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INHOUD (*CONTENTS*)

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INHOUD *CONTENTS*

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ANNOTATED CHECKLIST OF HEMIPTERA-HETEROPTERA OF THE NETHERLANDS[1][2]

by

BEREND AUKEMA

ABSTRACT

Aukema, B., 1989. Annotated checklist of Hemiptera-Heteroptera of The Netherlands. – Tijdschrift voor Entomologie 132: 1-104, figs. 1-120, tab. 1. [ISSN 0040-7496]. Published 3 July 1989.

A list of 586 species of Heteroptera recorded from The Netherlands is presented. Local distribution is indicated by data on the presence in the twelve Dutch provinces, while for new, rare and endangered species the records are included in more detail. Eighteen species are recorded for the first time from The Netherlands: *Deraeocoris flavilinea* (Costa), *Tytthus geminus* (Flor), *Brachyarthrum limitatum* Fieber, *Criocoris sulcicornis* (Kirschbaum), *Reuteria marqueti* Puton, *Heterocordylus genistae* (Scopoli), *Lygus adspersus* (Schilling), *Lygus wagneri* Remane, *Lygocoris populi* Leston, *Capsus pilifer* Remane, *Capsodes sulcatus* (Fieber) and *Trigonotylus caelestialium* (Kirkaldy) (Miridae), *Temnostethus longirostris* (Horváth) and *Scoloposcelis pulchella* (Zetterstedt) (Anthocoridae), *Coranus woodroffei* Putshkov (Reduviidae), *Kleidocerys privignis* (Horváth), *K. truncatulus ericae* (Horváth) and *Scolopostethus pseudograndis* Wagner (Lygaeidae). *Kleidocerys privignis* is new for Western Europe.

Key words. – Heteroptera; checklist; faunistics; distribution maps.

Berend Aukema, Pomona 66, Wageningen, The Netherlands.

INTRODUCTION

Between 1853 and 1951 five editions of a checklist of Dutch Heteroptera appeared (De Graaf & Snellen van Vollenhoven 1853, De Graaf, Six & Snellen van Vollenhoven 1860, Snellen van Vollenhoven 1868-1878a, 1878, Fokker 1883-1899 and Reclaire 1932-1951). Because the last supplement to the list of Reclaire was published in 1951 there was a growing need for a new updated list.

Reclaire (1932-1951) listed a total of 514 species from The Netherlands. In the present, sixth list, 586 species are included. Fourteen species of the list of Reclaire are omitted, because they are either considered incidentally introduced (*Stephanitis pyrioides* (Scott), *Pinthaeus sanguinipes* (Fabricius) and *Rhaphigaster nebulosa* (Poda)), misidentified (*Sigara venusta* (Douglas & Scott), *Velia rivulorum* (Fabricius), *Chartoscirta geminata* (Costa), *Orthonotus cylindricollis* (Costa), *Phytocoris juniperi* Frey-Gessner, *Xylocoris parvulus* (Reuter), *Piesma capitatum* (Wolff) and *Rhopalus rufus* Schilling), or sunk as synonyms (*Monosynamma nigritulum* (Zetterstedt), *Orthocephalus ferrarii* Reuter and *Neides favosus* Fieber). On the other hand *Microvelia pygmaea* (Dufour), *Saldula palustris* (Douglas), *Amblytylus brevicollis* Fieber and *Eurydema ventralis* Kult had to be added, because their origin and/or identity, questionable at the time, could be established. Furthermore, two taxa previously included as varieties have been raised to specific status, viz. *Drymus ryeii* Douglas & Scott and *Megalonotus sabulicola* (Thomson).

The specimens of *Coranus tuberculifer* Reuter recorded by Blöte (1954, as f. nov. spec.) belong to *C. woodroffei* Putshkov.

Callicorixa wollastoni (Douglas & Scott), *Eurycolpus flaveolus* Stål, *Phytocoris hirsutulus* Flor, *Peritrechus distingendus* (Flor), *Stictopleurus crassicornis* (Linnaeus), *Sciocoris umbrinus* (Wolff), *Sehirus dubius* (Scopoli) and *Geotomus punctulatus* (Costa) are listed erroneously for The Netherlands by Stichel (1955-1962).

The recording of *Callicorixa producta* (Reuter) from The Netherlands (Polderman & Van der Velde 1971) was due to misidentification of immature specimens of *Callicorixa praeusta* (Fieber); Jansson (1986) included *Micronecta griseola* Hor-

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[1] Dedicated to the memory of R. H. Cobben, the well-known Dutch Hemipterist, who died at 7 December 1987.

[2] Mededeling EIS-Nederland, nr. 41.

váth erroneously as a Dutch species by misinterpreting a locality label (Nieser, in litt.).

Cremnocephalus alpestris Wagner was caught in Flevoland (7.viii.1982, 1 male, B. van Aartsen, coll. Museum Amsterdam), but for the present it has to be considered a casual introduction since it was caught far away from its natural habitat (pine forest).

Thus the number of real additions to the list since 1951 is no less than 80 species (16%). The following 18 species are recorded here for the first time from The Netherlands:
Miridae: *Deraeocoris flavilinea* (Costa), *Tytthus geminus* (Flor), *Brachyarthrum limitatum* Fieber, *Criocoris sulcicornis* (Kirschbaum), *Reuteria marqueti* Puton, *Heterocordylus genistae* (Scopoli), *Lygus adspersus* (Schilling), *Lygus wagneri* Remane, *Lygocoris populi* Leston, *Capsus pilifer* Remane, *Capsodes sulcatus* (Fieber), *Trigonotylus caelestialium* (Kirkaldy); Anthocoridae: *Temnostethus longirostris* (Horváth), *Scoloposcelis pulchella* (Zetterstedt); Reduviidae: *Coranus woodroffei* Putshkov; Lygaeidae: *Kleidocerys privignus* (Horváth), *Kleidocerys truncatulus ericae* (Horváth) and *Scolopostethus pseudograndis* Wagner. [Two additional species are recorded in an addendum].

Kleidocerys privignis, thusfar only known from Bulgaria and Southern Russia (Stichel 1957-1962; Josifov 1986) is new for Western Europe.

Nomenclature and sequence of taxa above subfamily level are according to Štys & Kerzhner (1975) and Štys & Jansson (1988). Below family level in general the sequence of Southwood & Leston (1964) is followed, with the exception of Corixidae (Jansson 1986), Tingidae (Péricart 1983), Nabidae (Péricart 1987), Anthocoridae and Cimicidae (Péricart 1972), Lygaeidae (Slater 1964, 1964a), Berytidae (Péricart 1984) and Rhopalidae (Göllner-Scheiding 1983), which are arranged according to the given references. Nomenclature of Miridae and Lygaeidae in general is according to the world catalogues of Carvalho (1957-1960) and Slater (1964) respectively, with regard to grammar corrections of Steyskal (1973, 1973a). Within (sub)genera the species are arranged in alphabetical order. All species are sequentially numbered throughout. Species with an asterisk (*) before their number are treated with the same number under Remarks.

Since the biological and phenological information given by Reclaire (1932) is still very valuable, the changes in names used are listed below to keep his work accessible. The species numbers used by Reclaire are those of the catalogue of Oshanin (1912).

The present list:	Reclaire (1932):
2 *Pachycoleus waltli*	3236 *Pachycoleus rufescens*
8 *Cymatia bonsdorffii*	3475 *Cymatia bonsdorffi*
10 *Glaenocorisa propinqua*	3472 *Glaenocorisa cavifrons*
16 *Corixa punctata*	3405 *Corixa geoffroyi*
17-20 *Hesperocorixa*	3424-3425 *Arctocorisa*
	3441-3442 *Arctocorisa*
18 *Hesperocorixa linnaei*	3425 *Arctocorisa linnei*
21 *Paracorixa concinna*	3468 *Callicorixa concinna*
22-35 *Sigara*	3413-3423 *Arctocorisa*
	3430-3438 *Arctocorisa*
	3443-3446 *Arctocorisa*
23 *Sigara stagnalis*	3413 *Arctocorisa lugubris*
24 *Sigara hellensii*	3423 *Arctocorisa hellensi*
25 *Sigara nigrolineata*	3446 *Arctocorisa fabricii*
35 *Sigara lateralis*	3419 *Arctocorisa hieroglyphica*
36 *Ilyocoris cimicoides*	3364 *Naucoris cimicoides*
38 *Aphelocheirus aestivalis*	3354 *Aphelochirus aestivalis*
43 *Notonecta obliqua*	3400 *Notonecta furcata*
51 *Velia caprai*	3281 *Velia rivulorum*
	3283 *Velia currens*
55 *Microvelia reticulata*	3279 *Microvelia schneideri*
59 *Gerris lateralis*	3256 *Gerris asper*
62-63 *Aquarius*	3245-47 *Gerris*

64 *Limnoporus rufoscutellatus*	3244 *Gerris rufoscutellatus*
69 *Halosalda lateralis*	3298 *Haldosalda lateralis*
70-80 *Saldula*	3309-3330 *Acanthia*
85 *Campylosteira verna*	1445 *Campylostira verna*
92 *Acalypta platycheila*	1466 *Acalypta platychila*
95 *Kalama tricornis*	1489 *Dictyonota tricornis*
107-109 *Physatocheila*	1602-1604 *Physatochila*
109 *Physatocheila smreczynskii*	1604 *Physatocheila quadrimaculata*
111-113 *Dictyla*	1615-22 *Monanthia*
111 *Dictyla convergens*	1620 *Monanthia humuli*
113 *Dictyla humuli*	1618 *Monanthia symphyti*
114 *Agramma laetum*	1642 *Serenthia laeta*
115-117 *Loricula*	2140-2144 *Microphysa*
120 *Myrmedobia exilis*	2148 *Myrmedobia tenella*
124-125 *Deraeocoris*	2444-2446 *Camptobrochis*
135 *Lopus decolor*	2824 *Onychumenus decolor*
138 *Conostethus griseus*	2857 *Conostethus salinus*
147 *Macrotylus paykulii*	2941 *Macrotylus paykulli*
149 *Orthonotus rufifrons*	2956 *Byrsoptera rufifrons*
151-152 *Tytthus*	2629-2630 *Cyrtorrhinus*
157 *Plesiodema pinetella*	2972 *Plesiodema pinetellum*
167 *Psallus confusus*	3017 *Psallus diminutus*
170 *Psallus haematodes*	3030 *Psallus roseus*
173 *Psallus salicis*	3012 *Psallus alnicola*
176 *Compsidolon salicellus*	3034 *Psallus salicellus*
177 *Phoenicocoris obscurellus*	2987 *Psallus obscurellus*
182 *Plagiognathus litoralis*	3095 *Plagiognathus fusciloris*
192-194 *Monosynamma*	3130 *Microsynamma*
195 *Campylomma annulicorne*	3137 *Campylomma annulicornis*
192 *Monosynamma bohemanni*	3130 *Microsynamma bohemani*
199 *Salicarus roseri*	3157 *Sthenarus roseri*
200 *Sthenarus rotermundi*	3160 *Sthenarus rottermundi*
202 *Hallodapus rufescens*	2563 *Allodapus rufescens*
210 *Dicyphus pallicornis*	2548 *Dicyphus pallidicornis*
225 *Orthocephalus coriaceus*	2755 *Orthocephalus mutabilis*
229 *Fieberocapsus flaveolus*	2631 *Cyrtorrhinus flaveolus*
230 *Cyllecoris histrionicus*	2605 *Cyllocoris histrionicus*
231 *Dryophilocoris flavoquadrimaculatus*	2607 *Cyllocoris flavoquadrimaculatus*
233 *Globiceps fulvicollis cruciatus*	2621 *Globiceps cruciatus*
239 *Heterotoma planicornis*	2687 *Heterotoma meriopterum*
241 *Blepharidopterus diaphanus*	2654 *Orthotylus diaphanus*
257 *Pseudoloxops coccineus*	2686 *Pseudoloxops coccinea*
258 *Cyrtorhinus caricis*	2628 *Cyrtorrhinus caricis*
259 *Neomecomma bilineatum*	2639 *Orthotylus bilineatus*
270-272 *Orthops*	2403-2405 *Lygus*
272 *Orthops kalmii*	2405 *Lygus kalmi*
273-276 *Pinalitus*	2387-2396 *Lygus*
279-286 *Lygocoris*	2364-75 *Lygus*
287 *Agnocoris reclairei*	2409 *Lygus rubicundus*
289 *Camptozygum aequale*	2414 *Camptozygum pinastri*
290-294 *Polymerus*	2424-2428 *Poeciloscytus*
295 *Charagochilus gyllenhalii*	2436 *Charagochilus gyllenhali*
298 *Miris striatus*	2342 *Pycnopterna striata*
299 *Hadrodemus m-flavum*	2339 *Homodemus M-flavum*
302 *Calocoris striatellus*	2281 *Calocoris ochromelas*

331-332 *Capsodes*	2480-2483 *Lopus*
334 *Acetropis gimmerthalii*	2492 *Acetropis gimmerthali*
335 *Stenodema calcarata*	2495 *Stenodema calcaratum*
336 *Stenodema trispinosa*	2496 *Stenodema trispinosum*
337 *Stenodema holsata*	2507 *Stenodema holsatum*
338 *Stenodema laevigata*	2503 *Stenodema laevigatum*
340 *Notostira elongata*	2510 *Notostira erratica*
341 *Megaloceraea recticornis*	2512 *Megaloceroea linearis*
349 *Leptopterna dolabrata*	2524 *Miris dolobratus*
350 *Leptopterna ferrugata*	2525 *Miris ferrugatus*
353 *Himacerus apterus*	2006 *Nabis apterus*
354 *Aptus mirmicoides*	2007 *Nabis lativentris*
355 *Anaptus major*	2010 *Nabis major*
356 *Stalia boops*	2012 *Nabis boops*
357 *Nabicula lineata*	2017 *Nabis lineatus*
358 *Nabicula limbata*	2016 *Nabis limbatus*
359 *Nabicula flavomarginata*	2019 *Nabis flavomarginatus*
372 *Anthocoris gallarumulmi*	2072 *Anthocoris gallarum-ulmi*
384 *Orius niger*	2090 *Triphleps nigra*
386 *Orius majusculus*	2095 *Triphleps majuscula*
387 *Orius minutus*	2096 *Triphleps minuta*
389 *Lyctocoris campestris*	2105 *Lyctocorus campestris*
390-392 *Xylocoris*	2110-2118 *Piezostethus*
395 *Dufouriellus ater*	2135 *Xylocoris ater*
402-404 *Empicoris*	1738-1744 *Ploiariola*
407 *Rhynocoris annulatus*	1933 *Rhinocoris iracundus*
417 *Piesma maculatum*	1423 *Piesma maculata*
418 *Piesma quadratum*	1424 *Piesma quadrata*
420-425 *Berytinus*	1393-1409 *Berytus*
427 *Gampsocoris punctipes*	1421 *Metacanthus punctipes*
429 *Lygaeus equestris*	874 *Spilostethus equestris*
431 *Nysius helveticus*	920 *Nysius lineatus*
435 *Ortholomus punctipennis*	925 *Nysius punctipennis*
438 *Kleidocerys resedae*	937 *Ischnorhynchus resedae*
439 *Kleidocerys truncatulus ericae*	938 *Ischnorhynchus ericae*
440 *Cymus aurescens*	934 *Cymus obliquus*
450 *Tropidophlebia costalis*	1038 *Camptotelus lineolatus*
456 *Drymus latus*	1337 *Drymus confusus*
468 *Lamproplax picea*	1346 *Drymus piceus*
462 *Eremocoris abietis*	1352 *Eremocoris erraticus*
465 *Gastrodes abietum*	1386 *Gastrodes abietis*
466 *Gastrodes grossipes*	1387 *Gastrodes ferrugineus*
482 *Stygnocoris sabulosus*	1199 *Stygnocoris pedestris*
483 *Pachybrachius fracticollis*	1075 *Pamera fracticollis*
484 *Pachybrachius luridus*	1078 *Pamera lurida*
485 *Aellopus atratus*	1232 *Microtoma atrata*
487 *Graptopeltus lynceus*	1257 *Aphanus lynceus*
490 *Peritrechus lundii*	1214 *Peritrechus sylvestris*
492-493 *Rhyparochromus*	1279-1280 *Aphanus*
494 *Raglius alboacuminatus*	1276 *Aphanus alboacuminatus*
495 *Xantochilus quadratus*	1266 *Aphanus quadratus*
496-500 *Megalonotus*	1099-1113 *Rhyparochromus*
502 *Aphanus rolandri*	1245 *Calyptonotus rolandri*
508 *Pterotmetus staphiliniformis*	1139 *Pterotmetus staphylinoides*
513-514 *Dicranocephalus*	765-768 *Stenocephalus*

