Caconeura salomonis* (Selys)], 1926: 492—493. Lectotype ♂ and first described ♀. Kei Is., Groot Kei, Gg. Daab, no. 149, 1922 (♂) and Elat, no. 156 (♀), H. C. Siebers. — Protonneuridae.

Syn. of *Notoneura eburnea* (Foerster), see Lieftinck, 1937a: 22—23, fig. 15—16 (♂ ♀ types of *Caconeura salomonis geminata* Fraser).

Currently placed in *Notoneura* Tillyard.

geometricus Selys (*Onychogomphus*), 1854: 31. Holotype ♀. Java, labelled "Java K[uhl] & v. H[asselt]" (white disk), with identification label of M.A.L. and "holotype" (see also Lieftinck, 1929b: 131—133). — Gomphidae.

First described ♂ from Java, by de Selys & Hagen (1858: 280—282, 20—22 sep., pl. 1 fig. 1) (IRSN).

glochidion Lieftinck (*Bironides*), 1963c: 759—761, fig. 8—11. Holotype ♂ and first described ♀. Papua, Central Province, 75 km W. of Pt. Moresby, Doa Estate, 13.X.1962 (♂) and 19.IX.1962 (♀), R. Straatman. — Libellulidae.

gloriosa Lieftinck (*Archboldargia*), 1949a: 145—146, fig. 144—144a, 147, 162. Holotype ♂ (immature). Central N. New Guinea, Sahuweri River valley, Top Camp, 2100 m, 29.I.1939, L. J. Toxopeus. — Coenagrionidae.

gomphoides Lieftinck (*Microtrigonia*), 1933d: 36—39, fig. 23—25. Lectotype ♂ and first described ♀. N. New Guinea, Humboldt Bay area, foot of Cycloop Mts., 400 m, IV—VI.1931, W. Stüber. — Libellulidae. Plate 6.

goniocercus Lieftinck (*Lestes*, sg. *Indolestes*), 1960c: 154—155, 159, fig. 24. Holotype ♂. W. New Guinea, western extremity, Malano, 15 km S.E. of Sorong, 2.IX. 1948, M. A. Lieftinck. — Lestidae.

gracilenta Lieftinck (*Synthemis*), 1935c: 285, 290—293, fig. 45. Lectotype ♂ and

first described ♀. N. New Guinea, Humboldt Bay area, Cycloop Mts., 1000 m, 13.IX.1932 (♂) and 9.IX.1932, W. Stüber. — Corduliidae.

gracilis Albarda *in* Selys (**Libellula**), 1887: 15—16. Lectotype ♂ and first described ♀. Iran, both labelled “N. Perzië, Sibakuh” and on the reverse side, “Libella gracilis Albarda”, in H. Albarda’s writing, Coll. Albarda acq. 1892 (print). Both with Ris’s identification label *Orthetrum ransonnetii* Br., det. Dr. F. Ris. — Libellulidae.

Syn. of *Orthetrum ransonnetii* (Brauer).

gracillima Fraser (**Teinobasis**), 1926: 494, fig. 7. Holotype ♂. A papered specimen, marked “T(9)” on the envelope and described as from “Java” (err. pro Celebes!). — Coenagrionidae.

Erroneously considered synonymous with *T. superba* (Selys) by Lieftinck, 1935c: 254. Bona species.

guyanensis Belle (**Progomphus**), 1966a: 20—24, fig. 33—43, 45, pl. 3. Holotype ♂ and first described ♀. Surinam, Upper Coropina River (Dauwdropkamp), 26.XII.1959 (♂), and Upper Para River, 30.IV.1963 (♀), J. Belle. — Gomphidae.

haematosoma Lieftinck (**Prodasineura**), 1937b: 84—86, fig. 16. Holotype ♂ and first described ♀. W. Borneo, Singkawang, forest brook near Bengkajang, 15.VI (♂) and 13.X.1933 (♀), L. Coomans de Ruiter. — Protoneuridae.

halcyon Lieftinck (**Palaiargia**), 1938: 97—99, fig. 33. Lectotype ♂ and first described ♀. N. New Guinea, southern Bewani Hills, upper course of Tami River, 5 days’ journey S.E. of Hollandia, 250 m, Fumb (Keerom?) River, 25—27.IV.1937, W. Stüber. — Coenagrionidae.

hamifera Lieftinck (**Macromia**), 1955c: 253—256, fig. 1—4. Holotype ♂. E. China, Prov. Fu Kien, Kuatun, Chung-an Hsien, 2300 m, 22—25.VIII.1943, T. C. Maa. — Corduliidae.

harrissoni Lieftinck (**Podolestes**), 1953e: 233—236, fig. 1—2. Holotype ♂ and first described ♀. N.W. Borneo, Sarawak, Kuching, Matang Road, 3rd mile, 22.IX.1950, M. A. Lieftinck. — Megapodagrionidae.

helvola Lieftinck (**Teinobasis**), 1930b: 155—157, fig. 21. Holotype ♂ and allotype ♀ (in cop.), S. Celebes, Maros, VI.1929, G. Overdijkink. — Coenagrionidae.

hermione Lieftinck (**Macromia**), 1952a: 442, 454—456, 461, 467—468, fig. 4, 9, 18, 22. Lectotype ♂ and first described ♀. Misool I., off W. New Guinea, surroundings of Fakal, ca. 50 m, 18.X.1948 (♂) and 23.IX.1948 (♀), M. A. Lieftinck. — Corduliidae.

heterostylus Lieftinck (**Platylestes**), 1932c: 248—251, fig. 1—2. Holotype ♂. S.W. Java, res. Banjumas, Djeruklegi, 28.I.1931, “Head and eyes dark brown. Thorax grass-green with black spots. Abdomen grass-green with black rings at articulations. Appendages white” (living colours, F. C. Drescher leg.). — Lestidae.

First described ♀ from Malaya and Sunda Islands (Lieftinck, 1960c: 135—136, fig.).

Now *Lestes* (*Platylestes*) *heterostylus* Lieft.

hilbrandi Lieftinck (**Hemicordulia**), 1942: 548—549, pl. 35 fig. 110—111. Holotype ♂. West Central New Guinea, Wissel Lakes group, Lake Paniai, 1742 m, 4.IX.1939, H. Boschma (Le Roux Exped.). — Corduliidae.

hippolyte Lieftinck (**Diplacina**), 1933d: 44, 57—58, fig. 31, 33. Lectotype ♂ and first described ♀. N. New Guinea, Humboldt Bay area, Cycloop Mts., 1000 m, 13.IX.1932, W. Stüber. — Libellulidae.

hoogerwerfi Lieftinck (*Ceriagrion*), 1940b: 360—361, fig. 14. Holotype ♂. N. Sumatra, Atjeh, Meluwak, Laut Tiga Sagi (mountain lake), ca. 1500 m, 24.IV.1937, A. Hoogerwerf. — First described ♀. S.W. Sumatra, Benkulen, Mt. Dempo, Tebat Kerindjing-ketjil, 1100 m, X.1941, W. C. Verboom. (See Asahina, 1967: 271—272, 322, fig. 46—52).

Now classified as a subspecies of *C. bellona* Laidlaw.

humeralis Lieftinck (subsp. of *Teinobasis serena* Lieft.), 1949a: 168—169, fig. 172, 217. Lectotype ♂ and first described ♀ (dark colour-phase). N. New Guinea, Humboldt Bay area, upper reaches of Bewani River system, Keerom River distr., Tompar, 25.VI.1939, W. Stüber. — Coenagrionidae.

humphriesi Lieftinck (*Lestes*), 1952b: 126—128, fig. 1—2. Holotype ♂ and first described ♀. S. Australia, Murray River near Renmark, 13.IX.1949, L. Humphries. — Lestidae.

Synonymous with *Lestes (Austrolestes) aridus* Tillyard, see Fraser, 1960: 24.

huonensis Lieftinck (*Idiocnemis*), 1958: 267—270, 284, fig. 27—31. Holotype ♂ and first described ♀. N.E. New Guinea, Huon Gulf, labelled "Sattelberg (Gegagalu), Sommer 1900, Carl Wahnes" (F. Förster's writing), identified by F. Förster with "I. inornata Selys Subrasse huonensis Foerster, Type" [nom. nud.], nos. 2253 and 2254, respectively, ex UMMZ. — Platycnemididae.

hurleyi Tillyard (*Rhyothemis*), 1926 (♂). First described ♀. N. New Guinea, Humboldt Bay area, Hollandia and env., 1931—1937, various locs., no dates selected, W. Stüber. See Lieftinck, 1942: 502—504, pl. 30 fig. 62—65. — Libellulidae.

The above females included the "allotype", which should be, however, assigned to a different (undescribed) subspecies; only the males reported from S. New Guinea (Digul River basin) are nominotypical *hurleyi*.

hyalinus Selys (*Chlorogomphus*), 1869b: 202 (39 sep.). Nom. nov. pro *C. magnificus* Selys ♂. Holotype ♂. Muller Java (print). — Cordulegasteridae.

The specimen is in a very dilapidated state, lacking its head, most of the thoracic segments and terminalia of abdomen. It was photographed in that condition by the late R. van Eecke at Leiden, who sent a copy to F. C. Fraser for publication of a wing-photograph reproduced in his revision (1929: 144, fig. 25A).

Conspecific with *C. magnificus* Selys, of which it is the ♂.

hylophila Lieftinck (*Huonia*), 1942: 489, 492, pl. 26 fig. 36—37. Holotype ♂. Central N. New Guinea, Sahuweri River basin, Araucaria Camp, 800 m, 28.III.1939, L. J. Toxopeus. — Libellulidae.

First described ♀ (incomplete). W. New Guinea, Vogelkop, Taminabuan (S.W.-coast), 16.III.1949, Sten Bergman.

ianthinipennis Lieftinck (*Neurobasis*), 1949a: 17—18, 22—23, fig. 6. Holotype ♂ and first described ♀. N. New Guinea, Humboldt Bay area, southern slopes of Cycloop Mts., 900 m, 26.VI.1938, J. Olthof. — Calopterygidae.

inaequale Lieftinck (*Ceriagrion*), 1932b: 592—594, fig. 65. Lectotype ♂ and allotype ♀ (in cop.). N. New Guinea, Humboldt Bay area, Hollandia, 27.VIII—4.IX. 1930, W. Stüber. — Coenagrionidae.

See Asahina (1967: 289—291, fig. 116—122).

incisura Lieftinck (*Archibasis*), 1949a: 185, 186, 188, fig. 229, 233. Holotype ♂ and first described ♀. W. Borneo, Singkawang, forest-marsh near Bakuan, 19.VII.

1932 (♂) and Sungei Bagak, 29.XII.1932 (♀), L. Coomans de Ruiter. — Coenagrionidae.

indicus Lieftinck (*Anax*), 1942: 589—591. Lectotype ♂. Peninsular India, Coorg, Hallery near Mercara, 15.V.1923, F. C. Fraser leg. & don., misidentified as *A. guttatus* Burm. — Aeshnidae.

First recognized as a distinct species upon a ♂ illustrated by Laidlaw (1921: 83—84, fig. 2, ♂ abdomen, sub *A. guttatus* Burm., Series A), from Barkuda I., 1479/H2 (N.E. Peninsular India, Orissa, Chilka Lake, N. Annandale leg.), ex Indian Mus., and probably no more in existence. See also the correspondence between the late J. Cowley and the author, in Lieftinck, 1955e: 84—86.

infans Lieftinck (subsp. of *Nannophlebia imitans* Ris), 1963c: 757—758. Holotype ♂. New Ireland (Bismarck Archip.), Kandan, 22.XII.1959, W. W. Brandt. — Libellulidae.

infracavum Schmidt (*Pseudagrion*), 1934: 349—350, fig. 49 (♂ E. Java). Lectotype ♂. E. Java, Ranu (Lake) Lamongan near Klakah, S.S. Hotel, X—XI.1928 (Deutsch. limnol. Sunda-Expedition 1928—29). Selected by E. Schmidt and in 1935 presented to the author. — Coenagrionidae.

Syn. of *P. nigrofasciatum* Lieftinck, 1934 (see Lieftinck, 1936a: 124, footnote).

inornata Selys (*Idiocnemis*), 1878b (♂). First described ♀ (in cop.). W. New Guinea, Vogelkop (western extremity), env. of Sorong, ca. 50 m, forest stream, 24.X.1948, M. A. Lieftinck. See Lieftinck, 1958: 264—266, fig. 10. — Platycnemididae.

inscriptus Hagen in Selys (*Onychogomphus?*), 1878a: 422—423. Holotype ♀. "Java K[uhl] & v. H[asselt]" (white disk), over drawer-label "Inscriptus Hagen/Java". See Lieftinck, 1929b: 130—131, fig. 22. — Gomphidae. Plate 4.

Currently known as *Burmagomphus inscriptus* (Hag. & de Selys) (= *B. jacobsoni* Ris, 1912, ♂ holotype in SMF, ♂ syntype in ML).

insulare Lieftinck (*Papuaagrion*), 1949a: 160, fig. 204—205. Holotype ♀. Schouten Is. (off N.W. New Guinea), Biak I., Bosnik, 15.VI.1938, L. J. Toxopeus. — Coenagrionidae.

interposita Lieftinck (*Phasmoticta*), 1951b: 17—24, fig. 8—10. Holotype ♂ (immature; wings and penile organ detached and papered separately). N. Australia, N. Queensland, Redlynch, 5.XI.1938, R. G. Wind. — Isostictidae.

Type-species of *Phasmoticta* Lieftinck (op. cit.).

A recent comparison (by J. A. L. Watson and the writer) of this individual with authentic specimens of *Oristicta filicicola* Tillyard, 1913 (terr. typ. Cooktown, N.Q.), a monotypic and inadequately described and figured zygopteron, reveals that these insects are probably conspecific, in which case *P. interposita* falls as a synonym of Tillyard's species (J. A. L. Watson, unpublished).

interrogata Selys (*Agrioptera*), 1878b (♀). First described ♂. Biak I. (Schouten Is., off N.W. New Guinea), Bosnik, 16.VI.1939, L. J. Toxopeus. See Lieftinck, 1942: 463, pl. 24 fig. 15. — Libellulidae.

Now *Nesoxenia mysis interrogata* (Selys).

inversa Lieftinck (*Drepanosticta*), 1949a: 55—56, fig. 29, 58—59. Holotype ♂. W. New Guinea, Berau peninsula (Vogelkop), Manokwari, 15.VI.1938, L. J. Toxopeus. — Platystictidae.

io Fraser (*Rhinocypha*), 1926: 485—486. Holotype ♂. "Sumatra" [err. pro Java!], without further particulars. — Chlorocyphidae.

Syn. of *R. heterostigma* Ramb., see Lieftinck, 1954: 11, footnote.

irene Lieftinck (*Notoneura*), 1949a: 64—67, fig. 62—66, 87—88. Holotype ♂ and first described ♀. Central N. New Guinea, Sahuweri River valley, Araucaria Camp, 700—800 m, 17 and 31.III.1939, respectively, L. J. Toxopeus & J. Olthof (3rd Archbold Exped.). — Protoneuridae.

irene Lieftinck (subsp. of *Rhythemis princeps* Kirby), 1942: 515—516, pl. 31 fig. 70—73, pl. 33 fig. 88—89. Lectotype ♂ and first described ♀. N. New Guinea, Humboldt Bay area, Hollandia, VII.1930, W. Stüber. — Libellulidae.

irina Lieftinck (*Macromia*), 1950b: 714—716. Holotype ♂. S. Celebes, foot of Mt. Lompobatang, Borong Rapoa, 800 m, VIII.1949, A. Diakonoff. — Corduliidae.

irregularis Brauer (*Tetrathemis*), 1868 (♀). First described ♂. Basilan I. (S. Philippine Is.), Maloong, 15.XI.1932, K. Kuwasima. See Lieftinck, 1942: 448—450, pl. 23 fig. 5 and 9. — Libellulidae.

Now *T. i. irregularis* Brauer.

ismene Lieftinck (*Diplacina*), 1933d: 44, 55—57, fig. 31—32. Lectotype ♂ and first described ♀. N. New Guinea, Humboldt Bay area, Hollandia, IV—VI.1931, W. Stüber. — Libellulidae.

isoetes Lieftinck (*Ischnura*), 1949a: 225—229, fig. 277—278, 281—284. Lectotype ♂ and first described ♀. Central W. New Guinea, Snow Mountain (Nassau) Range, Lake Habbema, 3250 m, 13.VIII. 1938, L. J. Toxopeus (3rd Archbold Exped.). — Coenagrionidae.

[**japonicus** Selys (*Sieboldius*), 1854: 83. Types ♂ and ♀, given as from "Japon. (Musée de Leyde)"; ♂ destroyed. — Gomphidae.

This species is a resident of Malaya, Sumatra and Borneo. The type ♂ was erroneously recorded from Japan, the description being based on a specimen labelled "Muller Borneo". This was examined by me in 1929, but has since been destroyed. An old ♀ (still extant) and labelled "Burger Japan" is possibly the specimen first described by de Selys as *japonicus* and may be conspecific with *S. albardae* Selys (1886), described from "Pékin".]

In the Brussels Museum (IRSN) are three males of later date, labelled "Lansbg. [= van Lansberge] Borneo" and "Bukau, N. Borneo".

javana Lieftinck [subsp. of *Copera vittata* (Selys)], 1940c: 292, 298—303, fig. 1^c, 2—4, pl. 10 fig. 23—25, pl. 11 fig. 3, pl. 12 fig. 3—4, pl. 13 fig. 4, pl. 14 fig. 4. Holotype ♂ and first described ♀. S.W. Java, southcoast, Ujung Genteng, 26—29.III.1937, M. A. Lieftinck. — Platycnemididae.

javica Fraser (*Gynacantha*), 1926: 479—480. Holotype ♀. W. Java, Buitenzorg [Bogor], 22.III.1920, coll. unknown, with Fraser's identification and "Type" written on envelope. — Aeshnidae.

Syn. of *Gynacantha basiguttata* Selys, see Lieftinck, 1930b: 165.

jejuna Lieftinck (*Tanymecosticta*), 1959a: 295—299, fig. 34—37. Holotype ♂ and first described ♀. W. New Guinea, western extremity, Sorong, ca. 40 m, 29.VIII. 1948, forest brook on hill slope, M. A. Lieftinck. — Isostictidae.

jubilaris Lieftinck (*Acrogomphus*), 1964a: 97—102, fig. 13—16. Holotype ♂. N.W. Borneo, Sarawak, Tabang, 7.IX.1958, M.B. 30 L, ex BISH. First described ♀. E. Borneo, Kutai, Samarinda distr., ca. 100 km upstream, Tabang River, kali Bengen, ca. 100 m, 1.XI.1956, A. M. R. Wegner. — Gomphidae.

jucunda Lieftinck (*Macromia*), 1955c: 270—274, fig. 25—26. Holotype ♂. W.

Java, Bogor (Buitenzorg), 250 m, Botanic Garden, 2.II.1954, M. A. Lieftinck. — Corduliidae.

jucundus Lieftinck (*Rhipidolestes*), 1948e: 9—12, fig. 6. Holotype ♂ and first described ♀. E. China, prov. Fu Kien, Kuatun, 2300 m, 2.VI.1938 (♂) and 7.VI.1938 (♀), J. Klapperich. — Megapodagrionidae.

juliana Lieftinck [subsp. of *Rhyothemis regia* (Brauer)], 1942: 517, pl. 31 fig. 74—77, pl. 33 fig. 86—87. Holotype ♂. N. New Guinea, Humboldt Bay area, near Lake Sentani, 300 m, 9.I.1933, "waterlily pond", W. Stüber. — Libellulidae.

karnyi Fraser (*Argiolestes*), 1926: 486—487. Lectotype ♂. Java [err. pro Celebes], without further indication, with F. C. Fraser's identification and TYPE indication. — Megapodagrionidae.

Described from "three males and one female, collected by Dr. H. Karny", an erroneous statement, as Karny did not collect in Celebes, the only specimen recovered in the Bogor museum being a ♂ undoubtedly originating from northern Celebes and caught by some Indonesian collector.

The specimen is conspecific with *Celebargiolestes cincta* (Selys). — Syn. nov.

karnyi Fraser (*Procordulia*), 1926: 472—473 (composite description!). Lectotype ♂ (head and prothorax detached, tips of superior apps. broken off). E. Java, Tengger Mts., 1200 m, 8.XII.1920, Hans Docters van Leeuwen, labelled "Procordulia karnyi ♂ Type" in F. C. Fraser's writing. — Corduliidae.

In the Buitenzorg Museum were 1 ♂, returned by Fraser and 1 ♀, both from the Tengger Mts., the ♀ dated 14.I.1921, same collector as lectotype, and labelled "Allotype". A second ♂, from S. Sumatra, Lampong distr., Wai Lima, XI—XII. 1921, H. H. Karny and H. C. Siebers (recorded in the original description) and labelled by Fraser "Procordulia javica sp. n. ♂ Type", is a misidentified example of *Zygonyx ida* Selys. Fraser's description of the ♂ terminalia of *P. karnyi* applies to the organs of *Z. ida*, with which it was evidently confounded. See also Lieftinck (1930b: 162—164), who considered it conspecific with *P. sambawana* Foerster; it is, however, probably subspecifically distinctive.

karnyi Laidlaw [subsp. of *Caconeura verticalis* (Selys)], 1926: 230—231. Lectotype ♂. Mentawai Is. (off W. Sumatra): Siberut I., X.1924, H. H. K[arny]. — Protoneuridae.

Now *Prodasinевра verticalis* (Selys), see Lieftinck, 1954: 43—44.

kimminsi Lieftinck (*Lieftinckia*), 1963a: 537—541, pl. 26 fig. 3, fig. 17—18. Holotype ♂. Solomon Is., S. Bougainville I., central part, Crown Prince Range, W. of Kieta, Kokorei (= Kokure), 900 m, 12.VI.1956, E. J. Ford Jr. First described ♀ (incomplete), same loc., 9.VI.1956, J. L. Gressitt. — Platycnemididae.

kimminsi Lieftinck (*Neurobasis*), 1955a: 163—166, pl. 3 fig. 5. Holotype ♂ and first described ♀. Papua, Kwagira River, Peria Creek, 50 m, 14.VIII—6.IX.1953, G. M. Tate (4th Archbold Exped.). — Calopterygidae.

krugeri Laidlaw (*Drepanosticta*), 1926: 228—229, fig. 2a-c. Lectotype ♂ (headless, otherwise in perfect condition). Mentawai Is. (off W. Sumatra): Sipora I., 21.X. 1924, H. H. K[arny], no. 95. — Platystictidae.

One intact ♂ from N. Pagai I. (Mentawai Is.), now also in the Leiden museum, according to Laidlaw (op. cit.), is a syntype (see Lieftinck, 1934d: 468—469, pl. 10 fig. 1—4).

- kuiperi** Lieftinck (*Amphicnemis*), 1937b: 99—101, fig. 23. Holotype ♂ and first described ♀. Billiton I. (west), Tjerutjuk, VIII.1935, F. J. Kuiper. — Coenagrionidae.
- lachesis** Lieftinck (*Macromia*), 1971b: 38—40, fig. 20, 25—26. Holotype ♂ and first described ♀. New Britain (Bismarck Archip.), Illugi, 8.XII.1962, J. Sedlacek (♂, ML), and Gaulim, 160 m, 20—28.X.1962, J. Sedlacek (♀, BISH). — Corduliidae.
- [**lacteola** Selys (*Platycnemis?*), 1863: 167—168. Holotype ♂, destroyed. "Le Japon. Musée de Leyde, où j'ai pris le signalement très-incomplet qu'ont vient de lire". — Platycnemididae.]
- laglaizei** Selys (*Telebasis*), 1878b (♂). First described ♀. N. New Guinea, Humboldt Bay area, Hollandia and env., I—II.1931, XII.1932, II, IV and X.1933, W. Stüber. See Lieftinck, 1935c: 259—260. — Coenagrionidae.
Now *Teinobasis laglaizei* (Selys).
- lairdi** Lieftinck (*Lieftinckia*), 1963a: 534—537, 542, pl. 26 fig. 2, fig. 13—16. Holotype ♂ (immature, in alcohol). Solomon Is., Guadalcanal I., Suta, 680 m, on ridge above Sutakiki River, 27.VI.1956, J. L. Gressitt. — Platycnemididae.
First described ♀ (immature). Solomon Is., Guadalcanal I., Tapenanje, 10—23. XII.1953, J. D. Bradley, BM. 1954—222, *Lieftinckia?* sp., det. D. E. Kimmins (BM).
- lamberti** Lieftinck (*Lanthanusa*), 1942: 497—499, pl. 27 fig. 42—43, 45. Holotype ♂. Central N. New Guinea, Snow Mountain (Nassau) Range, moss-forest N.E. of Lake Habbema, 2800 m, 25.X.1938, L. J. Toxopeus (3rd Archbold Exped.). — Libellulidae.
- laminatum** Lieftinck (*Papugrion*), 1937a: 28, 37—39, fig. 25—26. Lectotype ♂ and first described ♀. N. New Guinea, Humboldt Bay area, upper course of Korimé River, Mameda-Warim, ca. 250 m, about 15 km W. of Lake Sentani, 24.IX.1934, W. Stüber. — Coenagrionidae.
- lamprostomus** Lieftinck (*Argiolestes*), 1949a: 49—51, fig. 26, 36. Holotype ♂ and first described ♀. Central N. New Guinea, Idenburg River basin, Bernhard Camp B, 100 m, 9.IV.1939 (♂) and 6.IV.1939 (♀), L. J. Toxopeus et al. (3rd Archbold Exped.). — Megapodagrionidae.
- lara** Krueger (*Euphaea*), 1898 (♂). First described ♀. E. Sumba (Lesser Sunda Is.), Kananggar, 700 m, V.1925, K. W. Dammerman. See Lieftinck, 1936a: 106—167, fig. 1. — Euphaeidae.
Now *E. lara lara* Krueger.
- latericum** Lieftinck (*Ceriagrion*), 1951c: 185—186, 193—196, fig. 3. Holotype ♂ and first described ♀. S.E. Sumatra, Palembang, Bukit Besar, 25.IX.1937, "dark rubber plantation" (♂) and Palembang, 3.IX.1937, "own garden" (♀), L. Coomans de Ruiter. — Coenagrionidae.
Now *C. latericum latericum* Lieft. (see Asahina, 1967: 291—293, fig. 123—135).
- leonardi** Lieftinck (*Idiocnemis*), 1958: 275—276, 282, fig. 52—54. Holotype ♂. Tagula I. (Sudest I., Louisiade Archip.), N.-coast, Joe Landing, 0—100 m, 18—21.VIII.1956, L. J. Brass (5th Archbold Exped.). — Platycnemididae.
- leopoldi** Fraser (*Procordulia*), 1932 (♂ juv.). First described ♀ and adult ♂. N. New Guinea, Humboldt Bay area, Cycloop Mts., 1000 m, IX—X.1932, W. Stüber. See

- Lieftinck, 1935c: 295—298, fig. 47—49. — Corduliidae.
- leptalea** Lieftinck (*Tanymecosticta*), 1959a: 299—300, fig. 5, 13, 38—41. Holotype ♂. Woodlark I. (Murua I.), Kulumadau, 0—100 m, 2.XI.1956, L. J. Brass (5th Archbold Exped.). — Isostictidae. Plate 1.
- lepyricollis** Lieftinck (*Drepanosticta*), 1949a: 57—59, fig. 31, 53—57. Holotype ♂. Central N. New Guinea, Idenburg River valley, above Bernhard Camp, 750 m, 25.III.1939, L. J. Toxopeus (3rd Archbold Exped.). — Platystictidae.
- lethe** Lieftinck (subsp. of *Diplacina paula* Ris), 1953d: 155, 161—164, fig. 1—2. Lectotype ♂. Misool I. (off New Guinea), Solal, source of Gu River, ca. 50 m, 15.X.1948, M. A. Lieftinck. — Libellulidae.
- liberata** Lieftinck (*Rhinocypha*), 1949a: 27—29, fig. 9. Holotype ♂. Solomon Is., Ugi I., off the northcoast of San Cristoval, 6.V.1934, no. 2513, R. A. Lever. — Chlorocyphidae.
- lieftincki** Asahina (*Ceriagrion*), 1967: 297—298, 325, fig. 144—149. Holotype ♂. Philippine Is., Basilan I., Maloong, 29.IX.1932, K. Kuwasima. — Coenagrionidae.
- lieftincki** Laidlaw (*Coeliccia*), 1932: 32—33, pl. 1 fig. 8, 14; pl. 2 fig. 13—14, pl. 3 fig. 2. Holotype ♂ and allotype ♀ (in cop.). S. Java, prov. Banjumas, S.-coast, Nusa Kambangan, 18.VI.1927, F. C. Drescher. — Platycnemididae.
- See also Kimmins, 1970: 180.
- lieftincki** Belle (*Negomphoides*), 1970: 154—158, fig. 258—264. Holotype ♂. Perú, environs of Tingo Maria on Guayaga river, 700 m, 1962, L. Gómez Alonso. First described ♀. Perú, dept. Huanuco, Huallaga river area, 6—700 m, Rio Rondos, X.1962—XI.1963, L. Gómez Alonso. — Gomphidae.
- lieftincki** Watson (subsp. of *Trapezostigma liberata* Lieft.), 1967: 396, 400, fig. 19, 43. Holotype ♂ and first described ♀. Central W. New Guinea, Wissel Lakes (Paniai), Lake Tigi, Waghete, 1740 m, 13.I.1955 (♂, no. 840) and 12.I.1955 (♀, no. 841), L. D. Brongersma et al. — Libellulidae.
- liesthes** Lieftinck (*Bironides*), 1937a: 51—53, fig. 36. Holotype ♂ and first described ♀. N. New Guinea, ca. 15 km south of Bougainville Hills, Nonno (Japu) hills, ca. 400 m, 12—21.II.1936, W. Stüber. — Libellulidae.
- lilacina** Foerster (*Trithemis*), 1899a (♂). First described ♀. E. Sumba (Lesser Sunda Is.), Kananggar, 700 m, V.1925, K. W. Dammerman. See Lieftinck, 1936a: 144—145. — Libellulidae.
- linsleyi** Lieftinck (*Lestes*, sg. *Indolestes*), 1960c: 148—151, 160, pl. 5 fig. 9—10; fig. 15, 26—27. Holotype ♂. Papua, Central Province, Brown Range, E. of Pt. Moresby, 8.VI.1955, J. L. Gressitt. — First described ♀. S. New Guinea, Digul River territ., Obaa distr., Mappi Post, IV.1938, J. M. van Ravenswaay Claasen. — Lestidae.
- lombockensis** Mac Lachlan (var. of *Euphaea lara* Krueger), 1898 (♂). First described ♀. W. Flores (Lesser Sunda Is.), Wai Radjang, 140 m, 16—18.XI.1929, J. K. de Jong. See Lieftinck, 1936a: 108—110, fig. 2 (name miss-spelt *lombokensis*). — Euphaeidae.
- Now *E. lara lombockensis* MacLachlan.
- longipennis** Selys in Selys & Hagen (*Calopteryx*), 1854: 50. Lectotype ♂ (immature). With printed label "v. Siebold, Japan", under old drawer-label "Atrata de Selys" (unknown handwriting). — Calopterygidae.
- Described in some detail, yet recognized as juvenile individuals of *C. atrata* Selys, 1853, originally described from China. Of these Japanese specimens the author says:

"Croyant ces exemplaires [deux ♂ du Musée de Leyde] distincts, je les avais d'abord nommés *C. longipennis* (De Selys)".

Synonymous with, or a subspecies of, *C. atrata* Selys.

- longispina** Lieftinck (*Elatoneura*), 1937b: 76—79, fig. 10—12. Holotype ♂ and first described ♀. W. Borneo, Singkawang, forest marsh near Bakuan, 17.II.1932, L. Coomans de Ruiter. — Protoneuridae.
- lorentzi** Lieftinck (*Notoneura*), 1938: 91—92, fig. 24—26. Holotype ♂ (ex alcohol). Central N.W. New Guinea, Boven [Upper] Jamur, between Geelvink Bay and Etna Bay, 4.VIII.1903, L. F. de Beaufort & H. A. Lorentz. — First described ♀. Berau Peninsula (Vogelkop, eastern interior), Manikiong territory, 14—28.II.1903, same collectors. — Protoneuridae.
- lorquini** Selys (*Telebasis*), 1877 (♀). First described ♂. E. Celebes, Malili, with label: K 68b, VIII.1932, R. Woltereck. See Lieftinck, 1935c: 256—257. — Coenagrionidae.
Now *Teinobasis lorquini* (Selys).
- lousiadensis** Lieftinck (*Idiocnemis*), 1958: 274—275, 283, fig. 43—51, 55. Holotype ♂ and first described ♀. Misima I. (St. Aignan, Louisiade Archip.), Sisa, north slopes, 350 m, 18.VII.1956, L. J. Brass (5th Archbold Exped.). — Platycnemididae.
- luciae** Lieftinck (*Teinobasis*), 1937a: 44—46, fig. 31. Holotype ♂ and first described ♀. N. New Guinea, ca. 15 km south of Bougainville Hills, Nonno (Japu) hills, ca. 400 m, 12.II.1936, W. Stüber. — Coenagrionidae.
- luctuosa** Lieftinck (*Neurothemis*), 1942: 480—482. Holotype ♂. S. New Guinea, Digul River territ., Mappi Post, low country, IV.1938, J. M. van Ravenswaay Claasen. — Libellulidae.
- lugens** Albarda in Selys (*Vestalis*), 1879: 359—360 (15—16 sep.). Lectotype ♂ and first described ♀. Central Sumatra, with written labels in Snelleman's hand: "Sumatra Exped./Moeara laboe tot 28/11.1877" (♂) and "v. Soengei aboe naar Moeara laboe, 3—10/10.1877" (♀), with *Vestalis lugens* Albarda ♂ and ♀, in Albarda's writing. Ex coll. H. Albarda. — Calopterygidae.
- The application of priority of publication would demand that the specific name should be attributed to de Selys Longchamps, not to Albarda, whose beautifully illustrated account was considerably delayed in publication and did not appear in print until the beginning of April 1881. Identical cases are *Libellago snellemani* (Alb.) and *L. sumatrana* (Alb.). However, the authorship of these three taxa was explicitly stated to be Albarda's by de Selys himself (1879: 350—351, 361—362, 397—399; and again in 1889: 445, 447, 478—479). Since de Selys' first descriptions (1879) were extracted from Albarda's manuscript, there can be no doubt that the names are correctly accredited to Albarda and that lectotype selections should be made from the material in his collection.
- lundquisti** Lieftinck (*Lestes* sg. *Indolestes*), 1949a: 31—33, fig. 10—12, 97. Holotype ♂. S.W. New Guinea, Sungei Aindua, W. of Uta (southcoast), 50—70 km inland, 4—9.VII.1941, E. Lundqvist et al. (Negumy Exped.). First described ♀. S. New Guinea, Merauke, 12.III.1939, R. G. Wind (see Lieftinck, 1960c: 147—148, fig. 14 & 25, pl. 4 fig. 7—8, ♂ ♀). — Lestidae.
- luteipes** Lieftinck (*Argiolestes*), 1956b: 71, 94—97, fig. 30—32. Holotype ♂. Papua, Cape Vogel Peninsula, Menapi, up to 150 m, 9.IV.1953, G. M. Tate (4th Archbold Exped.). — Megapodagrionidae.
- luxatus** Lieftinck (*Lestes*), 1932b: 492, 495—497, fig. 2. Lectotype ♂ and first des-

cribed ♀. N. New Guinea, Humboldt Bay area, Hollandia, XI—XII.1930, W. Stüber. — Lestidae.

Now *Lestes (Indolestes) luxatus* Lieft.

lygisticercus Lieftinck (*Lestes*), 1932b: 492, 497, fig. 3. Holotype ♂. N. New Guinea, Humboldt Bay area, Hollandia, III.1931, W. Stüber. First recorded ♀. N. New Guinea, Humboldt Bay area, Njau Sanké, 15 km S. of Bougainville Mts., 15—25.XI.1935, W. Stüber (Lieftinck, 1949a: 30). — Lestidae.

Now *Lestes (Indolestes) lygisticercus* Lieft.

maclachlani Foerster (*Anax*), 1898 (♂). First described ♀. N. New Guinea, Humboldt Bay area, Hollandia, V.1930, W. Stüber. See Lieftinck, 1942: 587, 605, pl. 39 fig. 140. — Aeshnidae.

madelenae Laidlaw (*Amphicnemis*), 1913 (♂). First described ♀. W. Borneo, Singkawang, forest-marsh near Bakuan, 7.XII.1931, L. Coomans de Ruiter. See Lieftinck, 1940b: 376—377. — Coenagrionidae.

magica Lieftinck (*Hemicordulia*), 1937b: 107—109, fig. 26. Holotype ♂. Bali I., East Bali, Mt. Abang, 1900 m, 7.IV.1936, on mountain ridge, C. G. G. J. van Steenis. — Corduliidae.

Synonymous with *H. australiae* (Ramb.), see Lieftinck, 1953c: 183—184.

magnificus Selys (*Chlorogomphus*), 1854: 99 (80 sep.), ♂ ♀ "Sumatra". Lectotype ♀. Muller Sumatra (print). First described ♂ (incomplete). Muller Java (print); this example is the holotype ♂ of *C. hyalinus* Selys, a new name first proposed for the ♂ in the *Secondes Additions* (1869b: 202), not in the *Monographie* (1858), as stated by de Selys. — Cordulegasteridae. Plate 5 (♂).

A syntypic ♀, also from "Sumatra", bears J. C. H. de Meijere's label "Waarschijnlijk type" (MA). This is in a much better condition than the lectotype, which now lacks its head, legs and abdomen.

After publication of his "Fissilabioidea" (1929), Fraser informed me in a letter that he wrongly gave the ♂ as the type of *C. magnificus* and that the ♀ from Sumatra should instead be designated lectotype, an opinion with which I concur.

Type-species of *Chlorogomphus* Selys.

Cf. also *Chlorogomphus hyalinus* Selys, in the present paper.

malacodora Lieftinck (*Lochmaeocnemis*), 1949a: 100—104, fig. 103, 116, 120—124, 131—133. Holotype ♂ and first described ♀. Central W. New Guinea, Idenburg River valley, above Bernhard Camp, 700 m, 11.II.1939 (♂) and 25.III.1939 (♀), L. J. Toxopeus (3rd Archbold Exped.). — Platycnemididae.

Type-species of *Lochmaeocnemis* Lieftinck (op. cit.).

malkini Belle (*Phyllocycla*), 1970: 75—77, fig. 112—115. Holotype ♂ and first described ♀. Brazil, Maranhão, Aldeia Yavaruhu (Aracu), 50 km E. of Canindé, 11-25.II.1966, B. Malkin & J. C. Pinheiro. — Gomphidae.

malleifera Lieftinck (*Macromia*), 1955c: 256—258, fig. 5—7. Holotype ♂. E. China, prov. Fu Kien, Kuatun, 2300 m, 6.VII.1938, J. Klapperich. — Corduliidae.

mariae Lieftinck (*Amphicnemis*), 1940b: 366, 374—375, pl. 15 fig. 1. Holotype ♂. E. Borneo, N. Kutai, Sangkulirang distr., Pelawan Besar, V.1937, M. E. Walsh. — Coenagrionidae.

mariae Lieftinck (*Leptogomphus*), 1948a: 249—251, fig. 10 and pl. 8. Holotype

- ♀. E. Borneo, N. Kutai, Sangkulirang distr., Dagaunan, VI.1937, M. E. Walsh. — Gomphidae.
- mariae** Lieftinck (*Rhinocypha*), 1930b: 136—138. Lectotype ♂. S. Sumatra, Benkulen, Lake (Danu) Ranau distr., E. of Surabaya, 600 m, 28.X.1929, M. J. van Steenis-Kruseman & C. G. G. J. van Steenis. First described ♀. S. Sumatra, near locality of lectotype, at Sukanegri, 31.XII.1937, L. Coomans de Ruiter. See Lieftinck, 1948a: 270. — Chlorocyphidae.
- maroccanus** Lieftinck (subsp. of *Gomphus simillimus* Selys), 1966c: 34—38, fig. 6. Holotype ♂, Morocco, Moyen-Atlas, El Hajeb, between Meknès and Azrou, ca. 1050 m, 25.V.1966, M. A. Lieftinck. — Gomphidae.
- First described ♀. Morocco, Moyen Atlas, Ifrane, 1600 m, 15-16.VII.1935, A. Ball (IRSN) (op. cit.).
- [**materna** Selys (*Agriocnemis*), 1877: 151—152. Holotype ♂ and first described ♀. "Sumatra. Un couple au musée de Leyde"; destroyed. — Coenagrionidae.]
- Currently considered synonymous with *A. femina* (Brauer), but probably subspecifically distinct.
- [**melaenops** Selys (*Gomphus*), 1854: 48. Syntype ♂. "Japon. (Musée de Leyde et Collect. Selys)"; destroyed. — Gomphidae.]
- A lectotype ♂ should be selected from de Selys' collection (IRSN).
- melanostoma** Lieftinck (*Anaciaeschna*), 1949b: 354—356, fig. 10. Holotype ♂ (immature). Solomon Is., Guadalcanal I., Aola, VIII.1938, unknown collector (ex NMB). — Aeshnidae.
- melanoxantha** Lieftinck (*Notoneura*), 1949a: 68—70, fig. 80—81, 89—90. Holotype ♂ and allotype ♀ (in cop.). Central N. New Guinea, Sahuweri River valley, Araucaria Camp, 800 m, 21.III.1939, L. J. Toxopeus & J. Olthof (3rd Archbold Exped.). — Protoneuridae.
- merope** Lieftinck (*Diplacina*), 1963c: 761—763, fig. 12—15. Holotype ♂. W. New Guinea, western extremity, Sorong, 2.III.1959, G. F. Mees. — Libellulidae.
- [**metallica** Fraser (*Parathemis*), 1926: 470—471, fig. 1. Holotype ♂. "Java" (err. pro Celebes); lost. Described from a single erroneously labelled ♂ ex Buitenzorg Museum (Mus. Zool. Bog.). — Libellulidae.]
- Type-species of *Parathemis* Fraser (op. cit.).
- Syn. of *Celebothemis delectolei* Ris (see Lieftinck, 1936c: 403).
- miae** Lieftinck (*Libellago*), 1940a: 84—88, fig. 1. Lectotype ♂ and allotype ♀ (in cop.). Ceylon, Central Prov., Haragama, 500 m, Mahaweliganga River, 18.IX.1938, M. A. Lieftinck. — Chlorocyphidae.
- Syn. of *Libellago adami* Fraser, 1939: 23—24, fig. 1a-c, ♂ only, from the same locality.
- micans** Lieftinck (*Teinobasis*), 1949a: 174—175, fig. 219. Holotype ♂ and first described ♀. W. New Guinea, Berau Peninsula (Vogelkop), Sungei Tisa (south-coast), 9.V.1941, E. Lundqvist (Negumij Exped.). — Coenagrionidae.
- micans** Lieftinck (*Diplacina*), 1953d: 175—177, fig. 8—9. Holotype ♂ (abd.-segm. 6—10 and apps. missing). Waigeu I. (off N. W. New Guinea), with printed label "Waigeu Bernstein", and "Diplacina smaragdina Selys", in de Selys' handwriting. — Libellulidae.
- micropsitta** Lieftinck (*Palaiargia*), 1957: 60—64, fig. 16 & pl. 4 fig. 2. Holotype

- ♂ and first described ♀. Misool I. (off W. New Guinea), env. of Fakal, 50—100 m, 2.X.1948, M. A. Lieftinck. — Coenagrionidae.
- migratum** Lieftinck [subsp. of *Orthetrum pruinosum* (Burm.)], 1951b: 35—37, fig. 14. Holotype ♂, N. Australia, Cape York Peninsula, Coen, 10.XI.1947, H. L. Pottinger. — Libellulidae.
- miniata** Fraser (*Macromia*), 1924: 450—451, pl. 25 fig. 7. Lectotype ♂. S. Peninsular India, Coorg, Somwarpet, 1.VII.1923, F. C. Fraser. — Corduliidae.
For particulars, see Kimmins, 1966: 204.
- miniata** Lieftinck (subsp. of *Palaiargia charmosyna* Lieft.), 1949a: 119, fig. 158. Holotype ♂ and first described ♀. Central N. New Guinea, Sahuweri River basin, Araucaria Camp, 800 m, 30.III.1939, L. J. Toxopeus (3rd Archbold Exped.). — Coenagrionidae.
- minutus** Belle (*Cyanogomphus*), 1970: 23—27, fig. 25, 42—47, pl. 3b, 4a-b. Holotype ♂ and first described ♀. Surinam, Mooi Wanna, Weijne road near Albina, 3.VI.1965, J. Belle. — Gomphidae.
- mirifica** Lieftinck (*Archboldargia*), 1949a: 142—145, fig. 139—143, 148, 161, 171. Holotype ♂ and first described ♀. West Central New Guinea, Wissel Lakes group, Enarotali, E.-shore of Lake Paniai, 1740 m, 27.IX.1939 (♂) and Arabu Bivouac, 10 mi. N.E. of Lake Paniai, ca. 1800 m, 22.X.1939 (♀), H. Boschma (Le Roux Exped.). — Coenagrionidae. Plate 2.
Type-species of *Archboldargia* Lieftinck (op. cit.).
- misoolensis** Lieftinck (subsp. of *Neurobasis australis* Selys), 1955a: 161—163, pl. 3 fig. 4. Holotype ♂ and first-described ♀. Misool I. (off W. New Guinea), Wartama River near Fakal, ca. 40 m, 2.X.1948, M. A. Lieftinck. — Calopterygidae.
- mnemosyne** Lieftinck (*Macromia*), 1935a: 190—191, fig. 7. Lectotype ♂. W. Borneo, Singkawang, swampy forest near Bakuan, low country, "at dusk", 22.I.1934, L. Coomans de Ruiter. — Corduliidae.
- modesta** Belle (*Phyllocycla*), 1970: 70—74, fig. 106—111, pl. 10b, 11a, 12b. Holotype ♂. Surinam, Surinam river (Afobakka), 28.XII.1963, J. Belle. First described ♀, Surinam, Saramacca, right Toekoemoetoe (Tafelberg creek), 6.X.1944, L. Schmidt. — Gomphidae.
- moerens** Lieftinck (*Huonia*), 1963c: 772—774, fig. 30—32. Holotype ♂. New Britain (Bismarck Archip.), N.-slope of Nakanai Mts., 150 m, 22.VII.1956, E. J. Ford Jr. — Libellulidae.
- moluccana** Lieftinck (*Anaciaeschna*), 1930a: 316—318, fig. 4. Holotype ♂. Buru I. (S. Moluccas), Wai Eno, beginning of IV.1921, L. J. Toxopeus. — Aeshnidae.
- moluccana** Lieftinck (*Drepanosticta*), 1938: 82—83. Lectotype ♂ and first described ♀. Buru I. (S. Moluccas), Nal'besi, 26.IV.1921 (♂) and Buru I., Station 2, I.1922 (♀), L. J. Toxopeus. — Platystictidae.
Nom. nov. pro *Drepanosticta auriculata*: Ris (1929: 141—142, ♂ ♀ Buru I.), nec *Platysticta auriculata* Selys, ♂ N.W. New Guinea, a congeneric species.
- moluccana** Lieftinck [subsp. of *Nesoxenia mysis* (Selys)], 1942: 461, 464, (not pl. 24, fig. 13—14!). Lectotype ♂ and first described ♀. Noord Halmahera [H.A.] Bernstein [N. Moluccas, Halmahera I.]; ♀ with additional pin-label "Agr. mysis Selys, ann. Dresden", in de Selys' writing. — Libellulidae.

This is a composite taxon, examples from the southern Moluccas and Kei Islands

(figured in the original description) belonging to a different and still undescribed subspecies of *N. mysis* Selys.

monoceros Lieftinck (*Drepanosticta*), 1965a: 185—186, fig. 12—15. Holotype ♂ and first described ♀. E. Borneo, Kutai, Bengen River, Tabang, 125 m, 28.IX.1956 (♂) and 6.X.1956 (♀), A.M.R. Wegner. — Platystictidae.

montaguei Campion (*Synthemis*) 1921 (♂). First described ♀. New Caledonia, N.E.-side, Pouébo, 200—250 m, 19-21.I.1964. R. Straatman. See Lieftinck (1971b: 51—52, fig. 36). — Corduliidae.

monticola Lieftinck (subsp. of *Tramea eurybia* Selys), 1942: 537—538, pl. 38 fig. 124. Holotype ♂ and first described ♀. Central W. New Guinea, Baliem River valley, Baliem Camp, 1600 m, 16.XII.1938 (♂) and 30.XI.1938 (♀), L. J. Toxopeus (3rd Archbold Exped.). — Libellulidae.

Now *Trapezostigma eurybia monticola* (Lieft.).

montivagans Lieftinck (*Anaciaeschna*), 1932c: 251—253, fig. 3. Holotype ♂ and first described ♀. W. Java, G. Gedeh-complex, Puntjak pass, Telaga Saät, 1450 m, III.1930 (♂, bred from larva) and 15.XII.1929 (♀ ad.), M.A. Lieftinck. — Aeshnidae.

mungo Needham (*Cacus*), 1940 (♂). First described ♀. Surinam, upper course of Coropina Creek, near Zanderij I (Airport), 20.I.1957, D. C. Geijskes. See Geijskes, 1964: 37—40, fig. 15—16. — Gomphidae.

Currently known as *Cacooides mungo* (Needham).

murcia Lieftinck (*Idionyx*), 1971b: 6, 12—14, fig. 3—4. Holotype ♂ and first described ♀. Central Sumbawa I. (Lesser Sunda Is.), Semongkat-atas, 21.IV.1961 (♂) and Semongkat, 300 m, 27.IV.1961 (♀), P. Jauffret & R. Pujol, ex coll. A. Heymer. — Corduliidae.

mutans Lieftinck [subsp. of *Nesoxenia mysis* (Selys)], 1942: 462, 465—466, pl. 24 fig. 18, pl. 41 fig. 163. Holotype ♂ and first described ♀. W. New Guinea, MacCluer Gulf, northcoast of Bombarai Peninsula, Babo, 22-23.VIII.1941, E. Lundqvist (Negumij Exped.). — Libellulidae.

Probably a distinct species.

mutata Lieftinck (*Oligoaeschna*), 1940b: 381—383, 384, fig. 18. Holotype ♂. E. Borneo, Kutai, Samarinda, I.1939, native coll., M.E. Walsh ded. First described ♀. E. Borneo, Kutai, Sangkulirang distr., Kariorang, 21.II.1937, J. W. Q. de Quarles. — Aeshnidae.

myzomela Lieftinck (*Palaiargia*), 1957: 51—53, fig. 11—12, pl. 2 fig. 1. Holotype ♀. West Central New Guinea, Wissel Lakes area, Kamo Valley, Ituda, 1500 m, 12.VIII.1955, J. L. Gressitt. — Coenagrionidae.

naias Lieftinck (*Libellago*), 1932a: 4—9. Holotype ♂ and first described ♀. W. Flores I. (Lesser Sunda Is.), Wai Radjang, along small streams, 16-18.XI.1929, J.K. de Jong. — Chlorocyphidae.

neotropica Belle (*Phyllocycla*), 1970: 97—100, fig. 147, 150—153, pl. 13b. Holotype ♂. Surinam, Brownsveg (road near Makambi creek), 11.VI.1961, D. C. Geijskes. — Gomphidae.

neris Lieftinck [subsp. of *Agrionoptera insignis* (Ramb.)], 1948b: 292—294, fig. 7. Holotype ♂ and first described ♀. Engano I. (off S.W. Sumatra), Meok, 24.V.1936, J. K. de Jong et al. — Libellulidae.

neris Lieftinck [subsp. of *Coeliccia membranipes* (Ramb.)], 1948b: 287—288, fig.

3—4. Holotype ♂ and first described ♀. Engano I. (off S. W. Sumatra), Kiojoh, 2.VI.1936 (♂) and 14.VI.1936 (♀), J. K. de Jong et al. — Platycnemididae.

[*nigra* Selys in Selys & Hagen [*Sapho* (mnais)], 1854: 65. Holotype ♂. "Japon"; destroyed (not in ML). — Calopterygidae.

An enigmatic specimen of unknown identity, figuring under the above names, though classified in a note sub *Mnais strigata* Hagen.]

nigra Foerster in Laidlaw (var. of *Disparoneura verticalis humeralis* Selys), 1907: 12—13. Lectotype ♂. Malay Peninsula, labelled by Förster: Camp Jor, Wasserscheide Pahang-Perak, 2000 Fuss, Albert Grubauer/*Disparoneura verticalis* Rasse humeralis Selys var. *nigra* F.; and: figured by C. H. Kennedy Aug.—Sept. 1924 (print). — Protoneuridae.

A synonym of *Prodasineura verticalis* (Selys).

nigriventris Lieftinck (*Idiocnemis*), 1937a: 8—9, fig. 2. Lectotype ♂ and first described ♀. N. New Guinea, Humboldt Bay area, Hollandia, XI—XII.1931 (♂) and I.1932 (♀), W. Stüber. — Platycnemididae.

nigrofasciata Lieftinck (*Notoneura*), 1932b: 523, 537—538, fig. 32—34. Lectotype ♂ and allotype ♀ (in cop.). N. New Guinea, Humboldt Bay area, Hollandia, 40 km S., 300 m, XI—XII.1931, W. Stüber. — Protoneuridae.

nigrofasciatum Lieftinck (*Pseudagrion*), 1934a: 6—8, fig. 1—2. Lectotype ♂. Java Orient., Hekm[eijer] (written label). — Coenagrionidae.

nubecula Lieftinck (*Rhinocypha*), 1948a: 266—270, fig. 16. Lectotype ♂ and first described ♀. N. Sumatra, Atjeh, Laut Tawar (Lake Takingeun), north shore, 1210 m, 19.VII.1941, F. C. van Wagensveld. — Chlorocyphidae.

nymphaeae Lieftinck (*Aethriamanta*), 1949a: 233—234, fig. 287. Holotype ♂ and first described ♀. N. New Guinea, Humboldt Bay area, Lake Sentani, W. of Hollandia, waterlily ponds, 13.I.1933 (♂) and 18.I.1933 (♀), W. Stüber. — Libellulidae.

obensis Lieftinck (*Argiolestes*), 1956b: 66, 75—77, fig. 3—4. Holotype ♂ and first described ♀. Ohi I. (N. Moluccas), N.W. Obi, Obi lake, kali Telaga, 100—160 m, 6.VIII.1953, A. M. R. Wegner et al. — Megapodagrionidae.

obensis Lieftinck (*Palaiargia*), 1957: 53—54, fig. 13. Holotype ♂ (immature). Obi I. (N. Moluccas), N.W. coast, Laiwui, 1.X.1953, A. M. R. Wegner et al. — Coenagrionidae.

obliterata Lieftinck (*Idiocnemis*), 1932b: 499—501, fig. 5. Lectotype ♂ and first described ♀, N. New Guinea, Humboldt Bay area, Hollandia, IX.1930, W. Stüber. — Platycnemididae.

obscura Fraser (*Neurothemis*), 1926: 472. Lectotype ♂. Karimondjawa Is. (Java Sea), X.1920, H. C. Delsman. — Libellulidae.

Currently placed as a subspecies of *Neurothemis terminata* Ris.

obscurum Lieftinck [subsp. of *Pseudagrion pilidorsum* (Brauer)], 1936a: 128, 131—132, fig. 12. Lectotype ♂. Nias I., Amadreja, 10.IX.1931, J. C. van der Meer Mohr. — Coenagrionidae.

obtusum Albarda (*Zyxomma*), 1881: 1, pl. 1 fig. 1—2. Lectotype ♂ and first described ♀. Central Sumatra, labelled: "Soepayang, 24/4 77" (♂) and "tot 24/4 77" (♀) Sumatra Exp., both labelled: *Zyxomma obtusum* Hag., in H. Albarda's writing, ex coll. H. Albarda. — Libellulidae.

oceanis Lieftinck (subsp. of *Rhinocypha angusta* Selys), 1947: 220—224, fig. 4—5,

- pl. 2 fig. 3. Holotype ♂ and first described ♀. Engano I. (off S.W. Sumatra), Buah-buah, ult. V—VII.1936, J. K. de Jong et al. — Chlorocyphidae.
- oceanis* Lieftinck [subsp. of *Neurothemis ramburi* (Brauer)], 1948b: 297—298. Holotype ♂ and first described ♀. Engano I. (off S.W. Sumatra), Buah-buah, 5.VI.1936, J. K. de Jong et al. — Libellulidae.
- olthofi* Lieftinck (*Teinobasis*), 1949a: 169—171, fig. 218. Holotype ♂. N. Central New Guinea, Idenburg River, Bernhard Camp, 50 m, 12.IV.1939, J. Olthof. — Coenagrionidae.
- olympica* Lieftinck (*Hemicordulia*), 1942: 549—555, pl. 36 fig. 114—115, pl. 37 fig. 116—117. Holotype ♂ and first described ♀. Central N. New Guinea, Snow Mountain (Nassau) Range, Lake Habbema, 3225 m, 21.VIII.1938, L. J. Toxopeus (3rd Archbold Exped.). — Corduliidae.
- oppositum* Lieftinck (*Papuagrion*), 1949a: 146—148, fig. 190, 206. Holotype ♂ and first described ♀. N. New Guinea, Humboldt Bay area, southern Bewani Hills, 300 m, Parfi, 20.VI.1939, W. Stüber. — Coenagrionidae.
- optata* Hagen *in* Selys (*Argia*), 1865: 390 (18 sep.). Holotype ♂. Obi I. (N. Moluccas), labelled "Ins. Obi, Bernstein" and "Optata Hag." in H. A. Hagen's handwriting. — Coenagrionidae.
First described ♀. Obi I., northwest coast, Laiwui, 18.X.1953, A. M. R. Wegner (see Lieftinck, 1957: 58—59).
Now *Palaiargia optata* (Hagen *in* Selys).
- oreadam* Lieftinck (*Oreagrion*), 1949a: 206—211, fig. 249—251, 260—263, 264—266, 269—270. Holotype ♂ and first described ♀. Central W. New Guinea, Snow Mountains (Nassau) Range, Lake Habbema, 3250 m, 1.VIII.1938, L. J. Toxopeus (3rd Archbold Exped.). — Coenagrionidae. Plate 3.
- oreophila* Lieftinck (*Huonia*), 1935c: 271, 274—277, fig. 33 (not 35), 36B, 37. Holotype ♂ and first described ♀. N. New Guinea, Humboldt Bay area, southern Cycloop Mts., 1000—1200 m, VIII.1932, W. Stüber. — Libellulidae.
- othello* Lieftinck (*Agyrtacantha*), 1942: 571—572, pl. 38 fig. 129—131. Holotype ♀. Central N. New Guinea, Idenburg River, Bernhard Camp, 50 m, 13.IV.1939, L. J. Toxopeus (3rd Archbold Exped.). — Aeshnidae.
- palawana* Lieftinck (*Coeliccia*), 1940b: 358—359, fig. 13. Holotype ♂. Philippine Is.: Palawan I., Alfonso XIII, 6.III.1935, K. Kuwasima. — Platycnemididae.
- palawana* Lieftinck [subsp. of *Copera vittata* (Selys)], 1940c: 290, 303—304, fig. 1e, pl. 10 fig. 20—22, pl. 11 fig. 8, pl. 12 fig. 9, pl. 13 fig. 7, pl. 14 fig. 7. Holotype ♂ and first described ♀. Philippine Is.: Palawan I., Alfonso XIII, 6.V.1935, K. Kuwasima. — Platycnemididae.
- pallidifrons* Ris (*Rhinocypha*), 1927: 9—10, fig. 3. Holotype ♀. W. Central Sumatra, Padang Highlands, Ophir distr., Tanangtalu, 1000 m, V.1915, E. Jacobson. Ex SMF no. 1389. — Chlorocyphidae.
- pan* Laidlaw (*Drepanosticta*), 1931 (♂). First described ♀ (juv.). Malay Peninsula, Perak, Cameron's Highlands, Jor River, 600 m, 13.III.1963, M. A. Lieftinck. See Lieftinck, 1965a: 174—176 (♂ ♀). — Platystictidae.
- pandanicola* Lieftinck (*Amphicnemis*), 1953f: 388—392, fig. 2. Holotype ♂ and first described ♀. S. Borneo, Sampit distr., 0—50 m, near Sampit, about 50 km inland, 20.VII.1953, M. A. Lieftinck. — Coenagrionidae.

- pandanicolum** Lieftinck (**Papuagrion**), 1949a: 153—155, fig. 188—189, 195. Holotype ♂ and first described ♀. Central W. New Guinea, Snow Mountain (Nassau) Range, Moss-forest N. of Lake Habbema, 2700 m, 23.VIII.1938 (♂) and 2850 m, 28.VIII.1938 (♀), L. J. Toxopeus (3rd Archbold Exped.). — Coenagrionidae.
- panybeus** Hagen (*Anax*), 1867 (♂). First described ♀. N. Celebes, Tondano, VII.1933, C. van Braekel. See Lieftinck, 1942: 597—599. — Aeshnidae.
- papuensis** Lieftinck [subsp. of *Neurothemis ramburi* (Brauer)], 1942: 482—484. Holotype ♂ and first described ♀. N. New Guinea, Humboldt Bay area, S. Cycloop Mts., near Lake Sentani, 150 m, 18.IV.1939, J. Olthof (♂), and Hollandia, III.1931, W. Stüber (♀). — Libellulidae.
- papuensis** Lieftinck (subsp. of *Tetrathemis irregularis* Brauer), 1942: 451—453, pl. 23 fig. 7, 11. Lectotype ♂ and first described ♀. N. New Guinea, Humboldt Bay area, Hollandia, XI—XII.1930 (♂) and IV—VI.1931 (♀), W. Stüber. — Libellulidae.
- paruensis** Geijskes (*Micrathyria*), 1963: 74—78, fig. 16. Holotype ♂ and first described ♀. N. Brazil, affluent creek of Upper Paru River, near Apisiké, 19.IV.1952 (♂) and 20.IV.1952 (♀), D. C. Geijskes. — Libellulidae.
- pasiphae** Lieftinck (*Gynacantha*), 1948c: 420—421, 424, 426—427, fig. 1. Holotype ♂. N. Halmahera I. (N. Moluccas), labelled "Halmahera [VII—VIII.1861, H. A.] Bernstein", and "Gynacantha Maclachlani ♂" in R. Martin's handwriting. First described ♀. N. Halmahera I., Tobelo, VI—VII. 1931, M. J. van Diejen. — Aeshnidae.
- pavo** Lieftinck (subsp. of *Neurobasis kaupi* Brauer), 1955a: 158—160, pl. 3 fig. 2. Holotype ♂ and first described ♀. S. Celebes, Mt. Lompobatanig (Pic of Bonthain), Borong Rapoa, 700 m, 21.VIII.1949, A. Diakonoff. — Calopterygidae.
- pectitus** Lieftinck (*Argiolestes*), 1949a: 53—54, fig. 28, 37; 110—116, fig. 47, 53—63. Holotype ♂ and first described ♀. Central N. New Guinea, Idenburg River basin, Bivouac 8 km S.W. of Bernhard Camp, 1150 m, 6.I.1939 (♂), and Rattan Camp, 1150 m, 9.II.1939 (♀), L. J. Toxopeus et al. (3rd Archbold Exped.). — Megapodagrionidae.
- pelecotomum** Lieftinck (*Pseudagrion*), 1932b: 567, 577—578, fig. 57, 59. Lectotype ♂. N. New Guinea, Humboldt Bay area, Lake Sentani, I—II.1931, W. Stüber. First recorded ♀. N. Central New Guinea, Idenburg River, Bernhard Camp, 50 m, 12—18.X.1938, J. Olthof (♂ ♀ in cop.). See Lieftinck, 1949a. — Coenagrionidae.
- penelope** Ris (*Gynacantha*), 1915b (♂). First described ♀. Central Celebes, Luwu distr., Palopo, 15.III.1941, "at house a.m.", L. L. A. Maurenbrecher. See Lieftinck, 1948c: 418—419. — Aeshnidae.
- perameles** Lieftinck (**Papuagrion**), 1949a: 159—160, fig. 201. Holotype ♀. S. New Guinea, Lorentz River, Sabang, 5.VII.1907 (Zuid N. Guinea Exped.), determined by H. W. van der Weele as *Argiolestes* spec. — Coenagrionidae.
- First described by Lieftinck (1935c: 247) sub *P. magnanimum* (Selys), but later recognized as a distinct species.
- perfuscatum** Lieftinck (*Pseudagrion*), 1937b: 94—97, fig. 21. Holotype ♂ and first described ♀. W. Borneo, Singkawang, Bengkajang, 5—16.XI.1931, L. Coomans de Ruiter. — Coenagrionidae.

- perimecosoma** Lieftinck (*Palaiargia*), 1957: 44—50, fig. 1—2, 4—10 & pl. 3 fig. 1. Holotype ♂ and first described ♀. Halmahera I. (N. Moluccas), central Halmahera, Mumar River, 200—300 m, 25.IX.1951, Sundanese collectors. — Coenagrionidae.
- perplexus** Lieftinck (subsp. of *Onychogomphus geometricus* Selys), 1935b: 20—21, fig. 2. Holotype ♂ (ex alcohol). N.E. Sumatra, Eastcoast prov., Deli, labelled "Sumatra S.O.K. Medan, 20 m, 1917, J. B. Corporaal". — Gomphidae.
- The specimen now lacks its terminal abdominal segments.
- persephone** Lieftinck (*Diplacina*), 1933d: 42, 47—49, fig. 28. Lectotype ♂ and first described ♀. N. New Guinea, Humboldt Bay area, Hollandia, IV—VI.1931 (♂), and same area, Nettar, XII.1932 (♀), W. Stüber. — Libellulidae.
- pertinax** Lieftinck (*Lestes*), 1932b: 493—495, fig. 1. Lectotype ♂ and allotype ♀ (in cop.). N. New Guinea, Humboldt Bay area, Hollandia, III.1931, W. Stüber. — Lestidae.
- pesechem** Lieftinck (*Papuagrion*), 1949a: 151—152, fig. 178—181, 193. Holotype ♂ and first described ♀. Central N. New Guinea, Sahuweri River Valley, Sigi Camp, 1350 m, 19.II.1939, L. J. Toxopeus (3rd Archbold Exped.). — Coenagrionidae.
- Now *P. pesechem pesechem* Lieft.
- phaeomeria** Lieftinck (*Gynacantha*), 1960a: 253—254, fig. 13a, b. Holotype ♂. Thailand-Tenasserim frontier area, Kwae Noi River valley, S. of Three Pagodas Pass, Niki, 150 m, 30.V.1946, J. E. Jonkers. — Aeshnidae.
- phaeoneura** Lieftinck (*Tramea*), 1953e: 268—269. Holotype ♂ and first described ♀. N. Borneo, Dent Province, Mt. Marapok, collector G. (printed label). The more precise locality is the one given for *Linaeschna polli* Martin, on p. 107 of this paper. — Libellulidae.
- Now *Trapezostigma phaeoneura* (Lieftinck).
- phalantus** Lieftinck (*Macrogomphus*), 1935a: 201—203, fig. 10—12. Holotype ♂ and first described ♀. W. Borneo, Singkawang, swampy forest near Bakuan, low country, 15.IX.1932, L. Coomans de Ruiter. — Gomphidae.
- phantasma** Lieftinck (*Rhinocypha*), 1935a: 175—176. Lectotype ♂ and first described ♀. Buton I. (off S.E. Celebes), Dwaalbaai, 19.I.1917, native coll., ex coll. J. Lindemans & D. C. Geijskes. — Chlorocyphidae.
- phasma** Lieftinck (*Selysioneura*), 1932b: 542, 547—549, fig. 42—43. Lectotype ♂ and first described ♀. N. New Guinea, Humboldt Bay area, Cycloop Mts., ca. 500 m, IV—VI.1931, W. Stüber. — Isostictidae.
- philippa** Ris (*Idionyx*), 1912c (♀ Mindoro). First described ♂. Philippine Is., Mindanao I., Misamis Or., Bal-ason, 2.IV.1960, H. Torre Villas; and ♂ ♀, Leyte I., S. Leyte, Anahawan, Mainit Spring, 31.V.1970, C. Plateros. See Lieftinck (1971b: 7—11, fig. 1—2). — Corduliidae.
- phoenicura** Ris (*Planiplax*), 1912b (♂). First described ♀. Surinam, Paramaribo, pond on shell ridge of Charlesburg, 6.VI.1957 (♂ ♀), J. Belle. See Geijskes, 1964: 41—42, fig. 20. — Libellulidae.
- phoenissa** Ris (*Caconeura*), 1929: 143—144, fig. 2. Holotype ♂ (indicated as Type by Ris). Buru I. (S. Moluccas), Nal'Besi, 26.IV.1921, L. J. Toxopeus. — Proto-neuridae.

Currently placed in *Notoneura* Tillyard.

- phryne** Lieftinck (subsp. of *Diplacina phoebe* Ris), 1953d: 158, 182, fig. 9. Holotype ♂. Ambon I. (S. Moluccas), 27.VII.1948, M. A. Lieftinck. First described ♀. Ambon I., Sungei Waitumu, ca. 30 m, 23.IV.1941, Sundanese collector. — Libellulidae.
- pijpersi** Belle (*Progomphus*), 1966a: 11—14, fig. 23—28. Holotype ♂ (in fragments) and first described ♀. Surinam, Wilhelmina Mountain Range (Camp 3), 5.VIII.1963, H. Pijpers. — Gomphidae.
- plagiatus** Lieftinck (*Burmagomphus*), 1964b: 16, 29—33, fig. 36—41. Holotype ♂. Malay Peninsula, Johore Bahru, Kp. Tinggi Mawai Rd., Sungai Mupor, 17.IV.1963, J. I. Furtado. Immature ♀, from same loc. and date, M. A. Lieftinck. — Gomphidae.
- plagioxantha** Lieftinck (*Notoneura*), 1932b: 523, 527, 538—540, fig. 35—37. Lectotype ♂ and first described ♀. N. New Guinea, Humboldt Bay area, Hollandia, III.1931, W. Stüber. — Protoneuridae.
- platystyla** Lieftinck (*Amphicnemis*), 1953e: 246—247, fig. 6a—b. Holotype ♂. S.E. Borneo, Kandangan distr., Ampah, 0—20 m, 29.IV.1948, Liem Swie Liong. — Coenagrionidae.
- platyura** Lieftinck (*Oligoaeschna*), 1940b: 378—380, 383, fig. 16—17. Holotype ♂ and first described ♀. E. Borneo, N. Kutai, Sangkulirang distr., Pelawan Besar, V.1937 (♂) and Batau Besi, V.1937 (♀), M. E. Walsh. — Aeshnidae.
- podolestoides** Laidlaw (*Devadatta*), 1934: 101—103, fig. 1. Holotype ♂ and first described ♀. W. Borneo, Singkawang, Gunung Poteng, 550 m, 21.VIII.1932, L. Coomans de Ruiter. — Amphipterygidae.
- Now *D. podolestoides podolestoides* Laidlaw.
- polli** Martin (*Linaeschna*), 1909a: 136—137, fig. 133—134, pl. III fig. 9. Holotype ♂. [N.W. Borneo, Sabah-Sarawak boundary, Brunei Bay area], with printed label "N. Borneo, Dent Province, Mt. Marapok, coll. G.", and labelled by R. Martin "Linaeschna Polli m.", and "Type unique". — Aeshnidae.
- Type-species of *Linaeschna* Martin (op. cit.).
- pollux** Lieftinck (*Onychogomphus*), 1941b: 247—253, pl. 13 fig. 7, pl. 14 fig. 4—6, pl. 15 fig. 1—4. Holotype ♂. S. Sumatra, Lampong distr., Wai Tebu (river) near Talang Padang, ca. 400 m, 29.III.1940, M. A. Lieftinck. — Gomphidae.
- polyhymnia** Lieftinck (*Macromia*), 1929a: 66, 97—99, fig. 18a-c. Holotype ♂. N. W. Sumatra, Padangsche Bovenlanden [Padang Highlands], Fort de Kock, 920 m, VIII.1924, E. Jacobson. — Corduliidae.
- pontica** Selys (race of *Libellula fulva* Muell.), 1887: 12. Lectotype ♂ and first described ♀. Iran, both labelled "Mesopotamia Malatia", and on the reverse side "L. fulva ras australis" (♂) and "L. fulva Mull. v. pontica ♀" (♀) in H. Albarda's writing, coll. Albarda acq. 1892 (print). — Libellulidae.
- praecellens** Lieftinck (*Lestes*), 1937b: 59—62, fig. 2—3. Holotype ♂ and first described ♀. S. Java, Tjidamar near Tjidaun, ca. 100 m, forest pool near Sempur-tjondong, 5.XI.1935, M. Bartels Jr. — Lestidae.
- praetermissum** Lieftinck (*Ceriagrion*), 1929b: 115—117, fig. 9. Holotype ♂ and first described ♀. Java, M. C. Piepers. — Coenagrionidae.
- See Asahina (1967: 308—310, fig. 189—195).
- praevia** St. Quentin (*Gomphoides*), 1967 (♂). First described ♀. Brazil, Santa Catarina

- (*Nova Teutonia*), 12.II.1949, coll. unknown. See Belle, 1970: 124—126, fig. 199, 200. — Gomphidae.
- praeivus** Lieftinck (*Lestes*), 1940b: 344—347, fig. 3. Holotype ♂ and first described ♀. E. Borneo, N. Kutai, Sangkulirang distr., Maluwi, IV.1937, M. E. Walsh. — Lestidae.
- propinqua** Lieftinck (subsp. of *Tramea euryale* Selys), 1942: 539—541, pl. 33 fig. 90—91, pl. 34 fig. 98. Holotype ♂ and allotype ♀ (in cop.). N. New Guinea, Humboldt Bay area, near Lake Sentani, 300 m, II.1933, W. Stüber. — Libellulidae.
Currently classified as a subspecies of *Trapezostigma transmarina* (Brauer).
- prothoracale** Lieftinck (*Papuagrion*), 1935c: 238, 242—245, fig. 16—18. Holotype ♂ and first described ♀. N. New Guinea, Humboldt Bay area, Agaffo, near Lake Sentani, sago forest swamp, 27.XII.1932, W. Stüber. — Coenagrionidae.
- prothoracica** Selys (*Telebasis*), 1877 (♂). First described ♀. "Waigeo Bernstein" (print) [Waigeu I., off N. W. New Guinea, III-V.1863]. See Lieftinck, 1938: 116—117. — Coenagrionidae.
Now *Teinobasis prothoracica* (Selys).
- pruinescens** Lieftinck (*Idiocnemis*), 1949a: 96—100, fig. 105, 134. Holotype ♂ and allotype ♀ (in cop.). Papua [S.E. New Guinea], Central Prov., Haveri, 700 m, 13.VIII.1893, Lamberto Loria. Ex Museo Civico di Stor. Nat., Genova. — Platycnemididae.
- pruinosa** Selys (*Mnais*), 1853: 20—21. Lectotype ♂ (adult). With printed label "v. Siebold, Japan", a green museum-label "cotype", and a white museum's identification label "Mnais pruinosa Sel., det. Selys". With additional label in Dr. S. Asahina's writing: "Mnais strigata ♂ f. pruinosa Selys, det. Asahina 1968. This is one of the original series of pruinosa". — Calopterygidae.
Type-species of *Mnais* Selys.
- puella** Lieftinck (*Brachygonia*), 1937b: 105—107, fig. 25. Holotype ♂ and first described ♀. W. Billiton I., Seru, 2.IV.1936, F. J. Kuiper. — Libellulidae.
- pugnax** Lieftinck (*Anax*), 1942: 583, 587, 604—606, pl. 38 fig. 134, pl. 39 fig. 138, 141, pl. 41 fig. 156. Holotype ♂ and first described ♀. Central N. New Guinea, Sahuweri River basin, Araucaria Camp, 800 m, 21.VIII.1939 (♂) and 24.III.1939 (♀), L. J. Toxopeus (3rd Archbold Exped.). — Aeshnidae.
- [**pulverulans** Selys (Race? de *Agriocnemis incisa* Hagen) [= *A. femina* (Brauer)], 1877: 150—151. Lectotype ♂, destroyed. "Célèbes. Mus. de Leyde et coll. Selys". Not in coll. Selys (IRSN). — Coenagrionidae.
Currently considered synonymous with *A. femina* (Brauer), but probably subspecifically distinct.]
- punctata** Selys (*Petalia*), 1854 (♂). First described ♀. Chili, "Felder Chile" (written, white disk), and two drawer labels "Puncta Hagen" and "Petalia Hagen"; with additional red Allotype label by M. A. L. — Neopetaliidae. Plate 7.
See de Selys, 1869b: 204.
Now *Neopetalia punctata* (Selys).
Type-species of *Petalia* Selys (op. cit., nom. praeocc.).
- pusilla** Lieftinck (subsp. of *Rhinocypha pagenstecheri* Foerster), 1953c: 136—137. Holotype ♂, Damar I. (Lesser Sunda Is.), labelled „Insel Dammer", collector unknown, ex coll. F. Förster. — Chlorocyphidae.
- pyroprocta** Lieftinck (*Notoneura*), 1960b: 122—126, fig. 7—12. Holotype ♂ and

first described ♀. Misool I. (off W. New Guinea), environs of Fakal, 0—50 m, 30.IX.1948, M. A. Lieftinck. — Protoneuridae.

quadristigma Lieftinck (*Prodasineura*), 1951a: 80—83, fig. 3, 4, 7, 8, 14—16. Holotype ♂ and first described ♀. S. E. Borneo, Kandangan distr., Ampah, 0—20 m, IV-V.1948, Liem Swie Liong. — Protoneuridae.

raineyi Williamson (*Telagrion*), 1915 (♂). First described ♀. Trinidad, Brasso, 8.II.1932, G. Belmontes. See Geijskes, 1932: 248—249. — Coenagrionidae.

ranatra Lieftinck (*Selysioneura*), 1949a: 78—80, fig. 82—83. Holotype ♂ and first described ♀. Central W. New Guinea, Sahuweri River valley, Araucaria Camp, 800 m, 2.IV.1939 (♂) and 2.III.1939 (♀), L. J. Toxopeus & J. Olthof (3rd Archbold Exped.). — Isostictidae.

ranauense Schmidt [subsp. of *Pseudagrion pruinosum* (Burm.)], 1934: 347—348, fig. 47b (♂ ♀ Sumatra). Lectotype ♂. S. W. Sumatra, Benkulen, Lake Ranau, I.1929 (Deutsch. limnol. Sunda-Exped. 1928—29). — Coenagrionidae.