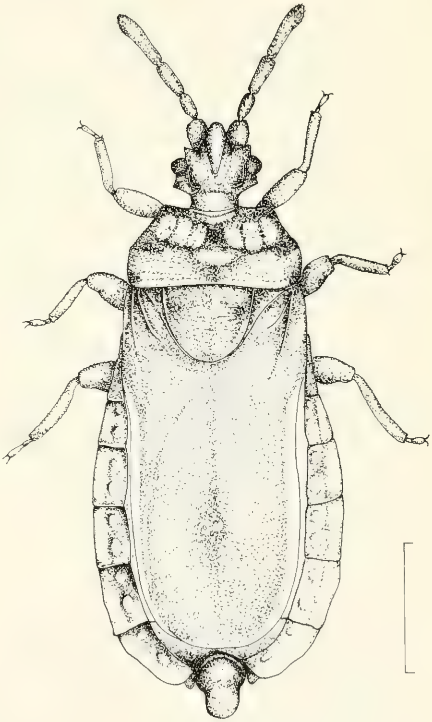
517 *Enoplops scapha*	703 *Coreus scapha*
518 *Coreus marginatus*	708 *Syromastus marginatus*
519 *Syromastus rhombeus*	696 *Verlusia rhombea*
520 *Spathocera dahlmannii*	725 *Spathocera dalmani*
521 *Arenocoris fallenii*	735 *Pseudophloeus falleni*
522 *Arenocoris waltlii*	737 *Pseudophloeus waltli*
528 *Corizus hyoscyami*	806 *Therapha hyosciami*
529-531 *Rhopalus*	812-815 *Corizus*
536 *Legnotus limbosus*	46 *Gnatoconus albomarginatus*
537 *Legnotus picipes*	47 *Gnatoconus picipes*
542 *Aethus flavicornis*	20 *Cydnus flavicorne*
544 *Cydnus aterrimus*	39 *Brachypelta aterrimus*
547 *Odontoscelis lineola*	112 *Odontoscelis dorsalis*
552 *Graphosoma lineatum*	255 *Graphosoma italicum*
558 *Eysarcoris aeneus*	383 *Eusarcoris aeneus*
559 *Eysarcoris fabricii*	385 *Eusarcoris melanocephalus*
561-562 *Holcostethus*	416-419 *Peribalis*
574 *Eurydema ventralis*	492 *Eurydema ornatum*

For all species the presence or absence in the 12 Dutch provinces (fig. 1) is given. Questionable records are indicated by a question mark. For rare, new or endangered species (the species marked with an asterisk (*) before their number) distributional data are treated in more detail under Remarks. In that section details on relevant literature, synonymy, published records, unpublished records and present status are given. Furthermore, distribution maps (figs. 2-120) are given for most species treated here (open circles: recorded before 1930; small dots: recorded between 1930 and 1960; large dots: recorded since 1960; question marks: doubtful records). Only records verified by the author are included. Unless otherwise stated, the material mentioned is deposited in the collection of the collector. Collections are indicated by their abbreviations.

Material of the following Dutch collections is included:

Museums and institutes: Zoologisch Museum, Amsterdam (ZMA); Rijksmuseum van Natuurlijke Historie, Leiden (RML); Vakgroep Entomologie, Landbouwuniversiteit, Wageningen (LUW); Fries Natuurhistorisch Museum, Leeuwarden (FNM); Natuurhistorisch Museum, Maastricht (NMM); Rijksinstituut voor Natuurbeheer, Arnhem (RINA); Biologisch Station, Wijster (BSW); Afdeling Bestrijding van Dierplagen, Ministerie van VROM, Wageningen (ABW); Plantenziektenkundige Dienst Wageningen (PDW); Delta Instituut, Yerseke (DI).

Private collections: B. van Aartsen, 't Harde (AA); B. Aukema, Wageningen (AU); J. Beernink, Zaandam (BE); K. den Bieman, Bennekom (BI); R.



416. *Aneurus laevis*. Scale: 1 mm.

H. Cobben (CB); C. Dolleman, Arnhem (D), Th. Heijerman, Wageningen (HE), D. J. Hermes, Geldrop (HS); R. Ph. Jansen, Amsterdam (JA); G. Morseld, Rheden (M); N. Nieser, Tiel (N); P. Poot, Maastricht (P); H. Vallenduuk, Lelystad (VA); J. H. Woudstra, Zaandam (W).

J. G. M. Cuppen (Vakgroep Hydrobiologie, Landbouwuniversiteit, Wageningen), H. Mosterdijk (Technologische Dienst Zeeuwse Waterschappen (ZW), Terneuzen) and N. Nieser, Tilburg, supplied many data for the Nepomorpha and Gerromorpha sections and the latter allowed the use of data from the files of the Dutch section of the European Invertebrate Survey, Leiden (marked !EIS in the "Remarks" section).

The reference section gives a complete list of works containing records on Dutch Heteroptera published since 1950. Publications not referred to in the text are marked with an asterisk.

Fig. 1. Division of The Netherlands in 12 provinces. FR: Friesland; GR: Groningen; DR: Drenthe; OV: Overijssel; FL: Flevoland; GL: Gelderland; UT: Utrecht; NH: Noord-Holland; ZH: Zuid-Holland; ZE: Zeeland; NB: Noord-Brabant; LB: Limburg.

CHECKLIST

No.	Taxon	FR	GR	DR	OV	FL	GL	UT	NH	ZH	ZE	NB	LB
	DIPSOCOROMORPHA												
	DIPSOCOROIDEA												
	Dipsocoridae												
	Ceratocombus Signoret												
1	coleoptratus (Zetterstedt)	●	–	●	–	●	●	●	●	●	–	–	●
	Pachycoleus Fieber												
*2	waltli Fieber	–	–	–	–	–	–	–	–	–	–	–	●
	NEPOMORPHA												
	NEPOIDEA												
	Nepidae												
	Nepinae												
	Nepa Linnaeus												
3	cinerea Linnaeus	●	●	●	●	●	●	●	●	●	●	●	●
	Ranatrinae												
	Ranatra Fabricius												
4	linearis (Linnaeus)	●	●	●	●	●	●	●	●	●	●	●	●
	CORIXOIDEA												
	Corixidae												
	Micronectinae												
	Micronecta Kirkaldy												
	subgenus Dichaetonecta Hutchinson												
*5	scholtzi (Fieber)	–	–	–	●	–	●	●	–	●	●	●	●
	subgenus Micronecta s.s.												
*6	minutissima (Linnaeus)	–	●	●	●	–	●	●	–	●	●	●	●
*7	poweri (Douglas & Scott)	–	–	–	●	–	●	–	–	–	–	●	–
	Cymatiainae												
	Cymatia Flor												
8	bonsdorffii (Sahlberg)	●	–	●	●	–	●	●	●	●	–	●	●
9	coleoptrata (Fabricius)	●	●	●	●	●	●	●	●	●	●	●	●
	Corixinae												
	Glaenocorisa Thomson												
10	propinqua propinqua (Fieber)	●	–	●	●	–	●	●	–	–	–	●	●

		FR	GR	DR	OV	FL	GL	UT	NH	ZH	ZE	NB	LB
	Arctocorisa Wallengren												
11	germari (Fieber)	●	–	●	–	●	●	●	●	●	●	●	●
	Callicorixa White												
12	praeusta praeusta (Fieber)	●	●	●	●	●	●	●	●	●	●	●	●
	Corixa Geoffroy												
13	affinis Leach	●	●	–	–	–	–	–	●	●	●	●	–
14	dentipes (Thomson)	●	–	●	●	–	●	●	●	●	–	●	●
15	panzeri (Fieber)	●	–	●	●	●	●	●	●	●	●	●	–
16	punctata (Illiger)	●	●	●	●	●	●	●	●	●	●	●	●
	Hesperocorixa Kirkaldy												
17	castanea (Thomson)	●	–	●	●	–	●	●	●	–	●	●	●
18	linnaei (Fieber)	●	●	●	●	●	●	●	●	●	●	●	●
19	moesta (Fieber)	●	–	–	–	–	–	–	●	●	●	●	–
20	sahlbergi (Fieber)	●	●	●	●	●	●	●	●	●	●	●	●
	Paracorixa Poisson												
21	concinna concinna (Fieber)	●	●	●	●	●	●	●	●	●	●	●	–
	Sigara Fabricius												
	subgenus Halicorixa Walton												
*22	selecta (Fieber)	●	–	–	–	–	–	–	–	●	●	–	–
23	stagnalis stagnalis (Leach)	●	–	–	–	●	–	–	●	●	●	●	–
	subgenus Microsigara Poisson												
*24	hellensii (Sahlberg)	–	–	–	–	–	●	–	–	–	–	●	●
	subgenus Pseudovermicorixa Jaczewski												
25	nigrolineata nigrolineata (Fieber)	●	–	●	●	●	●	●	●	●	●	●	●
	subgenus Retrocorixa Walton												
26	limitata limitata (Fieber)	●	–	●	●	●	●	●	●	–	●	●	●
27	semistriata (Fieber)	●	●	●	●	●	●	●	●	●	●	●	●
	subgenus Sigara s.s.												
28	striata (Linnaeus)	●	●	●	●	●	●	●	●	●	●	●	●
	subgenus Subsigara Stichel												
29	distincta (Fieber)	●	●	●	●	●	●	●	●	●	●	●	●
30	falleni (Fieber)	●	●	●	●	●	●	●	●	●	●	●	●
31	fossarum (Leach)	●	–	●	●	–	●	●	●	●	●	●	●
*32	iactans Jansson	–	●	–	–	–	–	–	–	–	–	–	–
*33	longipalis (Sahlberg)	–	●	●	●	–	–	●	–	–	–	●	–
34	scotti (Fieber)	●	●	●	●	–	●	●	●	–	●	●	●
	subgenus Vermicorixa Walton												
35	lateralis (Leach)	●	●	●	●	●	●	●	●	●	●	●	●

NAUCOROIDEA

Naucoridae

Naucorinae

		FR	GR	DR	OV	FL	GL	UT	NH	ZH	ZE	NB	LB
	Ilyocoris Stål												
36	cimicoides (Linnaeus)	●	●	●	●	●	●	●	●	●	●	●	●

		FR	GR	DR	OV	FL	GL	UT	NH	ZH	ZE	NB	LB
	Naucoris Geoffroy												
*37	maculatus Fabricius	–	–	–	–	–	–	●	–	●	–	●	–
	Aphelocheiridae												
	Aphelocheirus Westwood												
*38	aestivalis (Fabricius)	–	–	–	●	–	–	–	–	–	–	●	●
	NOTONECTOIDEA												
	Notonectidae												
	Notonectinae												
	Notonecta Linnaeus												
39	glauca glauca Linnaeus	●	●	●	●	●	●	●	●	●	●	●	●
40	lutea Müller	●	●	●	●	●	●	●	●	●	–	●	●
41	maculata Fabricius	●	●	●	●	–	●	●	●	–	–	●	●
42	viridis Delcourt	●	–	●	●	●	●	●	●	●	●	●	●
43	obliqua Thunberg	●	●	●	●	–	●	●	●	●	●	●	●
*44	reuteri Hungerford	●	–	●	●	–	●	–	–	–	–	–	–
	PLEOIDEA												
	Pleidae												
	Plea Leach												
45	minutissima Leach	●	●	●	●	●	●	●	●	●	●	●	●

GERROMORPHA

		FR	GR	DR	OV	FL	GL	UT	NH	ZH	ZE	NB	LB
	MESOVELIOIDEA												
	Mesoveliidae												
	Mesovelia Mulsant & Rey												
46	furcata Mulsant & Rey	●	–	●	●	–	●	●	●	●	●	●	●
	HEBROIDEA												
	Hebridae												
	Hebrus Curtis												
	subgenus Hebrus s.s.												
47	pusillus (Fallén)	●	●	●	●	●	●	●	●	●	●	●	●
	subgenus Hebrusella Poisson												
48	ruficeps (Thomson)	●	●	●	●	●	●	●	●	●	●	●	●
	HYDROMETROIDEA												
	Hydrometridae												

		FR	GR	DR	OV	FL	GL	UT	NH	ZH	ZE	NB	LB
	Hydrometra Latreille												
49	gracilenta Horvth	–	●	●	●	–	●	●	●	●	–	●	●
50	stagnorum (Linnaeus)	●	●	●	●	●	●	●	●	●	●	●	●
GERROIDEA													
Veliidae													
	Veliinae												
	Velia Latreille												
	subgenus Plesiovelia Tamanini												
51	caprai Tamanini	●	–	●	●	●	●	●	●	●	●	●	●
*52	saulii Tamanini	–	–	–	–	–	●	–	–	–	–	–	●
	Microveliinae												
	Microvelia Westwood												
*53	buenoi Drake	–	–	–	●	–	●	●	●	●	–	●	●
*54	pygmaea (Dufour)	–	–	–	–	–	–	–	–	–	–	●	●
55	reticulata (Burmeister)	●	●	●	●	●	●	●	●	●	●	●	●
Gerridae													
	Gerrinae												
	Gerris Fabricius												
56	argentatus Schummel	–	●	●	●	●	●	●	●	●	●	●	●
57	gibbifer Schummel	●	–	●	●	–	●	●	●	●	–	●	●
58	lacustris (Linnaeus)	●	●	●	●	●	●	●	●	●	●	●	●
*59	lateralis Schummel	–	–	–	●	–	●	–	–	–	–	●	●
60	odontogaster (Zetterstedt)	●	●	●	●	●	●	●	●	●	●	●	●
61	thoracicus Schummel	●	●	●	●	●	●	●	●	●	●	●	●
	Aquarius Schellenberg												
62	najas (De Geer)	–	●	●	●	–	●	●	●	●	–	●	●
63	paludum (Fabricius)	–	–	–	–	–	●	–	●	–	●	●	●
	Limnoporus Stål												
64	rufoscutellatus (Latreille)	●	–	●	●	–	●	●	●	●	●	●	●
LEPTOPODOMORPHA													
LEPTOPODOIDEA													
Saldidae													
	Chiloxanthinae												
	Chiloxanthus Reuter												
65	pilosus (Fallén)	●	●	–	–	–	–	–	●	–	●	●	–

		FR	GR	DR	OV	FL	GL	UT	NH	ZH	ZE	NB	LB
	Saldinae												
	Saldini												
	Salda Fabricius												
66	littoralis (Linnaeus)	●	●	●	●	●	–	●	●	●	●	●	–
*67	morio (Zetterstedt)	–	–	–	●	–	–	–	–	–	–	–	–
*68	muelleri (Gmelin)	●	–	–	–	–	–	–	–	–	●	–	–
	Chartoscirtini												
	Halosalda Reuter												
69	lateralis (Fallén)	●	●	–	–	●	–	–	●	●	●	●	–
	Saldula Van Duzee												
	subgenus Macrosaldula Southwood & Leston												
*70	scotica (Curtis)	–	–	–	–	–	●	–	–	–	–	●	●
	subgenus Saldula s.s.												
*71	arenicola (Scholtz)	●	–	●	●	–	●	●	●	–	–	–	●
*72	c-album (Fieber)	–	–	–	–	–	–	–	–	–	–	–	●
*73	fucicola (Sahlberg)	–	–	–	●	●	●	●	●	–	–	●	●
*74	melanoscela (Fieber)	●	●	–	–	–	●	–	–	–	–	–	●
*75	opacula (Zetterstedt)	●	–	●	●	–	●	●	●	●	–	–	●
76	orthochila (Fieber)	●	–	●	●	●	●	●	●	●	–	●	●
77	pallipes (Fabricius)	●	–	●	●	●	●	●	●	●	●	●	●
*78	palustris (Douglas)	●	●	–	●	–	–	–	●	●	●	●	–
79	pilosella (Thomson)	●	●	●	●	●	●	●	●	●	●	●	–
80	saltatoria (Linnaeus)	●	●	●	●	●	●	●	●	●	●	●	●
	Micracanthia Reuter												
*81	marginalis (Fallén)	●	–	–	–	–	●	–	–	–	–	●	●
	Chartoscirta Stål												
82	cincta (Herrich-Schffer)	●	●	●	●	●	●	●	●	●	●	●	●
83	cocksii (Curtis)	●	–	●	●	–	●	●	●	●	●	●	●
*84	elegantula (Fallén)	–	–	–	–	–	–	–	●	–	–	–	●

CIMICOMORPHA

TINGOIDEA

Tingidae

		FR	GR	DR	OV	FL	GL	UT	NH	ZH	ZE	NB	LB
	Tinginae												
	Campylosteira Fieber												
85	verna (Fallén)	–	–	–	–	–	●	●	●	–	–	–	●
	Acalypta Westwood												
86	carinata (Panzer)	–	–	●	–	–	–	●	●	–	–	●	●
87	gracilis (Fieber)	–	–	–	–	–	–	–	●	●	●	–	–
*88	marginata (Wolff)	–	–	–	–	–	●	●	●	–	–	–	●
*89	musci (Schrank)	–	–	–	–	–	–	–	–	–	–	–	●