Selected by E. Schmidt and in 1935 presented to author. A syntype ♂ is in the Brit. Mus. (N.H.) collection, see Kimmins, 1970: 191.

rangifera Lieftinck (*Notoneura*), 1949a: 70—71, fig. 77—79, 91—92. Holotype ♂ and allotype ♀ (in cop.). S. New Guinea, Digul River territ., Ederat near Aja Maru, II.1939, J. M. van Ravenswaay Claasen. — Protoneuridae.

rangifera Lieftinck (*Selysioneura*), 1959a: 290—291, 294, fig. 6, 25—27. Holotype ♂. Normanby I. (d'Entrecasteaux Archip.), Mt. Pabinama, 3 mi. E.N.E. of Cape Prevost, 820 m, 4.V.1956, L. J. Brass (5th Archbold Exped.) — Isostictidae.

rappardi Lieftinck (*Onychogomphus*), 1937b: 110—113, fig. 27—28. Holotype ♂. S. W. Sumatra, Benkulen prov., Redjang distr., Pagar Gunung, 550 m, "open stream", 12.XII.1936, F. W. Rappard. — Gomphidae.

raymondi Lieftinck (*Phyllothemis*), 1950a: 643—645, fig. 7—9. Holotype ♂. N. E. Sumatra, Deli, Serbalawan, Dolok Ilir Estate, 200 m, 17.V.1948, R. Straatman. — Libellulidae.

rectangulare Lieftinck (*Papuagrion*), 1937a: 27, 31—33, fig. 21. Holotype ♂ and first described ♀. N. New Guinea, Humboldt Bay area, southern slope of Mt. Cycloop, 1000 m, 23.IX.1934 (♂) and 17-23.IX.1935 (♀), W. Stüber. — Coenagrionidae.

resecta Lieftinck (*Coeliccia*), 1953e: 236—239, fig. 3. Holotype ♂. S.E. Borneo, Kutai, Balikpapan, Sungai Mentawir, sea-level, 6.X.1950, A. M. R. Wegner. — Platycnemididae.

reticulata Fraser (*Gynacantha*), 1926: 478—479. Holotype ♂. Kei Is., labelled "Kei Eiland, Gg. Daab, no. 142, 14.IV.1922, H. C. Siebers", with Fraser's identification and "Type" written on envelope. — Aeshnidae.

Syn. of *Agyrtacantha dirupta* (Karsch), see Lieftinck, 1930b: 166.

retrograda Lieftinck (subsp. of *Rhinocypha tincta* Rambur), 1938: 49—66, fig. 1, 4B-D, I, 5D. Holotype ♂ and first described ♀. W. New Guinea, Berau Peninsula (Vogelkop), N.E. coast, Manokwari, 23.V.1903 (♂) and 5.VIII.1903 (♀) (Nieuw Guinea Exped.), ♂ "R. tincta Rb.", det. R. Martin 1907, ♀ "R. tincta Rb.", det. H. W. van der Weele. — Chlorocyphidae.

rhapsia Lieftinck (*Selysioneura*), 1959a: 288—290, 293, fig. 2, 22—24. Holotype ♂. Normanby I. (d'Entrecasteaux Archip.), Mt. Pabinama, 3 mi. E.N.E. of Cape

- Prevost, 820 m, 10.V.1956, L. J. Brass (5th Archbold Exped.). — *Isostictidae*. Plate 1.
- reophila** Lieftinck (*Huonia*), 1935c: 271—274, fig. 34—35 (not 33!), 36A. Lectotype ♂ and first described ♀. N. Halmahera I. (N. Moluccas), Tobelo, VII-VIII. 1931, M. J. van Diejen. — *Libellulidae*.
- rhodosoma** Lieftinck (*Ischnura*), 1959b: 220—222, fig. 1, 4. Holotype ♂. W. New Guinea, Berau Peninsula (Vogelkop), Arfak Mts., Anggi Gita (lake), ca. 1800 m, 15-25.X.1948, A. J. Kostermans. — *Coenagrionidae*. Plate 2.
- richardi** Lieftinck (*Lanthanusa*), 1942: 494—497, pl. 27 fig. 40—41, 44. Holotype ♂ and first described ♀. Central N. New Guinea, Sahuweri River valley, Mist Camp, 1800 m, 14.I.1939 (♂) and 9.I.1939 (♀), L. J. Toxopeus (3rd Archbold Exped.). — *Libellulidae*.
- [**risi** van der Weele (*Lestes*), 1909: 23—24, fig. 1—2. Holotype (presumably lost; see Lieftinck, 1960c: 151—154, pl. & fig., with full information). First described ♀ (immature), S. New Guinea, labelled "Merauke" (pencil), "Lestes ♀ nova spec.!" (red ink, F. Ris' handwriting), "Lestes risi Weele, type" (H. W. van der Weele's writing). — *Lestidae*.
- The lost (and unique) ♂ is here considered to be the holotype, as it would seem unwise to designate the ♀ as the lectotype of *L. risi* Weele.
- Currently placed in the subgenus *Indolestes* Fraser, which has priority over *Tricholestes* Fraser, 1951 (nom. praeocc.) and *Esanlestes* Fraser, 1957, two generic names proposed subsequently for this aberrant species; see, however, Lieftinck, 1960c (op. cit.)].
- robusta** Fraser (*Drepanosticta*), 1926: 491—492. Lectotype ♀. Kei Islands, Gn. Daab, 1922, no. 149, H. C. Siebers, "Drepanosticta robusta ♀ Type", in Fraser's writing. One very immature ♂, same locality, no. 89, "Drepanosticta robusta sp.n.", also in Fraser's hand, but with additional red label "Cotype". — *Platystictidae*.
- rosenbergi** Brauer (*Tramea*), 1866 (♂). First described ♀. Sula Is. (S. Moluccas), Sula Mangole, Lampau, sea-level, IX.1939, S. Bloembergen. See Lieftinck, 1942: 523—524, 531—532, pl. 34 fig. 100. — *Libellulidae*.
- Now *Trapezostigma rosenbergi* (Brauer).
- rufipedum** Lieftinck (*Papuagrion*), 1937a: 26, 35—37, fig. 23—24. Holotype ♂. N. New Guinea, Humboldt Bay area, southern slope of Mt. Cycloop, 1000 m, 19.IX.1935, W. Stüber. — *Coenagrionidae*.
- rufithorax** Selys (*Telebasis*), 1877: 122—123. Lectotype ♂ and first described ♀. Obi I. (N. Moluccas), labelled "Bernstein ins. Obi" (written, white disk), ♀ with additional white label "3 Hagen" (written), under drawer label *Telebasis rufithorax* Selys. Selected by Lieftinck, 1947. — *Coenagrionidae*.
- Currently placed in *Teinobasis*.
- rufostigma** Selys (*Platysticta*), 1886b (♂). First described ♀. W. Borneo, env. of Singkawang, forest-brook near Andjungan, Mampawa Rd., 19.III.1932, L. Coomans de Ruiter. See Lieftinck, 1933a: 295—296 (♂ ♀). — *Platystictidae*.
- Now *Drepanosticta rufostigma* (Selys).
- sagitta** Lieftinck (subsp. of *Rhinocypha tincta* Ramb.), 1938: 66—67, fig. 1, 4 E-H, Q. Holotype ♂ and first described ♀. W. New Guinea, Berau Peninsula (Vogelkop, southern interior), Vengatap near Aja Maru, 500 m, XII.1937 (♂) and id., Jenau, 350 m, XII.1937 (♀), J. M. van Ravenswaay Claasen. — *Chlorocyphidae*.

sagittiferum Lieftinck (**Aciagrion**), 1949a: 200—201, fig. 243. Lectotype ♂. Tanimbar (Timorlaut) Is., Jamdena I., IV.1938, P. Buwalda. — Coenagrionidae. Plate 2.
First described ♀. E. Sumba (Lesser Sunda Is.), Rende Wai, 100 m, 14.VI.1949 (Sumba Exped. 1949, NMB, XII B 39).

Type-species of *Austroallagma* Lieftinck, 1953c: 157—163, fig.

salomonis Lieftinck (**Agriocnemis**), 1949b: 349—352, fig. 9. Lectotype ♂. Solomon Is., Ganonga I. (south of Vella Lavella I.), Koreovuka, 2.X.1936, R. A. Lever. — Coenagrionidae.

saltator Lieftinck (**Argiolestes**), 1956b: 65, 105—106, fig. 42—43. Holotype ♂. Papua, Maneau Range, N. slopes of Mt. Dayman, 1550 m, 9.VII.1953, G. M. Tate (4th Archbold Exped.). — Megapodagrionidae.

saltuarius Lieftinck (**Argiolestes**), 1956b: 71, 101—102, fig. 37—38. Holotype ♂. Papua, Port Moresby, 40 km inland, hill forest, Rona Falls, 275 m, 17.II.1936, coll. unknown. — Megapodagrionidae.

salva Ris (**Lyriothemis**), 1927: 37—38, fig. 24. Holotype ♂. Central Sumatra, Kerintji, Pantjuran Gading (Barisan Range), 1000 m, IX.1915, Edw. Jacobsen. Ex SMF no. 17628. — Libellulidae.

schmidtianum Lieftinck (**Pseudagrion**), 1936a: 122—124, 127, fig. 8—10. Lectotype ♂. S. Timor I., Amarasi, XII.1931-I.1932, Ed. Handschin. — Coenagrionidae.

scintillans Lieftinck (**Teinobasis**), 1932b: 580—582, fig. 61. Lectotype ♂ and first described ♀. N. New Guinea, Humboldt Bay area, Hollandia, XI-XII.1930 (♂) and VI-VII.1930 (♀), W. Stüber. — Coenagrionidae.

selysi Foerster (**Argiolestes**), 1899a (♂). First described ♀. N. New Guinea, Humboldt Bay area, Cycloop Mts., 1000 m, VI-X.1932, W. Stüber. See Lieftinck, 1935c: 208—211. — Megapodagrionidae.

Now *Podopteryx selysi* (Foerster).

[**semitincta** Selys (**Rhinocypha**), 1869a: 664—665 (20—21 sep.). The original specimens from "Gilolo" (Halmahera I., N. Moluccas) in the Leiden museum are no more in existence. Females examined by Hagen and de Selys are still represented in that collection from S. Halmahera, Batjan I. and Morotai I., leg. Bernstein. — Chlorocyphidae.]

Specimens of either sex, labelled by de Selys himself and originating from Elbor, Gilolo and Batjan (N. Moluccas), are in de Selys' collection (IRSN), so that any selection of a lectotype should, I think, be made from one of these. See also Lieftinck, 1938: 59—63, fig.

Currently placed as a subspecies of *R. tincta* Rambur.

serena Lieftinck (**Teinobasis**), 1932b: 582—585, fig. 62. Lectotype ♂ and first described ♀. N. New Guinea, Humboldt Bay area, Hollandia, XI-XII.1930, W. Stüber. — Coenagrionidae.

Now *T. serena serena* Lieft. (1949a).

sericea Selys (**Cordulia**), 1871 (♂). First described ♀. Surinam, Coppename River near Kroetoe Mt., bush creek, 23.XI.1943, D. C. Geijskes. See Geijskes, 1970: 16—18, fig. 3—4. — Corduliidae.

Now *Paracordulia sericea* (Selys).

siebersi Fraser (**Drepanosticta**), 1926: 490—491, fig. 6a. Holotype ♂ and "allotype ♀" (mutilated and in poor condition). E. Java, Mts. Tengger, 5000 ft., without

further particulars. Identification in F. C. Fraser's handwriting. — Platystictidae.

Bona species.

sieboldi Selys (*Cordulegaster*), 1854: 107. Lectotype ♀ (in fragments: most of thorax and abdomen missing). Japan, labelled "Burger, Japan" (written, white disk), under drawer label "Sieboldii Selys" (written). Since de Selys stated "Japon, Leide et Coll. Selys", this example was selected lectotype by M.A.L. in 1958. — *Cordulegasteridae*.

Currently known as *Anotogaster sieboldi* (Selys).

silaceum Lieftinck (*Pseudagrion*), 1932b: 568—570, fig. 54. Lectotype ♂ and first described ♀. N. New Guinea, Humboldt Bay area, Hollandia, IX.1930 (♂) and III.1931 (♀), W. Stüber. — *Coenagrionidae*.

silvarum Lieftinck (*Orthetrum*), 1934c: 267—269, fig. 3. Lectotype ♂. W. Java, Mt. Pangrango-Gedeh, forest above Tjisarua Est., 1300 m, 17.VII.1932, M. A. Lieftinck. — *Libellulidae*. Plate 6.

silvicola Lieftinck (*Notoneura*), 1949a: 72, fig. 71—73, 93. Holotype ♂. S.W. New Guinea, Etna Bay, sea-level, 24.XI.1939, H. Boschma (Le Roux Exped.). — *Protoneuridae*.

silvicola Lieftinck (*Huonia*), 1942: 489—492, fig. 1. Holotype ♂. W. New Guinea, Berau Peninsula (Vogelkop), Sungai Anakasi (westcoast of the "neck" of Vogelkop, 14.V.1941, E. Lundqvist (Negumij Exped.). — *Libellulidae*.

First described ♀. Misool I. (off W. New Guinea), Fakal, ca. 150 m, 5.X.1948, M. A. Lieftinck. See Lieftinck, 1953d: 192, fig. 11.

simalura Ris (subsp. of *Brachydiplax chalybea* Brauer), 1919: 1123 (♂). First described ♀. Engano I. (off S.W. Sumatra), Kiojoh, 21.V—12.VII.1936, J. K. de Jong. See Lieftinck, 1948b: 295—296. (Probably a distinct subspecies.) — *Libellulidae*.

simalurum Lieftinck [subsp. of *Pseudagrion pilidorsum* (Brauer)], 1948b: 289—290, fig. 5. Lectotype ♂. Simalur I. (off W. Sumatra), Sinabang, I.1913, E. Jacobson, coll. no. 3327. Described by Ris (1915a: 12—13) sub *P. pilidorsum* Brauer. — *Coenagrionidae*.

simplex Lieftinck (subsp. of *Mesogomphus reinwardti* Hagen & Selys), 1934b: 20, 23—27, fig. 3b, 4. Lectotype ♂. Sumatra mer., Benkulen, Banding Agung [Lake Ranau], 27.X.1929, "at lamp", C. G. G. J. van Steenis. — *Gomphidae*.

Now *Paragomphus simplex* (Lieftinck), but possibly synonymous with *P. capricornis* (Foerster), from Malaya.

simplex Lieftinck (*Argiolestes*), 1949a: 51—53, fig. 27, 38. Holotype ♂ and first described ♀. Central N. New Guinea, Idenburg River basin, above Bernhard Camp, 700—750 m, 19.III.1939, L. J. Toxopeus & J. Olthof (3rd Archbold Exped.). — *Megapodagrionidae*.

simulata Belle (*Aphylla*), 1964a: 26—32, fig. 7—10; 34, fig. 12—14 (larva, supposition). Holotype ♂ and first described ♀. Surinam, upper Coropina River, Dauwdropkamp, 14.X.1956 (♂) and Upper Para River, 4.I.1959 (♀), J. Belle. — *Gomphidae*.

simulatrix Lieftinck (*Hylaeargia*), 1949a: 136—139, fig. 146, 160, 163—167, 168—170. Holotype ♂ and first described ♀. Central N. New Guinea, Sahuweri River basin, Sigi Camp, 1500 m, 15—28.II.1939, L. J. Toxopeus (3rd Archbold Exped.). — *Coenagrionidae*.

Type-species of *Hylaeargia* Lieftinck (op. cit.).

sinense Asahina (*Ceriagrion*), 1967: 311—313, 326, fig. 203—211. Holotype ♂. S.E.

China, West Tien-Mu-Shan, 9.VI.1935, H. Höne. — Coenagrionidae.

sinuatipennis Lieftinck (*Arrhenocnemis*), 1933d: 4—10, fig. 1—5. Holotype ♂. N. New Guinea, Humboldt Bay area, upper course of Korimé River, Ajjep, ca. 10 km S.W. of Lake Sentani, 165 m, XI—XII.1931, "Leib schwarz, Punkte grün. Brust blau, oben mit 2 grünen Streifen. Buckel schwarz" (living colours, W.S.), W. Stüber. First described ♀. N. New Guinea, Mamberamo River valley, Van Rees Hills, Batavia rapids (low country), III—IV.1940, J. P. K. van Eechoud. — Megapodagrionidae.

Type species of *Arrhenocnemis* Lieftinck (op. cit.).

Originally described in Platycnemididae but later transferred to Megapodagrionidae.

Family status still questionable.

sinuatus Fraser (*Burmagomphus*), 1933 (♀). First described ♂. Ceylon, C.P., Hara-gama, stream near Mailapitiya, 16—18.IX.1938, and banks of Mahaweliganga, 18.IX.1938, M. A. Lieftinck. See Lieftinck, 1940a: 104—110, fig. 7—9, pl. 1 fig. 3 (incl. larva). — Gomphidae.

Now *B. pyramidalis sinuatus* Fraser.

smedleyi Laidlaw (subsp. of *Amphicnemis louisae* Laidlaw), 1926: 232, fig. 3. Lectotype ♂ and first described ♀. Mentawai Archip., Siberut I., IX.1924 (♂), and 16.IX.1924 (♀), C. Boden Kloss & N. Smedley, ex coll. F. F. Laidlaw. — Coenagrionidae.

Now considered bona species.

snellemanni Albarda in Selys (*Micromerus*), 1879: 398—399 (52—53 sep.). Lectotype ♂. Central Sumatra, with written labels in Snelleman's hand: "Sumatra Exped. v[an] Soeng[ei] aboe n[aar] Moear[a] Lab.[oe] 3—13/10.1877" — "Micromerus Snellemanni Albarda ♂", in Albarda's writing. Ex coll. H. Albarda. — Chlorocyphidae.

First described ♀. N. Sumatra, Atjeh, Pendeng, 400 m, II.1937, A. Hoogerwerf (BM), see Laidlaw, 1950, Trans. R. Ent. Soc. Lond. 101: 276—277.

Currently known as *Libellago (Melanocypha) s. snellemanni* (Albarda).

See also *Micromerus sumatranus* Alb. and *Vestalis lugens* Alb.

snelleni Selys (*Rhyothemis*), 1878b: 293, 299 (♂ Celebes). Lectotype ♂. N. Celebes, labelled "Rosenberg, Celebes Ayer Pann" (print & written), "28 Hag. 65" (written on yellow), "Snelleni Selys" (written drawer-label). — Libellulidae.

For collector and locality notes of this and other species taken by Von Rosenberg, see Lieftinck (1942: 599).

Currently classified as a subspecies of *Rhyothemis phyllis* (Sulzer).

sollaarti Lieftinck (*Brachydiplax*), 1953e: 262—264, fig. 11 a-b. Holotype ♂. S. Sumatra, Lampong distr., Tandjong Karang, Bergen Estate, 50 m, 26.XII.1952, A. Sollaart. — Libellulidae.

spatulifera Lieftinck (*Drepanosticta*), 1929b: 112—114, fig. 4—6. Holotype ♂ and first described ♀. Java occ., prov. Banjumas, G. Slamet, Baturraden, 2500 ft., 15.IV.1928, F. C. Drescher. — Platystictidae.

spinicaudum Lieftinck (*Papuagrion*), 1937a: 27, 29—31, fig. 19. Holotype ♂. N. New Guinea, Humboldt Bay area, southern slope of Mt. Cycloop, 1000 m, 5.IV.1935, W. Stüber. — Coenagrionidae.

sponsus Lieftinck (*Argiolestes*), 1956b: 70, 86—87, fig. 18—19. Holotype ♂ and first described ♀. Central N. New Guinea, Idenburg River basin, Hill-forest Camp, between Araucaria Camp and Bernhard Camp B, ca. 700 m, 29.III.1939, L. J.

- Toxopeus* & J. Olthof (3rd Archbold Exped.). — Megapodagrionidae.
- starreanum* Lieftinck (*Pseudagrion*), 1949a: 181, fig. 173—174, 212. Lectotype ♂. W. New Guinea, Kowiai distr., Kaimana (southcoast), 17.XI.1941, J. J. van der Starre. — Coenagrionidae.
- starrei* Lieftinck (*Pornothemis*), 1948a: 270—274, fig. 17. Holotype ♂. E. Sumatra, Palembang, "on board steamer on Musi River, near Palembang", 25.II.1938, J. J. van der Starre. — Libellulidae.
- stenomantis* Lieftinck (*Selysioneura*), 1932b: 543, 549—551, fig. 44—46. Lectotype ♂ and first described ♀. N. New Guinea, Humboldt Bay area, Hollandia, IV—VI. 1931, "nur auf Bäume", W. Stüber. — Isostictidae.
- stenoptera* Lieftinck (*Gynacantha*), 1934c: 265—266, fig. 1. Holotype ♂. With old locality label: "Auctie v[an] Eyndh[oven] Java", in H. Albarda's handwriting. — Aeshnidae.
- stephanodera* Lieftinck (*Asthenocnemis*), 1949a: 90—91, fig. 96, 98, 100, 108—110. Holotype ♀. "Nelle Guinée v. 5 cornes thorax" (red label in R. Martin's handwriting), ex Mus. Paris. — Platynemididae.
- N.B. — Erroneously labelled as from New Guinea! The specimen undoubtedly originates from the Philippine Islands, which is evident from a series of both sexes that have been taken in Palawan I. (P.I.) by members of the Danish "Noona Dan" Expedition (September 1961), the ♂ being still undescribed.
- Type-species of *Asthenocnemis* Lieft. (op. cit.).
- Family status doubtful.
- stigmatizans* Lieftinck (*Teinobasis*), 1938: 109—112, 113, fig. 42, 44. Holotype ♂ and first described ♀. N. New Guinea, Bewani-Wari Hills, Sawia, 200 m, X—XI. 1936, W. Stüber. — Coenagrionidae.
- stillacruoris* Lieftinck (*Paramecognemis*), 1956a: 254—258, fig. 5—7 (as *P. stillacruoris*). Holotype ♂. N.E. New Guinea, Upper Jimmi Valley, north slopes of Sepik-Waghi Divide (W. of Mt. Wilhelm), Tsenga, 1200 m, 13.VII.1955, J. L. Gressitt. — Platynemididae.
- [*strigata* Hagen in Selys (*Mnais*), 1853 (♂ ♀ Japon). First described ♀. Japan; destroyed? (not in ML). — Calopterygidae.
- Redescribed and fore wing figured by de Selys in the Monographie ("... une femelle du Musée de Leyde", 1854: 64—65, pl. 3 fig. 1).]
- strumidens* Lieftinck (*Idiocnemis*), 1958: 261—263, 282, fig. 12—16; 290—292, fig. 69, 74—76. Holotype ♂ and first described ♀. W. New Guinea, western extremity, Sorong, grassy trail near Malano, 30.IX.1948, M. A. Lieftinck. — Platynemididae.
- stueberi* Lieftinck (*Anacordulia*), 1938: 127—128, fig. 52 (as *A. stüberi*). Holotype ♀. N. New Guinea, Humboldt Bay area, Hollandia, 19.XII.1930. W. Stüber. — Corduliidae.
- First discussed and figured ♂. N. New Guinea, Bewani Hills, Wembi, 270 m, 18.XII.1937, W. Stüber.
- Currently considered as a synonym of *Metaphya tillyardi* Ris, 1913, and *Anacordulia maccullochi* Tillyard, 1926 (see Lieftinck, 1961b: 420—423, fig. 4—5, ♂).
- Now placed in *Metaphya* Laidlaw.
- stueberi* Lieftinck (*Papurgaria*), 1938: 101—105, fig. 36a, 37a, 38—39 (as *P. stüberi*). Holotype ♂ and first described ♀. N. New Guinea, southern Bewani Hills, upper

course of Tami River, 5 days' journey S.E. of Hollandia, 250 m, Fumb (Keerom?) River, 26.IV.1937, W. Stüber. — Coenagrionidae.

Type-species of *Papuargia* Lieftinck (op. cit.).

stueberi Lieftinck (*Ischnura*), 1932: 594—596, fig. 66 (as *I. stueberi*). Lectotype ♂ and first described ♀. N. New Guinea, Humboldt Bay area, Hollandia, III.1931, W. Stüber. — Coenagrionidae.

suavis Lieftinck (*Teinobasis*), 1953e: 244—246, fig. 5. Holotype ♂ and first described ♀. S.E. Borneo, Kandangan distr., Ampah, 0—20 m, 7 km N.W., IV—V.1948 (♂) and same area, Ranamun, 21.V.1948, Liem Swie Liong. — Coenagrionidae.

subornatus Lieftinck (subsp. of *Argiolestes ornatus* Selys), 1935c: 218, 224—228, fig. 8b-d, 10. Lectotype ♂ and allotype ♀ (in cop.). N. New Guinea, Humboldt Bay area, Kressi, 120 km south, 300 m, I.1932, W. Stüber. — Megapodagrionidae.

Currently considered a distinct species (see Lieftinck, 1949a: 46, and 1956b: 88—89, fig. 23).

suensoni Lieftinck (*Gomphus*), 1939b: 285, 294—297, fig. 11—12. Holotype ♂ and first described ♀. Central E. China, South Shensi, 13.VII.1936, E. Suenson. — Gomphidae.

Now transferred to genus *Sinogomphus* May.

sufficiens Lieftinck (subsp. of *Idiocnemis zebrina* (Lieft.)), 1958: 274, fig. 38—42. Holotype ♂ and first described ♀. Fergusson I. (d'Entrecasteaux Archip.), mountains between Agamoia and Ailuluai, S.-coast, 900 m, 14.VI.1956, L. J. Brass (5th Archbold Exped.). — Platycnemididae.

sufficiens Lieftinck (*Lanthanusa*), 1955b: 157—160, fig. 1—4. Holotype ♂ and first described ♀. Goodenough I. (d'Entrecasteaux Archip.), 1600 m Camp, east slopes, 11—12.X.1953, K. M. Wynn & L. J. Brass (4th Archbold Exped.). — Libellulidae.

sufficiens Lieftinck (*Rhyacocnemis*), 1956a: 250—254, fig. 1—4. Holotype ♂. Goodenough I. (d'Entrecasteaux Archip.), 1600 m Camp, east slopes, 12.X.1953, K. M. Wynn & L. J. Brass (4th Archbold Exped.). — Platycnemididae.

Type-species of *Rhyacocnemis* Lieftinck (op. cit.).

sumatrana Lieftinck (*Oligoaeschna*), 1953e: 253—255, fig. 8. Holotype ♂. W. Sumatra, Mt. Kerintji (Peak of Indrapura), Kaju Aro Est., 1600 m, 30.X.1952, R. Straatman. — Aeshnidae.

sumatranus Albarda in Selys (*Micromerus*), 1879: 397—398 (51—52 sep.). Lectotype ♂ and first described ♀. Central Sumatra, with written labels in Snelleman's hand: "Sumatra Exped./Silago tot 12/7.77" (♂), and "Moeara laboe tot 28.11.77" (♀); with "Micromerus sumatranus Albarda" in Selys' writing. Ex coll. H. Albarda. — Chlorocyphidae.

Now *Libellago sumatrana* (Albarda).

See also *Micromerus snellemani* Alb. and *Vestalis lugens* Alb.

sundana Lieftinck (subsp. of *Epophthalmia vittata* Burm.), 1931: 30, 38, 45, 61—64, pl. 1 fig. 3, fig. 1, 8, 16. Holotype ♂ and first described ♀, W. Java, Bogor (Buitenzorg), 250 m, Botanic garden, 21.III and 3.X.1930, respectively, M. A. Lieftinck. — Corduliidae.

sundana Krueger (*Platysticta*), 1898 (♂). First described ♀. West, Central and East Java, various locs., no dates selected. See Lieftinck, 1934d: 470—471. — Platystictidae.

Now *Drepanosticta sundana* (Krueger).

[*superba* Selys (*Telebasis*), 1877: 114—115. Originally described after males and females from "Célèbes, Menado (Musée de Leyde); Moluques, par M. Lorquin (Coll. Sélys)". The name is Hagen's (see de Selys: "Agrion superbum Hag., Mus. de Leyde", op. cit.: 114), but was validated by de Selys. At present old-time examples of *T. superba* in the Leiden museum are labelled "Halmahera [leg.] Bernstein", sub nom. *Agrion nobile* Hagen, in H. A. Hagen's handwriting, the individuals from Celebes being probably destroyed. Hence one of the specimens labelled "Moluques, Lorquin", in de Selys' collection (IRSN) should be designated lectotype. — Coenagrionidae.

Currently placed in *Teinobasis*.]

superstes Foerster (*Bironides*), 1903 (♂). First described ♀. E. Papua, Peria Creek, Kwagira River, 50 m (Camp 7, 4th Archbold Exped.), 25.VIII.1953, G. M. Tate. See Lieftinck, 1963c: 758—759. — Libellulidae.

surinamensis Geijskes (*Micrathyria*), 1963: 71—74, fig. 15. Holotype ♂. Surinam, near Sectie O, 11.V.1949, D. C. Geijskes. First described ♀. Surinam, Sipaliwini savanna, pool in forest near airstrip, 12.II.1961, D. C. Geijskes. — Libellulidae.

sylvia Lieftinck (*Procordulia*), 1935c: 295, 298—300, fig. 50. Holotype ♂ and first described ♀ (immature). N. New Guinea, Humboldt Bay area, Cycloop Mts., ca. 1000 m, 12.IX.1932 (♂) and 19.V.1932 (♀), W. Stüber. — Corduliidae.

tachyerges Lieftinck (*Mesogomphus*), 1934b: 19, 30—33, fig. 3, 6. Lectotype ♂. E. Sumba I. (Lesser Sunda Is.), Kananggar, 700 m, Waidjelo River, V.1925, K. W. Dammerman. — Gomphidae. Plate 5.

First described ♀. W. Sumba I., Waimangura, 436 m, 19.VIII.1949 (Sumba Exped. 1949, NMB), see Lieftinck, 1953c.

Currently known as *Paragomphus tachyerges* (Lieft.).

tansiptera Lieftinck (*Palaiargia*), 1953e: 239—240, fig. 4. Holotype ♂. Halmahera I. (N. Moluccas), Mt. Sembilan, 600 m, 4.X.1951, Sundanese collectors. — Coenagrionidae.

tarafia Lieftinck [subsp. of *Nesoxenia mysis* (Selys)], 1942: 462, 464—465, pl. 24 fig. 17, pl. 41 fig. 164. Lectotype ♂ and first described ♀. N. New Guinea, ca. 150 km W. of Humboldt Bay (Hollandia), Dempta Hills, Tarafia, 600 m, 10.V.1935, W. Stüber. — Libellulidae.

Probably bona species.

tenebricosa Lieftinck (*Prodasineura*), 1937b: 82—84, fig. 15. Holotype ♂ and first described ♀. W. Borneo, Singkawang, forest brook near Bengkajang, 15.VI.1933 (♂) and same area, Raja river near Montrado, 22.X.1931 (♀), L. Coomans de Ruiter. — Protoneuridae.

tenella Lieftinck (*Drepanosticta*), 1935b: 7, fig. 1. Lectotype ♂ and first described ♀. S. Sumatra, S. Lampong prov., Gisting and environs, foot of Mt. Tanggamus, 4—600 m, 25—30.XII.1934, M. A. Lieftinck. — Platystictidae.

tenella Lieftinck (*Archibasis*), 1949a: 184, 186, 188, fig. 235—236. Holotype ♂. W. Borneo, Singkawang, forest-brook near Bengkajang, 15.VI.1933, L. Coomans de Ruiter. First described ♀. E. Borneo, Kutai, Sangkulirang, VI.1937, M. E. Walsh. — Coenagrionidae.

tenera Lieftinck (*Hemicordulia*), 1930b: 157—159, fig. 22. Holotype ♂. Central Java, prov. Banjumas, G. Slammat, Baturraden, 760 m, 14.II.1929, native coll., F. C. Drescher. — Corduliidae.

- renuispinus** Lieftinck (*Argiolestes*), 1938: 73—75, fig. 9, 10a, 11. Holotype ♂ and first described ♀. S.E. New Guinea, Astrolabe Range, Moroka, 1300 m, IX.1893 (♂) and 27.VII.1893 (♀), Lamberto Loria, ex MCG. — Megapodagrionidae.
- terpsichore** Foerster (*Macromia*), 1900 (♂). First described ♀. N. New Guinea, Humboldt Bay area, Hollandia, V.1930, W. Stüber. See Lieftinck, 1942: 562—563. — Corduliidae.
- teuchestes** Lieftinck (*Bironides*), 1933d: 30, 33, fig. 18, 19—22. Lectotype ♂ and first described ♀. N. New Guinea, Humboldt Bay area, Hollandia, IV—VI.1931 (♂), and same area, 400 m, IX.1930 (♀), W. Stüber. — Libellulidae. Plate 6.
- thais** Lieftinck (*Huonia*), 1953d: 189, 208—216, fig. 10C, 19—23. Holotype ♂ and first described ♀. Misool I. (off W. New Guinea), Kasim River, 100—150 m, 12.IX.1948 (♂) and 17.IX.1948 (♀), M. A. Lieftinck. — Libellulidae.
- thalassina** Lieftinck (*Notoneura*), 1949a: 74—76, fig. 94—95. Holotype ♂ and first described ♀. S. New Guinea, Digul River territ., Ederat near Aja Maru, II.1939, J. M. van Ravenswaay Claasen. — Protoneuridae.
- thalia** Lieftinck (*Selysioneura*), 1953b: 642—646, fig. 1, 5, 9, 12. Holotype ♂ and first described ♀. Halmahera I. (N. Moluccas), Mumar River, 200—300 m, 25.IX.1951, Sundanese collectors. — Isostictidae. Plate 1.
- thisbe** Lieftinck (*Huonia*), 1953d: 188, 200—203, fig. 16, 19, 20. Holotype ♂. Misool I. (off W. New Guinea), Fakal, ca. 150 m, 23.IX.1948, M. A. Lieftinck. — Libellulidae.
- tillyardi** Lieftinck (subsp. of *Tramea loewi* Brauer), 1942: 527—530, pl. 33 fig. 97, pl. 34 fig. 103. Holotype ♂ and first described ♀. N.E. Australia, N. Queensland, Redlynch, 4.IX.1938 (♂) and Kuranda, 12.VIII.1938 (♀), R. G. Wind. — Libellulidae.
- Falls within the range of variation of *Trapezostigma loewi* (Brauer), see Lieftinck, 1962: 91. Hence synonymous with that species.
- titschacki** Schmidt (*Gomphoides*), 1952 (♂). First described ♀. Perú, Rio Rondos (Huallaga River area), X.1962—II.1963 (♂ ♀), L. Gómez Alonso. See Belle, 1970: 100—102, fig. 154—155. — Gomphidae.
- Now *Phyllocycla titschacki* (Schmidt).
- tonsillare** Lieftinck (*Aciagrion*), 1937a: 49—51, fig. 34—35. Lectotype ♂ and allotype ♀ (in cop.). N. New Guinea, Humboldt Bay area, upper course of Korimé River, Mameda (W. of Lake Sentani), 200—300 m, XII.1934. W. Stüber. — Coenagrionidae.
- toxopei** Lieftinck (*Hemicordulia*), 1926: 281—284, fig. 1—4. Holotype ♀. Buru I. (S. Moluccas), Leksula, 25.XII.1921, L. J. Toxopeus. — First described ♂. Buru I., Kunturun, 9.VII.1921, same collector (Lieftinck, 1930a: 314—315, fig. 3). — Corduliidae.
- tristis** Lieftinck (*Argiolestes*), 1935c: 218, 229—231, fig. 13. Lectotype ♂ and allotype ♀ (in cop.). N. New Guinea, Humboldt Bay area, Cycloop Mts., southern slopes, 1000 m, 26.IV.1932, W. Stüber. — Megapodagrionidae.
- truncatum** Lieftinck (*Xiphiagrion*), 1949a: 197—199, fig. 238. Holotype ♂ and first described ♀. N. New Guinea, Humboldt Bay area, southern Bewani Hills, upper reaches of Tami River, 300—500 m, Sawia, X—XI.1936, W. Stüber. — Coenagrionidae.
- tumidula** Lieftinck (*Agyrtacantha*), 1937a: 63—65, fig. 39c, 40. Lectotype ♂ and

- first described ♀. N. New Guinea, Humboldt Bay area, southern slope of Mt. Cycloop, 700 m, IX.1933, W. Stüber. — Aeshnidae.
- umbratilis** Lieftinck (*Selysioneura*), 1932b: 543, 551, 602, fig. 47. Lectotype ♀. N. New Guinea, Humboldt Bay area, Hollandia, IV—VI.1931, W. Stüber. First described ♂, same area, Hollandia, 1.II.1932, W. Stüber (see Lieftinck, 1949a: 81—82, fig. 84). — Isostictidae.
- undulatus** Needham (*Gomphoides*), 1944 (♂). First described ♀. Surinam, Coropina Creek, upper part, near Zanderij, 30.IV.1951, D. C. Geijskes. See Geijskes, 1964: 40—41, fig. 18—19. — Gomphidae.
- uropetala** Lieftinck (*Oligoaeschna*), 1968a: 149, 152, 171—174, fig. 6—7. Holotype ♂ and first described ♀. N.E. Sumatra, Deli, Laut Tador, 90 m, 10.IV.1949 (♂) and 12.V.1948 (♀), R. Straatman. — Aeshnidae.
- vanderweelei** Martin (*Heliaeschna*), 1907b: 222—223 (sub *H. van der Weelei*). Holotype ♂. With erroneous locality label: "Sala Bendo, Liberia Büttikofer", written on white disk, "Heliaeschna Van der Weelei Martin ♂" in R. Martin's writing, and "limpida Sél" in pencil (unknown hand). Ex Mus. Paris. — Aeshnidae.
Syn. of *Heliaeschna simplicia* Karsch. See also Lieftinck, 1940b: 389.
- venatrix** Lieftinck (*Plattycantha*), 1937a: 73—75, fig. 43, 45. Lectotype ♂. N. New Guinea, Humboldt Bay area, southern slopes of Mt. Cycloop, 1000 m, IX.1932, W. Stüber. — Aeshnidae.
- venilia** Lieftinck (*Selysioneura*), 1953b: 651—654, 658, fig. 4, 14. Holotype ♀. W. New Guinea, Berau Peninsula (Vogelkop), Beraur distr., Klamono Oilfields, 40 km inland, 40—50 m, 23—24.VIII.1948, M. A. Lieftinck. — Isostictidae. Plate 1.
- venusta** Lieftinck (*Oligoaeschna*), 1968a: 147, 168, fig. 6 & pl. 13. Holotype ♂. E. Borneo, Kutai, Tabang, Bengen River, 125 m, 9.IX.1956, A. M. R. Wegner. — Aeshnidae.
- viduata** Lieftinck (subsp. of *Ischnura aurora* Brauer), 1949a: 222—223, fig. 275. Holotype ♂ and first described ♀. Central W. New Guinea, Baliem River valley, environs of Baliem R. Camp, 1700 m, 15.XI.1938, L. J. Toxopeus (3rd Archbold Exped.). — Coenagrionidae. Plate 2.
- viduatum** Lieftinck [subsp. of *Orthetrum sabina* (Drury)], 1942: 475—478, pl. 25 fig. 33. Holotype ♂ and allotype ♀ (in cop.). Central W. New Guinea, Baliem River valley, 1600 m, 11.XII.1938, L. J. Toxopeus (3rd Archbold Exped.). — Libellulidae.
- viola** Lieftinck (*Archibasis*), 1948 (nom. nov., sine descr.); 1949a: 184, 186, 188—189, fig. 230, 234. Holotype ♂ and first described ♀. Karimondjawa Is. (Java Sea), Kali Todjero, P. Karimon, 28.XI.1930, M. A. Lieftinck. — Coenagrionidae.
- virgula** Lieftinck (*Selysioneura*), 1959a: 282—284, fig. 1, 10, 19—21. Holotype ♂. Woodlark I. (Murua I.), Kulumadau, 10.II.1957, W. W. Brandt. — Isostictidae. Plate 1.
- walshae** Lieftinck (*Acrogomphus*, sub *walshi*), 1935a: 203—205, fig. 13—15 (1937b: 118, footnote, nom. emend.). Holotype ♂. S.W. Sumatra, Benkulen distr., Muara Tenam, ca. 250 m, 16—23.VI.1925 (rect. 1935), M. E. Walsh. First described ♀. W. Java, Djampang Tengah (Bodjonglopang), Tjitalahab Estate, 650 m, 30.IV.1940, taken in cop., Mrs. C. Rosier. — Gomphidae. Plate 4.
- wayana** Geijskes (*Staurophlebia*), 1959: 151, 164—168, fig. 74, pl. 7b. Holotype ♂

- and first described ♀. Surinam, Loë Creek, Litani River, 20.VIII.1939, D. C. Geijskes. — Aeshnidae.
- wijaya** Lieftinck (*Microgomphus*), 1940a: 98—104, fig. 4—6 & pl. 1 fig. 4 (exuviae). Holotype ♂ (freshly emerged, with exuviae) and first described ♀ (immature). Ceylon, Central Prov., Haragama, tributary of Mahaweliganga River, near Mailapitiya, 500 m, 17—18.IX.1938, M. A. Lieftinck. Holotype ♂ preserved with exuviae in alcohol. — Gomphidae.
- williamsoni** Ris (*Dythemis*), 1919 (♂). First described ♀. Surinam, Upper Coropina Creek near Zanderij, 1.II.1958, J. Belle. See Geijskes, 1964: 45—47, fig. 17. — Libellulidae.
- williamsoni** Laidlaw (*Leptogomphus*), 1912 (♂). First described ♀. E. Borneo, Kutai, Sangkulirang distr., Dagaunan, VI.1937, M. E. Walsh. See Lieftinck, 1948a: 247—249, pl. 8 and fig. 10. — Gomphidae.
- xanthe** Ris (*Rhinocypha*), 1927: 7—9, fig. 2. Lectotype ♂ and first described ♀. N. Central Sumatra, foot of Kerintji Peak, Sungai Kumbang, 1400 m, VIII.1915, E. Jacobson, ♂ with coll. no. 88/09 (or 60/88). — Chlorocyphidae.
- xanthe** Lieftinck (*Notoneura*), 1938: 93, fig. 27—28. Holotype ♂. Salawati I. (off western extremity of New Guinea), [H. A.] Bernstein leg. — Protoneuridae.
- xanthocyane** Lieftinck (*Oreagrion*), 1949a: 216—220, fig. 246, 252—253, 256—257, 268, 273—274. Holotype ♂ and first described ♀. Central N. New Guinea, Snow Mountain (Nassau) Range, peat bog swamps in moss forest, N. of Lake Habbema, 3000 m, 24.VIII.1938, L. J. Toxopeus (3rd Archbold Exped.). — Coenagrionidae. Plate 3.
- xanthocyanus** Selys (*Micromerus*), 1869a: 666 (22 sep.). Lectotype ♂. [N. Celebes], labelled "Rosenberg, Limbotto, Celebes" (written), and "Micromerus xanthocyanus Selys", in de Selys' handwriting. For particulars concerning the collector, his localities and dates of capture, see Lieftinck, 1942: 599.
Now *Libellago xanthocyanus* (Selys).
- zebrina** Lieftinck (*Idiocnemis*), 1958: 272—274, 283, fig. 33—37. Holotype ♂ and first described ♀. Papua, North-Eastern Prov., Cape Vogel Peninsula, Menapi, up to 150 m, 9.IV.1953, G. M. Tate (4th Archbold Exped.). — Platynemididae.

IV. ANNOTATED LIST OF TYPE-SPECIMENS IN FOREIGN
INSTITUTIONAL COLLECTIONS DESCRIBED BY DUTCH AUTHORS

N.B. — The following symbols (bracketed in the next list) have been used to indicate the whereabouts of type-specimens of species-group taxa belonging to this category:

- AMNH — American Museum of Natural History, New York
 BISH — Bernice P. Bishop Museum, Honolulu
 BM — British Museum (Natural History), London
 CAS — Science Museum, California Academy of Sciences, San Francisco
 CNHM — Chicago Natural History Museum, Chicago
 CUI — Department of Entomology, Cornell University, Ithaca
 IRSN — Institut Royal des Sciences Naturelles, Bruxelles
 KU — Entomological Laboratory, Kyushu University, Fukuoka
 MAT — Koninklijk Museum voor Midden-Afrika, Tervuren
 MBUD — Természettudományi Múzeum Allattára, Budapest
 MC — Zoologisk Institut & Museum (Universitetets Zoologiske Museum), Copenhagen
 MKB — Zoologisches Forschungsinstitut u. Museum Alexander Koenig, Bonn
 ML — Rijksmuseum van Natuurlijke Historie, Leiden
 MNB — Museum für Naturkunde an der Humboldt-Universität, Berlin
 MP — Muséum National d'Histoire Naturelle, Paris
 NMB — Naturhistorisches Museum, Basel
 NRS — Naturhistoriska Riksmuseet, Stockholm
 ROMT — Royal Ontario Museum, Toronto
 RSM — Royal Scottish Museum, Edinburgh
 SMF — Natur-Museum Senckenberg, Frankfurt a.M.
 UMMZ — Museum of Zoology, University of Michigan, Ann Arbor
 USNM — United States National Museum (now National Museum of Natural History, Washington, D.C.)
 ZIUL — Zoological Institute, University, Lund
 ZMA — Instituut voor taxonomische Zoölogie, Amsterdam
 ZMH — Zoologisches Staatsinstitut und Zoologisches Museum, Hamburg

aconita Lieftinck (*Trithemis*), 1969c: 40—44, fig. 7C. Holotype ♂. Congo, Katanga, Lower Luapula Region, Kisamamba, S. of Kasenga, Mululushi River, at bridge on Kasenga-Kialwe road, 950 m, 3.IV.1961, J. J. Symoens, no. 8504 (MAT). — Libellulidae.

aequalis Lieftinck (*Trithemis*), 1969c: 44—45, fig. 7A. Holotype ♂ and first described ♀. N.E. Zambia, Lake Bangweulu Region, 2 km from Ndoba, 1150 m, 30.XII.1961 (♂) and Mundubi, W.-shore of Lake Chifunabuli, 1140 m, 30.XII.1961 (♀), J. J. Symoens, nos. 9134 (♂) and 9149 (♀) (MAT). — Libellulidae.

aerides Lieftinck (*Teinobasis*), 1962: 20, 34—36, fig. 10a-c. Holotype ♂. E. Caroline Is. (Micronesia), Ponape I., Mt. Pairot, 660 m, IV—IX.1950, Adams (USNM, 65142). — Coenagrionidae.

- alcathoe** Lieftinck (*Gynacantha*), 1961a: 145—148, fig. 44, 51, 52. Holotype ♂. Philippine Is., Mindanao I., Davao Prov., Tagum, Madaum, sea-level, 10.X.1946, F. G. Werner (CNHM). — Aeshnidae.
- anderi** Lieftinck (*Anisogomphus*), 1948d: 59—63, fig. 1—2. Holotype ♂. China, prov. Hunan, Tien-Chao-Shan, ca. 1200 m, 31.VIII.1938, G. Österlin (ZIUL). — Gomphidae.
- annulosum** Lieftinck (*Ceriagrion*), 1934a: 11—12, fig. 4. Holotype ♂. Java, with pin-label: Java Fr[uhstorfer] 61 (yellow square), and *Pseudagrion annulosum* Selys, n.sp. Java (written drawer label, both in de Selys' writing) (IRSN). — Coenagrionidae.
- First described ♀. S.W. Java, Sempurtjondong, Tjidaun, 8.XI.1935, M. Bartels Jr. (see Asahina, 1967: 263—265, 323, fig. 13).
- arboreus** Lieftinck (*Burmagomphus*), 1940a: 111, 112. Lectotype ♂. Burma, R. A. Earnshaw; with several identification labels (UMMZ). Selected by Lieftinck, 1964. — Gomphidae.
- Nom. nov. pro *Burmagomphus vermiculatus* (rect. *vermicularis*!) Williamson, nec R. Martin, from Burma, i.e. the above specimen (see Williamson, 1907, Proc. U.S. Nat. Mus. 33: 301—303, fig.). Also for *Burmagomphus williamsoni* Fraser, 1926, nec *B. vermicularis williamsoni* Foerster, 1914. For further particulars, see Lieftinck, 1940a: 111, and 1964b: 15, 17—22, fig.
- ariel** Lieftinck (*Teinobasis*), 1962: 20, 31—34, fig. 8—9. Holotype ♂ and first described ♀. E. Caroline Is. (Micronesia), Ponape I., Agric. Exper. Sta., VI—IX. 1950, Adams (♂, USNM 65141). No selection of allotypic ♀. — Coenagrionidae.
- arsinoe** Lieftinck (*Diplacina*), 1953d: 156, 171—173, fig. 5—6. Holotype ♂. Papua, Kokoda, 1200 ft., VIII.1933, L. E. Cheesman (BM). See Kimmins, 1968: 281. — Libellulidae.
- aruanus** Lieftinck (*Lestes* sg. *Indolestes*), 1951b: 8—9, fig. 4. Holotype ♂ (head wanting). Aru Is., L. albicauda McLachlan, det. R. MacLachlan (BM). See Kimmins, 1970: 194. — Lestidae.
- asahinai** Lieftinck (*Macromidia*), 1971b: 21. Nom. nov. pro *Idionyx philippa*, Asahina, 1968 (♂ Palawan), nec Ris, 1912c (♀ Mindoro, P.I.). Holotype ♂. Palawan I., 5—8 mi. E. of Tarumpitao, Pf., 28.V.1958, H.E.M. (see Asahina, 1968: 357—358, fig. 5—10, pl. 2 fig. 11) (BISH). — Corduliidae.
- atrocyana** Lieftinck (*Notoneura*), 1960b: 117—120, fig. 1—5. Holotype ♂ and first described ♀. Waigeu I. (off N.W. New Guinea), Camp Nok (Mt. Buffelhoorn), 2500 ft., IV.1938, L. E. Cheesman (BM). See Kimmins, 1970: 176. — Protoneuridae.
- atropa** Lieftinck (*Vestalis*), 1965b: 337, 351—353, fig. 4, 8. Holotype ♂. N.W. Borneo, Sarawak, Mt. Dulit Trail, 10.VIII.1932/Primitive forest/Oxford Univ. Exped. (BM). See Kimmins, 1969: 304. — Calopterygidae.
- aurantipes** Lieftinck (*Platycnemis*), 1965c: 248—250, fig. 10. Holotype ♂ and first described ♀. Madagascar, Prov. Tamatave, Périnet, 25.IX.1958, F. Keiser et al. (NMB). — Platycnemididae.
- austrosundanum** Lieftinck (*Orthetrum*), 1953c: 208—210, fig. 72. Holotype ♂ and first described ♀. Sumba I. (Lesser Sunda Is.), Waimangura, ca. 430 m, Wulu Mano, 20.VIII.1949 (Sumba Exped. 1949, NMB XII C 302). — Libellulidae.
- bellax** Lieftinck (*Lestes* sg. *Indolestes*), 1953c: 145—148, fig. 4—5. Holotype ♂

- and first described ♀. Sumba I. (Lesser Sunda Is.), E. Sumba, Rende Wai, 100 m, 11—16.VI.1949 (Sumba Exped. 1949, NMB, XII B 37). — Lestidae.
- berlandi** Lieftinck (*Drepanosticta*), 1939a: 145—147, fig. 1. Holotype ♂. Lombok I. (Lesser Sunda Is.), Sapit, 2000 ft., IV.1896, H. Fruhstorfer (MP). — Platystictidae.
- berlandi** Lieftinck (*Macromia*), 1941a: 94—98, fig. 1—2. Holotype ♂. Indochina, labelled: "Tonkin, monts Mauson, Avril-Mai, 2—3.000, H. Frühstorfer", and "M. borneensis", by R. Martin (MP). See also Martin, 1907a: 69, fig. A (base of hind wing ♂ holotype, sub *M. borneensis* Krüger, misidentified). — Corduliidae.
- bigemmata** Lieftinck (*Elattonera*), 1971a: 194—198, fig. 6. Holotype ♂. Ceylon, Western Prov., Labugama, 24 mi. E.S.E. of Colombo, loc. 17, 9.III.1962, A. Perera, Lund Univ. Ceylon Exped. 1962 (ZIUL). — Protoneuridae.
- bivittata** Lieftinck (*Protosticta*), 1939a: 151—154, fig. 4. Holotype ♂. Celebes, labelled "Célèbes/Protosticta simplicinervis?? nov. sp.", in R. Martin's handwriting (MP). First described ♀. S. Celebes, Bonthain, C. Ribbe, 1884 (ML).
- blandulus** Lieftinck (*Heliogomphus*), 1929b: 123—125, fig. 14—16. Holotype ♂. Equat. [W.] Borneo, basin of Kapuas River, "Sumpfwald am Bika Fluss", 4.II.1925, leg. Prof. H. Winkler (ZMH). — Gomphidae.
- boharti** Lieftinck (*Tapeinothemis*), 1950a: 638—642, fig. 5—6. Holotype ♀. Solomon Is., Little Florida I., 15-31.III.1945, G. E. Bohart (USNM). — Libellulidae.
- Type-species of *Tapeinothemis* Lieftinck (op. cit.).
- brincki** Lieftinck (*Drepanosticta*), 1917a: 191—192, fig. 2a-c. Holotype ♂ and first described ♀ (subadult). Ceylon, Prov. Sabaragamuwa, Deerwood, Kuruwita, 6 mi. N.N.W. of Ratnapura, loc. 90 III, 21.II.1962, in ravine, Lund Univ. Ceylon Exped. 1962 (ZIUL). — Platystictidae.
- burmana** Lieftinck (*Gynacantha*), 1960a: 248—251, fig. 11a-b. Holotype ♂. Burma, labelled in de Selys' writing: "Palone, 16.IX.89" and "Gynac. bayadera S. ♂", with additional labels from R. Martin (IRSN). — Aeshnidae.
- caesarea** Lieftinck (*Gomphidia*), 1929b: 139—143, fig. 31—32. Holotype ♂. Central W. Borneo, Lebang Hara, 25.XI-5.XII.1924, Prof. H. Winkler leg. (ZMH). — Gomphidae.
- calliope** Lieftinck (*Gynacantha*), 1953e: 260—262, fig. 10. Holotype ♂. Waigeu I., off N. W. New Guinea, Camp Nok, 2500 ft., IV.1938, L. E. Cheesman (BM). See Kimmins, 1969: 301. — Aeshnidae.
- callirrhoe** Lieftinck (*Diplacina*), 1953d: 156, 169—171, fig. 5—6. Holotype ♂. W. New Guinea, Berau Peninsula (Vogelkop), Karoon, labelled "N. Guinée Laglaize" and "Diplacina smaragdina S. ♂" (lilac labels in de Selys' handwriting) and additional pin-labels "D. smaragdina det. F. Ris" (IRSN). — Libellulidae.
- N.B. — The ♂ and ♀ in de Selys' collection, with the same locality labels and selected by F. Ris and myself as the types of true *D. smaragdina* Selys, are lectotype and allotype, respectively, of that species; these also are deposited in the Brussels museum (see lieftinck, op cit.: 173—174).
- cardinalis** Lieftinck (*Agrionoptera*), 1962: 72, 74, fig. 20b, 21f, 22g, h. Holotype ♂ and first described ♀. W. Caroline Is. (Micronesia), Palau Is., Babelthup I., Ulimang, XII. 1947, Dybas (♂ USNM 65145, ♀ USNM). — Libellulidae.
- carolinensis** Lieftinck (*Teinobasis*), 1962: 20, 23—24, fig. 5, 6, 10. Holotype ♂ and

first described ♀. E. Caroline Is. (Micronesia), Truk Is., Wena (Moen) I., Nantuka area (Mts. Chukumong and Tonaachau), 21.III.1949, Langford (♂ USNM 65137) and 25.III.1949, same coll. (♀ USNM). — Coenagrionidae.

castor Lieftinck (*Onychogomphus*), 1941b: 246—247, pl. 16 fig. 6, pl. 14 fig. 1—3. Holotype ♂. Malay Peninsula, Kelantan, Heyne vdt. 1903, ex coll. F. Förster (UMMZ). — Gomphidae.

ceylonicum Lieftinck (*Mortonagrion*), 1971a: 198—199, fig. 8. Holotype ♂. Ceylon, Northwest Prov., Kadaimparu, 15 mi. N. of Negombo, loc. 36, 3.I.1962, Lund Univ. Ceylon Exped. 1962 (ZIUL). — Coenagrionidae.

chrysochlora Lieftinck (*Hemicordulia*), 1953c: 188—191, fig. 54—57. Holotype ♂. Sumba I. (Lesser Sunda Is.), Central Sumba, Langgalirü, 400—600 m, 4-15.X.1949 (Sumba Exped. 1949, NMB, XII C 230). — First described ♀. W. Sumba I., Waimangura, 436 m, 12-26.VIII.1949 (id., same coll.-no.). — Corduliidae.

coartans Lieftinck (*Argiolestes*), 1956b: 69, 81—84, fig. 10, 14—15. Holotype ♂ and first described ♀. Waigeu I., off N.W. New Guinea, Camp Nok, 2500 ft., IV.1938, L. E. Cheesman (BM). See Kimmins, 1970: 198. — Megapodagrionidae.

commutata Lieftinck (*Notoneura*), 1938: 90—91, fig. 23. Holotype ♂ and first described ♀. Bismarck Archip., New Britain, Herbertshöh, 1896 (♂) and Ralum (♀), F. Dahl (SMF); selected by Lieftinck, 1949b: 335. — Protoneuridae.

Nom. nov. pro *Caconeura exul*: Ris, 1900 (♂ ♀ New Britain, Herbertshöh), nec *Alloneura exul* Selys, 1886b.

cyrene Lieftinck (*Synthemis*), 1953a: 71, 74, 78—81, fig. 5—9. Holotype ♂ and first described ♀. N.E. New Guinea, Saiko, 5500—6000 ft., Buba River (Upper Waria River), IX-X.1936, F. Shaw-Mayer (BM). — Corduliidae.

See Kimmins, 1968: 296.

dajakanus Lieftinck (*Lestes* sg. *Indolestes*), 1948e: 3—6, fig. 2—3. Holotype ♂. N.W. Borneo, Sarawak Distr., E. Mjöberg (NRS). — Lestidae.

decorata Lieftinck (*Oligoaeschna*), 1968a: 146, 158—159, pl. 12 & tfig. 2. Holotype ♀. Assam, Shillong, 5000 ft., 5.V.1924, Crinoline Falls, T.B. Fletcher, ex coll. F. C. Fraser (BM). — Aeshnidae.

deminuta Lieftinck (*Diplacodes*), 1969c: 32—35, fig. 5a-d. Holotype ♂ and first described ♀. N.E. Zambia, Lake Bangweulu Region, Samfya, 1160 m, 13.I.1962 (♂) and id., “dembo” of Kasamba River, 1160 m, 17.IV.1963 (♀), J. J. Symoens, no. 9960 (♂) and 10296 (♀) (MAT). — Libellulidae.

dendrolagina Lieftinck (*Drepanosticta*), 1938: 83—84, 87, fig. 19c, 20. Lectotype ♂ and first described ♀. N.E. New Guinea, Astrolabe Bay, Sattelberg (Gegagalu), 900 m, Carl Wahnes 1899, various dates, ex coll. F. Foerster (UMMZ). — Platystictidae.

dentiplaga Lieftinck (subsp. of *Rhinocypha tinctoria* Ramb.), 1938: 69—70, fig. 1, 3A-C, 4N, 5F. Holotype ♂ and first described ♀. N.E. New Guinea, Huongolf, Hänishafen, Taimi Inseln, III.1900, Carl Wahnes (UMMZ). — Chlorocyphidae.

dione Lieftinck (*Macromia*), 1971b: 26—28, fig. 8—9. Holotype ♂. N.E. Sumatra, Deli/6594, L. Martin, with label “*Macromia?* westwoodi Selys” (unknown writing) (MNB). — Corduliidae.

discrepans Lieftinck (*Aethiothemis*), 1969c: 26—28, fig. 4. Holotype ♂ and first described ♀. Congo, Katanga, Lower Luapula Region, Kabiashia, Luanza River, 1000 m, 23.IV.1966, F. Malaisse, no. 4155 (MAT). — Libellulidae.

- dolabrata** Lieftinck (*Teinobasis*), 1938: 114—116, fig. 47. Holotype ♂ and allotype ♀ (in cop.). N.E. New Guinea, Huongolf, Hänischhafen, Taimi Ins., III.1900, Carl Wahnes; nos. 2239 and 2240 of F. Förster's collection (UMMZ). — Coenagrionidae.
- donaldi** Lieftinck (*Lanthanusa*), 1955b: 161—164, fig. 5—6. Holotype ♂ and first described ♀. N.E. New Guinea, Saiko, 5500—6000 ft., Buba River (Upper Waria River), IX-X.1936, D. Shaw-Mayer (BM). See Kimmins, 1968: 284. — Libellulidae.
- ducatrix** Lieftinck (*Devadatta*), 1969a: 205—207, fig. 1—2. Holotype ♂. Tonkin, Than Moi, VI-VII, H. Fruhstorfer, with yellow label "Heptaneura natator Martin Type" (nom. nud.), in R. Martin's handwriting (MP). — Amphipterygidae.
- eduardi** Lieftinck (*Hemicordulia*), 1953c: 185—188, fig. 52—53. Holotype ♂. W. Sumba I. (Lesser Sunda Is.), Rara, 340 m, near Korokangali, 7.VIII.1949, A. M. R. Wegner (Sumba Exped. 1949, NMB XII C 229). — Corduliidae.
- elisabethae** Lieftinck (*Nesolestes*), 1965c: 243—244, fig. 7. Holotype ♂. Madagascar, Prov. Diégo-Suarez, Montagne d'Ambre, 24.V.1958, F. Keiser et al. (NMB). — Megapodagrionidae.
- elisabethae** Lieftinck (*Zygonyx*), 1963b: 56—58, fig. 4—6. Holotype ♂ and first described ♀. Madagascar, Prov. Diégo-Suarez, Montagne d'Ambre, 21.V.1958 (♂) and 23.V.1958 (♀), F. Keiser et al. (NMB). — Libellulidae.
- ephippiatus** Lieftinck (*Argiolestes*), 1956b: 72, 97—98, fig. 35—36. Holotype ♂. N.E. New Guinea, Kokoda, 1200 ft., IX.1933, L. E. Cheesman (BM). See Kimmins, 1970: 197. — Megapodagrionidae.
- euphrosyne** Lieftinck (*Macromia*), 1952a: 439, 450—454, fig. 3, 7. Holotype ♂ and first described ♀. Waigeu I. (off N.W. New Guinea), Camp Nok (Mt. Buffelhorn), 2500 ft., IV.1938, L. E. Cheesman (BM). — Corduliidae.
- evelynae** Lieftinck (*Notoneura*), 1960b: 120—122, fig. 6. Holotype ♂. Waigeu I. (off N.W. New Guinea), Camp Nok (Mt. Buffelhorn), 2500 ft., IV.1938, L. E. Cheesman (BM). See Kimmins, 1970: 177. — Protoneuridae.
- evelynae** Lieftinck (*Synthemis*), 1953a: 71, 73, 81—84, fig. 10—11. Holotype ♂ (abdominal segments 6—10 and apps. missing) and first described ♀. Papua, Mafulu, 4000 ft., XII.1933, L. E. Cheesman (BM). See Kimmins, 1968: 296. — Corduliidae.
- exoleta** Lieftinck (*Coeliccia*), 1961a: 140—141, fig. 49. Holotype ♂. Philippine Is., Mindanao I., Davao Prov., E-slope of Mt. McKinley, 2500 ft., 7.IX.1946, F. G. Werner (CNHM). — Platynemidae.
- fickei* Foerster (*Protolestes*), 1899b (♀). First described ♂. N. Madagascar, Prov. Diégo-Suarez, Montagne d'Ambre, 24.V.1958, F. Keiser et al. (NMB & ML). See Lieftinck, 1965c: 244—246, fig. 9. — Megapodagrionidae.
- floresiana** Lieftinck (*Drepanosticta*), 1939a: 147—149, fig. 2. Holotype ♂ (head and prothorax missing). Flores I., labelled "Flores" in R. Martin's handwriting (MP). First described ♀, same label (ML). — Platystictidae.
- fontinalis** Lieftinck (*Drepanosticta*), 1937b: 64—67, fig. 5—6. Holotype ♂. Malay Peninsula. Two labels in F. Förster's handwriting: "Kelantan Ost Malacca Heine vdt. 1903/Platysticta quadrata kelantana n. rasse Förster" [nom. in litt.] (UMMZ). First described ♀. Malay Peninsula, Selangor, Templer Park, 12 mi. from Kuala Lumpur, forest seepage near Sungai Chui Tinggi, 21—23.III.1963 (♂ ♀), M. A. Lieftinck (ML). See Lieftinck, 1965a: 181—184. — Platystictidae.

- tortis** Lieftinck (*Teinobasis*), 1962: 20, 26—29, fig. 7. Holotype ♂ and first described ♀. E. Caroline Is. (Micronesia), Ponape I., Mt. Nahnalaud, VI-IX.1950, Adams (USNM 65139). — *Coenagrionidae*.
- fraseri** Lieftinck (*Drepanosticta*), 1955e: 70—72, fig. 1. Lectotype ♂. Ceylon, Central Prov., Kandy, 2.XI.1953, F. Keiser et al. (NMB). — *Platystictidae*.
- fraterna** Lieftinck (*Notoneura*), 1933c: 410—413, fig. 1. Lectotype ♂ and first described ♀. N. Australia, N.T., Z.-Lagoon, 19.IV.1931, Ed. Handschin (NMB). — *Protoneuridae*.
- frontalis** Lieftinck (*Eusynthemis*), 1949b: 359—361, fig. 12. Holotype ♀ (immature). Solomon Is., Guadalcanal I., XII. 1921. J. A. Kusché (CAS). — *Corduliidae*.
- fruhstorferi** Lieftinck (subsp. of *Onychogomphus modestus* Selys), 1934b: 34—36, fig. 7. Holotype ♂. With labels "Java Fr [uhstorfer] ♂" and "Onychogomphus Fruhstorferi ♂ Java", in de Selys' handwriting (IRSN). — *Gomphidae*. Plate 4.
First discussed ♀. S. Sumatra, Lampong distr., foot of Mt. Tanggamus, Giesting, 500 m, 7.VII.1934, L. J. Toxopeus (ML).
Now considered a distinct species (see Lieftinck, 1948e: 23).
- gamblesi** Lieftinck (*Lokia*), 1969c: 16—18, fig. 2. Holotype ♂. N.E. Zambia, Middle Luapula Region, Kisongo, swampy "dembo" of Loshi River, 1190 m, 24.XII.1962, J. J. Symoens, no. 9913 (MAT). — *Libellulidae*.
- gracilis** Belle (*Epigomphus*), 1970: 12—15, fig. 20—24. Holotype ♀. Brazil, Mirituba, Tapájos, Amazon, IV.1921, A. H. Fassl, cat. no. 15122 (SMF). — *Gomphidae*.
- guamensis** Lieftinck [subsp. of *Agrionoptera insignis* (Ramb.)], 1962: 71, 73, fig. 22c-d. Holotype ♂ and first described ♀. S. Mariana Is. (Micronesia), Guam I., V.1945, Bohart & Gressitt (♂ USNM 65777, ♀ USNM). — *Libellulidae*.
- gurneyi** Lieftinck (*Papuagrion*), 1949b: 341—343, fig. 5. Holotype ♂. Solomon Is., Bougainville I., 6.VIII-16.XI.1944 (no precise date), A. B. Gurney (USNM). — *Coenagrionidae*.
- handschini** Lieftinck (*Isosticta*), 1933c: 417—420, fig. 3—4. Lectotype ♂ and first described ♀ (juv.). N. Australia, N.T., Burnside, 21.IV.1932 (♂) and Kadarri, 20.IV.1931 (♀), Ed. Handschin (NMB). — *Isostictidae*.
- icterica** Lieftinck (*Macromia*), 1929a. 64, 84—86, fig. 11—12. Holotype ♂. China, Canton (no further particulars), ex coll. K. J. Morton (RSM). — *Corduliidae*.
- ierea** Geijskes (*Argia*), 1932: 244—248, fig. 6—9. Lectotype ♂. Trinidad I., Sangre Grande, 16.I.1930, G. Belmontes (ROMT). — *Coenagrionidae*.
Synonymous with *Argia insipida* Hagen in Selys.
- imitans** Lieftinck (*Calicnemia*), 1948e: 12—15, fig. 7. Holotype ♂ and first described ♀. S. Burma, Tenasserim, Malvedaung, 30 km S. of Ye, 300 m, 17.XI.1934, R. Malaise (NRS). — *Platycnemididae*.
- inaequidens** Lieftinck (*Idiocnemis*), 1932b: 503—504, fig. 7—8. Holotype ♂. N. Guinea Biró 1900, Stephansort Astrolabe Bai (printed label), "Idiocnemis bident." (F. Förster's handwriting) (MBUD). — *Platycnemididae*.
First described ♀. N.E. New Guinea, Bongu, Urwald Astrolabebai, Wahnes leg., Sommer 1899 (F. Förster's handwriting) (MBUD; ML).
- inaequistigma** Fraser (*Millotagrion*), 1953 (♂). First described ♀. E. Madagascar,

- Prov. Tamatave, Moramanga, 9 km south, 22.XII.1957, F. Keiser et al. (NMB). See Lieftinck, 1965c: 251—253, fig. 11. — Coenagrionidae.
- Type-species of *Millotagrion* Fraser (op. cit.).
- incisurum** Lieftinck (*Pseudagrion*), 1949b: 336—338, fig. 2. Holotype ♂. Solomon Is., Guadalcanal I., XII.1920-I.1921, J. A. Kusche (CAS). — Coenagrionidae.
- inconspicua** Lieftinck (*Drepanosticta*), 1938: 85—86, 87, fig. 21. Holotype ♂. Waigiu I., off N.W. New Guinea, labelled "Waigiu", probably ex Staudinger (SMF). — Platystictidae.
- ixias** Lieftinck [subsp. of *Rhythemis phyllis* (Sulz.)], 1953c: 221—223. Holotype ♂ and first described ♀. Sumba I. (Lesser Sunda Is.), E. Sumba, Melolo, sea-level, 23.V.-8.VI.1949 (Sumba Exped. 1949, NMB, XII C 342). — Libellulidae.
- johnseni** Lieftinck (*Burmagomphus*), 1966a: 193—197, fig. 1—5. Holotype ♂. Thailand, N.W., Kwae Noi area, Ban Kao, 13-18.XI.1961, P. Johnsen, no. 1286 (MC). — Gomphidae.
- junghuhni** Lieftinck (*Megalogomphus*), 1934c: 266—267, fig. 2. Holotype ♀. With two labels: "Java, Heyne", and "Heterogomphus près cochinchinensis Selys ♀", the latter in de Selys' handwriting (IRSN). — Gomphidae.
- keiseri** Lieftinck (subsp. of *Macrogomphus annulatus* Selys), 1955e: 81—83, fig. 4. Holotype ♂. Ceylon, Central Prov., Weragamtota, 14.IX.1953, "am Licht", F. Keiser et al. (NMB). — Gomphidae.
- khasiana** Lieftinck (*Oligoaeschna*), 1968a: 146, 156—158, fig. 2—3. Holotype ♂. Assam, Khasia Hills, in R. MacLachlan's writing, ex coll. MacLachlan (BM). — Aeshnidae.
- kimminsi** Lieftinck (*Idiocnemis*), 1958: 270—272, 284, fig. 56—60. Holotype ♂ and first described ♀. New Britain (Bismarck Archip.), A. Willey, Reg. Mar. 1, 1898, nos. 98 & 73, both with label "Idiocnemis nov. spec.", in F. Ris' handwriting (BM). See Kimmins, 1970: 180. — Platycnemididae.
- kimminsi** Lieftinck (*Synthemis*), 1953a: 71, 73, 75—78, fig. 1—4. Holotype ♂ and first described ♀. N.E. New Guinea, Saiko, 5500—6000 ft., Buba River (Upper Waria River), 24.X.1936, F. Shaw-Mayer (BM). See Kimmins, 1968: 298. — Corduliidae.
- kirbyi** Foerster (*Wahnesia*), 1900: 105 (no descr., hab. Bongu, N.E. New Guinea). See *kirbyi* Lieftinck, next item.
- kirbyi** Lieftinck (*Argiolestes*), 1935c: 217, 228—229, fig. 11—12. Lectotype ♂. N. Guinea Biró 1899 Sattelberg, Huon Golf, 22.III.1899 (printed labels), Wahnesia Kirby, in Dr. Pongrácz' handwriting (MBUD). — Megapodagrionidae.
- Although no specific description of *A. kirbyi* was given by Förster, the name was validly proposed and should be attributed to Förster, not Lieftinck. See Förster, 1900: 105 (*Wahnesia* n.g. with types *W. kirbyi* n.sp. and *montivagans* n.sp., in MBUD, both nom. nud.; and Lieftinck (1938: 78).
- Correctly classified as *A. kirbyi* (Foerster).
- laidlawi** Lieftinck (*Burmargiolestes*), 1960a: 236—237. Type series (3 ♂ 1 ♀ from N. India, Darjeeling distr., and 2 ♂ 1 ♀ from Gopaldhara, same distr.) ex Indian Museum, Calcutta (?), possibly destroyed.
- Nom. nov. pro *Argiolestes melanothorax*: Laidlaw (1917: 323—325, pl. 15 fig.

1, ♂ Darjeeling), nec *A. melanothorax* Selys, 1891a (Burma).

Type-species of *Burmargiolestes* Kennedy, 1925, who founded the genus on the Indian species (see Lieftinck, op. cit.).

leonorae Lieftinck (*Idiocnemis*), 1949a: 95—96, fig. 106—107. Holotype ♂. N.E. New Guinea, Huon Gulf, "Bidung [or Bulung?] gebiet, Ogeramngang, 1500—2000 m, 1914" (F. Förster's handwriting), No. 2499 of the Förster collection (UMMZ). —Platycnemididae.

leonorae Lieftinck (*Teinobasis*), 1937b: 97—99, fig. 22. Holotype ♂. Malay Peninsula, Penang I., Staudinger vend., ex coll. F. Förster (UMMZ). — Coenagrionidae.