		FR	GR	DR	OV	FL	GL	UT	NH	ZH	ZE	NB	LB
*90	nigrina (Fallén)	–	–	●	–	–	●	●	●	–	–	–	–
91	parvula (Fallén)	●	–	●	–	●	●	●	●	●	–	●	●
*92	platycheila (Fieber)	●	–	●	–	–	●	–	–	–	–	–	–
	Dictyonota Curtis												
93	fuliginosa (Costa)	–	–	●	●	–	●	●	●	–	–	●	●
94	strichnocera (Fieber)	–	–	–	–	–	●	●	●	–	–	●	●
	Kalama Puton												
95	tricornis (Schrank)	●	–	–	–	–	●	●	●	●	●	●	●
	Derephysia Spinola												
	subgenus Derephysia s.s.												
96	foliacea (Fallén)	●	–	●	●	–	●	●	●	●	●	●	●
	Galeatus Curtis												
*97	maculatus (Herrich-Schäffer)	–	–	–	–	–	●	–	–	–	–	–	–
	Stephanitis Stål												
98	oberti (Kolenati)	–	–	●	–	–	●	●	●	–	–	–	●
99	rhododendri Horváth	–	–	–	–	–	●	●	●	●	–	●	–
	Lasiacantha Stål												
*100	capucina (Germar)	–	–	–	–	–	–	–	–	–	–	–	●
	Tingis Fabricius												
	subgenus Tropidocheila Fieber												
*101	reticulata (Herrich-Schäffer)	–	–	–	–	–	●	–	●	●	–	●	–
	subgenus Neolasiotropis Wagner												
*102	pilosa Hummel	–	–	–	–	–	–	–	–	●	–	–	●
	subgenus Tingis s.s.												
103	ampliata (Herrich-Schäffer)	●	●	●	●	●	●	●	●	–	●	●	●
104	cardui (Linnaeus)	●	●	●	●	●	●	●	●	●	●	●	●
*105	crispata (Herrich-Schäffer)	–	–	–	–	–	–	–	–	–	–	●	●
	Catoplatus Spinola												
106	fabricii (Stål)	–	–	–	●	–	●	●	–	–	●	●	●
	Physatocheila Fieber												
*107	costata (Fabricius)	–	–	–	–	–	–	–	–	–	–	–	●
*108	dumetorum (Herrich-Schäffer)	–	–	–	–	–	●	●	●	●	●	–	●
*109	smreczynskii (China)	●	●	●	●	–	●	●	●	–	–	●	●
	Oncochila Stål												
*110	simplex (Herrich-Schäffer)	–	–	–	–	–	●	–	–	–	–	–	●
	Dictyla Stål												
111	convergens (Herrich-Schäffer)	●	–	●	●	–	●	●	●	●	●	●	●
112	echii (Schrank)	–	–	–	–	–	●	–	●	●	–	–	●
113	humuli (Fabricius)	●	–	–	–	–	●	●	●	●	●	●	–
	Agramma Stephens												
114	laetum (Fallén)	●	–	●	–	–	●	●	●	●	●	●	●

MIROIDEA

Microphysidae

		FR	GR	DR	OV	FL	GL	UT	NH	ZH	ZE	NB	LB
	Loricula Curtis												
115	bipunctata (Perris)	●	–	●	●	–	●	●	●	●	●	●	●
116	elegantula (Bärensprung)	●	●	●	●	–	●	●	●	●	●	●	●
117	pselaphiformis Curtis	●	–	●	●	–	●	●	●	●	●	–	●
	Myrmedobia Bärensprung												
118	coleoptrata (Fallén)	●	–	●	●	–	●	●	●	●	–	●	●
*119	distinguenda Reuter	–	–	–	–	–	●	–	–	–	–	–	–
120	exilis (Fallén)	●	–	●	●	–	●	●	●	●	–	–	●

Miridae

		FR	GR	DR	OV	FL	GL	UT	NH	ZH	ZE	NB	LB
	Bryocorinae												
	Bryocorini												
	Monalocoris Dahlbom												
121	filicis (Linnaeus)	●	●	●	●	–	●	●	●	●	●	●	●
	Bryocoris Fallén												
122	pteridis (Fallén)	●	●	●	●	–	●	–	●	●	●	●	●
	Deraeocorinae												
	Clivinematini												
	Bothynotus Fieber												
*123	pilosus (Boheman)	–	–	–	–	–	●	●	–	–	–	●	●
	Deraeocorini												
	Deraeocoris Kirschbaum												
	subgenus Camptobrochis Fieber												
124	lutescens (Schilling)	●	–	●	●	–	●	●	●	●	●	●	●
*125	punctulatus (Fallén)	–	–	–	–	–	●	●	●	●	●	●	●
	subgenus Deraeocoris s.s.												
*126	annulipes (Herrich-Schäffer)	●	–	●	●	–	●	–	●	–	–	●	●
127	cordiger (Hahn)	–	–	●	●	–	●	●	●	–	●	●	●
*128	flavilinea (Costa)	–	–	–	–	–	●	–	–	–	–	–	–
129	olivaceus (Fabricius)	–	–	–	●	–	●	●	●	–	●	●	●
130	ruber (Linnaeus)	●	●	–	●	●	●	●	●	●	●	●	●
*131	scutellaris (Fabricius)	–	–	●	●	–	●	–	–	–	–	–	●
132	trifasciatus (Linnaeus)	–	–	●	●	–	●	●	●	–	–	●	●
	Alloeotomus Fieber												
133	germanicus Wagner	●	–	–	●	–	●	●	●	●	–	●	●
134	gothicus (Fallén)	●	–	●	●	–	●	●	●	●	–	●	●

		FR	GR	DR	OV	FL	GL	UT	NH	ZH	ZE	NB	LB
	Phylinae												
	Phylini												
	Lopus Hahn												
135	decolor (Fallén)	●	–	●	●	●	●	●	●	●	●	●	●
	Oncotylus Fieber												
*136	punctipes Reuter	–	–	–	●	–	●	–	–	–	–	–	●
*137	viridiflavus (Goeze)	–	–	–	–	–	●	–	–	–	●	–	–
	Conostethus Fieber												
138	griseus (Douglas & Scott)	●	–	–	–	–	–	–	●	●	●	●	–
*139	roseus (Fallén)	–	–	●	●	●	●	–	●	–	–	–	●
*140	venustus (Fieber)	–	–	–	–	–	●	●	–	–	●	–	●
	Hoplomachus Fieber												
*141	thunbergi (Fallén)	–	–	–	●	–	●	●	●	–	–	●	●
	Megalocoleus Reuter												
142	molliculus (Fallén)	●	–	●	●	–	●	●	●	●	●	●	●
143	pilosus (Schrank)	●	●	●	●	–	●	●	●	●	●	●	●
	Amblytylus Fieber												
144	albidus (Hahn)	–	–	–	–	–	●	●	●	●	–	●	●
*145	brevicollis Fieber	–	–	–	–	–	●	–	–	–	–	–	–
146	nasutus (Kirschbaum)	–	–	–	–	●	●	●	●	–	–	–	●
	Macrotylus Fieber												
147	paykullii (Fallén)	●	–	–	●	–	●	–	●	●	●	–	●
*148	solitarius (Meyer-Dür)	–	–	–	–	–	–	–	–	–	–	●	●
	Orthonotus Stephens												
149	rufifrons (Fallén)	–	–	–	–	–	●	●	●	●	●	–	●
	Harpocera Curtis												
150	thoracica (Fallén)	●	–	●	●	●	●	●	●	●	●	●	●
	Tytthus Fieber												
*151	geminus (Flor)	–	–	●	–	–	–	–	–	–	–	–	–
*152	pygmaeus (Zetterstedt)	●	–	●	●	●	●	●	–	–	●	–	–
	Brachyarthrum Fieber												
*153	limitatum Fieber	–	–	–	–	–	●	–	–	–	–	–	●
	Phylus Hahn												
154	coryli (Linnaeus)	●	–	●	●	●	●	●	●	●	●	●	●
155	melanocephalus (Linnaeus)	●	–	●	●	–	●	●	●	●	●	●	●
156	palliceps (Fieber)	–	–	●	●	–	●	●	●	–	–	●	–
	Plesiodema Reuter												
157	pinetella (Zetterstedt)	–	–	●	●	–	●	●	●	●	–	●	●

		FR	GR	DR	OV	FL	GL	UT	NH	ZH	ZE	NB	LB
	Psallus Fieber												
	subgenus Apocremnus Fieber												
158	betuleti (Fallén)	–	●	●	●	●	●	●	●	●	–	●	●
	subgenus Mesopsallus Wagner												
159	ambiguus (Fallén)	●	●	●	●	●	●	●	●	●	●	●	●
	subgenus Phylidea Reuter												
160	quercus (Kirschbaum)	●	–	●	●	●	●	●	●	●	●	●	●
	subgenus Hylopsallus Wagner												
*161	assimilis Stichel	–	–	–	–	–	–	–	–	–	–	–	●
162	perrisi (Mulsant & Rey)	●	●	●	●	–	●	●	●	●	●	●	●
*163	pseudoplatani Reichling	–	–	●	–	–	●	–	●	–	–	–	●
164	variabilis (Fallén)	●	●	●	●	●	●	●	●	●	–	●	●
*165	wagneri Ossiannilsson	●	●	●	●	–	●	●	●	●	–	●	●
	subgenus Psallus s.s.												
166	albicinctus (Kirschbaum)	–	–	●	●	–	●	●	●	–	–	●	●
*167	confusus Rieger	●	–	●	●	●	●	●	●	●	–	●	●
168	falleni Reuter	●	●	●	●	–	●	●	●	●	●	●	●
169	flavellus Stichel	–	–	–	–	●	●	●	●	●	●	–	●
170	haematodes (Gmelin)	●	●	●	●	●	●	●	●	●	●	●	●
171	lepidus Fieber	–	–	–	●	●	●	●	●	●	–	–	●
*172	mollis (Mulsant & Rey)	–	–	–	●	–	●	–	–	–	–	●	–
*173	salicis (Kirschbaum)	●	–	–	–	–	●	●	●	●	–	●	●
174	varians (Herrich-Schäffer)	●	●	●	●	●	●	●	●	●	–	●	●
	subgenus Pityopsallus Wagner												
175	luridus Reuter	–	–	●	●	–	●	●	●	–	–	–	●
	Compsidolon Reuter												
	subgenus Coniortodes Wagner												
176	salicellus (Herrich-Schäffer)	–	–	●	–	●	●	●	–	●	–	●	●
	Phoenicocoris Reuter												
177	obscurellus (Fallén)	●	–	●	●	●	●	●	●	●	●	●	●
	Atractotomus Fieber												
178	magnicornis (Fallén)	●	●	●	●	●	●	●	●	●	–	●	●
179	mali (Meyer-Dür)	–	●	●	●	●	●	●	●	●	●	●	●
*180	parvulus Reuter	–	–	●	–	–	●	●	●	–	–	●	●
	Plagiognathus Fieber												
	subgenus Poliopterus Wagner												
181	albipennis (Fallén)	–	–	●	–	–	●	●	●	●	●	●	●
*182	litoralis Wagner	●	–	–	–	–	–	–	●	–	●	●	–
	subgenus Plagiognathus s.s.												
*183	alpinus (Reuter)	–	–	–	–	–	–	–	–	–	–	–	●
184	arbustorum (Fabricius)	●	●	●	●	●	●	●	●	●	●	●	●
185	chrysanthemi (Wolff)	●	–	●	●	●	●	●	●	●	●	●	●
*186	fulvipennis (Kirschbaum)	–	–	–	●	–	●	–	●	–	–	●	●
	subgenus Parapsallus Wagner												
187	vitellinus (Scholtz)	–	–	●	●	–	●	●	●	–	–	●	●
	Chlamydatus Curtis												
	subgenus Euattus Kerzhner												
188	pulicarius (Fallén)	–	–	●	●	●	●	●	●	●	–	●	●

		FR	GR	DR	OV	FL	GL	UT	NH	ZH	ZE	NB	LB
189	pullus (Reuter)	–	–	–	–	–	●	●	●	●	–	●	●
	subgenus Chlamydatus s.s.												
190	saltitans (Fallén)	●	–	●	●	●	●	●	●	●	●	●	●
	subgenus Eurymerocoris Kirschbaum												
*191	evanescens (Boheman)	–	–	–	–	–	●	–	●	●	●	●	●
	Monosynamma Scott												
*192	bohemanni (Fallén)	●	–	●	–	–	●	–	●	●	●	●	●
193	maritimum Wagner	●	–	–	–	–	–	–	●	●	●	–	–
*194	sabulicola Wagner	–	–	–	–	●	●	●	●	●	–	●	●
	Campylomma Reuter												
*195	annulicorne (Signoret)	–	–	●	–	●	●	●	●	–	–	–	●
196	verbasci (Meyer-Dür)	–	–	●	●	–	●	●	●	●	●	●	●
	Criocoris Fieber												
*197	crassicornis (Hahn)	–	–	–	–	–	●	–	–	–	–	–	●
*198	sulcicornis (Kirschbaum)	–	–	–	–	–	–	–	–	–	●	–	–
	Salicarus Kerzhner												
199	roseri (Herrich-Schäffer)	–	●	–	●	●	●	●	●	●	●	●	●
	Sthenarus Fieber												
200	rotermundi (Scholtz)	●	–	–	–	●	●	●	●	●	●	–	●
	Asciodema Reuter												
*201	obsoletum (Fieber)	–	–	–	●	–	●	●	–	–	●	●	●
	Hallodapini												
	Hallodapus Fieber												
*202	rufescens (Burmeister)	–	–	●	●	–	●	–	●	●	–	–	–
	Systellonotus Fieber												
203	triguttatus (Linnaeus)	●	–	–	●	–	●	–	●	–	●	●	●
	Cremnocephalus Fieber												
*204	albolineatus Reuter	–	–	●	●	–	–	–	–	–	–	–	–
	Dicyphinae												
	Macrolophus Fieber												
205	nubilus (Herrich-Schäffer)	–	–	–	●	–	●	●	●	–	–	–	●
	Dicyphus Fieber												
	subgenus Dicyphus s.s.												
*206	constrictus (Boheman)	–	–	–	–	–	–	–	–	●	–	–	–
207	epilobii Reuter	●	–	●	●	●	●	●	●	●	●	●	●
208	errans (Wolff)	–	–	–	–	–	●	●	●	●	●	●	●
209	pallidus (Herrich-Schäffer)	–	–	●	–	–	●	●	●	●	●	●	●
	subgenus Idolocoris Douglas & Scott												
210	pallicornis (Meyer-Dür)	●	–	●	●	–	●	●	●	●	–	–	●

		FR	GR	DR	OV	FL	GL	UT	NH	ZH	ZE	NB	LB
	subgenus Brachycerea Fieber												
211	annulatus (Wolff)	–	–	–	–	–	●	–	–	–	●	–	●
212	globulifer (Fallén)	●	●	●	●	–	●	●	●	●	●	●	●
	Campyloneura Fieber												
213	virgula (Herrich-Schäffer)	●	–	●	–	●	●	●	●	●	●	●	●
	Orthotylinae												
	Pilophorini												
	Hypseloecus Reuter												
*214	visci (Puton)	–	–	–	–	–	–	–	–	–	–	–	●
	Pilophorus Hahn												
215	cinnamopterus (Kirschbaum)	●	–	●	●	–	●	●	●	●	●	●	●
216	clavatus (Linnaeus)	●	–	●	●	●	●	●	●	●	●	●	●
217	confusus (Kirschbaum)	●	–	–	●	–	●	●	●	●	●	●	●
218	perplexus (Douglas & Scott)	●	–	●	●	–	●	●	●	●	●	●	●
	Halticocorini												
	Halticus Hahn												
219	apterus (Linnaeus)	–	–	–	●	–	●	–	●	–	●	–	●
*220	luteicollis (Panzer)	–	–	–	–	–	–	–	–	–	–	–	●
*221	saltator (Geoffroy)	–	–	–	–	–	●	–	–	–	–	●	●
	Strongylocoris Blanchard												
*222	leucocephalus (Linnaeus)	–	–	●	●	–	●	●	–	–	–	●	●
223	luridus (Fallén)	●	–	●	●	–	●	●	●	–	●	●	●
	Pachytomella Reuter												
224	parallela (Meyer-Dür)	●	–	●	●	●	●	●	●	●	–	●	●
	Orthocephalus Fieber												
225	coriaceus (Fabricius)	–	–	●	●	–	●	●	●	●	●	●	●
*226	saltator (Hahn)	●	●	●	●	–	●	●	●	●	●	●	●
	Orthotylini												
	Reuteria Puton												
*227	marqueti Puton	–	–	–	–	–	●	–	●	–	–	–	–
	Malacocoris Fieber												
228	chlorizans (Panzer)	●	●	●	–	●	●	●	●	–	●	●	●
	Fieberocapsus Carvalho & Southwood												
*229	flaveolus (Reuter)	●	–	–	–	–	–	–	●	●	●	–	–
	Cyllecoris Hahn												
230	histrionicus (Linnaeus)	●	●	●	●	●	●	●	●	●	●	●	●

		FR	GR	DR	OV	FL	GL	UT	NH	ZH	ZE	NB	LB
	Dryophilocoris Reuter												
231	flavoquadrimaculatus (De Geer)	●	●	●	●	●	●	●	●	●	●	●	●
	Globiceps Le Peletier & Serville												
	subgenus Paraglobiceps Wagner												
232	flavomaculatus (Fabricius)	●	–	–	●	–	●	●	●	–	–	●	●
233	fulvicollis cruciatus Reuter	●	–	–	●	–	●	●	●	●	●	●	●
	subgenus Globiceps s.s.												
*234	sphegiformis (Rossi)	–	–	–	–	–	–	–	–	–	–	–	●
	Heterocordylus Fieber												
*235	genistae (Scopoli)	●	–	–	–	–	–	–	●	–	–	–	●
*236	leptocerus (Kirschbaum)	–	–	–	●	–	●	–	–	–	–	–	●
237	tibialis (Hahn)	●	–	●	●	–	●	●	●	●	●	●	●
*238	tumidicornis (Herrich-Schäffer)	–	–	–	–	–	–	–	–	–	–	–	●
	Heterotoma Le Peletier & Serville												
*239	planicornis (Pallas)	●	●	●	●	●	●	●	●	●	●	●	●
	Blepharidopterus Kolenati												
240	angulatus (Fallén)	●	●	●	●	●	●	●	●	●	●	●	●
*241	diaphanus (Kirschbaum)	●	●	●	●	●	●	●	●	●	●	–	●
	Orthotylus Fieber												
	subgenus Pinocapsus Southwood												
*242	fuscescens (Kirschbaum)	–	–	–	–	–	●	–	–	–	–	–	●
	subgenus Orthotylus s.s.												
243	flavinervis (Kirschbaum)	●	–	●	●	–	●	●	●	●	●	–	●
244	marginalis Reuter	●	–	●	●	●	●	●	●	●	●	●	●
245	nassatus (Fabricius)	–	–	●	–	–	●	●	●	●	●	–	●
246	prasinus (Fallén)	–	–	–	–	–	●	–	●	●	–	–	●
247	tenellus (Fallén)	●	–	●	●	–	●	●	●	●	–	–	●
*248	virens (Fallén)	–	–	–	●	–	–	–	–	–	–	–	●
249	viridinervis (Kirschbaum)	●	–	●	●	–	●	●	●	●	●	–	●
	subgenus Litocoris Fieber												
250	ericetorum (Fallén)	●	●	●	●	–	●	●	●	–	–	●	●
	subgenus Neopachylops Wagner												
251	adenocarpi (Perris)	–	–	●	–	–	●	●	●	–	–	●	●
252	concolor (Kirschbaum)	●	–	–	●	–	●	●	●	●	–	●	●
253	virescens (Douglas & Scott)	●	●	●	●	●	●	●	●	●	–	●	●
	subgenus Melanotrichus Reuter												
254	flavosparsus (Sahlberg)	●	●	●	●	–	●	●	●	●	●	–	●
255	moncreaffi (Douglas & Scott)	●	–	–	–	–	–	–	●	–	●	–	–
256	rubidus (Fieber)	●	–	–	–	–	–	–	●	–	●	●	–
	Pseudoloxops Kirkaldy												
257	coccineus (Meyer-Dür)	–	–	●	–	●	●	●	●	●	●	–	●
	Cyrtorhinus Fieber												
*258	caricis (Fallén)	●	–	●	–	–	●	–	–	–	–	–	–
	Neomecomma Southwood												
259	bilineatum (Fallén)	–	–	●	●	–	●	–	●	–	–	●	●

		FR	GR	DR	OV	FL	GL	UT	NH	ZH	ZE	NB	LB
	Mecomma Fieber												
	subgenus Mecomma s.s.												
*260	ambulans (Fallén)	–	–	–	●	–	●	●	–	–	–	–	●
	Mirinae												
	Pithanini												
	Myrmecoris Gorski												
*261	gracilis (Sahlberg)	–	–	●	–	–	●	–	–	–	–	●	●
	Pithanus Fieber												
262	maerkelii (Herrich-Schäffer)	●	–	●	●	●	●	●	●	●	●	●	●
	Mirini												
	Lygus Hahn												
*263	adspersus (Schilling)	–	–	–	●	–	●	●	●	–	●	–	●
*264	gemellatus (Herrich-Schäffer)	–	–	–	●	–	●	–	●	–	–	●	●
*265	maritimus Wagner	●	–	–	–	–	●	●	●	●	●	●	●
*266	pratensis (Linnaeus)	●	–	●	●	–	●	●	●	●	●	●	●
267	rugulipennis Poppius	●	●	●	●	●	●	●	●	●	●	●	●
*268	wagneri Remane	–	–	●	–	–	–	–	–	–	–	–	–
	Liocoris Fieber												
269	tripustulatus (Fabricius)	●	●	●	●	●	●	●	●	●	●	●	●
	Orthops Fieber												
*270	basalis (Costa)	●	–	–	–	●	●	●	●	●	●	●	●
271	campestris (Linnaeus)	●	●	●	●	●	●	●	●	●	●	●	●
272	kalmii (Linnaeus)	●	–	–	–	–	●	●	●	●	●	●	●
	Pinalitus Kelton												
*273	atomarius (Meyer-Dür)	–	–	–	–	–	–	–	●	–	–	–	–
274	cervinus (Herrich-Schäffer)	●	●	●	●	–	●	●	●	●	●	●	●
275	rubricatus (Fallén)	●	–	●	●	–	●	●	●	●	●	●	●
*276	viscicola (Puton)	–	–	–	–	–	–	–	–	–	–	–	●
	Plesiocoris Fieber												
*277	minor Wagner	●	–	–	–	–	–	–	●	–	–	–	–
278	rugicollis (Fallén)	●	–	●	●	●	●	●	●	●	●	●	●
	Lygocoris Reuter												
	subgenus Lygocoris s.s.												
279	pabulinus (Linnaeus)	●	●	●	●	●	●	●	●	●	●	●	●
	subgenus Neolygus Knight												
280	contaminatus (Fallén)	●	●	●	●	●	●	●	●	●	●	●	●
*281	populi Leston	–	–	–	–	–	●	–	●	–	–	–	–
282	viridis (Fallén)	●	–	●	●	●	●	●	●	●	●	●	●
	subgenus Apolygus China												
*283	limbatus (Fallén)	–	–	–	●	–	●	–	–	–	–	●	●
284	lucorum (Meyer-Dür)	●	–	●	●	●	●	●	●	●	●	●	●
285	rhamnicola (Reuter)	–	–	●	●	–	●	●	–	–	–	–	●
286	spinolae (Meyer-Dür)	●	–	–	●	–	●	–	–	●	●	–	●

		FR	GR	DR	OV	FL	GL	UT	NH	ZH	ZE	NB	LB
	Agnocoris Reuter												
*287	reclairei Wagner	–	–	–	●	●	●	●	●	●	–	●	●
*288	rubicundus (Fallén)	–	–	–	–	–	●	–	–	–	–	●	●
	Camptozygum Reuter												
289	aequale (Villers)	●	–	●	●	●	●	●	●	●	●	●	●
	Polymerus Hahn												
	subgenus Poeciloscytus Fieber												
290	palustris (Reuter)	●	–	●	●	–	●	●	●	●	●	●	●
291	unifasciatus (Fabricius)	●	–	●	●	–	●	●	●	●	●	●	●
*292	vulneratus (Panzer)	●	–	–	–	–	–	–	●	●	●	–	–
	subgenus Polymerus s.s.												
*293	holosericeus Hahn	–	–	–	●	–	●	–	–	–	–	–	●
*294	nigrita (Fallén)	–	–	●	●	–	●	●	–	–	–	–	●
	Charagochilus Fieber												
295	gyllenhalii (Fallén)	●	–	–	●	–	●	●	●	●	●	–	●
	Dichrooscytus Fieber												
*296	intermedius Reuter	–	–	●	●	–	●	●	–	–	–	–	●
297	rufipennis (Fallén)	●	–	●	●	–	●	●	●	●	–	●	●
	Miris Fabricius												
298	striatus (Linnaeus)	●	–	●	●	–	●	●	●	–	–	●	●
	Hadrodemus Fieber												
*299	m-flavum (Goeze)	–	–	–	–	–	–	–	–	–	–	–	●
	Calocoris Fieber												
	subgenus Trichocalocoris Wagner												
*300	pilicornis (Panzer)	–	–	–	–	–	–	–	–	–	–	–	●
*301	schmidtii (Fieber)	–	–	–	–	–	●	–	–	–	–	–	●
	subgenus Rhabdomiris Wagner												
*302	striatellus (Fabricius)	●	●	●	●	–	●	●	●	●	●	●	●
	subgenus Closterotomus Fieber												
*303	biclavatus (Herrich-Schäffer)	–	–	–	–	–	–	–	–	–	–	–	●
304	fulvomaculatus (Villers)	●	–	●	●	–	●	●	●	●	●	●	●
	subgenus Calocoris s.s.												
*305	affinis (Herrich-Schäffer)	–	–	–	–	–	–	–	–	–	–	–	●
306	norvegicus (Gmelin)	●	●	●	●	–	●	●	●	●	●	●	●
307	roseomaculatus (De Geer)	●	●	●	●	–	●	●	●	●	●	–	●
	Adelphocoris Reuter												
308	quadripunctatus (Fabricius)	–	–	●	–	●	●	●	●	–	–	●	●
309	lineolatus (Goeze)	●	●	●	●	–	●	●	●	●	●	●	●
310	seticornis (Fabricius)	–	–	–	–	–	●	●	–	●	●	●	●
311	ticinensis (Meyer-Dür)	●	–	●	●	–	●	●	●	●	–	●	●
	Megacoelum Fieber												
*312	beckeri (Fieber)	–	–	●	●	–	●	●	●	–	–	–	●
313	infusum (Herrich-Schäffer)	●	–	●	●	–	●	●	●	–	●	●	●

		FR	GR	DR	OV	FL	GL	UT	NH	ZH	ZE	NB	LB
	Stenotus Jakovlev												
314	binotatus (Fabricius)	•	•	•	•	•	•	•	•	•	•	•	•
	Miridius Fieber												
*315	quadrivirgatus (Costa)	–	–	–	–	–	–	–	–	–	•	–	–
	Phytocoris Fallén												
	subgenus Phytocoris s.s.												
316	dimidiatus Kirschbaum	•	–	•	•	•	•	•	•	–	•	•	•
*317	intricatus Flor	–	–	•	•	–	•	–	•	–	–	–	•
318	longipennis Flor	•	•	•	•	•	•	•	•	•	•	•	•
319	pini Kirschbaum	–	–	•	•	–	•	•	•	–	•	–	•
320	populi (Linnaeus)	•	•	•	–	–	•	•	•	•	•	–	•
321	reuteri Saunders	•	–	•	–	–	•	•	•	•	•	–	•
322	tiliae (Fabricius)	•	•	•	•	–	•	•	•	•	•	•	•
	subgenus Ktenocoris Wagner												
323	insignis Reuter	–	•	•	•	–	•	•	•	–	–	•	•
*324	singeri Wagner	–	–	–	–	–	–	–	–	–	–	–	•
325	ulmi (Linnaeus)	•	–	•	•	–	•	•	•	•	•	•	•
326	varipes (Boheman)	•	•	•	–	–	•	–	•	•	•	•	•
	Capsus Fabricius												
327	ater (Linnaeus)	•	•	•	•	–	•	•	•	•	•	•	•
*328	pilifer Remane	•	–	•	•	–	•	•	•	–	–	–	–
*329	wagneri Remane	–	–	–	•	–	•	–	•	–	–	•	•
	Pantilius Curtis												
330	tunicatus (Fabricius)	•	•	•	•	•	•	•	•	•	•	•	•
	Capsodes Dahlbom												
*331	gothicus (Linnaeus)	–	–	–	–	–	–	–	–	–	–	–	•
*332	sulcatus (Fieber)	–	–	–	–	–	•	–	–	–	–	–	–
	Stenodemini												
	Acetropis Fieber												
333	carinata (Herrich-Schäffer)	–	–	–	•	–	•	•	•	–	–	•	•
*334	gimmerthalii (Flor)	–	–	–	–	–	–	–	–	•	–	–	–
	Stenodema Laporte												
	subgenus Brachystira Fieber												
335	calcarata (Fallén)	•	•	•	•	•	•	•	•	•	•	•	•
*336	trispinosa Reuter	•	•	–	•	•	–	–	•	•	•	–	•
	subgenus Stenodema s.s.												
337	holsata (Fabricius)	•	•	•	•	–	•	•	•	–	–	•	•
338	laevigata (Linnaeus)	•	•	•	•	•	•	•	•	•	•	•	•
*339	virens (Linnaeus)	•	–	–	•	–	•	–	•	•	–	•	•
	Notostira Fieber												
340	elongata (Geoffroy)	•	•	•	•	•	•	•	•	•	•	•	•
	Megaloceroea Fieber												
*341	recticornis (Geoffroy)	–	–	•	•	•	•	•	–	–	•	–	•

		FR	GR	DR	OV	FL	GL	UT	NH	ZH	ZE	NB	LB
	Trigonotylus Fieber												
*342	caelestialium (Kirkaldy)	●	●	●	●	●	●	●	●	●	●	●	●
343	psammaecolor Reuter	●	–	–	–	–	–	–	●	●	●	–	–
344	pulchellus (Hahn)	–	–	–	●	–	●	●	●	–	–	●	●
*345	ruficornis (Geoffroy)	●	●	●	●	●	●	●	●	●	●	●	●
	Teratocoris Fieber												
346	antennatus (Boheman)	●	–	●	–	–	●	●	●	●	●	●	●
*347	paludum Sahlberg	–	–	●	–	–	●	●	–	–	–	–	–
*348	saundersi Douglas & Scott	●	–	–	–	–	–	–	●	●	●	–	–
	Leptopterna Fieber												
349	dolobrata (Linnaeus)	●	–	●	●	–	●	●	–	–	–	●	●
350	ferrugata (Fallén)	●	●	●	●	●	●	●	●	●	●	●	●
	Isometopinae												
	Isometopus Fieber												
*351	intrusus (Herrich-Schäffer)	–	–	–	–	–	●	●	–	–	–	●	●
CIMICOIDEA													
Nabidae													
	Prostemmatinae												
	Prostemmatini												
	Prostemma Laporte												
*352	guttula (Fabricius)	–	–	–	–	–	–	–	–	–	●	–	●
	Nabinae												
	*Nabini												
	Himacerus Wolff												
353	apterus (Fabricius)	●	●	●	●	●	●	●	●	●	●	●	●
	Aptus Hahn												
354	mirmicoides (Costa)	●	●	●	●	–	●	●	●	●	●	●	●
	Anaptus Kerzhner												
355	major (Costa)	●	–	●	●	●	●	●	●	●	●	●	●
	Stalia Reuter												
*356	boops (Schiödte)	●	–	●	–	–	●	●	●	●	●	●	●
	Nabicula Kirby												
	subgenus Limnonabis Kerzhner												
357	lineatus (Dahlbom)	●	–	●	●	●	●	●	●	●	●	●	●
	subgenus Dolichonabis Reuter												
358	limbatus (Dahlbom)	●	●	●	●	●	●	●	●	●	●	●	●
	subgenus Nabicula s.s.												
359	flavomarginatus (Scholtz)	●	●	●	●	–	●	●	●	●	●	●	●