Synonymous with *T. rajab* Laidlaw, 1912.

liberata Lieftinck (*Tramea*), 1949b: 371—372. Holotype ♂. Solomon Is., Guadalcanal I., XII.1920, J. A. Kuschel (CAS). — Libellulidae.

Now *Trapezostigma liberata* (Lieftinck).

malaisei Lieftinck (*Rhipidolestes*), 1948e: 7—9, fig. 4—5. Holotype ♂. N.E. Burma, Kambaiti, 2000 m, 28.V.1934, R. Malaise (NRS). — Megapodagrionidae.

manicaria Williamson (*Metaleptobasis*), 1915 (♂). First described ♀. Trinidad, Sangre Grande, 5.III.1930, G. Belmontes (ROMT). See Geijskes, 1932: 260—262, fig. 17—28. — Coenagrionidae.

marsyas Lieftinck (*Drepanosticta*), 1965a: 173, 178—180, fig. 3—7. Holotype ♂. Malay Peninsula, Pahang, Cameron's Highlands, 4—5000 ft., 15.VI.1935, H. M. Pendlebury 1937—472 (ex F. M. S. Mus.), with red type-disk and "Drepanosticta marsyas ♂ Type" [nom. in litt.] in F. F. Laidlaw's handwriting (BM). See Kimmins, 1970: 174 (the month of capture should be June, not April). — Platystictidae.

martini Ris (*Argiocnemis*), 1900 (♂). First described ♀ (imperfect). Admiralitäts Inseln [Admiralty Is.], N.-Küste, Seeadler Hafen, Papitalei, No. 140 der Hamburg Südsee Expedition, 18-20.X.1908, G. Duncker (ZMH). See Lieftinck, 1949b: 347. — Coenagrionidae.

Now *Mortonagrion martini* (Ris).

mauritia Williamson (*Metaleptobasis*), 1915 (♂). First described ♀. Trinidad, Sangre Grande, 26.I.1930, G. Belmontes (ROMT). See Geijskes, 1932: 258—260, fig. 15—16. — Coenagrionidae.

melidora Lieftinck (*Palaeargia*), 1953e: 241—244, fig. 4. Holotype ♂ and first described ♀. Waigeu I. (off N.W. New Guinea), Camp Nok, 2500 ft., III-IV.1938, L. E. Cheesman. Holotype ♂ with collector's note: "lateral stripe of thorax pale gr(een), dorsally blue, mac(ulae) of abdomen blue" (BM). See also Kimmins, 1970: 188. — Coenagrionidae.

merina Lieftinck (*Argiocnemis*), 1965c: 254—255, fig. 12. Holotype ♂. Madagascar, Prov. Tamatave, Fampanambo, 19.XI.1958, F. Keiser et al. (NMB). — Coenagrionidae.

microstigma Lieftinck (*Argiolestes*), 1956b: 72, 99—101, fig. 40—41. Holotype ♂. Papua, Mafulu, 4000 ft., I.1934, L. E. Cheesman (BM). See Kimmins, 1970: 197. — Megapodagrionidae.

mima Lieftinck (*Libellago*), 1932a: 2—4, fig. 1. Holotype ♂. Borneo, with labels "63/mimus Borneo" (yellow) "Micr. mimus S. ♂ Borneo" (white), the last two in de Selys' writing; L. mima Lieft., holotype, det. M.A.L. (IRSN). — Chlorocyphidae.
A synonym of *L. semiopaca* (Selys).

- montivagans** Foerster (*Wahnesia*), 1900: 105 (no descr., hab. Bongu, N. E. New Guinea).
- See next item (same species).
- montivagans** Lieftinck (*Argiolestes*), 1935c: 204, 214—217, 233—234 (sub *A. sidonia* Martin). Lectotype ♂ and first described ♀. N. Guinea Biró 1899 Simbang Huon Golf, 18.II.1899 (print), *Wahnesia montivagans*, in Dr. Pongrácz' writing (MBUD).
- See explanation sub *A. kirbyi* Lieft. (huj. op.).
- Currently classified as *A. montivagans* (Foerster).
- nasiterna** Lieftinck (*Palaiargia*), 1938: 99—100, fig. 34—35. Holotype ♂. Waigeu I., off N.W. New Guinea, ex Staudinger (SMF). — Coenagrionidae.
- nigrolutea** Lieftinck (*Teinobasis*), 1962: 19, 29—31, fig. 8. Holotype ♂ and first described ♀. E. Caroline Is. (Micronesia), Ponape I., S. of Nanpohnmal, 17.I.1953, Clarke (♂ USNM 65140). — Coenagrionidae.
- occipitalis** Belle (*Epigomphus*), 1970: 15—18, fig. 27—36. Holotype ♂ and first described ♀. Perú, Mishuyacu, Iquitos, Amazon, 16.VII.1930 (♂) and 26.III.1930 (♀), Klug, cat. no. 15116 and 15118, respectively (SMF). — Gomphidae.
- ochrostomus** Lieftinck (*Argiolestes*), 1949a: 48—49, fig. 14—16, 25. Holotype ♂ and first described ♀. "Waigiu [Waigeu I., off N.W. New Guinea], Staudinger vend., ex coll. F. Ris (SMF). — Megapodagrionidae.
- olivaceus** Lieftinck (*Heliogomphus*), 1961a: 143—145, fig. 50. Holotype ♂. Philippine Is., Palawan I. group, Busuanga I. (Calamianes), Dimaniang, near sea level, III.1947, H. Hoogstraal (CNHM). — Gomphidae.
- orchestra** Lieftinck (*Idionyx*), 1953c: 193—196, fig. 65—67. Holotype ♂ and first described ♀. Sumba I. (Lesser Sunda Is.), W. Sumba, Waimangura, 436 m, 12-26. VIII.1949 (Sumba Exped. 1949, NMB XII C 241). — Corduliidae.
- orestes** Lieftinck (*Gomphus*), 1939b: 285, 287—290, fig. 5—6. Holotype ♂ and first described ♀. E. China, Fu Kien, near Kwa Tun, 2300 m, 8.VI.1938 (♂) and 19.V.1938 (♀), J. Klapperich (MKB). — Gomphidae.
- Transferred to genus *Sinogomphus* May.
- oryzae** Lieftinck (subsp. of *Ischnura aurora* Brauer), 1962: 44, fig. 13. Holotype ♂ and first described ♀. Ryukyu Is., Okinawa I., Chizuka, VII. 1945, Bohart & Harnage (♂ USNM 65143, ♀ USNM). — Coenagrionidae.
- palauense** Lieftinck (*Pseudagrion*), 1962: 36—38, fig. 10. Holotype ♂. W. Caroline Is. (Micronesia), Palau Is., Babelthuap I., Melekeiok-Ngardok Lake, 24.II.1936, Esaki (KU). — Coenagrionidae.
- palauensis** Lieftinck (*Drepanosticta*), 1962: 14—16, fig. 3. Holotype ♂ and allotype ♀ (in cop.). W. Caroline Is. (Micronesia), Palau Is., Babelthuap, jungle 2 mi. N.W. of Ngiwal, 21.V.1957, Sabrosky (USNM 65135). — Platystictidae.
- palauensis** Lieftinck (*Teinobasis*), 1962: 19, 21, fig. 4—5. Holotype ♂. W. Caroline Is. (Micronesia), Palau Is., Koror I., 15-24.III.1948, Maehler (USNM 65136). — Coenagrionidae.
- palawana** Lieftinck (*Prodasineura*), 1948a: 232—234, fig. 4. Holotype ♂. Palawan

I., labelled "Palawan, Fruhst(orfer)", in de Selys' handwriting (IRSN). — Proto-neuridae.

pallida Belle (*Phyllocycla*), 1970: 109—111, fig. 168—170. Holotype ♂. Brazil, Santa Catarina (Nova Teutonia), 4.XII.1949; ex coll. K. H. Buchholz (MKB). — Gomphidae.

pechumani Belle (*Epigomphus*), 1970: 19—20, fig. 37—41. Holotype ♂. Colombia (CUI). — Gomphidae.

peleus Lieftinck (*Gomphus*), 1939b: 285, 291—294, fig. 9—10. Holotype ♂. E. China, Fu Kien, near Kwa Tun, 2300 m, 31.V.1938, J. Klapperich (MKB). — Gomphidae.

A topotypical ♂ paratype was taken I.VI.1938 by the same collector (ML).

Now placed as *Sinogomphus peleus* (Lieftinck).

petalura Lieftinck (*Oligoaeschna*), 1968a: 150, 175—176, fig. 8. Holotype ♂. Hainan I., Mt. Wuchi, 24.V.1903, 1911—288, *Jagoria* sp., det. D. E. Kimmins (BM). — Aeshnidae.

philippa Lieftinck (*Drepanosticta*), 1961a: 132—133, fig. 45B, 46A-C. Holotype ♀ and first described ♀. Philippine Is., Luzon, Abra prov., Massiat, creek in mountain gully, 21.V.1946, H. Hoogstraal (CNHM). — Platystictidae.

ponapensis Lieftinck (*Teinobasis*), 1962: 20, 24—26, fig. 7. Holotype ♂. E. Caroline Is. (Micronesia), Ponape I., Mt. Ngihneni, 730 m, VI-IX.1950, Adams (USNM 65138). — Coenagrionidae.

prometheus Lieftinck (*Gomphus*), 1939b: 278—281, fig. 1—2. Holotype ♂ and first described ♀. E. China, Fu Kien, near Kwa Tun, 2300 m, 5.VI.1938 (♂) and 25.VI.1938 (♀), J. Klapperich (MKB). — Gomphidae.

A topotypical ♂ paratype was taken the same day as the holotype (ML).

Type-species of *Fukienogomphus* H. F. Chao.

proselytus Lieftinck (*Protolestes*), 1965c: 246. Lectotype ♂. E. Madagascar, Ambodirafia, XI, Olsufieff. — Megapodagrionidae.

This is one of the specimens described and figured by the late Erich Schmidt as *Protolestes Fickei* Foerster, which is a different species. See Schmidt, 1951: 147—150, fig. 22a, 23c, 24, 26a-b; and Lieftinck, op. cit., who proposed the new name.

The lectotype (ex coll. E. Schmidt) is at present in Dr. S. Asahina's collection (Tokyo).

prothoracalis Lieftinck (*Argiolestes*), 1956b: 72, 98—99, fig. 33—34. Holotype ♂. N.E. New Guinea, Kokoda, 1200 ft., VI.1933, L. E. Cheesman (BM). See Kimmins, 1970: 197. (The original locality is wrongly given as in "Northern Papua"). — Megapodagrionidae.

pulverulans Lieftinck (*Nesolestes*), 1965c: 239—240, fig. 3—5. Lectotype ♂ and first described ♀. Madagascar, Prov. Fianarantsoa, Ranomafana, 22.I.1958, F. Keiser et al. (NMB). — Megapodagrionidae.

pusilla Lieftinck (subsp. of *Agrionoptera sanguinolenta* Lieft.), 1962: 71, 76—77, fig. 20c, 21g, 22k-l. Holotype ♂ and first described ♀. Caroline Is. (Micronesia), Truk I., Wena I. (Moen), Nantuka (Civil Adm. Area), 31.I.-27.IV.1949, Potts (♂ USNM 65147, ♀ USNM). — Libellulidae.

pylades Lieftinck (*Gomphus*), 1939b: 285—287, fig. 3—4. Holotype ♂. E. China, Fu Kien, near Kwa Tun, 2300 m, 24.V.1938, J. Klapperich (MKB). — Gomphidae.

Transferred to *Sinogomphus* May.

- pytho* Lieftinck (*Drepanosticta*), 1937b: 68—70, fig. 7. Holotype ♂. W. Sumatra, Padang 1913 (?Rolle vend.), labelled on paper triangle "Platysticta Grosskopf, W. Sumatra, Padang", in F. Förster's handwriting (UMMZ, coll. no. 1252). — Platystictidae.
- radama* Lieftinck (*Nesolestes*), 1965c: 241—243, fig. 8. Holotype ♂ and first described ♀. Madagascar, Prov. Tananarive, Moramanga, 9.X.1958 (♂) and Prov. Tamatave, Périnet, 4.XII.1957 (♀), F. Keiser et al. (NMB). — Megapodagrionidae.
- ramajana* Lieftinck (*Disparoneura*), 1971a: 194, fig. 3—4. Holotype ♂ (immature). Ceylon, Central Prov., Horton Plains, 7000 ft., 12 mi. S.S.E. of Nuwara Eliya, loc. 163, 19.III.1962, Lund Univ. Ceylon Exped. 1962 (ZIUL). — Protoneuridae.
- sanguinolenta* Lieftinck (*Agrionoptera*), 1962: 71, 74—75, fig. 20c-d, 21g-h, 22i-l. Holotype ♂ and first described ♀. E. Caroline Is. (Micronesia), Ponape I., Mt. Paipalap, 240 m, VI-IX.1950 (♂) and Agric. Exper. Sta., VI-IX.1950 (♀), Adams (♂ USNM 65146, ♀ USNM). Libellulidae.
Now *A. sanguinolenta sanguinolenta* Lieft.
- sanguinolenta* Lieftinck (*Rhinocypha*), 1961a: 125—128, fig. 44a. Holotype ♂. S. Philippine Is., Mindanao I., Davao Prov., E.-slope of Mt. McKinley, 2500 ft., 7.IX.1946, F. G. Werner (CNHM). — Chlorocyphidae.
- schoederi* Belle (*Cyanogomphus*), 1970: 27—29, fig. 48—51. Holotype ♂. Brazil, Tapájos, Amazon, V.1920, A. H. Fassel, coll. no. 15235 (SMF). — Gomphidae.
- septima* Martin (*Macromia*), 1904 (♀). First described ♂. Java, Fr[uhstorfer] [18]93 (IRSN). See Lieftinck, 1929a: 67, 100—101, fig. 19—20. — Corduliidae.
- simonae* Lieftinck (*Tanymecosticta*), 1969a: 208—210, fig. 3—5. Holotype ♂. Kei Is., labelled "Protosticta? Platysticta auriculata? Key" (pink label in R. Martin's handwriting) (MP). — Isostictidae.
- sinhalensis* Lieftinck (*Drepanosticta*), 1971a: 192—193, fig. 1. Holotype ♂. Ceylon, Prov. Sabaragamuwa, Deerwood, Kuruwita, N.N.W. of Ratnapura, loc. 90III, 18-21.III.1962, Lund Univ. Ceylon Exped. 1962 (ZIUL). — Platystictidae.
- solitarius* Lieftinck (?*Anisogomphus*), 1971a: 199—203, fig. 5 & 9. Holotype ♂ (immature, with exuviae). Ceylon, Central Prov., Rambukpath Oya, 10 mi. N.W. of Hatton, loc. 153, 18.III.1962, Lund Univ. Ceylon Exped. 1962 (ZIUL). — Gomphidae.
- sophrosyne* Lieftinck (*Macromia*), 1952a: 442, 449—450, fig. 1, 8. Holotype ♂. Waigeu I. (off N.W. New Guinea), Camp Nok (Mt. Buffelhoorn), 2500 ft., IV.1938, L. E. Cheesman (BM). — Corduliidae.
- sutteri* Lieftinck (*Lestes* sg. *Indolestes*), 1953c: 142—145, fig. 3, 6. Holotype ♂ and first described ♀. Sumba I. (Lesser Sunda Is.), Central Sumba, Langgaliru, 400—600 m, 4-15.X.1949 (Sumba Exped. 1949, NMB XIIB 38). — Lestidae.
- symoensi* Lieftinck (*Phyllogomphus*), 1969c: 11—13, fig. 1. Holotype ♀. Congo, Katanga, Kafubu Region, Lubumbashi (Elisabethville), 1300 m, 28.XII.1960, J. J. Symoens, no. 8026 (MAT). — Gomphidae.
- telamon* Lieftinck (*Gomphus*), 1939b: 285, 290—291, fig. 7—8. Lectotype ♂. E. China, Fu Kien, near Kwa Tun, 2300 m, 30.V.1938, J. Klapperich (MKB). — Gomphidae.

A topotypical ♂ paratype was taken the same day (ML).

Transferred to genus *Sinogomphus* May.

thalia Lieftinck (*Macromia*), 1929a: 67, 103—104, fig. 21. Holotype ♂. Assam, Khasia Hills; ex coll. F. F. Laidlaw (BM). See Kimmins, 1968: 300. — Corduliidae.

thelmae Lieftinck (*Ischnura*), 1966b: 92—96, fig. 1. Holotype ♂ and first described ♀. South Pacific: Rapa I. (Oparu), Rapa Maii Bay, 23.X.1963 (♂, USNM, reg. no. 68921) and Rapa Haurei, 3.XII.1963 (♀, USNM), J. F. Gates Clarke & Mrs. Thelma M. Clarke. — Coenagrionidae.

thelyphonus Lieftinck (*Microgomphus*), 1929b: 125—128, 130, fig. 17—20. Holotype ♂ and first described ♀. Java mer., H. Fruhstorfer, labelled "Microg. race de chelifer, à étudier" (♂) and "Microgomphus Fruhstorferi S", in de Selys' handwriting. Types selected by M.A.L. in description and labelled accordingly, from a total of 2 ♂ and 1 ♀ (IRSN). — Gomphidae. Plate 4.

Currently known as *Microgomphus chelifer thelyphonus* Lieft.

thisbe Lieftinck [subsp. of *Rhythemis regia* (Brauer)], 1953c: 223—226. Holotype ♂ and first described ♀. Sumba I. (Lesser Sunda Is.), E. Sumba, Rende Wai, 100 m, 11-16.VI.1949 (Sumba Exped. 1949, NMB, XII C 346). — Libellulidae.

timorana Lieftinck (subsp. of *Rhinocypha pagenstecheri* Foerster), 1936a: 111—114, fig. 3. Lectotype ♂ and first described ♀. S. Timor I. (Lesser Sunda Is.), Kupang, XII.1931-1.1932, Ed. Handschin (NMB). — Chlorocyphidae.

tincta Rambur (*Rhinocypha*), 1842 (♂). First described ♀. Waigeou (lavender-coloured label in de Selys' writing) [Waigeu I., off N.W. New Guinea] (IRSN). See Lieftinck, 1938: 63—64, fig. 1. — Chlorocyphidae.

Now *R. tincta tincta* (Ramb.).

tonkinicus Fraser (*Onychogomphus*), 1926 (♂). First described ♀. Tonkin, Than-Moi, VI-VII, H. Fruhstorfer (print), with two labels "Heterogomphus naninus Foerst. ♀", and "Onychogomphus naninus Foerster ♀ Type", both in F. Förster's handwriting (UMMZ).

Now *Phaenandrogomphus tonkinicus* (Fraser), see Lieftinck, 1969a: 210—214, fig. 13—14.

trimaculata Lieftinck (*Drepanosticta*), 1939a: 149—151, fig. 3. Holotype ♂. Philippine Is., Luzon, Bilucau, 1876, L. Laglaize, with label in R. Martin's handwriting "Platysticta, près bicornuta ou bicornuta" (MP). — Platystictidae.

turconii Selys (*Rhinocypha*), 1891b: 215—216 (♂). First described ♀. Philippine Is., Mindanao I., Davao Prov., east slope of Mt. McKinley, 3000 ft., 22.IX.1946 (♂ ♀), F. G. Werner (CNHM). See Lieftinck, 1961a: 122—124. — Chlorocyphidae.

walkeri Geijskes (*Oligoclada*), 1931: 213—214. Holotype ♂. Trinidad I., Sangre Grande, 26.III.1930, G. Belmontes (ROMT). — Libellulidae.

wernerii Lieftinck (*Coeliccia*), 1961a: 137—138, fig. 48. Holotype ♂. Philippine Is., Palawan I., Iwahig, mountains W. of Lapulapu, 2—3000 ft., 1-2.III.1947, F. G. Werner (CNHM). — Platycnemididae.

yapensis Lieftinck [subsp. of *Agrionoptera insignis* (Ramb.)], 1962: 71, 72—73, fig. 20a, 21e, 22a-b. Holotype ♂ and first described ♀. W. Caroline Is. (Micronesia), Yap I., Ruul district, VII-VIII.1950, Goss (♂ USNM 65144, ♀ USNM). — Libellulidae.

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ADDENDA TO PART IV

argentea Ris (*Argyrothemis*), 1911 (♂). First described ♀. French Guyana, Massikiri, Oyapock, 16.XI.1969, Mission Balachowsky et al. (MP). See Geijskes, 1971: 668—669, fig. 2 A-B. — Libellulidae.

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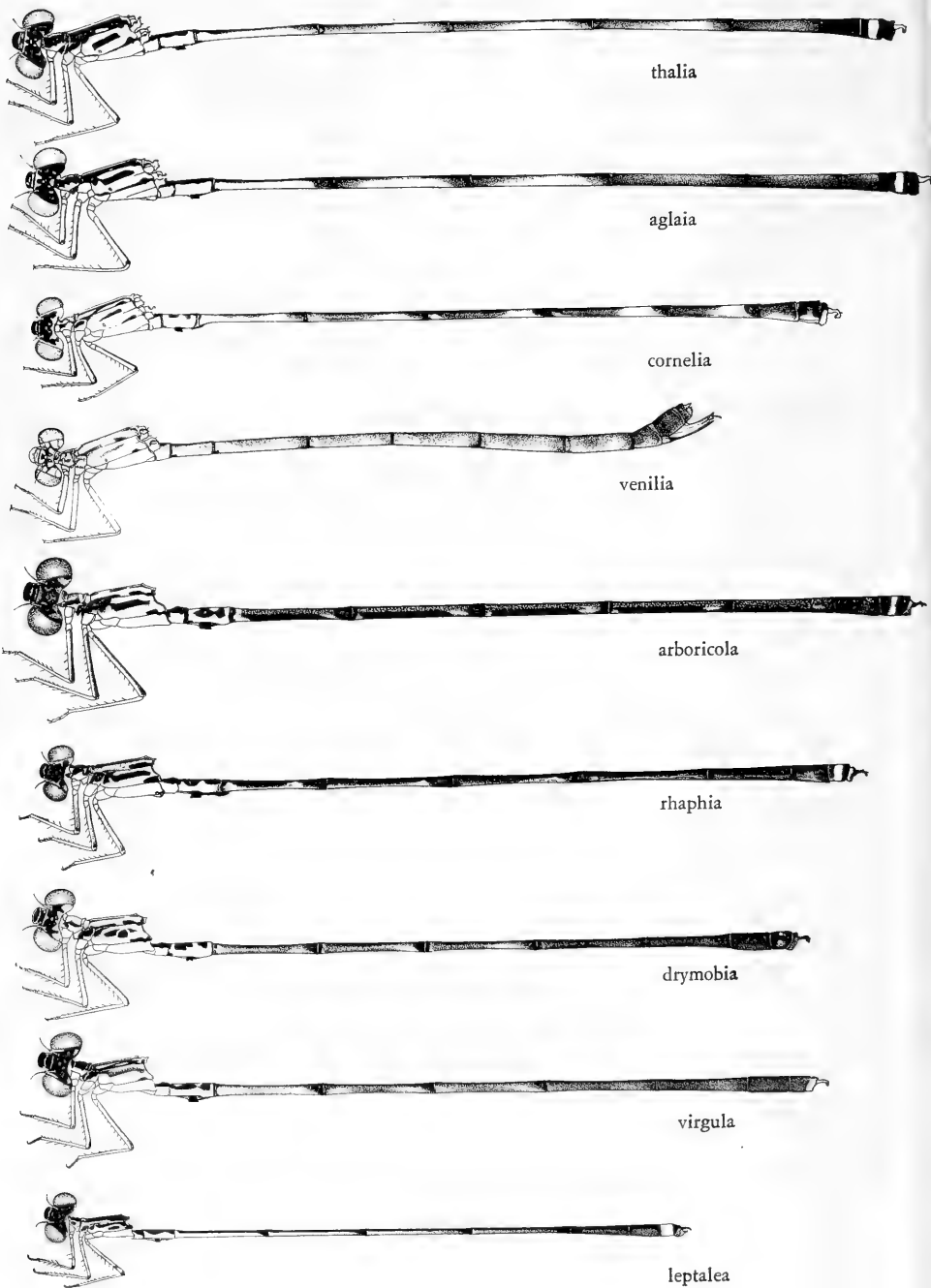
carminita Calvert (*Telebasis*), 1909 (♂). First described ♀. French Guyana, Savanne à Graminées, 30 km de Kourou vers Trakombo, 21.X.1969 (♂ ♀), Mission Balachowsky et al. (MP). See Geijskes, 1971: 660—663, fig. 1 F. — Coenagrionidae.

longitudinalis Ris (*Anatya*), 1919 (♂). First described ♀. French Guyana, Saut-Maripa, 25—27.XI.1969, at light (♂ ♀), Mission Balachowsky et al. (MP). See Geijskes, 1971: 672—673, fig. 3 A-B. — Libellulidae.

Now *Erythrodiplax longitudinalis* (Ris).

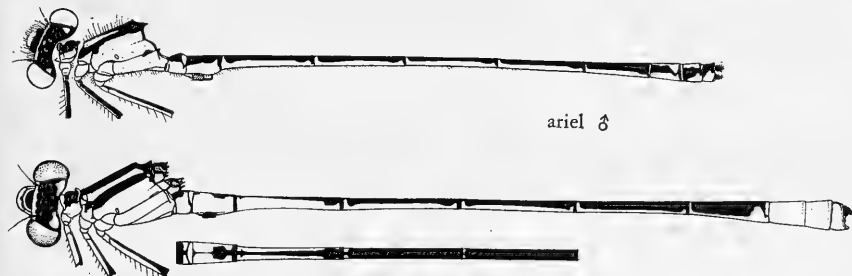
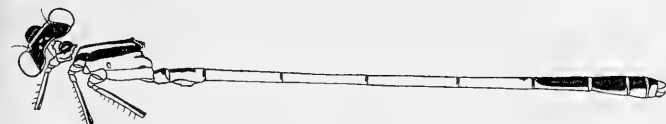
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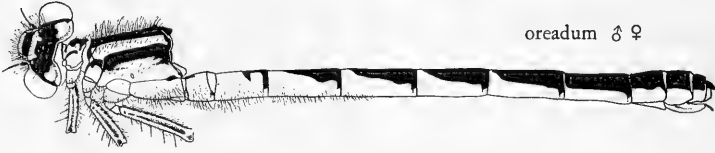
Genera *Selysioneurina* and *Tanymercosticta*

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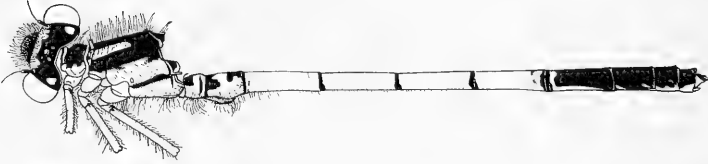


Genera *Archboldargia*, *Ischnura* and *Austroallagma*

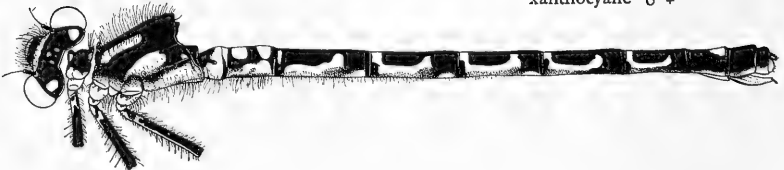
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oreadum ♂ ♀

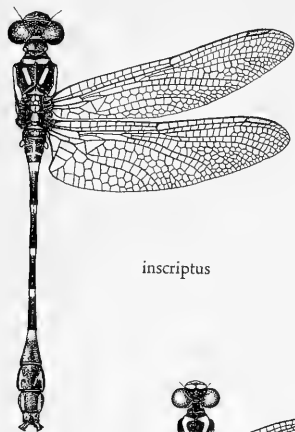


armeniacum ♂ ♀



xanthocyane ♂ ♀

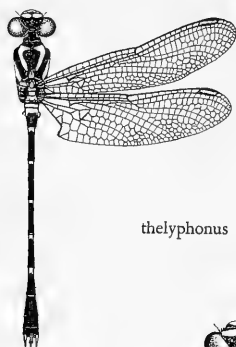
Genus *Oreagrion*



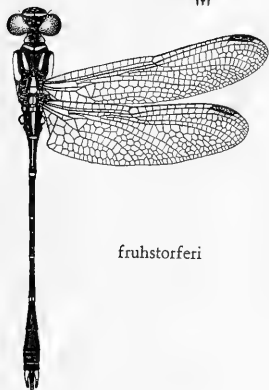
incriptus



drescheri



thelyphonus



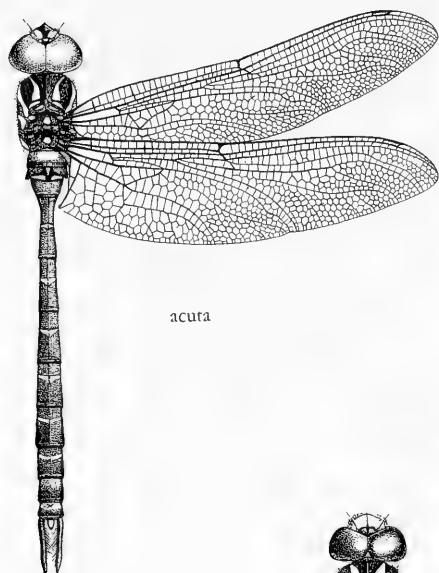
fruhstorferi



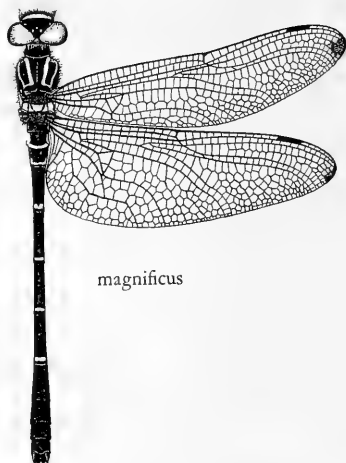
walshae

Genera *Burmagomphus*, *Heliogomphus*, *Onychogomphus* and *Acrogomphus*

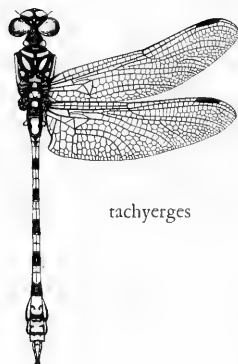
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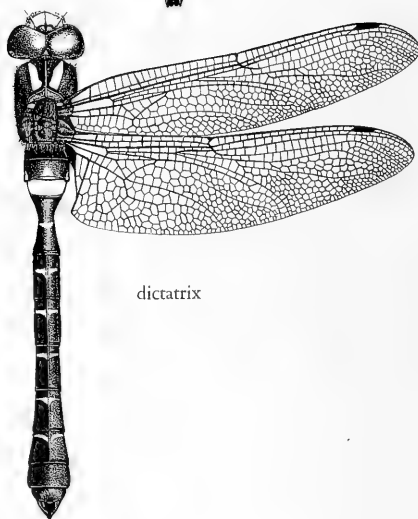
acuta



magnificus



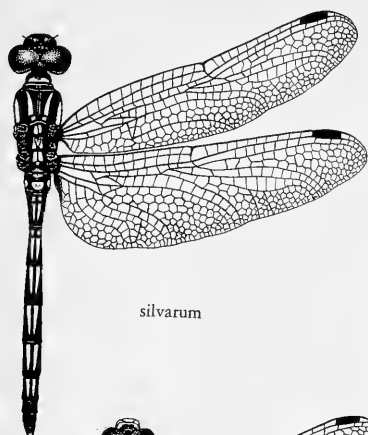
tachyerges



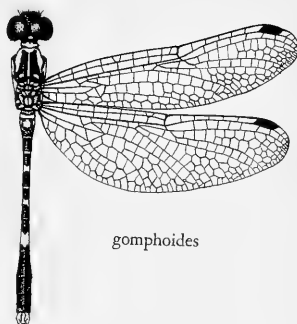
dictatrix

Genera *Chlorogomphus*, *Paragomphus*, *Platycantha* and *Oreaeschna*

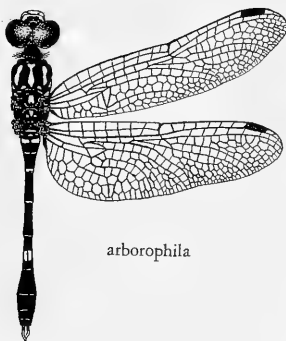
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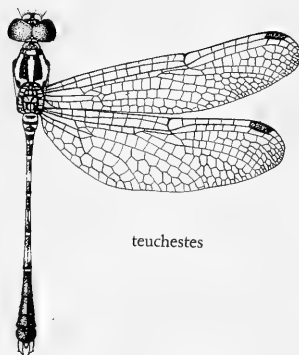
silvarum



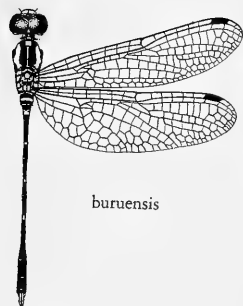
gomphoides



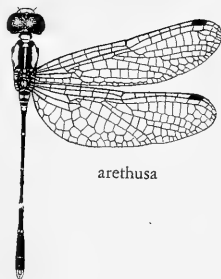
arborophila



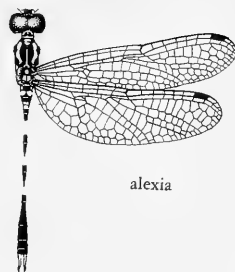
teuchestes



buruensis



arethusa



alexia

Genera *Nannopblebia*, *Bironides*, *Microtrigonia*, *Orthetrum* and *Huonia*

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Photos Ch. HOORN JR.

Above: *Nannophyopsis chalcosoma* Lieftinck, ♂; below: *Neopetalia punctata* (Selys), first described ♀

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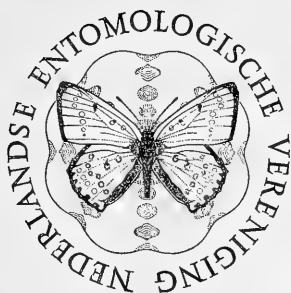
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DESCRIPTIONS D'ATTACIDAE (=SATURNIIDAE)¹) NOUVEAUX D'AMERIQUE CENTRALE ET DU SUD (LEPIDOPTERA)

par

CLAUDE LEMAIRE

Paris, France

SYNOPSIS

L'auteur décrit 17 espèces et 7 sous-espèces nouvelles d'Attacidae (= Saturniidae) d'Amérique centrale et du Sud. Ces taxa se répartissent dans les quatre sous-familles représentées sur le continent américain: Attacinae (5 espèces, 2 sous-espèces), Hemileucinae (5 espèces, 1 sous-espèce), Arsenurinae (1 sous-espèce), Dryocampinae (7 espèces, 3 sous-espèces). La note contient également 6 synonymies nouvelles et la désignation de 2 lectotypes.

Le matériel typique appartient au British Museum (Nat. Hist.) et aux collections de M. M. LICHY, DARGE et LEMAIRE; les holotypes de ces trois dernières collections seront déposés au Muséum national d'Histoire naturelle, Paris.

ATTACINAE

Copaxa (*Copaxa*) *escalantei* spec. nov.

Fig. 1, nr. 1—2; Pl. 1 Fig. 1

Holotype: 1 ♂, Mexique, Puebla, San Juan Apulco, VI.1960 (Dr. T. Escalante) (genitalia ♂, prép. C. Lemaire n° 2298) (coll. C. Lemaire); allotype: 1 ♀, X.1963; paratypes: 4 ♂, VI.1960, X.1963, tous mêmes localité, récolteur et collection.

♂. — Envergure: 87—112 mm; longueur des ailes antérieures: 50—61 mm.

Antennes jaune paille: 30 articles. Tête, prothorax et tarses gris brun violacé, le reste du corps jaune. Couleur fondamentale des quatre ailes jaune vif sur la face dorsale, jaune terne mêlé de grisâtre ou de brunâtre sur la face ventrale. Ornementation habituelle des espèces du genre, caractérisée ici par la netteté avec laquelle se détachent, sur le dessus des ailes antérieures, en noirâtre, brun noir ou violacé, les nervures, la rayure externe, très large et s'interrompant sous l'apex au niveau de R 5, et la bande submarginale. Le nombre de taches hyalines varie de trois à cinq sur les ailes antérieures, de deux à quatre sur les ailes postérieures. Un semis d'écailles noirâtres sur les bords distal et subcostal de la cellule.

♀. — Envergure: 127—132 mm; longueur des ailes antérieures: 70 mm.

Diffère du mâle, outre la forme plus allongée des ailes antérieures, par la coloration fondamentale beige brun du corps et des quatre ailes, avec, sur ces dernières, des zones brun orangé et violacées. Six ou sept taches hyalines sur les ailes antérieures, six sur les ailes postérieures.

¹) Par application de l'article 23 (a) (ii) du Code international de Nomenclature zoologique et de l'opinion 450, publiée le 8 mars 1957, de la Commission internationale de Nomenclature zoologique qui, en vertu de ses pleins pouvoirs a placé Attacidae Burmeister, 1878, sur la liste officielle des noms du groupe-famille en Zoologie, sous le n° 142. Décision regrettable, rendant inutilisable Saturniidae Boisduval, 1837, en dépit de sa priorité et allant à l'encontre de l'usage consacré par la majorité des auteurs. A noter qu'Attacidae avait été utilisé par Duponchel dès 1844!

Espèce très proche de *C. (C.) expandens* Walker (= *trimacula* W. Rothschild, syn. nov.²⁾) avec qui elle a été confondue, notamment par Draudt (1929: 724, pl. 105, a ♂) et par C. C. Hoffmann (1942: 236, n° 1415). En diffère par le nombre supérieur des taches hyalines ornant les exemplaires des deux sexes (au plus trois sur les ailes antérieures et une seule sur les ailes postérieures chez *C. (C.) expandens*), par la coloration fondamentale jaune très constante des exemplaires mâles (varie du jaune au brun foncé et au brun rougeâtre ou orangé chez *C. (C.) expandens*) dont l'apex est en général plus aigu et saillant. Antennes sensiblement plus courtes (30 articles contre 34 à 36). L'armure génitale mâle (Fig. 1 nr. 3—4) est nettement distincte de celle de *C. (C.) expandens* par la forme de l'aedeagus et surtout par la structure des larges processus sclérifiés ou harpes qui émanent des valves sur la face interne de la costa.

Je dédie avec plaisir cette espèce inédite à l'éminent entomologiste mexicain, M. le Docteur T. Escalante, à qui je suis redevable du matériel typique.

Copaxa (Copaxa) andensis spec. nov.

Fig. 2 nr. 1—2; Pl. 1 Fig. 2

Holotype: 1 ♂, Colombie, Valle Cauca, Los Andes, 1700 m, 25.XII.1966 (L. et L. Denhez) (genitalia ♂, prép. C. Lemaire n° 1854) (coll. C. Lemaire); paratypes: 2 ♂, même localité, 21.II.1966, 2 ♂, Valle Cauca, route de Cali à Buenaventura, km 18, 1800 m, 28.X, 9.XII.1970, tous mêmes récolteurs et collection.

♂. — Envergure: 88—104 mm; longueur des ailes antérieures: 51—58 mm.

Antennes jaune paille: 31 articles. Tête et prothorax noirâtres, avec fréquemment une touffe de poils jaune entre les scapes. Tarses roses, le reste du corps brun foncé, plus ou moins orangé. Couleur fondamentale de la face dorsale des quatre ailes beige brun foncé, avec généralement des zones plus orangées, de la face ventrale gris beige violacé. Les rayures brun noir et la bande submarginale sont assez faiblement marquées mais les fascies antémédianes sont généralement nettes. Les taches hyalines sont liserées, sur la face dorsale, de noir, puis de jaune; il en existe de trois à cinq sur les ailes antérieures et, sur les ailes postérieures, une seule, avec parfois un petit point accessoire.

Espèce voisine de *C. (C.) multifenestrata* (Herrich-Schäffer) avec laquelle elle coexiste dans la localité typique. En diffère par la forme de l'apex qui est arrondi, par l'interruption de la rayure externe des ailes antérieures entre M 1 et M 5, atteignant rarement celle-ci et par la réduction du nombre des fenêtres hyalines (il en existe généralement plusieurs sur les ailes postérieures de *C. (C.) multifenestrata*). Les femelles que nous rapportons avec un léger doute à cette espèce présentent le même ensemble de caractères. L'armure génitale mâle (Fig. 2) est distincte de celle de *C. (C.) multifenestrata* par sa structure bien plus robuste, avec l'aedeagus nettement plus long et surtout par la forme des harpes qui, au lieu d'être réduites à de petites formations subconiques (Fig. 2, n° 3), se présentent ici comme de longs appendices très sclérifiés, légèrement épineux. Cette espèce nouvelle est également connue de l'Equateur, rio Negro, du Pérou, Carabaya, de la Bolivie, Cochabamba, où elle vole à des altitudes variant entre 1500 et 2000 mètres.

²⁾ *C. (C.) trimacula* a été décrit par W. Rothschild (1895:40) d'après deux exemplaires d'Amérique centrale, sans autre précision de localité, qui sont actuellement conservés par le British Museum (Nat. Hist.). Nous désignons comme lectotype celui de ces deux spécimens dont l'armure génitale mâle, examinée par nous, porte le n° de préparation: Saturniidae, n° 120, on slide. L'holotype ♂ de *C. (C.) expandens* est originaire du Venezuela.

Copaxa (Copaxa) denhezi spec. nov.

Fig. 3; Pl. 2 Fig. 3

Holotype: 1 ♂, Colombie, Valle Cauca, Anchicaya, 1000/1400 m, 6.VIII.1968 (genitalia ♂, prép. C. Lemaire n° 1840) (L. et L. Denhez) (coll. C. Lemaire).

♂. — Envergure 97 mm; longueur des ailes antérieures: 55 mm.

Antennes jaune orangé: 30 articles. Front brun foncé, prothorax gris violacé, le reste du corps beige brun. Ailes brunes sur les deux faces, avec de légères éclaircies sur le dessus des ailes antérieures et des zones gris violacé sur la face ventrale. Ornementation habituelle des espèces du genre. La rayure externe des ailes antérieures s'interrompt à l'intersection de R 5 et du bord externe, les bandes antémédianes sont nettes, les bandes submarginales, sur la face dorsale, étant au contraire très estompées. Les taches hyalines sont finement liserées de brun noir, puis de jaune, sur les deux faces; elles sont au nombre de six sur les ailes antérieures, de quatre sur les ailes postérieures.

Difficilement séparable de *C. (C.) multifenestrata*; ne diffère des grands exemplaires sombres de cette espèce que par la forme un peu plus falquée des ailes antérieures, avec l'apex plus aigu et par la position de la rayure externe de ces ailes qui, sur la face dorsale, atteint, au niveau de R 5, le bord externe dont elle reste toujours assez éloignée chez *C. (C.) multifenestrata*. L'armure génitale mâle (Fig. 2 nr. 3), bien plus robuste que chez ce dernier, en diffère par la structure de l'aedeagus et surtout des harpes, beaucoup plus développées et rappelant davantage celles de *C. (C.) escalantei* (Fig. 1 nr. 1—2). Les lobes de l'anellus sont beaucoup plus courts que chez celui-ci et plus fortement asymétriques.

Espèce dédiée à mon excellent correspondant M. L. Denhez à qui je suis redevable de l'holotype.

Copaxa (Copaxa) canella miranda subsp. nov.

Pl. 2 Fig. 4; Pl. 3 Fig. 5

Holotype: 1 ♂, Bolivie, Cochabamba, Carrasco, Siberia, 1650 m, I.1964, (coll. C. Lemaire); allotype: 1 ♀, 26.XII.1962; paratypes: 19 ♂, XII.1962, I, X, XII.1963, I.1964, 7 ♀, X, XII.1963, I.1964, tous mêmes localité et collection.

♂. — Envergure: 95—126 mm; longueur des ailes antérieures: 50—65 mm.

♀. — Envergure: 112—124 mm; longueur des ailes antérieures: 62—68 mm.

Cette sous-espèce diffère de la sous-espèce nominative par l'envergure moyenne, très supérieure, des exemplaires des deux sexes, celle de *C. (C.) c. canella* n'excédant guère 105 mm, ainsi que par son ornementation beaucoup plus marquée et contrastante, surtout celle du mâle, notamment sur les ailes antérieures où les nervures sont très fortement soulignées de noirâtre et la rayure médiane onduleuse toujours très nette. La coloration fondamentale des exemplaires mâles, brune chez *C. (C.) c. canella*, est ici beige terne, avec des reflets orangés et un très abondant semis d'écailles noirâtres, ou orange vif; elle rappelle alors celle de *C. (C.) joinvillea* Schaus (mais où l'apex des ailes antérieures est moins saillant) et surtout de *C. (C.) simson* Maassen à qui les plus grands exemplaires ressemblent étonnamment (mais dont l'armure génitale est différente). La coloration dominante de la femelle est jaune vif, avec des semis d'écailles noirâtres et les bandes submarginales rouge vineux, comme chez *C. (C.) c. flavina* Draudt.

Nous connaissons cette sous-espèce nouvelle, outre la localité typique, de diverses stations de la Bolivie, Cochabamba (El Limbo, 2000/2200 m, Alto Palmar, 1000 m) et du Pérou, Junin (La Merced) et Pasco (Oxapampa).

Copaxa (Sagana) herbuloti spec. nov.

Fig. 4; Pl. 3 Fig. 6

Holotype: 1 ♂, Pérou, Piura, Huancabamba genitalia ♂, (prép. C. Lemaire n° 1820) (coll. C. Lemaire).

♂. — Envergure: 70 mm; longueur des ailes antérieures: 40 mm.

Antennes jaune noirâtre: 25 articles. Front brun rougeâtre, dessus du thorax semé de longues écailles jaunes, abdomen brun orangé sur la face dorsale, rougeâtre sur la face ventrale, tarsi roses. Ailes antérieures très falquées, apex arrondi, bord externe fortement concave, tornus droit. Couleur fondamentale des ailes antérieures brune avec un abondant semis d'écailles jaunes; aire externe brun noirâtre. Tache pré-apicale noire, liserée distalement de blanc et suivie en dehors d'une tache rose. Rayures brunes, extrêmement vagues, l'externe nettement préapicale et tangente à la grande fenêtre disco-cellulaire qui est liserée de brun noir.

Zone subcostale et basale des ailes postérieures rose, aire médiane brune, semée d'écailles jaunes; fenêtre disco-cellulaire liserée de noir, puis de jaune. Aire externe orangée. Petites taches submarginales brunes. Pas de rayures nettes.

Face ventrale rougeâtre sur l'aire baso-médiane et la région apicale, brun jaune sur l'aile externe qui est précédée, sur les quatre ailes, d'une bande violacée.

Par la structure de l'armure génitale mâle (Fig. 4) et par la position de la deuxième médiane des ailes antérieures qui émane de l'angle antérieur de la cellule, cette espèce entre dans le sous-genre *Sagana* Walker auprès de *C. (S.) sapatoza* (Westwood). Diffère de ce dernier, notamment par la forme des ailes antérieures, plus falquées, la coloration des quatre ailes, l'effacement des rayures et la forme des fenêtres disco-cellulaires; en revanche les armures génitales mâles des deux espèces sont très voisines.

Avec grand plaisir je dédie cette espèce nouvelle à mon excellent ami Claude Herbulot.

Rothschildia paucidentata spec. nov.

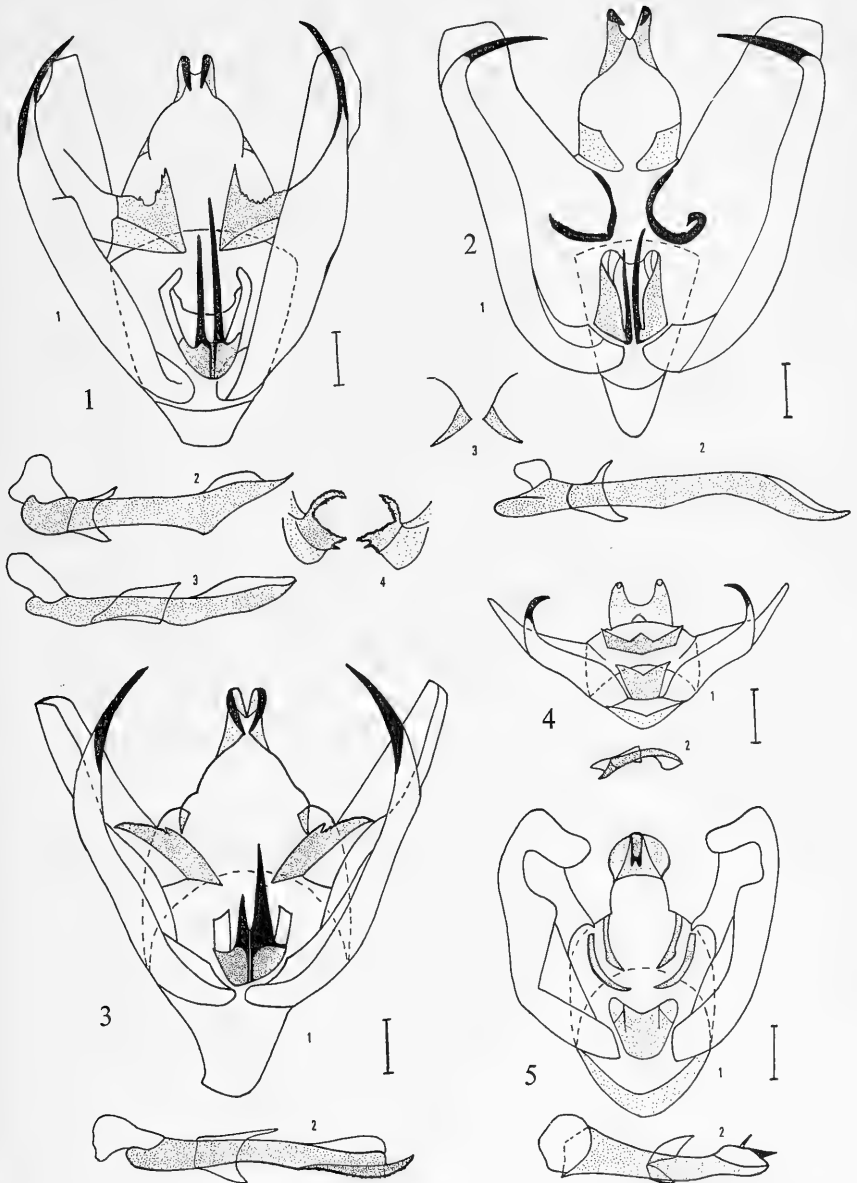
Fig. 5; Pl. 4 Fig. 7

Holotype: 1 ♂, Venezuela, Aragua, Colonia Tovar, 1700 m, 29.V.1963 (W. Gatz) (coll. C. Lemaire); allotype: 1 ♀, sans date de capture; paratypes: 3 ♂, V, VII.1963, tous même récolteurs, localités, et collection.

♂. — Envergure: 108—118 mm; longueur des ailes antérieures: 59—63 mm.

Antennes jaune orangé: 30 articles. Front brun, larges colliers pro- et métathoraciques blancs, thorax et face dorsale de l'abdomen acajou plus ou moins rougeâtre. Touffe anale blanche, dessous du corps brun avec une touffe de poils rougeâtres sur la région antérieure du thorax et deux lignes stigmatales et substigmatales brunes, liserées de blanc. Face antérieure des tarsi brune, postérieure blanche.

Ailes antérieures allongées et falquées. Couleur fondamentale acajou sur la face dorsale, brun foncé sur la face ventrale. Ornementation habituelle des espèces du genre. Rayures externes blanches, liserées distalement de brun rouge, celles du dessus des



Armure genitale ♂ des Attacidae. Fig. 1.—1, *Copaxa (Copaxa) escalantei* sp.n., vue ventralement, pénis détaché; 2, id., pénis vu latéralement; 3, *C. (C.) expandens* Walker, pénis vu latéralement; 4, id., harpes. Fig. 2.—1, *Copaxa (Copaxa) andensis* sp.n., vue ventralement, pénis détaché; 2, id., pénis vu latéralement; 3, *C. (C.) multifenestrata* (Herrich-Schäffer), harpes. Fig. 3.—1, *Copaxa (Copaxa) denbezi* sp.n., vue ventralement, pénis détaché; 2, id., pénis vu latéralement. Fig. 4.—1, *Copaxa (Sagana) herbuloti* sp.n., vue ventralement, pénis détaché; 2, id., pénis vu latéralement. Fig. 5.—1, *Rothschildia paucidentata* sp.n., vue ventralement, pénis détaché; 2, id., pénis vu latéralement. L'échelle figurée représente 1 mm

ailes antérieures droites, dirigées obliquement vers la base entre la costa et le bord interne, avec une seule dent bien indiquée entre Cu 1b et Cu 1a. Bandes submarginales violacées et semées d'écaillés noires sur les deux faces, vagues dorsalement, nettes ventralement. Taches marginales des ailes postérieures rouges entre la costa et Cu 1b, noires ensuite. Trait préapical blanc des ailes antérieures droit entre R 5 et M 1, et se prolongeant vers la base sur M 1. Fenêtres disco-cellulaires triangulaires, relativement petites, présentant sur les ailes antérieures un angle rentrant très net.

♀. — Envergure: 118 mm; longueur des ailes antérieures: 66 mm.

Ailes beaucoup moins falquées que le mâle, même coloration. Fenêtres disco-cellulaires plus grandes, dépourvues ou presque d'angles rentrants sur les ailes antérieures, à bord proximal droit ou convexe sur les ailes postérieures. Rayures externes des ailes antérieures pas ou peu obliques, un peu plus sinueuses que chez les exemplaires mâles.

Espèce voisine de *R. lebeau* (Guérin-Méneville) dont elle diffère par des caractères externes constants: coloration plus sombre et, semble-t-il, très peu variable (à l'inverse de chez *R. l. lebeau*), rayures externes des ailes antérieures beaucoup plus droites et différemment orientées, surtout celles des exemplaires mâles, avec un trait proximal blanc nettement plus étroit et une absence presque totale de dents. Les fenêtres disco-cellulaires sont beaucoup plus petites, celles du mâle n'atteignant pas la rayure externe des ailes postérieures, avec des liserés blancs, puis noirs, bien plus fins, parfois imperceptibles. Forme de ces fenêtres également très différente puisque chez *R. lebeau*, leur bord interne est, sur les ailes antérieures, droit ou convexe et dépourvu d'angle rentrant et, sur les ailes postérieures, convexe.³⁾

Les armures génitales mâles (Fig. 5) des deux espèces sont identiques mais le fait ne présente pas de signification particulière, étant assez fréquent dans le genre *Rothschildia*: ainsi l'armure de *R. jorulla* (Westwood) ne diffère-t-elle pas non plus de celle de *R. lebeau*.

Rothschildia lebeau yucatanana subsp. nov.

Pl. 4 Fig. 8

Holotype: 1 ♂, Mexique, Quintana Roo, X-can, VI.1969 (E. C. Welling) (coll. C. Lemaire); allotype: 1 ♀, même localité, 21.V.1969; paratypes: 13 ♂, 2 ♀, même localité, VI.1964, V, VI, VIII.1967, V, IX.1968, V, VI.1969; 6 ♂, Yucatan, Chaksikin, VI.1964, 1 ♂, Yucatan, Umán, VI. 1966, 2 ♂, Yucatan, Chichen Itza, VI.1956, tous même récolteur et collection.

♂. — Envergure: 83—103 mm; longueur des ailes antérieures: 48—60 mm.

♀. — Envergure: 95—98 mm; longueur des ailes antérieures: 57—61 mm.

Cette sous-espèce qui paraît propre à la péninsule du Yucatan, présente les mêmes variations de coloration que la sous-espèce nominative, mais, par son envergure moyenne très inférieure à celle-ci (dont certains exemplaires dépassent 120 mm), ainsi que par la présence d'un liseré marginal blanc, constant sur la face dorsale des ailes antérieures, très fréquent sur les ailes postérieures, elle rappelle surtout *R. lebeau forbesi* Benjamin. La rayure externe des ailes antérieures est plus large que chez ce dernier et en général plus fortement dentée, moins défléchie vers la base sous la costa et plus régulièrement convexe. Les liserés blancs des fenêtres disco-cellulaires sont généralement plus nets. Mais ce qui caractérise le mieux cette sous-espèce inédite est la forme très peu falquée

³⁾ Pour comparaison, voir *R. lebeau yucatanana* subsp. nov., Pl. 4 Fig. 8.

des ailes antérieures des exemplaires mâles, avec l'apex à peine saillant et le bord externe presque droit, comme chez la femelle et au contraire des autres sous-espèces où le mâle a toujours les ailes antérieures beaucoup plus falquées.

HEMILEUCINAE

Dirphia lichyi spec. nov.

Fig. 6; Pl. 5 Fig. 9—10

Holotype: 1 ♂, Venezuela, Aragua, Río Choroní, Puerto Colombia, ex larva, 7.II.1945 (R. Lichy) (sa coll.); allotype: 1 ♀, 13.II.1945; paratypes: 22 ♂, 13 ♀, tous même localité, ex larva, 27.I./7.III.1945, 1 ♂, Carabobo, vallée du Río Borburata, 250 m, 1.XII.1956/31.III.1957, 1 ♂, même localité, 670 m, 10.V.1950, tous mêmes récolteur et collection.

♂. — Envergure: 76—91 mm; longueur des ailes antérieures: 43—48 mm.

Antennes jaune orangé: 43 articles. Tête, dessus du thorax et tarses bruns, abdomen jaune orangé, annelé dorsalement de noir. Aires interne et externe des ailes antérieures gris clair, aire médiane brune, rayure externe gris clair, liserée distalement de brun, bande submarginale brune, bordée distalement de gris clair, très striée et ne se détachant nettement qu'entre Cu 1b et M3, d'une part, M 1 et la costa, d'autre part. Le signe en Y couché qui représente la tache disco-cellulaire chez les *Dirphia* du groupe, *D. tarquinia* (Cramer) est ici très fin et sa branche proximale n'atteint généralement pas l'aire interne; sa branche subcostale, plus courte, renferme un très léger trait brun jaune.

Ailes postérieures orange terne, plus ou moins ombrées de noirâtre sur l'aire externe, ornées d'une très vague rayure externe noirâtre, convexe et d'une tache disco-cellulaire noire, en forme de virgule. Face ventrale uniformément beige orangé, sans aucun ornement.

♀. — Envergure: 105—120 mm; longueur des ailes antérieures: 58—65 mm.

Diffère essentiellement du mâle par sa taille très supérieure, son aspect plus massif et par la coloration des ailes antérieures dont l'aire baso-médiane est entièrement brune et l'aire externe, plus étroite, brun clair, occupée dans toute sa partie proximale par la large bande submarginale gris rosé. Tache disco-cellulaire des ailes antérieures plus allongée, avec le petit trait brun jaune de la branche subcostale très vague ou absent; celle des ailes postérieures plus large.

Espèce très proche de *D. tarquinia* et ayant la même envergure, très supérieure à celle des autres *Dirphia* du même groupe. Elle en diffère, le mâle par le développement de l'aire médiane, qui, sur la face dorsale des ailes antérieures, au lieu d'être réduite à un simple losange, parfois très petit, occupe tout le milieu de l'aile et est aussi large sur le bord interne que sous la costa, la femelle par la disparition totale de la zone claire correspondant à l'aire interne des mêmes ailes. Les deux espèces coexistent dans une des localités typiques (Río Borburata). Leurs armures génitales (Fig. 6) sont similaires mais le fait est courant entre espèces voisines du genre *Dirphia*.

La femelle de *D. lichyi* a été décrite par Bouvier (1924: 384) comme «variation extrême de *tarquinia*», en même temps qu'un mâle appartenant, lui, à cette dernière espèce. Schüssler (1934: 412), jugeant à tort ces deux exemplaires, sans les avoir vus, conspécifiques, les a nommés *Hyperdirphia tarquinia* forme *bouvieri*, nom de rang infra-subspécifique, à invalider par application de l'article 45 (d) (iii) du Code international de Nomenclature zoologique. Afin d'éviter toute confusion, nous désignons comme lectotype de

cette «forme» le syntype mâle du Venezuela, Bané (M. Grisol), conservé par le Muséum de Paris. *D. tarquinia* forme *bouvieri* devient ainsi un synonyme pur et simple de *D. tarquinia*.

Il était juste de dédier cette nouvelle espèce à M. René Lichy qui, en réalisant son élevage, a permis de la séparer avec certitude de *D. tarquinia*.

Dirphia crassifurca spec. nov.

Fig. 7; Pl. 6 Fig. 11—12

Holotype: 1 ♂, Venezuela, Mérida, Valle la Mucuy, 2300 m, 7.IX.1956 (R. Lichy) (sa coll.); allotype: 1 ♀, 8.IX.1956; paratypes: 13 ♂, 1 ♀, 1/11.IX.1956, 17.VI.1966, tous mêmes localité, récolteur et collection.

♂. — Envergure: 66—74 mm; longueur des ailes antérieures: 35—40 mm.

Antennes jaune paille: 38 articles. Palpes labiaux brun noir, front, prothorax et dessus du corps orangés, dessus du thorax brun foncé, de l'abdomen orange, annelé de noir; tarsi bruns. Aire baso-médiane des ailes antérieures gris clair, assez étroite, aire médiane brun foncé, aire externe brun clair mais presque entièrement recouverte par les stries, alternativement gris clair et brun foncé, de la bande submarginale. Rayures gris clair, l'externe dirigée très obliquement en dehors de la costa vers le bord interne, l'interne droite. Tache disco-cellulaire en Y couché à branches très larges, mais courtes, la distale fréquemment tronquée, la subcostale renfermant un très léger trait jaune clair.

Ailes postérieures orange s'obscurcissant vers le bord externe; rayure externe noirâtre, très estompée. Petit trait disco-cellulaire noir. Face ventrale orangée avec, sur chaque aile, une rayure externe blanche très estompée, celle des ailes postérieures droite. Un vague trait disco-cellulaire sur ces dernières.

♀. — Envergure: 88—91 mm; longueur des ailes antérieures: 47—49 mm.

Aire interne des ailes antérieures gris violacé, aire médiane brune, aire externe brune également mais occupée, dans sa partie proximale, par la bande submarginale beige rosé, avec quelques stries brun noir. Ailes postérieures gris noirâtre avec un reflet orangé vers la base. Vague tache disco-cellulaire blanchâtre, teintée d'orangé. Face ventrale brun terne, rayures externes blanches, celles des ailes postérieures bien marquées; la tache disco-cellulaire de la face dorsale transparait nettement.

Armure génitale mâle (Fig. 7) beaucoup plus grêle que celle de *D. tarquinia*, mais sans différence de structure notable.

Cette espèce dont l'envergure, chez les exemplaires des deux sexes, est bien moindre que celle de *D. tarquinia* et *D. lichyi*, est essentiellement caractérisée par la largeur des branches de la tache disco-cellulaire des ailes antérieures, très supérieure à celle observée chez toutes les espèces du même groupe.

Cerodirphia marahuaca spec. nov.

Fig. 8; Pl. 7 Fig. 14

Holotype: 1 ♂, Venezuela, Amazonas, base du Cerro Marahuaca, Caño Tchari, 7.V.1950 (R. Lichy) (genitalia ♂, prép. C. Lemaire n° 2324) (coll. R. Lichy); paratype: 1 ♂, mêmes localité, date, récolteur et collection.

♂. — Envergure: 70—75 mm; longueur des ailes antérieures: 37—40 mm.

Antennes jaune paille: 43 articles. Palpes labiaux, front, thorax et tarsi orangés;

abdomen noir, annelé de blanc sur les faces dorsale et latérales, beige orangé sur la face ventrale, touffe anale orangée.

Couleur fondamentale de la face dorsale des quatre ailes rose, avec une légère nuance orangée, notamment sur la base des ailes postérieures. Rayures externes noirâtres, celles des ailes postérieures très estompées ou réduites à un trait subcostal. Tache disco-cellulaire des ailes antérieures, en forme d'Y couché, relativement petite, avec la branche inférieure très réduite, celle des ailes postérieures absente. Face ventrale beige rosé, très pâle avec, pour seule ornementation, les rayures externes noirâtres. Costa des ailes postérieures blanches, bordées de noir, sur les deux faces, franges concolores.

Cette espèce diffère de *C. speciosa* (Cramer) par le rose beaucoup plus vif de la coloration de la face dorsale des quatre ailes, où les nervures ne se détachent pas en noirâtre, et par son envergure très supérieure, par laquelle elle se situe auprès de *C. mota* (Druce). Mais, chez ce dernier, les nervures sont soulignées de jaune d'or sur la face dorsale, les franges sont blanches et il n'existe aucune trace de rayure externe sur le dessus des ailes postérieures.

L'armure génitale mâle (Fig. 8) est très différente de celles de *C. speciosa* et *C. mota*: elle est essentiellement caractérisée par la structure de l'uncus dont l'extrémité postérieure est simple (elle présente deux pointes chez *C. speciosa*) et la face dorsale surmontée d'un rostre n'existant chez aucune des espèces voisines. Le huitième segment est dépourvu de sclérisation différenciée.

Cerodirphia avenata araguensis subsp. nov.

Fig. 9; Pl. 7 Fig. 15

Holotype: 1 ♂, Venezuela, Aragua, río Choroní, 13.VI.1970 (Mme A. Gadou) (genitalia ♂, prép. C. Lemaire n° 2105) (coll. C. Lemaire); allotype: 1 ♀, Aragua, route de Maracay à Choroní, km 25, 1600 m, 15.IX.1945 (R. Lichy) (sa coll.); paratypes: 29 ♂, VIII.1940, VI.1942, IX.1943, IX.1945, VII.1948, IX.1950, VIII.1954, VIII.1966, mêmes localités, récolteur et collection.

♂. — Envergure: 70—89 mm; longueur des ailes antérieures: 36—47 mm.

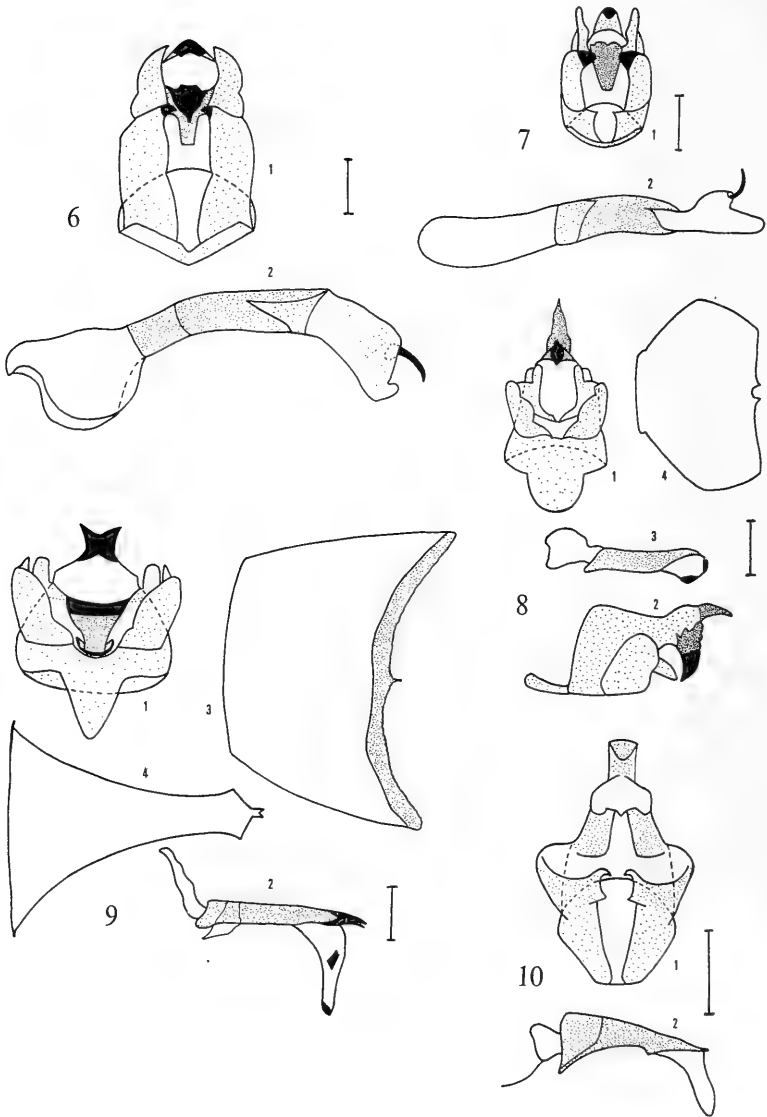
Antennes jaune paille: 37 articles. Palpes labiaux, front, thorax et pattes brun orangé; abdomen noir, annelé de blanc, sur les faces dorsale et latérales, brun foncé ou brun orangé sur la face ventrale, touffe anale orangée.

Face dorsale beige brun ou brun roux plus ou moins orangé, avec une rayure externe noire sur chaque aile, celles des ailes antérieures droites et très largement préapicales, celles des ailes postérieures convexes. Tache disco-cellulaire des ailes antérieures blanche, en forme d'Y couché, dont la branche subcostale renferme un long trait noir, strié de blanc, celle des ailes postérieures blanche, en forme de virgule, souvent très développée. Dessous des ailes de la même teinte que la face dorsale, même ornementation mais la tache disco-cellulaire des ailes antérieures fait défaut ou transparait faiblement. Costa des ailes postérieures blanche sur les deux faces, franges concolores.

♀. — Envergure: 102 mm; longueur des ailes antérieures: 54 mm.

Couleur fondamentale brun roux orangé sur les deux faces. Même ornementation que le mâle.

Draudt (1930: 769, pl. 116, c ♀) a décrit *C. avenata* de Paname, Chirique, comme „forme” de *C. speciosa* (Cramer) alors qu'il s'agit en fait d'une espèce distincte, caractérisée par la teinte, d'un rose très différent, des quatre ailes, par l'effacement des



Armure génitale ♂ des Attacidae. Fig. 6. — 1, *Dirphbia lichyi* sp.n., vue ventralement, pénis détaché; 2, id., pénis vu latéralement. Fig. 7. — 1, *Dirphbia crassifurca* sp.n., vue ventralement, pénis détaché; 2, id., pénis vu latéralement. Fig. 8. — 1, *Cerodirphbia marahuaca* sp.n., vue ventralement, pénis détaché; 2, id., même armure vue latéralement; 3, id., pénis vu latéralement; 4, id., sternite 8. Fig. 9. — 1, *Cerodirphbia avenata araguensis* subsp.n., vue ventralement, pénis détaché; 2, id., pénis vu latéralement; 3, id., sternite 8; 4, id., tergite 8. Fig. 10. — 1, *Kentroleuca spitzi* sp.n., vue ventralement, pénis détaché; 2, id., pénis vu latéralement. L'échelle figurée représente 1 mm

nervures qui se détachent toujours en noir sur le fond chez *C. speciosa* et surtout par la présence, sur les deux faces des ailes postérieures d'une tache disco-cellulaire blanche. L'armure génitale mâle (Fig. 9) diffère de celle de *C. speciosa*, par la structure de l'uncus, plus large et par l'allongement de la sclérification du huitième tergite. *C. avenata araguensis* est caractérisé par l'envergure moyenne des exemplaires, très supérieure à celle de la sous-espèce nominative, par sa coloration dominante brune, plus ou moins orangée, jamais rose, et enfin par la netteté des rayures sur les deux faces.

Kentroleuca spitzii spec. nov.

Fig. 10; Pl. 6 Fig. 13

Holotype: 1 ♀, Brésil, Goiás, Leopoldo de Bulhoes, X.1936 (R. Spitz) (coll. R. Spitz < Tring Mus. < British Museum, Nat. Hist.); allotype: 1 ♂, Brésil, District Fédéral, Brasília, Brasilia Country Club, 19.X.1968 (N. Tangerini) (coll. C. Lemaire); paratypes: 2 ♀, X.1968, X.1969, mêmes localité, récolteur et collection.

♂. — Envergure: 44—51 mm; longueur des ailes antérieures: 23—27 mm.

Antennes bipectinées, noires: 54 articles. Palpes labiaux brunâtres, tête et dessus du thorax gris jaune, face dorsale de l'abdomen jaune orangé, dessus du corps gris clair, taches stigmatales blanches dans de larges stries latérales noires, tarses noirs.

Apex des ailes antérieures arrondi, obtus, bord externe convexe, tornus très large et arrondi. Couleur fondamentale noire sur laquelle se détachent, en jaune, les nervures, en blanc, les rayures (l'externe droite), les franges et deux larges stries dont la première traverse longitudinalement la cellule et la seconde relie la base au bord externe, entre la nervure anale et Cu 1b.

Ailes postérieures noires, un peu plus sombres sur l'aire baso-médiane, nervures jaunes, franges blanches. Face ventrale noire, nervures jaunes, rayures externes blanches, nettes sur les quatre ailes; sur les ailes antérieures, mêmes stries blanches que sur la face dorsale, mais très estompées.

♀. — Envergure: 58—70 mm; longueur des ailes antérieures: 30—35 mm.

Ne diffère du mâle que par la présence d'assez vagues rayures externes noirâtres ou blanchâtres sur le dessus des ailes postérieures. Franges de ces ailes grises.

Diffère de *K. lineosa* (Walker) et de *K. albilinea* (Schaus) par la forme plus arrondie des ailes antérieures et, de plus, du premier par l'absence de rayure externe sur la face dorsale des ailes postérieures, au moins chez les exemplaires mâles, du second par la teinte noire, chez les exemplaires des deux sexes, de l'aire baso-médiane de ces ailes. Aspect général plus proche de *K. dunkinfieldi* (Schaus), mais, chez ce dernier, les deux fascies longitudinales blanches des ailes antérieures font défaut, les rayures externes de ces ailes sont fortement convexes, celles des ailes postérieures nettes, et les antennes sont jaune orangés.

Armure génitale mâle (Fig. 10) plus grêle que celles des trois espèces précitées; au contraire de chez elles, la vesica est dépourvue de cornutus.

Travassosula mulierata spec. nov.

Fig. 11; Pl. 7 Fig. 16

Holotype: 1 ♂, Pérou, Junin, Chanchamayo, 700 m, VI.1960 (coll. C. Lemaire); paratype: 1 ♂, Pérou, Carabaya, rio Huacamayo, La Union, 2000 ft, XII-1904 (saison hu-

mide) (G. Ockenden) (Tring Mus. = British Museum, Nat. Hist.).

♂. — Envergure: 48—52 mm; longueur des ailes antérieures: 27—29 mm.

Antennes noirâtres: 32 articles; la longueur des pectinations apicales diminue progressivement sur les 12 derniers articles où seules les pectinations basales subsistent. Palpes labiaux, tête, thorax bruns, abdomen rouge dorsalement, brunâtre latéralement et sur la région anale, rougeâtre ventralement; tarsi noirs, avec des écailles violacées.

Face dorsale des quatre ailes brun terne. Ailes antérieures très allongées, bord externe convexe, avec une petite dent subapicale, tornus arrondi. Ailes postérieures présentant vers le milieu du bord costal une profonde incision, suivie d'une dent et d'une légère concavité. Ornementation, sur les deux faces, semblable à celle de *T. subfumata* (Schaus).

Le mâle de *T. mulierata* ressemble étonnamment à la femelle de *T. subfumata* et diffère donc, par les mêmes caractères externes qu'elle (envergure supérieure, forme des quatre ailes, avec l'incision beaucoup plus profonde du bord costal des ailes postérieures) du mâle de cette dernière espèce. Armure génitale (Fig. 11) plus robuste et structure des valves différente, avec l'extrémité de la costa très sclérifiée, en forme de pointe, et le bord interne du sacculus moins renflé. Bulbus ejaculatorius plus long.

ARSENURINAE

Copiopteryx semiramis gadouorum subsp. nov.

Pl. 8 Fig. 17

Holotype: 1 ♂, Venezuela, Bolivar, El Pao, 450 m, VII-1968 (M. et M^{me} A. Gadou) (coll. C. Lemaire); allotype: 1 ♀, V.1963; paratypes: 5 ♂, 1 ♀, V, VI.1963, VI.1967, tous mêmes localités, récolteurs et collection.

♂. — Envergure à l'apex: 79—90 mm; longueur des ailes antérieures: 49—53 mm; longueur des ailes postérieures: 117—130 mm.

♀. — Envergure: 94—95 mm; longueur des ailes antérieures: 55 mm; longueur des ailes postérieures: 109 mm.

Sous-espèce caractérisée par la taille moyenne des exemplaires des deux sexes, très nettement inférieure à celle de la sous-espèce nominative: ainsi, chez cette dernière qui est connue du Surinam, des Guyanes française et ex-anglaise et du Nord du Venezuela, l'envergure du mâle se situe entre 105 et 110 mm, de la femelle entre 100 et 125 mm et la longueur des ailes postérieures atteint et dépasse 160 mm chez le mâle (145 mm sur la figure de Cramer), 140 mm chez la femelle. *C. s. gadouorum* se situe donc, par la taille, auprès de *C. s. montei* Gagarin (= *C. s. travassosi* May) que Travassos (1934:412) considérait comme une espèce valable, mais en diffère par un certain nombre de caractères, particulièrement évidents chez les exemplaires mâles: aspect général plus gracile, coloration plus claire, bord externe des ailes antérieures moins oblique entre R 1 et l'angle interne, fenêtres disco-cellulaires de ces ailes beaucoup plus étroites, queues proportionnellement un peu plus longues mais surtout sensiblement plus grêles (largeur 2 mm, 5 contre 3 mm, 5 environ, à mi-distance de la base de l'aile et de son extrémité postérieure). Ces caractères sont moins prononcés chez les exemplaires femelles, sauf en ce qui concerne la longueur des ailes postérieures et la coloration.

C'est avec le plus grand plaisir que je dédie cette nouvelle sous-espèce à M. et à M^{me} A. Gadou qui ont personnellement récolté la totalité du matériel typique.

DRYOCAMPINAE (= ADELOCEPHALINAE)⁴⁾*Eacles imperialis quintanensis* subsp. nov.

Pl. 9 Fig. 18—19

Holotype: 1 ♂, Mexique, Quinta-Roo, X-Can, 12.V.1969 (E. C. Welling) (coll. C. Lemaire); allotype: 1 ♀, même date; paratypes: 44 ♂, 6 ♀, VI.1967, V.1968, V, VI.1969, tous mêmes localités, récolteur et collection.

♂. — Envergure: 89—106 mm; longueur des ailes antérieures: 45—55 mm.

♀. — Envergure: 113—121 mm; longueur des ailes antérieures: 58—65 mm.

Sous-espèce dimorphique: sur 45 exemplaires mâles, 23 présentent une coloration fondamentale jaune, avec une ornementation et des zones brun violacé, tandis que, chez les 22 autres, le jaune est partout remplacé par une teinte gris violacé, rarement brun rougeâtre, très uniforme et beaucoup plus terne que chez *E. imperialis nobilis* Neumoegen. Le même dimorphisme existe chez les exemplaires femelles, avec semble-t-il, prédominance des spécimens jaunes (6 sur 7).

Sur les ailes antérieures les rayures interne et externe sont toujours séparées par une large zone médiane alors qu'elles fusionnent au dessus du bord interne chez la plupart des exemplaires mâles des sous-espèces néarctiques: *E. i. imperialis* (Drury), *E. i. pini* Michener, *E. i. nobilis* Neumoegen, *E. i. oslari* W. Rothschild. Les ailes antérieures des mâles sont plus allongées et falquées que chez ces quatre sous-espèces, les rayures plus étroites sur les quatre ailes; la tache ocellaire subcostale des ailes antérieures est toujours très éloignée de la rayure interne au lieu d'être presque constamment recouverte par cette dernière.

Sur ces divers points les mâles d'*E. i. quintanensis*, mis à part *E. i. tucumana* W. Rothschild, 1907, dont les rayures, surtout l'externe des ailes postérieures sont beaucoup plus larges, se rapprochent de ceux des sous-espèces sud-américaines (mais aucune de celles-ci n'est dimorphique): *E. i. magnifica* Walker, 1855, *E. i. cacicus* (Boisduval), 1868, *E. i. opaca* Burmeister, 1878, *E. i. approximans* Bouvier, 1923. Comme chez ces sous-espèces, le dessus du thorax de la femelle, du moins de celle appartenant à la morphé claire, est entièrement jaune, à l'exception d'une tache mésothoracique violette; en revanche les taches ocellaires sont ici beaucoup plus fortes chez les exemplaires des deux sexes et elles présentent, surtout chez les individus à fond jaune, un centre clair beaucoup plus contrastant. De plus, sur les ailes antérieures, ces taches sont toujours plus rapprochées, en contact ou presque, au lieu d'être le plus souvent isolées.

Les mêmes caractères séparent la sous-espèce nouvelle d'*E. i. decoris* W. Rothschild, décrit du Guatemala mais également connu du Mexique (Etats de Mexico, Oaxaca, Veracruz et Chiapas) qui n'est pas dimorphique, dont l'envergure moyenne, surtout celle du mâle est très supérieure et dont la tache sous-costale des ailes antérieures, chez les exemplaires de ce sexe, est plus petite et se perd fréquemment dans la rayure interne.

⁴⁾ La désignation de cette sous-famille pose un problème de Nomenclature assez délicat. Le genre *Ceratocampa* Harris, 1833, basé sur deux espèces qui sont en fait les types respectifs des genres *Citheronia* Hübner, 1819 et *Eacles* Hübner, 1819, n'est pas valable et il en est de même de *Ceratocampidae* Harris, 1841, nom dérivé du groupe famille, par application de l'article 11 (e) du Code international de Nomenclature zoologique. Le plus ancien nom utilisable du groupe famille devient donc *Dryocampini*, nom de tribu, proposé par Grote et Robinson en 1866, si, comme nous l'estimons, le genre *Dryocampa* Harris, 1833, est valable. Si au contraire on pense que *Dryocampa* n'est qu'un synonyme ou un sous-genre d'*Anisota* Hübner, 1820, la famille doit se nommer *Adeloccephalinae* Boisduval, 1868 (= *Citheroniinae* Neumoegen et Dyar, 1894 = *Sphingicampinae* Packard, 1901 = *Syssphinginae*, Packard, 1905).

***Eacles imperialis anchicayensis* subsp. nov.**

Pl. 10 Fig. 20

Holotype: 1 ♂, Colombie, Valle Cauca, Anchicaya, 1000/1400 m, 3.XI.1964 (L. et L. Denhez) (coll. C. Lemaire); allotype: 1 ♀, 17.XII.1964; paratypes: 23 ♂, 10 ♀, VIII.1963, I, VIII à XII.1964, I, VII, VIII, X.1965, VIII.1967, VI.1968, tous mêmes localité, récolteurs et collection.

♂. — Envergure: 110—131 mm; longueur des ailes antérieures: 55—65 mm.

♀. — Envergure: 145—164 mm; longueur des ailes antérieures: 79—85 mm.

Cette sous-espèce, non dimorphique, présente un certain nombre de caractères communs avec celles déjà connues de l'Amérique centrale et du Sud, tels la forme falquée des ailes antérieures du mâle, la coloration jaune, à l'exception d'une tache mésothoracique violette, du thorax de la femelle, la position relative des rayures sur la face dorsale des ailes antérieures, le diamètre des taches ocellaires chez les exemplaires des deux sexes. De toutes ces sous-espèces, d'ailleurs décrites de régions géographiques toutes autres, Guatemala et Mexique (*E. i. decoris*, et *E. i. quintanensis*), Est et Sud-Est du Brésil (*E. i. magnifica* et *E. i. cacicus*), Argentine (*E. i. opaca* et *E. i. tucumana*) et Venezuela central (*E. i. approximans*), elle diffère par son envergure beaucoup plus grande, par la forme plus allongée et falquée des ailes antérieures du mâle avec l'apex très aigu et le bord externe plus fortement concave et enfin par la vivacité de la coloration fondamentale jaune, contrastant beaucoup avec les zones sombres violet foncé qui sont très intensément marquées chez les exemplaires mâles.

***Citheronia lichyi* spec. nov.**

Fig. 12; Pl. 10 Fig. 21

Holotype: 1 ♂, Venezuela, Amazonas, rio Temi, Yavita, 128 m, 9.IX.1947 (R. Lichy) (genitalia ♂, prép. C. Lemaire n° 2267) (coll. R. Lichy); paratype: 1 ♂, mêmes localité, récolteur et collection.

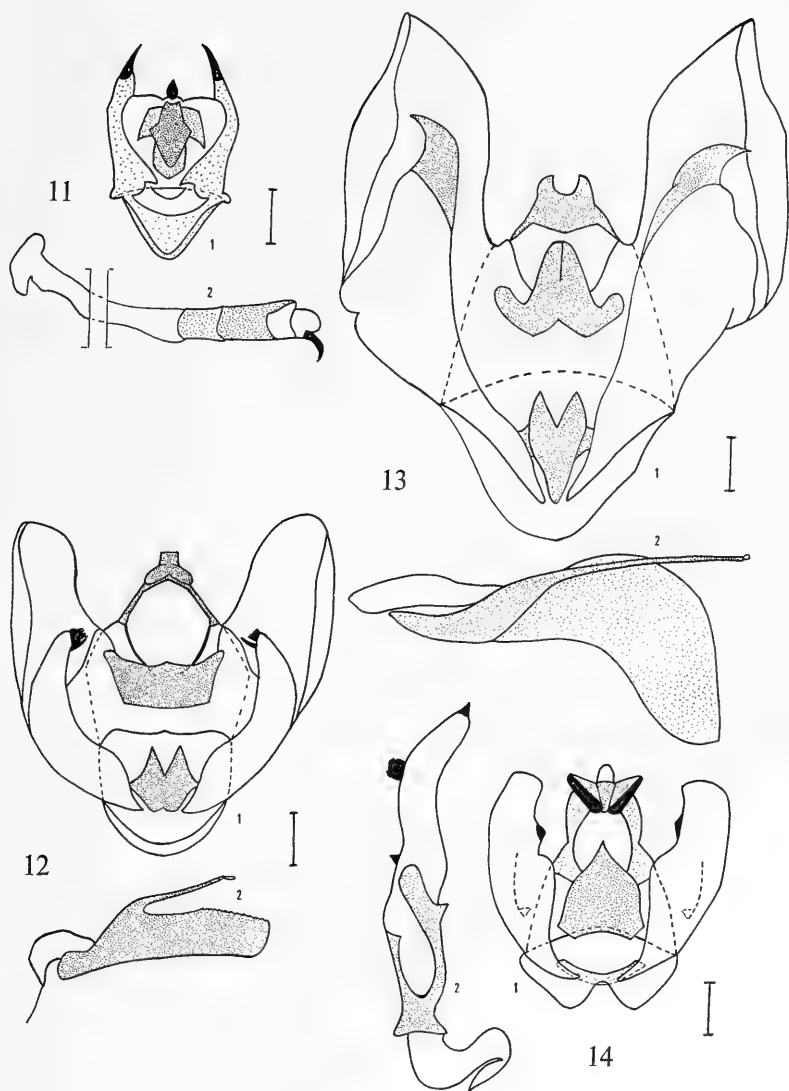
♂. — Envergure: 69—73 mm; longueur des ailes antérieures: 35—38 mm.

Antennes jaune orangé: 43 articles dont 15 quadripectinés, suivis de 26 simples. Front, tibia et tarse orangés, le reste du corps jaune safran. Ailes antérieures très allongées, apex aigu, bord externe convexe, tornus très arrondi et obtus. Couleur fondamentale jaune safran; aires interne et externe gris-ardoise sur lesquelles les nervures sont finement teintées d'orangé. Bande submarginale orangée, diffuse. Petit point disco-cellulaire orangé à centre noirâtre, quelques vagues taches orangées sur l'aire médiane, la plus nette entre A et Cu 1b.

Ailes postérieures jaune clair, passant au jaune safran vers le bord anal, avec seulement un point disco-cellulaire rose. Face ventrale semblable à la face dorsale mais l'aire interne des ailes antérieures est de la même teinte jaune safran que le fond.

L'armure génitale (Fig. 12), quoique plus grêle, n'est distincte de celle de *C. brissoti* (Boisduval) que par la structure de l'aedeagus dont le bord ventral est droit au lieu d'être fortement concave.

Cette espèce diffère, par son ornementation, presque aussi réduite que celle de *C. sepulcralis* Grote et Robinson, de toutes les autres espèces du genre. Ainsi, font totalement défaut, sur l'abdomen, les anneaux dorsaux polychromes et les taches stigmates, sur les ailes antérieures, la série de larges taches postmédianes claires, si caractéristi-



Armure génitale ♂ des Attacidae. Fig. 11. — 1, *Travassosula mulierata* sp.n., vue ventralement, pénis détaché; 2, id., pénis vu latéralement. Fig. 12. — 1, *Citheronia lichyi* sp.n., vue ventralement, pénis détaché; 2, id., pénis vu latéralement. Fig. 13. — 1, *Citheronia andina* sp.n., vue ventralement, pénis détaché; 2, id., pénis vu latéralement. Fig. 14. — 1, *Bouvierina gadouae* sp.n., vue ventralement, pénis détaché; 2, id., pénis vu ventralement. L'échelle figurée représente 1 mm

ques de la plupart des *Citheronia*, sur les ailes postérieures, les rayures interne et externe.

C'est avec le plus grand plaisir que je dédie à M. René Lichy cette nouvelle espèce; certainement une des plus intéressantes de toutes celles qu'il ait récoltées au Venezuela.

***Citheronia andina* spec. nov.**

Fig. 13; Pl. 10 Fig. 22

Holotype: 1 ♂, Pérou, Junin, La Merced, 700 m, IX.1963 (G. et L. W. Harris) (genitalia ♂, prép. C. Lemaire n° 1536) (coll. C. Lemaire); paratype: 1 ♂, Pérou, Huallaga-Tai, même collection.

♂. — Envergure: 101—106 mm; longueur des ailes antérieures: 51—55 mm.

Antennes jaune orangé: 39 articles dont 15 quadripectinés, suivis de 22 simples. Front rouge orangé, une touffe de poils jaunes à la base du pédicelle, thorax rouge orangé, avec des touffes de poils jaunes sur le prothorax, le métathorax, la base des ailes antérieures et la face ventrale. Abdomen rouge orangé, annelé de jaune, sur la face dorsale, jaune sur la face ventrale; stigmates rouge orangé. Tarses de la même teinte, semés de poils jaunes.

Ailes antérieures très allongées, apex légèrement arrondi, bord externe un peu convexe. Couleur fondamentale gris ardoise, nervures peu contrastantes, sauf sur le bord externe où elles prennent une teinte orange plus marquée. Ornementation, sur les deux faces, semblable à celle de la plupart des espèces du genre. Taches postmédianes du dessus des ailes antérieures jaune pâle, certaines pouvant être semées d'écailles orange; les trois premières, la cinquième, la sixième et la dernière en partant de la costa sont les plus larges, la quatrième est parfois absente, la septième très petite. Tache basale jaune clair. Autres taches et bande submarginale orange terne. Ailes postérieures jaune pâle, avec une large zone basale rouge contenant le plus souvent la tache discocellulaire de la même teinte et pouvant même fusionner avec la rayure externe; rouge également, celle-ci s'élargit sensiblement vers le bord anal. Bord externe des ailes postérieures convexe.

Espèce très voisine de *C. equatorialis*, *C. aroa*, et *C. bellavista*¹⁾. Diffère nettement des deux dernières par la forme des ailes antérieures, plus larges, avec l'apex bien moins aigu, le bord externe légèrement convexe au lieu d'être absolument droit, le tornus plus arrondi. Le bord externe des ailes postérieures est plus franchement convexe, que chez *C. aroa* surtout, et, sur la face dorsale de ces ailes, la zone basale rouge est en général plus étendue.

Beaucoup plus difficilement séparable par les caractères externes de *C. equatorialis*, si ce n'est que, chez ce dernier, d'après les exemplaires examinés, les deux arceaux formés par la bande submarginale, sur la face dorsale des ailes antérieures, entre Cu 1b et M 3, sont beaucoup plus larges et entièrement recouverts d'écailles orange au lieu de présenter sur leur bord proximal une profonde concavité gris ardoise.

Les armures génitales des quatre espèces présentent d'excellents caractères qui peuvent être ainsi résumés:

1. Bord interne du sacculus très fortement recourbé vers l'avant, dans le prolongement

¹⁾ L'examen du matériel typique nous a permis d'établir que *C. consobrina* W. Rothschild, 1907, *C. mogya* Schaus, 1920 et *C. mexicana* var. *brasiliensis* Bouvier, 1927, sont des synonymes récents de *C. aroa* Schaus, 1896, syn. nov. En revanche, *C. mexicana* var. *equatorialis* Bouvier, 1927 et *C. mexicana* forme *bellavista* Draudt, 1929 sont des espèces valables.

du crochet apical, bord postérieur du juxta denté, processus ventral de l'aedeagus relativement grêle *C. aroa*

— Bord interne du sacculus continu, bord postérieur du juxta non denté, aedeagus très robuste à fort processus ventral 2

2. Sacculus aussi long que la costa, à crochet apical dorsalement épineux. Processus ventral de l'aedeagus relativement court, à extrémité apicale droite *C. equatorialis*

— Sacculus nettement plus court que la costa à crochet apical lisse. Processus ventral de l'aedeagus très fort, à extrémité apicale aigüe 3

3. Gnathos très étroit. Bord dorsal du processus ventral de l'aedeagus muni d'une dent très proéminente *C. bellavista*

— Gnathos plus large. Bord dorsal du processus ventral de l'aedeagus régulièrement convexe ou très légèrement incisé (fig. 13) *C. andina*

Nous avons reçu *C. andina*, non seulement de la localité typique, mais également de l'Equateur, Orient et de la Bolivie, Cochabamba.

Bouvierina gadouae spec. nov.

Fig. 14; Pl. 11 Fig. 23

Holotype: 1 ♂, Venezuela, District Fédéral, Caracas (Mme A. Gadou) (genitalia ♂, prép. C. Lemaire n° 1579) (coll. C. Lemaire); allotype: 1 ♀, Venezuela, Miranda, Los Teques (même coll.); paratypes: 3 ♂, District Fédéral, Antimano, 900 m, VIII, IX, 1934, 1 ♂, Aragua, plage de Puerto Colombia, 15.VIII.1944, 1 ♀, Caracas Sud, 880 m, 1.VI.1937 (R. Lichy) (sa coll.), 2 ♀, Los Teques (coll. C. Lemaire).

♂. — Envergure: 56—62 mm; longueur des ailes antérieures: 28—31 mm.

Antennes jaune orangé: 43 articles dont 19 quadripectinés, suivis de 22 simples. Front et prothorax beige jaunâtre, dessus du thorax de la même teinte, passant au gris violacé sur les tegulae; abdomen beige orangé, ombré de grisâtre, sur la face dorsale, gris violacé sur la face ventrale. Tarses gris violacé.

Ailes antérieures peu allongées, apex assez arrondi, bord externe convexe, tornus large. Couleur fondamentale beige terne, avec de nombreuses mouchetures gris violacé; aires interne et externe gris violacé. Rayure interne très vague, externe plus ou moins marquée, nettement préapicale (4 mm), droite ou un peu convexe. Taches apicale et subcostale blanches pouvant fusionner.

Face ventrale gris beige terne, mouchetée de noirâtre; une zone rose vers la base des ailes antérieures. Seuls ornements: sur celles-ci, une rayure externe noirâtre ou brunâtre et une forte tache disco-cellulaire noire, sur les ailes postérieures, une rayure externe très vague.

♀. — Envergure: 63—78 mm; longueur des ailes antérieures: 30—40 mm.

Antennes simples. Même coloration que le mâle, avec toutefois le dessus de l'abdomen plus orangé, l'aire médiane des ailes antérieures plus claire, les taches subcostales et disco-cellulaires blanches de ces ailes remplacées par un halo noirâtre et enfin la zone rose de la face ventrale très atténuée.

Présence, comme chez *B. smithi* (Druce, 1904) (= *andrea* Dognin, 1912, syn. nov.) de nombreuses mouchetures noirâtres sur la face dorsale des ailes antérieures, mais coloration toute autre, de même que la position de la rayure externe de ces ailes, apicale chez *B. smithi*, très éloignée de l'apex chez l'espèce nouvelle qui rappelle à cet égard, ainsi que par son aspect général, teinte mise à part, *B. quadrilineata* (Grote et Robinson).

Armure génitale mâle (Fig. 14) très différente de celles de *B. smithi* et *B. quadrilineata*, notamment par la structure de l'uncus, des valves et de l'aedeagus.

Je dédie avec plaisir cette espèce inédite à Mme A. Gadou à qui je suis redevable d'une partie du matériel typique.

***Bouvierina ocellata jasonoides* subsp. nov.**

Fig. 15; Pl. 11 Fig. 24

Holotype: 1 ♂, Colombie, Valle Cauca, Calima, 1800 m, V.1970 (L. et L. Denhez) (genitalia ♂, prép. C. Lemaire n° 1579) (coll. C. Lemaire); paratypes: 3 ♂, IV.1967, XII.1968, II.1969, mêmes localité, récolteurs et collection.

♂. — Envergure: 76—85 mm; longueur des ailes antérieures: 42—46 mm.

Antennes jaune orangé: 42 articles dont 20 quadripectinés, suivis de 20 simples. Tête et dessus du corps orange vif, tegulae violettes, face ventrale de l'abdomen beige violacé, tarsi violets.

Ailes antérieures triangulaires: apex très aigu, bord externe droit, très oblique. Couleur fondamentale orange vif, passant au violet sur les aires interne et externe, rayures droites, violettes. Point disco-cellulaire blanc, pouvant être surmonté d'un minuscule point subcostal de la même teinte. Bord externe des ailes postérieures généralement lobé vers l'angle anal. Coloration dominante de ces ailes orange, passant au rouge sur le bord anal; vague rayure externe rouge, droite ou légèrement convexe reliant la costa, un peu avant l'apex, au début du dernier tiers du bord anal.

Face ventrale jaune orangé sur l'aire interne des ailes antérieures, gris violacé sur l'aire externe, de cette dernière teinte, mais plus pâle, sur les ailes postérieures. Forte tache disco-cellulaire des ailes antérieures noire à centre blanc. Rayures violettes, celles des ailes postérieures incomplètes.

Par la structure de l'armure génitale mâle (Fig. 15) se situe très près de *B. ocellata bidens* (W. Rothschild); toutefois, d'après le matériel examiné, le gnathos est plus large, les harpes, très fines, sont sensiblement plus longues et le bord interne du sacculus présente, près de l'extrémité apicale, un renflement qui est généralement absent ou imperceptible chez *B. o. bidens*. Diffère surtout de ce dernier par des caractères externes constants: apex des ailes antérieures plus aigu, coloration beaucoup plus vive de la face dorsale de ces ailes, dont le ton orange tend davantage vers le jaune, avec les zones violettes plus contrastantes. Même différences de teinte mais plus atténuées, sur la face ventrale. Bord externe des ailes postérieures lobé et non régulièrement convexe. D'aspect et bien que les deux espèces appartiennent à deux genres très différents, *B. o. jasonoides* ressemble surtout étonnamment à *Adeloneivaia jason* (Boisduval), tant par la forme des ailes que par la teinte et l'ornementation, avec pour seul caractère distinctif la coloration violette des tegulae. Il n'est pas exclu qu'il s'agisse d'une bonne espèce.

***Scolesa nebulosa* spec. nov.**

Fig. 16; Pl. 11 Fig. 25

Holotype: 1 ♂, Brésil, Pernambuco (genitalia ♂, prép. C. Lemaire n° 2399) (coll. Frank Johnson = British Museum, Nat. Hist.).

♂. — Envergure: 52 mm; longueur des ailes antérieures: 26 mm.

Antennes jaune orangé: 32 articles dont 15 quadripectinés, suivis de 15 simples.

Front beige, thorax gris violacé, avec une ligne médiane beige sur le métathorax, abdomen beige orangé sur les faces dorsale et latérales, gris violacé sur la face ventrale; tarsi gris violacé.

Ailes antérieures très allongées, bord externe convexe, tornus large et arrondi. Couleur fondamentale gris violacé, avec des mouchetures noirâtres, plus pâle sur les aires interne et externe. Pas de rayures. Vague point disco-cellulaire noir. Ailes postérieures gris violacé terne, passant au beige vers le bord anal, sans aucune ornementation. Face ventrale uniformément gris violacé, sauf une zone beige au dessus du bord interne des ailes antérieures et, sur ces ailes, quelques stries et un point disco-cellulaire noirâtres.

Aspect général de *S. hypoxantha* (W. Rothschild), mais absence de rayures et tache disco-cellulaire des ailes antérieures plus petite. Armure génitale mâle (Fig. 16) très différente (harpes, processus émanant de la base de la valve gauche et bulbus ejaculatorius beaucoup plus courts) et rappelant davantage celle de *S. totoma* (Schaus), espèce dont la coloration et l'ornementation sont toutes autres. La vesica est garnie de trois cornuti dont un très allongé: il n'en existe que deux chez *S. hypoxantha* et *S. totoma*.

***Ptiloscola descimoni* spec. nov.**

Fig. 17; Pl. 12 Fig. 26

Holotype: 1 ♂, Equateur, Occidente, Santo Domingo, 600 m, 17.VII.1968 (S. E. Velastegui) (genitalia ♂, prép. C. Lemaire n° 1719) (coll. C. Lemaire).

♂. — Envergure: 55 m; longueur des ailes antérieures: 30 mm.

Antennes jaune orangé. Tête et thorax beige violacé, avec sur le thorax une ligne médiane jaune. Abdomen jaune, finement annelé de noirâtre, sur la face dorsale, brun violacé sur la face ventrale. Tarsi rose violacé. Dessus des ailes antérieures gris violacé, plus clair sur l'aire externe entre le bord interne et Cu 1a. Tache disco-cellulaire réduite à un simple trait. Rayures brunes, onduleuses. Bord externe des ailes postérieures légèrement convexe. Aire baso-médiane de ces ailes brune, aire externe gris violacé. Face ventrale gris violacé, assez terne, rayures brunes.

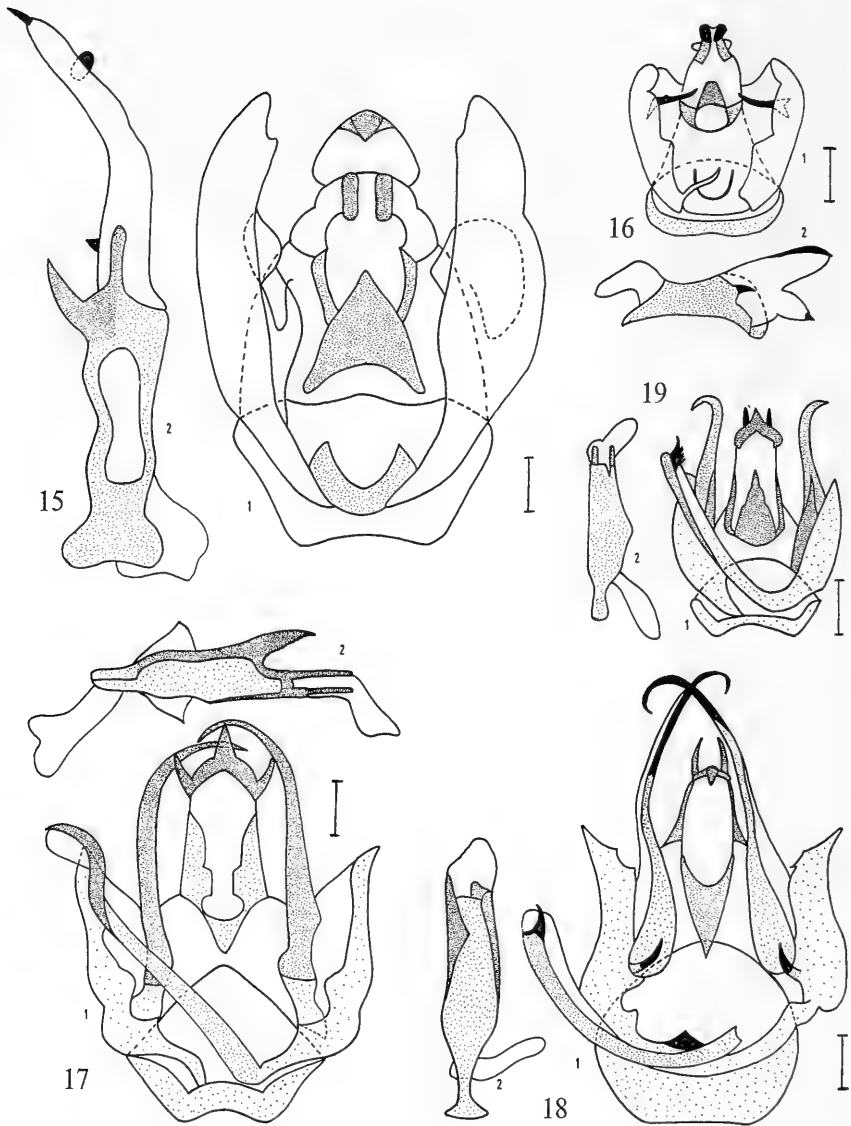
Espèce ne différant, semble-t-il par aucun caractère externe de *P. lilacina* (Schaus, 1900) (= *affinis* W. Rothschild, 1907). Armures génitales mâles très différentes: chez *P. descimoni* (Fig. 17), les deux pointes situées latéralement sur le bord dorsal de l'uncus sont beaucoup plus longues, le long processus qui émane de la face interne de chacune des valves est plus robuste et plus fortement sclérifié, il n'existe pas d'épines à la base de ce processus, le lobe gauche du juxta en est également dépourvu et enfin l'aedeagus présente latéralement un épéron n'existant chez aucune autre espèce du genre.

Avec le plus vif plaisir, je dédie cette espèce inédite à mon ami Henri Descimon à qui je suis redevable de beaucoup de matériel de l'Equateur, provenant principalement de ses récoltes personnelles.

***Ptiloscola dargei* spec. nov.**

Fig. 18; Pl. 12 Fig. 27

Holotype: 1 ♂, Nicaragua, route de Managua à Rivas, km 14,5, 6.IX.1969 (M. Darge) (sa coll.); allotype: 1 ♀, 4.X.1969; paratypes: 12 ♂, 3 ♀, VI, IX.1969, tous mêmes localité et récolteur, 3 ♂, Mexique, Chiapas, volcan Tacana, San Jeronimo, 450 m, IX.1970 (E. C. Welling), 1 ♂, Honduras britannique, Stann Creek District, Midd-



Armure génitale ♂ des Attacidae. Fig. 15. — 1, *Bouvierina ocellata jasonoides* subsp.n., vue ventralement, pénis détaché; 2, id., pénis vu ventralement. Fig. 16. — 1, *Scolesia nebulosa* sp.n., vue ventralement, pénis détaché; 2, id., pénis vu latéralement. Fig. 17. — 1, *Ptiloscola descimoni* sp.n., vue ventralement, pénis détaché; 2, id., pénis vu ventralement. Fig. 18. — 1, *Ptiloscola dargei* sp.n., vue ventralement, pénis détaché; 2, id., pénis vu ventralement. Fig. 19. — 1, *Ptiloscola wellingi* sp.n., vue ventralement, pénis détaché; 2, id., pénis vu ventralement. L'échelle figurée représente 1 mm

lesex, 3.VII.1964 (même récolteur) (tous coll. C. Lemaire, sauf 9 paratypes ♂, 2 paratypes ♀ de Managua, in coll. M. Darge).

♂. — Envergure: 48—52 mm; longueur des ailes antérieures: 25—27 mm.

Antennes jaune orangé: 34 articles dont 13 quadripectinés, suivis de 19 simples. Front brun, dessus du thorax violet, avec une ligne médiane jaune de largeur variable, parfois absente. Face dorsale de l'abdomen jaune, annelée de noirâtre, dessous du corps brun violacé, tarsi roses. Ailes antérieures brun violacé, plus ou moins foncé, plus sombres sur l'aire médiane et souvent sur l'aire interne. Rayures brunes, légèrement onduleuses, tache disco-cellulaire réduite à un simple trait où à un point. Bord externe des ailes postérieures convexe, aire baso-médiane de ces ailes brune, aire externe brun violacé. Face ventrale des quatre ailes de la même teinte mais passant fréquemment au noirâtre sur l'aire baso-médiane, rayures brun noir.

♀. — Envergure: 66 mm; longueur des ailes antérieures: 35 mm.

Antennes simples, jaune foncé. Tête et dessus du thorax bruns, avec une très étroite ligne médiane jaune sur le thorax. Ailes beaucoup plus larges que celles du mâle, même ornementation; coloration dominante brune sur les deux faces.

Diffère surtout par la structure de l'armure génitale mâle (Fig. 18) de *P. descimoni* et *P. lilacina*. Les valves sont plus courtes que chez ces deux espèces, le processus émanant de la face interne de chacune d'elles est moins développé et moins sclérifié que chez *P. descimoni* et les épines qui se dressent à la base de ces processus, comme chez *P. lilacina*, sont ici beaucoup plus courtes. Uncus semblable à celui de *P. lilacina*, juxta et aedeagus également, mais ce dernier beaucoup moins robuste.

Je suis heureux de pouvoir dédier cette espèce nouvelle à M. Michel Darge qui a récolté au Nicaragua la plupart du matériel typique et a bien voulu m'en confier l'étude.

Ptiloscola wellingi spec. nov.

Fig. 19; Pl. 12 Fig. 28

Holotype: 1 ♂, Mexique, Quintana-Roo, X-Can, 18.V.1969 (E. C. Welling) (coll. C. Lemaire); allotype: 1 ♀, 20.V.1969; paratypes: 10 ♂, 2 ♀, même localité, VI, XI. 1967, V.1969, 5 ♂, Yucatan, Chaksikin, Uman, VI, XI.1967, V.1969, tous mêmes récolteur et collection.

♂. — Envergure: 37—46 mm; longueur des ailes antérieures: 20—23 mm.

Antennes jaune clair: 41 articles dont 18 quadripectinés, suivis de 21 simples. Tête et thorax de coloration extrêmement variable, du brun au beige clair et au beige orangé, tegulae fréquemment gris violacé; abdomen jaune ou beige orangé presque toujours annelé de noir, beige violacé, plus ou moins foncé sur la face dorsale; tarsi rose violacé.

Coloration du dessus des quatre ailes également très variable mais toujours claire, beige, beige orangé, gris violacé. Ornementation habituelle des espèces du genre: rayures noirâtres, plus ou moins violacées, un peu lunulaires, surtout sur les ailes antérieures, celles des ailes postérieures s'estompant fréquemment avant le bord anal. Tache disco-cellulaire des ailes antérieures généralement blanche, pouvant être accompagnée d'une petite tache annexe de la même teinte, entre M 3 et M 2, ou parfois réduite à un point ou à un trait noirâtre. Bord externe des ailes postérieures convexe. Face ventrale de la même teinte que la face dorsale. Rayures noirâtre violacé, celles des ailes antérieures pouvant être partiellement effacées.

♀. — Envergure: 50—54 mm; longueur des ailes antérieures: 26—28 mm.

Antennes simples. Coloration du corps présentant vraisemblablement les mêmes variations que chez les exemplaires mâles. Ailes beaucoup plus larges, à fond brun clair ou beige orangé chez les spécimens examinés. Tache disco-cellulaire des ailes antérieures réduite à un simple trait ou halo.

Espèce voisine de *P. surrotunda* (Dyar). En diffère par son envergure sensiblement inférieure et par sa coloration beaucoup plus claire. L'armure génitale mâle (Fig. 19) est beaucoup plus grêle, les longs processus émanant de la face interne des valves ne sont pas droits mais recourbés vers l'apex, l'extrémité postérieure du lobe droit du juxta est moins sclérifiée et moins abondamment garnie d'épines et surtout le lobe gauche de la même pièce est dépourvu de la touffe d'épines très sclérifiée qui existe chez *P. surrotunda*.

Cette espèce inédite est dédiée à mon excellent correspondant mexicain, M. E. C. Welling à qui je suis notamment redevable de la très belle série typique.

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Pl. 1, Fig. 1, *Copaxa (Copaxa) escalantei* sp.n., holotype ♂. Fig. 2, *Copaxa (Copaxa) andensis* sp.n., holotype ♂

C. LEMAIRE : *Attacidae nouveaux*



Pl. 2, Fig. 3, *Copaxa (Copaxa) denbezi* sp.n., holotype ♂. Fig. 4, *Copaxa (Copaxa) canella miranda* subsp. n., holotype ♂



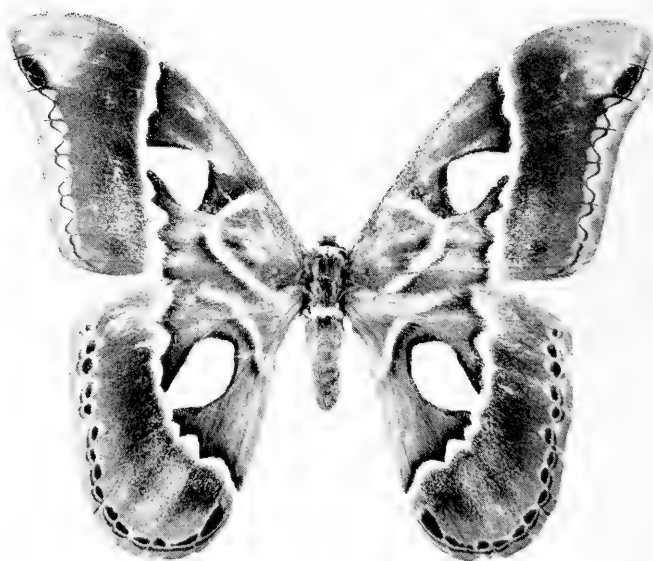
Pl. 3, Fig. 5, *Copaxa (Copaxa) canella miranda* subsp. n., paratype ♀. Fig. 6, *Copaxa (Sagana) herbuloti* sp. n., holotype ♂

C. LEMAIRE : *Attacidae nouveaux*

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Pl. 4, Fig. 7, *Rothschildia paucidentata* sp. n., paratype ♂. Fig. 8, *Rothschildia lebeau yucatana* subsp. n., holotype ♂

C. LEMAIRE: *Attacidae nouveaux*



Pl. 5, Fig. 9, *Dirphia lichyi* sp.n., holotype ♂. Fig. 10, id., allotype ♀

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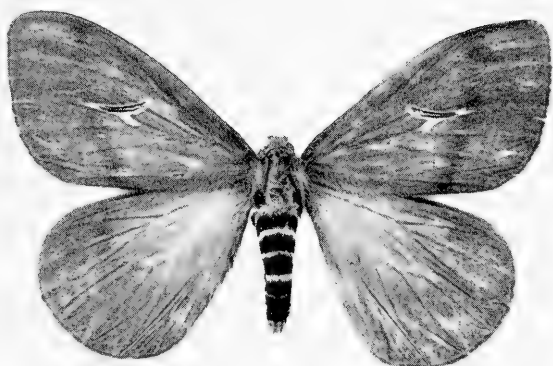


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Pl. 6, Fig. 11, *Dirphia crassifurca* sp. n., holotype ♂. Fig. 12, id., allotype ♀. Fig. 13, *Kentroleuca spitzi* sp. n., holotype ♀

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Pl. 7, Fig. 14, *Cerodirphia marabuaca* sp. n., paratype ♂. Fig. 15, *Cerodirphia avenata araguensis* subsp. n., paratype ♂. Fig. 16, *Travassosula mulierata* sp. n., paratype ♂

C. LEMAIRE: *Attacidae* nouveaux



Pl. 8. Fig. 17. *Copiopteryx semiramis gadonorum* subsp. n., holotype ♂



Pl. 9, Fig. 18, *Eacles imperialis quintanensis* subsp. n., holotype ♂. Fig. 19, id., paratype ♂
(morphe jaune)

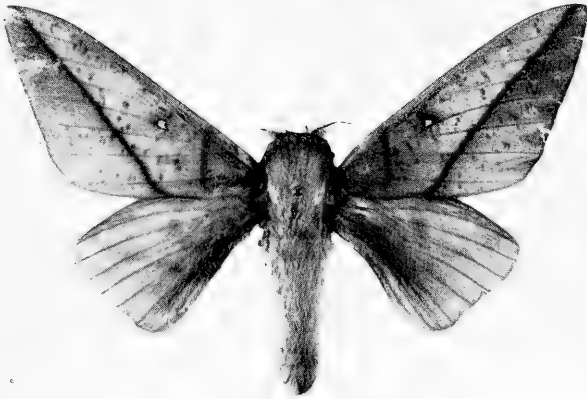


Pl. 10, Fig. 20, *Eacles imperialis anchicayensis* subsp. n., holotype ♂. Fig. 21, *Citheronia lichyi* sp. n., paratype ♂. Fig. 22, *Citheronia andina* sp. n., ♂

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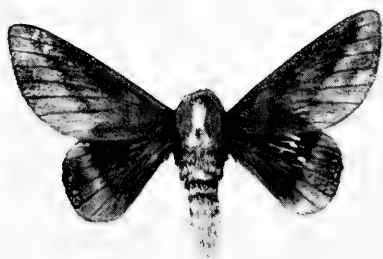


Pl. 11, Fig. 23, *Bouvierina gadouae* sp. n., holotype ♂. Fig. 24, *Bouvierina ocellata jasonoides* subsp. n., paratype ♂. Fig. 25, *Scolesia nebulosa* sp. n., holotype ♂

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Pl. 12, Fig. 26, *Ptiloscota descimoni* sp. n., holotype ♂. Fig. 27, *Ptiloscota dargei* sp. n., holotype ♂. Fig. 28, *Ptiloscota wellingi* sp. n., holotype ♂

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No. 1. A. J. Besseling, 1964. — De Nederlandse Watermijten (Hydrachnellae Latreille, 1802) (The Hydrachnellae of the Netherlands), 199 pp., 333 figs., D.Fl. 30.—

AMORPHACARUS PARVISETOSUS SPEC. NOV. (MYOBIIDAE,
TROMBIDIFORMES), FROM NEOMYS FODIENS PENNANT
(SORICIDAE)

by

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Zoological Institute, Catholic University, Nijmegen

ABSTRACT

An undescribed species of *Amorphacarus* (Myobiidae), has been found in the head and shoulder region of the water shrew, *Neomys fodiens* Penn. (Soricidae). Remarks on the genus *Amorphacarus* are appended.

On investigating a number of *Neomys fodiens* Pennant, caught near Nijmegen, we found in the head and shoulder regions a number of mites of the family Myobiidae which deviate considerably from species so far described.

The following characteristics: legs of the first pair unequal, one being dwarfed, segment I longer than broad, segment II much broader than long with ventral tubercle, tarsus II with two claws, most of the hairs with very fine spatulate points, some of the dorsal setae slightly inflated, very long and double and coiled penis, all point to the genus *Amorphacarus* Ewing, 1938. The species of this genus are skin parasites of Soricidae (Poppe, 1896; Jameson, 1948; Ewing, 1938; Radford, 1949; Dubinin, 1957; Jameson 1971).

Amorphacarus parvisetosus spec. nov.

Female (holotype). — Body broader than in other species of the genus. Length including gnathosoma 570 μ , in 17 paratypes measured σ 504 μ (431—571), width 356 μ , in the paratypes σ 340 μ (263—364).

Dorsum (Fig. 1). Body transversely striated with exception of the vulvar and genital regions. Pores of dorsal glands (*P*) between vertical internal and vertical external (*v i* and *v e*). Three pairs of long filiform setae, very finely striated lengthwise *v e* (100 μ), scapular external (*sc e*) 200 μ , lateral 1 (*l 1*) 220 μ . Vertical internal (*v i*), scapular internal (*sc i*) and the file of dorsal setae (*d1—d4*) short, cored (Howell & Elzinga, 1962) with fine spatulate point (detail *d 1*). Lateral setae 4 (*l 4*) short, setiform. Laterals 2 and dorsals 5 lacking. Genital opening terminally with five pairs of genital setae (*g1—g5*), *g 4* and *g 5* functionally arranged to copulatory complex. Vulva (*Vu*) surrounded by two weakly sclerotized vulvar valves with genital hooks (*a 3*), which usually cover opening of bursa copulatrix. Anal internal (*a i*) and anal external (*a e*) setae short, almost spine-like (Fig. 2).

Venter (Fig. 3). — Ventral side delicately striated. Back of coxal field I reshaped to tubercles standing caudally, more strongly sclerotized. Setae of coxal regions setiform. Present are *cx I* 1, 2, 4, *cx II* 1, 3, 4, *cx III* 1, *cx IV* 1. Lateral setae 5 (*l 5*) of about 330 μ .

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Fig. 1—8. *Amorphbacarus parvisetosus* spec. nov., female (holotype), 1, female dosum; 2, vulva region; 3, female venter; 4, broad lateral seta 1 of a paratype; 5, gnathosoma dorsal; 6, broad lateral seta 5 of a paratype; 7, leg I dorsum; 8, leg I venter

Gnathosoma (Fig. 5). — Gnathosoma specialized, with stinging and sucking apparatus. Chelicerae (*Ch*) with barbed hooks on the outside. Pedipalps and hypostome (*Hyp*) closing mouth opening on lateral and ventral side. Pedipalps of two movable segments, ventral long claw-shaped tibia (*Ti*), surrounding tarsus (*Ta*), both segments carrying one hair each. Gnathosoma with two ventral hairs, rostral anterior (*ra*) and rostral posterior (*rp*). Dorsal to basis of pedipalps rostral dorsal setae (*rd*), directed towards the mouth opening. Stigmata (*sg*) dorsal at the back of gnathosoma, no stigmal hairs.

Legs, ventro-lateral. All legs with five free segments (trochanter (*Tr*), femur (*Fe*), genu (*G*), tibia (*Ti*), tarsus (*Ta*) and two claws (*Kl*). Legs II—IV with pretarsus (*Ptr*), claws situated dorsally (Fig. 14, 16, 18).

Legs on the first pair (Fig. 7, 8) unequal, eight paratypes measured have a longer right leg, nine a longer left one. Proportion great leg/small leg, $\bar{\sigma}$ 1.163 (1.06—1.23). Tarsi with very small claws (*Kl*), ventro-terminally inserted, without noticeable pretarsus. Claws hair-like in adults, but well developed in subadult stages (Fig. 26). When comparing species of Myobiidae one comes to the conclusion that claws are present instead of setae. There is no species with more than six setae and three solenidia on tarsus I. As in *A. parvisetosus* there are six well-shaped setae and three solenidia (ω 1-3), the other two very little spine-like forms must be reduced claws. Except long spatulate *p d* all tarsal setae are setiform. Genu postero-lateral with large clasping tubercle. We are not quite sure, whether a very little solenidion sigma is present dorso-mediad near anterior border of genu. Femur with broad tubercle, movable enlarged hair (*p v*) and dorsally a long and thick, lengthwise striated postero-dorsal seta (*pd*), characteristic for many myobiids, and a short *m d*, also striated.

Legs II with strong claws of unequal size, dorsally on the pretarsus (Fig. 14, 15). Solenidia omega 1 postero-lateral and omega 2 antero-dorsal. The medio-dorsal hair of the tarsus is long and setiform in the female (Fig. 1), stout, striated and spatulate at the point in the male (Fig. 14). Ventral hairs seti to filiform and non striated. Solenidion sigma distinct dorso-mediad on genu.

Legs III and IV (Fig. 16—19) with claws of very different size. A part of ventral setae of tarsus, tibia and genu are enlarged and striated lengthwise.

Male (allotype). — Body broader than in other species. Length, including gnathosoma, 319 μ , in 14 paratypes measured $\bar{\sigma}$ 328 μ (314—347); width 180 μ , in the paratypes $\bar{\sigma}$ 194 μ (179—224).

Dorsum (Fig. 9). — Setae *ve*, *sc e* and *ll* long, filiform. Setae *vi*, *sc i* and *l 4* very short. The file of dorsals 1—5 is lacking. Genital opening (Fig. 11) at level of legs III. Genital orifice surrounded by four shields: one short and broad with two pairs of setae, two little shields with one seta each, and a middle scutcheon-shaped sclerotization with two large hairs forming a sledge for the penis, a pair of broad, barbed striated hairs and a pair of little setiform ones. The penis begins (also in all paratypes) median above legs IV, bends backwards to the left and then continues with two loopings towards the genital opening.

Venter (Fig. 10). Gnathosoma and hairs in coxal regions as in female.

Leg I (Fig. 12, 13) different from that in female: setae *p d* of tarsi remarkably longer than in female, setae *m d* of genu short, stout and striated lengthwise. Seven paratypes measured have a longer right leg and seven other a longer left leg, proportion great leg/small leg $\bar{\sigma}$ 1.23 (1.14—1.31).

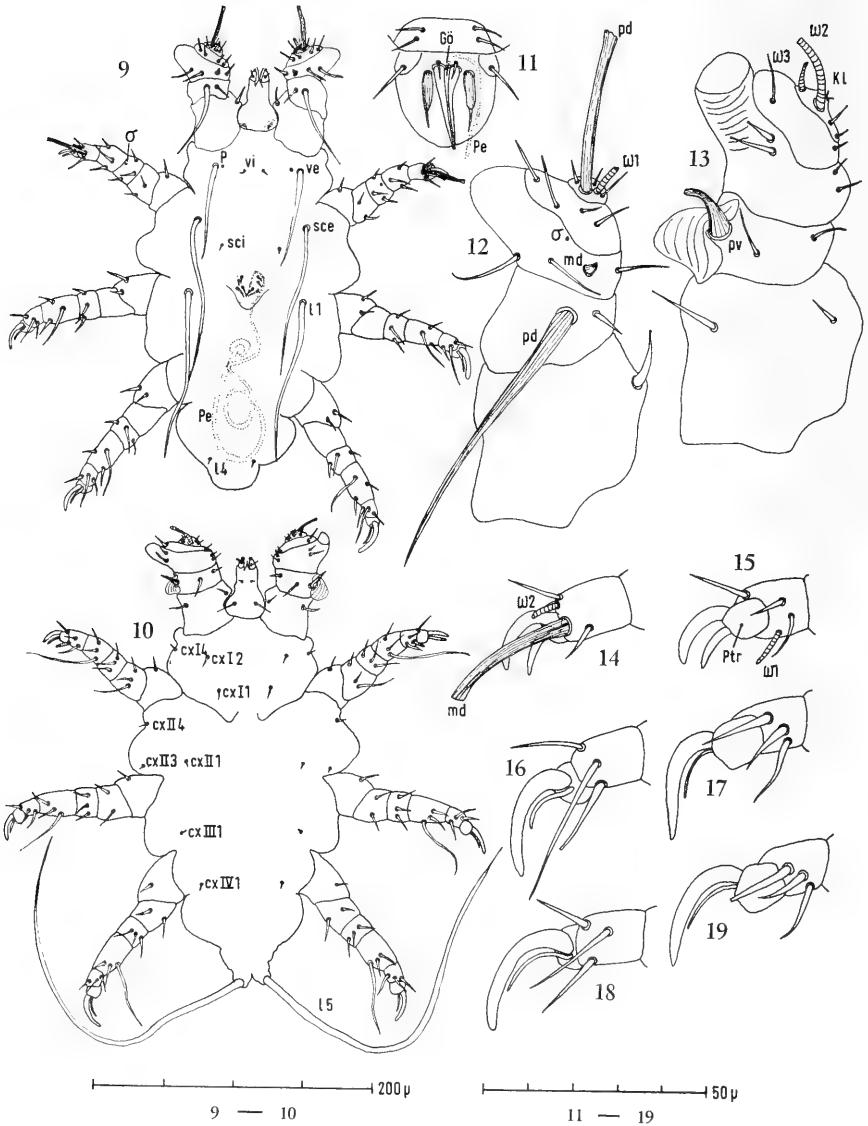


Fig. 9—19. *Amorphaecarus parvisetosus* spec. nov., male (allotype). 9, male dorsum; 10, male venter; 11, genital region; 12, leg I dorsum; 13, leg I venter; 14, tarsus II dorsum; 15, tarsus II venter; 16, tarsus III dorsum; 17, tarsus III venter; 18, tarsus IV dorsum; 19, tarsus IV venter

Chaetotaxy

legs	I	II	III	IV
tarsus	6 + (3)	6 + (2)	6	6 solenidia in ()
claws	2	2	2	2
tibia	6	6	6	6
genu	8 + (1?)	6 + (1)	6	6
femur	5	5	2	2
trochanter	3	2	3	3

IMMATURE DEVELOPMENTAL STAGES

As hitherto neither the larval nor the nymphal stages of *Amorphacarus* species have been described nor drawn, nor their chaetotaxy, we present detailed figures for *A. parvisetosus*.

Eggs. — Fully developed eggs within eight females (Fig. 3), length \varnothing 89 μ (83—95). Eggs attached lice-like to basis of hairs.

Common to all developmental stages are legs with four free segments. Presence of solenidium sigma on genu II indicates fusion of genu and femur. Legs I with two big claws ventrally without pretarsus. Tarsus I with one dorsal and one ventral big clasping tubercle. Legs II—IV with pretarsus and one claw, only leg II in the tritonymph with two claws. Gnathosoma long, cylindrical and split at the end. Dorsal pore (*P*) situated far above vertical external. Body transversely finely striated, with exception of ventral side of legs II, where cross-striation bulges caudally.

Larva. — Length including legs I, 210 μ , width 110 μ .

Dorsum (Fig. 21) demonstrates the primitive phylogenetical pattern present in all genera from insectivores of the third evolutionary branch of Myobiidae (Dusbabek, 1969). Present are *ve*, *sci*, *sc e*, *l 1*, *l 3*, *l 5*, *d 1*, *d 2*, *d 3*, *d 5*. The hairs are blade-like, barbed and striated similar to the description of dorsals 1—3 of females from *A. elongatus*, called "schuppenförmig, zweigliedrig" by Poppe (1896). Vulva medio-subterminal.

Venter (Fig. 20). Present are only *cx I 1*. Legs I unequal (quotient 1.18). Femur I with remarkably long, setiform *p d*.

Protonymph. — Length including gnathosoma 219 μ , width 163 μ . Dorsum (Fig. 23). Less setae than in the larva, hairs relatively small and only partly slightly barbed. Present are *ve*, *sci*, *sc e*, *l 1* and *l 4*. Like in protonymphs of genera of third evolutionary branch the file of dorsal setae and *l 3* are lacking; *p d* seta on femur I stout, conical, striated. Trochanteres II—IV without setae.

Venter (Fig. 22). Added are peg-shaped and striated second seta in coxal field I and setiform first setae in coxal fields II and III.

Deutonymph. — Length including gnathosoma 255 μ , width 175 μ .

Dorsum (Fig. 25). Chaetotaxy as in the protonymph. Trochanteres II—III with one seta each. Legs I unequal (quotient 1.10).

Venter (Fig. 24). Setation as in the protonymph, additional *cx IV 1*.

Tritonymph. — Length including gnathosoma \varnothing 354 μ (275—431), width \varnothing 223 μ (179—258).

Dorsum (Fig. 29). Setation like deutonymph, additional dorsal 5, vertical internal and trochanter seta on leg IV.

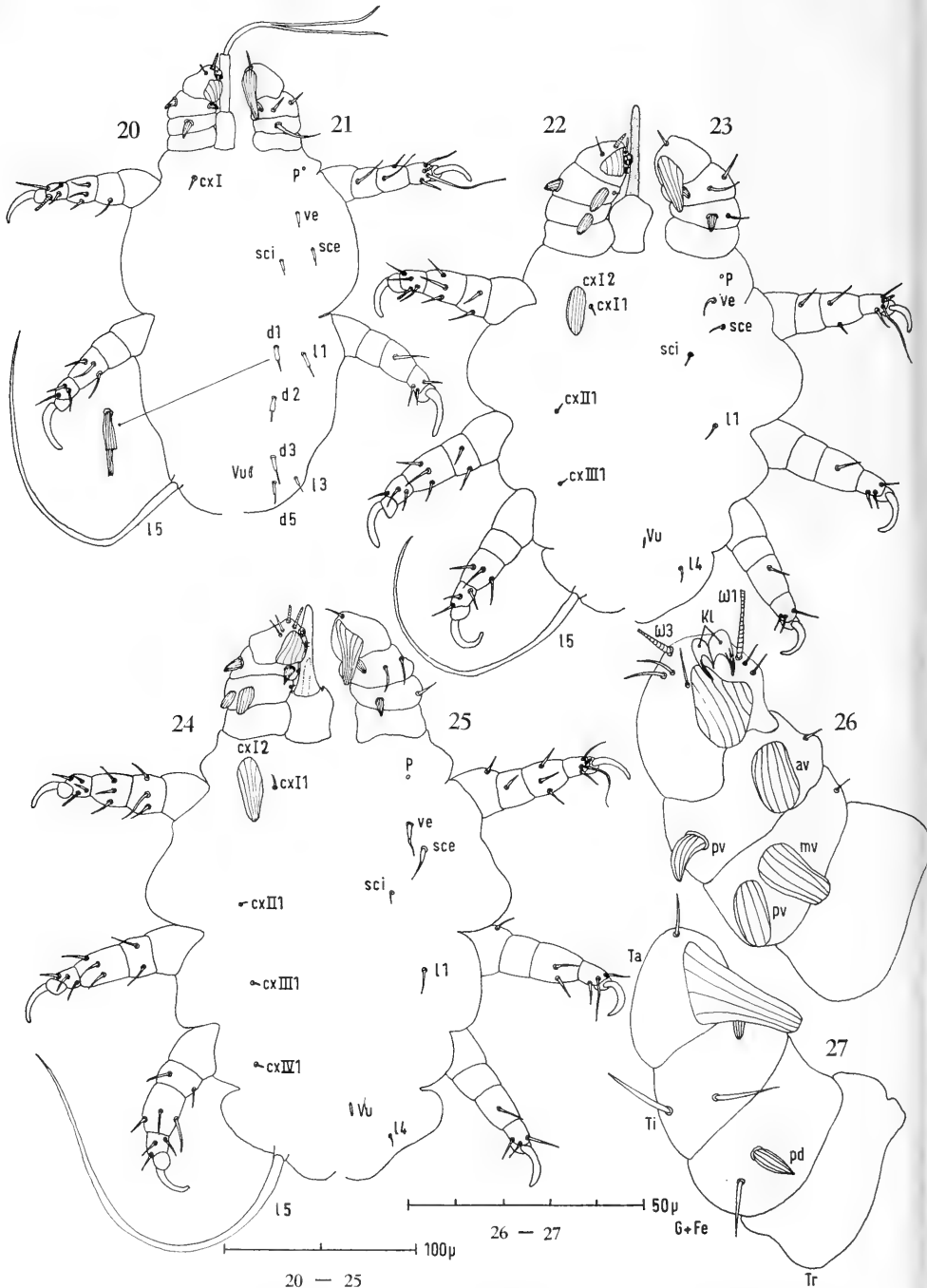


Fig. 20—27. *Amorphacarus parvisetosus* spec. nov., 20, larva venter; 21, larva dorsum; 22, protonymph venter; 23, protonymph dorsum; 24, deutonymph venter; 25, deutonymph dorsum; 26, tritonymph leg I venter; 27, tritonymph leg I dorsum

Venter (Fig. 28). Additional to setation of deutonymph are rostral posterior, enlarged *cx I* 3 and setiform *cx II* 3. Legs I unequal (quotient 1.10). Tarsus I ventrally (Fig. 26) with two big claws and a clasping tubercle. Enlarged hairs on tibia and genu-femur with probably clasping function. Tarsus I dorsal (Fig. 27) with large clasping tubercle, *p d* of femur I short and stout.

Chaetotaxy of subadult stages

legs	larva			protonymph				deutonymph				trityonymph			
	I	II	III	I	II	III	IV	I	II	III	IV	I	II	III	IV
claws	2	1	1	2	1	1	1	2	1	1	1	2	1	1	1
tarsus	2	6	6	4	6	6	6	5	6	6	6	6	6	6	6
solenidia	1	2	—	2	2	—	—	2	2	—	—	2	2	—	—
tibia	5	5	4	6	5	4	4	6	6	5	4	6	6	5	5
genu-femur	2	2	—	3	3	2	—	5	4	2	2	5	4	2	2
trochanter	—	—	—	—	—	—	—	—	1	1	—	—	1	1	1

Type host: *Neomys fodiens* Pennant.

Type locality: Nijmegen, the Netherlands, 15.IX.1967, leg. F. Lukoschus. On the same host and locality: 24.IX.1964, 12.V.1967, 12.IX.1967. Isle of Texel, The Netherlands, 26.IX.1968. Gmünd, Austria, 16.VII.1966, 16.X.1966, Wien, Austria, 1967 (hosts preserved in alcohol, in Naturhistorisches Museum Wien, by courtesy of Dr. K. Bauer).

Miss M. Kolebinova, Zoological Institute, Academy of Sciences, Sofia, found the species on the same host near Witescha, Bulgaria, 23.VIII.1966. Probably the mite is specific for the host throughout its range.

Pathogeny. — The mites were found at the base of the hairs in head and shoulder parts. Larvae and nymphs prove to be cell-fluid suckers, only adults are found with blood in the intestines. In 4 out of 41 adults one of the legs IV shows stump-shaped regeneration, that points to a lesion caused by self-defence of the host.

IDENTIFICATION OF THE SPECIES

Especially the size of the dorsal setae 2 and 3 are important, as well as the presence of dorsals 5.

Table I. Characteristics of females of *Amorphacarus* species. Data in $\mu \bullet \times$ = barbed hairs.

	dates taken from	<i>d</i> 2	<i>d</i> 3	<i>l</i> 2	<i>d</i> 4	<i>l</i> 3	<i>d</i> 5
<i>A. elongatus</i>	description + specimens from the type host	65 \times	70 \times	—	28 \times	27 \times	27 \times
<i>A. bengererorum</i>	description + holotype	41 \times	42 \times	31 \times	17	20	—
<i>A. parvisetosus</i>	types	5	4	—	6	6	—

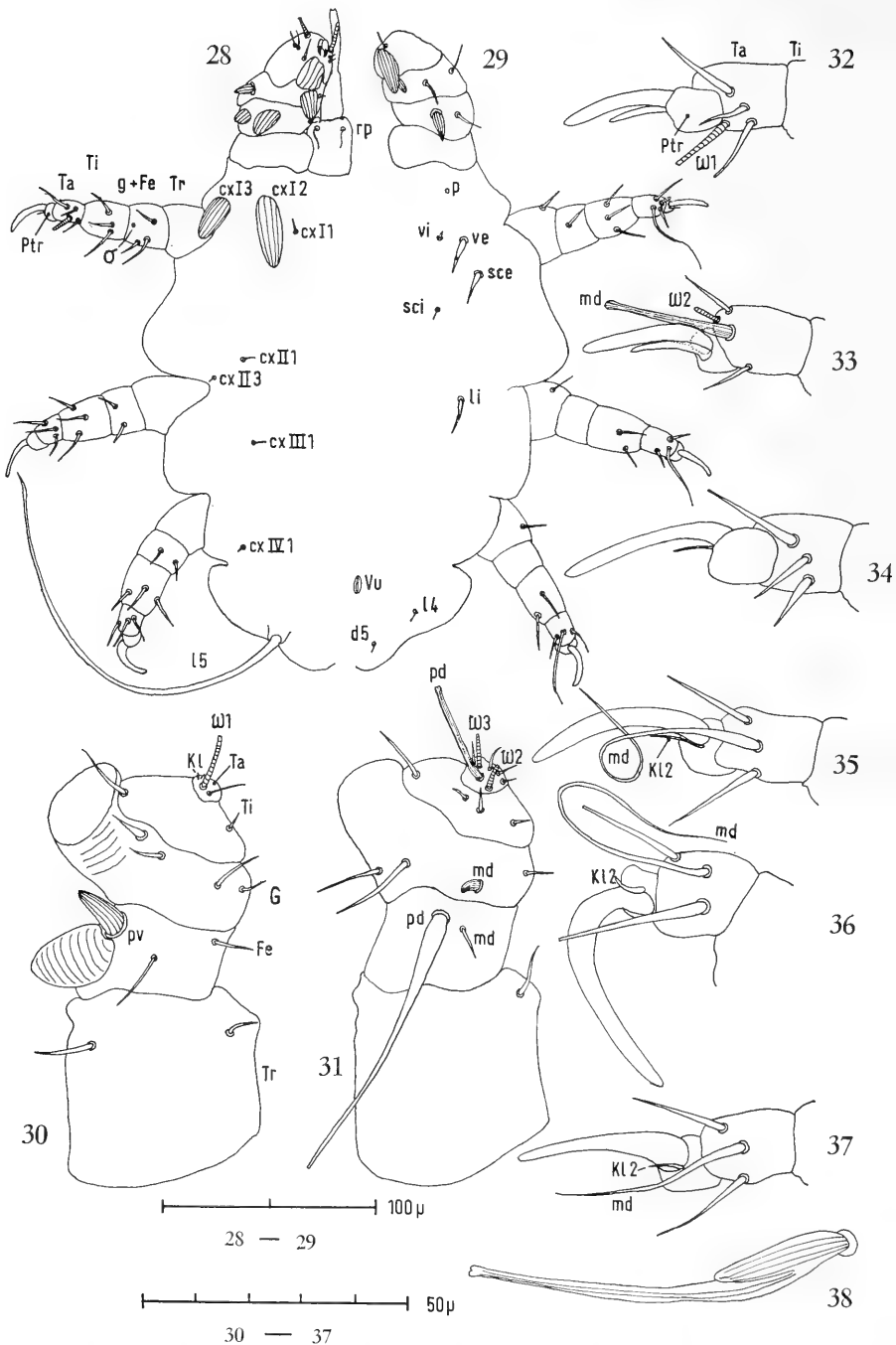


Fig. 28—29. *Amorphbacarus parvisetosus* spec. nov. 28, tritonymph venter; 29, tritonymph dorsum; 30—38. *Amorphbacarus elongatus* (Poppe, 1896), 30, leg I venter; 31, leg I dorsum; 32, tarsus II venter; 33, tarsus II dorsum; 34, tarsus III venter; 35, tarsus III dorsum; 37, tarsus IV dorsum; 38, dorsal seta 1; 36, *Amorphbacarus bengererorum* Jameson, 1948 (holotype), tarsus IV dorsum

REMARKS ON THE CHARACTERISTICS OF *Amorphacarus*

Genus *Amorphacarus* has been erected by Ewing (1938) for *A. elongatus* Poppe, 1896, and was considered monotypic at that time. The description was valid only for females. Males were not available for study. The following characteristics were given:

"Legs of the first pair unequal, one being dwarfed; segment I longer than broad, inner margin concave; segment II much broader than long, with dorsal tubercle; segment III distinct from IV, bearing large clasping tubercle; segment IV broader than long, rounded distally. Capitulum asymmetrical. Tarsus II with two claws; tarsi III and IV each with one claw. Some of dorsal setae inflated or foliaceous."

Jameson, describing the second species, *A. hengererorum* (1948), gives the following characteristics (1955): "Leg I apparently of three segments, the fourth sometimes concealed beneath the third; one pair of terminal claws; the first pair of legs markedly unequal in size. Leg II with a pair of claws; legs III and IV with a single claw. Dorsal setae slightly inflated, non-striated. Body shape rather slender. Penis very long and double coiled. From shrews (Soricidae)."

Radford (1948, 1949): "Capitulum and leg I asymmetrical; tarsus II with two claws in the female, one in the male; tarsi III and IV with one claw. Leg I with three or four segments without tarsal claws".

The characteristics mentioned above for *A. parvisetosus* make extension of the diagnosis of the genus *Amorphacarus* necessary.

In view of the differences given by the various authors, it appears worth while to look for more details in *A. elongatus* with more modern optical tools.

We are able to state, that:

1) Leg I of *A. elongatus* from the type-host *Sorex araneus* (Fig. 30, 31) has five segments and a pair of very little claws. Though the last three segments are compressed, their existence is furthermore demonstrated by the complete chaetotaxy, as in the more primitive genera *Protomyobia* Ewing, 1938, *Eadiea* Jameson, 1948, *Pteracarus* Jameson & Chow, 1952. Compare also Jameson (1955), fig. 2, *Eadiea desmanae* Lukoschus 1969 and *Eadiea multisetosa* Lukoschus & Driessen (1969).

2) The legs II-IV (Fig. 32—35, 37) have two claws. These are very difficult to distinguish in the legs III and IV, the posterior claw being even smaller than in the species described above and in *Archemyobia inexpectata* Jameson, 1955.

3) All the body hairs show slight spatulate points, as already reported by Poppe (1896): "Eine besonders langgestreckte Art, deren Borstenbesatz der Dorsalseite des ♀ dadurch ausgezeichnet ist, dass sämtliche Borsten an ihrem distalen Ende abgestumpft sind" (Fig. 38).

4) In the type-specimens of *A. hengererorum* Jameson, 1948, the body hairs have also a slightly spatulate point. In the female (holotype) leg IV has also a small second claw, very difficult to distinguish (Fig. 36).

New generic characteristics proposed are as follows: Leg I with five segments. Segments III-V compressed. First pair of legs asymmetrical in size. Body setae with slightly spatulate points. Penis very long and double-coiled. Claws very variable. Legs I with two very small or without claws. On leg II the claws are subequal-unequal or there is only one claw. Legs III and IV with very unequal claws or with only one claw. From shrews (Soricidae). Genotype *Amorphacarus elongatus* Poppe, 1896 (syn. *Myobia elongata* Poppe, 1896).

When regarding the very long and double-coiled penis, the setae with slightly spatulate points, and the asymmetrical size of legs I as most important characteristics, and not the number and the size of the claws, it may be possible to include into the genus *Amorphacarus* species from Soricidae in America and Asia, to be described in the near future by E. W. Jameson, jr., Davis, California, as well as *Blarinobia* species.

Types. — Holotype ♀ and allotype ♂: Rijksmuseum van Natuurlijke Historie, Leiden. Paratypes ♀ and ♂: British Museum (Natural History), Londen; U.S. National Museum, Washington; Zoologische Staatssammlung, München; Department of Zoology, University of California, Davis (U.S.A.); Zoological Institute, Academy of Sciences, Leningrad; Muséum National d'Histoire Naturelle, Paris; Instituut voor Tropische Geneeskunde Prins Leopold, Antwerpen; Bulgarische Akademie der Wissenschaften, Zoologisches Institut, Sofia; Zoologisch Laboratorium der Katholieke Universiteit, Nijmegen¹⁾.

The institutes mentioned above will also be provided with specimens of *A. elongatus* (Poppe, 1896) from the type-host *Sorex araneus*, with well visible claws on the tarsi III and IV.

Acknowledgement. — We are indebted to Prof. Dr. E. W. Jameson, Davis, U.S.A., for his discussions and for reading the manuscript.

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- , 1949. A revision of the fur mites Myobiidae (Acarina) (suite). *Bull. Mus. Nat. Hist. Paris* 2e sér., 21: 91—97.

¹⁾ The coll. nos. received are:

	<i>A. parvisetosus</i>	<i>A. elongatus</i>
Leiden	P 1208-8	P 1210
Paris	55 J 1,55 J 12	55 J 2
Hamburg	A 43 / 69	
München	P 495 / 1-2	P 494 / 1

LIFE CYCLE OF MELESODECTES AURICULARIS
FAIN & LUKOSCHUS (GLYCYPHAGIDAE,
SARCOPTIFORMES)

by

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ABSTRACT

Rearing of hypopi of *Melesodectes auricularis* Fain & Lukoschus, 1968, was successful. Morphology suggests relationship to Hypoderidae and Saprogllyphidae.

INTRODUCTION

In a former paper Fain and Lukoschus (1968) described hypopus and tritonymph of this species found in the concha of European badgers. Hypopi lacking attaching organs on idiosoma (sucker plates or claspers) or on tibiae of forelegs show similarities to hypopi of the family Hypoderidae, but they have more primitive legs.

In the meantime we succeeded in rearing hypopi from badgers killed by trucks in the spring. We are very obliged to the Rijksinstituut voor Veldbiologisch Onderzoek (RIVON) at Zeist and to Dr. Franz Krapp, Zoologisch vergl.-anatomisches Institut Freiburg (Switzerland) for forwarding us parasitized conchae of badgers.

METHODS AND RESULTS OF REARING EXPERIMENTS

Original material was obtained from the ears of European badgers (*Meles meles*): 28.III.1969 near Grimentz (Kanton Wallis), Switzerland, 17.IV.1969 near Freiburg, Switzerland, 20.IV.1969 near Vierlingsbeek (Prov. Limburg), the Netherlands. They were lactating females. A starved suckling 20.IV.1969 near Vierlingsbeek.

The conchae sent to us were partly scraped out, other parts containing hypopi have been divided into pieces with:

1) only epidermis, with ear-wax; 2) epidermis with fatty connective tissues; 3) concha, fatty tissues and muscular tissues.

The ear pieces were placed into glass tubes plugged by cotton wool and kept in darkness at room temperature and at constant relative humidity of: a) 75%, b) 85%, c) variable humidity by wetting of the cotton stopper twice a day.

A similar technique has been utilized with success by Fain (1968, 1969b and 1969c) to obtain the development of the hypopi of several other species of Glycyphagidae.

Hypopi and ear-wax scraped off were placed in glass tubes with:

4) yeast; 5) evaporated milk; 6) oatmeal and yeast; 7) pollard and yeast; 8) skin scales, yeast, evaporated milk; 9) skin scales, yeast, oatmeal and pollard.

The tubes were kept under the humidity conditions mentioned above. In all rearing

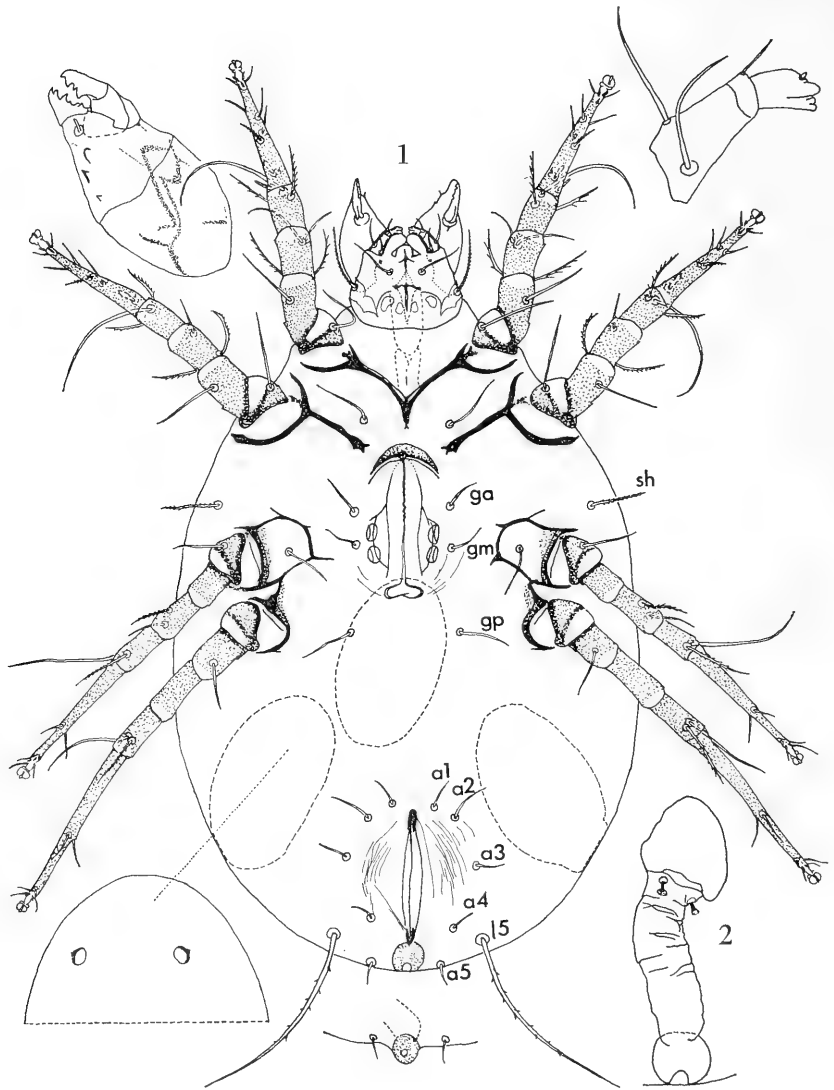


Fig. 1, 2 — *Melesodectes auricularis* Fain & Lukoschus, 1968. 1) female venter, 2) bursa copulatrix. *a1-a5* anal setae, *ga* genital anterior, *gm* genital median, *gp* genital posterior, *s* lateral setae, *sh* subhumeral

media and humidity conditions partial rise of tritonymphs was observed, but development to adults only in the tubes with ear parts, further development to larvae and protonymphs only in tubes with fatty tissues.

At 85% relative humidity mould cultures were developing, but mites were not observed to feed on them. Best results were obtained with 3) concha + fatty tissues + muscular tissues at variable humidity.