		FR	GR	DR	OV	FL	GL	UT	NH	ZH	ZE	NB	LB
	Nabis Latreille												
*360	brevis Scholtz	–	–	–	●	–	●	–	–	–	●	●	●
361	ericetorum Scholtz	●	●	●	●	–	●	●	●	●	●	●	●
362	ferus (Linnaeus)	●	●	●	●	●	●	●	●	●	●	●	●
*363	pseudoferus Remane	●	–	●	●	–	●	●	●	●	●	●	●
364	rugosus (Linnaeus)	–	–	–	–	–	●	●	●	–	●	●	●
Anthocoridae													
	Anthocorinae												
	Anthocorini												
	Temnostethus Fieber												
365	gracilis (Horváth)	●	●	●	●	–	●	●	●	●	●	●	●
*366	longirostris (Horváth)	–	–	–	●	●	●	●	●	–	–	–	●
367	pusillus (Herrich-Schäffer)	●	–	●	●	–	●	●	●	●	–	●	●
	Elatophilus Reuter												
*368	nigricornis (Zetterstedt)	●	–	●	●	–	●	●	–	–	–	●	●
	Anthocoris Fallén												
*369	amplicollis Horváth	–	–	–	–	–	–	●	–	–	–	–	●
*370	butleri Le Quesne	–	–	–	–	–	●	●	●	–	–	–	●
371	confusus Reuter	●	●	●	●	–	●	●	●	●	●	●	●
372	gallarumulmi De Geer	●	–	–	●	–	●	●	●	●	●	–	●
373	limbatus Fieber	–	–	●	–	●	●	●	●	●	●	●	●
*374	minki minki Dohrn	–	–	●	–	●	●	●	●	–	–	–	●
375	nemoralis (Fabricius)	●	●	●	●	●	●	●	●	●	●	●	●
376	nemorum (Linnaeus)	●	●	●	●	●	●	●	●	●	●	●	●
*377	pilosus (Jakovlev)	–	–	–	–	–	–	–	–	–	–	–	●
378	sarothamni Douglas & Scott	●	–	●	–	–	–	–	●	–	●	●	●
*379	simulans Reuter	–	–	●	●	●	●	●	●	●	●	–	●
*380	visci Douglas	–	–	–	–	–	–	–	–	–	–	–	●
	Tetraphleps Fieber												
381	bicuspis (Herrich-Schäffer)	–	–	–	–	–	●	●	●	–	●	–	●
	Acompocoris Reuter												
*382	alpinus Reuter	●	–	●	●	–	●	●	●	–	●	●	●
383	pygmaeus (Fallén)	●	–	●	●	–	●	●	●	●	–	●	●
	Oriini												
	Orius Wolff												
	subgenus Orius s.s.												
384	niger (Wolff)	●	–	●	–	●	●	●	●	●	●	●	●
	subgenus Heterorius Wagner												
*385	laticollis (Reuter)	●	–	●	–	●	●	●	●	–	–	–	●
386	majusculus (Reuter)	●	●	●	●	●	●	●	●	–	●	●	●
387	minutus (Linnaeus)	●	●	●	–	–	●	●	●	●	–	●	●
*388	vicinus (Ribaut)	–	–	–	–	–	●	–	●	–	–	–	●

		FR	GR	DR	OV	FL	GL	UT	NH	ZH	ZE	NB	LB
	Lyctocorinae												
	Lyctocorini												
	Lyctocoris Hahn												
389	campestris (Fabricius)	●	●	●	●	●	●	●	●	●	●	●	●
	Xylocorini												
	Xylocoris Dufour subgenus Proxylocoris Carayon												
390	galactinus (Fieber)	–	–	●	●	●	●	●	●	●	●	●	●
	subgenus Xylocoris s.s.												
391	cursitans (Fallén)	–	–	●	●	–	●	●	●	●	–	●	●
*392	formicetorum (Boheman)	–	–	–	●	–	●	●	●	●	●	–	●
	Cardiastethini												
	Brachysteles Mulsant & Rey												
*393	parvicornis (Costa)	–	–	–	–	–	●	●	●	●	●	–	●
	Cardiastethus Fieber												
*394	fasciiventris (Garbiglietti)	–	–	–	–	–	●	–	–	–	–	–	–
	Dufouriellus Kirkaldy												
395	ater (Dufour)	–	–	●	–	–	●	●	●	●	●	●	●
	Scolopini												
	Scoloposcelis Fieber												
*396	pulchella (Zetterstedt)	–	–	–	–	–	–	–	●	–	–	–	–
	Cimicidae												
	Oeciacus Stål												
*397	hirundinis (Lamarck)	–	–	–	●	–	●	–	–	●	●	●	●
	Cimex Linnaeus												
398	lectularius Linnaeus	–	–	–	–	–	●	●	●	●	–	●	●
*399	columbarius Jenyns	–	●	–	–	–	●	●	●	●	–	–	–
*400	dissimilis (Horváth)	–	–	–	–	–	–	●	●	–	●	–	–
*401	pipistrelli Jenyns	●	–	–	–	–	–	–	–	–	●	–	–
	REDUVOIDEA												
	Reduviidae												
	Emesinae												
	Empicoris Wolff												
*402	baerensprungi (Dohrn)	–	–	–	–	–	●	●	–	–	–	–	–
403	culiciformis (De Geer)	–	–	●	●	–	●	●	●	●	●	●	●
404	vagabundus (Linnaeus)	●	●	●	●	–	●	●	●	●	●	●	●

		FR	GR	DR	OV	FL	GL	UT	NH	ZH	ZE	NB	LB
	Stenopodainae												
	Pygolampis Germar												
*405	bidentata (Goeze)	–	–	–	–	–	●	–	–	–	–	●	●
	Reduviinae												
	Reduvius Fabricius												
406	personatus (Linnaeus)	●	–	●	●	●	●	●	●	●	●	●	●
	Harpactorinae												
	Rhynocoris Hahn												
*407	annulatus (Linnaeus)	–	–	●	–	–	–	–	–	–	–	●	●
	Coranus Curtis												
*408	subapterus (De Geer)	●	–	●	–	–	●	–	●	●	●	–	–
*409	woodroffei Putshkov	–	–	●	●	–	●	●	●	–	–	●	●
	Phymatinae												
	Phymata Latreille												
*410	crassipes (Fabricius)	–	–	–	–	–	●	–	–	–	–	–	–
PENTATOMORPHA													
ARADOIDEA													
Aradidae													
	Aradinae												
	Aradus Fabricius												
411	cinnamomeus (Panzer)	●	–	●	●	–	●	●	●	●	●	●	●
*412	corticalis (Linnaeus)	–	–	–	–	–	●	–	–	–	–	–	–
413	depressus (Fabricius)	●	–	●	–	●	●	●	●	●	●	●	●
*414	signaticornis Sahlberg	–	–	–	–	–	●	–	–	–	–	●	–
	Aneurinae												
	Aneurus Curtis												
*415	avenius (Dufour)	–	–	●	–	–	–	–	–	–	–	–	●
*416	laevis (Fabricius)	●	–	●	●	–	●	●	●	●	–	●	●
PIESMATOIDEA													
Piesmatidae													
	Piesma Le Peletier & Serville												
417	maculatum (Laporte)	●	–	●	●	–	●	●	●	●	●	●	●
*418	quadratum (Fieber)	–	–	●	–	–	–	–	●	●	●	●	●
*419	salsolae (Becker)	–	–	–	–	–	–	–	●	–	–	–	–

		FR	GR	DR	OV	FL	GL	UT	NH	ZH	ZE	NB	LB
	COROIDEA												
	Berytidae												
	Berytinae												
	Berytinus Kirkaldy												
	subgenus Berytinus s.s.												
420	clavipes (Fabricius)	–	–	–	–	–	●	–	–	–	●	–	●
421	hirticornis (Brullé)	–	–	–	–	–	●	–	–	–	–	●	●
422	minor (Herrich-Schäffer)	●	–	●	●	–	●	●	●	●	●	●	●
	subgenus Lizinus Mulsant & Rey												
423	crassipes (Herrich-Schäffer)	–	–	●	–	–	●	●	●	●	●	●	●
*424	montivagus (Meyer-Dür)	–	–	–	–	–	–	–	–	–	●	–	–
425	signoreti (Fieber)	●	–	●	–	–	●	●	●	●	●	●	●
	Neides Latreille												
426	tipularius (Linnaeus)	●	–	–	–	–	●	●	●	●	●	●	●
	Metacanthinae												
	Gampsocoris Fuss												
427	punctipes (Germar)	●	–	–	–	–	–	–	●	●	●	–	●
	Metatropis Fieber												
*428	rufescens (Herrich-Schäffer)	–	–	–	●	–	–	–	–	–	–	–	●
	Lygaeidae												
	Lygaeinae												
	Lygaeus Fabricius												
*429	equestris (Linnaeus)	?	–	–	–	–	–	–	–	–	–	–	●
	Spilostethus Stål												
*430	saxatilis Scopoli	–	–	–	–	–	–	–	–	–	–	–	●
	Orsillinae												
	Nysius Dallas												
	subgenus Macroparius Stål												
431	helveticus (Herrich-Schäffer)	●	●	●	●	–	●	●	●	–	–	●	●
	subgenus Nysius s.s.												
432	ericae (Schilling)	●	–	●	●	–	●	–	●	–	–	●	●
433	thymi (Wolff)	●	●	●	●	●	●	●	●	●	●	●	●
	subgenus Tropinysius Wagner												
434	senecionis (Schilling)	●	●	●	–	–	●	●	●	●	●	●	●
	Ortholomus Stål												
*435	punctipennis (Herrich-Schäffer)	–	–	–	–	–	–	–	●	●	●	–	–
	Orsillus Dallas												
*436	depressus Dallas	–	–	–	–	–	●	–	●	–	–	–	–

		FR	GR	DR	OV	FL	GL	UT	NH	ZH	ZE	NB	LB
	Ischnorhynchinae												
	Kleidocerys Stephens												
*437	privignis Horváth	–	–	–	–	–	–	–	–	–	●	●	●
438	resedae (Panzer)	●	●	●	●	●	●	●	●	●	●	●	●
*439	truncatulus ericae (Horváth)	–	–	–	–	–	–	–	●	–	–	–	–
	Cyminae												
	Cymus Hahn												
*440	aurescens Distant	–	–	–	●	–	●	–	–	–	–	●	●
441	claviculus (Fallén)	●	●	●	●	●	●	●	●	●	●	●	●
442	glandicolor Hahn	●	–	●	●	–	●	●	●	●	●	●	●
*443	melanocephalus Fieber	–	–	●	●	●	●	●	●	–	●	●	●
	Blissinae												
	Ischnodemus Fieber												
444	sabuleti (Fallén)	●	●	●	●	–	●	●	●	●	●	●	●
	Geocorinae												
	Geocoris Fallén												
*445	ater (Fabricius)	–	–	–	–	–	–	●	–	–	–	–	–
446	grylloides (Linnaeus)	●	–	●	–	–	●	●	●	●	●	●	●
*447	megacephalus (Rossi)	–	–	–	–	–	–	–	–	–	●	–	–
	Oxycareninae												
	Metopoplax Fieber												
*448	ditomoides (Costa)	–	–	–	–	–	–	–	–	–	–	–	●
	Oxycarenus Fieber												
*449	modestus (Fallén)	–	–	–	–	–	●	–	–	–	–	●	●
	Tropidophlebia Kerzhner												
*450	costalis (Herrich-Schäffer)	–	–	–	–	–	–	●	●	–	–	–	–
	Artheneinae												
	Chilacis Fieber												
451	typhae (Perris)	●	–	●	●	●	●	●	●	●	●	●	●
	Heterogastrinae												
	Heterogaster Schilling												
452	urticae (Fabricius)	●	●	●	●	–	●	●	●	●	●	●	●
	Rhyparochrominae												
	Plinthisini												

		FR	GR	DR	OV	FL	GL	UT	NH	ZH	ZE	NB	LB
	Plinthisus Stephens												
453	brevipennis (Latreille)	●	–	●	●	–	●	●	●	●	●	●	●
*454	pusillus (Scholtz)	–	–	●	–	–	●	–	●	●	–	●	–
	Antillocorini												
	Tropistethus Fieber												
*455	holosericeus (Scholtz)	–	–	–	–	–	–	●	–	●	–	–	●
	Drymini												
	Drymus Fieber												
	subgenus Drymus s.s.												
*456	latus Douglas & Scott	–	–	–	–	–	–	–	–	–	–	–	●
*457	pilicornis (Mulsant)	–	–	–	–	–	–	–	●	–	–	–	–
	subgenus Sylvadrymus Le Quesne												
458	brunneus (Sahlberg)	●	●	●	●	●	●	●	●	●	●	●	●
*459	pumilio Puton	–	–	–	–	–	–	–	–	–	●	–	●
*460	ryeii Douglas & Scott	●	●	●	●	●	●	●	●	●	●	●	●
461	sylvaticus (Fabricius)	●	–	●	●	●	●	●	●	●	●	●	●
	Eremocoris Fieber												
462	abietis (Linnaeus)	●	–	–	–	–	●	●	●	●	●	●	●
463	plebejus (Fallén)	●	–	●	●	–	●	●	●	●	●	●	●
*464	podagricus (Fabricius)	–	–	–	–	–	–	–	–	–	●	–	●
	Gastrodes Westwood												
465	abietum Bergroth	●	–	●	–	–	●	●	●	–	●	●	●
466	grossipes (De Geer)	●	–	●	●	●	●	●	●	●	●	●	●
	Ischnocoris Fieber												
467	angustulus (Boheman)	–	–	●	●	–	●	●	●	–	–	●	●
	Lamproplax Douglas & Scott												
*468	picea (Flor)	●	–	●	–	–	●	–	–	–	–	–	●
	Scolopostethus Fieber												
469	affinis (Schilling)	●	●	●	●	●	●	●	●	●	●	●	●
470	decoratus (Hahn)	●	–	●	●	●	●	●	●	●	–	●	●
471	pictus (Schilling)	–	–	–	●	–	●	●	●	●	●	●	●
*472	pilosus (Reuter)	–	–	–	●	–	●	–	–	–	–	–	–
*473	pseudograndis Wagner	–	–	–	–	–	–	–	–	–	–	–	●
474	puberulus Horváth	–	–	–	–	●	●	–	●	●	–	–	●
475	thomsoni Reuter	●	●	●	●	●	●	●	●	●	●	●	●
	Taphropeltus Stål												
476	contractus (Herrich-Schäffer)	–	–	●	–	–	●	●	●	●	●	●	●
*477	hamulatus (Thomson)	–	–	–	–	–	–	–	–	–	●	–	●
	Stygnocorini												
	Acompus Fieber												
478	rufipes (Wolff)	–	●	●	●	–	●	●	●	●	–	●	●

		FR	GR	DR	OV	FL	GL	UT	NH	ZH	ZE	NB	LB
	Lasiosomus Fieber												
*479	enervis (Herrich-Schäffer)	–	–	–	–	–	–	–	–	–	●	–	●
	Stygnocoris Douglas & Scott												
480	fuligineus (Geoffroy)	●	–	●	●	●	●	●	●	●	●	●	●
481	rusticus (Fallén)	●	–	–	●	●	●	●	●	●	●	●	●
482	sabulosus (Schilling)	●	●	●	●	–	●	●	●	●	●	●	●
	Myodochini												
	Pachybrachius Hahn												
483	fracticollis (Schilling)	●	–	●	●	–	●	●	●	●	–	●	●
*484	luridus Hahn	–	–	●	–	–	●	●	●	–	–	–	–
	Rhyparochrominae												
	Rhyparochromini												
	Aellopus Wolff												
*485	atratus (Goeze)	–	–	–	–	–	–	–	–	–	–	–	●
	Beosus Amyot & Serville												
486	maritimus (Scopoli)	–	–	–	–	–	●	●	●	●	●	●	●
	Graptopeltus Stål												
487	lynceus (Fabricius)	●	–	–	–	–	●	●	●	●	●	●	●
	Peritrechus Fieber												
*488	angusticollis (Sahlberg)	–	–	–	–	–	–	–	–	–	–	–	●
489	geniculatus (Hahn)	●	●	●	●	●	●	●	●	●	–	●	●
*490	lundii (Gmelin)	–	–	–	–	–	●	●	●	–	●	●	●
491	nubilus (Fallén)	●	–	●	–	–	●	●	●	●	●	●	●
	Rhyparochromus Hahn												
492	phoeniceus (Rossi)	●	–	–	●	–	●	●	●	●	–	●	●
493	pini (Linnaeus)	●	–	●	●	–	●	●	●	–	–	●	●
	Raglius Stål												
*494	alboacuminatus (Goeze)	–	–	–	–	–	–	–	–	–	–	–	●
	Xanthochilus Stål												
495	quadratus (Fabricius)	–	–	–	–	–	●	●	–	●	–	●	●
	Megalonotini												
	Megalonotus Fieber												
*496	antennatus (Schilling)	●	–	–	–	–	●	–	–	–	–	–	●
497	chiragra (Fabricius)	●	●	●	●	●	●	●	●	●	●	●	●
498	dilatatus (Herrich-Schäffer)	–	–	–	–	–	●	●	●	–	●	●	●
499	praetextatus (Herrich-Schäffer)	●	–	–	–	–	●	●	●	●	●	–	●
*500	sabulicola (Thomson)	–	–	–	–	–	●	–	●	●	●	●	●
	Sphragisticus Stål												
501	nebulosus (Fallén)	●	●	–	●	●	●	●	●	●	●	●	●