In this rearing experiment one of us (F.L.) noted as shortest developmental intervals: 17.IV.1969 death of badger, shipment of ears; 20.IV. arrival at Nijmegen, tritonymphs present, starting of rearing experiments; 21.IV. first adults; 22.IV. first copulations; 24.IV. first eggs; 26.IV. first larvae; 29.IV. first protonymphs; 4.V. all mites dead without forming of hypopi; large numbers of larvae developed to only few protonymphs.

Tests of reproduction capacity by placing newly hatched adult couples into rearing mixtures 8 and 9 proved to be ineffective, only three of 15 couples laid up to four eggs (2, 3, 4).

Function of thickened legs II of male could be observed in copulating pairs. Tibiae IV of female are grasped by the clasper formed by apophysis on femur and tibia of male leg II. Frequently but not always, also tibia or tarsus of leg III of female is grasped by male tarsus II bent backwards.

Transfer of larvae to rearing media 5—9 did not result in rise of protonymphs.

On the suckling badger, the mother of which had parasitized ears, no hypopi or other developmental stages of this species were found in the ears nor between the hairs of the fur. On the ventral side of the abdomen and on the inner side of femora of hind legs small injuries of the epidermis were observed.

In skinning with the aid of a dissecting microscope in these parts and ventrally on thorax 16 hypopi were found in the connective tissue, partly in the muscular tissue, partly in the tissues attached to the skin.

SYSTEMATICAL POSITION OF THE GENUS *Melesodectes* AND OF THE SUBFAMILY MELESODECTINAE

Until adults of the genus *Melesodectes* were investigated by us, we ranged it among the Glycyphagidae. From the discovery of both adult forms and larvae it now appears that this genus also shows some characteristics known from Saproglyphidae.

Zachvatkin (1941) has divided Tyroglyphoidea (= actually Acaroidea) in three families, of which characteristic data are summarized below:

1) Tyroglyphidae (= actually Acaridae): Tarsal claws sessile and connected with tarsus by two sclerites. Idiosoma with distinct sejugal furrow. Cuticle smooth, small and colourless. Hairs of hysterosoma neither pectinated nor leaf-shaped. Female without epigynum. Male with well developed adanal suckers and two suckers on tarsi IV. Genital suckers well developed, digitiform. Organ of Claparède ("Bruststiele") well developed in larva.

2) Saproglyphidae: Tarsal claws small, ambulacrum situated on top of a long pretarsus and not connected with tarsus by two sclerites. Idiosoma with distinct sejugal furrow. Cuticle smooth or distinctly striated, membranous. Idiosomal hairs smooth and piliform. Female with or without epigynum. Male without adanal or tarsal suckers (except in the genus *Pontoppidania* Oudemans where these suckers are present). Genital suckers generally disciform. Hairs *ve* are lacking. Organ of Claparède well developed.

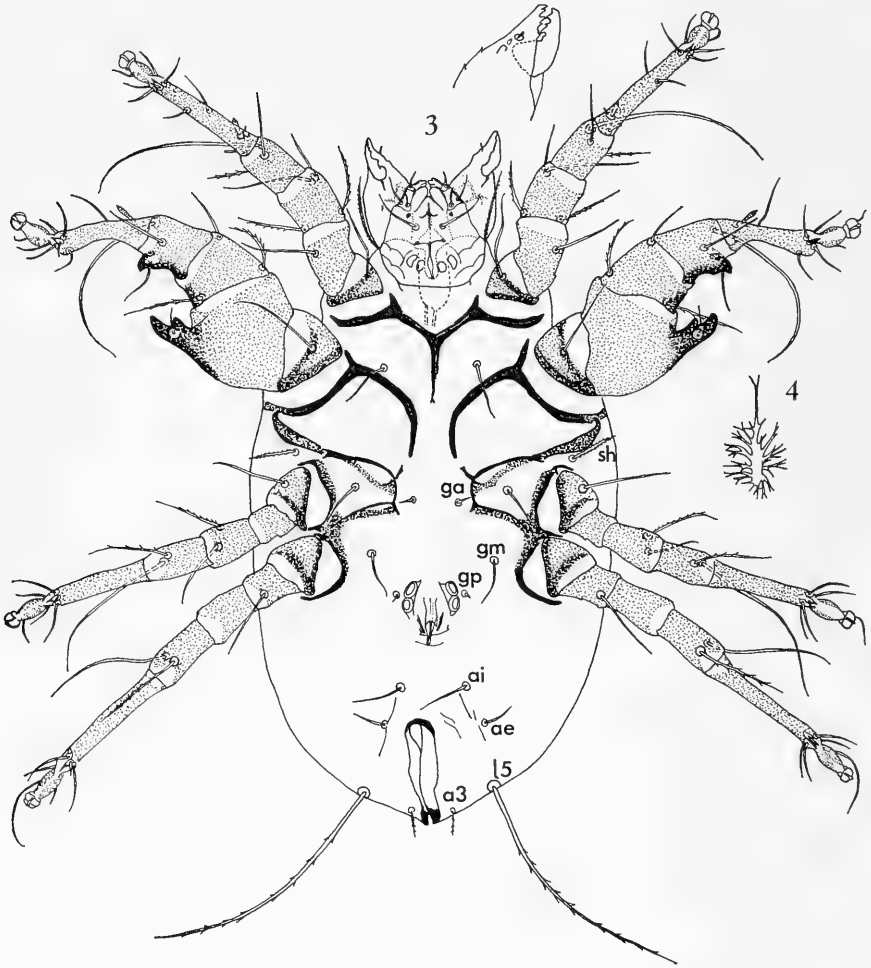


Fig. 3, 4. — *Melesodectes auricularis* Fain & Lukoschus, 1968. 3) male, venter, 4) supracoxal seta

3) Glycyphagidae: Tarsal claws as in Saproglyphidae. Sejugal furrow usually lacking. Cuticle thick, coloured and often with patterns or verrucous. Idiosomal hairs variable, rarely piliform. Male without adanal or tarsal suckers. Epigynium generally present in female. Genital suckers usually present, but slightly developed (disciform, rarely digitiform). Hairs *ve* generally present. Organ of Claparède reduced.

The genus *Melesodectes* shows claws similar to those in Saproglyphidae and Glycyphagidae. The sejugal furrow is present, but is only slightly characterized and may even quasi disappear in swollen specimens. Cuticle slender, colourless without patterns nor verrucous; however, on certain parts of the body of the less swollen specimens, some very narrow irregular ridges can be observed. Hairs of idiosoma are piliform, carrying short and only few barbules. The female shows a well shaped epigynium. The male is

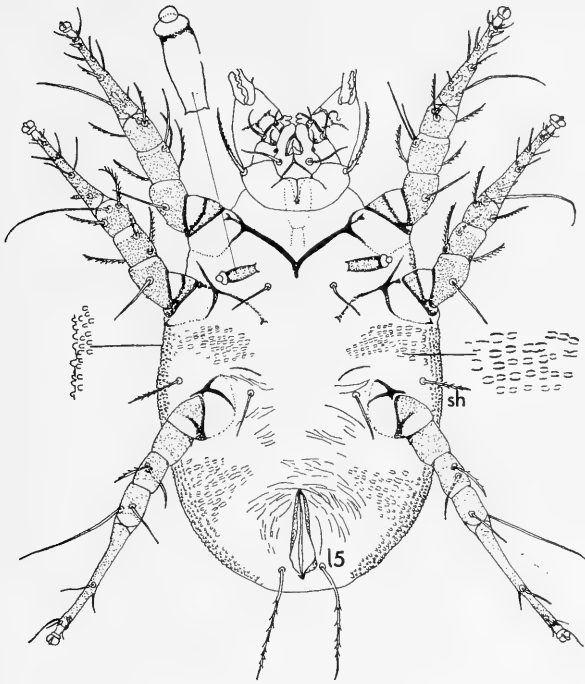


Fig. 5. — *Melesodectes auricularis* Fain & Lukoschus, 1968, larva, venter

devoid of adanal or tarsal suckers. The genital suckers are very short, almost disciform. In the larva the organ of Claparède is well developed. Finally the tarsi appeared to be long and narrow, particularly in the female.

Some characteristics, such as the presence of the sejugal furrow, the weak and smooth structure of the cuticle, the well developed organ of Claparède, bring this genus close to the family Saproglyphidae. However, this genus does not fully fit into this family, because of the presence of the hairs *ve*, the slight development of the sejugal furrow, the distinct elongation of the tarsi, and the branched shape of the supracoaxal hair. In view of these characteristics it may rather be ranged among the Glycyphagidae. Actually, it forms a different group, intermediate between these two families.

With respect to the hypopus, it cannot be ranged among any of the three families of Acaroidea, because of its deviating character.

Hence our supposition may be justified to maintain this genus in an independent subfamily (*Melesodectinae*) and to range it provisionally within the family Glycyphagidae.

Female: Idiosoma egg-shaped, length except gnathosoma average of 24 specimens measured 564μ (464—664), width \varnothing 400μ (291—455). Cuticula smooth, without epidermal structures or coloured pattern, with some irregular striations or wrinkles.

Venter (Fig. 1): Epimera I fused in Y-chape, epimera VI fused with epimerites III, forming closed coxal fields. Genital opening between epimera II and III; epigynium



Fig. 6. — *Melesodectes auricularis* Fain & Lukoschus, 1968 protonymph venter

sickle-shaped and well sclerotized. Two vulvar valves without genital apodemes. Disc-shaped short genital suckers beneath vulvar valves. Anal opening ventral subterminal ($129\ \mu$ long). Bursa copulatrix (Fig. 2) opens terminal in a more sclerotized chamber, protuberant in part of the females. Bursa $150\ \mu$ long and relatively very wide, spermatheca soft and only somewhat larger than bursa. Two cup-like appendages near mouth of spermatheca. Ventral hairs setiform: *ga* ($40\ \mu$), *gm* ($40\ \mu$), *gp* ($54\ \mu$), *a1* ($30\ \mu$), *a2* ($45\ \mu$), *a3* ($29\ \mu$), *a4* ($25\ \mu$), *a5* ($24\ \mu$). Dorsal setae translocated to venter, pectinated: *sh* ($55\ \mu$), *l5* ($210\ \mu$).

Gnathosoma: Pedipalpal coxae with two pairs of setae, lateral of them pectinate. Pedipalps with two segments, proximal segment with two setae, distal with one seta, one solenidion and button-like proximal protuberances. Chelicerae heavily dentated with little mandibular spine and four conical spurs.

Legs with five free segments, all tarsi elongated. Single little claw on lengthened pretarsus. Chaetotaxy of legs: tarsi 12-12-10-10, tibiae 2-2-1-1, genua 2-2-1-0, femora 1-1-0-1, trochantera 1-1-1-0, coxal fields 1-0-1-0.

Solenidiotaxy: Tarsi 3-1-0-0, tibiae 1-1-1-1, genua 2-1-1-0, famulus present on tarsus I (Fig. 17, 18).

Dorsum (Fig. 8): Sejugal furrow indistinct and only in median part. All dorsal setae with exception of *ve* (25 μ) pectinate. *vi* (90 μ) in front of smooth *ve*. Supracoxal setae (Fig. 11) branched and forked with small organ of Grandjean, *sc e* (225 μ) four times as long as *sc i* (57 μ), *d 1* (60 μ), *d 2* (29 μ), *d 3* (385 μ), *d 4* (140 μ), *d 5* (255 μ), *l 1* (65 μ), *l 2* (50 μ), *l 3* (33 μ), *l 4* (280 μ), *b* (198 μ). Pore of oil gland medially to lateral 3.

In gravid females up to five eggs with well developed shells are observed. In freshly deposited eggs the shell has a honeycomb pattern, when observed under the dissecting microscope, however, after mounting in Hoyer's mixture no shell structures are visible. In far embryonated eggs two small chitinous cup-like structures are present.

Male: Idiosoma length average of 20 specimens measured 406 μ (360-450), width \varnothing 274 μ (252-302). General shape unlike female, because of distinctly brown coloured legs. Legs II strongly thickened, forming copulatory clasping organs.

Venter (Fig. 3): Epimera I long Y-shaped, epimera II and epimerites II forming almost closed coxal fields II, epimera III and IV fused. Genital opening behind legs IV, penis short. Two pairs of small disc-shaped genital suckers between very *g p*, *g m* 33 μ , *g a* 10 μ . Anus ventro-terminal, with only three pairs of anal setae. Gnathosoma as in female.

Legs thicker, tarsi shorter than in female, pretarsi longer, stalk much broader than in female (Fig. 17, 20). Legs II strongly thickened and specialized for clasping organs. Large two-pointed femoral apophysis and tibial spur-shaped pincers, supported by posterolaterally notched tarsus.

Chaetotaxy: Tarsi 8-8-6-6, tibiae 2-2-1-1, genua 2-2-1-0, femora 1-1-0-1, tochantera 1-1-1-0, coxal fields 1-0-1-0.

Solenidiotaxy: Tarsi 3-1-0-0, tibiae 1-1-1-1, genua 2-1-1-0. Famulus present on tarsus I (Fig. 19, 20).

Dorsum as in female. Setae insignificantly smaller than in female.

Larva: Idiosoma egg-shaped, length average of 14 specimens 208 μ (164-306), width \varnothing 159 μ (99-216). Cuticula in freshly emerged specimens mammillated and irregularly striated, in fullgrown larvae smooth like in adults.

Venter (Fig. 5): Epimera I fused in V-shape, epimera II and III free. Organ of Claparède 28 μ long with long well sclerotized and coloured basal part, soft uncoloured ring and coloured end. Anus ventral subterminal without anal setae. Gnathosoma as in adults.

Legs almost like in female. Chaetotaxy of legs: Tarsi 12-12-10, tibiae 2-2-1, genua 2-2-1, femora 1-1-0, trochantera 0-0-0, coxal fields 1-0-1.

Solenidiotaxy: Tarsi 1-1-0, tibiae 1-1-1, genua 2-1-1. Famulus on tarsus I remarkably longer than in adults (Fig. 12, 13).

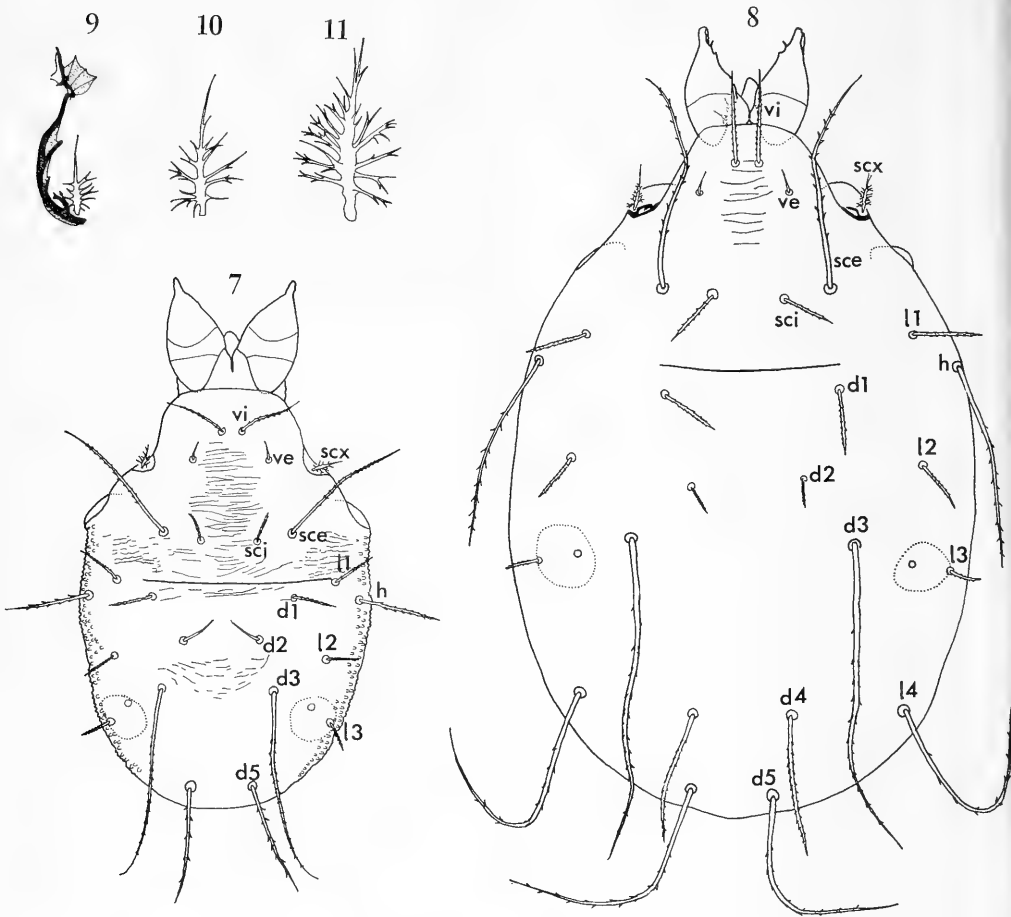


Fig. 7—11. — *Melesodectes auricularis* Fain & Lukoschus, 1968. (7) larva, dorsum, (8) female, dorsum, supracoxal setae of larva (9), protonymph, (10) and female (11). *sc* supracoxal setae, *d* 1-5 dorsal setae, *b* humeral seta, *l* 1-5 lateral setae, *ve* vertical external setae, *vi* vertical internal setae

Dorsum (Fig. 7): Idiosomal setae (lacking are *d* 4 and *l* 4) with exception of *ve* and *d* 2 pectinate and with the same length relations as in adults. Supracoxal setae (Fig. 9) branched and forked, Grandjean organ palmate (more distinct than in adults).

Protonymph: Length of idiosoma average of 14 specimens measured 357 μ (302—473), width \varnothing 253 μ (198—338).

Venter (Fig. 6): Epimerae I fused in V- or very short Y-shape, epimerae II-IV free. Anus ventral subterminal with three pairs of anal setae. One pair of disc-shaped genital suckers and genital median setae between legs IV. Gnathosoma as in adults.

Chaetotaxy of legs: Tarsi 12-12-10-10, tibiae 2-2-1-0, genua 2-2-1-0, femora 1-1-0-0, trochantera 0-0-0-0, coxal fields 1-0-1-0.

Solenidiotaxy: Tarsi 2-1-0-0, tibiae 1-1-0-0, genera 2-1-1-0. Famulus present on tarsus I (Fig. 14, 15).

Dorsum like tritonymph, only length of setae somewhat shorter, supracoxal setae (Fig. 10) less branched.

DEPOSITION OF SPECIMENS

Adults and developmental stages have been deposited in:
Rijksmuseum van Natuurlijke Historie;
British Museum (Natural History);
Rocky Mountain Laboratory, Hamilton, Montana;
Field Museum of Natural History, Chicago;
Department of Zoology, University of Massachusetts, Amherst, Mass.;
Zoologisches Staatsinstitut und Zoologisches Museum, Hamburg; coll. nr. A22/71
U.S. National Museum, Washington;
Institute of Parasitology, Academy of Sciences, Praha;
Zoological Institute, Academy of Sciences, Leningrad;
Institut de Médecine Tropicale Prince Léopold, Antwerpen;
Zoologisch Laboratorium, Katholieke Universiteit, Nijmegen.

DISCUSSION

Morphological characteristics of hypopi, adults and larvae suggest relations to the family Hypoderidae (subcutaneous parasites of birds and rodents) and also to the family Saprogllyphidae.

Genera of the subfamily Hypodectinae, parasites of birds, have a remarkable biology. Developmental cycles have been observed in *Hypodectes propus* Nitzsch, 1861, subdermal parasites of pigeons, by Fain and Bafort (1966). In this species free small hypopi are found in nests of pigeons during breeding time and also under the skin in nestlings. Within the tissue of birds these hypopi extend for 7—10 times. They rest within the tissues until the full-grown pigeon sits on eggs. Then the large tissue hypopi are eliminated by the bird and give direct development to adults. From the numerous eggs hatch free hypopi. Larval and protonymphal stages remain rudimentary within the egg shell. Development is shortened by lack of free living larvae, protonymphs and tritonymphs and in time development from large tissue hypopi → adults → reproduction → free hypopi to a short breeding period. Most absorption of food seems to be within tissue hypopus. There are no observations on feeding of the adults. Free hypopi get through little resistant epidermis of nestlings (Fain, 1967). Development is suggested to be affected by hormonal conditions of host while breeding.

Of the subfamily Muridectinae, subdermal parasites of rodents, neither adults nor developmental cycles have been observed (Fain, 1968, 1969).

Although in our rearing experiments the whole cycle, including forming of hypopi ex protonymphs, could not be observed, results may be compared. Development from hypopi to protonymph occurs within a very short time (shortest observed time: 12 days, in laboratory conditions). As lactation period in *Meles meles* lasts 12—14 weeks, there will be sufficient time for infection of nestlings, even if the development may be distinctly longer under field conditions.

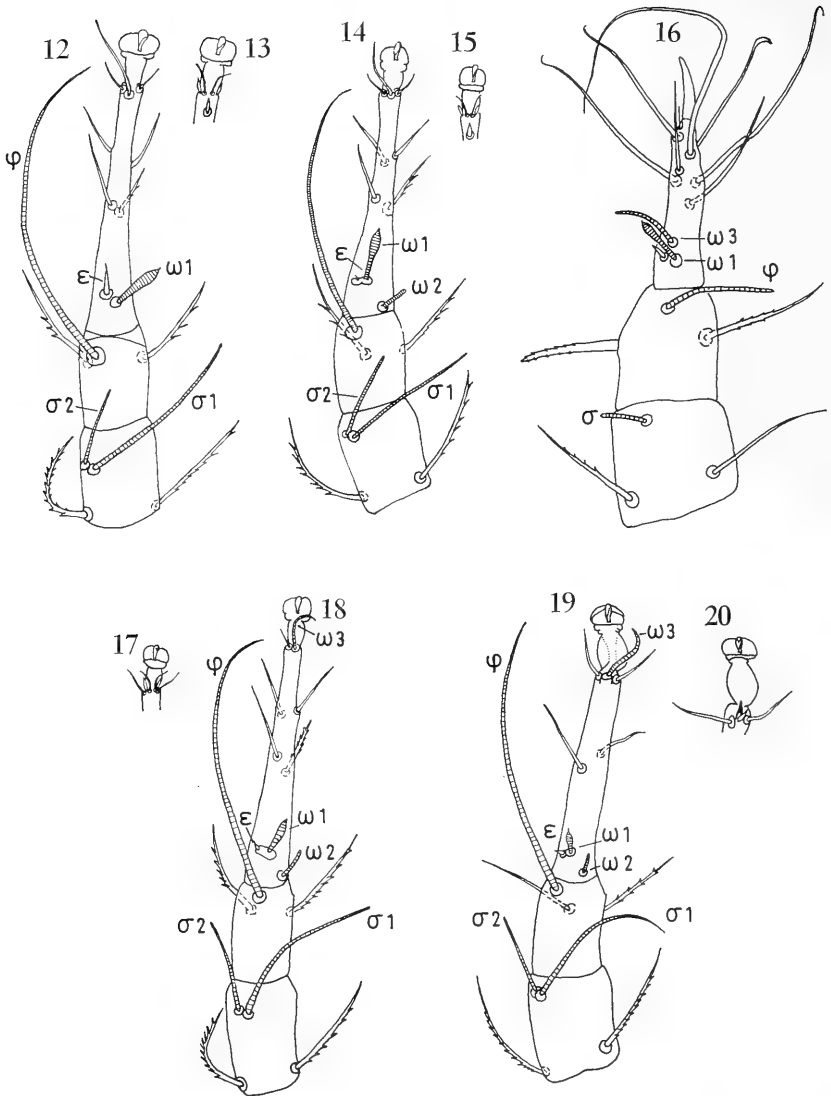


Fig. 12—20. — *Melesodectes auricularis* Fain & Lukoschus, 1968, leg I of larva dorsally (12), ventrally (13), of protonymph (14, 15), of hypope (16), female (17, 18) and male (19, 20)

Contrary to Hypodectinae, feeding of free living stages is necessary. There has been no development nor egg production without suitable food. Low numbers of developed protonymphs may be caused by shortage of food or decay.

It is interesting to mention that Fain (1969c, p. 758), working with hypopi of *Labidophorus talpae* and *Orycteroxenus dispar* from the mole (*Talpa europaea*), succeeded in obtaining the development of hypopi into tritonymphs, but was unable to rear

adults from the latter. It seems that here also the nymphs were unable to develop into adult stage in the absence of suitable food. In two other experiments this author (1968b and 1969b), working in Central Africa with the same technique, was able to obtain the development of endofollicular hypopi of the genera *Lophuromyopus* and *Rodentopus* into tritonymphs and adults. Free moving adults were obtained after a delay of 6 days. No food was provided during the experiment.

These experiments show that the development into the adult stage is variable according to the species involved. Some may require food, while other do not.

Failure of rearing mites on defined rearing media, fitted for most species of nest-inhabitant mites, suggests that *Melesodectes* is not a free-living nest-inhabitant, hypopi of which are phoretic on hosts for reaching new habitats, like *Xenoryctes krameri*, but a specialized monophageous parasite.

Successful rearing only on epidermis and fat tissue of the host suggests that in field conditions free living stages also feed on debris of host tissues present within the nests only during lactation period.

Observation of injuries and penetrated hypopi subcutaneous in a nestling shows close relations to Hypoderinae. The strong knife-like claws of hypopi (also typical in many Hypodectinae genera) may enable the penetration of the epidermis of nestling.

Presence of chitinous cup-like structures within the embryonated egg shows striking similarities to those in some families of host specific cutaneous mites like *Myialges anchora* (Oudemans, 1935), *Myialges macdonaldi* (Evans, Fain & Bafort, 1963) and *Gliricoptes betulinus* (Kok, Lukoschus & Fain, in press).

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FOUR NEW SPECIES OF THE GENUS PSORERGATES TYRELL FROM EUROPEAN HOSTS (ACARINA, PSORERGATIDAE)

by

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ABSTRACT

Four new species of the genus *Psorergates*, itch mites of small mammals, are described. Systematic positions are discussed. The new species *Psorergatus muscardinus*, *baueri*, *neerlandicus* and *quercinus* are parasites of *Muscardinus avellanarius* (Germany), *Neomys fodiens* (Austria), *Microtus oeconomus* (the Netherlands) and *Eliomys quercinus* (Spain), respectively.

INTRODUCTION

This study is a continuation of a series of investigations on Psorergatidae, itch mites of rodents, carnivores and insectivores from Europe (Fain, Lukoschus & Hallmann, 1966; Lukoschus, Fain & Beaujean, 1967; Lukoschus, 1967, 1968a, b, 1969; Fain & Lukoschus, 1948; de Cock, Lukoschus & Ariani, 1971) and Canada (Kok, Lukoschus & Clulow, 1970, 1971).

When systematically investigating European hosts, one of us (F.L.) succeeded in discovering new species of the genus *Psorergates* which are described below.

The species have been collected from alcohol preserved hosts in Naturhistorisches Museum, Wien (Dr. K. Bauer), Centro Pirenaico de Biologia Experimental in Jaca, Spain (Prof. Dr. E. Balcells R.), from dor-mice kindly sent to us for observations by Dr. O. Henze, Institut für angewandte Zoologie, München, and from freshly trapped voles. We highly appreciate the kind co-operation of our colleagues.

Psorergates muscardinus spec. nov.

(Figs. 1—13)

Female (holotype). — Shape and body as in other species of the genus *Psorergates*. Length including gnathosoma 178 μ , average in 18 paratypes measured 168 μ (145—186), width 145 μ , average in the paratypes 139 μ (124—152).

Venter (Fig. 1). Cuticle soft. Ventral setae (*vs*) 10 μ (8—12), distance between ventral setae 12 μ (7—14). Genital opening (*vu*) 18 μ (15—19) long, lying between two adanal lobes, each of which carries a pair of terminal setae of about 81 μ (69—88). Epimerae I bent abroad. Epimerae II—IV beneath body surface.

Legs inserted ventro-laterally. Articulation between epimera and trochanters strongly sclerotized. All trochanters with a long and strongly sclerotized ventral spur that is pointing to the anterior part of the body. Femora of all legs with a large prominent ventral spur and a pair of postero-lateral setae. Length of these setae 23—27 μ on femora

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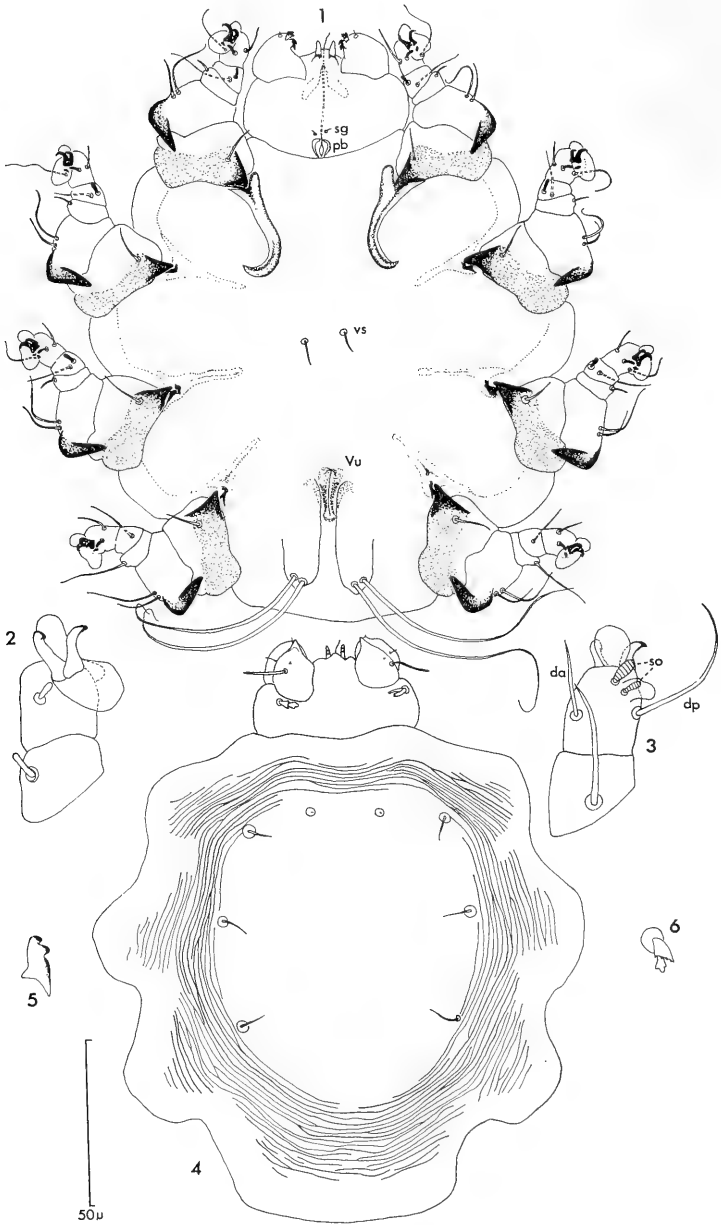


Fig. 1—6. *Psorergates muscardinus* spec. nov. female. 1, holotype, venter; 2, leg I, tarsus and tibia, ventral; 3, leg I, tarsus and tibia, dorsal; 4, holotype, dorsum; 5, chelicera in lateral view; 6, gnathosomal seta

I—IV. Apical seta of each pair almost twice as long as basal one. Genua with postero-lateral seta, $5\ \mu$ on genua I—III and $17\ \mu$ (17 — 29) on genu IV. Tibiae with short club-like spines antero-ventrally (not present on leg IV) and a longer dorso-medial seta. Tarsi with long dorso-posterior seta (*dp*), shorter dorso-anterior seta (*da*) and latero-ventral club-like spine (Fig. 2). Postero-dorsal seta not present on tarsi IV. Tarsi I and II dorsally with two solenidia (Fig. 3), dorso-medial solenidion bulbous, antero-lateral one lying inside a duplication of the epidermis. Two single-pointed claws and a bilobed empodium inserted ventrally at the end of the tarsi.

Dorsum (Fig. 4). Dorsal shield well sclerotized and distinctly punctured. Length of shield $99\ \mu$, average in paratypes $101\ \mu$ (96 — 106), width $78\ \mu$, average in paratypes $80\ \mu$ (74 — 83). Three pairs of lateral setae present on the shield, second pair about $8\ \mu$ (8 — 9) long. Antero-medially of the first pair of lateral shield setae a pair of minute setae present, $11\ \mu$ (10 — 12), at some distance of the margin of the shield. Soft parts of the dorsal side striated.

Gnathosoma and mouth parts like in other *Psorergates* species. Gnathosomal setae (Fig. 6) $5.5\ \mu$ (5 — 7) long, bilobed with slightly incised borders. Subgnathosomal setae (*sg*) short, pharyngeal bulb (*pb*) oval with a gland duct to mouth opening. On the palpal tibia two dorsal setae present, the anterior one very small, length of posterior seta $12\ \mu$ (12 — 14). Further present on the palpal tibia a small soft lateral seta and a spur on the dorsal end. Palpal tarsus with a bi-pointed and a three-pointed claw. Chelicerae with stinging bristles and dentated digitus fixus. The digitus fixus from a squashed paratype in lateral view is given in Fig. 5.

Male (allotype). — Shape and body like in other *Psorergates* species. Length including gnathosoma $154\ \mu$, average in 15 paratypes measured $144\ \mu$ (131 — 154), width $138\ \mu$, average in the paratypes $125\ \mu$ (115 — 138).

Venter (Fig. 8). Similar to that in female, but only with two terminal setae of $34\ \mu$ (32 — 38) on a sclerotized medial tubercle. Legs as in female, but all setae somewhat shorter: ventral setae $8\ \mu$ (6 — 10), distance between ventral setae $14\ \mu$ (13 — 20), trochanteral setae $8\ \mu$ (7 — 9), femoral setae I—III $15\ \mu$ (14 — 16), femoral setae IV $20\ \mu$ (17 — 22), genual setae I—III $4\ \mu$, genual setae IV $16\ \mu$ (13 — 18).

Dorsum (Fig. 7). Genital opening near medio-anterior border of shield. Two pairs of minute genital setae beside the genital opening, posterior setae $8\ \mu$ (8 — 9) apart, anterior setae $5\ \mu$ (3 — 5) apart. Length of the very weakly sclerotized dorsal shield $99\ \mu$ average in the paratypes $89\ \mu$ (79 — 99), width $74\ \mu$, average in the paratypes $68\ \mu$ (63 — 74). Single-pointed penis of $29\ \mu$ (29 — 34), penis envelope $22\ \mu$ (18 — 24), on dorsal side shorter. Striation pattern of the soft dorsal parts different from female.

Gnathosoma and mouth parts built as in female. Posterior palpal tibial setae $5\ \mu$ (3 — 5) and gnathosomal setae $3\ \mu$ (3 — 5).

Immature stages. — Egg with thin shell, almost globular. Dimensions of five measured eggs: $92 \times 87\ \mu$, $90 \times 85\ \mu$, $120 \times 108\ \mu$, $110 \times 108\ \mu$, $103 \times 101\ \mu$.

Larva (Fig. 9). Disc-shaped with three pairs of two-segmented legs. Average length in 11 specimens measured $106\ \mu$ (97 — 120), average width $87\ \mu$ (78 — 99). Cuticle soft, with indistinct dorsal striation. Trochanters with well developed spurs, small indistinct epimerae, segments, femur to tarsus fused, forming a flattened unit with two three-pointed claws. Gnathosoma (Fig. 10) almost as large as in adults, but setae on gnathosoma (Fig. 11) somewhat smaller, subgnathosomal setae longer than in adults.

Protonymph (Fig. 12). Like larva, but four pairs of two-segmented legs. Fused

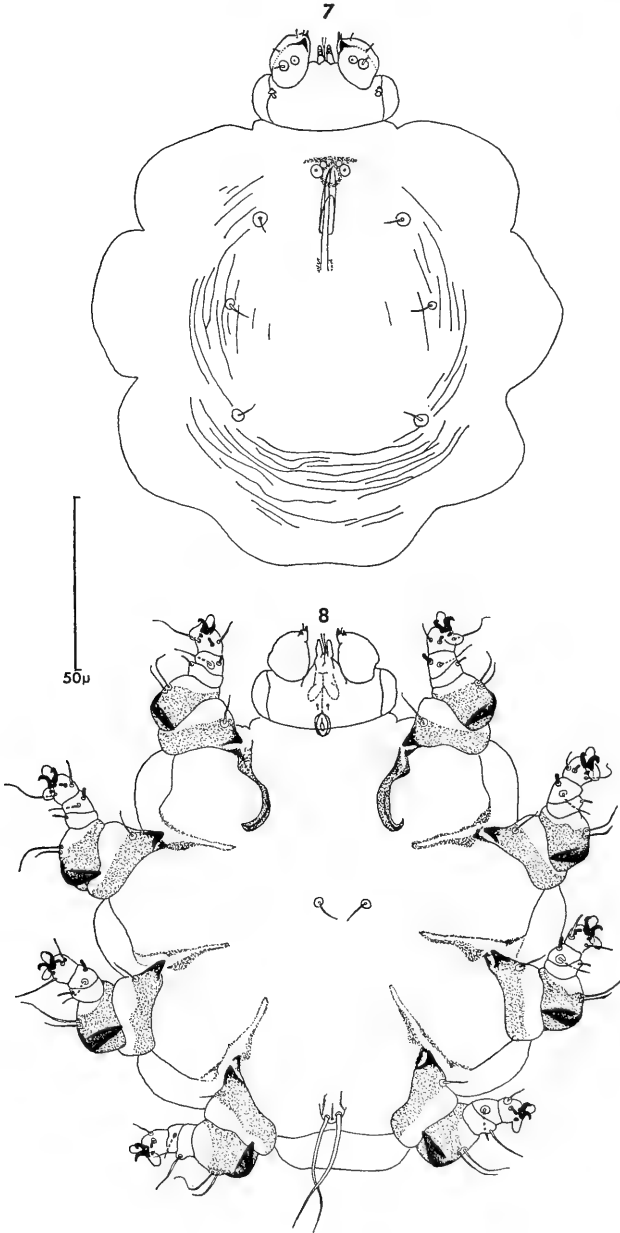


Fig. 7—8. *Psorergates muscardinus* spec. nov. male. 7, allotype, dorsum; 8, allotype, venter

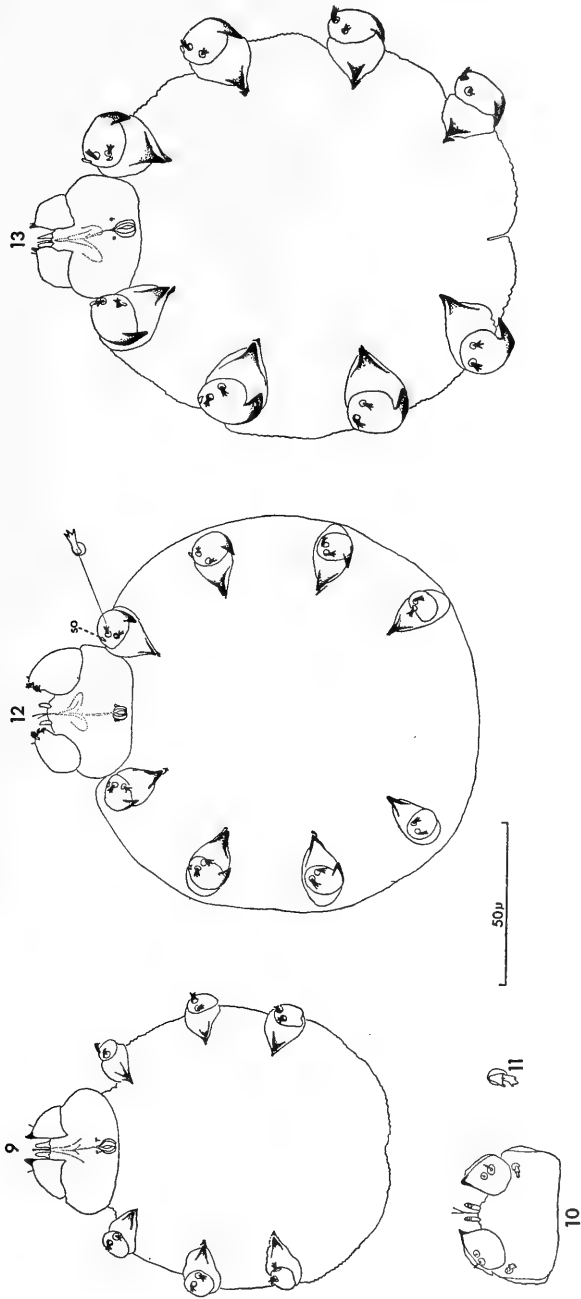


Fig. 9—13. *Provergates muscardinus* spec. nov. developmental stages. 9, larva, venter; 10, gnathosoma larva, dorsal; 11, gnathosoma seta of larva; 12, protonymph, venter; 13, deutonymph, venter

segment with an apophysis that may be lacking on leg IV. Solenidia (*so*) present on legs I and II. Setae on gnathosoma longer than in larva, except subgnathosomal setae. Average length in 6 specimens measured 127μ (115—143), average width 108μ (97—122). Posterior palpal tibial setae longer than in larva.

Deutonymph (Fig. 13). Like protonymph, but larger. Spur on the fused segment bigger than in protonymph and never lacking on leg IV. Two solenidia present on leg I, one solenidium on leg II. Gnathosomal setae longer than in protonymph, as well as posterior palpal tibial setae ($4-5 \mu$), but shorter than in adults. Average length in 10 specimens measured 161μ (149—184), width 138μ (124—156).

Type host. — *Muscardinus avellanarius* Linnaeus.

Type locality. — München, Germany, 18.V.1969 and 8.VII.1969.

Pathology. — The mites live within the epidermis of the ear concha, causing hyperceratosis.

Deposition of types. — Holotype and allotype: Zoologisches Institut und Zoologisches Museum, Hamburg.

Paratypes ♀ and ♂: U.S. National Museum, Washington; British Museum (Natural History), London, coll.nr. 1971/158-9; Rijksmuseum van Natuurlijke Historie, Leiden, coll.nr. P 1213-4; Naturhistorisches Museum, Wien; Muséum National d'Histoire Naturelle, Paris, coll.nr. 11.I. 13-14; Acarology Laboratory, Columbus, Ohio; Field Museum of Natural History, Chicago; Institut de Médecine Tropicale Prince Léopold, Antwerpen; Department of Zoology, Catholic University, Nijmegen.

***Psorergates baueri*¹⁾ spec. nov.**
(Figs. 14—19)

Female (holotype). — Shape and body build as in other species of the genus *Psorergates* from insectivora (Lukoschus 1968a, b). Length including gnathosoma 117μ , average in 11 paratypes measured 114μ (99—129), width 92μ , average in the paratypes 91μ (78—101).

Venter (Fig. 14). Cuticula soft. In the middle of the venter two setae of about 4μ (4—6), and 6μ (5—10) apart. Epimera II—IV and anterior part of epimera I lying beneath the body surface. Posterior part of epimera I bent outwards and circularly closed. Genital opening 10μ (8—11) long, lying between two adanal lobes, each of which carries a pair of terminal setae of 54μ (48—58).

Legs inserted ventro-laterally. Articulation between epimera and trochanters strongly chitinized. All trochanters with a strongly sclerotized spur that is pointing to the anterior part of the body, and a small spur directed towards the large femoral spur. Distally to the strong spur a trochanteral seta of 5μ (5—8). Femora of all legs with a large ventral spur. Femora I—III with a pair of postero-lateral setae of 24μ (20—27), of which the basal is always shorter than the apical. Femur IV with only one seta: 24μ (20—27). Postero-lateral setae on genua I—III 1μ , on genu IV 36μ (33—45). Tibia with short antero-ventral spine (lacking on leg IV) and a longer dorso-medial seta. Tarsi with postero-dorsal (*dp*) seta of 16μ (14—18), antero-dorsal (*da*) seta of 2—3 μ and a ventral spine. Postero-dorsal seta not present on leg IV. Two solenidia on the dorsal

¹⁾ The species is named in honour of Dr. K. Bauer, Naturhistorisches Museum, Wien (Austria).

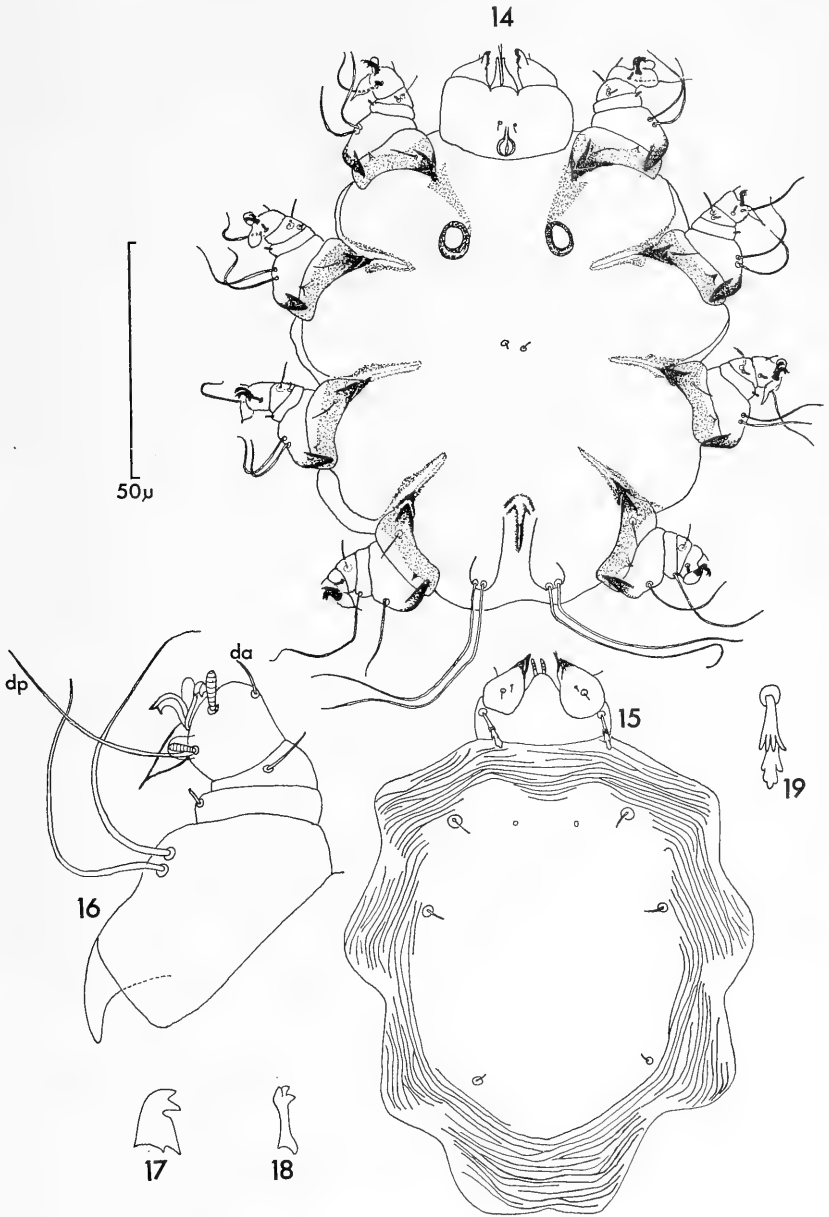


Fig. 14—19. *Psorergatus baueri* spec. nov., female. 14, holotype, venter; 15, holotype, dorsum; 16, leg I, femur-tarsus, dorsal; 17, chelicera in lateral view; 18, palpal claw in lateral view; 19, gnathosomal seta

side of tarsi I and II (Fig. 16), dorso-medial solenidion bulbous, antero-lateral within a duplication of the epidermis. Two two-pointed claws and a bi-lobed empodium inserted ventrally at the end of the tarsi.

Dorsum (Fig. 15). Dorsal shield well sclerotized and distinctly punctured. Soft parts of dorsum striated. Length of shield 77μ , average in the paratypes 77μ (67—81), width 58μ , average in paratypes 62μ (53—68). Three pairs of lateral setae, distinctly distant from the margin of the shield. Second pair 4μ (3—5) long. Antero-medially of first pair of lateral setae a pair of minute setae present.

Gnathosoma and mouth parts like in other *Psorergates* species. Gnathosomal setae bilobed, 7μ (5—8), short lobe with relatively deeply incised border (Fig. 19). Posterior dorsal seta on palpal tibia very short (2μ). Further present on palpal tibia: a very small anterior seta, a lateral seta, and a spur on the dorsal end. Palpal tarsus with two claws (Fig. 18) and one spine. Chelicerae with stinging bristles and dorsally dentated digitus fixus (Fig. 17).

Male unknown.

Immature stages. — Egg: thin-shelled, $69 \times 58 \mu$, $78 \times 69 \mu$, $71 \times 60 \mu$.

Larva: Like in other *Psorergates* species, $76 \times 62 \mu$.

Protonymph: Not found.

Deutonymph: Like in other *Psorergates* species, $120 \times 99 \mu$, without spurs on fused leg segments.

Type host. — *Neomys fodiens* (Pennant).

Type locality. — St. Michael, Salzburg, Austria, 9.VII.1967.

Pathology. — The mites were found between the tendons of the forelegs within the upper layers of the epidermis, causing hyperkeratosis.

Deposition of types. — Holotype ♀ at Wien; paratypes at Leiden P 1218-9, Hamburg, Washington, Antwerpen, Nijmegen, London (1971/166), Paris (11 J 15).

Psorergates neerlandicus spec. nov.

(Figs. 20—25)

Female (holotype). — Shape and body build as in other *Psorergates* species from the *apodemi*-group (Lukoschus, Fain & Beaujean, 1967). Length, including gnathosoma, 132μ , the same as in two paratypes, width behind second pair of legs 115μ , like in paratypes.

Venter (Fig. 20). Venter with soft cuticula. In the middle two ventral setae of 7μ long, 9μ apart. Genital opening 10μ long, lying between trochanteral spurs IV, flanked by two adanal lobes, each of which carries a pair of terminal setae of about 79μ long. Chitinous ducts from genital opening indistinct. Anus not present. Posterior part of epimera I half circular, bent outwards. This crescent-shaped part standing out from the venter. Anterior part of epimera slightly, articulation with trochanters strongly chitinized. Epimera II—IV shaped as an oblong obtuse-angled triangle beneath surface of venter. Inwards-pointing parts slightly, articulation with trochanters, strongly sclerotized.

Legs inserted ventro-laterally. Trochanters with strong, extending ventral spur, pointing to the anterior part of the body, and a seta (9μ) distally of this spur. Basal part of trochanters strongly chitinized with a small spur towards the femoral spur. Femora of all legs with a pair of postero-lateral setae and a large ventral spur. Basal seta of pairs

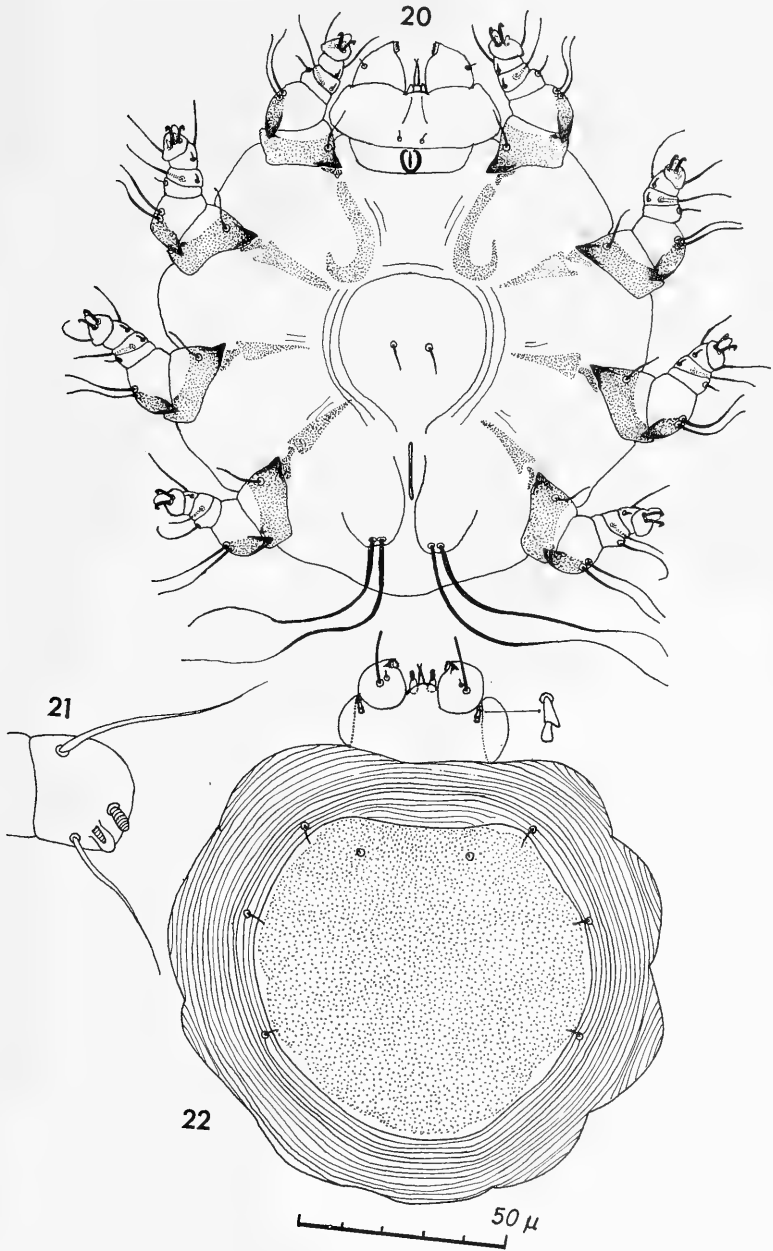


Fig. 20—22. *Psorergates neerlandicus* spec. nov. female. 20, holotype, venter; 21, leg I, tarsus, dorsal; 22, holotype, dorsum

always little shorter than apical. Apical setae $19\ \mu$ long on femora I—III, $24\ \mu$ on femur IV. A seta present upon a small sclerotized elevation on the genua, with the length of $16\ \mu$ on genu IV and of $5\ \mu$ on genua I—III. Short tibia with an antero-ventral spine (lacking on tibia IV) and a longer dorso-medial seta. Tarsi with antero-ventral spine, postero-dorsal seta and antero-dorsal seta of about the same length. Postero-dorsal setae not present on tarsus IV. Tarsi I and II with a big, club-shaped solenidion and a smaller solenidion within a duplication of the epidermis (Fig. 21).

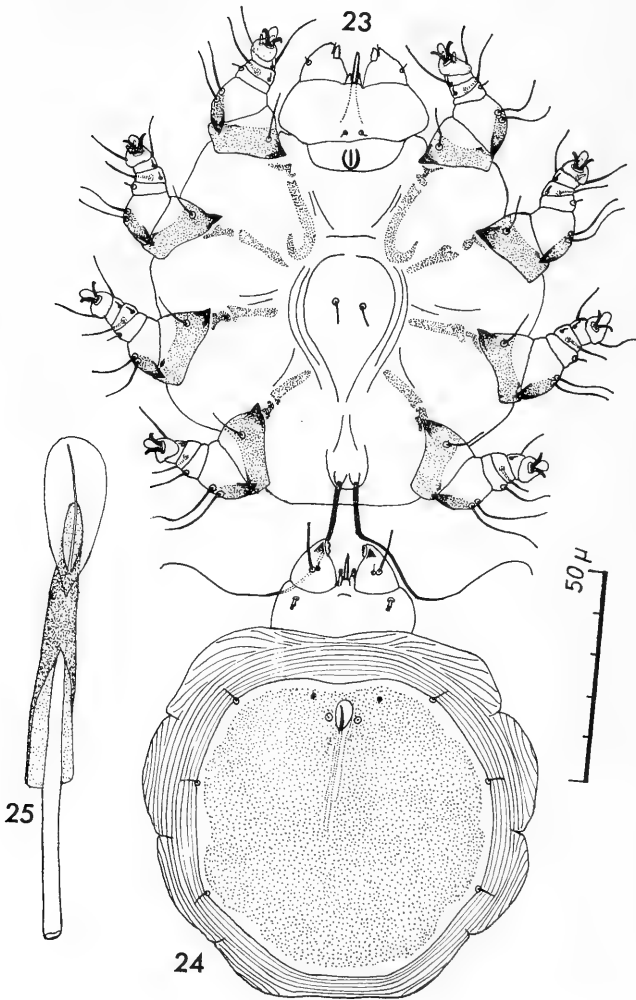


Fig. 23—25. *Psorergates neerlandicus* spec. nov. male. 23, allotype, venter; 24, allotype, dorsum; 25 penis, enlarged

Both strong single-pointed claws and bilobed empodium inserted ventrally at the end of the tarsus.

Dorsum (Fig. 22). Dorsal shield well sclerotized and punctured up to $2\ \mu$ from the shield border. Distinctly marked off from the softly chitinized, striated dorsal side. Length of shield $77\ \mu$, width $77\ \mu$. Three pairs of lateral setae of $5\ \mu$, standing at the border of the shield. Median setae very small, nearly point-shaped, situated $8\ \mu$ from shield margin.

Gnathosoma and mouth parts like in other *Psorergates* species. Gnathosomal setae $4\ \mu$ long, two-segmented, with unindented border. Middle part of gnathosoma epistoma-like, covering mouth opening and posterior part of the chelicerae. Palpal tibia with two dorsal setae: posterior one $12\ \mu$ long and well-developed up to the end (seems to be broken), anterior seta very short ($1\ \mu$). On lateral side of the palp a soft seta. Dorsal end of palpal tibia with strongly chitinized spur. Palpal tarsus inserted ventro-medially. Chelicerae consisting of dentated digitus fixus with saw-function and stinging bristles.

Male (allotype). — Shape and body build like in other *Psorergates* species from *apodemi*-group. Length including gnathosoma $110\ \mu$, average in 4 paratypes $109\ \mu$ (104 — 119), width $94\ \mu$, average in the paratypes $94\ \mu$ (82 — 101).

Venter (Fig. 23). Terminal setae 62 — $67\ \mu$ long, standing on a small sclerotized median tubercle. Setae on ventral side barely shorter than in female: ventral setae 5 — $6\ \mu$, distance between ventral setae 7 — $10\ \mu$, trochanteral setae 7 — $9\ \mu$, femoral setae I—III 16 — $20\ \mu$, femoral setae IV 19 — $20\ \mu$, genual setae I—III $2\ \mu$ and genual setae IV 12 — $14\ \mu$.

Dorsum (Fig. 24). Similar to female, but antero-medially on dorsal shield an oval genital opening with two pairs of minute setae. Anterior pair of genital setae 18 — $19\ \mu$ apart, posterior pair $7\ \mu$ apart. Average length of shield $73\ \mu$ (70 — 78), width $70\ \mu$ (67 — 73). Lateral shield setae $4\ \mu$ long. Average length of penis $26\ \mu$ (24 — $30\ \mu$), average length of penis envelope $22\ \mu$ (20 — 23) (Fig. 25). Penis envelope shortened on dorsal side.

Gnathosoma as in female. Posterior tibial setae of palp somewhat shorter: average $10\ \mu$ (8 — 11).

Type host. — *Microtus oeconomus* (Pallas).

Type locality. — Texel Island, the Netherlands, 26.IX.1968.

Pathology. — The mites were found within the epidermis on the venter of the abdomen, causing hyperkeratosis and papillomitoses.

Deposition of types. — Holotype and allotype at Leiden P 1220-1. Paratypes: Antwerpen, Washington, Nijmegen.

Psorergates quercinus spec. nov.

(Figs. 26—33)

Female (holotype). — Shape and body build as in other species of the genus *Psorergates*. Length including gnathosoma $175\ \mu$, averages in 10 paratypes measured $169\ \mu$ (157 — 179), width $125\ \mu$, average in paratypes $143\ \mu$ (118 — 151).

Venter (Fig. 26). Cuticle soft. Ventral setae $11\ \mu$ long, $16\ \mu$ (14 — 18) apart. Anterior part of epimerae I and epimerae II—IV beneath body surface. Posterior part of epimerae I standing out from venter. Genital opening more chitinized than in other

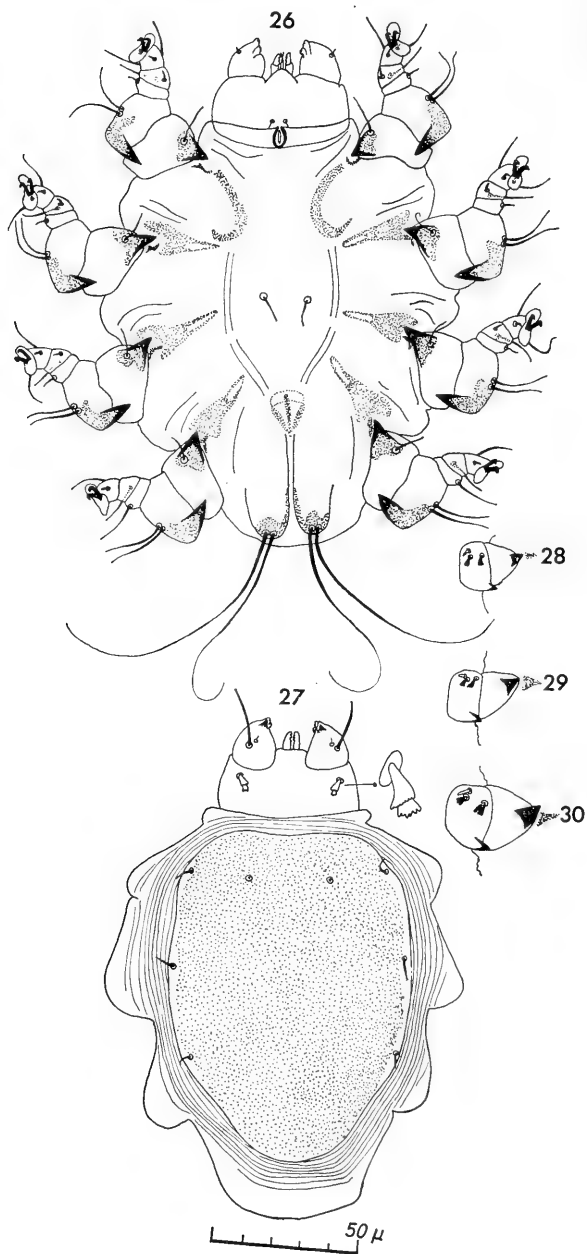


Fig. 26—30. *Psorergates quercinus* spec. nov. female. 26, holotype, venter; 27, holotype, dorsum; 28, larva, leg I, ventral; 29 protonymph, leg I, ventral; 30, deutonymph, leg I, ventral

species, 15 μ long, lying in front of two adanal lobes, each of which carries a pair of terminal setae of about 80 μ (72—84).

Legs inserted ventro-laterally. Trochanteral spurs peaked. Base of trochanters strongly chitinized. Trochanteral setae 12—16 μ . Femora with a large prominent spur and two setae. Apical one of these setae slightly longer than basal: 18—22 μ long on femur I—III, 22—24 μ on femur IV. Genua with a seta on a small elevation: 5 μ on genua I—III, 16—18 μ on genu IV. Tibiae with a thin antero-ventral spine (lacking on tibia IV) and a longer dorso-medial seta. Further present on tarsi an antero-ventral spine, a postero-dorsal seta (10 μ) and an antero-dorsal seta (11 μ). Postero-dorsal seta lacking on tarsus IV. Bilobed empodium and two single-pointed claws inserted ventrally at end of tarsus. Tarsi I and II with a big solenidion and a minute one within a duplication of the epidermis.

Dorsum (Fig. 27). Dorsal shield well sclerotized and distinctly punctured almost up to the margin. Anterior border slightly concave. Average length 112 μ (109—118), average width 85 μ (76—87). Shield setae standing on small unpunctured elevations, distinctly at some distance from shield border. Lateral setae 7—8 μ long. Minute median setae 16—18 μ from shield margin.

Gnathosoma and mouth parts as in other *Psorergates* species. Gnathosomal seta 5 μ long, at the end manifold incised. Palpal tibia dorsally with two setae of which the posterior one is 17—19 μ long and well-developed up to the end (seems to be broken). Anterior seta on palpal tibia very short; 2 μ . On lateral sides of the palpi a soft seta. Palpal tarsus inserted ventro-medially. Chelicerae with dentated digitus fixus and stinging bristles.

Male (allotype). — Shape and body build as in other *Psorergates* species. Length including gnathosoma 150 μ , average in 8 paratypes 142 μ (129—154), width 130 μ , in paratypes 123 μ (109—134).

Venter (Fig. 31), similar to female, but only two terminal setae (46—49 μ) on a long sclerotized median tubercle. Legs as in female, but all setae shorter; ventral setae 7 μ , distance between ventral setae 16—19 μ , trochanteral setae 6—9 μ , femoral setae I—III 12—14 μ , femoral setae IV 13—16 μ , genual setae I—III 2—4 μ and genual setae IV 8—13 μ .

Dorsum (Fig. 32). Dorsal shields well sclerotized and distinctly punctured. Behind the first pair of lateral setae shield bent inwards in a typical way, similar in all paratypes. Second lateral shield seta 5 μ long. Soft parts of dorsum striated. Two pairs of minute genital setae on small unpigmented tubercles, anterior genital setae 24—25 μ apart, posterior setae 19—20 μ apart. Length of single-pointed penis 46—52 μ , penis envelope 28—31 μ . Penis envelope deeply incised dorsally.

Gnathosoma as in female, palpal tibial setae (6—8 μ) and gnathosomal setae (4 μ) shorter.

Immature stages. — Egg. Almost globular, thin-shelled. Dimensions of 6 eggs measured: 91 \times 85 μ , 94 \times 85 μ , 91 \times 85 μ , 85 \times 79 μ , 108 \times 105 μ , 105 \times 105 μ .

Larva. Disc-shaped with three pairs of two-segmented legs. Dimensions of three specimens measured: 96 \times 77 μ , 91 \times 88 μ , 116 \times 99 μ . Cuticle soft with indistinct dorsal striation. Trochanters with well-developed spurs, small, indistinct epimera, segments femur to tarsus fused, forming a flattened unit with two three-pointed claws. On this unit further present: on leg I (Fig. 28) one solenidion and a small spur, on leg

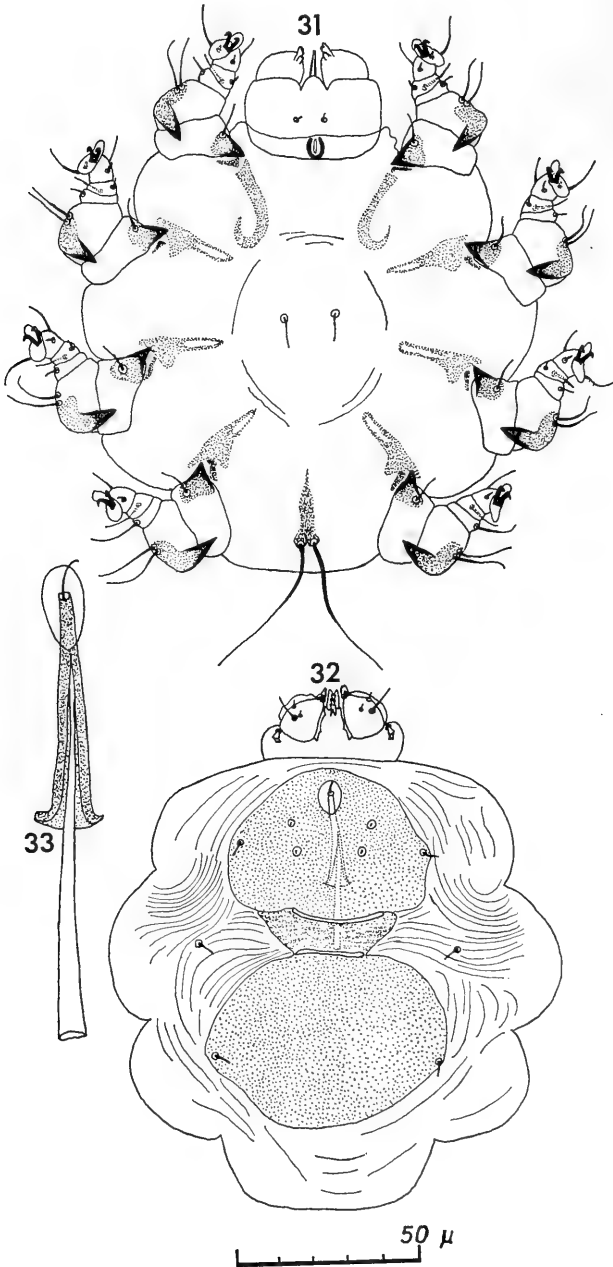


Fig. 31—33. *Psorergatus quercinus* spec. nov., male. 31, allotype, venter; 32, allotype, dorsum; 33, penis, enlarged

II one solenidion and an indistinct spur. Leg III without spur or solenidion. Gnathosoma almost as large as in adults, but setae on gnathosoma somewhat shorter.

Protonymph. Like larva, but four pairs of two-segmented legs. Spur on fused segment better developed and present on all legs. Solenidia present on leg I and II. Setae on gnathosoma longer than in larva, subgnathosomal setae somewhat shorter. Posterior palpal tibial setae $4\ \mu$ long. Average length in 4 specimens measured $131\ \mu$ (119—142), average width $117\ \mu$ (108—128).

Deutonymph. Like protonymph but larger. Spur on fused segment stronger than in protonymph. Posterior palpal tibial setae longer than in protonymph ($6.5\ \mu$). Average length in 5 specimens measured $173\ \mu$ (148—187), average width $148\ \mu$ (133—153).

Type host. — *Eliomys quercinus* (Linnaeus).

Type-locality. — Madrid, Spain, 16.VII.1967.

Pathology. — The mites live within the epidermis of the concha of the ears, causing hyperkeratosis.

Deposition of types. — Holotype and allotype: Departamento de Zoología del Suelo y Entomología aplicada, Madrid. Paratypes: Hamburg, Washington, Leiden (P 1215-7), London (1971/156-7), Wien, Paris (11 J 11-12), Ohio, Chicago, Antwerpen, Nijmegen.

COMPARISON WITH RELATED SPECIES

On account of their characteristics one cannot incorporate *Psorergates muscardinus* and *Psorergates quercinus* within the *apodemi*-, *muricola*- or *dissimilis*-group. They show closer relationship to *Psorergates eliomydis*. Comparison of these three species is only possible for females. *P. muscardinus* is distinct from *P. eliomydis* by its bigger size, shape of the genital opening and bilobed gnathosomal setae. The epimerae I are less bent and narrower at the anterior end in *P. muscardinus*. The postero-dorsal seta (*dp*) on the tarsi is only slightly longer than the antero-dorsal seta (*da*) in *P. eliomydis*, but more than twice as long in *P. muscardinus*. Further differences are to be found in the length of ventral setae, genual setae, lateral shield setae, posterior palpal tibial setae and gnathosomal setae.

P. quercinus differs mainly from *P. eliomydis* by its bigger size and bilobed gnathosomal setae. The anterior end of the epimera I is narrow and lying beneath the body surface, as contrasted with *P. eliomydis*. There also are differences in length of the ventral setae, femoral setae I—III and gnathosomal setae.

Females of *P. muscardinus* and *P. quercinus* have the same size, but differ in shape of the gnathosomal setae, genital opening and anterior part of the epimera I. The dorsal shield of *P. quercinus* is more oblong than in *P. muscardinus*. The median setae are farther removed from the shield margin in *P. quercinus* and further differences are present in the length of the femur setae I—III, posterior palpal tibial setae, and the distance between the ventral setae. The males are more different. The typical shape of the dorsal shield of *P. quercinus* males is an important distinctive character. Also remarkable is the difference in length of penis and penis envelope. The genital setae are much wider apart in *P. quercinus* than in *P. muscardinus*. Further differences are present in the length of the terminal setae, setae of genu IV, shield setae and posterior palpal tibial setae.

Psorergates neerlandicus shows the diagnostic characters of the *apodemi*-group; the

palpal tibial setae are thick (and seem to be broken at the end). In the males the anterior genital setae are more than twice as far apart as the posterior ones. There are very few differences between this species and *P. microti*. Females only differ slightly in size and length of some setae. *P. neerlandicus* females have longer terminal, ventral, femoral and gnathosomal setae. Males of *P. neerlandicus* have obviously longer terminal and shorter genual setae I—III than males of *P. microti*. Further there are minor differences present in the lengths of femoral setae I—III and penis envelope.

P. baueri from the host *Neomys fodiens*, belongs to the "insectivora"-group, because the dorso-anterior setae of the tarsi are short, the lateral shield setae are distinctly remote from the shield margin and the ends of the gnathosomal setae are incised several times. The relationship to *P. sorici* and *P. cinereus* appears from the bi-pointed claws and the presence of only one seta on femur IV.

P. cinereus is much bigger than *P. baueri* and there are obvious differences in the times. The relationship to *P. sorici* and *P. cinereus* appears from the bi-pointed claws and gnathosomal setae. There is less difference between *P. sorici* and *P. baueri*: *P. baueri* has shorter femoral setae IV, trochanteral setae and gnathosomal setae, but the ventral setae are slightly longer.

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No. 3. G. A. Graaf Bentinck en A. Diakonoff. — *De Nederlandse Bladrollers (Tortricidae), (The Netherlands Leaf-Rollers (Tortricidae))*. 350 pp. en 98 pl. D.Fl. 70.—

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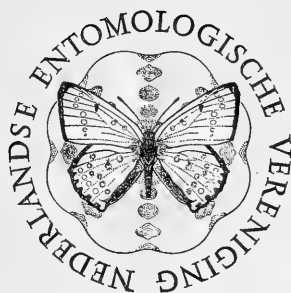
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THE GENUS BUATHRA CAMERON IN EUROPE¹⁾ (HYMENOPTERA, ICHNEUMONIDAE)

by

G. VAN ROSSEM

Plant Protection Service, Wageningen

ABSTRACT

Three European species of *Buathra* Cameron, 1903, can be distinguished. Designations of lectotypes are presented for *Ichneumon laborator* Thunberg, 1822, *Cryptus curvicauda* Thomson, 1896, and *Cryptus divisorius* Tschek, 1872. *Cryptus medius* Szépligeti, 1916, does not belong to *Buathra* (Townes, 1970). The paper is illustrated by five figures.

ACKNOWLEDGEMENTS

For the loan of specimens I am grateful to: W. J. Pulawski, Muzeum Zoologiczne, Wroclaw (ZI); D. S. Peters, Natur-Museum Senckenberg, Frankfurt (SM); M. Fischer, Naturhistorisches Museum, Vienna (NMW); B. Petersen, Universitetets Zoologiske Museum, Copenhagen (MC); S. Jonsson, Uppsala Universiteit (UU); H. Andersson, Department of Entomology, Lund University (ML); Rijksmuseum van Natuurlijke Historie, Leiden (RMNH); C. A. W. Jeekel, Zoologisch Museum, Entomologische Afdeling, Amsterdam (MA); K. W. R. Zwart, Laboratorium voor Entomologie, Wageningen (ELW); and the private collectors, J. G. Betrem, Deventer; J. Glowacki, Poland; E. Haeselbarth, München, and H. Priesner, Linz.

I am much indebted to my colleagues A. Noordijk, for drawings and D. L. J. Dijkstra, for advice on arithmetical problems. I am grateful to C. G. Johnson, Rothamsted Experimental Station, for critical remarks and corrections.

METHODS AND ABBREVIATIONS

External measurements were taken with an ocular micrometer (1 cm at 10 ×) on a Zeiss stereo microscope. Absolute measurements were taken at 10 × enlargement. The length of the ovipositor was measured from the apex of the gaster. Most relative measurements were taken at 40 ×. For length: breadth relations I use the term index. As differences in indices are often very small, students are advised to take measurements carefully. For terminology I follow Richards (1956) and Townes (1969).

OOL = distance from the outer edge of a lateral or posterior ocellus to the compound eye (ocular-ocellar line).

POL = distance between the inner edges of the two lateral ocelli (postocellar line).

¹⁾ For keys to the genera of *Cryptina* see Van Rossem (1969b) and Townes (1970).

INTRODUCTION

The genus *Buathra* was proposed by Cameron (1903). A full description was given by Townes (1970). Separation of *Buathra* from *Meringopus* is rather difficult and arbitrary as it is based on the variable position of the axillary vein in the hind wing. The establishment of *Buathra* is thus controversial and in my opinion *Buathra* could be merged into *Meringopus*. An example of a species in an intermediate position is *Meringopus reverendus* Van Rossem, 1969a (Townes, 1970: 193).

Townes (1970) placed *Cryptus medius* Szépligeti, 1916, in *Buathra*. This cannot be valid because Szépligeti's lectotype does not have the dorsal tentorial pits. I consider *C. medius* to be a species of *Cryptus* (Van Rossem, 1969b).

Assessment of western European *Buathra* material shows that three taxa can be distinguished. One of these is *B. divisoria*, an alpine species, which presents no problems. The two others, in older literature referred to as "*Cryptus tarsoleucus*" and "*Cryptus laborator*", were difficult to separate and at first offered no satisfactory evidence for considering them as independent species (Habermehl, 1918, 1920; Roman, 1903, 1910). However, after prolonged study I found a character that separates at least the females of the two above mentioned taxa with reasonable certainty. Whether males can be matched is uncertain. Consequently the lectotype of Thunberg's (1822) *Ichneumon laborator* cannot contribute much to our knowledge. It is clear from his text that Roman (1912) did not take Thunberg's species for the same as "*Cryptus tarsoleucus*" of authors, thus we could for the sake of stability best follow Roman and continue to use the name "*laborator*" for the other taxon. Roman (1912) placed *Cryptus fulvipes* "Kriechbaumer ap. Magr." in the synonymy of *Cryptus laborator* Thunberg. From Magretti's (1884) original description it is clear that also in this case there is question of male type material, which makes certain identification impossible. It should be noted, that Kriechbaumer never described a *Cryptus fulvipes* and consequently Magretti is the author. As the name *fulvipes* has no priority, we can best leave the question for what it is.

Key to the species

Females

1. Gena slightly concave just behind the lower articulation of mandible (Fig. 1). Ovipositor about the length of hind tibia *B. divisoria* (Tschek)
- Gena not concave. Ovipositor conspicuously longer than hind tibia 2
2. Postanellus : ovipositor tip (distance between nodus and apex, Fig. 2) > 1.0. Ovipositor somewhat upcurved, nodus rather strong (Fig. 3). Anterior propodeal carina present. Index of hind femur > 5.6 *B. tarsoleuca* (Schrank)
- Postanellus : ovipositor tip (Fig. 2) < 1.0. Ovipositor straight, nodus rather weak (Fig. 4). Anterior propodeal carina absent. *B. laborator* (Thunberg)

Males

1. The following characters in combination: gena concave just behind the lower articulation of mandible (Fig. 1). Propodeal spiracle almost round. Both propodeal carinae well developed, posterior one sublaterally rather strongly dentated *B. divisoria* (Tschek)

- Characters not combined as above 2
 2. Anterior propodeal carina present *B. tarsoleuca* (Schrank)
 — Anterior propodeal carina wholly or partly absent *B. laborator* (Thunberg)

Remark: this distinction between the males of *B. tarsoleuca* and *B. laborator* is unreliable.

Buathra tarsoleuca (Schrank, 1781)

Ichneumon tarsoleucus von Paula Schrank, 1781, Enumeratio insectorum austriacae indigenorum: 359 (type lost: nomen dubium), ♂.

Cryptus curvicauda Thomson, 1896, Opusc. Ent. 21: 2350, ♀.

The type material of *Ichneumon tarsoleucus* Schrank, all males, is lost. Irrespective of the fact that males remain undeterminable, it is not possible to decide on the identity of Schrank's material from the short description. Thus *Ichneumon tarsoleucus* is a nomen dubium. The interpretation of "*Cryptus tarsoleucus*" of authors goes back to Gravenhorst (1829: 447) and his first reviser, Taschenberg (1865: 71). A specimen that is probably an original of Gravenhorst is still in the collection at Wrocław, but it is rather aberrant from the general conception of authors, nor is this specimen mentioned by Gravenhorst or Taschenberg; therefore I have not selected it as the neotype but have marked it with an orange label stating: "*Cryptus tarsoleucus* (Schrank) 3rd specimen in Gravenhorst coll."

Some important characters of the female. — Apical part of ovipositor between nodus and tip (of upper valve) (Fig. 3) shorter than postanellus. Index: > 1.0. Anterior propodeal carina mostly present, at least medially. Gaster with a tendency towards a deep reddish brown or purple reddish tone. Ovipositor nearly always upcurved, nodus strong (Fig. 3).

Male. — I have not succeeded in associating the proper male with the *tarsoleuca* female. The character given in the key (presence of anterior propodeal carina) is unreliable.

With respect to the type material of *Cryptus curvicauda* Thomson, H. Andersson, at Lund, reported as follows: There are no specimens under this name in Thomson's collection. All the other species mentioned in *Opusc. Ent. 21* are represented in the collection and also another species labelled "*bellitarsis*". This "*bellitarsis*" is represented by six females, labelled "OG" = Sweden, Östergötland (the type area of *curvicauda*). I think that the females from Östergötland labelled as *bellitarsis* must be the syntypes of *curvicauda* and that Thomson first intended to use that name and forgot to change the label.

Characteristics of the lectotype of *Cryptus curvicauda*. Female, 16.0 mm. Front wing 11.8 mm. Labels: a small white tag "OG", a modern green label "1968/11"; a red rimmed box label "*bellitarsis m.*" in ink. Index of apical part of ovipositor and postanellus, 1.2. Anterior propodeal carina indicated medially. Gaster reddish brown. Ovipositor curved, nodus strong. Lectotype labelled accordingly and identified as *B. tarsoleuca*. Two other specimens were labelled paralectotype.

Occurrence. — The female is likely to occur on peat-moors, perhaps in the vicinity of fens.

Material examined. — France: ♂, La Grave, 1500 m, leg. Becker (coll. Dittrich) (ZI). Italy: ♂, Bolzano, VI.1913, leg. Smits van Burgst (ELW). Netherlands: ♀

Gieten, 17.VI.1950 (coll. Betrem); ♀, Dwingelo (Dr.), Davidsplassen, 27—31.VII.1963, leg. Ph. Pronk (RMNH); ♀, Terlet (Gld), 19.IX.1966, leg. R. T. Simon Thomas (PD); ♀, Leuvenum, VII.1926, leg. H. J. Klaassen (MA); ♀, Winterswijk, 29.VI.1921, moeras bij de Vlijt (?), coll. Koornneef (ELW); ♀, Oisterwijk, 1.VIII.1921, op *Peucedanum palustre*, coll. Koornneef (ELW); ♂, den Dolder, 21.V.1931, op *Anthriscus*, leg. Bouwman, coll. Koornneef (ELW). Poland: ♀, Orlach (near Wrocław?), 13.VII.1880, coll. Dittrich (ZI); ♀, Myszyniec, 1949 (coll. J. Glowacki). Sweden: 3 ♀, Östergötland, coll. Thomson (lectotype and paralectotypes of *Cryptus curvicauda*) (ML).

Buathra laborator (Thunberg, 1822)

Ichneumon laborator Thunberg, 1822, Zap. imp. Akad. Nauk 8: 273, ♂.

Cryptus fabricii Schiödte, 1857, in Rink, Grønland geografisk og statistisk beskrevet 2 (3): 62, ♀ ♂.

Cryptus fulvipes Magretti, 1884, Bull. Soc. Ent. Ital. 16: 99, ♂.

Characteristics of the lectotype of *Ichneumon laborator*. Male, 12.9 mm. Front wing 8.5 mm. Labels: one label in ink with Roman's handwriting "*Cryptus laborator* Thbg" (Roman, 1912). With the specimen is an old box label in ink (Thunberg's handwriting?) "laborator T.", in the left bottom corner is written "Sv" (Suecia?). Lectotype hereby designated. Head black. Antennae with tyloidae on segments 18—26. Frons rather concave, with a distinct pit dorsolaterally of each antennal socket. Thorax black. Anterior propodeal carina mesally indicated. Posterior propodeal carina complete, sublaterally dentated. Index of propodeal spiracle, 2.5. Wings slightly infusate. Nervulus somewhat antefurcal. Axillary vein (3A) in the hind wing convergent to inner margin. Index of hind femur, 6.0. All femora yellow red. Gaster slender, with first tergite black, polished. The following tergites alutaceous, with adpressed hairs, blackish with a ferruginous undertone. The hind margin of tergite 2 fulvous. Apex of clasper truncate¹).

I regret to say that I have been unable to identify Thunberg's specimen with any certainty. I think that at present it is best to follow Roman (1912) and thus take the name "*laborator*" for the "other" taxon. The female is easily separated from the *tarsoleuca* female (compare the key).

With respect to *Cryptus fabricii* Schiödte I can make the following observations. There are two syntypes in the Universitetets Zoologiske Museum at Copenhagen (a male and a female). A lectotype has not been selected up to now. As far as I can judge the male closely agrees with Dutch males of *Buathra laborator*. Through the kindness of Dr. B. Petersen I was able to study a female from Greenland. This specimen falls within the range of ordinary European material of *B. laborator*. I see no special reason to distinguish a subspecies for material from Greenland (Townes & Townes, 1962). Apart from *B. laborator laborator* and *B. laborator fabricii*, Townes & Townes (1962) recognized three other subspecies. A note on *Cryptus fulvipes* Magretti was given in the introduction.

Biology. — *Buathra laborator* is a parasite of Lepidoptera. The Laboratorium voor Entomologie at Wageningen (ELW) has a ♀ bred from a pupa of either a Noctuid or a Notodontid, found in a clump of grass at Wageningen. The cocoon of the wasp

¹) I believe this character to be unreliable.

measures 17 mm and is almost black in colour with a conspicuous greyish band in the middle. The aperture of escape lies immediately dorsad (or ventrad) of the pole. K. W. R. Zwart kindly informed me that he was able to breed this species on larvae of *Galleria mellonella* (Linné, 1758) which had just formed cocoons, thus suggesting a pupal parasite. Zwart found the larva to be ectoparasitic, as should be expected. In the laboratory also a cocoon of a ♂ wasp was obtained on *Galleria mellonella*. The colour of this cocoon is lighter than of the other specimen, but it also shows the central band (length: 14 mm).

Material examined. — Austria: ♀, Oberweiden, Marchfeld, A.i., leg. Hammer (coll. Priesner); ♀, Weidling, A.i. Wien, Mader (coll. Priesner). Denmark: ♀ ♂, Grønland (syntypes of *Cryptus fabricii* Schiødt) (MC); ♀, Grønland, leg. Vahl (Mus. Westerm.) as *C. glabrator* Zetter. (MC). England: ♂ ♀, England (no data) 1949 (coll. Betrem). France: ♀, BA, la Foux d'Allos, 1700 m, 29.VII.1964 (leg. M. C. and G. Kruseman) (MA), Germany: ♂, Ransern(?), 15.V.1890 (coll. Dittrich) (ZI); ♀, illegible, 4.VIII.1905 (coll. Dittrich) (ZI). Netherlands; ♀, Ellecom, 5.IX.1922 (coll. Koornneef) (ELW); ♀, 20.VI.1940 (coll. Koornneef) (ELW); ♂, Groesbeek, 2.VI.1898, leg. De Vos (coll. Oudemans) (MA); 2 ♀, Wageningen, 19.VI.1963 & 21.III.1965 (ELW); 3 ♀, Wageningen, resp. mother & 2 daughters & 1 ♂ (son) (leg. Zwart) (ELW); ♀, Neerijnen (Gld.), 15—30.VI.1950 (leg. C. de Jong) (RMNH); the following females from Rhenen (coll. Koornneef) (ELW) 29.V.1919; 16 & 18.VIII.1930; 12.VI.1932; 6 & 18.VIII.1933; 26.VII.1935; 1, 3 & 10.VIII.1935; 13.V.1936; 17, 26 & 27.VII.1936; 30.VII.1936 (2 sp.); 4.VIII.1936 (2 sp.); 11, 16 & 25.VIII.1936; 24 & 25.V.1937; 7.VI.1937; 2 ♂. Rhenen, 18.V.1934 (ELW); ♀, Hilversum, 17.VI.1952 (coll. den Hoed) (ELW). Poland: ♀, Nimptsch (south of Wroclaw) (coll. Dittrich) (ZI); 2 ♀, Podkowa Leśna ad Warszawa, 14.VI.1953 (4?) and 1 ♀, 26.VII.1953 (coll. J. Glowacki). Sweden: ♂, lectotype of *Ichneumon laborator* Thunberg (UU).

Buathra divisoria (Tschek, 1872)

Cryptus divisorius Tschek, 1872, Verh. zool.-bot. Ges. Wien 22: 235, ♀ ♂.

The type series (2 ♀ & 1 ♂) of *Cryptus divisorius* is extant and kept in the Vienna Museum. The species should be placed in the genus *Buathra*.

Characteristics of the lectotype of *Cryptus divisorius*. Female, 8.4 mm. Front wing 6.9 mm long. Labels: a white tag "1/10 866" in ink (Tschek's writing); a printed label "Tschek 1872 Piesting"; "divisorius Tsch. det. Habermehl." Lectotype hereby designated.

Head black. Labial and maxillary palpi brown. Mandibulae fuscous. Clypeus strongly convex, polished, with some scattered punctures. Face alutaceous, closely and finely punctured, with adpressed, silvery hairs. Facial convexity shown. Lower half of frons concave, polished, with some transverse ridges and conspicuous tentorial pits dorso-laterad of antennal sockets. Upper frons somewhat rugose. OOL-region alutaceous. Left antenna missing. Right antenna missing beyond 6th segment. Postanellus slender, index 6.6. OOL : diameter posterior ocellus, 1 : 1. OOL : POL, 3 : 4. Vertex somewhat coarse, with transverse wrinkling. Temple and gena polished towards outer orbit of compound eye, with scattered punctures. Toward genal carina with rather conspicuous

wrinkling. Temple and gena with short grey bristles. Lower part of gena directly beyond mandibular base with a concavity (compare Fig. 1). This character is rather difficult to observe when the head is pressed against pleuron 1. Malar space coriaceous, not quite $1.5 \times$ the mandibular breadth. Inner and outer orbits and spot on eye margin at vertex narrowly marked yellow.

Thorax black. Epomia strong. Mesoscutum polished, laterally with regular punctures, mesally somewhat coarse. Prescutal sutures well developed. Notum 1, episternum 2 and propodeum coarsely sculptured. Propodeum with anterior transverse carina present but weak. Posterior transverse carina well developed, sublaterally rather strongly dentated. Propodeal spiracles relatively small, index 2. Wings subhyaline. Nervulus (Cu-a) slightly antefurcal. Axillary vein (3A) in hind wing convergent to inner margin. Legs with front coxae, trochanters, femora (for the greater part), middle coxae, trochanters and femora (for the greater part) fuscous-ferruginous. Hind coxae and trochanters black, femora orange. Front tibia somewhat inflated, brownish. Tibiae and tarsi of other legs brown.

Gaster with first segment black. Other tergites finely coriaceous, dark brown. Ovipositor 2.8 mm. Ovipositor: hind tibia, 62 : 65 (Fig. 5).

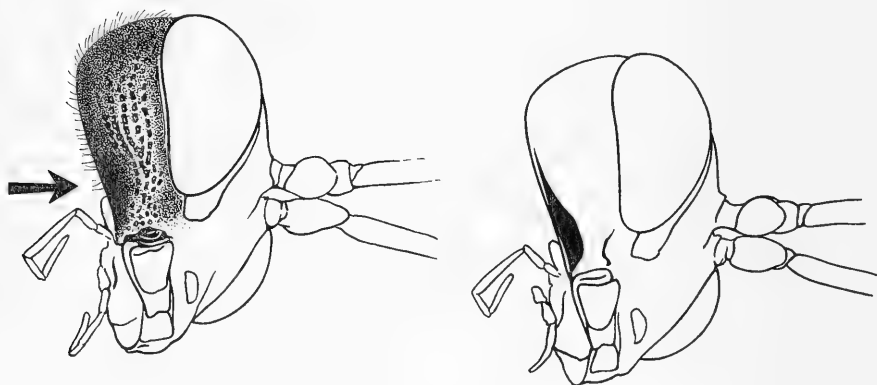


Fig. 1a, ♂, *Buathra divisoria* (Tschek), gena concave, Villnöss, 1965, leg. Van Rossem.
Fig. 1b, the same, schematically

Description of the male paralectotype of *Cryptus divisorius*. Length 9.0 mm. Front wing 6.3 mm long. Labels: a small green tag, a white printed label "Tschek 1872 Piesting", a box label "divisorius Kriech" (in purple ink), a white tag "divisorius Tsch. det. Habermehl".

Head black. Right antenna missing beyond 12th segment, left antenna missing beyond 5th segment. Deep tentorial pits present dorsolaterad of antennal sockets. Gena concave directly behind the mandibular base (Fig. 1). Yellow markings on: mandibles, clypeus, inner orbits with a continuation on malar space, outer orbits. Spot on eye margin in OOL-region.

Thorax black. Both propodeal transverse carinae well developed, the posterior one sublaterally dentated. Propodeal spiracle almost circular, index 1.3. Axillary vein (3A)

of hind wing convergent to inner hind margin. Legs with 2nd (partly), 3rd and 4th segment of hind tarsi white. Gaster with a ferruginous undertone.

Material examined: Austria: 2 ♀ & 1 ♂, Piesting, leg. Tschek, the type series of *C. divisorius* (NMW); 1 ♂, Obere Regalm, Kaisergebirge, Tirol, 1300 m, 9.VIII.1959 (coll. Haeselbarth); 1 ♂, Vorderkeiserfelden, Waisergebirge, Tirol, 1500 m, 1.VII.1956 (coll. Haeselbarth). Italia: ♂, Funes (Villnöss) (prov. Bolzano) 1100—1400 m, 13—30.V.1965, leg. G. van Rossem (Pl. Prot. Serv.). Fürstentum Liechtenstein: ♀, Triesenberg, 1450 m, 1.IX.1969 (coll. Haeselbarth).

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Fig. 2, 3, 4 and 5, ovipositors of *Buathra*: 2, distance between nodus and apex of ovipositor tip; 3, *B. tarsoleuca*, Myszyńiec, 1949, leg. Glowacki; 4, *B. laborator*, Rhenen, 30.vii.1936, leg. Koornneef; 5, *B. divisoria*, paralectotype



A NEW SPECIES OF CRYPTUS FROM THE CANARY ISLANDS (HYMENOPTERA, CRYPTINAE)

by

G. VAN ROSSEM

Plant Protection Service, Wageningen

Cryptus verutus spec. nov.¹⁾

Characteristics of the holotype. Female, 9.2 mm. Front wing, 7.5 mm. Labels: a white tag "Guimar", 31.V.(19)65 — Tenerife, leg. I. Klimesch (written). Holotype, labelled accordingly. The specimen belongs to the collection of Prof. Dr. H. Priesner at Linz (Austria).

Head black with slight yellow lining of inner and outer orbits. Clypeus strongly convex, polished with some scattered punctures from which relatively long, erect bristles arise. Facial convexity weak. Face regularly and closely punctured, with fine alutaceous microsculpture. Malar space : breadth mandibular base, 1 : 1 (broad). Scapi broadly pear-shaped. Postanellus slender, index 6.0. Antennal scrobes weakly concave, transversely wrinkled. Frons rugosely wrinkled. OOL: diameter posterior ocellus, 1 : 1. OOL narrow, alutaceous. Ocelli relatively large. Vertex with close punctures and somewhat transversely wrinkled. Temple and gena polished, finely and widely punctured with conspicuous, suberect hairs.

Thorax black, only a yellow spot on notum 1 at dorsal apex of epomia, all over roughly sculptured, except mesoscutum and scutellum 2 which are polished with more widely spaced rough punctures. Entire thorax with erect to suberect strong bristles. Epomia strong. Prescutal sutures long, reaching wing base, with rough transverse wrinkles. Speculum large. Wings somewhat infusate. Areola with strongly converging sides, closely resembling that in *C. immitis* Tschek. In the hind wing, medial cell long, with sides (M + Cu-1 and 1A) parallel. Nervellus intercepted far below the middle, the angle with M + Cu-1 right. Cu-1 reaching wing margin. Axillus gradually converging towards inner hind margin of hind wing. Propodeum with anterior transverse carina obsolete; posterior transverse carina well developed in the sublateral region, there forming a rather strong ridge. Propodeal spiracle small, elliptic. Legs with all coxae and most of the trochanters black. All femora orange; indices: 4.5 (1); 5.5(2); 5.7 (3).

Gaster with petiole slender. Petiole (measured from dorsal edge of orifice to spiracle): postpetiole, 5 : 2. Petiole black, rest of gaster orange. All tergites subpolished, with vague indication of microsculpture. Ovipositor slightly curved, exceptionally long, 1.0 length of front wing, with a long tapering tip.

Cryptus verutus hierroensis subsp. nov.

A specimen from the island of Hierro (Canaries) agrees reasonably with the specimen

¹⁾ Verutus = armed with a spear.

described above. Some characters rather suggest that it belongs to a geographically isolated population.

The following description relates to the holotype, one of two specimens under the label *Cryptus hellenicus* in Schmiedeknecht's material in the Berlin museum (compare my paper on *Meringopus*, 1969a).

Characteristics of the holotype. Female, 9.5 mm. Front wing, 7.5 mm. Labels: a light blue tag Hierro (Canar. Ins.) Hinz V. (printed); 9.IV.(18)98 (written). A large white label with Schmiedeknecht's writing: "*Cryptus* n. sp. dicht bei *C. hellenicus* Schmied". Holotype, labelled accordingly.

Head black with slight yellow lining of inner and outer orbits. Clypeus strongly convex, polished, with some scattered punctures. Hairs spoilt, but relatively long. Facial convexity weak. Face regularly and closely punctured, with fine alutaceous microsculpture. Malar space: breadth mandibular base, 6 : 5. Scapi broadly pear-shaped. Postanellus slender, index 7.4. Antennal scrobes weakly concave, lower part polished. Frons rugosely wrinkled. OOL: diameter posterior ocellus, 1 : 1. OOL narrow. Ocelli relatively large. Vertex closely punctate, somewhat transversely wrinkled. Temple and gena polished, finely and widely punctured, with long hairs (spoilt).

Thorax black, only a yellow spot at dorsal apex of epomia; all over roughly sculptured, except mesoscutum and scutellum 2, which are polished, with more widely spaced rough punctures. Entire thorax with erect to suberect strong bristles. Epomia indicated. Prescutal sutures long, reaching beyond base of fore wing, with rough transverse wrinkles. Wings somewhat infusate. Areola with strongly converging sides. In the hind wing, medial cell long, with sides (M + Cu-1 and 1 A) parallel. Nervellus intercepted far below the middle; the angle with M + Cu-1 right. Cu-1 reaching wing margin. Axillus converging towards hind margin. Propodeum with anterior transverse carina obsolescent; posterior transverse carina present, bluntly and weakly dentate sublaterally. Propodeal spiracle small, elliptic. Legs with all coxae and trochanters black. All femora orange; indices: 4.6 (1); 5.6 (2); 5.2 (3).

Gaster. An important difference with the nominate form lies in the relation between the lengths of petiole and postpetiole. Petiole (measured from dorsal edge of orifice to spiracle) : postpetiole, 4.5 : 2. Petiole definitely shorter and stouter than in the nominate form, black. Rest of gaster orange. All tergites finely alutaceous. Ovipositor, 0.96 length of front wing, slightly curved. Tip resembling that in the nominate form.

Male. — Unknown.

Discussion. — *Cryptus verutus* shows relationship towards *Cryptus immitis* Tschek. There are nevertheless some important differential characters; a. the ovipositor longer, 0.96—1.0 length of front wing; 0.63—0.73 in *immitis*; b. only anterior transverse carina present; in *immitis* both carinae in most specimens strong, with indication of area superomedia; c. tergites 2 and 3 almost polished to subpolished; in *immitis* rather conspicuously granulated; d. antennae without white band; in *immitis* with a white band.

In my key (Van Rossem, 1969b : 310) to the females of *Cryptus*, *C. verutus* should be placed in item 11 as follows:

11. Ovipositor longer than 0.80 length of front wing. Tergites 2 and 3 subpolished or with very fine microsculpture. Only anterior carina of propodeum present
 *C. verutus* sp. n.

- Ovipositor shorter than 0.80 length of front wing. Tergites 2 and 3 conspicuously alutaceous or finely granulated. Usually both propodeal carinae well indicated 11 a & b (as in my key)

ACKNOWLEDGEMENTS

For the loan of specimens I am indebted to Prof. Dr. H. Priesner (Linz, Austria) and Dr. E. Königsman, Zoologisches Museum (Berlin, DDR).

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ADDITIONAL NOTES ON THE GENUS TRYCHOSIS FOERSTER IN EUROPE (HYMENOPTERA, CRYPTINAE)

by

G. VAN ROSSEM

Plant Protection Service, Wageningen

Trychosis priesneri spec. nov.

Characteristics of the holotype of *Trychosis priesneri*. — Female, 9.3 mm. Front wing 6.7 mm. Labels: a white tag "Winden, Bgld. [Burgenland] 12.VII.1959 H. Priesner". Holotype, labelled accordingly. The specimen is in the collection of Prof. Dr. H. Priesner, Linz, Austria.

Head black, roughly sculptured, relatively small. Thorax black. Mesoscutum strikingly high, giving the thorax a hunchbacked appearance. Vertical carina on anterior part of epicnemium developed into a rounded tooth-like structure. Gaster with postpetiole and tergites 2,3 and 4 (in part), orange. Apex fuscous. Ovipositor, 0.17 length of front wing, relatively short. 15 other specimens, including 3 males, were labelled paratype.

Description of the female. — Front wing 6.0—7.5 mm. Head relatively small, black, palpi brown. Closely and roughly punctured; with conspicuous, erect silvery hairs. Clypeus strongly convex. Antennae brown, ventrally reddish, index of postanellus 3.5—4.1. Antennal scrobes scarcely indicated. Frons roughly punctured.

Thorax black, with erect silvery hairs. Pronotum closely and roughly punctured with strong crista. Mesoscutum strongly rising above the level of the ocelli, giving the specimen a hunchbacked appearance, more widely punctured and polished between. Scutellum rather convex, with strong punctures. Vertical carina on anterior part of epicnemium developed into a rounded tooth-like structure as in *T. tristator*. Episternum 2 with rough punctures almost touching, interspaces shiny. Propodeum large, strongly declivitous towards propodeal orifice, closely sculptured; with anterior transverse carina in most specimens complete; posterior transverse carina sublaterally present. Wings somewhat fuscous. Nervellus intercepted above the middle. Coxae fuscous-red to black. Femora rather variable in colour between fuscous-yellow and black (hind femora). Tarsi between fuscous-yellow and brown. Femora rather stout; index front femur, 3.4—4.0; hind femur, 4.6—5.3.

Gaster with postpetiole, tergites 2, 3 and 4 (in part) orange, polished, with minute punctures from which adpressed to suberect microsetae arise. Apex fuscous. Ovipositor strikingly short, 0.16—0.17 length of front wing.

Male. — For description three males were available. The colour pattern of these closely resembles that of the female. The most characteristic feature of the female, viz. the hunchbacked thorax, also occurs in the male and makes it rather easily recognizable.

Head black, rather small, flat in the antero-posterior line, closely and roughly sculptured, with erect silvery hairs. Clypeus convex. Antennal scrobes little pronounced. Tyloids on antennal segments 12—17.

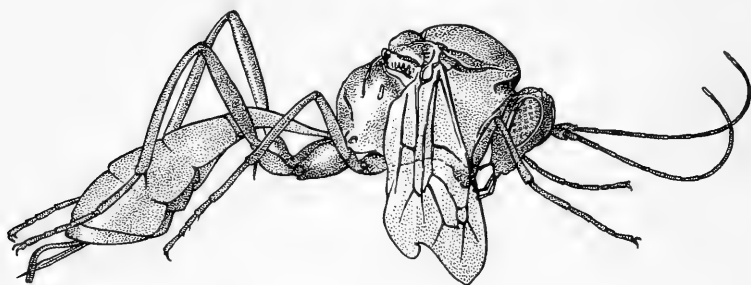


Fig. 1. *Trychosis priesneri*, ♀, Konya Asiat. Türk.) (coll. Priesner), $\times 6.5$

Thorax black, mesoscutum strongly rising above the level of the ocelli. Pronotum, mesoscutum and episternum 2 with strong punctures, interstices shiny. Vertical carina on anterior part of epicnemium developed into a rounded tooth-like structure. Scutellar fovea narrow and deep. Scutellum 2 strongly convex. Propodeum roughly sculptured. Anterior transverse carina complete; posterior interrupted medially. Coxae fuscous-red to black. Front and middle femora yellowish-red; front and middle tibiae and tarsi yellow, dorsally with a rather conspicuous streak of white. Hind legs fuscous, including the tarsi.

Gaster with postpetiole, tergites 2, 3 and 4 (in part) orange, subpolished, with fine punctures, implantations of adpressed microsetae. Apex fuscous.

In my key (Van Rossem, 1966) the females of *Trychosis priesneri* are inserted as follows:

2. Vertical carina on anterior part of epicnemium developed into a rounded tooth-like structure 3
3. Tergite 2 subpolished, with very close setae and microsculpture. Thorax not conspicuously rising above the level of the ocelli . . . *T. tristator* and *T. glabricula*¹⁾
- Tergite 2 polished, setae and microsculpture more widely placed. Thorax hunchbacked (Fig. 1) *T. priesneri*

Separation of the males:

1. Vertical carina on anterior part of epicnemium with a strong, tooth-like structure . . . 2
2. Front and middle tibiae with a rather conspicuous white streak. Hind leg fuscous. Thorax strongly hunchbacked *T. priesneri*
- Front and middle tibiae without a white streak. Hind tarsi with a white band. Thorax not hunchbacked *T. tristator*

Distribution. — The species seems to be widely distributed in the central and southern regions of Europe. The greater part of the material which I studied was kindly placed at my disposal by Professor Dr. H. Priesner, Linz (Austria), who told me that he had known this species since 1959. I recognized it when studying Palearctic *Trychosis* material sent to me by Dr. Henry Townes. I am glad to name this species after Dr. Hermann Priesner.

¹⁾ *T. glabricula* is possibly only a small form of *T. tristator*.

Material examined. — Austria: ♀, Winden, Bgld., 12.VII.1959, leg. H. Priesner (coll. Priesner) (the holotype); ♀, Winden, Bgld., 12.VII.1959, leg. H. Priesner; ♀, Winden, Bgld., 9.VII.1964, leg. H. Priesner; ♂, Winden, Bgld., 4—7.VII.1959, leg. H. Priesner; ♀, Winden, Bgld., 12.VII.1959, leg. H. Priesner; ♀, Winden, 10.VII.1962, leg. H. Priesner; ♀, Umgebung Wien, 10.VI.1958, leg. K. Kusdas (coll. Priesner); ♀, Neusiedlersee, Umg., Bgld., 11.VII.1960, leg. Kusdas (coll. Priesner); ♀, Neusiedlersee, Umg., Bgld., 14.VII.1961, leg. Kusdas (coll. Priesner). France: ♂, Carpentras (Vaucl.), 24—27.V.1952, leg. Verhoeff (coll. PD)*); ♂, Carpentras (Vaucl.), 1—3.VIII.1953, leg. Verhoeff (coll. PD)*). Greece: ♀, Sitia (Kreta), 20.V. 1963, leg. Kusdas (coll. Priesner). Switzerland: ♀, Wallis (ex coll. Berlin) (coll. Townes). Turkey: ♀, Konya, Asiat. Türk., 26.V.1965, leg. J. Schmidt (coll. Priesner). Yugoslavia: ♀, Hvar (Dalmatia), 10.VI.1962, leg. Gusenleitner (coll. Priesner). Label illegible: ♀, Ostrów Mar (?), 26.VII.1958, coll. Glowacki.

Trychosis gradaria (Tschek, 1870)

Cryptus gradarius Tschek, 1870, Verh. zool.-bot. Ges. Wien 20: 151—152.

Goniocryptus punctatus Szépligeti, 1916, Ann. Mus. Nat. Hung. 14: 250. Syn. nov.

Trychosis gradaria: Van Rossem, 1966, Zool. Verh. 79: 16.

The specimen of *Goniocryptus punctatus* in Szépligeti's collection at Budapest is a female of *Trychosis gradaria* (Tschek, 1870), which thus appears to be a senior synonym of *punctatus*. As the author mentions only one specimen, this is the holotype and I have labelled it as such.

Characteristics of the holotype of *Goniocryptus punctatus*. Female, 12.4 mm. Front wing 7.5 mm. Labels: P. Maróth (= Pilis-Maróth) Szépligeti; a red tag; a label with Szépligeti's writing "Goniocryptus 18. punctatus n.sp." (18 is the number, not meaning 18-punctatus). Index of front femur, 3.3. Index of radial cell, 4.1. Ovipositor 1.8 mm.

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*) These specimens were placed under *T. tristator* in my paper of 1966.



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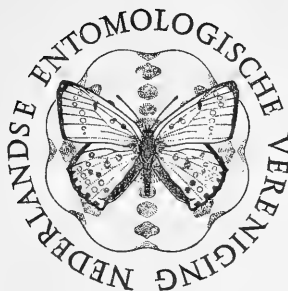
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238, Abb. 1, Karte 1.

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Subscription may be obtained from all booksellers or direct from the Librarian, Zeeburgerdijk 21, Amsterdam-1006, except for *Entomologia experimentalis et applicata*, which is available through booksellers or from the North-Holland Publishing Co., Post Office Box 103, Amsterdam.

TIJDSCHRIFT VOOR ENTOMOLOGIE

Redactie (Editorial Board)	Pater Chrysanthus, A. Diakonoff, P. J. van Helsing, C. A. W. Jeekel, R. de Jong, J. Krikken, M. A. Lieftinck.
Address	<i>Rijksmuseum van Natuurlijke Historie, Raamsteeg 2, Leiden.</i>

The Journal serves the publication of papers on Insecta, Myriapoda and Arachnoidea. It appears in separate issues, forming an annual volume of 350—400 pages.

Subscription rate: D.Fl. 62.50 per volume.

MONOGRAFIEEN VAN DE NEDERLANDSE ENTOMOLOGISCHE VERENIGING

Redactie (Editorial Board) and address as for *Tijdschrift voor Entomologie*.

The Monographs are intended for the publication of larger entomological papers on a single subject and will appear irregularly.

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No. 1. A. J. Besseling, 1964. — De Nederlandse Watermijten (Hydrachnellae Latreille, 1802) (The Hydrachnellae of the Netherlands), 199 pp., 333 figs., D.Fl. 30.—

DIE TIPULIDEN DER BENELUX-LÄNDER (DIPTERA, TIPULIDAE)

von

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ZUSAMMENFASSUNG

Seit Goetghebuer & Tonnoir (1920—1921) und De Meijere (1939) sind keine Listen mehr veröffentlicht worden über die gesammte Tipuliden-Welt eines der Benelux-Länder. Nach einer kurzen Beschreibung der Landschaft geben wir eine Liste der Tipulinae, Cylindrotominae und Limoniinae. In dieser Liste wird erstens verzeichnet in welchem der Benelux-Länder die Arten vorkommen, zweitens in welchen Landschaften sie bisher gesammelt worden sind. Folgen noch Bemerkungen über Arten, die nur wenig gefunden sind. Hier auch die Beschreibung von *Limnophila (Limnophila) arnoudi* spec. nov.

KURZE BESCHREIBUNG DER LANDSCHAFT UND WICHTIGSTE SAMMELGEBIETE

„Die Gegend... ist der Erzeugung von Bachmücken besonders günstig. Viele Sümpfe..., die nicht unbedeutenden, hin und wieder Sumpfungen, Gräben, feuchte Wiesen einschliessenden Waldungen, ... die Ufer der langsam fliessende (Flüsse) sind der Entstehung dieser Thiere besonders beförderlich. Man wird daher den Reichthum unsrer Gegend an Arten leicht erklärbar finden.“

Schummel, 1813: Vorrede.

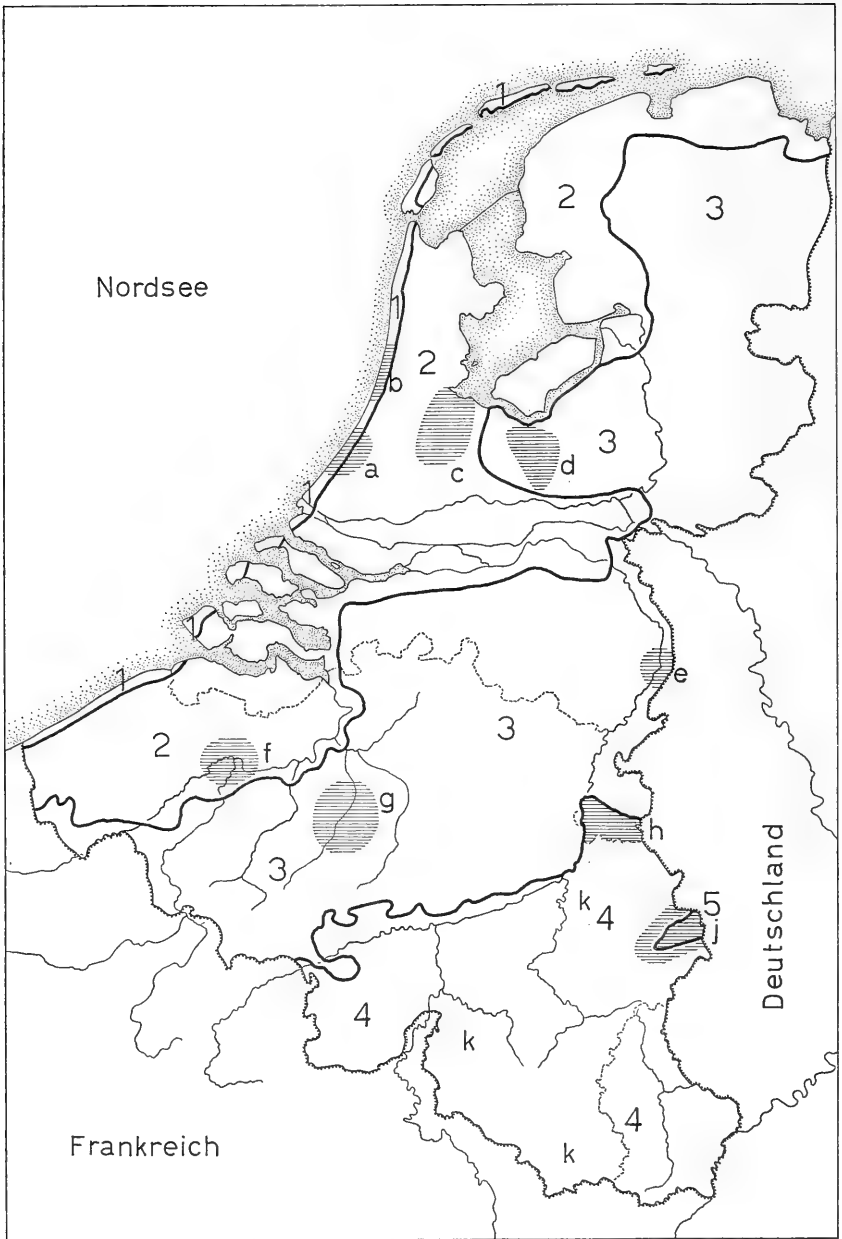
Dasselbe können wir auch sagen von den Benelux-Ländern: Belgien, Holland und Luxemburg, wo auf etwa 65.000 qkm jetzt 100 Tipulinae, 4 Cylindrotominae und 188 Limoniinae bekannt sind. Zum Vergleich: Finnland, 337.000 qkm, 105 Tipulinae (Mannheims, 1967); Italien, 301.000 qkm, 130 Tipulinae (Mannheims & Theowald, 1959); Schweden, 449.000 qkm, 117 Tipulinae, 4 Cylindrotominae und 202 Limoniinae (Tjeder, 1955).

Die Benelux-Länder zeigen auf einem kleinen Gebiet eine große Abwechslung durch Landschaften (siehe Karte). An der Küste entlang finden wir Sanddünen (1), trocken und warm, mit Dünenkesseln, die meist etwas feuchter sind.

Hinter den Dünen (2) gibt es feuchte Gebiete, meist unter dem Meeresspiegel, von Dünen und Deiche gegen das Wasser geschützt. Es ist das Gebiet von Wiesen und Flachmooren, auch von Tongebieten mit Landwirtschaft und von vereinzelt kleinen Wäldern mit *Alnus*, *Salix* und *Populus*. Im Norden dieses Gebietes sind auch salzige Küstenwiesen.

Der östliche Teil von Holland und der anschließende Teil von Belgien (3) haben trockenere Sand- und Tonboden mit Wiesen und Landwirtschaft, aber auch mit Wäldern von *Betula*, *Quercus*, *Carpinus* und *Fagus*. Hier gibt es auch Heiden und Hochmoore oder Restante davon. Das äußerste Osten dieses Gebietes, anschließend an Deutschland, hat etwas mehr Landklima.

¹⁾ Anschrift des Verfassers: Instituut voor Taxonomische Zoologie (Zoologisch Museum), afd. Entomologie, Zeeburgerdijk 21, Amsterdam-O.



Karte 1. Die Benelux-Länder. Einteilung in Landschaften (schwere Linie) und die wichtigsten Stellen wo gesammelt worden ist (schraffiert). Erläuterung im Text

Das Hügelland von Südlimburg und den Ardennen (4) steigt von 100 bis zu 600 m hinauf. Zum Teil wird dieses Gebiet benutzt für Wiesen und Landwirtschaft. Hier finden wir aber auch größere Wälder mit Nadel- und Laubholz. Die südlichen Täler der Ardennen sind auffallend wärmer als der Rest der Benelux-Länder und dort finden wir Pflanzen und Tiere eines viel südlicheren Areals.

Die Hochmoore der Hautes-Fagnes (5) auf ungefähr 900 m sind kalt und haben mehrere subalpine Pflanzen- und Tierarten.

Diese große Abwechslung von feuchteren und trockneren, kälteren und wärmeren, flachen und hügeligen Gebieten mit allerhand Bodenarten und Vegetationen macht es verständlich daß in den Benelux-Ländern viele europäische Tipuliden-Arten einheimisch sind.

Obwohl seit etwa 1850 in vielen Gebieten der Benelux-Länder nach Tipuliden gesucht worden ist, können wir noch wenig sagen über ihre genaue Verbreitung. In einigen Gebieten ist mehrere Jahre intensiv gesammelt worden, in andern nur dann und wann einige Tage. Infolge dessen sind oft seltenere Tipuliden-Arten nur bekannt von Stellen wo intensiv geforscht wurde, z.B. von Amsterdam (!), wo De Meijere von 1890 bis 1940 sammelte. Dergleiche Arten werden aber gewiß auch wohl an weniger städtischen Stellen vorkommen.

An den nachfolgenden Stellen ist intensiv gesammelt worden (Karte):

- a. das Gebiet zwischen Haag und Leiden: Van der Wulp, 1850—1900;
- b. die Dünen westlich von Haarlem: De Meijere, 1890—1940;
- c. Amsterdam und die Gebiete südlich dieser Stadt: De Meijere, 1890—1940;
- d. die Gebiete südöstlich von Amsterdam: Theowald, 1950—1960;
- e. die Umgebung von Venlo: Van den Brandt, 1860—1900;
- f. Gent und Umgebung: Goetghebuer, 1915—1925;
- g. Brüssel und Umgebung: Tonnoir, etwa 1920;
- h. Südlimburg: Br. Arnoud, 1950—1965;
- j. die Hochmoore der Hautes-Fagnes und Umgebung: Collart und andere vom Museum Brüssel, 1950—1955;
- k. das ganze Ardennen-Gebiet: De Laever, 1954—1970.

Im Vergleich mit vielen andern europäischen Ländern sind die Benelux-Länder eingehend auf Tipuliden untersucht worden. Es wird aber auch hier noch lange dauern bis wir von allen Arten die Verbreitung bis in Einzelheiten kennen.

ARTENLISTE

Verzeichnis der Abkürzungen:

Land: H, B oder L: die Art kommt vor in Holland, Belgien oder Luxemburg;

—: die Art ist im diesbezüglichen Lande nicht nachgewiesen.

1, Küstendünen,

2, westliche feuchtere Gebiete,

3, zentrale und östliche trocknere Gebiete,

4, Hügelland von Südlimburg und Ardennen,

5, kältere Hochmoore der Hautes-Fagnes und Umgebung.

— nicht in dem Gebiet nachgewiesen.

. ist in diesem Gebiet nur an vereinzelt Stellen nachgewiesen worden,

+ ist in diesem Gebiet an mehreren Stellen nachgewiesen (mehr als 5 Stellen).

* vor den Artnamen siehe unter: Bemerkungen über einzelne Arten.

Tipulinae	Land			Landschaft				
	H	B	L	1	2	3	4	5
<i>Dolichozeza</i> Curtis, 1825								
<i>albipes</i> (Ström, 1768)	H	B	—	.	.	+	+	+
<i>Ctenophora</i> Meigen, 1818 (= <i>Flabellifera</i> Meigen, 1800)								
Subg. <i>Ctenophora</i> Meigen, 1818								
<i>elegans</i> Meigen, 1818	H	B	—	—	.	+	+	—
<i>festiva</i> Meigen, 1804	H	B	—	.	.	+	+	—
<i>flaveolata</i> (Fabricius, 1794)	H	B	—	.	.	+	+	—
* <i>guttata</i> Wiedemann in Meigen, 1818	H	—	—	—	.	.	—	—
* <i>ornata</i> Wiedemann in Meigen, 1818	H	B	—	—	.	.	.	—
<i>pectinicornis</i> (Linnaeus, 1758)	H	B	—	.	+	+	.	—
Subg. <i>Tanyptera</i> Latreille, 1804								
<i>atrata</i> (Linnaeus, 1758)	H	B	—	+	+	+	+	+
<i>nigricornis</i> (Meigen, 1818)	H	B	—	—	—	+	.	.
Subg. <i>Dictenidia</i> Brullé, 1833								
<i>bimaculata</i> (Linnaeus, 1761)	H	B	—	+	+	+	+	+
<i>Nephrotoma</i> Meigen, 1818 (= <i>Pales</i> Meigen, 1800)								
= <i>Pachyrhina</i> Macquart, 1834)								
<i>aculeata</i> (Loew, 1871)	H	B	—	—	—	+	.	—
* <i>analis</i> (Schummel, 1833)	H	B	L	+	+	+	.	—
<i>appendiculata</i> (Pierre, 1919) (= <i>Tipula maculata</i>								
Meigen, 1804, nec <i>Tipula maculata</i> Linnaeus, 1758								
= <i>Tipula maculosa</i> Meigen, 1758 = <i>Tipula macu-</i>								
<i>losa</i> Gmelin in Linnaeus, 1790)	H	B	—	+	+	+	+	+
<i>cornicina</i> (Linnaeus, 1758)	H	B	—	.	+	+	.	—
<i>crocata</i> (Linnaeus, 1758)	H	B	—	.	+	+	+	—
<i>dorsalis</i> (Fabricius, 1781)	H	B	—	—	+	+	.	—
* <i>flavescens</i> (Linnaeus, 1758) (= <i>lineata</i> Scopoli,								
1763)	H	B	L	+	+	+	+	.
<i>flavipalpis</i> (Meigen, 1830)	H	B	—	+	+	+	.	—
<i>guentfalica</i> (Westhoff, 1880)	H	B	—	+	+	+	.	—
* <i>lindneri</i> (Mannheims, 1951)	H	B	—	.	—	.	—	—
<i>lunulicornis</i> (Schummel, 1833)	H	B	—	—	.	+	.	—
<i>pratensis</i> (Linnaeus, 1758)	H	B	—	+	+	+	.	.
* <i>quadrifaria</i> (Meigen, 1804)	H	B	L	+	+	+	+	—
* <i>quadristriata</i> (Schummel, 1833)	H	B	—	.	—	.	—	—
* <i>scalaris</i> (Wiedemann in Meigen, 1818)	H	—	—	—	+	.	—	—
* <i>scurra</i> (Meigen, 1818)	H	B	L	+	+	+	+	—
* <i>submaculosa</i> Edwards, 1928	H	B	—	+	—	+	+	—
<i>Prionocera</i> Loew, 1844 (= <i>Stygeropsis</i> Loew, 1863)								
<i>pubescens</i> Loew, 1844	H	B	—	—	—	.	.	—
<i>subsericornis</i> Zetterstedt, 1851	H	—	—	—	.	.	—	—
<i>turcica</i> (Fabricius, 1781)	H	B	—	.	+	+	.	.
* <i>Tipula</i> Linnaeus, 1758								
Subg. <i>Tipula</i> Linnaeus, 1758								
<i>czizeki</i> De Jong, 1925	H	—	—	.	+	+	—	—
* <i>oleracea</i> Linnaeus, 1758	H	B	—	+	+	+	+	+
* <i>paludosa</i> Meigen, 1818	H	B	—	+	+	+	+	+
Subg. <i>Yamatotipula</i> Matsumura, 1916								
<i>caesia</i> Schummel, 1833	H	B	—	—	—	.	.	—
* <i>coeruleascens</i> Lackschewitz, 1923	H	B	—	—	—	.	—	.
<i>couckeii</i> Tonnoir, 1921	H	B	—	—	—	.	+	.
<i>lateralis</i> Meigen, 1804	H	B	—	+	+	+	+	+
<i>marginata</i> Meigen, 1818	H	B	—	—	+	+	—	—

	Land			Landschaft				
	H	B	L	1	2	3	4	5
<i>montium</i> Egger, 1863 (= <i>pseudolateralis</i> Tonnoir in Goetghebuer & Tonnoir, 1921)	H	B	—	.	—	+	+	—
* <i>pruinosa</i> Wiedemann, 1817	H	B	L	—	+	+	+	+
<i>quadrivittata</i> Staeger, 1840	H	—	—	—	.	.	—	—
<i>stolitalis</i> Westhoff, 1881 (= <i>pierrei</i> Tonnoir in Goetghebuer & Tonnoir, 1921)	H	B	—	+	+	+	—	—
Subg. <i>Acutipula</i> Alexander, 1924								
<i>fulvipennis</i> Degeer, 1776	H	B	—	.	.	+	+	+
<i>luna</i> Westhoff, 1881	H	B	—	.	+	+	+	+
<i>maxima</i> Poda, 1761	H	B	—	.	—	+	+	+
<i>vittata</i> Meigen, 1804	H	B	—	.	+	+	+	+
Subg. <i>Platypipula</i> Matsumura, 1916								
<i>luteipennis</i> Meigen, 1830	H	B	—	—	+	+	.	—
<i>melanoceros</i> Schummel, 1833	H	B	—	—	—	+	.	—
Subg. <i>Nigrotipula</i> Hutson & Vane-Wright, 1969 (= <i>Anomaloptera</i> Lioy, 1863, nec Perris, 1843)								
<i>nigra</i> Linnaeus, 1758	H	B	—	.	+	+	+	.
Subg. <i>Schummelia</i> Edwards, 1931								
<i>variicornis</i> (Schummel, 1833)	H	B	—	.	+	+	+	+
* <i>yerburyi</i> Edwards, 1924	H	B	—	.	—	+	.	—
* <i>zernyi</i> Mannheims, 1952	—	B	—	—	—	—	.	.
<i>zonaria</i> Goetghebuer in Goetghebuer & Tonnoir, 1921	—	B	—	—	—	—	.	—
Subg. <i>Vestiplex</i> Bezzi, 1924								
* <i>excisa</i> Schummel, 1833	H	—	—	—	—	.	—	—
<i>bortorum</i> Linnaeus, 1758 (in: Goetghebuer & Ton- noir, 1921 als <i>nubeculosa</i> Meigen)	H	B	—	—	—	+	+	—
* <i>nubeculosa</i> Meigen, 1804 (in: Goetghebuer & Ton- noir, 1921 als <i>rubripes</i> Schummel)	H	B	L	—	—	.	+	+
* <i>scripta</i> Meigen, 1830	H	B	L	+	+	+	+	+
Subg. <i>Lunatipula</i> Edwards, 1931								
* <i>alpina</i> Loew, 1873	—	B	—	—	—	—	.	—
<i>brunneinervis</i> Pierre, 1921	—	B	—	—	—	—	.	—
<i>bullata</i> Loew, 1873	—	B	—	—	—	—	—	—
<i>cava</i> Riedel, 1913	H	B	—	+	.	+	+	.
<i>dilatata</i> Schummel, 1833	H	B	—	—	—	.	.	—
* <i>fascipennis</i> Meigen, 1818	H	B	L	+	+	+	+	+
* <i>helvola</i> Loew, 1873	H	B	—	—	—	+	—	—
* <i>limitata</i> Schummel, 1833	—	B	—	—	—	—	.	—
* <i>livida</i> Van der Wulp, 1858	H	B	L	+	—	.	.	—
* <i>longidens</i> Strobl, 1909	—	B	—	—	—	—	—	—
* <i>lunata</i> Linnaeus, 1758	H	B	L	+	+	+	+	—
* <i>magnicauda</i> Strobl, 1895	—	B	—	—	—	—	—	—
<i>pelio stigma</i> Schummel, 1833	H	B	—	.	—	.	.	.
* <i>pustulata</i> Pierre, 1920	—	B	—	—	—	—	.	—
<i>selene</i> Meigen, 1830	H	B	—	.	—	+	.	—
<i>vernalis</i> Meigen, 1804	H	B	—	+	+	+	+	+
Subg. <i>Mediotipula</i> Pierre, 1924								
* <i>bidens</i> Bergroth, 1888	—	B	—	—	—	—	+	—
* <i>stigmatella</i> Schummel, 1833	—	B	—	—	—	—	.	—
Subg. <i>Savtbenkia</i> Mannheims, 1962								
* <i>alpinum</i> Bergroth, 1888	H	B	—	—	—	.	+	+
* <i>benesignata</i> Mannheims, 1954	—	B	—	—	—	—	—	.
* <i>limbata</i> Zetterstedt, 1838	—	B	—	—	—	—	—	.

	Land			Landschaft				
	H	B	L	1	2	3	4	5
<i>grisescens</i> Zetterstedt, 1851 (= <i>macrocera</i> Zetterstedt, 1851, nec Say, 1823)	—	B	—	—	—	—	.	—
<i>marmorata</i> Meigen, 1818	H	B	—	.	+	+	.	.
<i>obsoleta</i> Meigen, 1818	H	B	—	.	.	.	.	—
<i>pagana</i> Meigen, 1818	H	B	—	.	.	.	.	.
<i>rufina</i> Meigen, 1818	H	B	—	—	+	+	+	+
* <i>signata</i> Staeger, 1840	H	B	—	—	.	.	.	—
<i>staegeri</i> Nielsen, 1922	H	B	—	—	.	+	.	—
<i>subnodicornis</i> Zetterstedt, 1838	—	B	—	—	—	—	—	+
* <i>subvafra</i> Lackschewitz, 1935	H	B	—	.	—	.	.	.
Subg. <i>Pterelachisus</i> Rondani, 1842								
<i>hortensis</i> Meigen, 1818	H	B	—	.	.	.	—	—
<i>irrorata</i> Macquart, 1826	H	B	—	.	+	+	.	.
* <i>meigeni</i> Mannheims, 1966 (= <i>hortulana</i> Meigen, 1818, nec Linnaeus, 1758)	H	B	—	+	.	.	+	.
<i>neurotica</i> Mannheims, 1966 (= <i>nervosa</i> Meigen, 1818, nec Schrank, 1803)	—	B	—	—	—	—	+	+
<i>pabulina</i> Meigen, 1818	H	B	—	+	.	+	+	.
<i>pseudoirrorata</i> Goetghebuer in Goetghebuer & Tonnoir, 1921	—	B	—	—	—	.	.	.
* <i>pseudovariipennis</i> Czizek, 1912	H	B	—	.	.	+	+	.
<i>truncorum</i> Meigen, 1830	H	B	—	.	.	+	.	—
<i>variipennis</i> Meigen, 1818	H	B	—	.	+	+	+	+
* <i>winthemi</i> Lackschewitz, 1932	—	B	—	—	—	—	.	—
Subg. <i>Odonatisca</i> Savtshenko, 1956								
<i>juncea</i> Meigen, 1818	H	—	—	+	.	.	—	—
Subg. <i>Dendrotipula</i> Savtshenko, 1964								
* <i>flavolineata</i> Meigen, 1804	H	B	L	—	.	+	+	.
Subg. <i>Beringotipula</i> Savtshenko, 1961								
<i>unca</i> Wiedemann, 1817	H	B	—	.	+	+	+	—
Cylindrotominae								
<i>Cylindrotoma</i> Macquart, 1834								
<i>distinctissima</i> (Wiedemann in Meigen, 1818)	H	B	—	+	+	+	+	—
<i>Diogma</i> Edwards, 1938								
<i>glabrata</i> (Meigen, 1818)	H	B	—	—	+	+	.	.
<i>Phalacrocer</i> Schiner, 1863								
<i>replicata</i> (Linnaeus, 1758)	H	B	—	.	+	+	—	—
<i>Triogma</i> Schiner, 1863								
<i>trisulcata</i> (Schummel, 1829)	H	B	—	—	.	.	—	—
Limoniinae								
<i>Limonia</i> Meigen, 1803								
Subg. <i>Metalimnobia</i> Matsumura, 1911								
<i>bifasciata</i> (Schrank, 1781)	H	B	—	.	+	+	+	—
* <i>quadrinotata</i> (Meigen, 1818)	H	B	—	—	—	.	.	—
* <i>zetterstedti</i> Tjeder, 1968 (= <i>elegans</i> Zetterstedt, 1838, nec Wiedemann, 1830)	H	B	—	+	+	+	+	+
Subg. <i>Limonia</i> Meigen, 1803								
<i>dilutior</i> Edwards, 1921	H	—	—	.	+	.	—	—
* <i>flavipes</i> (Fabricius, 1787)	H	B	L	+	.	.	+	+
<i>bercegovinae</i> Strobl, 1898	H	—	—	+	.	—	—	—
<i>macrostigma</i> (Schummel, 1829)	H	B	—	.	+	+	+	+

	Land			Landschaft				
	H	B	L	1	2	3	4	5
* <i>maculicosta</i> (Coquiliet, 1905)	—	B	—	—	—	—	.	—
<i>nigropunctata</i> (Schummel, 1829)	H	B	—	.	.	+	+	+
<i>nubeculosa</i> (Meigen, 1818)	H	B	—	+	+	+	+	+
* <i>stigma</i> (Meigen, 1818)	H	B	—	+	—	—	.	.
* <i>sylvicola</i> (Schummel, 1829)	—	B	—	—	—	—	.	—
* <i>taurica</i> (Strobl, 1894)	—	B	—	—	—	—	.	—
* <i>tripunctata</i> (Fabricius, 1781)	H	B	L	+	+	+	+	+
* <i>trivittata</i> (Schummel, 1829)	H	B	L	.	+	+	+	—
Subg. <i>Neolimonia</i> Alexander, 1964								
* <i>dumetorum</i> (Meigen, 1818)	H	B	L	.	+	+	+	+
Subg. <i>Dicranomyia</i> Stephens, 1829								
* <i>aquosa</i> Verrall, 1886	—	B	—	—	—	—	.	—
<i>autumnalis</i> (Staeger, 1840)	H	—	—	+	+	+	—	—
<i>chorea</i> (Meigen, 1818)	H	B	—	.	+	+	+	+
* <i>danica</i> Kuntze, 1919	H	—	—	—	.	—	—	—
<i>didyma</i> (Meigen, 1818)	H	B	—	.	+	+	+	.
* <i>distendens</i> Lundström, 1912	H	B	—	—	.	.	—	.
* <i>frontalis</i> (Staeger, 1840) (= <i>ostensackeni</i> Westhoff, 1882).	H	B	—	—	.	+	—	—
* <i>fusca</i> (Meigen, 1818) (= <i>pilipennis</i> Egger, 1863)	H	B	—	—	—	+	+	+
* <i>lucida</i> De Meijere, 1919	H	B	—	—	—	+	—	—
<i>luteipennis</i> Goetghebuer in Goetghebuer & Tonnoir, 1920	—	B	—	—	.	—	.	.
* <i>melleicauda complicata</i> De Meijere, 1919	H	—	—	—	.	—	—	—
* <i>mitis</i> (Meigen, 1830)	H	B	L	.	.	+	+	+
* <i>modesta</i> (Meigen, 1818)	H	B	L	+	+	+	+	+
* <i>omissinervis</i> De Meijere, 1919	H	—	—	—	.	—	—	—
* <i>ornata</i> (Meigen, 1818)	H	B	L	—	—	—	+	—
<i>sera</i> (Walker, 1848)	H	—	—	+	+	—	—	—
* <i>sericata</i> (Meigen, 1830)	—	B	—	—	—	—	.	—
* <i>stigmatica</i> (Meigen, 1830)	—	B	—	—	?	?	—	—
* <i>tristis</i> (Schummel, 1829)	H	B	—	—	.	.	.	—
* <i>ventralis</i> (Schummel, 1829)	H	B	—	—	.	.	.	—
Subg. <i>Melanolimonia</i> Alexander, 1965								
<i>morio</i> (Fabricius, 1787)	H	B	—	.	+	+	.	—
Subg. <i>Achyrolimonia</i> Alexander, 1965								
* <i>decemmaculata</i> (Loew, 1873)	H	B	—	—	.	.	.	.
Subg. <i>Atypophthalmus</i> Brunetti, 1911								
* <i>inusta</i> (Meigen, 1818)	—	B	—	—	—	—	.	—
Subg. <i>Rhipidia</i> Meigen, 1818								
* <i>ctenophora</i> (Loew, 1871)	H	—	—	—	.	—	—	—
<i>duplicata</i> (Doane, 1900) (= <i>maculata</i> Meigen, 1818, nec Meigen, 1804)	H	B	—	+	+	+	+	+
* <i>uniseriata</i> Schiner, 1864	H	B	—	—	.	.	—	—
<i>Elliptera</i> Schiner, 1863								
* <i>omissa</i> Egger, 1863	—	B	—	—	—	—	.	—
<i>Dicranoptycha</i> Osten-Sacken, 1859								
* <i>fuscescens</i> (Schummel, 1829) (= <i>cinerascens</i> sensu) De Meijere et Goetghebuer & Tonnoir, nec Meigen, 1818)	H	B	—	—	—	.	.	—
<i>Taphrophila</i> Rondani, 1856 (= <i>Antocha</i> Osten-Sacken, 1859)								
<i>vitripennis</i> (Meigen, 1830)	H	B	—	—	—	.	+	—
<i>Tbaumastoptera</i> Mik, 1866								
<i>calceata</i> Mik, 1866	—	B	—	—	—	.	—	—

	Land			Landschaft				
	H	B	L	1	2	3	4	5
<i>Helius</i> Lepelletier & Serville in Latreille et al., 1828 (= <i>Megarhina</i> Lepelletier & Serville in Latreille et al., 1828 = <i>Rhamphidia</i> Meigen, 1830)								
<i>flavus</i> Walker, 1856	H	—	—	—	.	.	—	—
<i>longirostris</i> (Wiedemann in Meigen, 1818)	H	B	—	+	+	+	.	+
<i>Ula</i> Haliday, 1833								
* <i>mollissima</i> Haliday, 1833 (= <i>crassicauda</i> Agrell, 1945)	H	B	—	—	.	.	.	.
* <i>sylvatica</i> (Meigen, 1818) (= <i>macroptera</i> (Macquart, 1826))	H	B	L	—	+	+	+	+
<i>Pedicia</i> Latreille, 1809								
Subg. <i>Pedicia</i> Latreille, 1809								
<i>rivosa</i> (Linnaeus, 1758)	H	B	—	—	—	+	+	+
Subg. <i>Crunobia</i> Kolenati, 1860								
* <i>littoralis</i> (Meigen, 1818) (= <i>inconstans</i> Osten-Sacken, 1859, sensu Goetghebuer & Tonnoir, 1921)	H	B	—	—	—	—	+	.
* <i>straminea</i> (Meigen, 1818) (= <i>schibneri</i> (Kolenati, 1860))	H	B	—	—	—	.	.	+
Subg. <i>Tricyphona</i> Zetterstedt, 1837								
<i>immaculata</i> (Meigen, 1818)	H	B	—	.	+	+	+	+
* <i>schummeli</i> Edwards, 1921	H	B	—	—	—	.	.	+
* <i>unicolor</i> (Schummel, 1829)	H	B	—	—	.	.	—	+
Subg. <i>Ludicia</i> Hutson & Vane-Wright, 1969								
* <i>claripennis</i> (Verrall, 1888)	H	B	—	—	—	.	—	.
* <i>lucidipennis</i> (Edwards, 1921)	—	B	—	—	—	—	.	—
Subg. <i>Amalopsis</i> Haliday, 1856								
<i>oculta</i> (Meigen, 1830) (= <i>gmundensis</i> Egger, 1863)	—	B	—	—	—	—	+	+
<i>Dicranota</i> Zetterstedt, 1838								
Subgenus <i>Dicranota</i> Zetterstedt, 1838								
<i>bimaculata</i> (Schummel, 1829)	H	B	—	—	—	+	.	—
Subg. <i>Paradicranota</i> Alexander, 1934								
<i>brevitarsis</i> Bergroth, 1890	—	B	—	—	—	—	.	—
<i>gracilipes</i> Wahlgren, 1905	—	B	—	—	—	.	.	.
* <i>pavida</i> (Haliday, 1833) (= <i>longitarsis</i> Bergroth, 1891)	H	B	—	—	—	.	.	—
* <i>subtilis</i> Loew, 1871	H	B	—	—	—	.	.	.
<i>Dactylolabis</i> Osten-Sacken, 1859								
* <i>sexmaculata</i> Macquart, 1846	—	B	—	—	—	—	.	.
<i>transversa</i> (Meigen, 1818) (= <i>gracilipes</i> Loew, 1869)	—	B	—	—	—	—	+	+
<i>Epiphragma</i> Osten-Sacken, 1859								
* <i>ocellaris</i> (Linnaeus), 1761	H	B	L	.	+	+	+	+
<i>Austrolimnophila</i> Alexander, 1920								
* <i>ochracea</i> (Meigen, 1818)	H	B	L	+	+	+	+	+
<i>Pseudolimnophila</i> Alexander, 1919								
* <i>lucorum</i> (Meigen, 1818)	H	B	—	—	.	+	+	.
<i>sepium</i> (Verrall, 1886)	H	B	—	.	+	+	+	—
<i>Limnophila</i> Macquart, 1834								
Subg. <i>Eutonia</i> Van der Wulp, 1874								
<i>barbipes</i> (Meigen, 1818)	H	B	—	—	+	+	—	—
Subg. <i>Limnophila</i> Macquart, 1834								
* <i>angustipennis</i> (Meigen, 1818)	H	B	—	—	+	+	.	—
* <i>arnoudi</i> spec. nov.	H	B	—	—	—	.	.	—
<i>pictipennis</i> (Meigen, 1818)	H	B	—	—	+	+	.	—
<i>punctata</i> Schrank, 1781	H	B	—	—	.	+	+	.

	Land			Landschaft				
	H	B	L	1	2	3	4	5
* <i>alboscuteolata</i> Von Roser, 1840	H	B	—	—	—	.	.	—
<i>lateralis</i> Macquart, 1835	H	B	—	—	—	.	+	—
Subg. <i>Lipophleps</i> Bergroth, 1915								
<i>abbreviata</i> Loew, 1873	H	B	—	—	.	.	.	—
Subg. <i>Gonomyia</i> Meigen, 1818								
* <i>bifida</i> Tonnoir in Goetghebuer & Tonnoir, 1920	—	B	—	—	—	—	.	—
<i>dentata</i> De Meijere, 1920 (= <i>incisurata</i> Tonnoir in Goetghebuer & Tonnoir, 1920)	H	B	—	—	.	.	.	.
* <i>lucidula</i> De Meijere, 1920	H	B	L	—	.	+	.	.
* <i>recta</i> Tonnoir in Goetghebuer & Tonnoir, 1920	—	B	—	—	—	—	.	—
<i>simplex</i> Tonnoir in Goetghebuer & Tonnoir, 1920	—	B	—	—	—	.	—	—
<i>tenella</i> (Meigen, 1818)	H	B	—	.	+	+	.	—
<i>Neolimnophila</i> Alexander, 1920								
<i>carteri</i> Tonnoir in Goetghebuer & Tonnoir, 1920	H	B	—	—	—	.	.	.
<i>placida</i> (Meigen, 1830)	H	—	—	—	.	.	—	—
<i>Crypteria</i> Bergroth, 1913								
<i>limnophiloides</i> Bergroth, 1913	—	B	—	—	—	.	.	.
<i>Lipsothrix</i> Loew, 1873								
* <i>errans</i> (Walker, 1848)	—	B	—	—	—	.	.	—
* <i>remota</i> (Walker, 1848) (in: Goetghebuer & Tonnoir als <i>Limnophila clara</i> Tonnoir)	H	B	—	—	—	.	.	—
<i>Gnophomyia</i> Osten-Sacken, 1859								
<i>lugubris</i> (Zetterstedt, 1838) (= <i>viridipennis</i> Gimmerthal, 1847 = <i>tripudians</i> Bergroth, 1891)	H	B	—	.	.	.	.	—
<i>Rhabdomastix</i> Skuse, 1890								
Subg. <i>Secandaga</i> Alexander, 1911								
<i>laeta</i> (Loew, 1873)	H	B	—	—	.	+	.	—
<i>Cheilotrichia</i> Rossi, 1848								
Subg. <i>Cheilotrichia</i> Rossi, 1848								
<i>imbuta</i> Meigen, 1818	H	B	—	—	.	+	+	—
Subg. <i>Platyoma</i> Lioy, 1863								
<i>cinerascens</i> (Meigen, 1818) (= <i>nubila</i> Schummel, 1829)	H	B	—	.	+	+	+	—
Subg. <i>Gonempeda</i> Alexander, 1924								
<i>flava</i> (Schummel, 1829)	H	B	—	.	+	+	.	—
<i>Erioptera</i> Meigen, 1803								
Subg. <i>Erioptera</i> Meigen, 1803								
* <i>divisa</i> (Walker, 1848) (= <i>macrophthalmia</i> Loew, 1871)	H	B	—	—	—	.	.	—
<i>fuscipennis</i> Meigen, 1818	H	B	—	—	.	.	.	—
* <i>fusculentia</i> Edwards, 1938	H	—	—	—	+	.	.	—
<i>gemina</i> Tjeder, 1967 (= <i>flavescens</i> Linnaeus sensu Meigen, 1818, nec Linnaeus, 1758)	H	B	—	.	+	+	+	.
<i>griseipennis</i> Meigen, 1838	H	B	—	.	+	+	.	—
* <i>limbata</i> Loew, 1873	—	B	—	—	—	.	—	—
* <i>lutea</i> Meigen, 1818	H	B	L	+	+	+	+	+
* <i>meijeri</i> Edwards, 1921	H	—	—	—	.	—	—	—
* <i>minor</i> De Meijere, 1920	H	—	—	—	.	—	—	—
<i>nielsenii</i> De Meijere, 1921	H	—	—	—	—	.	—	—
* <i>nigripalpis</i> Goetghebuer in Goetghebuer & Tonnoir, 1920	—	B	—	—	—	.	—	—
<i>squalida</i> Loew, 1871	H	B	—	—	.	+	.	—
<i>trivialis</i> Meigen, 1818	H	B	—	.	+	+	.	+
Subg. <i>Trimicra</i> Osten-Sacken, 1861								
<i>pilipes</i> (Fabricius, 1887)	H	B	—	.	+	+	.	—

	Land			Landschaft				
	H	B	L	1	2	3	4	5
Subg. <i>Symplecta</i> Meigen, 1830								
<i>hybrida</i> (Meigen, 1804) (= <i>punctipennis</i> (Meigen, 1818))	H	B	—	+	+	+	+	.
Subg. <i>Psiloconopa</i> Zetterstedt, 1830 (= <i>Acyphona</i> Osten-Sacken, 1869).								
<i>areolata</i> Siebke, 1872	H	B	—	—	.	.	.	—
<i>maculata</i> (Meigen, 1804)	H	B	—	.	+	+	.	.
* <i>occoecata</i> Edwards, 1936	—	—	L	—	—	—	.	—
<i>stictica</i> (Meigen, 1818)	H	B	—	+	+	+	.	—
<i>vicina</i> (Tonnoir in Goetghebuer & Tonnoir, 1920)	H	B	—	.	—	+	—	—
Subg. <i>Arctoconopa</i> Alexander, 1955								
* <i>melampodia</i> (Loew, 1873)	—	B	—	—	—	—	.	—
<i>Chionea</i> Dalman, 1816								
* <i>lutescens</i> Lundström, 1907	H	B	—	—	—	.	.	.
<i>Ormosia</i> Rondani, 1856								
Subg. <i>Ormosia</i> Rondani, 1856								
* <i>albitibia</i> Edwards, 1921	—	B	—	—	—	.	—	—
* <i>bicornis</i> (De Meijere, 1920)	H	B	—	—	.	.	.	—
* <i>clavata</i> (Tonnoir in Goetghebuer & Tonnoir, 1920)	—	B	—	—	—	—	.	—
* <i>depilata</i> Edwards, 1938 (= <i>hederae</i> Curtis sensu De Meijere, 1920, nec Curtis, 1835)	H	B	—	—	.	.	+	—
<i>hederae</i> (Curtis, 1835) (= <i>uncinata</i> De Meijere, 1920)	H	B	—	.	+	.	.	—
<i>lineata</i> (Meigen, 1904)	H	B	—	—	+	.	+	.
<i>murina</i> (Goetghebuer in Goetghebuer & Tonnoir, 1920)	—	B	—	—	—	—	.	+
<i>nodulosa</i> (Macquart, 1826 sensu De Meijere, 1920)	H	B	—	—	+	.	+	.
<i>pseudosimilis</i> Lundström, 1906	H	B	—	—	.	.	.	+
* <i>staegerina</i> Alexander, 1953 (= <i>similis</i> Schummel sensu Staeger, 1840, nec Schummel, 1829)	—	B	—	—	—	—	.	—
Subg. <i>Rhypholophus</i> Kolenati, 1860								
<i>bifurcata</i> Goetghebuer in Goetghebuer & Tonnoir, 1920	—	B	—	—	.	.	.	—
* <i>bivittata</i> Loew, 1873	H	—	—	—	.	.	—	—
* <i>haemorrhoidalis</i> Zetterstedt, 1838	H	B	—	—	.	.	.	—
<i>varia</i> (Meigen, 1818)	H	B	—	.	+	+	.	.
Subg. <i>Scleroprocta</i> Edwards, 1938								
* <i>pentagonalis</i> (Loew, 1873) (= <i>sororcula</i> Zetterstedt sensu auct. nec Zetterstedt, 1851 = <i>fascipennis</i> sensu auct. nec Zetterstedt, 1838)	H	B	—	—	—	.	.	—
* <i>sororcula</i> (Zetterstedt, 1851) (= <i>danica</i> Nielsen, 1925)	H	—	—	—	—	.	—	—
<i>Molophilus</i> Curtis, 1833								
Subg. <i>Molophilus</i> Curtis, 1833								
* <i>appendiculatus</i> (Staeger, 1840) (= <i>armatus</i> De Meijere, 1920)	H	B	L	.	+	+	+	.
* <i>ater</i> (Meigen, 1804)	H	B	—	—	—	.	—	+
* <i>bifidus</i> Goetghebuer in Goetghebuer & Tonnoir, 1920	H	B	L	—	—	.	.	—
* <i>bibamatus</i> De Meijere, 1918	H	B	—	.	+	.	—	—
* <i>cinereifrons</i> De Meijere, 1920	H	B	—	—	+	+	.	—
<i>corniger</i> De Meijere, 1920	H	B	—	—	—	.	.	—
* <i>curvatus</i> Tonnoir in Goetghebuer & Tonnoir, 1920	H	B	—	—	—	.	.	—
* <i>czizeki</i> Lackschewitz, 1939 (1940)	—	B	—	—	—	—	.	—
* <i>flavus</i> Goetghebuer in Goetghebuer & Tonnoir, 1920	H	B	—	—	—	.	—	+
<i>griseus</i> (Meigen, 1818) (= <i>bifilatus</i> Verrall, 1886)	H	B	—	—	+	+	.	—
<i>medius</i> De Meijere, 1918	H	B	—	—	.	+	.	.
<i>niger</i> Goetghebuer in Goetghebuer & Tonnoir, 1920	—	B	—	—	.	.	.	—

	Land			Landschaft				
	H	B	L	1	2	3	4	5
<i>obscurus</i> (Meigen, 1818)	H	B	—	.	+	+	+	.
* <i>occultus</i> De Meijere, 1818 (= <i>falciger</i> Goetghebuer in Goetghebuer & Tonnoir, 1920)	H	B	—	—	—	.	—	+
<i>ocbraceus</i> (Meigen, 1818) (= <i>appendiculatus</i> Ver- rall, sensu De Meijere nec Staeger, 1840)	H	B	—	—	+	+	.	—
<i>ocbrescens</i> Edwards, 1938 (= <i>ocbraceus</i> De Meijere et Goetghebuer & Tonnoir, nec Meigen, 1818)	H	B	—	.	.	.	.	—
<i>pleuralis</i> De Meijere, 1920	H	B	—	—	+	.	.	—
<i>propinquus</i> Egger, 1863 (= <i>gladius</i> De Meijere, 1920)	H	B	—	.	+	+	.	.
<i>serpentiger</i> Edwards, 1938 (= <i>propinquus</i> De Meijere et Goetghebuer & Tonnoir, nec Egger, 1863)	H	B	—	—	.	.	.	—
<i>undulatus</i> Tonnoir in Goetghebuer & Tonnoir, 1920	—	B	—	—	—	.	.	—
<i>Tasiocera</i> Skuse, 1890								
Subg. <i>Dasymolophilus</i> Goetghebuer in Goetghebuer & Tonnoir, 1920								
<i>murina</i> (Meigen, 1818)	H	B	—	.	+	.	.	.