		FR	GR	DR	OV	FL	GL	UT	NH	ZH	ZE	NB	LB
	Gonianotini												
	Aphanus Laporte												
502	rolandri (Linnaeus)	●	●	●	●	●	●	●	●	–	–	–	–
	Emblethis Fieber												
*503	griseus (Wolff)	–	–	–	–	–	–	–	–	–	●	–	–
*504	verbasci (Fabricius)	–	–	–	–	–	–	–	–	–	–	●	●
	Gonianotus Fieber												
505	marginepunctatus (Wolff)	●	–	–	–	–	●	●	●	●	●	●	–
	Macrodema Fieber												
506	microptera (Curtis)	●	–	●	●	●	●	●	●	●	●	●	●
	Pionosomus Fieber												
507	varius (Wolff)	●	–	●	–	–	●	●	●	●	●	●	●
	Pterotmetus Fieber												
508	staphiliniformis (Schilling)	●	–	●	●	●	●	–	●	–	–	●	●
	Trapezonotus Fieber												
509	arenarius (Linnaeus)	●	●	●	●	●	●	●	●	●	●	●	●
*510	desertus Seidenstücker	●	●	●	●	–	●	●	●	–	–	●	●
511	dispar Stål	●	–	●	–	–	●	●	●	●	●	–	●
	Pyrrhocoridae												
	Pyrrhocoris Fallén												
512	apterus (Linnaeus)	–	–	–	–	–	●	●	●	●	●	●	●
	Stenocephalidae												
	Dicranocephalus Hahn												
*513	agilis (Scopoli)	–	–	–	–	–	–	–	?	?	–	●	●
*514	medius (Mulsant & Rey)	–	–	–	–	–	●	–	●	–	–	–	●
	Coreidae												
	Coreinae												
	Gonocerus Latreille												
*515	acuteangulatus (Goeze)	–	–	–	–	–	●	–	–	–	–	–	●
*516	juniperi Herrich-Schäffer	–	–	–	●	–	–	–	–	–	–	●	●
	Enoplops Amyot & Serville												
517	scapha (Fabricius)	–	–	–	–	–	–	–	–	●	●	●	●
	Coreus Fabricius												
518	marginatus (Linnaeus)	●	●	●	●	–	●	●	●	–	●	●	●
	Syromastus Berthold												
519	rhombeus (Linnaeus)	–	–	–	–	–	●	●	●	●	●	●	●

		FR	GR	DR	OV	FL	GL	UT	NH	ZH	ZE	NB	LB
	Spathocera Stein												
520	dahlmannii (Schilling)	–	–	●	●	●	●	●	●	●	–	●	●
	Pseudophloinae												
	Arenocoris Hahn												
521	fallenii (Schilling)	●	–	–	–	–	–	–	●	●	●	–	–
*522	waltlii (Herrich-Schäffer)	–	–	–	–	–	●	–	–	–	●	–	–
	Bathysolen Fieber												
*523	nubilus (Fallén)	–	–	–	–	–	–	–	–	–	–	–	●
	Ceraleptus Costa												
524	lividus Stein	●	–	–	–	–	●	●	●	●	●	●	●
	Coriomeris Westwood												
525	denticulatus (Scopoli)	●	–	–	–	–	●	●	●	●	●	●	●
Alydidae													
	Alydus Fabricius												
526	calcaratus (Linnaeus)	–	–	–	–	–	●	●	●	–	–	●	●
Rhopalidae													
	Rhopalinae												
	Rhopalini												
	Liorhyssus Stål												
*527	hyalinus (Fabricius)	–	–	–	–	–	●	–	–	–	–	–	–
	Corizus Fallén												
*528	hyoscyami (Linnaeus)	–	–	–	–	–	●	●	–	–	●	●	●
	Rhopalus Schilling												
	subgenus Rhopalus s.s.												
529	parumpunctatus Schilling	●	–	●	●	–	●	●	●	●	●	●	●
*530	subrufus (Gmelin)	–	–	–	–	–	●	●	●	–	–	–	●
	subgenus Aeschyntelus Stål												
531	maculatus (Fieber)	●	–	●	●	–	●	●	–	–	–	●	●
	Chorosomatini												
	Myrmus Hahn												
532	miriformis (Fallén)	●	–	●	●	●	●	●	●	●	●	●	●
	Chorosoma Curtis												
533	schillingi (Schilling)	●	●	●	●	●	●	●	●	●	●	●	●

		FR	GR	DR	OV	FL	GL	UT	NH	ZH	ZE	NB	LB
	Maccevethini												
	Stictopleurus Stål												
*534	abutilon abutilon (Rossi)	–	–	–	–	–	●	●	–	–	●	●	●
*535	punctatonervosus (Goeze)	–	–	–	–	–	●	–	–	–	–	●	●

PENTATOMOIDEA

Cydnidae

		FR	GR	DR	OV	FL	GL	UT	NH	ZH	ZE	NB	LB
	Sehirinae												
	Legnotus Schioedte												
536	limbosus (Geoffroy)	●	–	–	–	–	●	●	●	●	–	●	●
537	picipes (Fallén)	●	–	●	–	–	●	–	●	●	●	–	●
	Sehirus Amyot & Serville												
	subgenus Tritomegas Amyot & Serville												
538	bicolor (Linnaeus)	●	●	●	●	–	●	●	●	●	●	●	●
	subgenus Adomerus Mulsant & Rey												
539	biguttatus (Linnaeus)	–	–	●	●	–	●	●	●	–	–	●	●
	subgenus Sehirus s.s.												
540	luctuosus Mulsant & Rey	●	–	–	–	–	●	●	●	●	●	●	●
*541	morio (Linnaeus)	–	–	–	–	–	●	●	–	–	–	–	●
	Cydninae												
	Aethus Dallas												
542	flavicornis (Fallén)	–	–	–	–	–	–	●	●	●	●	–	–
*543	nigrita (Fallén)	–	–	–	–	–	●	–	●	●	●	●	●
	Cydnus Fabricius												
*544	aterrimus (Forster)	–	–	–	–	–	–	–	–	–	–	–	●

Thyreocoridae

		FR	GR	DR	OV	FL	GL	UT	NH	ZH	ZE	NB	LB
	Thyreocoris Schrank												
545	scarabaeoides (Linnaeus)	●	–	–	–	–	●	●	●	●	–	●	●

Scutelleridae

		FR	GR	DR	OV	FL	GL	UT	NH	ZH	ZE	NB	LB
	Odontoscelis Laporte												
546	fuliginosa (Linnaeus)	–	–	–	–	–	●	–	●	●	●	–	●
*547	lineola (Rambur)	●	–	–	–	–	●	●	●	●	●	●	–
	Phimodera Germar												
*548	humeralis (Dalman)	–	–	–	–	–	●	●	●	●	–	–	–
	Eurygaster Laporte												
*549	austriaca (Schrank)	–	–	–	–	–	●	●	●	●	●	–	●
550	maura (Linnaeus)	–	–	–	–	–	●	●	●	●	●	●	●
551	testudinaria (Geoffroy)	–	–	–	–	–	●	●	●	–	–	●	●

Pentatomidae

		FR	GR	DR	OV	FL	GL	UT	NH	ZH	ZE	NB	LB
	Podopinae												
	Graphosoma Laporte												
*552	lineatum (Linnaeus)	–	–	–	–	–	–	–	–	–	–	●	●
	Podops Laporte												
553	inuncta (Fabricius)	–	–	●	–	–	●	●	●	●	●	●	●
	Pentatominae												
	Sciocoris Fallén												
554	cursitans (Fabricius)	●	–	–	–	–	●	●	●	●	●	●	●
	Aelia Fabricius												
555	acuminata (Linnaeus)	●	–	●	●	–	●	●	●	●	–	●	●
556	klugii Hahn	●	–	●	●	–	●	●	●	●	–	●	●
	Neottiglossa Kirby												
557	pusilla (Gmelin)	●	–	●	●	–	●	●	●	●	–	●	●
	Eysarcoris Hahn												
558	aeneus (Scopoli)	–	–	–	–	–	●	–	–	–	–	●	●
559	fabricii (Kirkaldy)	–	–	–	–	–	●	●	–	–	–	–	●
	Rubiconia Dohrn												
*560	intermedia (Wolff)	–	–	–	●	–	●	–	–	–	–	–	–
	Holcostethus Fieber												
*561	sphacelatus (Fabricius)	–	–	–	–	–	–	–	–	–	–	–	●
*562	vernalis (Wolff)	–	–	–	–	–	–	–	●	●	●	–	●
	Palomena Mulsant & Rey												
563	prasina (Linnaeus)	–	–	●	●	–	●	●	●	–	–	●	●
*564	viridissima (Poda)	–	●	–	●	–	●	●	●	–	–	●	●
	Chlorochroa Stål												
*565	juniperina (Linnaeus)	●	–	●	●	–	●	●	●	–	–	●	●
*566	pinicola (Mulsant & Rey)	–	–	–	–	–	●	●	●	–	●	●	●
	Carpocoris Kolenati												
*567	fuscispinus (Boheman)	–	–	–	–	–	●	–	–	–	–	●	●
568	purpureipennis (De Geer)	–	–	–	–	–	–	●	●	–	●	●	●
	Dolycoris Mulsant & Rey												
569	baccarum (Linnaeus)	●	–	●	●	–	●	●	●	●	●	–	●
	Piezodorus Fieber												
570	lituratus (Fabricius)	●	–	●	–	–	●	●	●	●	●	●	●
	Pentatoma Olivier												
571	rufipes (Linnaeus)	●	●	●	●	–	●	●	●	●	–	●	●

		FR	GR	DR	OV	FL	GL	UT	NH	ZH	ZE	NB	LB
	Eurydema Laporte												
*572	dominulus (Scopoli)	–	–	–	●	–	–	–	–	–	–	●	●
573	oleracea (Linnaeus)	●	–	–	●	–	●	●	●	●	–	●	●
*574	ventralis (Kolenati)	–	–	–	–	–	–	–	–	–	–	●	–
	Amyotinae												
	Picromerus Amyot & Serville												
575	bidens (Linnaeus)	●	●	●	●	●	●	●	●	●	●	●	●
	Arma Hahn												
576	custos (Fabricius)	–	●	–	●	●	●	●	●	●	●	●	●
	Troilus Stål												
577	luridus (Fabricius)	●	–	●	●	●	●	●	●	●	–	●	●
	Rhacognathus Fieber												
578	punctatus (Linnaeus)	●	–	●	●	–	●	●	●	●	●	●	●
	Jalla Hahn												
*579	dumosa (Linnaeus)	●	–	–	–	–	●	●	–	–	●	–	●
	Zicrona Amyot & Serville												
580	caerulea (Linnaeus)	●	●	●	●	●	●	●	●	●	–	●	●
Acanthosomatidae													
	Acanthosomatinae												
	Acanthosoma Curtis												
581	haemorrhoidale (Linnaeus)	●	–	●	●	●	●	●	●	●	●	●	●
	Cyphostethus Fieber												
582	tristriatus (Fabricius)	●	–	●	●	–	●	●	●	–	–	●	●
	Elasmostethus Fieber												
583	interstinctus (Linnaeus)	●	●	●	●	●	●	●	●	●	●	●	●
	Elasmuchinae												
	Elasmucha Stål												
584	ferrugata (Fabricius)	–	–	–	–	–	●	●	–	–	–	●	●
585	fieberi (Jakovlev)	●	●	●	●	–	●	●	●	–	–	●	●
586	grisea (Linnaeus)	●	●	●	●	●	●	●	●	●	●	●	●

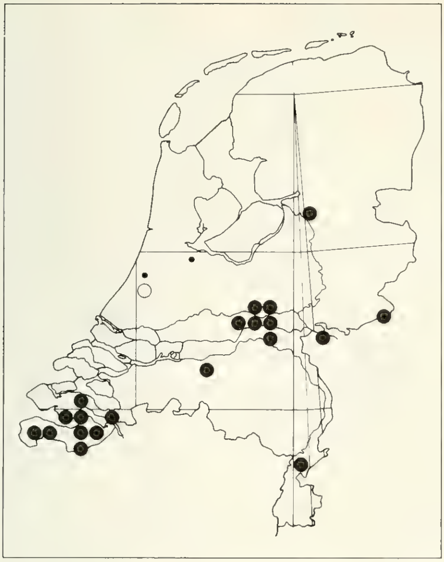


Fig. 2. *Micronecta scholtzi*. Symbols on this and following maps: open circles: recorded before 1930 only; small dots: recorded between 1930 and 1960; large dots: recorded since 1960; ?: doubtful record.

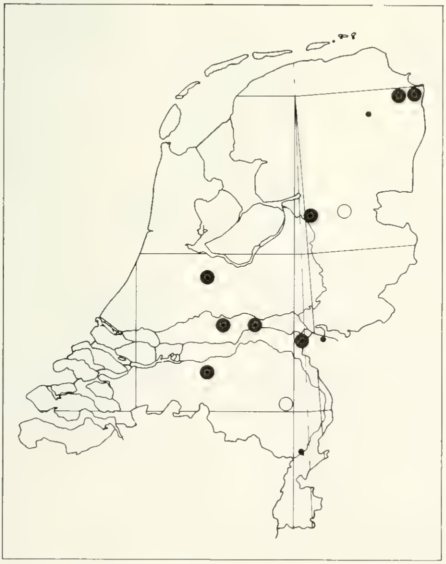


Fig. 3. *Micronecta minutissima*.

REMARKS

2. **Pachycoleus waltli**

References. – Reclaire (1936: 256, as *P. rufescens* Sahlberg; 1940: 113).

Published records. – • Limburg: Spaubeek (Reclaire 1936); Wijlre (Reclaire 1940).

Unpublished records. – • Limburg: Noorbeek, iii-half.iv.1960, 1 ♂, 2 ♀ and 1 larva, Br. Arnoud; Ravensbos, 13.ix.1961, R. H. Cobben; Herkenbosch, Meijnweg, 16.ix.1961, R. H. Cobben; Elsloo, 11.v. 1967, P. J. Brakman (RML) & P. Poot.

5. **Micronecta scholtzi** (fig. 2)

Synonym: *M. meridionalis* Costa (Jansson 1986).

References. – Reclaire (1932: 235; 1940: 115, as *meridionalis* Costa; 1943: 121); Nieser (1982: 61-62, as *meridionalis*).

Published records. – • Gelderland: Nijmegen (Nieser 1982). • Utrecht: Abcoude, 13.vii.1936, G. Kruseman (ZMA) (Reclaire 1943). • Z-Holland: Leiden (Reclaire 1932); Warmond, Poelsmeer, D. C. Geijskes (Reclaire 1940). • Zeeland: Kwadendamme, 28.vi.1977 (DI) (Nieser 1982; !EIS); Nisse, 28.vi.1977 (DI) (Nieser 1982; !EIS).

Unpublished records. – • Overijssel: Zwolle, Schelle, 5.vi.1988, B. Aukema. • Gelderland: Lobith, 18.v.1959 (K. W. R. Zwart); Wageningen, 11.ix.1971, R. H. Cobben; Lienden, 28.vii.1981, K. den Bieman; Hemmen, 29.v.1985, B. Aukema; Wamel, 16.ix.19, K. den Bieman; Winterswijk, Italiaanse Meren, 25.vii.1986, D. J. Hermes. • Utrecht: Rhenen, 1.vi.1985, B. Aukema; Ibid., Blauwe Kamer, 29.viii.1985, B. Aukema & J. H. Woudstra. • Zeeland: 's-Gravenpolder, 28.vii & 5.x.1976, DI, N. Tramper; Nisse, 30.vii.1976, DI, N. Tramper; Ibid., 8.iii & 28. vi.1977, DI, I. J. Weeber; Ibid., 27.vii & 11.x.1978, DI, S. van der Boog; Zuiddorpe, 2.vii.1981, DI, B. Krebs; Rilland, 29.ix.1988, ZW, H. Mosterdijk; Aardenburg, 1 locality, Axel, 7 localities, Hontenisse, 1 locality, Hulst, 5 localities and Oostburg, 2 localities, 1986-1988, ZW, H. Mosterdijk; • N-Brabant: Drunen, Zeedijk, 28.vii.1981, Nieser et al. (!EIS). • Limburg: Echt, 27.viii.1975, E. J. van Nieukerken (RML).

6. **Micronecta minutissima** (fig. 3)

References. – Reclaire (1932: 235); Nieser (1982: 62).

Published records. – • Overijssel: Ommen, vi.1916, D. MacGillavry (ZMA) (Reclaire 1932; 1943, as *M. poweri*). • Gelderland: Buren (Nieser 1982); • Utrecht: Maarseveen (Nieser 1982). • Z-Holland: Voorne (Nieser 1982); • Zeeland: 's Gravenpolder, Nisse (Nieser 1982; !EIS). • N-Brabant: Deurne, 26.v.1920, G. Romijn (ZMA) (Reclaire 1932).

Unpublished records. – • Groningen: Haren, 5.vi.1976, Beerta, 8.vi.1988, Winschoten, 8.vi.1988, B. Aukema. • Drenthe: Zuidlaren, vii.1956, A. J. Besseling (K. W. R. Zwart, RML, ZMA, P). • Overijssel: Zwolle, Schelle, 5.vi.1988, B. Aukema. • Gelderland: Lobith, 1959.v.18 (K. W. R. Zwart); Lienden, 3.vii.1972, R. H. Cobben; Ubbergen, Groenlanden, 1.vi.1974, E. J. van Nieukerken (RML); Echteld, Ochten, 8.vii.1975, B. Drost

(N). • Z-Holland: Tienhoven, 21.v.1981, N. Nieser et al. (!EIS). • N-Brabant: Drunen, Zeedijk, 28.vii.1981, N. Nieser et al. (!EIS). • Limburg: Roermond, 6.viii.1946, R. H. Cobben (Reclaire 1951, as *M. poweri*).