BEMERKUNGEN ÜBER EINZELNE GATTUNGEN UND ARTEN

Ctenophora guttata Wiedemann

Holland: nur zwei Exemplare bekannt (Delft, Friedhof Jaffa, V.1866, Piaget; und Breda, V. (etwa 1900, Heylaerts).

C. ornata Wiedemann

Holland: Umgebung Arnheim.

Erstnachweis für Belgien: 2 ♂ Buzenol, 15.VI.1964, De Laever.

Nephrotoma analis (Schummel)

Erstnachweis für Luxemburg: Mondorf und Bech-Kleinmacher, Juni 1970, Theowald.

N. flavescens (Linnaeus)

Erstnachweis für Luxemburg: Mondorf und Bech-Kleinmacher, Juni 1970, Theowald.

N. lindneri (Mannheims)

Erstnachweis für Belgien: 1 ♀ La Panne, 17.V.1932, Goetghebuer. Das Exemplar steckte in der Sammlung Goetghebuer (Brüssel) unter *pratensis* (Linnaeus).

N. quadrifaria (Meigen)

Erstnachweis für Luxemburg: 8 ♂, 3 ♀ Mondorf, 29.VI.1970, Theowald.

N. quadristriata (Schummel)

Erstnachweis für Belgien: 1 ♂ Coxyde-Bains, 14.VI.

N. scalaris (Wiedemann)

Alle von Goetghebuer & Tonnoir als *scalaris* aufgeführten Exemplare sind *flavipalpis* (Meigen).

N. scurra (Meigen)

Erstnachweis für Luxemburg: 1 ♀ Mondorf, 29.VI.1970, Theowald.

N. submaculosa Edwards

De Laever & Mannheims (1958) führten diese Art erstmalig auf für Belgien (Sclessin, Liège, Bois de la Vecquée). Ich sah noch Exemplare von Archennes, Coxyde-Bains, Coxyde-St. Idesbald, Knocke und La Gileppe. Es ist auch in Belgien wohl eine viel vorkommende Art.

Prionocera pubescens Loew

De Laever & Mannheims (1958) führten diese Art erstmalig auf für Belgien (Vence).

Im Museum Brüssel sah ich noch 2 ♂ Postel, 11.VI.1923, G. Severin.

Tipula Linnaeus

Wir folgen der neuen Einteilung in Untergattungen vorgeschlagen von Savtshenko (1961), fügen aber die Untergattungen *Pterelachisus* und *Oreomyza* zusammen (Alexander, 1965; Theowald, 1957a).

T. (Tipula) oleracea Linnaeus

Goetghebuer & Tonnoir (1921) stellen *paludosa* Meigen als Synonym zu *oleracea* Linnaeus. In der Sammlung Brüssel stehen sie aber als zwei gute Arten aufgestellt.

T. (Tipula) paludosa Meigen

Erstnachweis für Belgien: wie zu erwarten war, sah ich diese Art von vielen Fundorten.

T. (Yamatotipula) coeruleescens Lackschewitz

Erstnachweis für Belgien: Hautes Fagnes, Sourbrodt, 24—26.V.1957, De Laever.

T. (Yamatotipula) pruinosa Wiedemann

Erstnachweis für Luxemburg: 1 ♂ Mondorf, 28.VI.1970, Theowald.

T. (Schummelia) yerburyi Edwards

Erstnachweis für Belgien: Mirwart.

Ich sah mehr als 20 Exemplare dieser Art aus Belgien. Sie wurden 1950—1955 gesammelt in der Umgegend von Mirwart.

T. (Schummelia) zernyi Mannheims

Erstnachweis für Belgien: 1 ♂ Buzenol, Vallée de Claireau, 31.VII.1919. A. Tonnoir. Dieses Exemplar stand in der Sammlung Goetghebuer, Brüssel, unter dem Namen *yerburyi* Edwards.

T. (Vestiplex) excisa Schummel

Erstnachweis für Holland: 1 ♀ Kerkrade, Amseldal, 1.IX.1965, Br. Arnoud. Diese boreo-alpine Art war bisher nur aus den Alpen und aus Lappland bekannt. Sie wurde in Holland erbeutet in einem ziemlich kalten und feuchten Tal auf 150 m. Unter den mehr als 4000 Tipuliden die ich von den Ardennen und den Hautes Fagnes sah, war diese Art nicht vertreten.

Schummel hat diese Art beschrieben von „Um Breslau“, d.h. auf ungefähr derselben Höhe. Theowald & Mannheims (1962) nahmen an, daß es sich bei der Fundortangabe Schummels wahrscheinlich um einen Irrtum handelt. Der Fund in Holland weist aber darauf hin, daß es vielleicht doch Restpopulationen dieser Art im europäischen Flachland gibt.

T. (Vestiplex) nubeculosa Meigen

Erstnachweis für Luxemburg: 1 ♀ Mondorf, 27.VI.1970, Theowald.

T. (Vestiplex) scripta Meigen

Erstnachweis für Luxemburg: 4 ♂, 4 ♀ Mondorf, 27.VI.1970, Theowald.

T. (Lunatipula) alpina Loew

Erstnachweis für Belgien: 2 ♂ Torgny, 29.VI.1958, De Laever.

T. (Lunatipula) fascipennis Meigen

Erstnachweis für Luxemburg: 1 ♂, 2 ♀ Bech-Kleinmacher, 30.VI.1970, Theowald.

T. (Lunatipula) helvola Loew

Erstnachweis für Belgien: 2 ♂, 1 ♀ Han-sur-Lesse, 17.VII.1957, De Laever.

T. (Lunatipula) limitata Schummel

Erstnachweis für Belgien: Mirwart (in Museum Brüssel), Bihain und Wavreille (De Laever).

T. (Lunatipula) livida Van der Wulp

Erstnachweis für Luxemburg: 3 ♂, 3 ♀ Mondorf, 27—29.VI.1970, Theowald.

T. (Lunatipula) longidens Strobl

Erstnachweis für Belgien: 1 ♂ Wavreille, 9.VI.1958, De Laever.

T. (Lunatipula) lunata Linnaeus

Erstnachweis für Luxemburg: 7 ♂, 6 ♀ Mondorf, 27—29.VI.1970, Theowald.

T. (Lunatipula) magnicauda Strobl

Erstnachweis für Belgien: 1 ♂ Han-sur-Lesse, 28.IV.1957, De Laever; 1 ♂ Wavreille, Belvaux, 11.V.1958, De Laever.

T. (Lunatipula) pustulata Pierre

Erstnachweis für Belgien: 1 ♂ Bihain, 22.IX.1962, De Laever.

T. (Mediotipula) bidens Bergroth

De Laever & Mannheims (1958) führten diese Art erstmalig auf für Belgien (Han-sur-Lesse). Ich sah weitere Exemplare von Spy-Bois, Onoz-Spy und Hastière.

T. (Mediotipula) stigmatella Schummel

Erstnachweis für Belgien.

Im Museum Brüssel steht ein Exemplar dieser Art ohne Fundort aus der Sammlung E. Candèze. Nach Horn & Kahle (1935) erhielt das Museum Brüssel im Jahre 1899 die Sammlung Candèze: „Elaterid., Lamellicorn., Lucanid., Longicorn. u. belg. Dipt.“ Demnach stammt das Exemplar wohl aus Belgien und wahrscheinlich aus den Ardennen.

T. (Savtshenkia) alpium Bergroth

De Laever & Mannheims (1958) stellten erstmalig das Vorkommen dieser Art in Belgien fest (Membach, Lac-de-la-Gileppe). In Collection de la Belgique (Brüssel) sah ich 5 als *obsoleta* Meigen bestimmte Stücke von Hockai, Herzogenwald und Baraque Michel. In der Sammlung Goetghebuer sah ich noch ein als *marmorata* Meigen bestimmtes Exemplar von St. Hubert.

T. (Savtshenkia) benesignata Mannheims

Erstnachweis für Belgien: 1 ♂ Hautes Fagnes, Duzo-Moupas, 10.IX.1948, R. Tollet.

T. (Savtshenkia) limbata Zetterstedt

Erstnachweis für Belgien: Bullange, 1.VIII—21.IX.1923, G. Severin.

T. (Savtshenkia) signata Staeger

Die in Goetghebuer & Tonnoir (1921) aufgeführten Exemplare sind alle *staegeri* Nielsen.

Erstnachweis für Belgien: 1 ♀ Buzenol, 6.X.1962, De Laever.

Theowald (1957b) führte diese Art erstmalig auch für Holland (Noorbeek). Seitdem wurde sie auch bekannt von Amsterdam.

T. (Savtshenkia) subvafra Lackschewitz

Erstnachweis für Belgien: 1 ♂ Hockai, 28.IX.1950, J. Cooreman; 1 ♂, 4 ♀ Bihain, 30.X.1965, De Laever.

T. (Pterelachisus) meigeni Mannheims (= *hortulana* Meigen, nec Linnaeus)

Fast alle in Goetghebuer & Tonnoir (1921) aufgeführten Exemplare von *hortulana* sind *pseudovariipennis* Czizek. Ich sah aber *meigeni* (= *hortulana*) von einer Reihe von Fundorten über ganz Belgien.

T. (Pterelachisus) pseudovariipennis Czizek.

Siehe Bemerkung unter *meigeni* Mannheims.

- T. (Pterelachisus) winthemi* Lackschewitz
Erstnachweis für Belgien: 1 ♂ Baillonville, Basse Adam, 9.V.1967, De Laever.
- T. (Dendrotipula) flavolineata* Meigen
Erstnachweis für Belgien: 1 ♀ Mondorf, 27.VI.1970, Theowald.
- Limonia (Metalimnobia) quadrimaculata* (Linnaeus)
Erstnachweis für Holland: 1 ♂ Kotten, 2.VII.1952, Theowald; 1 ♀ Noorbeek, 27.V.1953, Br. Arnoud.
Erstnachweis für Belgien: Forêt de Soignes, Bois de Ghlin, Mirwart, Onoz, Florenville.
- L. (Metalimnobia) zetterstedti* Tjeder, 1968.
Erstnachweis für Belgien: Han-sur-Lesse, Losheimergraben, Membach, St. Hubert, Vestreux und Cedrege, alle De Laever (nach Mannheims, in litt.).
- L. (Limonia) flavipes* (Fabricius)
Erstnachweis für Luxemburg: 10 ♂, 21 ♀ Mondorf, 27—30.VI.1970, Theowald.
- L. (Limonia) maculicosta* (Coquillett, 1905)
Erstnachweis für Belgien: 1 ♂ Torgny, 17.VII.1934, De Laever (nach Mannheims, in litt.).
- L. (Limonia) stigma* (Meigen)
Goetghebuer & Tonnoir kennen diese Art in Belgien nur von Virton. Ich sah noch Exemplare von Mirwart und Malmedy.
- L. (Limonia) sylvicola* (Schummel)
In Belgien noch immer nur bekannt von Virton.
- L. (Limonia) taurica* (Strobl)
Erstnachweis für Belgien: 1 ♀ Seraing s. Meuse, 12.VI.1955, De Laever (nach Mannheims, in litt.).
- L. (Limonia) tripunctata* (Fabricius)
Erstnachweis für Luxemburg: Mondorf und Bech-Kleinmacher, Juni 1970, Theowald.
- L. (Limonia) trivittata* (Schummel)
War in Belgien nur bekannt von Genval. Ich sah weitere Exemplare von Pepinster, Forêt de Soignes, Huccorgne und Bossière.
Erstnachweis für Luxemburg: Mondorf und Bech-Kleinmacher, Juni 1970, Theowald.
- L. (Neolimonia) dumetorum* (Meigen)
Erstnachweis für Luxemburg: 1 ♂ Mondorf, 27.VI.1970, Theowald.
- L. (Dicranomyia) aquosa* Verrall
In Belgien noch immer nur bekannt von Denée.
- L. (Dicranomyia) danica* Kuntze
De Meijere (1928) führt diese Art auf für Amsterdam. Bis heute sind in Holland keine weiteren Fundorte bekannt.
- L. (Dicranomyia) distendens* Lundström
In Belgien noch immer nur bekannt von Hockai.
- L. (Dicranomyia) frontalis* (Staeger)
In Belgien noch immer nur bekannt von Heide.
- L. (Dicranomyia) fusca* (Meigen)
Diese Art war in Holland nur bekannt von Ootmarsum. Ich sah weitere Exemplare von Herkenbosch, Eygelshoven, Bunde und Ravensbos.
- L. (Dicranomyia) lucida* De Meijere
Diese Art war in Holland nur bekannt von Bunde. Ich sah weitere Exemplare von Heerlen, Kerkrade, Eygelshoven und Eys-Wittem.

- L. (Dicranomyia) melleicauda complicata* De Meijere
Nach Mannheims (in litt.) ist *complicata* De Meijere, 1919, eine Unterart der nearktischen *melleicauda* Alexander, 1917.
Die Unterart wurde beschrieben nach Exemplaren von Diemen. Bis heute sind in Holland keine weiteren Fundorte bekannt.
- L. (Dicranomyia) mitis* (Meigen)
Diese Art war in Belgien nur bekannt von Hockai. Ich sah Exemplare von mehr als 15 weiteren Fundorten.
Erstnachweis für Luxemburg: 4 ♂, 1 ♀ Mondorf, 27.VII.1970, Theowald.
- L. (Dicranomyia) modesta* (Meigen)
Erstnachweis für Luxemburg: Mondorf und Bech-Kleinmacher, Juni 1970, Theowald.
- L. (Dicranomyia) omisinnervis* De Meijere
Die Art wurde beschrieben nach einem Männchen von Zwammerdam. Ich sah weitere Exemplare von Holland: Brabantse Biesbosch 2♂, 6 ♀, 15—18.VI.1970 M. Peerdeman.
- L. (Dicranomyia) ornata* (Meigen)
Diese Art war in Holland bekannt von Houthem. Ich sah ein weiteres Exemplar von Gulpen.
Erstnachweis für Belgien: 1 ♂ Houyet, 14.VII.
- L. (Dicranomyia) sericata* (Meigen)
In Belgien war diese Art nur bekannt von Falaën. Ich sah 1 ♂ und 7 ♀ von Sy.
- L. (Dicranomyia) stigmatica* (Meigen)
Goetghebuer & Tonnoir führen diese Art auf von Melle und Linkebeek, fügen aber hinzu: „Cette détermination n'est pas tout-à-fait sûre, nos captures ne comportant que des ♀ ♀”. Ich habe keine weiteren Exemplare dieser Art gesehen.
- L. (Dicranomyia) tristis* (Schummel)
In Belgien war diese Art nur bekannt von Virton. Ich sah keine weitere Exemplare.
- L. (Dicranomyia) ventralis* (Schummel)
In Belgien war diese Art nur bekannt von Falaën. Ich sah noch 1 ♀ von Postel.
- L. (Achyrolimonia) decemmaculata* (Loew)
Erstnachweis für Holland: 1 ♀ Neerijnen, 12.V.1953, C. de Jong; 1 ♀ Amersfoort 17.VI.1961, Theowald.
Erstnachweis für Belgien: Ben-Ahin, Forêt de Soignes, Reinhardtstein.
- L. (Atypophthalmus) inusta* (Meigen)
Erstnachweis für Belgien: 1 ♂ Falmignoul (Ravin du Colibri), 9.VII.1943, Collart.
- L. (Rhipidia) ctenophora* (Loew)
De Meijere (1921) kennt von dieser seltenen Art 1 ♂ aus Bussum. Sie wurde später in Holland nicht wieder gefunden.
- L. (Rhipidia) uniseriata* Schiner
De Meijere (1919) kennt 1 ♀ von Bodegraven. Bis heute sind von Holland keine weiteren Exemplare bekannt.
- Elliptera omissa* Egger
Erstnachweis für Belgien: Eprouve (grottes), Visé, Bomal.
- Dicranoptycha fuscescens* (Schummel)
De Meijere (1919) kennt 1 ♀ dieser Art aus Holland (Zutphen). Ich sah noch 1 ♂ Schin-op-Geul, 1.V.1961, Gravestein.
In Belgien ist diese Art nur bekannt von Virton.

Ula mollissima Haliday

Erstnachweis für Holland: 1 ♂ Amsterdam, 23.IX.1960, J. Lourens; 1 ♂ Amsterdam 28.X.1960, K. J. N.; 1 ♀ Amsterdam, 13.VI.1962; 1 ♂, 2 ♀ Berg en Terblijt, Mussenputgroeve, 18.I.1962, Exc. Zool. Museum.

Erstnachweis für Belgien: Hautes Fagnes, Duzo-Moupas; Forêt de Soignes; Mirwart; Bois de Cerfontaine.

U. sylvatica (Meigen)

Erstnachweis für Luxemburg: 1 ♀ Bech-Kleinmacher, 30.VI.1970, Theowald.

Pedicia (Crunobia) littoralis (Meigen)

De Meijere (1921) kannte diese Art aus Holland nur von Bunde. Ich sah weitere Exemplare von Epen, Mechelen, Holset und Vaals.

P. (Crunobia) straminea (Meigen)

Erstnachweis für Holland: 2 ♂ Wageningen, IX, Coll. Geijskes.

In Belgien war diese Art bekannt von Hockai. Ich sah weitere Exemplare von Francorchamps, Mirwart und Malmedy.

P. (Trichyphona) schummeli Edwards

De Meijere kennt diese Art aus Holland von Winterswijk. Das Beleg-Exemplar ist aber nicht mehr in seiner Sammlung vorhanden. Ich fand aber unter den unbestimmten Stücken noch 1 ♂ Vlodrop (Limb.), 7.VI.1903, De Meijere.

Erstnachweis für Belgien: Hautes Fagnes, Chôdières; H.F., Duzo-Moupas; H.F., Nesseloo; H.F., Baraque Michel; Herzogenwald.

P. (Tricyphona) unicolor (Schummel)

In Belgien war diese Art bekannt von Hockai. Ich sah weitere Exemplare von Hautes Fagnes, Longloup und H.F. Les Wez.

P. (Ludicia) claripennis (Verrall)

Erstnachweis für Holland: 1 ♂ Holset, 13.VIII.1955, Br. Arnoud.

P. (Ludicia) lucidipennis (Edwards)

Erstnachweis für Belgien: 1 ♂ Jemelle, 6.VIII.

Dicranota (Paradicranota) brevitarsis Bergroth

Erstnachweis für Belgien: 1 ♂ Ben-Ahin, 18.VI; 1 ♀ Lesterny, 14.V.

D. (Paradicranota) pavida (Haliday)

In Holland war diese Art nur bekannt von Bunde. Ich sah weitere Exemplare von Terziet und Holset.

Erstnachweis für Belgien: Cerfontaine, Mirwart, Forêt de Soignes.

D. (Paradicranota) subtilis Loew

In Holland war diese Art bekannt von Bunde. Ich sah weitere Exemplare von Heerlen und Eygelshoven.

Erstnachweis für Belgien: Bevercé, Bois de Dave, Olloy de Berceau, Virton.

Dactylolabis sexmaculata Macquart

Erstnachweis für Belgien: Furfooz, Mazy, Herzogenwald, Mazy-Onoz, Thon.

Epiphragma ocellaris (Linnaeus)

Erstnachweis für Luxemburg: 2 ♂, 1 ♀ Mondorf, 27—29.VI.1970, Theowald.

Austrolimnophila ochracea (Meigen)

Erstnachweis für Luxemburg: 4 ♀ Mondorf, 29.VI.1970, Theowald.

Pseudolimnophila lucorum (Meigen)

Diese Art war in Belgien nur bekannt von dem Forêt de Soignes. Ich sah weitere Exemplare von Poix St. Hubert, Falaën, Houvet, Mirwart und Malmedy.

Limnophila (Limnophila) angustipennis (Meigen)

Erstnachweis für Belgien: 1 ♀ Lamerteau, 2.VIII.

***Limnophila (Limnophila) arnoudi* spec. nov. (Abb. 1)**

Diese Art ist *Limnophila (Limnophila) punctata* (Schrank, 1781) täuschend ähnlich. Zwischen den Weibchen beider Arten finde ich keine Unterschiede. Vielleicht sind die Beine bei den Weibchen von *arnoudi* etwas robuster gebaut. Bei den Männchen gibt es nur deutliche Unterschiede im Bau des Hypopygs.

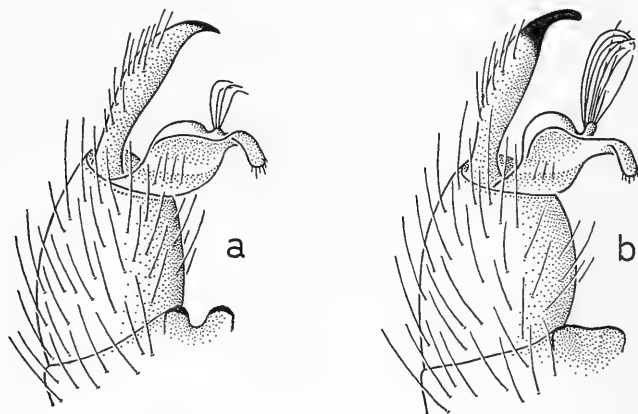


Abbildung 1. 9. Tergit und Basistylusanhänge. a, *Limnophila punctata* (Schrank); b, *Limnophila arnoudi* spec. nov.

Das 9. Tergit ist bei *arnoudi* in der Mitte fast nicht ausgeschnitten, bei *punctata* deutlich ausgeschnitten mit zwei an der Spitze geschwärtzten Hinterrandfortsätzen. Die äußeren Basistylusanhänge sind bei *arnoudi* stumpf und am Ende stark geschwärtzt, bei *punctata* spitz und nur am äußersten Ende der Spitze schwarz. Die inneren Basistylusanhänge tragen bei *arnoudi* einen Büschel von etwa acht langen schwachgebogenen Haaren, bei *punctata* sind immer nur vier kurze starkgebogene Haare vorhanden.

Holotypus: ♂ Holland, Streythagerbeek, 18.V.1963, Br. Arnoud leg.

Paratypen: Holland, 1 ♂, dieselben Data wie der Holotypus; Eyselshoven, 2 ♂, 20.V. 1966; 1 ♂, 26.V.1967; 1 ♂, 19.V.1968; 1 ♂, 31.V.1968; Noorbeek, 1 ♂, 27.V. 1958, alle Br. Arnoud leg. Holland, Bunde, 4 ♂, 26.V.1951, Theowald leg. Belgien, Tervueren, 1 ♂ (ohne weitere Data).

Geografische Verbreitung: Ich sah Exemplare aus Holland (Südlimburg) und Belgien (Umgebung Brüssel). Mannheims (in litt.) sah Exemplare aus dem Siebengebirge (südöstlich von Bonn) und Savtshenko (in litt.) fand sie in den Karpaten.

L. (Idioptera) pulchella (Meigen)

Diese Art war in Belgien nur bekannt von Baraque Michel. Ich sah weitere Exemplare von Hockai und Rymenam.

L. (Eloeophila) mundata Loew

In Belgien bekannt von Virton. Ich sah keine weiteren Exemplare dieser Art.

L. (Eloeophila) submarmorata Verrall.

Erstnachweis für Holland: Eygelshoven, Mechelen, Heerlen, Noorbeek.

L. (Eloeophila) trimaculata (Zetterstedt)

Erstnachweis für Holland: 2 ♂, 1 ♀ Wageningen, 30.IV.1936, Geyskes.

In Belgien war diese Art bekannt von Hockai. Ich sah weitere Exemplare von Malmédy und Nonceveux.

L. (Eloeophila) verralli Bergroth

In Holland war diese Art bekannt von Amersfoort. Ich sah keine weiteren Exemplare dieser Art.

L. (Philidorea) abdominalis Staeger

In Belgien war diese Art bekannt von Eecloo. Ich sah keine weiteren Exemplare dieser Art.

L. (Philidorea) aperta Verrall

Erstnachweis für Belgien: 1 ♀ Mirwart, 6.VII.

L. (Philidorea) bicolor (Meigen)

In Belgien ist diese Art nur bekannt von Hockai.

L. (Philidorea) glabricula (Meigen)

Erstnachweis für Holland: 1 ♂ Eygelshoven, 21.VII.1954, Br. Arnoud.

L. (Philidorea) heterogyna Bergroth

Erstnachweis für Belgien: 1 ♀ Postel, VII.

L. (Philidorea) meigeni Verrall

Diese Art wurde von De Meijere mit *phaeostigma* (Schummel) verwirrt.

Erstnachweis für Holland: Hilversum, Vlodrop, Amersfoort, Duurswoude.

L. (Philidorea) phaeostigma (Schummel)

In Holland nur bekannt von Brunssum und Bennekom. Die Angaben von De Meijere sind *meigeni* Verrall.

Erstnachweis für Belgien: Hockai; Bihain; Samrée; Haute Fagne, Noir Flohay; H.F., Duzo-Moupas; H.F., Baraque Michel; H.F., Fraineux; Calmpthout.

L. (Philidorea) squalens Zetterstedt

Erstnachweis für Belgien: Haute Fagne, Chodîres ; H.F., Hoegne; H.F., Duzo-Moupas; H.F., Baraque Michel; Hockai, Bihain, Postel, Mirwart.

L. (Brachylimnophila) nemoralis (Meigen)

Erstnachweis für Luxemburg: 2 ♂ Mondorf, 29.VI.1970, Theowald.

L. (Neolimnomyia) batava Edwards

Erstnachweis für Luxemburg: 1 ♂ Mondorf, 27.VI.1970, Theowald.

L. (Adelphomyia) punctum (Meigen)

Diese Art war in Holland nur von Denekamp bekannt. Ich sah weitere Exemplare von Heerlen, Strijthagen und Eygelshoven.

Philaria platyptera (Macquart)

Erstnachweis für Belgien: Bois de Couvin, Chimay, Oignies, Cerfontaine, Furfooz.

Hexatoma bicolor (Meigen)

Diese Art war in Belgien bekannt von Hockai. Ich sah weitere Exemplare von Malmédy, Bois de Couvin und Mirwart.

H. gaedii (Meigen)

Van den Brandt erbeutete vor etwa hundert Jahren einmal ein Weibchen in der Nähe von Venlo. Diese Art wurde später nie wieder gefunden.

H. nubeculosa Burmeister

Van der Wulp nennt ein Weibchen aus Holland. Das Exemplar ist nicht mehr vorhanden und die Art ist nie wieder gefunden worden.

H. vittata (Meigen)

Erstnachweis für Belgien: 1 ♀ Boma, 24.VI.

Paradelphomyia (Oxyrbiza) nielsenii Kuntze

Erstnachweis für Holland: 1 ♂ Baarn, 26.IX.1905, De Meijere.

Gonomyia (Ellipteroides) alboscuteolata Von Roser

In Holland ist diese Art seit De Meijere (1916) nur von Bunde bekannt.

Erstnachweis für Belgien: Houyet und Malmedy.

G. (Gonomyia) bifida Tonnoir

Diese Art wurde beschrieben nach Exemplaren von Virton. Bis heute sind keine neuen Fundorte in Belgien bekannt.

G. (Gonomyia) lucidula De Meijere

Erstnachweis für Luxemburg: 1 ♀ Bech-Kleinmacher, 30.VI.1970, Theowald.

G. (Gonomyia) recta Tonnoir

Diese Art wurde beschrieben nach Exemplaren von Virton und ist bisher in Belgien nur von diesem Fundort bekannt.

Lipsothrix errans (Walker)

Erstnachweis für Belgien: Bihain, Mirwart, Forêt de Soignes.

L. remota (Walker)

Goetghebuer & Tonnoir (1921) kennen diese Art als *Limnophila clara* Tonnoir von Buzenol. Ich sah weitere Exemplare von: Mirwart, Lesterny, Grotte de Rochefort, Malmedy.

Erioptera (Erioptera) divisa (Walker)

In Holland war diese Art bekannt von Epen. Ich sah weitere Exemplare von Vaals, Kerkrade, Heerlen, Eygelshoven und Holset.

In Belgien ist diese Art nur bekannt von Virton.

E. (Erioptera) fusculeta Edwards

Erstnachweis für Holland: De Bilt, Heerlen, Wassenaar, Zwammerdam, Mechelen, Kerkrade, Ravensbos, Vijlen, Bodegraven, Zunderdorp, Nieuwersluis, Epen.

E. (Erioptera) limbata Loew

In Belgien ist diese Art nur bekannt von Uccle.

E. (Erioptera) lutea Meigen

Erstnachweis für Luxemburg: 1 ♂ Bech-Kleinmacher, 30.VI.1970, Theowald.

E. (Erioptera) meijeri Edwards

In Holland ist diese Art nur bekannt von Leimuiden.

E. (Erioptera) minor De Meijere

In Holland ist diese Art nur bekannt von Nieuwersluis.

E. (Erioptera) nigripalpis Goetghebuer

In Belgien ist diese Art nur bekannt von Forêt de Soignes.

E. (Psiloconopa)occoecata Edwards

Erstnachweis für Luxemburg: 1 ♂ Bech-Kleinmacher, 30.VI.1970, Theowald.

E. (Arctoconopa) melampodia (Loew)

Erstnachweis für Belgien: Mazy, Mazy-Onoz, Onoz-Spy.

Chionea lutescens Lundström

In Belgien ist diese Art nur bekannt von Francorchamps.

Ormosia (Ormosia) albitibia Edwards

Erstnachweis für Belgien: 1 ♂ Petit-Lanaye (Grotte carrière), 8.IX.

O. (Ormosia) bicornis (De Meijere)

In Holland nur bekannt von Linschoten, in Belgien nur von Virton.

O. (Ormosia) clavata (Tonnoir)

Diese Art war in Belgien nur bekannt von Virton. Ich sah noch 1 ♂ von Mirwart.

O. (Ormosia) depilata Edwards

Erstnachweis für Belgien: Lesterny, Oignies, Bois de Couvin, Chimay.

O. (Ormosia) staegerina Alexander

Erstnachweis für Belgien: Ethe, Buzenol.

O. (Rhypholophus) bivittata Loew

Diese Art ist aus Holland nur bekannt von Diemen.

O. (Rhypholophus) haemorrhoidalis Zetterstedt

Erstnachweis für Holland: 1 ♂ Heerlen, 24.IX.1964, Br. Arnoud.

O. (Scleroprocta) pentagonalis (Loew)

Diese Art ist in Holland nur bekannt von Bunde.

O. (Scleroprocta)-sororcula (Zetterstedt)

Erstnachweis für Holland: 1 ♂ Eyselshoven, 19.V.1958, Br. Arnoud.

O. (Molophilus) appendiculatus (Staeger)

Erstnachweis für Luxemburg: 2 ♂ Mondorf, 28.VI.1970, Theowald.

O. (Molophilus) ater (Meigen)

Erstnachweis für Holland: 1 ♂ De Lutte, 15.VI.1926, De Meijere.

O. (Molophilus) bifidus Goetghebuer

Erstnachweis für Holland: Heerlen, Mechelen, Eyselshoven.

Erstnachweis für Luxemburg: 3 ♂, 2 ♀ Bech-Kleinmacher, 30.VI.1970, Theowald.

O. (Molophilus) bihamatus De Meijere

Diese Art ist in Belgien nur bekannt von Overmeire.

O. (Molophilus) curvatus Tonnoir

Erstnachweis für Holland: 1 ♂ Eyselshoven, 16.VII, 1954, Br. Arnoud.

In Belgien war diese Art bekannt von Forêt de Soignes. Ich sah weitere Exemplare von Mirwart und Lesterny.

O. (Molophilus) czizeki Lackschewitz

Erstnachweis für Belgien: 2 ♂, 2 ♀ Lesterny, 14.V.

O. (Molophilus) flavus Goetghebuer

In Holland ist diese Art nur bekannt von Bunde.

In Belgien war diese Art bekannt von Hockai. Ich sah weitere Exemplare von Francorchamps.

O. (Molophilus) occultus De Meijere

In Belgien war diese Art nur bekannt von Hockai. Ich sah weitere Exemplare von Haute Fagne (Nesselo-Roer).

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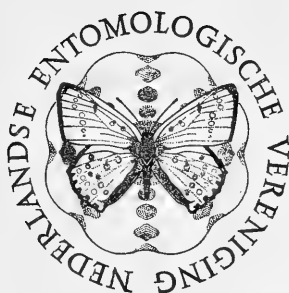
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NEW SPECIES OF THE PAPUAN GENUS TAFAlA VALCK LUCASSEN (COLEOPTERA: CETONIIDAE)

by

J. KRIKKEN

Rijksmuseum van Natuurlijke Historie, Leiden

With 53 text-figures and 1 plate

ABSTRACT

Four new species of the genus *Tafaia* Valck Luc. are described and figured, viz. *T. brunnea*, *T. difficilis*, *T. bacchusi* and *T. signifer*, all from New Guinea. These are keyed along with the only species hitherto known and a form not described herein. A key to some genera of the *Lomaptera* alliance serves to distinguish *Tafaia* from allied genera.

A few decennia ago Valck Lucassen (1939: 141) proposed the genus *Tafaia* for the accommodation of a singular new cetoniine beetle of the *Lomaptera* alliance, collected in eastern New Guinea. Valck Lucassen's paper remained the only original record of the genus. In that same year, however, two expeditions exploring unknown portions of western New Guinea had already secured other forms referable to *Tafaia*. I noticed these beetles when looking through the Leiden museum's cetoniid accessions. Recently the British Museum (Natural History) placed further *Tafaia*-like beetles at my disposal, while correspondence with G. Ruter revealed that more captures are due to be reported.

Some obstacles in classifying *Tafaia* species and their relatives cannot be suppressed. The type of *T. viridiaenea* Valck Luc. is a female, and a comparison with the females described hereafter showed them all to be quite similar. The males, however, are variably different, and judged from one case a pronounced sexual dimorphism may be expected in others. In a second case a male could not be associated with a female from the same region, though their conspecificity seems likely. Anyway, despite a certain heterogeneity, the available males and females all run fairly easily down to *Tafaia* in Valck Lucassen's key (1961: 4—5) to the genera of the *Lomaptera* alliance. In this connexion it may be noticed that, although Valck Lucassen has produced a very useful key, a clear-cut classification has not been gained so far, owing to the existence of poorly known intergeneric and otherwise problematic forms. Valck Lucassen himself was well aware of this, as appears from the notes accompanying his key. To avoid any misunderstanding, the generic limitations of *Tafaia* are reconsidered below, in a key to some genera of the *Lomaptera* alliance (= *Lomapterides* sensu Schenkling, 1921: 110—128). From this key the close affinities of *Tafaia* and *Digenethle* Thomson are evident; they may eventually turn out to be at most subgenerally distinct.

For allowing the study of the *T. viridiaenea* type and for submitting more material, I am indebted to Messrs R. D. Pope and M. E. Bacchus of the British Museum (Natural History), London. Mr. G. Ruter, correspondent of the Muséum National d'Histoire Naturelle, Paris, kindly allowed the inclusion of information on two *Tafaia*-like beetles while a paper of his dealing with these insects is forthcoming.

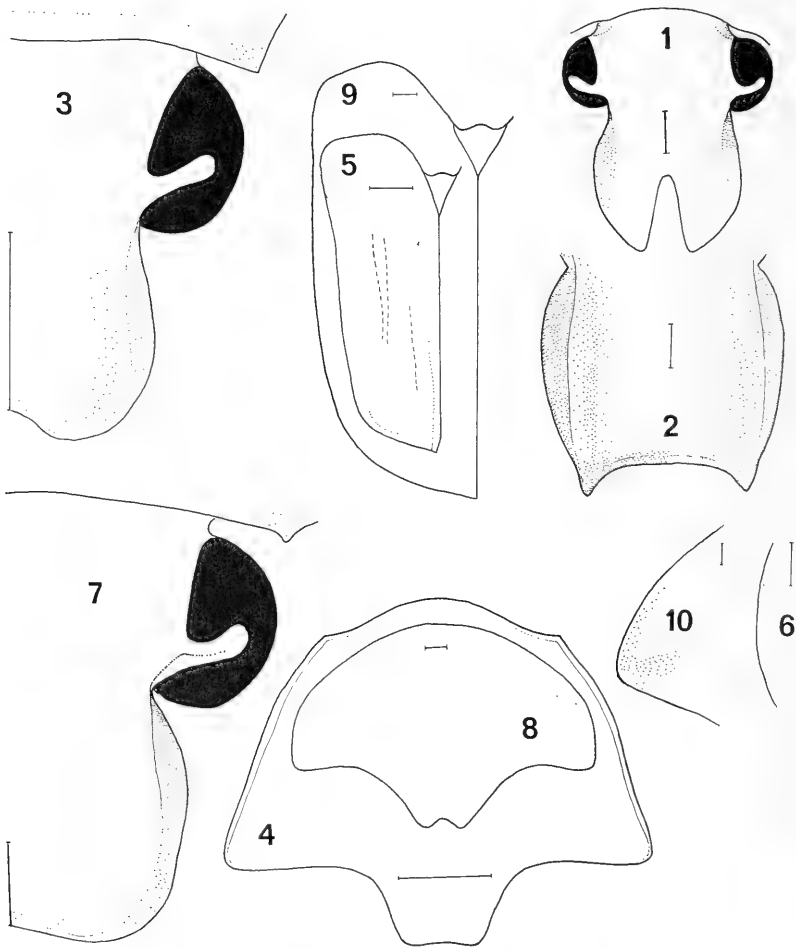


Fig. 1—10. Comparison of genera of the *Lomaptera* alliance, outlines. 1, *Lomaptera macrophylla* Gestro, ♂, Wissel Lakes area, head; 2, *Agestrata punctatostriata* Lansberge, ♂, Sangi & Talaud, clypeus; 3—6, *Microlomaptera aenea* Kraats, ♂, Aru Is.; 7—10, *Digenethle caelata* Thomson, ♂, Sattelberg; 3, 7, head; 4, 8, pronotum; 5, 9, left elytron; 6, 10, pygidial outline. 1 — 3, 7, full-face, 4, 5, 8, 9, dorsal, 6, 10, dextro-lateral view. Scale-lines = 1 mm

KEY TO SOME GENERA OF THE *Lomaptera* ALLIANCE

- 1. Anterior border of clypeus emerginate, lateral lobes simply rounded (Figs. 3, 7, etc.). Scutellum very distinct (Figs. 5, 9, etc.). Pygidial shape simple, more or less convex, with simply arcuate outline (ventral view) 2
- Anterior border of clypeus deeply incised (Fig. 1), or shallowly emarginate with small, pointed lateral protrusions (the oriental genus *Agestrata* Eschscholtz, Fig. 2), in the latter case body-dimensions excessive. Scutellum indistinct, or even entirely invisible. Pygidium frequently

- modified. Parameral structure differing according to genus. — E and S Asia, Australia, and neighbouring islands, hundreds of species eight genera
2. Pygidium shallowly convex, without distinct dorso-ventral transition (compare Fig. 6 with 10). Phallus relatively complex, with transverse dorso-basal parameral cavity; flaps between parameres (Fig. 11) small. Dorsal outline of pronotum as in Fig. 4, at least with noticeable anterolateral angles. Clypeal surface convex medially. Small forms, total length not exceeding 20 mm. — Aru Islands and New Guinea, two described species *Microlomaptera* Kraatz
- Pygidium strongly convex, outline as in Fig. 10, 23, etc. Phallus relatively simple. Dorsal outline of pronotum with obsolete antero-lateral angles (Fig. 8, etc.) 3
3. Clypeal surface concave, consequently margins raised, more or less distinctly carinate. Flaps between parameres small or absent (Fig. 13 and 14). Superior terminal spur of hind tibiae spatulate (Fig. 20) (in the known females). If elytral disc striolate, pattern of striae not fully obsolete. — New Guinea, at least six species *Tafaia* Valck Luc.
- Clypeo-frontal surface somewhat convex. Flaps between parameres (Fig. 12) large. Elytra non-striate, non-costate, densely, braidedly striolate throughout discal striolae transverse or oblique. — New Guinea, four described species *Digeneible* Thomson

KEY TO THE SPECIES OF *Tafaia*

1. Forms with tapering mesosternal process (Fig. 22, 49), its length exceeding middle coxal width. Postero-lateral angle of hind coxae (Fig. 21, etc.) distinct owing to concavely curvilinear posterior edge 2
- Mesosternal process (Fig. 28) short. Postero-lateral angle of hind coxae (Fig. 27) obtuse. Pronotum bicolorous. Sides of distal sternites with sparse primary and dense secondary punctation 5
2. Pygidium protruding, but short, largely covered by elytra. Antennal club (Fig. 47) modified in the males (at least as long as the remaining segments combined). Anal sternite very short (e.g. as in Fig. 50); pygidial length (ventral view) at least twice the median length of this sternite; borders of anal sternite not reaching ventro-dorsal transition. Strial pattern of elytra distinct. Elytral and pronotal colours not different. For tibiae of males with apical denticle only 6
- Pygidium distinctly visible from above. Lamellae of antennal club (compare Fig. 37 with 47) not enlarged. If anal sternite relatively short, pronotal and elytral colours different, and ventrum (particularly anteanal sternite) only very sparsely setose 3
3. Abdominal sternites, particularly anteanal one, with numerous brown setae. Dorsum concolorous; colour of appendages may differ from that of body, which is brownish or greenish. Larger forms, with spatulate superior terminal spur on the hind tibiae of the only known female sex 4
- Abdominal sternites glabrous or nearly so, punctation sparse. Dorsum distinctly bicolorous; head and pronotum yellow-brown, elytra dark brown, etc. Lateral borders of pronotum raised. Elytra non-striate. Clypeal surface with crowded punctulation (Fig. 31a). Length 22.5—27 mm. — E New Guinea *bacchusi* sp. nov.
4. Clypeal surface distinctly punctate-rugulate. Lateral surface of abdominal sternites with numerous distinct seta-bearing primary punctures. Colour of entire dorsum greenish bronze. Spatulate spur of hind tibiae wide, width subequal to length of second tarsal segment, hind tibiae orange, apex black. Habitus Pl. 1 Fig. 1. Length 30 mm. — E New Guinea: Mt. Tafa . *viridiaenea* Valck Luc.
- Cephalic surface with many primary punctures separated by more than their own diameters. Lateral surface of abdomen with dense transverse striolation, primary punctures obsolete, though setae present. Colour of entire dorsum brown. Spatulate spur of hind tibiae (Fig. 20) relatively narrow. All tibiae blackish. Length 30—31.5 mm. — W New Guinea: Central Range *brunnea* sp. nov.
5. Middle tibiae with external spine at about two-thirds from tibial base. Serially arranged primary punctures on elytral disc very distinct. Single known female with spatulate superior spur in hind tibiae. Elytral apex striolate. Length 31 mm. — W New Guinea: Central Range *difficilis* sp. nov.
- Middle tibiae lacking external elevations. Series of primary punctures on elytral disc indistinct. Superior spur of hind tibiae tapering. Elytral apex non-striolate. Length 26 mm. — W New

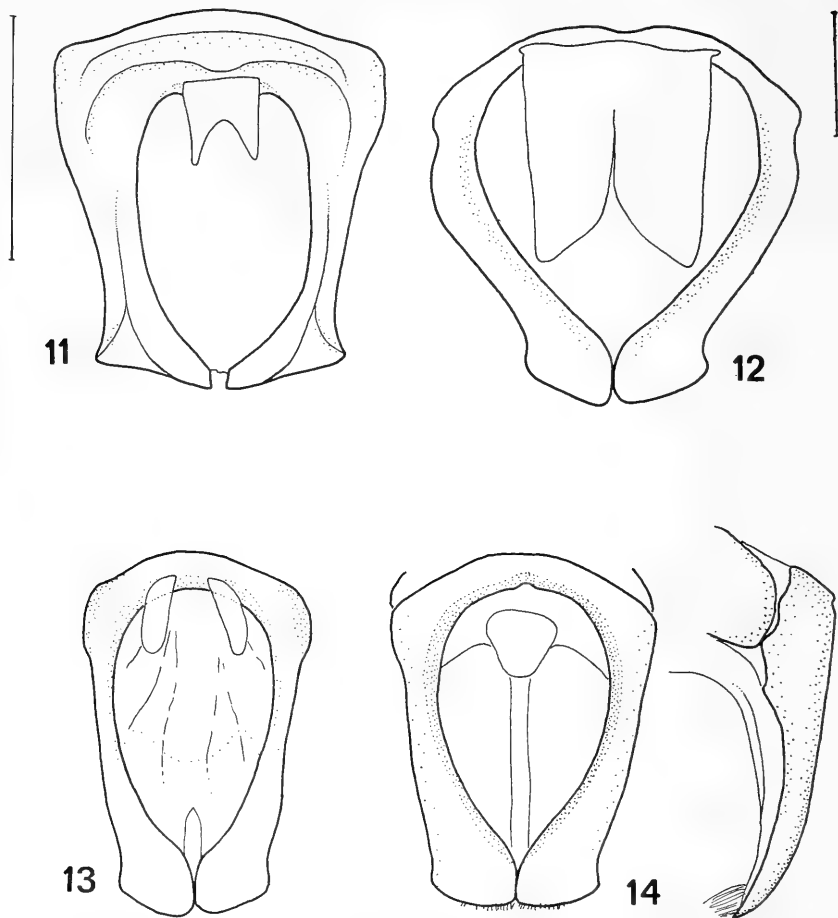


Fig. 11—14. Parameres, full-face view. 11, *Microlomaptera aenea* Kr., Aru Is.; 12, *Digenethle caelata* Th., Sattelberg; 13, *Tafaia* sp. nr *difficilis*, Moss Forest Camp; 14, *Tafaia bacchusi* sp. nov., Mt. Kaindi, with laevo-lateral view. Scale-lines = 1 mm, 12—14 same scale

- Guinea: Central Range male of *difficilis* or sp. ined.
6. Dorsum green. Head glabrous, clypeus shallowly concave. Antescutellar lobe truncate. Lamellae of antenna in male about as long as remaining segments combined. Length 22 mm. — E New Guinea: Mt. Jimmi sp. nov. Ruter ms.
- Dorsum brown. Clypeo-frontal surface setose, clypeal margins distinctly raised (Fig. 42, 51). Antescutellar lobe (Fig. 43) conspicuously notched. Antennal lamellae of male (Fig. 47) much longer than remaining segments combined. Length 23—24 mm. — E New Guinea: Morobe District *signifer* sp. nov.

***Tafaia brunnea* sp. nov.**

Fig. 15—23, Pl. 1 Fig. 2

Female (holotype). — Approximate length 30, width 16, height 11 mm. Brown, with tinge of red, weakly shiny, most of integument shagreened; tips, margins, sutures of

several elements more or less infuscated, tibiae and tarsi blackish; pilosity brown. Habitus, Pl. 1 Fig. 2.

Cephalic contours, Fig. 15. Clypeus shallowly concave, hence margins raised; cephalic primary punctation moderately dense, punctures approximately isodiametric, moderately impressed; punctural diameters on clypeus 0.05—0.15 mm, their densities ca. 20/sq. mm; interspaces with close secondary punctation, punctures fine, shallow. Eye-canths with about 5 long setae. Maximum length of head 4.50, maximum width 4.95 mm; ratio l/w 0.90.

Pronotal contours, Fig. 16; surface evenly convex, lateral margins not raised. Pronotal punctation double; discal surface with scattered, sparse primary punctation, densities increasing laterad, passing into marginal striolation; diameters of postero-median punctures 0.05—0.10 mm, their densities ca. 10/sq. mm; diameters of sublateral punctures 0.10—0.15, their densities 10—15/sq. mm; entire pronotal surface with secondary punctation like on the head. Median length of pronotum 9.6, maximum width 12.7 mm; ratio l/w 0.75. Scutellum (Fig. 17) raised medially, with numerous extremely fine punctures, and several seta-bearing punctures in front.

Elytral contours, Fig. 17; juxtasutural costa of elytron distinct behind, obsolete in front; strial pattern indistinct; elytral base sparsely punctate; disc with numerous infuscated punctures, each surrounded by an arcuate striola; separate elements obsolescent caudad and laterad, passing into braided striolation. Secondary punctation dense, punctures extremely fine. Distance between elytral and scutellar apices 14.5 mm; maximum length of left elytron 19.5, maximum width of elytra combined 14.5 mm, their ratio 1.34.

Latero-ventral surface of prothorax densely striolate, with numerous semierect setae; antero-median portion of prosternum distinctly raised, with long brown setae in front. Mesosternal process (Fig. 22) well-developed, dorsally with median ridge, ventrally weakly transversely convex. Mesepimera and mesosternum densely striolate, with numerous semierect setae. Metasternal disc shallowly sulcate medially, shiny, with several fine punctures; metasternal wings, metepisterna and greater part of hind coxal surface densely transversely striolate, with numerous semierect setae. Metepimera shiny, with small as well as extremely fine punctures. Postero-lateral angles of hind coxae (Fig. 21) distinct. Visible abdominal sternites 1—4 medially with sparse hemipunctures (i.e. punctures with about half of their borders obsolete) bearing fine semierect setae; laterally these sternites are densely punctulate-striolate, similarly setose; sternite 5 with numerous hemipunctures in the middle, punctures with coarse, semierect setae; laterally this sternite is transversely striolate, with similar setae, middle of sternites 1—6 with vague, fine secondary punctation; anal sternite finely, transversely striolate, glabrous. Pygidium (Fig. 23) with arcuate apical outline (seen from above); dorsal and ventral surface separated by transversely carinate apex; anal edge indistinctly marginate, margin widened medially; pygidial sculpture consisting of approximately concentric striolae; many fine setae are noticeable.

Fore tibia (Fig. 18) with 3 denticles and well-developed terminal spur; both sides with many seta-bearing hemipunctures. Inferior side of fore femur with setae, striolae and punctures. Middle and hind tibiae (Fig. 19) with scattered medium-sized hemipunctures, bearing semierect setae; outer surface of middle and hind tibiae lacking elevations; superior terminal spur of hind tibiae (Fig. 20) spatulate, longer than simply acuminate inferior one; spurs of middle tibiae both acuminate, inferior slightly longer.

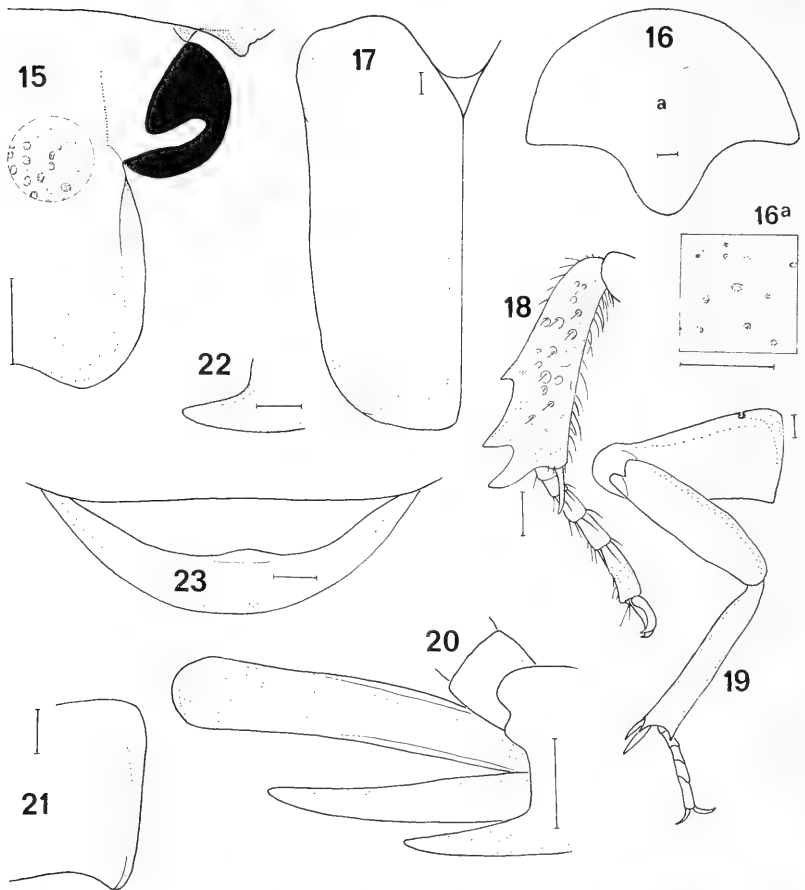


Fig. 15—23. *Tafaia brunnea* sp. nov., ♀ holotype, Top Camp. 15, left half of elytron, inset with details; 16, pronotum, 16a, enlarged details of pronotal disc (point a); 17, left elytron, scutellum; 18, right fore tibia, superior side; 19, right hind leg; 20, apex right hind tibia; 21, lateral part of hind coxa; 22, mesosternal process, laevo-lateral; 23, pygidium 15, 18—19, full-face, 16—17, dorsal, 20, dextro-lateral, 21, 23, ventral view. Scale-lines = 1 mm

Inferior side of middle and hind femora sparsely striolate-punctate, with semierect setae, mixed with many irregularly set punctules.

Variation. — Length 30—31.5 mm. No taxonomically noteworthy differences among the few females at hand.

Diagnostic remarks. — *Tafaia brunnea* may be identifiable from the sculptural features of many body-parts and the following combination of characters. Dorsum brown, concolorous, tibiae entirely blackish. Mesosternal process well-developed, tapering. Postero-lateral angle of hind coxae distinct. Spatulate spur of hind tibiae (in the female) relatively narrow. Pronotal borders immarginate. Elytral striation obsolete.

Material examined. — 3 females (Leiden museum).

Holotype, western New Guinea, labelled as follows: "Ned. Ind.-American/New Guinea Exped./Top Camp 2100 m/8.II.1939 L. J. Toxopeus". One paratype with the same data, except collected 7.II.1939; another from the Wissel Lakes area: Digitara, ult.XI.1939, leg. J. Hoeka (K.N.A.G.-Le Roux expedition).

Tafaia difficilis sp. nov.

Fig. 24—29, Pl. 1 Fig. 3

Female (holotype). — Approximate length 31, width 17, height 11.5 mm. Dark brown, more or less shiny, pronotum very shiny; lateral portions of thoracic segments (including pronotum), as well as hind coxae and sides of pygidium yellow-brown; tips, margins, sutures of several elements more or less infuscated, tibiae blackish; pilosity brown; microsculpture indistinct on head and pronotum (magnification $\times 50$). Habitus, Pl. 1 Fig. 3.

Cephalic contours, Fig. 24. Clypeus concave, antero-lateral borders distinctly raised; clypeo-frontal surface with vague secondary punctation and rugulation; primary punctures closely set anteriorly, approximately isodiametric, shallow, ill-defined, their diameters ca. 0.1 mm, densities in the middle ca 30/sq. mm. Surface of vertex with vague primary and secondary punctures. Eye-canths with slightly over 10 erect setae. Maximum length of head 4.75, maximum width 5.35 mm; ratio l/w 0.89.

Pronotal contours and disposition of colours, Fig. 25; surface evenly convex; sides shallowly marginate except near postero-lateral angles; lateral zones yellow-brown with an isolated patch of dark brown, discal surface dark brown, extremely shiny. Pronotal primary punctures shallow but distinct, approximately isodiametric, their diameters increasing laterad, lateral punctures with obsolete hind borders and some of them confluent; primary punctures on basal lobe small and sparse; densities of primary punctures on disc about 40 or less/sq. mm, their diameters less than 0.05 mm, increasing laterad to over twice that size for the punctures along the border; secondary punctation dense, covering entire pronotum, punctures extremely fine. Median length of pronotum 9.1, maximum width 12.4 mm; ratio l/w 0.73. Scutellum (Fig. 26) punctate-regulate in front, with numerous semierect setae; posterior surface with exceedingly fine punctation.

Elytral contours, Fig. 26; juxtasutural costa distinct behind, obsolete in front; striae represented by 6 series of well-defined umbilicate punctures, their diameters varying, amounting to nearly 0.5 mm, distances varying as well; distal portions of elytron transversely striolate; remaining surface with fine, sparse, scattered primary punctures, a secondary punctation like on the pronotum, though less dense, and a microsculpture. Distance between elytral and scutellar apices 16.8 mm; maximum length of left elytron 19.8, maximum width of elytra combined 14.5 mm, their ratio 1.38.

Legs and ventral side of body with minute secondary punctures, partly obliterated or replaced by other sculptures. Coxae and ventro-lateral portions of thorax with seta-bearing striolae, metepimera with seta-bearing punctures. Yellow-brown are: proepimeral concavities, humeral extremity of mesepimera, metasternal wings, metepisterna, and metepimera (margins infuscated). Raised antero-median part of prosternum longitudinally sulcate. Mesosternal process (Fig. 28) short. Postero-lateral angle of hind coxae (Fig. 27) rounded. Visible abdominal sternites striolate-setose, 2—4 with many sparsely set, small hemipunctures bearing semierect setae; anteanal sternite with coarser, large,

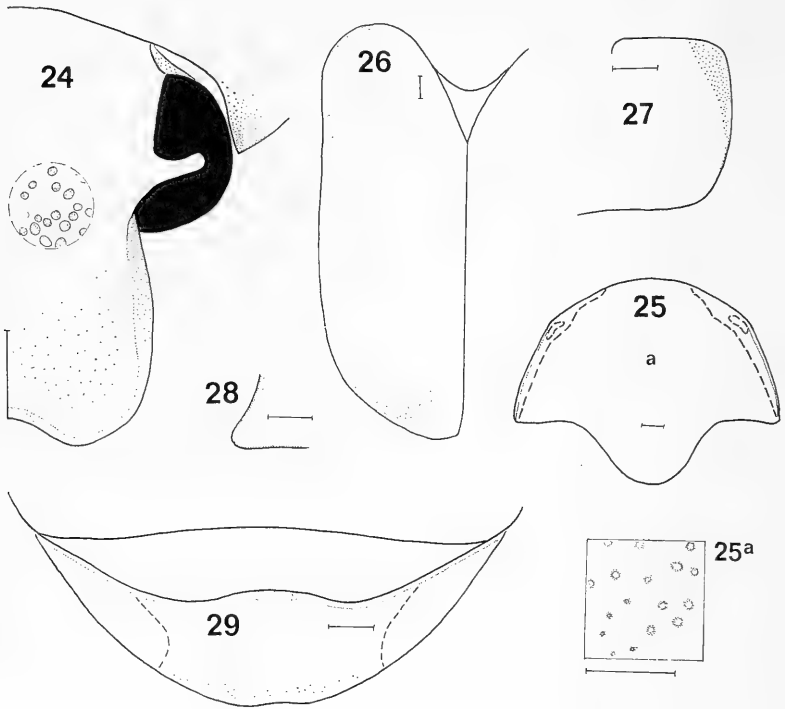


Fig. 24—29. *Tafaia difficilis* sp. nov., ♀ holotype, Moss Forest Camp. 24, left half of head, inset with details; 25, pronotum, 25a, enlarged details of pronotal disc (point a); 26, left elytron, scutellum; 27, lateral part of hind coxae; 28, mesosternal process, laevo-lateral; 29, pygidium. 24, full-face, 25—26, dorsal, 27, 29, ventral view. Scale-lines = 1 mm

seta-bearing hemipunctures, their diameters ca 0.1 mm, density in the middle ca 7/sq. mm; anal sternite transversely striolate with some inconspicuous punctures lacking setae. Pygidium (Fig. 29) with arcuate apical outline (seen from above), extreme apex lightly emarginate; dorsal and ventral sides distinctly separated, ventral side with median longitudinal callosity, but apex slightly impressed; sculpture consisting of approximately concentric striolae, obliterated on ventral surface; setae sparse, fine, inconspicuous.

Fore tibia with 3 denticles and well-developed terminal spur, like in *T. brunnea*; superior side with numerous scattered, rather large seta-bearing hemipunctures, inferior side with several smaller seta-bearing punctures. Fore femur with many small seta-bearing punctures above, larger seta-bearing hemipunctures beneath. Middle and hind tibiae with scattered medium-sized hemipunctures bearing coarse semierect setae; external side of middle tibiae with spine-like projection slightly behind the middle; superior terminal spur of hind tibiae spatulate, longer than simply acuminate inferior one; spurs of middle tibiae of equal length, acuminate; middle tibiae with many, hind tibiae with few seta-bearing hemipunctures, their dimensions variable. Inferior side of middle and hind femora with scattered hemipunctures bearing semierect setae, less sparse on the middle ones.

Diagnostic remarks. — *Tafaia difficilis* may be identifiable from the following combination of characters. Mesosternal process short. Postero-lateral angle of hind coxae obsolescent. Pronotum with yellow-brown lateral margins enclosing a dark patch halfway pronotal length. Sculptural features of dorsum distinctive as well.

Material examined. — Holotype, western New Guinea, labelled thus: "Neth. Ind.-Amer. New/Guinea Exped. 2600—/2800 m. Moss Forest/ Camp 9.X.—5.XI.1938/L. J. Toxopeus leg." (Leiden).

Note. — See at the end of the following description.

Tafaia sp.

Fig. 13, Pl. 1 Fig. 4

Male. — Approximate length 26, width 12, height 9 mm. Dark brown, largely shiny; lateral portions of thoracic segments (including pronotum) as well as hind coxae and most of pygidium yellow brown; tips, margins, sutures more or less infuscated; pilosity brown; most of integument with microsculpture (magnification $\times 50$). Habitus, Pl. 1 Fig. 4.

Cephalic contours largely similar to those of *T. difficilis* (preceding description). Clypeus concave, lateral borders distinctly raised; clypeo-frontal surface with vague secondary punctation and rugulation; primary punctures closely set anteriorly, approximately isodiametric, very shallow and ill-defined. Vertex with more distinct primary punctures and exceedingly fine secondary ones. Eye-canthi with slightly more than 10 erect setae. Maximum length of head 4.65, maximum width 4.70 mm; ratio l/w 1.00.

Pronotal contours and disposition of colours largely similar to those of *T. difficilis*; surface evenly convex; sides shallowly marginate except near postero-lateral angles. Pronotal primary punctures approximately isodiametric, shallow but distinct, their hind borders more or less obsolescent; primary punctures of basal lobe fine; densities of discal primary punctures ca 25—30/sq. mm, their diameters ca 0.05 mm; extremely fine secondary punctation covering entire pronotum. Maximum length of pronotum 8.15, maximum width 10.2 mm; ratio l/w 0.81. Scutellum (shaped like in *T. difficilis*) punctate in front, with some setae; apical surface with exceedingly fine punctures.

Elytral contours and disposition of striae largely similar to those of *T. difficilis*; juxtasutural costa distinct behind, obsolete in front; striae represented by several irregular series of ill-defined impressions, basally with traces of genuine punctures in their centres, distally these impressions are irregularly confluent; surface on and around apical umbone non-striolate, slightly uneven; entire surface with secondary punctation like on pronotum. Distance between elytral and scutellar apices 11.6 mm; maximum length of left elytron 15.9, maximum width of elytra combined 12.3 mm, their ratio 1.30.

Legs and ventral side of body with minute secondary punctures. Vento-lateral portions of prothorax striolate, partly setose, posterior concavity yellow-brown, other thoracic elements also yellow-brown, as in *T. difficilis*. Raised antero-median part of prosternum longitudinally sulcate. Mesosternal process short. Mesepimera proximally with seta-bearing striolae, elsewhere, on metepisterna, metasternal wings, and hind coxae, with sparse, small, seta-bearing hemipunctures, some of them transversely confluent. Postero-lateral angle of hind coxae shortly rounded. Abdominal sternites with very sparsely set, very small hemipunctures, partly bearing fine semierect setae; anal

segment with fine subtransverse striolae laterally. Superior surface of pygidium with similar fine striolae, inferior side with sparse, small punctures; anal border marginate.

Fore tibia with only two denticles, terminal spur well-developed; both sides with a number of small hemipunctures, a few of them bearing fine setae. Inferior side of middle and hind tibiae with scattered hemipunctures bearing semierect setae, denser on the middle ones, external projections lacking, spurs of middle and hind tibiae simply tapering, superior spurs longer than inferiors. Inferior side of fore and middle femora sparsely provided with small punctures, some of them bearing setae; hind femora almost entirely smooth and glabrous beneath.

Parameres, Fig. 13.

Material examined. — One specimen (Leiden), western New Guinea, labelled thus: "Neth. Ind. - Amer. New/Guinea Exped. 2600—/2800 m. Moss Forest Camp 9.X.—5.XI.1938/L. J. Toxopeus leg."

Note. — This specimen may represent the male sex of *T. difficilis* sp. nov., since the features mentioned in the key to the species (couplet 5) may be only sexual. As I am not certain of its identity, I am describing this male separately, without naming it.

Tafaia bacchusi sp. nov.

Fig. 14, 30—41, Pl. 1 Fig. 5

Male (holotype). — Approximate length 22.5, width 16, height 7 mm. Cupreous yellow-brown: head, thorax, scutellum, pygidium, all weakly shiny; elytra, legs, antennae, abdominal sternites much darker brown, moderately shiny; most parts with a faint tinge of green; tips, margins, sutures of several parts more or less infuscated; entire integument more or less shagreened; pilosity brown. Habitus, Pl. 1 Fig. 5.

Cephalic contours, Fig. 30. Clypeus shallowly concave, margins raised, rather abruptly declivous laterally; cephalic surface slightly uneven, almost entirely crowded with minute punctures; clypeus with many vague puncture-like impressions; surface adjacent to eyes as well as eye-canths with a number of distinct fine punctures, crowded punctulation absent there. Maximum length of head 3.65, maximum width 4.15 mm; ratio l/w 0.89.

Pronotal contours, Fig. 31; surface evenly convex, sides marginate, except near shortly rounded postero-lateral angles. Pronotal sculpture like that of the head, minute punctures not crowded though closely set, more than 100/0.25 sq. mm; disc with small superficial impressions, their diameters not exceeding 0.1 mm; impressions of lateral surface arcuate, margins almost striolate. Maximum length of pronotum 7.3, maximum width 8.9 mm; ratio l/w 0.82. Scutellum (Fig. 32) almost smooth.

Elytral contours, Fig. 32; juxtasutural costa of elytron distinct behind, obsolete in front; disc with several more or less arcuate punctures which distally pass into striolae, particularly around apical umbone; entire surface covered with closely set, minute punctures. Distance between elytral and scutellar apices 10.2 mm; maximum length of left elytron 13.5, maximum width of elytra combined 10.9 mm, their ratio 1.24.

Outline of antenna and mouthparts, Fig. 37—41. Femora, tibiae, and ventral side of body with cover of minute secondary punctures; ventro-lateral portions of thorax with distinct though in places very superficial striolation. Antero-median portion of prosternum distinctly raised, with long brown setae in front. Mesosternal process (Fig. 35) well-developed; parts of ventral elements of mesothorax with erect setae. Metasternum with hemipunctures passing into striolae laterad, many bearing subappressed to erect

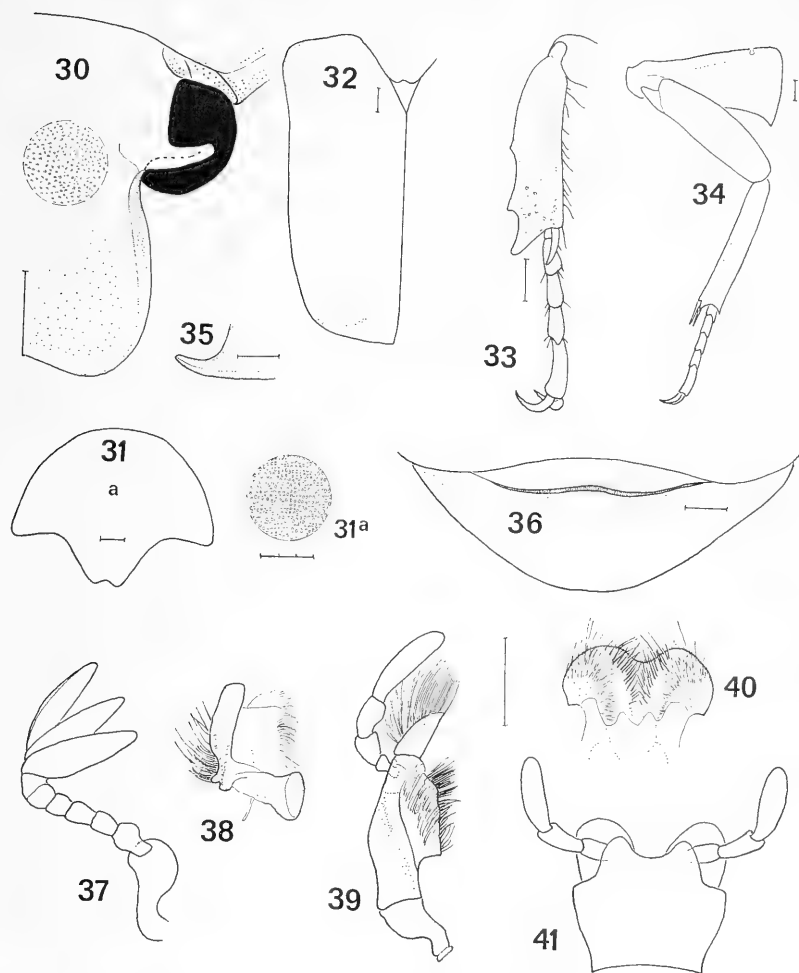


Fig. 30—41. *Tafaia bacchusi* sp. nov., ♂ paratype, Mt. Kaindi. 30, left half of head, inset with details; 31, pronotum, 31a, enlarged details of pronotal disc (point a); 32, left elytron, scutellum; 33, right fore tibia, superior side; 34, right hind leg; 35, mesosternal process, laevo-lateral; 36, pygidium; 37, right antenna; 38—41, mouth-parts, 38, right mandible, 39, right maxilla, 40, labrum, 41, mentum and labium. 30, 33—34, full-face, 31—32, dorsal, 36—41, ventral view. Scale-lines = 1 mm, except 31a = 0.3 mm

fine, very inconspicuous setae; disc with secondary punctation only. First visible abdominal sternite striolate, lateral portions of following very vaguely striolate, medial surface at most slightly wrinkled. Pygidium (Fig. 36) with arcuate apical outline (seen from above), dorsal and ventral surface separated; sculpture consisting of approximately concentric striolae, obliterated on ventral side.

Fore tibia (Fig. 33) with 3 denticles and well-developed terminal spur; both sides of

tibia scatteredly hemipunctate, some punctures of inferior side seta-bearing, internal side with distinct series of seta-bearing punctures. Fore femur with striolae behind, anterior margin with seta-bearing punctures. Middle and hind tibiae (Fig. 34) with scattered, medium-sized hemipunctures, most of them bearing a fine short seta; external side of middle and hind tibiae lacking elevations; terminal spurs all acuminate, of equal length in the middle legs, superior one distinctly longer in the hind legs. Inferior side of middle and hind femora almost glabrous, faintly striolate, hemipunctate behind, primary sculpture of hind femora vague.

Parameres, Fig. 14.

Variation. — Length 22.5—27 mm. No taxonomically noteworthy variation. I have examined the parameres of the six males available and they are all remarkably alike.

Diagnostic remarks. — *Tafaia bacchusi* may be identifiable from its small size, sculptural features, its colours and their disposition, and the following combination of characters. Abdominal sternites in the males not impressed medially, sparsely punctate and glabrous, or nearly so. Mesosternal process well-developed, tapering. Postero-lateral angle of hind coxae distinct. Phallus lacking parameral flaps. Lateral borders of pronotum raised. Elytral striation obsolete. Anal sternite short (at least in the male).

Material examined. — Six males, five in the British Museum (Natural History), one in Leiden. Holotype, eastern New Guinea, labelled thus: "Neth. Guinea:/Morobe Dist./Mt. Kainde 8,000 ft./22.IX.1964", "Stn. No. 20.", "M.E. Bacchus./B. M. 1965—120". Three paratypes with the same data; two paratypes from Mt. Hagen, one leg. F. S. Mayer, the other collected at 8,000 ft in 1949.

Note. — G. Ruter is going to publish a description of a male from Wapenamanda closely allied to this species. From the ms. description and the drawings supplied to me some differences could be abstracted, but I am unable to place it satisfactorily and to insert it in my key.

Tafaia signifer sp. nov.

Fig. 42—53, Pl. 1 Fig. 6

Male (holotype). — Approximate length 24, width 11.5, height 9 mm. Brown, shiny; frons, scutellum, parts of ventral side, pygidium and legs blackish; tips, margins, sutures of several elements more or less infuscated; pilosity yellow to orange. Habitus, Pl. 1 Fig. 6; legs very slender.

Cephalic contours and disposition of colours, Fig. 42. Clypeus distinctly concave, margins strongly raised, particularly along anterior emargination, clypeal surface with close primary punctation, punctures deep, well-defined, more or less isodiametric, many bearing erect setae; punctural diameters 0.05—0.15 mm, their densities 50—60/sq. mm; secondary punctures vague, scattered, minute. Punctation of blackish posterior part of head sparse in the middle, close beside eyes; these punctures medium-sized, with fine setae; secondary punctation indistinct. Eye-canths with a number of fine seta-bearing punctures. Maximum length of head 4.2, maximum width 4.2; ratio l/w 1.00.

Pronotal contours, Fig. 43; surface shallowly, evenly convex; lateral margin broadly thickened, except behind; basal lobe extensive, its apex distinctly notched. Medial surface of pronotum sparsely punctate, punctures distinct, approximately isodiametric, their diameters on disc 0.05—0.10 mm, densities 10—20/sq. mm; lateral punctation dense, more or less transverse, particularly in front, passing into poorly pronounced marginal

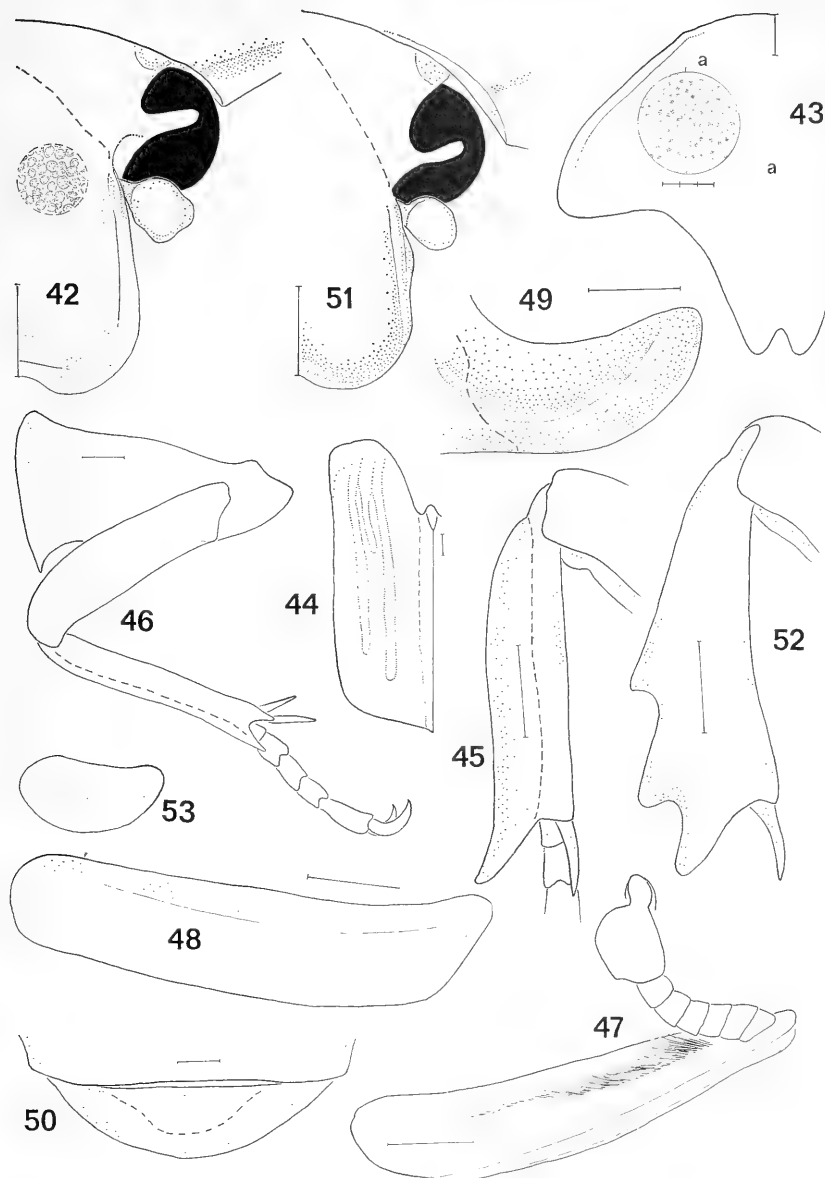


Fig. 42—53, *Tafaia signifer* sp. nov.; 42—50, ♂ holotype, Mt. Kaindi; 51—53, ♀ allotype, Bulolo. 42, left half of head, inset with details (setosity indistinct from above); 43, left half of pronotum, inset a with enlarged details of centre (point a) of pronotum; 44, left elytron, scutellum; 45, right fore tibiae, superior side (no details); 46, left hind leg; 47, left antenna; 48, outside of 3rd lamella; 49, mesosternal process, with indication of colour limit, dextro-lateral view. 51, left half of head; 52, right fore tibia, superior side; 53, outside of 3rd antennal lamella. 42, 45, 46, 51, 52, full-face, 43—44, dorsal view. Scale-lines = 1 mm, except inset 43a = 0.3 mm

striolation; density sublateral punctures 20—30/sq. mm; secondary punctuation dense. Maximum length of pronotum 8.3, maximum width 9.9 mm; ratio l/w 0.83. Scutellum (Fig. 44) largely covered by pronotal lobe, scutellar apex acute, surface with sparse, minute punctures.