7. Micronecta poweri

References. – Reclaire (1943: 121); Nieser (1982: 62-63).

Published records. – • Overijssel: Oud-Ootmarsum, 28.v.1966, N. Nieser (Nieser 1982; !EIS). • Gelderland: Winterswijk, 15-21.vi.1921, 1 ♂, 1 ♀, P. van der Wiel (ZMA) (Reclaire 1943). • N-Brabant: Oirschot, vii.1908, D. MacGillavry (ZMA) (Reclaire 1932, as *M. minutissima*; 1943).

Present status. – Very rare, not recorded since 1966.

22. Sigara selecta (fig. 4)

References. – Fokker (1891: 360); Duffels (1962); Higler & Duffels (1965: 109); Krebs (1982).

Note. – The records from Hilversum, Bergen op Zoom and Halsteren in Reclaire (1932: 229) concern other species (Reclaire 1943; Duffels 1962).

Published records. – • Friesland: Terschelling (Duffels 1962; Higler & Duffels 1965). • Z-Holland: Ouddorp, Kwade Hoek, Brielse Meer (Krebs 1982). • Zeeland: Zierikzee (Fokker 1891; Duffels 1962), Yer-seke (Duffels 1962); Schouwen-Duiveland, 8 localities, Tholen, 1 locality, Noord-Beveland, 2 localities, Walcheren, 1 locality, Zuid-Beveland, 5 localities, Zeeuws-Vlaanderen, 2 localities (Krebs 1982).

Unpublished records. – • Friesland: Terschelling, Striep, 22-24.viii.1962, J. H. Woudstra (W, BE). • Zeeland: Ellewoutsdijk, 11.vii.1987, B. Aukema.

24. Sigara hellensii (fig. 5)

References. – Snellen van Vollenhoven (1878a: 357); Reclaire (1932: 230; 1936: 257; 1943: 121; 1948: 52); Nieser (1982: 69).

Published records. – • Gelderland: Leuvenum, Nunspeet (Reclaire 1932); Arnhem, Warnsborn (Reclaire 1943); Hierdense Beek, Ellecom, Middachten (Nieser 1969; 1982). • N-Brabant: Breda (Snellen van Vollenhoven 1878). • Limburg: Belfeld (Reclaire 1936); Maasniel (Reclaire 1948).

Unpublished records. – • Gelderland: Leuvenum, Hierdense Beek, 25-26.vii.1961 & 3.viii.1961, J. Beernink & J. H. Woudstra; Oosterbeek, Hemelse Berg, 6.iv.1960, R. H. Cobben.

32. Sigara iactans

References. – Cuppen (1988).

Published records. – • Groningen: Midwolda (Cuppen 1988).

Unpublished records. – • Groningen: Midwolda, 8 & 10.vi.1988 (7 ♂), 18.x.1988 (16 ♂), B. Aukema; Winschoten, 8.vi.1988, 1 ♂, B. Aukema.

33. Sigara longipalis (fig. 6)

References. – Nieser (1982: 71).

Published records. – • Overijssel: Oud-Ootmarsum (Nieser). • N-Brabant: Drunen, 15.vii.1981; Kaatsheu-

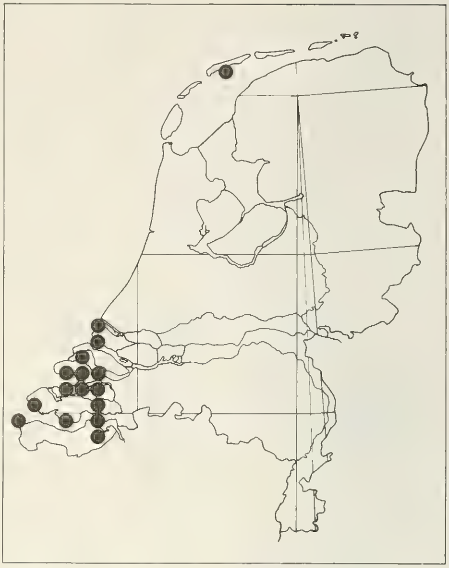


Fig. 4. *Sigara selecta*.

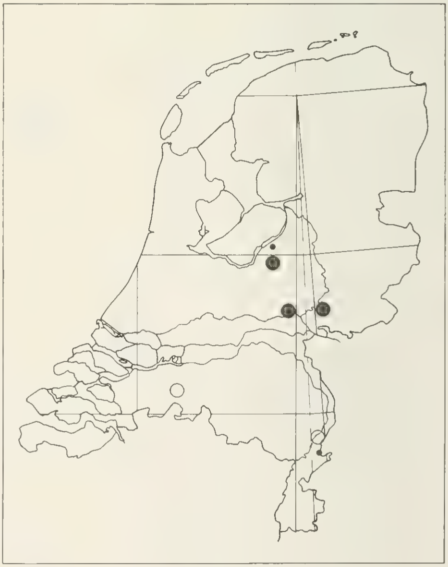


Fig. 5. *Sigara hellensii*.

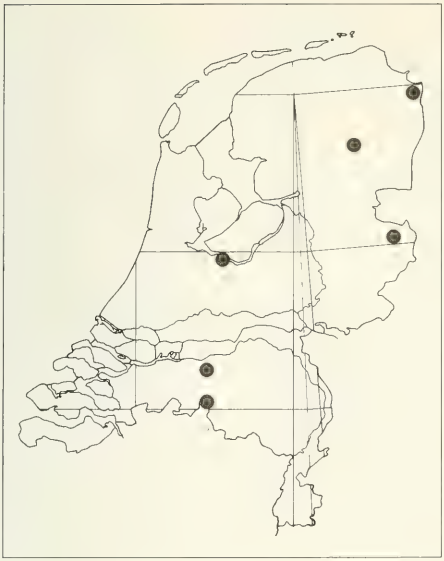


Fig. 6. *Sigara longipalis.*

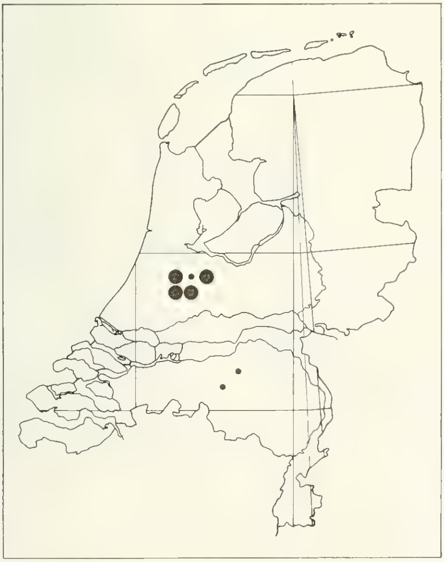


Fig. 7. *Naucoris maculatus.*

vel, 18.viii.1981; De Moer, 12.viii.1981 (Nieser 1982; !EIS);

Unpublished records. – • Groningen: Beerta, 8.vi.1988, 1 ♂, B. Aukema. • Drenthe: Beilen, Hijken, 14.iv.1974, 1 ♂, E. J. van Nieukerken (RML). • Overijssel: Ootmarsum, 15.vii.1974, 1 ♂ at light, B. Aukema. • Utrecht: Eemnes, 14.ix.1988, R. Beenen (N). • N-Brabant: Hilvarenbeek, Beeksche Bergen, 20.vii.1985, 6 ♂, J. Sparreboom (RML).

37. **Naucoris maculatus** (fig. 7)

References. – Reclaire (1932: 225; 1940: 114); Gravestein (1942: lviii); Nieukerken (1972).

Published records. – • Utrecht: Vinkeveen (Gravestein 1942). • Z-Holland: Nieuwkoop (Van Nieukerken 1972). • N-Brabant: Oisterwijk (Reclaire 1932); Berlicum (Reclaire 1940).

Unpublished records. – • Z-Holland: Noorden, De Haeck, 26.iv.1969, N. Nieser (!EIS); Ibid., 10 & 25.viii.1974, B. Aukema; Ibid., 1.ix.1974, B. Aukema & J. Beernink; Tienhoven, 13.x.1984, F. van Nunen & R. Beenen (P).

38. **Aphelocheirus aestivalis** (fig. 8)

References. – Reclaire (1932: 225; 1948: 51); Moller Pillot (1971: 140).

Published records. – • Overijssel: Oldenzaal (Reclaire 1932). • N-Brabant: Gilze-Rijen, Aa-gebied (Reclaire 1932); Boxtel (Reclaire 1948); Dommelen (Moller Pillot 1971). • Limburg: Mook, Heijen, Afferden (Reclaire 1932).

Unpublished records. – • N-Brabant: Spoordonk, Beerze, 26.viii.1964, N. Nieser (!EIS).

44. **Notonecta reuteri** (fig. 9)

References. – Schober & Wassenaar (1980); Nieser (1982: 56).

Note. – The specimens from Hoog-Buurlo, Gerritsfles (20-23.vii.1918, 2 ♀, M. Weber, coll. ZMA) recorded in Reclaire (1932: 227) as *N. lutea* belong to this species.

Published records. – • Friesland: Terschelling, Vlieland (Schober & Wassenaar 1980). • Drenthe: Beilen, Dwingeloo, Havelte (Schober & Wassenaar 1980). • Gelderland: Hoog-Buurlo, Gerritsfles (Schober & Wassenaar 1980); Buren (Nieser 1982).

Unpublished records. – • Friesland: Terschelling, Kroonpolders, 5.viii.1970, G. Visser (W). • Overijssel: Denekamp, Bergvennen, 2.vii.1970, 2 ♂, B. Aukema. • Drenthe: Ruinen, Kraloërplas, 22.ix.1984, 3 ♂, 4 ♀, 23.ix.1984, 1 ♂, 1 ♀, B. Aukema; Dwingeloo, IJsbaan, 23.ix.1984, 11 ♂, 2 ♀, 12.x.1984, 4 ♂, B. Aukema; Wijster, Meeuwenven, 2.x.1984, 2 ♂, 3 ♀, B. Aukema.

52. **Velia saulii**

References. – Van Nieukerken (1976).

Published records. – • Limburg: Bunde, Cotessen, Epen, Wittem (Van Nieukerken 1976).

Unpublished records. – • Gelderland: Winterswijk, Bekendelle, 5.v.1980, 1 ♀, K. den Bieman. • Limburg: Epen, Geul & Beversbeek, 4 & 5.v.1980, in large numbers, B. Aukema.

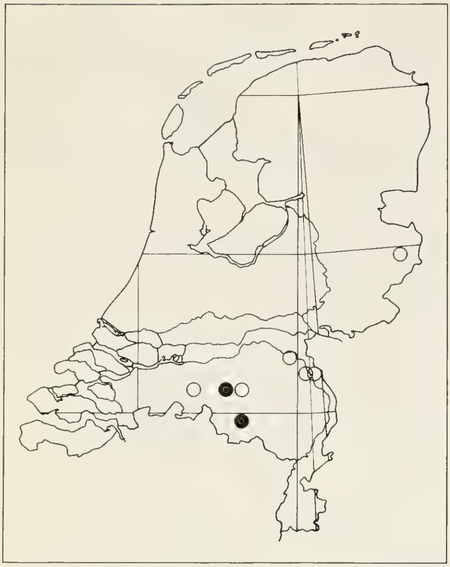


Fig. 8. *Aphelocheirus aestivalis*.

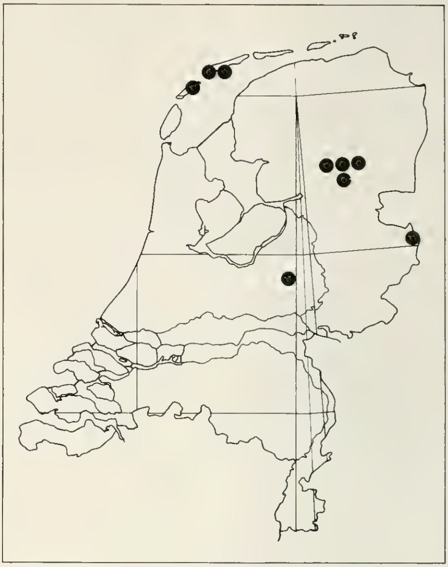


Fig. 9. *Notonecta reuteri*.

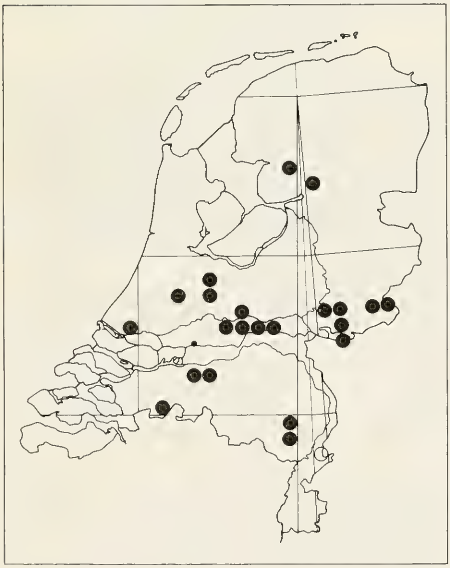


Fig. 10. *Microvelia buenoi*.

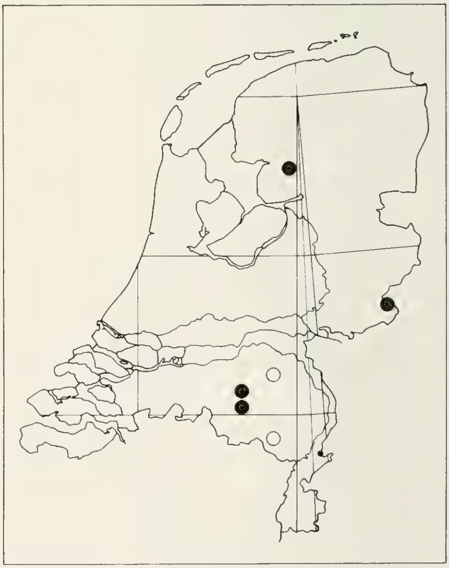


Fig. 11. *Gerris lateralis*.

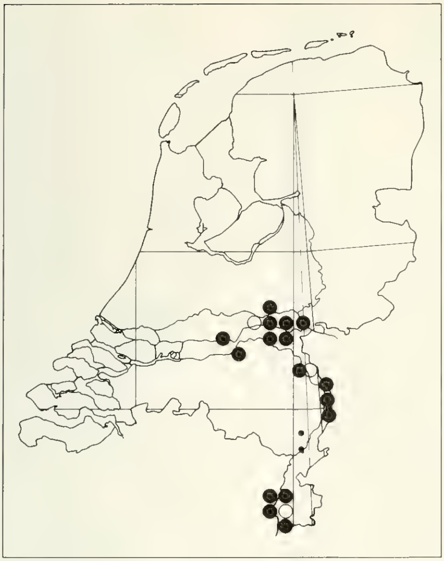


Fig. 12. *Saldula scotica*.

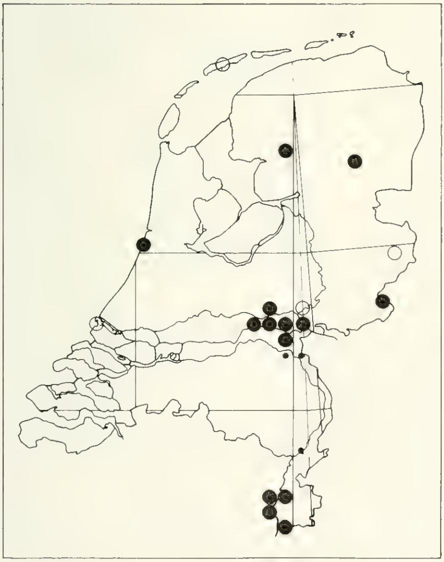


Fig. 13. *Saldula arenicola*.

53. **Microvelia buenoi** (fig. 10)

Synonym: *M. umbricola* Wróblewski (Kanyukova 1986).

References. – Higler (1962, as *M. umbricola*; 1967a); Laeijendecker & Nieser (1971: 11, as *umbricola*); Nieukerken (1972, as *umbricola*); Nieukerken & van Tol (1972, as *umbricola*); Van der Velde (1973, as *umbricola*); Cuppen (1978, as *umbricola*); Giesen & Geurts (1985, as *umbricola*).

Published records. – • Overijssel: Vollenhove, Dwarsgracht (Higler 1962); Belt Schutsloot (Cuppen 1978). • Gelderland: Winterwijk (Laeijendecker & Nieser 1971); Nijmegen, Hatertse- and Overasseltse vennen (Cuppen 1978); Doesburg, Eldrik, Gendringen, Hummelo, Hoog-Keppel, Silvolde (Giesen & Geurts 1985). • N-Holland: Kortenhoef (Higler 1962). • Z-Holland: Nieuwkoop (Nieukerken 1972); Schipluiden (Van der Velde 1973); Schoonrewoerd, Everdingen (Cuppen (1978). • Limburg: Nederweert, Groote Peel (Higler 1967a; Nieukerken & van Tol 1972); Meerlo-Wanssum, Geijsteren, Horst, Mariapeel, Helden (Cuppen 1978).