Elytral contours, Fig. 44; juxtasutural costa distinct behind, obsolete in front; juxtasutural interstria separated from adjacent surface by longitudinal striola; disc with three shallow costula, 2nd obsolete behind, the others extending to distal surface; costulae separated by irregularly arcuate striolae, some of them associated with punctules; lateral and distal surface densely transversely striolate, striolation interrupted by aforesaid costulae; humeral surface non-striolate; apical umbone obsolete; secondary punctuation scarcely noticeable (magnification $\times 50$). Distance between elytral and scutellar apices 9.6 mm; maximum length of left elytron 14.0, maximum width of elytra combined 10.9 mm, their ratio 1.29.

Segments of antennal club (Fig. 47) exceedingly long, about twice the length of the remaining segments together; exposed inward side of lamella 1 with track of semierect setae, their length decreasing apicad, outward side of lamella 3 with striola paralleling superior edge (Fig. 48). Antero-median portion of prosternum distinctly raised, with very long setae. Latero-ventral surface of prothorax striolate, setose, except for yellow-brown margin; proepimeral cavity deep. Mesosternal process (Fig. 49) large, somewhat prow-shaped; base blackish, tip brown. Yellow mesepimeron striolate-punctate, finely setose, laterally with few punctules only. Metasternal disc with sparse hemipunctules bearing fine setae; secondary punctuation distinct, though punctures minute, sparse, scattered. Remainder of pectus, and hind coxal surface striolate, setose. Postero-lateral angle of hind coxa (Fig. 46) very distinctly produced. Black-brown venter with shallowly impressed midline, sternites laterally with arcuate, more or less confluent, seta-bearing striolae; medial surface with sparse, partly seta-bearing hemipunctures, setae very fine; posterior margin of anteanal sternite with numerous hemipunctures bearing long, coarse setae; secondary punctures as on metasternal disc, though less distinct; visible part of anal sternite (Fig. 50) remarkably narrow. Pygidium (Fig. 50) strongly convex, with distinctly separated dorsal and ventral sides; apex protruding only slightly beyond elytral apex; anal border distinctly marginate; pygidial surface with dense, approximately concentric striolation; sides of ventral surface yellow-brown.

Fore tibia (Fig. 45) with acute apical denticle only, terminal spur well-developed; superior side of tibia finely striolate, several striolae associated with punctule bearing fine seta; inferior side with numerous seta-bearing punctules; colour of this male's fore tibia externally blackish, internally brown, colours of other tibiae similar. Tarsal segments brown, infuscated distally; claws large, simply sickle-shaped. Fore femur superiorly closely hemipunctate in front, nearly all punctures bearing a semierect, rather long seta; inferior side striolate-setose. Middle and hind tibiae (Fig. 46) lacking external elevations; internal costa with a series of densely, obliquely set, long setae, remaining surface with numerous small punctures bearing small bristles; terminal spurs of middle and hind tibiae acuminate, those of middle tibiae about equal-sized, superior one on hind tibiae slightly longer than inferior; tarsal segments of middle and hind tibiae slightly compressed. Inferior side of middle and hind femora striolate, setose, setae long, semiappressed.

Parameres asymmetric, apparently mis-shapen; two separated flaps present.

Female (allotype). — Approximate length 23, width 12, height 8.5 mm. Brown,

shiny; frons, parts of pectus blackish; sternites dark brown; tips, margins, sutures, lateral spots on pronotum more or less infuscated; colour generally lighter than in male holotype; pilosity yellowish. Habitus much like male.

Cephalic contours, Fig. 51. Clypeus distinctly concave, margins only shallowly raised along anterior margination; diameters of punctures 0.05—0.15 mm, densities ca. 15 and less/0.25 sq. mm. Maximum length of head 4.2, maximum width 4.0 mm; ratio l/w 1.05.

Pronotum and scutellum largely similar to those of male; diameters of punctures on pronotal disc 0.05—0.10, their densities 10—20/sq. mm; densities sublaterally 20—30/sq. mm. Maximum length of pronotum 8.3, maximum width 10.3 mm; ratio l/w 0.81.

Elytra largely similar to those of male, differences as follows; juxtasutural costa less distinctly raised behind; discal interstriae more equally developed, extending onto distal surface without becoming obliterated by dense striolation, which is restricted to lateral and apical parts. Distance between elytral and scutellar apices 11.6 mm; maximum length of left elytron 14.6, maximum width of elytra combined 11.8 mm, their ratio 1.21.

Segments of antennal club (Fig. 53) large, but length not exceeding that of remaining segments together. Lateral parts of pectus and hind coxae largely brown. Mesosternal process tapering, lateral ridges indistinct. Abdominal sternites not impressed medially, lateral sculpture of visible sternites 1—4 extending onto medial surface; anteanal sternite with numerous seta-bearing hemipunctures, their densities ca 12/sq. mm. Pygidial colour largely yellow-brown, dorso-basal surface dark-brown.

Fore tibia (Fig. 52) 3-denticulate, broad; superior side with partly seta-bearing hemipunctures; denticular side somewhat infuscated. Setae fringing internal costa of middle and hind tibiae less numerous (ca 30) than in male; remainder of these tibiae with many seta-bearing hemipunctures; superior spur of hind tibiae narrowly spatulate. Inferior side of middle and hind femora with partly confluent seta-bearing hemipunctures.

Sexual dimorphism and variation. — Since only one specimen of either sex is available, these aspects cannot be distinguished with certainty. Most conspicuous are sexual differences in the structure of antenna and fore tibia; the male has the abdominal sternites impressed along the midline.

Diagnostic remarks. — *Tafaia signifer* may be identifiable from the following combination of characters. Basal lobe of pronotum distinctly notched in front of scutellum, of which only a small portion is visible. Clypeo-frontal surface setose. Visible portion of anal sternite very narrow, its posterior border not reaching ventro-dorsal transition. Only apex of pygidium visible from above. Elytral disc with shallow longitudinal costulae, apico-sutural angle of elytra distinct. Colour predominantly brown. Antennal lamellae of male about twice the length of the remaining segments together. Fore tibiae of male slender, with apical denticle only, those of female broad, 3-denticulate. Clypeus of male with strongly raised margins. Mesosternal process well-developed, tapering. Postero-lateral angle of hind tibiae produced. Lateral borders of pronotum distinctly raised.

Material examined. — One male, one female, Department of Agriculture, Port Moresby, to be deposited in the British Museum (Natural History). Holotype, eastern New Guinea, with locality-label reading: "In flight./Mt. Kaindi/ Wau, M. Dist./ 18.1.1970 F. R. Wylie". Allotype from the same region: Morobe Dist.: Bulolo, 25.XI. 1968, leg. F. R. Wylie, taken from "gauze screen house".

Approximate location altitude of places mentioned above¹⁾

Bulolo	7° 12' S	146° 39' E	600 m
Digitara	3° 41'	136° 28'	1800—2200
Hagen, Mt.	5° 45'	144° 05'	2400
Kaindi, Mt.	7° 21'	146° 43'	2400
Moss Forest Camp	4° 00'	138° 43'	2650—2800
Tafa, Mt.	8° 38'	147° 07'	1800
Top Camp	3° 30'	139° 02'	2100
Wapenamanda	5° 40'	143° 55'	1750—2700

¹⁾ To be located: Mt. Jimmi (E New Guinea, between Baiyer River and Jimmi River, high altitude, collections made by Jolivet, 1969).

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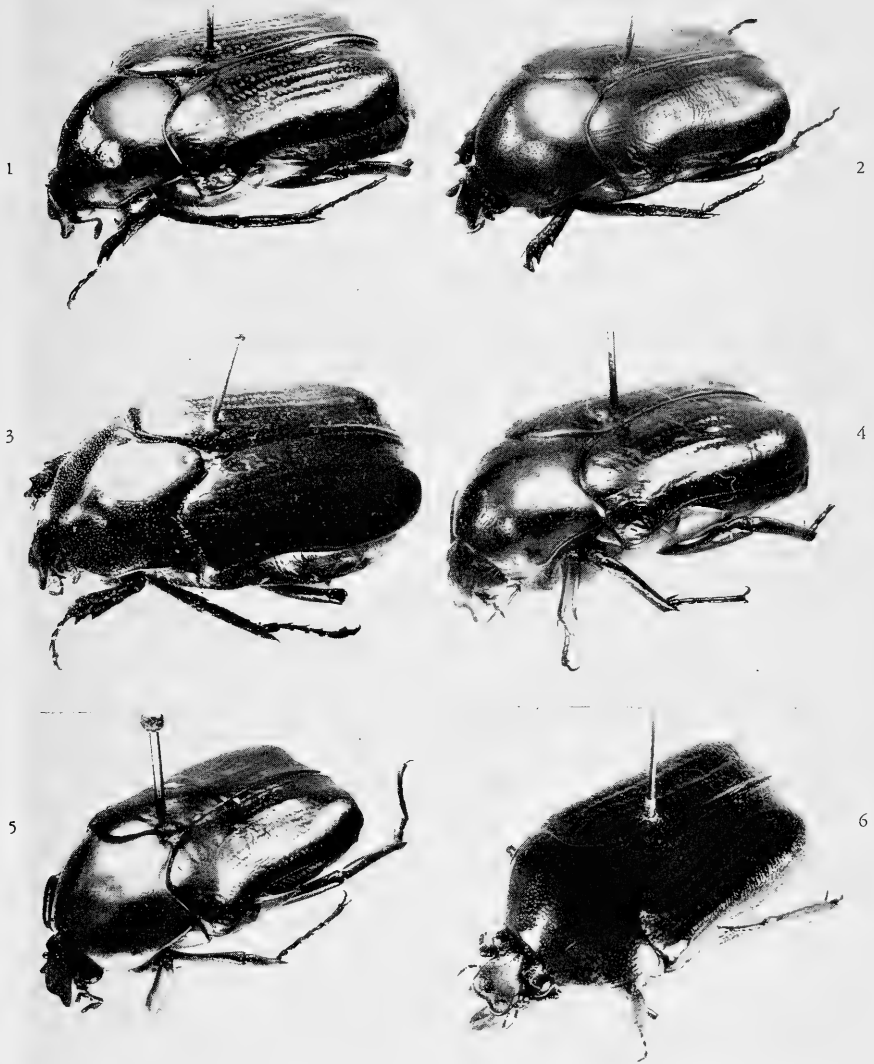


Plate 1. Figs. 1—6. General appearance of *Tafaia* species. 1, *T. vividiaenea* Valck Luc., ♀ holotype, Mt. Tafa, length 30 mm; 2, *T. brunnea* sp. nov. ♀ holotype, Top Camp, length 30 mm; 3, *T. difficilis* sp. nov. ♀ holotype, Moss Forest Camp, length 31 mm; 4, *Tafaia* sp. nr. *difficilis*, ♂, Moss Forest Camp, length 26 mm; 5, *T. bacchusi* sp. nov., ♂, holotype, Mt. Kaindi, length 22.5 mm; 6, *T. signifer* sp. nov., ♂ holotype, Mt. Kaindi, length 24 mm

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Vol. 12, 1971, *Supplement to Vols. 1 and 2*, 311 pp., D.Fl. 98.— (D.Fl. 106.—)
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INHOUD

J. DEN HOLLANDER. — Life-histories of species of the *Pardosa pullata* group, a study of ten populations in the Netherlands (Araneae, Lycosidae), p. 255—281, graphs 1—2c.

Tijdschrift voor Entomologie; deel 114. afl. 8

Gepubliceerd 29-XII-1971

*) Met titelpagina, register en omslag

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LIFE HISTORIES OF SPECIES IN THE PARDOSA PULLATA
GROUP, A STUDY OF TEN POPULATIONS IN THE
NETHERLANDS
(ARANEAE, LYCOSIDAE)

by

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ABSTRACT

The phenology of several populations of the *Pardosa pullata* group — *P. prativaga* (L. Koch), *P. prativaga* var. *fulvipes* (Collett) and *P. pullata* (Clerck) — in the Netherlands was studied in 1969 and 1970. The results are discussed in the context of the habitats of the respective species, the classification of the *P. pullata* group, as well as in the context of the possibility of hybridization in mixed populations.

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I. INTRODUCTION

In the *Pardosa pullata* group the species *Pardosa prativaga* (L. Koch, 1870) (including *P. prativaga* var. *fulvipes* (Collett, 1875)) and *P. pullata* (Clerck, 1757) are distinguished. The species differ in the annulation and spinosity of the legs to a fairly large extent (Wiebes, 1959). However, the general morphology suggests a very close relationship. Comparison of several populations showed that within either species morphological differences exist between samples from pure and those from mixed populations. These data and the observation of specimens intermediate between *P. pullata* and *P. prativaga* in the field suggest that hybridization may occur (Locket & Millidge, 1951; Den Hollander, 1970).

In this paper the phenology of the species mentioned above is dealt with. The results are discussed in the context of the habitats of the species, the systematic relationships and the possibility of hybridization between the species. Studies concerning physiological and ethological barriers, as well as niche differentiation are in progress.

The life-history of the species of the *P. pullata* group is of the common *Pardosa* type (Wiebes, 1960; Vlijm, Kessler & Richter, 1963; Vlijm & Kessler-Geschiere, 1967). In early spring only juvenile spiders occur. Within a few weeks after the appearance of the first adults the numbers of males and females without cocoon reach a maximum. Probably during this period mating occurs (Tretzel, 1954; Wiebes, 1960). The first females with cocoon appear in the same period. Pulli emerge from the cocoons after about 4 weeks; they stay 1—3 days upon the abdomen of the female.

In the beginning of June the numbers of adult males decrease. The number of females decreases in late summer. Simultaneously the numbers of juveniles increase. These juveniles overwinter.

II. MATERIAL AND METHODS

The *P. pullata* group is considered separated into three subgroups: the *pullata*, *prativaga* and *fulvipes* subgroups (Den Hollander, 1970).

Ten populations in the Netherlands (Table 1) were sampled with a frequency of about once per ten days, from April to October, in 1969 and 1970. Each sample was obtained by collecting any visible spider by hand during a 20 min. period. Thus catch size will depend on such factors as the structure of the habitat, the developmental stage of the spider and the weather conditions.

Measurements of the cephalothorax length (i.e. the distance between the posterior lobes of the cephalothorax and the anterior margin of the posterior median eyes, cf. Den Hollander, 1970), were used to study the succession in time of the larval instars. Measurements in micrometer units (1 MU = 0.042) were obtained with a Reichert Stereomicroscope at a magnification of 6.3×4 (accuracy 2.3%). When taking the measurements, the anterior margin of the eyes and the posterior lobes of the cephalothorax were brought in focus simultaneously.

The period of carrying pulli is short in relation to the period between the successive samples, so that the chances of catching females carrying pulli are small. Consequently, only few of them were caught. Therefore data on this stage are not included.

III. RESULTS

1. Changes in population structure during the year

A. General differences between the subgroups

Table II presents mean numbers per sample of juveniles, adult males and females (the latter without cocoon, indicated as ♀ ♀, or with cocoon, indicated as ♀ ♀ c), for the three subgroups separately.

a. Adults

Comparison of the phenological characteristics of the three subgroups gives the following results. Differences occurred as to the period of the final moult in the three subgroups (*pullata*: 4''/4'''; *fulvipes*: 5'; *prativaga*: 5''; 4', 4'', 4''' stand for first, second and third decades of April, respectively). In each subgroup adult males were found about one week earlier than females. The highest numbers of males occurred in May. However, in the subgroup *pullata* males were also present in April and, in smaller numbers, in June and July. High numbers of males occurred in the *fulvipes* subgroup in both May and June. Males of the *prativaga* subgroup generally were found only during May.

The numbers of females without cocoon (♀ ♀) were highest in May in the subgroups *pullata* and *prativaga*. In the *fulvipes* subgroup large numbers of ♀ ♀ occurred in May, but also in June and July. Small numbers of ♀ ♀ occurred in June in the subgroups *pullata* and *prativaga*, and in August and September in the subgroup *fulvipes*. Thus in May the numbers of both ♂ ♂ and ♀ ♀ were highest. This indicates that the period of copulation then occurs. With respect to this period rather slight differences existed between the three subgroups (*pullata*: 5'''; *fulvipes*: 5''''; *prativaga*: 5''').

Table I. The localities of the studied populations of the *P. pullata* group

Locality	Code	Species
Vogelenzang, Heemstede	VZ	<i>P. prativaga</i>
Groene Punt, Oostvoorne	GP	<i>P. prativaga</i>
Lange Pad, Oostvoorne	LP	<i>P. prativaga</i>
Bosweitje, Rockanje	BW	<i>P. prativaga</i> , <i>P. pullata</i>
Amstelveense Poel, Bovenkerk	AP	<i>P. pullata</i>
Hollandse Rading, Hilversum	HR	<i>P. pullata</i>
Arnica-weitje, Schiermonnikoog	Sch	<i>P. pullata</i>
de Eese, Steenwijk	E	<i>P. prativaga</i> var. <i>fulvipes</i>
de Woldberg, Steenwijk	S	<i>P. prativaga</i> var. <i>fulvipes</i>

Females carrying cocoons (♀ ♀ c) appeared in the middle of May (5'') in the *pullata* subgroup. In the subgroups *prativaga* and *fulvipes* they appeared in the beginning of June (6'). Thus the egg maturing period (i.e. the period between the appearance of the first ♀ ♀ and that of the first ♀ ♀ c) was different in the three subgroups (*prativaga*: 10—20 days; *fulvipes* and *pullata*: 20—30 days).

In all three subgroups the numbers of ♀ ♀ c were highest in June. However, in the subgroup *pullata* ♀ ♀ c occurred already in May and in the *fulvipes* subgroup large numbers of ♀ ♀ c were found not only in June, but also in July and August. In the *prativaga* subgroup they hardly occurred outside June. After the periods of peak num-

bers only small numbers of ♀ ♀ c were found in July (*prativaga*), in July and August (*pullata*) and in September (*fulvipes*).

The first pulli emerged from the cocoons in the period between the middle of June and the beginning of July. Again some differences existed between the subgroups (*pullata*: 6''/7'''; *prativaga* and *fulvipes*: 6'''/7'). Thus in the subgroups *prativaga* and *fulvipes* females carry their egg sacs during a period of 20—30 days. The length of this period seems to be longer in the subgroup *pullata* (30—40 days).

In the subgroup *prativaga* adult females hardly occurred after the emergence of the pulli. This means that females of this subgroup produced a cocoon only once. Probably they die after the emergence of the pulli. Adult females did occur in the subgroups *pullata* and *fulvipes* in that period. However, in the *pullata* subgroup their numbers were low, as compared with those in May and June. The *fulvipes* females occurred in comparable numbers both before and after the emergence of the pulli. For the subgroups *pullata* and *fulvipes* more information comes from comparing the numbers of females carrying cocoons with those without cocoons (♀ ♀ c/♀ ♀). In the subgroup *pullata* maxima in this ratio occurred in the beginning of June (6') and in the middle of July (7''), respectively. In the *fulvipes* subgroup the first peak occurred in the middle of June (6''), the second one around the end of July (7'''/8'). It may be assumed that the ♀ ♀ c found after the emergence of the first pulli are females which had constructed a cocoon for the second time. Indeed the sampled cocoons in the period just after the emergence of the first pulli were very fresh. Thus the majority of the females in the *pullata* subgroup produced a cocoon only once, as was the case in the *prativaga* subgroup. A smaller part produced a second cocoon (small numbers in July). In the *fulvipes* subgroup large numbers of females with a cocoon could be caught in the respective periods. This indicates that in this subgroup production of a second cocoon is the rule. The small numbers of ♀ ♀ c occurring after the indicated periods in the respective subgroups, viz. in July for *prativaga*, in August for *pullata* and in September for *fulvipes*, probably concerned females which accidentally had lost their cocoon before the pulli emerged and afterwards produced a new one.

b. Juveniles

Juvenile spiders also occurred at different times during the year in the three subgroups. Generally their numbers decreased strongly during the period of the final moult. In the subgroups *pullata* and *prativaga* juveniles were nearly absent in the samples after the appearance of the first ♀ ♀ c. In the *fulvipes* subgroup, on the other hand, large numbers of juveniles occurred throughout the whole summer.

In the subgroups *pullata* and *fulvipes* juveniles occurred in large numbers in autumn, as well as in spring. However, *prativaga* juveniles scarcely could be found in the autumn samples. This may be caused by the specific behaviour of these juveniles in relation to habitat (see below).

B. Population differences within the subgroups

Table III presents the numbers of juveniles, adult males and females (the last without or with cocoon, indicated with ♀ ♀ and ♀ ♀ c, respectively) per sample.

a. Subgroup *prativaga*

The phenological data of the different populations of the *prativaga* subgroup were

Table II. The number of juveniles, adult males and females (the last without (♀♀) and with (♀♀c) cocoon) per sample, summarized per subgroup for the two years.

	4			5			6			7			8			9			10				
	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III		
subgroup <i>pratibaga</i>																							
juv.	35	32	54	57	26	17	2	1	2	1	2					5	15	5				7	
♂♂	-	-	-	1	19	16	4	1	1	-	-												
♀♀	-	-	-	-	6	19	5	-	2	1	-												
♀♀c	-	-	-	-	-	2	9	9	8	3	2												
subgroup <i>fulvipes</i>																							
juv.	19	16	61	47	58	27	26	24		42	15	38	26		41								63
♂♂	-	-	1	15	33	12	15	5		1	1	-	-		-								
♀♀	-	-	-	13	28	24	31	9		26	15	8	1		9								
♀♀c	-	-	-	-	-	2	23	39		39	31	41	19		13								
subgroup <i>pullata</i>																							
juv.	35	29	27	19	3	3	1	-	1	1	-	4	5		21				44	37	30		33
♂♂	-	4	12	19	12	20	6	3	2	2	-	1	-		-								
♀♀	-	1	6	9	13	12	3	4	4	2	1	2	4		1								
♀♀c	-	-	-	-	6	15	21	15	8	5	9	6	3		3				1				

Table III. The numbers of juveniles, adult males and females (the last without (♀ ♀) and with (♀ ♀ c) cocoon) per sample for each population in 1969 and 1970, respectively; a: subgroup *pratvaga*; b: subgroup *pullata*; c: subgroup *fulvipes*.

subgroup <i>fulvipes</i> population	April			May			June			July			August			September			Oct		
	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I		
S																					
Juv.	16	10	99	67	28	67	28	5	28	36	28	5	28	56	28	49	36	56	72	96	77
♂♂	-	-	7	-	-	6	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-
♀♀	-	-	1	-	-	16	58	5	10	16	58	5	10	42	26	3	8	6	4	4	1
♀♀c	-	-	-	-	-	25	18	36	31	25	18	36	31	50	60	23	50	11	4	4	-
E																					
Juv.	-	27	82	40	35	10	26	46	38	10	26	46	38	5	44	20	3	40	29	48	88
♂♂	-	-	3	24	-	6	8	8	2	6	8	8	2	-	-	2	-	-	-	-	-
♀♀	-	-	11	-	-	17	37	14	21	5	9	36	16	9	36	16	8	9	9	5	3
♀♀c	-	-	-	-	-	44	22	50	35	10	40	43	15	32	10	40	43	15	32	7	-

very similar. Small differences were found between the successive years. In 1970 ♀♀ occurred about 10 days earlier (5''') than in 1969 (6'). In all the populations of the *prativaga* subgroup more adult females occurred after the emergence of the first pulli from the cocoons (July) in 1970 than in 1969. In the former year probably a relatively small proportion of these females produced a second cocoon.

b. Subgroup *fulvipes*

The phenological data are rather similar in the different *fulvipes* populations. In population E adults occurred somewhat earlier (4''') than in population S (5'). In the former females produced their cocoon about ten days ahead of population S (5''' and 6', respectively). These differences existed in both years although they were less conspicuous in 1970 than in 1969.

c. Subgroup *pullata*

The phenological data of the populations of the *pullata* subgroup were rather different from each other, as compared with those of the subgroups *prativaga* and *fulvipes*. This was especially true in 1970. The differences concern the time of the final moult, the length of the egg maturing period, the time of cocoon construction and the length of the period when males occur in the populations. In 1969 the phenological data of the populathions HR, BW and Sch were similar. In population AP both males and females became adult 10—20 days later (4''' and 5', respectively) than in the other populations (4'). In all populations ♀♀ appeared in the same period (5''). Thus the length of the egg maturing period varied from 10 (AP) to 30 days (HR, BW, Sch). The number of males decreased strongly in the beginning of June (6') in the respective populations. This means that the length of the period that males occurred in large numbers in the populations varied from 40 (AP) to 50 days (HR, BW, Sch).

In 1970 the phenological data of population BW were comparable with those in 1969. However, in the other populations the first adults appeared 10—30 days later than in the former one (Sch: 10 days; AP: 20 days; HR: 30 days). Obviously the time of the final moult in 1970 occurred 0—30 days later than that in 1969 in the respective days (BW: 0 days; AP: 0—10 days; Sch: 10 days; HR: 30 days).

Again in 1970 the numbers of males decreased strongly in the same period as in 1969 in all populations (6'). As males became adult rather late in some populations, the length of the period that males occurred in the populations varied in 1970 from 20—50 days (HR: 20 days; AP: 30 days; Sch: 40 days, BW: 50 days).

As opposed to females in population BW, those in the populations HR, Sch and AP constructed their cocoons in 1970 ten days later than in 1969 (5'' and 5''', respectively). Thus the length of the egg maturing period varied in 1970 from 10—30 days (HR: 10 days; BK: 20 days; Sch: 30 days; BW: 30 days).

In 1970, as compared with 1969, the numbers of ♀♀ were larger in the July and August samples. This was especially clear in the population HR. As in the *prativaga* subgroup, more females probably produced a second cocoon in the former year.

From the above data the following conclusions can be drawn. The time of the final moult is variable within the *pullata* subgroup. Variations occur between different populations in one year, as well as in one population between successive years. However, construction of cocoons and disappearance of males from the populations occur about in the same period in all populations in the two successive years. Thus especially the

length of the egg maturing period (10—30 days) as well as the length of the period that males occur in the populations (20—50 days) varies. The later the final moult occurs in spring the shorter both periods are. In this respect the subgroup *pullata* differs clearly from the subgroups *prativaga* and *fulvipes*. The final moult in the latter two subgroups normally occurs in late spring (5', 5''). The length of the egg maturing period in these subgroups (10—20, and 20—30 days, respectively) equals that of the period in those *pullata* populations, in which the final moult also occurs in late spring. The same holds for the period that males occur in the populations in large numbers (*prativaga*: 20 days; *fulvipes*: 20—40 days; *pullata*: 20—50 days).

C. The number of eggs per cocoon

Table IV gives the mean number of eggs per cocoon for the respective populations
 Table IV. The mean number of eggs per cocoon in *P. pullata*. The numbers are given per population (at different times during the breeding season) for 1969 and 1970, respectively (a: subgroup *prativaga*; b: subgroup *pullata*; c: subgroup *fulvipes*).

population	data	number of cocoons	variation	mean number of eggs
a: subgroup <i>prativaga</i>				
VZ	4/6; 15/6-16/6	32, 12	31-72, 27-50	52, 42
BW	2/6-26/6; 28/5- 5/6	33, 24	32-72, 25-70	52, 47
LP	19/6-26/6; 5/6-30/6	20, 16	(32-63)	49, 45
GP	2/6- 9/6; 5/6	10, 13	29-52, 40-70	46, 48
b: subgroup <i>pullata</i>				
HR	4/6; 26/5	27, 18	22-39, 22-40	31, 29
	29/7	18	8-27	18
BW	23/5- 2/6; 22/5	33, 22	23-56, 30-54	37, 39
	28/7; 30/6	11, 13	10-40, 12-39	26, 27
Sch	5/6; 19/6	33, 16	21-44, 14-39	30, 26
	23/7-30/7	18	7-33	19
AP	22/5- 5/6; 26/5	26, 27	22-62, 30-54	44, 41
c: subgroup <i>fulvipes</i>				
S	6/6-13/6; 16/6	26, 36	20-47, 15-49	32, 31
	1/8; 13/7	23, 30	8-29, 9-48	19, 22
	24/8	10	4-16	11
E	6/6-13/6; 16/6	26, 25	24-54, 19-45	33, 31
	13/7	22, 22	10-25, 7-27	17, 18
	1/8; 24/8	10	7-17	12

and the successive years. The egg sacs were taken from samples in June, July and August.

Obviously the largest numbers of eggs per cocoon occurred in the subgroup *prativaga*, the smallest numbers were found in the *fulvipes* subgroup in the cocoons sampled in August. The numbers of eggs in the cocoons of the *pullata* subgroup (sampled in June and July) were slightly higher than in the *fulvipes* subgroup. The numbers in the July egg sacs were about 30—40% lower than those in the June egg sacs. Again 30—40% less eggs were found in the August cocoons than in the July cocoons. Thus it seems likely that in those populations of the *pullata* subgroup in which cocoons can be found during July, these cocoons represent second cocoons. In the same way, cocoons found in the populations of the *fulvipes* subgroup during July and August represent second and third cocoons, respectively.

The mean number of eggs per cocoon differs only little between the two populations of the subgroup *fulvipes*. The differences between the four populations of the subgroup *prativaga* were also small, although some differences existed between the numbers of eggs per cocoon in the successive years, particularly in the population VZ. Rather large differences occurred between the populations of the *pullata* subgroup. The egg sacs in the populations BW and AP contained a larger (30%) number of eggs than those in the populations HR and Sch.

Although the smallest numbers of eggs per cocoon occurred in the *fulvipes* subgroup, these females produced the largest numbers of offspring. All females produced two egg batches and 40% produced a third one. Thus the total number of eggs produced by 100 females amounts to about 5500. In the *prativaga* subgroup the females produced a cocoon only once and the total number of eggs produced by 100 females thus amounts to about 4700. Only 40% of the females in the *pullata* subgroup produced a second cocoon. The total number of eggs produced by 100 females in this subgroup thus amounts to about 4400, the smallest number as compared with that in the subgroups *prativaga* and *fulvipes*.

Concerning these figures, however, it must be taken into account that not all eggs in an egg batch develop to pulli, because parasites may destroy some of the eggs in a cocoon (Kessler, personal communication).

D. Conclusions

The final moult occurs earlier in the *pullata* subgroup (April) than in the subgroups *prativaga* and *fulvipes* (May). However, the time of the final moult is variable within the *pullata* subgroup both between populations and successive years. On the other hand cocoon production, as well as the disappearance of males from the populations, occur in the three subgroups about in the same period (the second half of May and the beginning of June, respectively). As a consequence the length of the egg maturing period, as well as the length of the period that males occur in the populations, is longer and more variable in the *pullata* subgroup than in the subgroups *prativaga* and *fulvipes*. The mean number of eggs per cocoon is largest in the *prativaga* subgroup and smallest in the *fulvipes* subgroup. This number decreases in the successive cocoons which are produced during the breeding season. Rather small differences exist between the successive years. The differences between the populations in the *pullata* subgroup are larger than those in the other subgroups.

On the basis of the occurrence of adult females with and without cocoons, as well as

the numbers of eggs per cocoon at different times during the breeding season, it is concluded that females in the *prativaga* subgroup produce a cocoon only once. Females in the *pullata* subgroup would produce once or twice a cocoon (variable per population and per year). Females in the *fulvipes* subgroup normally produce an egg batch two or three times in succession.

2. Growth of juvenile spiders

In the previous section the assumption was made that females in the subgroup of *prativaga* generally produced a cocoon only once, though in 1970 a minority of the females may have produced a second one. In general a minor part of the females in the *pullata* subgroup produced a cocoon twice, whereas in the subgroup *fulvipes* all females normally produced two cocoons. To obtain more evidence on this point the cephalothorax length of the juveniles from the autumn and spring samples was measured. Graph 1 represents the frequency distributions of the cephalothorax length of juveniles in the respective samples.

It is assumed that every part of a polymodal frequency distribution (when it occurs consistently both in autumn and in spring) will represent juveniles emerging from cocoons produced in different periods of the breeding season. The number of larval instars of the concerned species is unknown. This number is rather variable even at the species level and seems to be dependent on environmental factors (Browning, 1941; Levy, 1970).

Generally, spiders moult three times during the larval stage and five to ten times during the nymphal stage (Holm, 1940; Juberthie, 1955; Vachon, 1957). In this study the successive larval instars as defined by cephalothorax lengths are presented by a graph indicating the number of moults, which will occur before the adult stage is reached (e.g., adults: stage A; subadults: stage A-1 etc.). Subadults in the three subgroups clearly show sexual dimorphism. As the spiders were collected by hand only juveniles of the later larval instars occurred in the samples.

Graph 1 shows that the cephalothorax lengths of juveniles in the corresponding stages are about the same in the three subgroups (stage A-1: 55 MU; stage A-2: 47 MU; stage A-3: 40 MU; stage A-4: 33 MU). Increase in cephalothorax length in the successive instars thus amounted to 7–8 MU. Pulli emerging from the cocoons showed cephalothorax lengths of about 20 MU. Thus it is plausible that the cephalothorax length of stage A-5 juveniles (which were not represented in the samples) amounts to about 26 MU and that pulli emerging from the cocoons correspond to stage A-6 juveniles (20 MU). In all the three subgroups pulli emerging from the cocoons will moult six times before the adult stage is reached.

A. Subgroup *prativaga*

In general juveniles in this subgroup show unimodal cephalothorax lengths in all samples (Graph 1a). This means that these juveniles will have emerged from the cocoons in the same period. In the autumn the juveniles have grown to stage A-2, i.e., four moults occurred after the emergence from the cocoons. These juveniles overwinter. Next spring they moult to subadults and afterwards the final moult occurs.

Especially in the autumn of 1970 small juveniles occurred in the samples from the populations BW and LP. These juveniles may have emerged from second cocoons produced by some females in these populations (see above).

Pulli emerged from the first cocoons in the beginning of July and from the second ones in the beginning of August. During September the juveniles from the first cocoons moult to stage A-2, those from the second cocoons to stage A-3. Thus four moults after emergence from the cocoons take 2—3 months, while three moults take 1—2 months.

B. Subgroup *pullata*

In general the frequency distributions of the cephalothorax length are bimodal (Graph 1b). The respective length classes in the autumn and spring samples represent stage A-2 and stage A-1 (subadult) juveniles. The bimodality of the distributions is very clear in the populations BW and Sch in 1969 and 1970. This suggests that in these populations the juveniles which occurred in autumn emerged from cocoons in different periods of the breeding season (stage A-1 from first cocoons in June, stage A-2 from second cocoons in July). After overwintering stage A-1 juveniles moulted to the adult stage, stage A-2 juveniles moulted to the subadult stage and adult stage, successively.

However, differences exist between the respective populations and between the successive years. In spring 1969 the juveniles of population HR showed uniform cephalothorax lengths (subadult). The same holds for juveniles collected in autumn 1969 and in spring 1970. It may be concluded that in this population, in both the breeding seasons 1968 and 1969, females produced a cocoon only once. On the other hand, in the autumn of 1970 juveniles of two length classes occurred in the samples. Therefore, in this breeding season at least part of the females evidently produced a second cocoon. The same, though to a lesser extent, is true for the population AP.

The last moult of juveniles before overwintering occurs during September in the *pullata* subgroup. Dependent on emergence from first (the middle of June) or second (the end of July) cocoons this moult represents the fifth or fourth moult after the emergence of pulli, respectively. Thus the developmental time from pulli (probably stage A-6) to subadult (stage A-1) takes 3 months, that from pulli (A-6) to stage A-2 juveniles 1—2 months. This means that the duration of the successive larval instars of juveniles in the *pullata* subgroup is shorter than that of juveniles in the subgroup *prativaga*.

C. Subgroup *fulvipes*

The growth of juveniles in the *fulvipes* subgroup is rather more complex. First, juveniles occur during the whole breeding season and secondly, the frequency distributions of cephalothorax lengths are polymodal (Fig. 1c). In late summer and autumn (August-October) three length classes could be clearly distinguished. Most juveniles occurred in the class of the largest cephalothorax lengths (stage A-1, subadult), but also stage A-2 and stage A-3 occurred. In spring juveniles of the same three length classes occurred. In summer (June-August) juveniles of various cephalothorax lengths were found but they could be classed mainly in stage A-2 and stage A-3.

It is suggested that this rather complex picture may result from the fact that females in the *fulvipes* subgroup produce two or three cocoons successively. After the breeding season stage A-3 juveniles appeared in the samples at the end of August. These juveniles will have emerged from first cocoons in the beginning of July. They moult to stage A-2 juveniles in September and in this stage they overwinter. In spring these juveniles moult to subadult (stage A-1) and then to adult. The life history of these juveniles thus

closely corresponds to that of the *prativaga* subgroup. The developmental time from the pulli stage (stage A-6) to the fourth moult afterwards (stage A-2) also amounts to 2—3 months.

However, at the same time stage A-3 juveniles still occurred in September. These juveniles will have emerged from second cocoons around the end of July. They overwinter in stage A-3 and moult to stage A-2 next spring. In this stage they are found during the breeding season. In August moulting to subadult (stage A-1) occurs, then they overwinter for a second time. Next spring the final moult occurs. The developmental time of these juveniles from pulli to the third moult afterwards (stage A-3) amounts to 1—2 months, as was the case in the *prativaga* subgroup.

During May stage A-3 juveniles again appeared in the samples. These juveniles will have emerged from third cocoons (in September). They may have overwintered as stage A-4 juveniles and moulted to stage A-3 in spring. During July and August these juveniles moult once (stage A-2) and again to become subadult (stage A-1). After overwintering the final moult occurs next spring. As a result of this specific life history of pulli emerging from second and third cocoons juveniles occur in the populations throughout the breeding season.

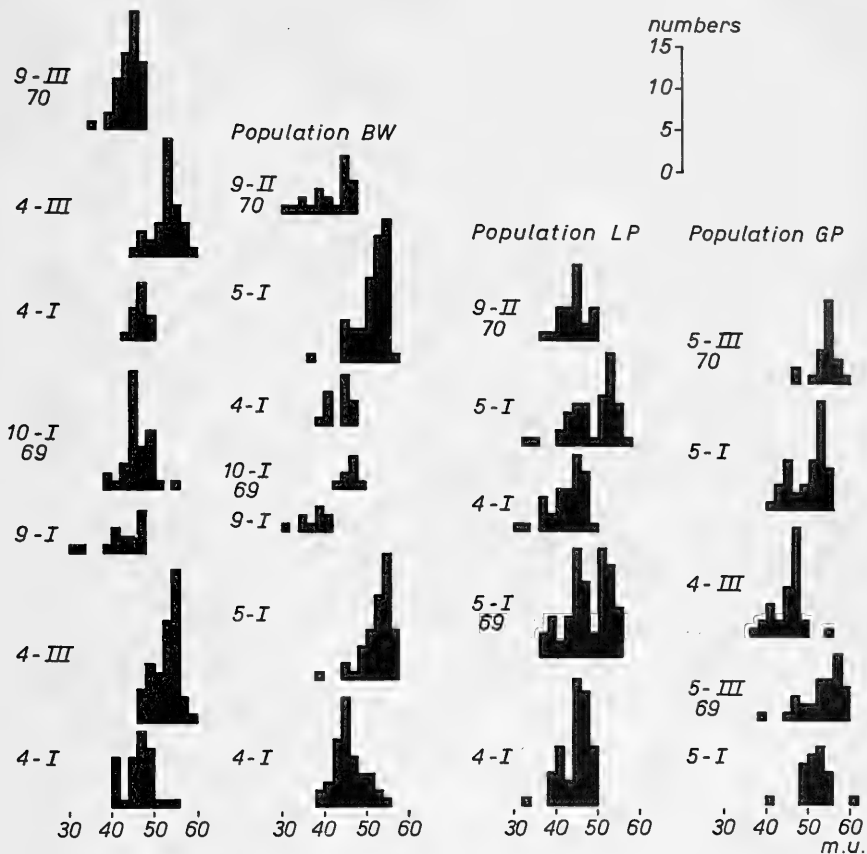
Concerning these juveniles an interesting phenomenon was found in the population E during the breeding season 1970. In June 1970 rather large numbers of subadults (stage A-1) were found which showed the abnormality of excessively large cephalothorax lengths. These lengths even exceeded that of adults. These anomalies may be caused by disturbancy of endocrine processes. A period of low temperatures seems to be essential in controlling the endocrine processes which regulate the final moult in spiders (unpublished results from the department). Probably the chain of these processes was disturbed by the exceptionally warm and sunny weather during October 1969 (about 27° C and 5% above normal, respectively).

The fact, that *fulvipes* juveniles which emerge from second and third cocoons do not moult after the first overwintering, suggests that the developmental stage during which the period of low temperatures occurs is important. The above data show that only when overwintering occurs in the last two instars (stage A-2 and stage A-1) before the adult stage, the final moult takes place next spring.

D. Conclusions

A comparison of the growth of juveniles in the three subgroups gives the following results. The number of larval instars after the emergence of pulli from the cocoons appears to be the same in the three subgroups. However, the duration of the successive larval instars (before overwintering) is shorter in the subgroup *pullata* than in both the subgroups *prativaga* and *fulvipes*. In all three subgroups the last moult before overwintering occurs in September, the first moult after overwintering in April (Graph 2). The stage in which instars overwinter differs between the subgroups. In the subgroup *prativaga* juveniles overwinter in the instar before the subadult stage (stage A-2). Juveniles in the *pullata* subgroup overwinter in stage A-2 as well as in the subadult stage (stage A-1). Juveniles in the subgroup *fulvipes* overwinter in the last four instars (stage A-4, A-3, A-2 and A-1). These differences can be understood as a result of differences in the duration of the successive larval instars as well as in the time of emergence from the cocoons (first, second or third cocoons). The measurements of cephalothorax length of juveniles confirm the conclusions stated in the previous section. Females in the sub-

Population VZ



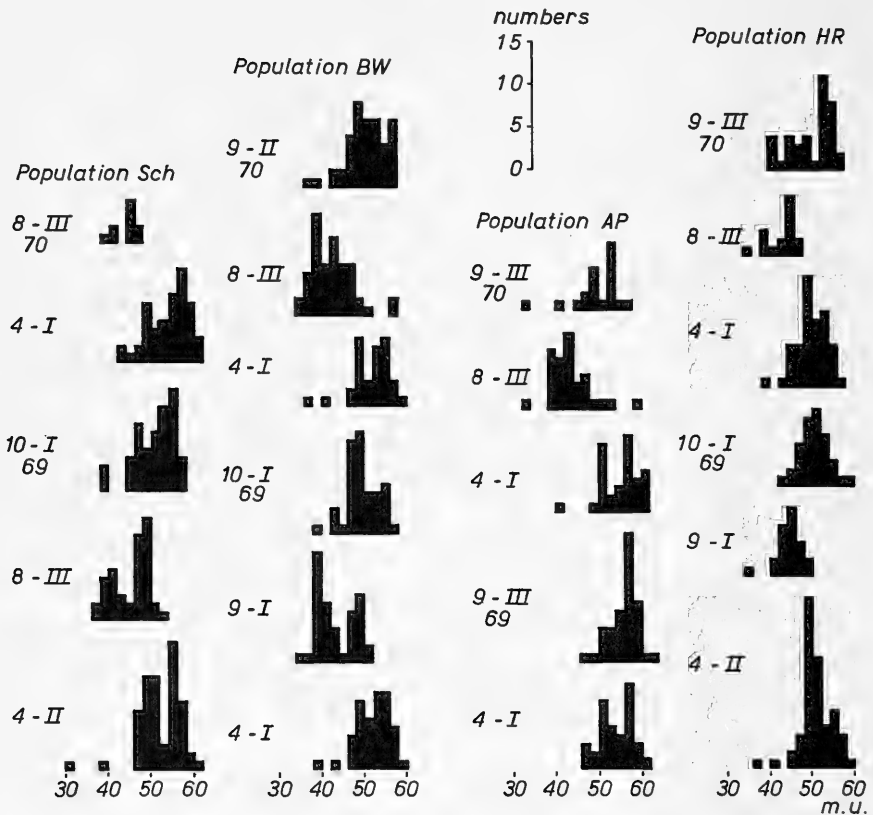
Graph 1a. The frequency distributions of the cephalothorax length of juveniles during the year. Subgroup *prativaga*

group *prativaga* normally produce a cocoon only once. Those in the *pullata* subgroup produce a cocoon once or twice dependent on the population and the year. In the subgroup *fulvipes* females normally produce two cocoons and part of the females produce a third one.

3. The habitats of the studied populations

A. Description

The general features of the habitats of *Pardosa* species have been described e.g. by Dahl (1908), Locket & Millidge (1951) and Wiebes (1959). According to these authors *P. prativaga* occurs in fields and marshy soils with a rather dense growth of high grasses and other plants. *P. pullata* would occur in the same localities but also

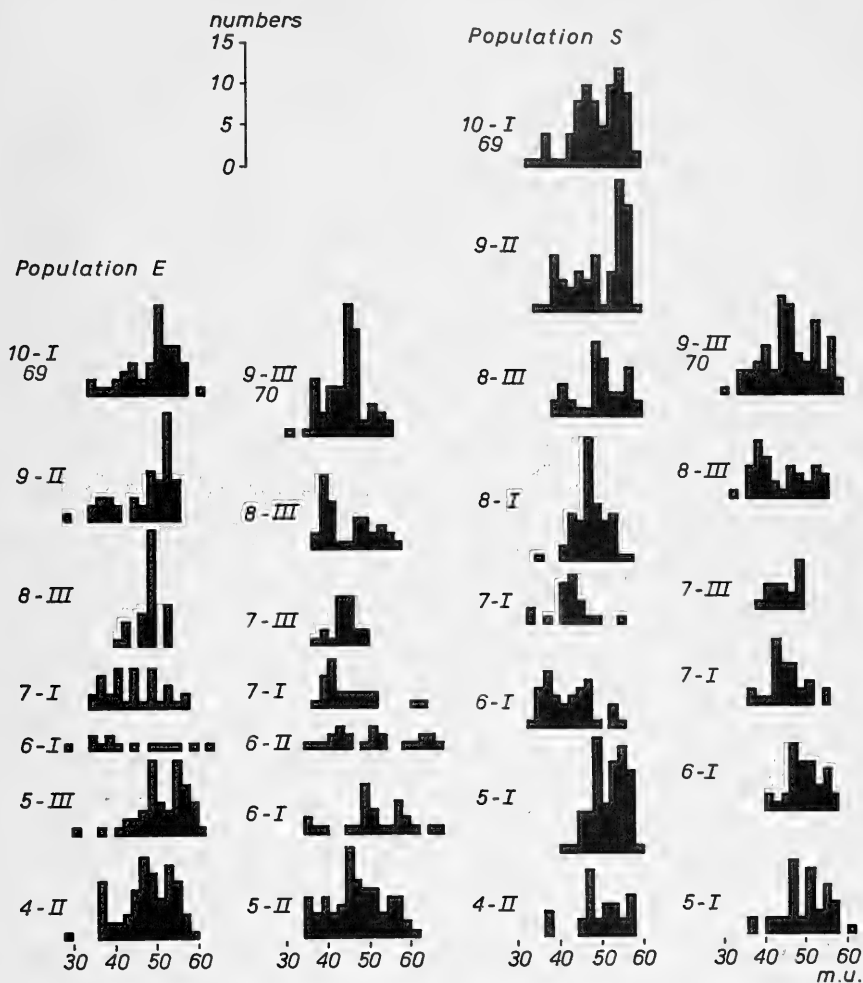


Graph 1b. The frequency distributions of the cephalothorax length of juveniles during the year. Subgroup *pullata*

in more dry places. A densely structured low vegetation, e.g. a moss carpet, will mostly be present. *P. prativaga fulvipes*, as far as we know for the Netherlands, is restricted to fens, grown with *Sphagnum*.

It is evident that the structure of the vegetation influences the temperature in this vegetation. Temperature is important for the life history of spiders, especially for the time of the final moult, the length of the egg maturing period and the development of juveniles (see above, and Jones, 1941). Temperature in the places where the spiders are found depends on weather conditions, exposure of the habitat and the structure of the vegetation. Observations concerning these features have been made during the sampling periods in the populations of the *P. pullata* group (Table 1, on p. 257).

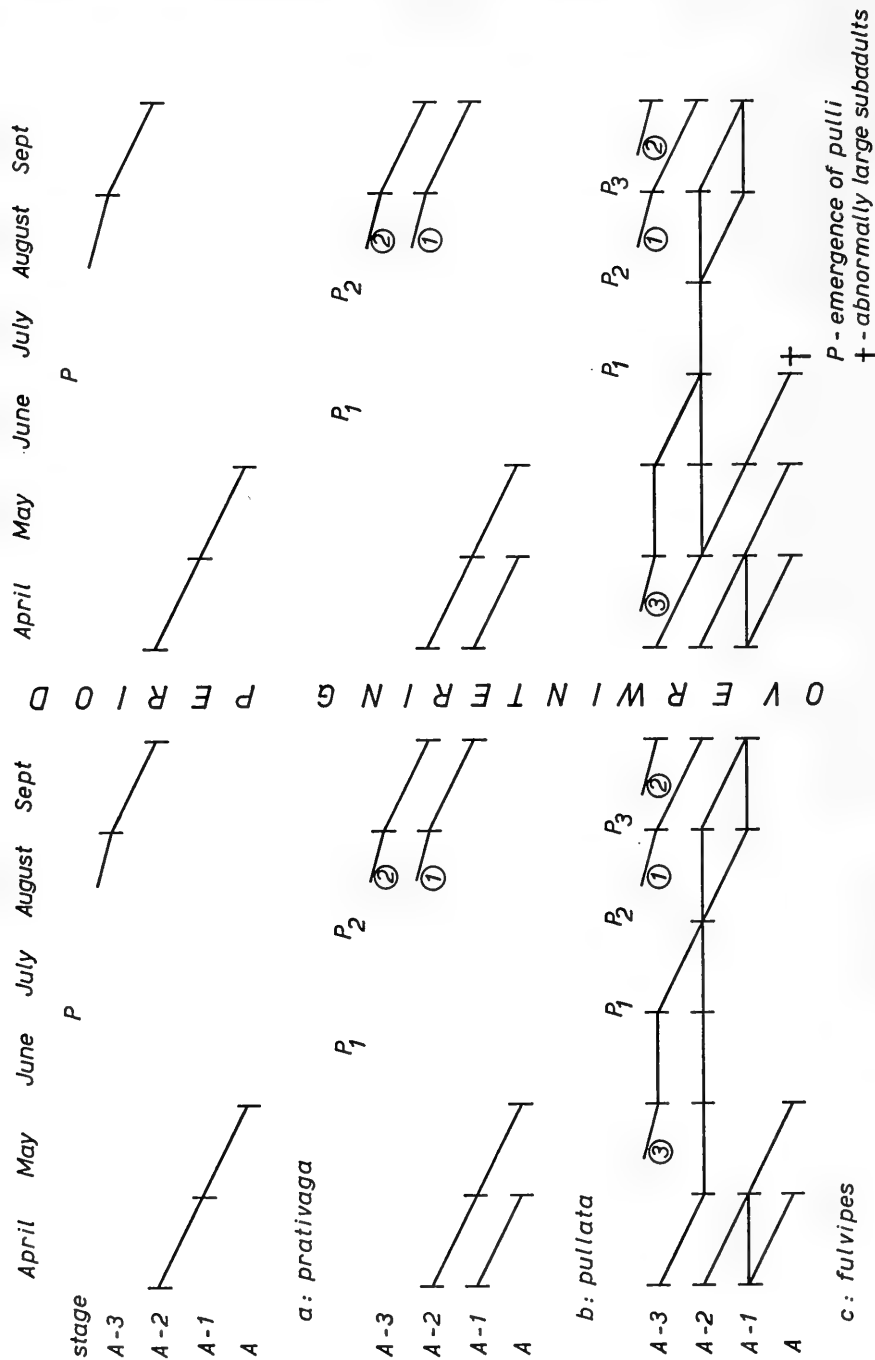
The populations LP, BW and GP occur in marshy valleys on the border of calcareous dunes. The field LP (*prativaga*) is sheltered by high shrubs (*Salix*, *Hippophae* and *Betula*) interspersed with *Calamagrostis* and *Phragmites*. The field GP (*prativaga*) is sheltered only partly by the surrounding shrubs (*Salix*, *Hippophae*, *Phragmites*, *Calamagrostis*). The vegetation of both fields mainly consists of *Salix*, *Hydrocotyle*, *Carex* and



Graph 1c. The frequency distributions of the cephalothorax length of juveniles during the year. Subgroup *fulvipes*

Parnassia. This vegetation is mown yearly. Thus the habitats of both populations consist of a high (more than 70 cm) loosely structured vegetation surrounding a low (10—20 cm) densely grown over habitat. The spiders occurred especially in the transitional area. In spring juveniles were found mainly on the mown field. In autumn both adults and juveniles occurred in the surrounding shrubs.

The field BW (*pratavaga*, *pullata*) also is yearly mown. It is surrounded by trees and shrubs (*Betula*). The vegetation consists of *Lysimachia*, *Hydrocotyle*, *Carex* and moss (*Polytrichum*). In spring this vegetation is rather low (10 cm) and interspersed with bare ground. In summer the *Lysimachia* has grown up to 40 cm, and thus a loosely structured vegetation occurs. The spiders were found all over the mown field.



Graph 2. Schematic representation of the phenology in the *Pardosa pullata* group. a, subgroup *prativaga*; b, subgroup *pullata*; c, subgroup *fulvipes*

The above mentioned habitats are very wet during spring and autumn. The population VZ (*prativaga*) occurs in a rather dry area throughout the year. This area is situated on the border of dunes and arable land and is surrounded by trees (*Fagus*, *Quercus*, *Populus*). The vegetation consists of *Carex*, *Calamagrostis*, *Urtica* and *Cirsium*. In spring juveniles mainly occurred on the flattened grass. Adults and, in autumn, juveniles could be found in the loosely structured *Urtica* and *Cirsium* vegetation (height up to 40 cm).

The population Sch (*pullata*) occurs in a marshy dune meadow sheltered by shrubs and trees (*Alnus*). This yearly mown field is densely grown with *Hydrocotyle*, *Carex*, *Festuca* and moss carpets of *Polytrichum* and *Sphagnum* (15 cm). Especially in spring, autumn and winter this area is very wet; the spiders occurred throughout the area.

The population HR (*pullata*) occurs in a rather dry area surrounded by trees (*Pinus*). The area is densely grown with a moss carpet (*Polytrichum*) (10 cm) interspersed with tussocks of *Festuca* and *Calluna*.

The population AP (*pullata*) occurs in a yearly mown marshy area grown over with a moss carpet (*Polytrichum*, *Sphagnum*: 10 cm), *Carex*, *Iris*, *Hydrocotyle* and *Juncus* (30 cm). The area is very wet throughout the year. It is rather exposed in that it is not surrounded by trees and shrubs. As in the populations Sch and HR, both juveniles and adults occurred throughout the area.

Both the populations E and S (*fulvipes*) occur in fens sheltered by trees (*Pinus*, *Larix* and *Betula*). The vegetation of both areas consists of a moss carpet (*Sphagnum*, 10 cm) interspersed with tussocks of *Eriophorum* and *Erica*. The field in which population E occurs is more dry with more and larger tussocks of *Eriophorum* (40 cm) than the field of population S. The spiders occurred throughout the field both in the moss carpet and in the tussocks of *Eriophorum*.

B. Conclusions

These data show that in general the habitats of the populations of the *P. pullata* group are wet fields sheltered by trees and shrubs. However, differences in soil moisture occur. The *fulvipes* populations (E and S) are found in the wettest habitats. Differences between the species exist in the structure of the habitat and in the behaviour of the spiders in the vegetation.

Populations of the *prativaga* subgroup (LP, BW, GP, VZ) occur in loosely structured, rather high vegetation with transitional areas. Adults remain low in the vegetation and motionless at low temperatures (ground temperature less than 15° C). With sunny, warm weather they walk through and over the plants. Juveniles (stage A-2 and stage A-1) show high locomotory activity in spring throughout the still undifferentiated vegetation. In autumn they (stage A-2) stay mainly in the dry layers of litter.

Populations of the *pullata* subgroup (BW, Sch, AP, HR) occur in densely structured, rather low vegetations, generally also including moss carpets. At low temperatures (less than 10° C) the spiders remain motionless in small spaces inside the vegetation. During warm, sunny weather they leave these spaces and walk upon the vegetation layer. Differences in behaviour in relation to the habitat are slight between juveniles (both in spring and in autumn) and adults.

The occurrence of populations of the *fulvipes* subgroup (E and S) is restricted to fens grown with a *Sphagnum* carpet. However, they occur in the densely structured moss carpet as well as in the loose tussocks of *Eriophorum*. The behaviour of the

Table V. Summary of the general differences and similarities between the studied subgroups of the *P. pullata* group.

	<i>pratvaga</i>	<i>pullata</i>	<i>fulvipes</i>
Subgroup			
final moult	5''	4''—4''' (5'')	5'
cocoon production	6'	5''	6'
egg maturing period	20 days	10—30 days	30 days
maximal numbers of ♂♂ and ♀♀	5'''	5'—5'''	5'—5'''
copulation period	May	May	May
maximal numbers of ♀♀c	6'''—7'	6'''—6'''	6'''—7'
emergence of first pulli	June	June	June
cocoon carrying period	20—30 days	30—40 days	20—30 days
length of reproduction cycle	50—60 days	45—75 days	60—70 days
number of cocoons	1	1 à 2	2 à 3
mean number of eggs per cocoon	40 à 50	30 à 40 (first roc) 20 à 30 (sec. coc)	30 (first cocoon) 20 (second cocoon) 10 (third cocoon)
variation			
number of juvenile stages	small 6	large 6	small 6
mean ceph. length of the respective juvenile stages (MU)		20 (pulli), 26, 33, 40, 47, 55 (subadult)	
mean ceph. length of adults (MU) ♂♂ ♀♀	60—65 60—70	60—65 60—65	55—60 55—60
juv. stages in October	stage A-2	A-2, A-1	A-4, A-3, A-2, A-1
juv. stages in January	stage A-2	A-2, A-1	A-4, A-3, A-2, A-1
juv. stages in April	stage A-2, A-1	A-2, A-1	A-3, A-2, A-1
juv. stages in July	stage —	—	A-3, A-2

spiders of this subgroup in relation to habitat structure is comparable with that of the *pullata* subgroup (moss carpet) as well as with that of the *prativaga* subgroup (*Eriophorum* tussocks). However, under unfavourable weather conditions adults and especially juveniles show higher locomotory activity throughout the year than both *pullata* and *prativaga*.

IV. GENERAL CONCLUSIONS AND DISCUSSION

The results with respect to the phenology of the species of the *P. pullata* group are summarized in Table V. These results agree very well with the data given by Dahl (1908), Palmgren (1939), Wiebes (1959) and Vlijm & Kessler-Geschiere (1967). Generally the final moult occurs in spring (April, May) in the three subgroups of the *P. pullata* group. During May the numbers of males and females are highest, indicating that the period of copulation then occurs. At the end of May and the beginning of June the females produce their cocoons. In the same period the males disappear from the populations. Pulli emerge from the cocoons at the end of June and the beginning of July. They moult six times before the adult stage is reached. Between every moult, until the subadult stage is reached, the juveniles grow about 0.3 mm in cephalothorax length from 0.84 mm in the pulli stage to 2.31 mm in the subadult stage. The cephalothorax length of adult males and females is different in the three subgroups (Den Hollander, 1970).

Some differences in phenology exist between the three subgroups of the *P. pullata* group (Table V). These differences mainly concern the period in which the final moult occurs and the growth of juveniles in relation to the period in which they emerge from the cocoons. In general both males and females of the *pullata* subgroup moult to adult earlier in spring (about 20 days) than those of the subgroup *fulvipes*; in the subgroup *prativaga* the final moult occurs about 10 days later than in the subgroup *fulvipes*. However, cocoon production occurs at about the same time in the three subgroups (second half of May). Thus the egg maturing period, measured from the moment in which the first adult females can be found till the moment in which the first females produce a cocoon, is longer in the *pullata* subgroup than in both other subgroups.

Even when the final moult occurs later, as happens in some populations in the *pullata* subgroup in some years, the females produce their cocoons at about the same time. Thus dependent on the period in which the final moult occurs the length of the egg maturing period varies in the *pullata* subgroup from 10 to 30 days (*prativaga*: 10—20, *fulvipes*: 20—30 days). The cocoon carrying period is longer in the subgroup *pullata* than in both other subgroups (30—40 days and 20—30 days, respectively). This means that the period between the appearance of the first adults and the emergence of the first pulli from the cocoons (i.e. one reproduction cycle) is different in the three subgroups. Generally this period is shortest in the *prativaga* subgroup (50—60 days). In the subgroup *fulvipes* this period lasts 60—70 days. The reproduction cycle is short (45 days) or long (75 days) in the subgroup *pullata*, dependent on the time of the final moult (the later the final moult occurs, the shorter this period lasts). Adult males disappear from the populations in the beginning of June in the three subgroups. Because subadult males moult to adult earlier in the *pullata* subgroup than in the other subgroups; the length of the period that males occur in the populations, is longest in this subgroup, but is variable in relation to the time of the final moult. In the *prativaga*

subgroup this period normally is shorter than that in both other subgroups. Richter c.s. (1971) also found that, under laboratory conditions, the reproduction cycle of *P. prativaga* was shorter than that of *P. pullata*. Because the number of eggs in cocoons of *prativaga* is larger than in *pullata*, *P. prativaga* produces a larger number of offspring in a shorter period than *P. pullata*. Richter c.s. (1971) discussed these results in the context of the abundance of the habitats and the use of the habitats by the two species. *P. prativaga* should occur in rather specific habitats and this species might make a stenotopic use of its habitat. This means that *P. prativaga* may be considered as a stenotopic species, *P. pullata* on the other hand would be an eurytopic species. However, *P. prativaga* var. *fulvipes* can be found only in fens with a *Sphagnum* carpet (Dahl, 1908; Holm & Kronestedt, 1970). Thus it may be considered a very stenotopic species. Nevertheless, the first reproduction cycle is longer than that in the subgroup *prativaga* and the egg sacs contain considerably less eggs. The length of its reproduction cycle may even be longer than that in the subgroup *pullata* and the number of eggs per cocoon is slightly lower than that in the *pullata* subgroup. Moreover, the mentioned laboratory experiments have not shown the variable length of the reproduction cycle in the *pullata* subgroup which sometimes even may be as short as that in the subgroup *prativaga*. However, in this context the microclimatic conditions of the habitat used by the respective species may be important.

Generally, the populations of the *P. pullata* group occur in two types of habitats. These habitats are characterized by a loosely structured, rather high (50 cm) vegetation on the one hand (*prativaga*) and a densely structured, rather low (15 cm) vegetation on the other hand (*pullata*, *fulvipes*). As a consequence of these different structures the characteristics of the microclimate vary between these habitats (Geiger, 1961). In the high vegetation a rather stable microclimate occurs. This microclimate is stabilized with regard to macroclimate at slightly lower temperatures and higher humidities. The microclimate in the low vegetation is very unstable. At sunny, calm weather both temperature and humidity of the microclimate are higher than those of the macroclimate. However, these conditions change quickly when wind velocity increases and the weather is clouded. Especially in spring the microclimate in the low vegetation is unstable because weather conditions vary in that time to a large extent. Thus, in the high vegetation a rather moderate stabilized microclimate occurs. On the contrary, in the low vegetation extreme conditions occur, dependent on the weather.

These microclimatological features may relate to the phenological characteristics of the species. The instability of the microclimate in the habitat of the populations of the subgroup *pullata* (low vegetation) may be related to the variations in the period in which the final moult occurs, both between populations and between the successive years. Inter-population variation of phenological data was larger in 1970 than in 1969. In addition, in most populations the final moult occurred later in 1970 than in 1969. Indeed, weather during the spring was very different in these years. In April 1970 there was 26% less sunshine than in 1969. Probably, the differences in the period of the final moult between the respective populations of the *pullata* subgroup are caused by differences in the structure of their habitats.

The microclimate in the habitat of the populations of the subgroup *prativaga* (high vegetation) is rather stable. Indeed, the final moult occurred very synchronized in the respective populations and in the same period in the successive years. The habitat of the populations of the *fulvipes* subgroup is to some extent intermediate between that of the

pratīvaga subgroup and that of the *pullata* subgroup. Both high and low vegetations occur in this habitat. Although the number of populations studied is too small for a clear conclusion, the final moult in the *fulvipes* subgroup seems to be less synchronized than that in the *pratīvaga* subgroup, but more synchronized than that in the *pullata* subgroup.

As most phenological characteristics relate to the period in which the final moult occurs, they are influenced by the microclimatological characteristics. Thus it seems plausible that variations in phenological characters of the species in the *P. pullata* group are related to the type of habitat in which they occur.

In this context the growth of juveniles is important. In the *pratīvaga* subgroup pulli emerge from the cocoons in the beginning of July only. They grow and overwinter as stage A-2 juveniles. Next spring they moult to subadult and adult (Graph 2a).

In the *pullata* subgroup pulli emerge from the cocoons in the second half of June (first cocoon) and in the second half of July (second cocoon), these juveniles overwinter as stage A-1 juveniles (first cocoon) and stage A-2 juveniles (second cocoon). (Graph 2b).

In the *fulvipes* subgroup females produce three cocoons in succession. Pulli emerge from these cocoons in the beginning of July (first cocoon), the beginning of August (second cocoon) and in the beginning of September (third cocoon), respectively. The juveniles which have emerged from the first cocoons grow to the adult stage as juveniles in the subgroup *pratīvaga* do. Those which have emerged from the second and third cocoons, however, overwinter twice before the final moult occurs. The first overwintering occurs during stage A-3 and stage A-4 for juveniles emerged from the second and third cocoons, respectively. The second overwintering takes place during stage A-1 (subadult) for both categories of juveniles (Graph 2c).

These results show that only juveniles which overwinter during the last two instars before the adult stage moult to adults next spring. Laboratory experiments (unpublished results) have shown that a period of low temperatures is necessary to induce the final moult. The present results show that such an induction only can occur during the last two instars before the final moult. Probably endocrine processes have to be started by a period of low temperatures during this developmental stage (Eckert, 1967; Streble, 1966). When these processes have been started the juveniles moult once or twice in succession to become adult during spring. In the other case they moult only once and occur in this stage in the populations during the summer. However, juveniles in the *pullata* subgroup normally moult to adult earlier in spring than juveniles in both other subgroups. Probably an external factor induces the time of the final moult. Temperature may be this factor. If this is true, then it may be concluded that the final moult in the *pullata* subgroup is already induced at lower temperatures than in the subgroup *pratīvaga* and *fulvipes*.

The numbers of eggs produced per female are rather similar in the three subgroups (*pratīvaga*: 47; *pullata*: 44, *fulvipes*: 55). However, this number is produced in the *pratīvaga* subgroup in one egg batch, whereas in the *pullata* subgroup this number is produced partly in two egg batches and in the *fulvipes* subgroup in three egg batches. This phenomenon may represent a mechanism of spreading of the risk (Den Boer, 1968). The habitat of *P. pratīvaga* var. *fulvipes* is very unstable, that of *P. pratīvaga* is rather stable. Thus *P. pratīvaga* var. *fulvipes* produces the total number of eggs in

three periods, *P. prativaga* in one period. The stability of the habitat of *P. pullata* is about intermediate: the total number of eggs is produced in one or two periods.

Using the classification of Southwood (1962) and Johnson (1969), Richter (1970) mentioned the habitat of *P. pullata* as abundant with intermediate stability. The habitat of *P. prativaga* would be rare and unstable. The same seems to be true for *P. prativaga fulvipes* to a larger extent. However, no clear relations seem to exist between the total number of eggs produced per female, in one, two or three egg batches, and the abundance and stability of the habitat.

The above mentioned results also may be discussed in the context of the classification of the species in the *P. pullata* group. Dahl (1908), Simon (1932), Wiebes (1959), Tongiorgi (1966) and Holm & Kronstedt (1970) describe various species and subspecies within the *P. pullata* group. This division is mainly based on small differences in the structure of the external genital organs, the annulation and spinosity of the legs and the size and colour of the specimens. However, Den Hollander (1970) has shown that some of these characters vary to a rather large extent, both within and between populations of the same species (*P. pullata*, *P. prativaga* and *P. prativaga* var. *fulvipes*). He also suggests the occurrence of hybridization in mixed populations of *P. pullata* and *P. prativaga*. Indeed, under laboratory conditions, intermediate specimens have been obtained from males of *P. prativaga* and females of *P. pullata* (Den Hollander, in preparation). Thus the distinction between the various species and subspecies of the *P. pullata* group seems to be rather doubtful. Indeed, the phenological differences between the species studied by me are rather small. Rather large variations could be shown between populations of the same species (*P. pullata*). Probably the phenological differences as well as the variation of phenological characteristics may relate to specific characteristics of the habitats used by the respective species.

On the other hand, various species of the *P. pullata* group occur in mixed populations. In France mixed populations of *P. pullata* and *P. prativaga*, *P. pullata* and *P. femoralis*, and of *P. prativaga* and *P. femoralis* have been observed. In the Netherlands mixed populations of *P. prativaga* and *P. pullata*, and of *P. pullata* and *P. prativaga* var. *fulvipes* occur (Den Hollander, 1970, and unpublished results). Thus the differences between the species may also result from a differential use of the habitat by the respective species. The evolution of the *P. pullata* group seems to be such that various species have originated which at present can be mainly separated only by their ecological characteristics. The development of morphological, ethological and physiological differences seems to be in progress (ecological speciation, Grant, 1963).

It should, however, also be mentioned that populations of the *P. pullata* group may have been isolated geographically from each other, e.g. during ice-ages. During this time of isolation characters may have been acquired which promote or guarantee reproductive isolation when the external barriers break down (Mayr, 1942). In the case of the *P. pullata* group, the development of these characters may be, as yet, incomplete.

Whatever the mechanisms of speciation (ecological or geographical) may have been, the various species have been adapted to special types of habitat. As a consequence, isolating characters have been evolved.

Further studies concerning these problems are necessary for further evaluation of the relations between the species of the *P. pullata* group.

The occurrence of hybridization between closely related species in mixed populations may be prevented by several mechanisms (Mayr, 1969). Mating between males and

females of different species, may be prevented by seasonal or habitat isolation, ethological isolation and mechanical isolation. The results of the present study deal with the occurrence of seasonal isolation in mixed populations of *P. prativaga* and *P. pullata*. Preliminary laboratory experiments have shown that ethological and mechanical barriers do not exist between males of *P. prativaga* and females of *P. pullata*. Ethological barriers seem to prevent mating of males of *P. pullata* with females of *P. prativaga* (cf. Den Hollander, in preparation).

The results of this phenological study have shown that males of *P. pullata* and receptive females of *P. prativaga* normally occur together in mixed populations. The reversed combination of males and females does not occur. Thus in mixed populations the species *P. prativaga* is isolated from the species *P. pullata*, partly by seasonal barriers and partly by ethological barriers. However, the seasonal barriers can be broken down by cold weather during spring. Then the final moult in *P. pullata* is postponed and males of *P. prativaga* occur together in the populations with receptive females of *P. pullata*. Generally, the two species use a different type of habitat. Indeed, even in mixed populations they seem to use different parts of the habitat. However, this is especially true for females carrying cocoons, while females without cocoons, i.e., receptive females, as well as males seem to use the habitat less differentially (Den Hollander & Lof, in preparation). These results show that habitat isolation, seasonal isolation, as well as ethological isolation, exist between the species concerned but that each of these barriers seems to be incomplete. Thus hybridization in mixed populations between males of *P. prativaga* and females of *P. pullata* may occur when, because of the weather conditions in spring, the final moult in *P. pullata* is postponed till the beginning of May.

Postscript. According to Mr. Kronstedt who kindly studied a number of specimens of each of the investigated populations, the form *P. prativaga* var. *fulvipes* (Collett, 1875) correctly should be named *P. sphagnicola* (Dahl, 1908). (Holm & Kronstedt, 1970).

V. SUMMARY

1. Ten populations of the *Pardosa pullata* group (*P. prativaga*: 4; *P. prativaga* var. *fulvipes*: 2; *P. pullata*: 4) were sampled once every ten days from April till September in 1969 and 1970.

2. The numbers of juveniles, adult males and females (the last with and without cocoon) in every sample were established. The length of the cephalothorax of the juveniles in every sample was measured. On the basis of these data the phenology of the species of the *P. pullata* group was studied:

3. Generally the final moult occurs earlier in spring in *P. pullata*, than in both *P. prativaga* and *P. prativaga* var. *fulvipes*. However, the time of the final moult varies in *P. pullata* per population and per year.

4. First cocoon production occurs in about the same period in the studied populations in both years.

5. In *P. prativaga* females normally produce a cocoon only once; in *P. pullata* they produce a cocoon once or twice, and in *P. prativaga* var. *fulvipes* the females produce two or three cocoons in succession.

6. The development of juveniles from pulli to the adult stage is somewhat different in the different species.

7. The numbers of eggs per cocoon in *P. prativaga* are larger than those in both *P. pullata* and *P. prativaga* var. *fulvipes*. When females produce two or more cocoons in succession, the number of eggs per cocoon is about 40% lower in each following egg batch.

8. The differences in the period in which the final moult occurs in populations of the *P. pullata* group are discussed in the context of microclimatological characteristics of the habitat.

9. As yet, no clear relationships seem to exist between the total number of eggs produced per female, in one, two or three egg batches, and the abundance and stability of the habitats.

10. The phenological data have been discussed in the context of the classification of the *P. pullata* group as well as in the context of the possibility of the occurrence of hybridization in mixed populations.

VI. ACKNOWLEDGEMENTS

I am deeply indebted to Prof. Dr. L. Vlijm for his valuable criticism during the investigation and the preparation of the manuscript, to Mr. G. W. H. van den Berg for drawing the graphs and to Miss M. J. Diesbergen for typing the manuscript.

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REGISTER VAN DEEL 114

- * Een sterretje duidt een naam aan nieuw voor de wetenschap.
- * An asterisk denotes a name new to science.
- ** Twee sterretjes duiden de naam aan van een voor de Nederlandse fauna nieuwe soort.
- ** Two asterisks denote the name of a species new to the Netherlands fauna.

Uit dit register zijn weggelaten de namen van Odonata, voorkomende in: „A catalogue of the type-specimens of Odonata ...” etc., pp. 65-139 van dit deel.

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