Unpublished records. – • Overijssel: Kalenberg, De Weerribben (J. H. Woudstra; B. Aukema). • Gelderland: Driel (S. van Heijnsbergen, W); Wamel, Korenburgerveen (K. den Bieman); Hemmen (B. Aukema); Buren (N. Nieser et al., !EIS). • Utrecht: Leersum (K. den Bieman); Rhenen, Blauwe Kamer (B. Aukema); Westbroek (K. W. R. Zwart, P). • N-Holland: Kortenhoef (P. van der Wiel, ZMA; R. H. Cobben; J. H. Woudstra). • N-Brabant: Woudrichem, Loevestein (R. H. Cobben); Zundert (J. H. Woudstra); Asten, Capelle, Drunen, Udenhout, Wernhout (N. Nieser et al., !EIS); Liessel (P. Poot). • Limburg: Leeuwen (P. van der Wiel, ZMA).

54. **Microvelia pygmaea**

References. – Reclaire (1940: 114)

Published records. – • Limburg: Afferden, 14.ix.1935, 1 ♀, A. Reclaire (ZMA) (Reclaire 1940).

Unpublished records. – • N-Brabant: Deurne, Mariapeel, Helenavaart, 30.ix.1983 (apterous ♂), 26.ix.1986 (apterous ♀) & 26.ix.1987 (2 apterous ♂), J. G. M. Cuppen; Ibid., Helenaveen, Helenavaart, 3.x.1986 (apterous ♀), J. G. M. Cuppen.

59. **Gerris lateralis** (fig. 11)

References. – Reclaire (1932: 217, as *G. asper* Fieber); Cobben (1946: 58, as *asper*); Laeijendecker & Nieser (1971: 11).

Published records. – • Gelderland: Winterswijk, Meddo (Laeijendecker & Nieser 1971). • N-Brabant: Uden (Reclaire 1932). • Limburg: Weert (Reclaire 1932); St. Odiliënberg (Cobben 1946).

Unpublished records. – • Overijssel: Kalenberg, Weerribben, 19.iv.1984, B. Aukema. • Gelderland: Staverden, 6.v.1969, micropterous ♀, P. H. van Doesburg (RML); Winterswijk, 15.iv.1979, micropterous ♂, Seijstermans (ZMA). • N-Brabant: Liempde, De Geelders, 9.x.1965, 13 & 15.v.1966, J. H. Woudstra; ibid., 17 & 28.vii.1966, B. Aukema; Best, 16.v.1985, 1 macropterous ♀, B. Aukema.

67. Salda morio

References. – Reclaire (1932: 221).

Published records. – • Overijssel: Deventer, 20.vi.1910, macropterous ♀, Klaassen (ZMA); Denekamp, viii.1916, brachypterous ♀, Koperberg (ZMA); ibid., v.1918, 5th instar larva, D. MacGillavry (ZMA).

Present status. – Not recorded since 1918.

68. Salda muelleri

References. – Brakman (1960: 23).

Published records. – • Zeeland: Hoofdplaat, 24.v-28.vi.1959, P. J. Brakman, in large numbers, 2 macropterous ♀ included (RML, ZMA, LUW, AU, P).

Unpublished records. – • Friesland: Ameland, Oerd, 4.vii-18.viii.1985 & 31.viii.1986, Th. Heijerman; Terschelling, Lies, 11.vii.1988, 1 ♀ & 12.vii.1988, 1 ♂, B. Aukema.

70. Saldula scotica (fig. 12)

References. – Fokker (1884: 31; 1891: 358); Reclaire (1932: 221; 1951: 21).

Present status. – Locally common in the southeast (Limburg, Noord-Brabant and Gelderland) on stony riversides.

71. Saldula arenicola (fig. 13)

References. – Fokker (1891: 358); Reclaire (1932: 223); Cobben (1950: 83; 1957: 255).

Published records. – • Friesland: Terschelling, vii.1908 (1 ♂) & viii.1912 (2 ♂, 1 ♀), D. MacGillavry (ZMA). • Overijssel: Oldenzaal, vii.1906, 1 ♀, D. MacGillavry (ZMA). • Gelderland: Velp, vii.1908, 1 ♂, D. MacGillavry (ZMA). • Z-Holland: Hoek van Holland, v, E. Everts (RML).

Present status. – Locally common on sandy riversides in the southeast (Limburg, Noord-Brabant, Gelderland and Utrecht), elsewhere occasionally on sandy shores along isolated smaller waterbodies.

72. Saldula c-album

References. – Cobben (1950: 83; 1957: 253).

Published records. – • Limburg: Plasmolen, 22.vii.1949, 1 ♀, R.H. Cobben (Cobben 1950); Eijsden, vii, 1 ♂, E. Everts (RML) (Cobben 1957).

Unpublished records. – • Limburg: Epen, Cottessen, in large numbers along De Geul, 8.viii.1983 & 16.viii.1986, Th. Heijerman; Ibid., 22.viii.1987, B. Aukema.

73. Saldula fucicola (fig. 14)

References. – Cobben (1950: 83, as *S. vestita* Douglas & Scott; 1957: 252-253).

Present status. – Widespread and common along riversides and in the recently reclaimed Flevopolders.

74. Saldula melanoscela (fig. 15)

References. – Fokker (1884: 131, as *Salda melanoscela*; 1891: 358); Reclaire (1932: 222); Woudstra (1971).

Published records. – • Friesland: Terschelling, Bosplaat (Woudstra 1971). • Gelderland: Vorden (Fokker

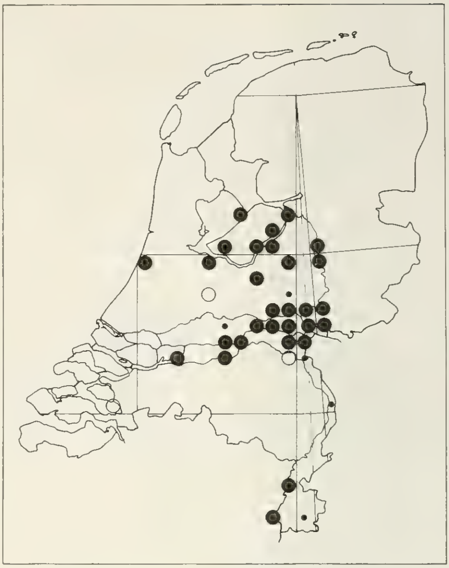


Fig. 14. *Saldula fucicola.*

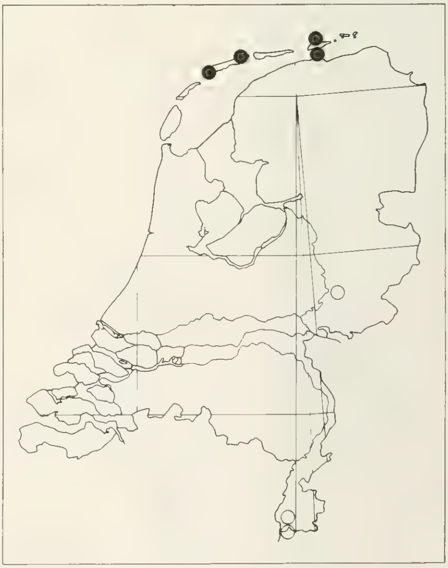


Fig. 15. *Saldula melanoscela.*

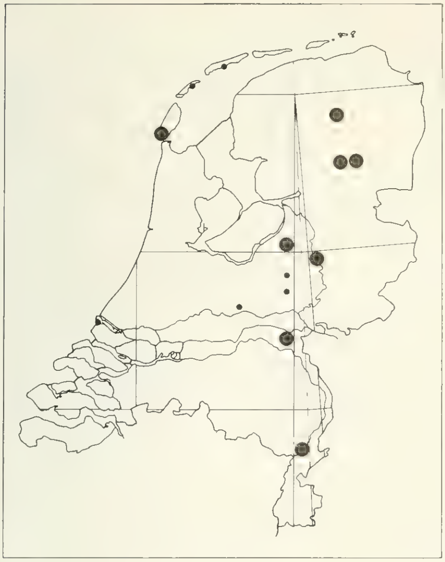


Fig. 16. *Saldula opacula.*

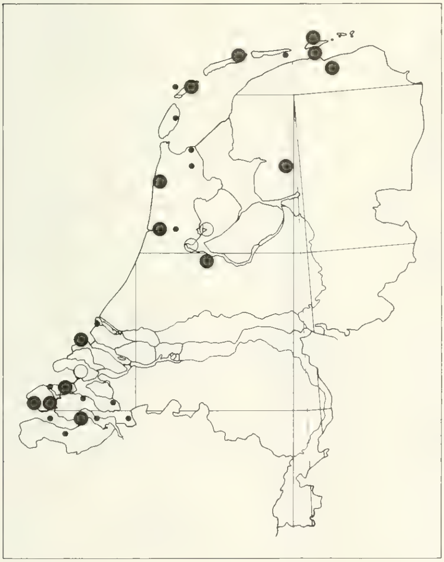


Fig. 17. *Saldula palustris.*

1884). • Limburg: Eijsden (Fokker 1891), Valkenburg (Reclaire 1932).

Unpublished records. – • Friesland: Terschelling, Bosplaat, 19.viii.1971 & Ibid., Noordvaarder, 2.ix.1984, J. H. Woudstra; Schiermonnikoog, Strandvlakte, 17.v, 11 & 12.vii and 15.ix.1972, A. Littel (AU, CB). • Groningen: Lauwersmeer, Ulrum, 11.iv & 10.v.1981, B. Aukema.

75. **Saldula opacula** (fig. 16)

References. – Reclaire (1940: 114); Cobben (1957: 253-255; 1959: 310-311).

Note. – The record from Zeeburg in Reclaire (1932) concerns *S. pallipes* (Reclaire 1948: 51).

Published records. – • Utrecht: Leersum (Reclaire 1940). • Z-Holland: Oostvoorne (Cobben 1957). • Limburg: Heel, Horn (Cobben 1957).

Unpublished records. – • Friesland: West-Vlieland, 8-9.viii.1956, W. H. Gravestein (ZMA); Terschelling, Griltjeplak, 24.viii.1954 (CB). • Drenthe: Assen, 28.vi.1930, 1 ♀, H. C. Blöte (RML); Dwingeloo, 1.ix.1932, 1 ♀ (RML); Ibid., 2.vii.1967, S. van Heijnsbergen (W); Wijster, IJsbaan, 6-12.ix.1975 & 15.iv.1981, B. Aukema; Ibid., Taaiveen, 26.iv.1976, B. Aukema; Ibid., Vossenberg, 24.vii.1984, B. Aukema; Spier, Kibbelhoek & Moddergat, 17.iv.1977, B. Aukema; Dwingeloo, Diepveen, 16.vi.1977, B. Aukema; Norg, Norgerholt, 24.vii.1977, B. Aukema. • Overijssel: Diepenveen, 13-14.vii.1967, 1 ♀, J. J. Meurer (ZMA). • Gelderland: Delense Zand, 23.iii.1952, 1 ♂, (CB); Gerritsfles, 16.iv.1959 (CB); Hatertse Vennen, 25.x.1964, S. J. van der Molen (CB); Tongeren, 16.iv.1983, K. den Bieman (HE, BI). • N-Holland: Texel, de Geul, 29.viii.1974, 1 ♂, B. Aukema. • Limburg: Horn, 6.iv.1963, R. H. Cobben.

78. **Saldula palustris** (fig. 17)

References. – Cobben (1957: 255).

Present status. – Widespread, coastal.

81. **Micracanthia marginalis** (fig. 18)

References. – Fokker (1899: 35, as *Salda marginalis*); Cobben (1957: 255-256, as *M. imitator* (L.); 1959: 311-312).

Note. – The record of Denekamp (Reclaire 1932: 223) concerns *S. saltatoria* (Reclaire 1950: 22).

Published records. – • Gelderland: Lochem, Winterswijk (Fokker 1899). • Limburg: Horn (Cobben 1957).

Unpublished records. – • Friesland: Terschelling, Hoorn, 12-13.viii.1965, J. H. Woudstra; Ibid., 23.viii.1965, J. Beernink; Ibid., Oosterend, 11-19.viii.1966, B. Aukema; Ibid., 13.vii.1969, J. H. Woudstra. • Gelderland: Staverden, 22.viii.1981, A. C. & W. N. Ellis (ZMA). • N-Brabant: Rul, 8.vi.1959, J. H. Woudstra (W, BE, P).

84. **Chartoscirta elegantula**

References. – Reclaire (1932: 224; 1948: 51); Cobben (1957: 256-257).

Published records. – • N-Holland: Diemen (Reclaire 1932). • Limburg: Swalmen (Reclaire 1948); St. Odiliënberg (Cobben 1957).

Present status. – Not recorded since 1958: St. Odiliënberg, 16.viii, R. H. Cobben (ZMA).

88. **Acalypta marginata** (fig. 19)

Note. – Older data on *A. marginata*, *A. nigrina* and *A. platycheila* are not reliable since these species were often misidentified in the past.

References. – Reclaire (1932: 127; 1936: 249; 1948: 43); Aukema (1983).

Published records. – • Limburg: Valkenburg (Reclaire 1936); Terblijt (Reclaire 1948); Stokhem (Aukema 1983).

Unpublished records. – • Gelderland: Schaarsbergen, 21.vii.1955, R. H. Cobben. • Utrecht: Leersum, 12.v.1979, 1 ♂, K. den Bieman. • N-Holland: Hilversum, 18.v.1985, R. Ph. Jansen (ZMA, JA); Ibid., 2.v & 10.v.1986, J. H. Woudstra, 5.v.1986, B. Aukema & 31.v.1986, K. den Bieman. • Limburg: Maastricht, vi.1894 (RML) (Reclaire 1932, as *platychila*); Linne, 25.v.1944, 1 ♂, R. H. Cobben (Reclaire 1948, as *nigrina*).

89. **Acalypta musci**

References. – Reclaire (1932: 126; 1934: 51).

Published records. – Valkenburg, Houthem (Reclaire 1932, 1934).

Present status. – Collected between 1923 and 1943 on the same locality.

90. **Acalypta nigrina** (fig. 20)

Note. – older data are unreliable (see *marginata* and *platycheila*).

References. – Reclaire (1932: 127; 1936: 249-250).

Published records. – • Gelderland: Groesbeek, Leuvenum (Reclaire 1936).

Unpublished records. – • Drenthe: Kraloo, 22.vii.1959, 22.vi.1960, 28.vi & 2.viii.1961, 25.vii.1962, 17.vi & 22.vii.1964, 11 & 18.viii.1965 & 24.viii.1966, P. J. den Boer (BSW). • Gelderland: Eerbeek, v.1916, 1 ♀, D. L. Uyttenboogaart (ZMA) (Reclaire 1932, as *marginata*); Wageningen, Oostereng, ix.1949, 1 ♀, J. van der Drift (RML). • Utrecht: Driebergen (Reclaire 1932, as *nigrina* and *marginata*). • N-Holland : Hilversum, 13.vi.1965, M. J. Gijswijt (W); Ibid., 22.viii-4.x.1986, R. Ph. Jansen (JA, W, ZMA).

92. **Acalypta platycheila** (fig. 21)

Note. – older data are unreliable (see *marginata* and *nigrina*).

References. – Reclaire (1932: 127; 1943: 110; 1948: 43).

Published records. – • Drenthe: Assen (Reclaire 1948).

Unpublished records. – • Friesland: Terschelling, Bosplaat, 15.vii.1958, W. H. Gravestein (ZMA); Ameland, Oerd, 18.viii.1985, Th. Heijerman. • Drenthe: Lheebroek, 29.vi, 13 & 20.vii.1960, P. J. den Boer (BSW, ZMA); Wijster, IJsbaan, 11.vi.1976, B. Aukema. • Gelderland: Winterswijk, 22.ix.1941, A. Reclaire & P. van der Wiel (ZMA) (Reclaire 1943, as *nigrina*); Bennekom, 16-17.vi & 8.vii.1956, R. H. Cobben.

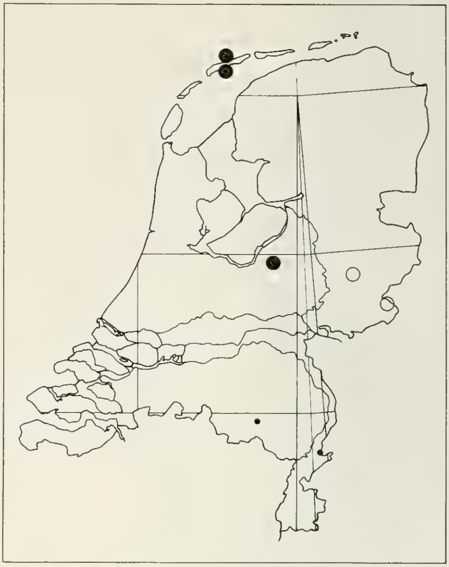


Fig. 18. *Micracanthia marginalis*.

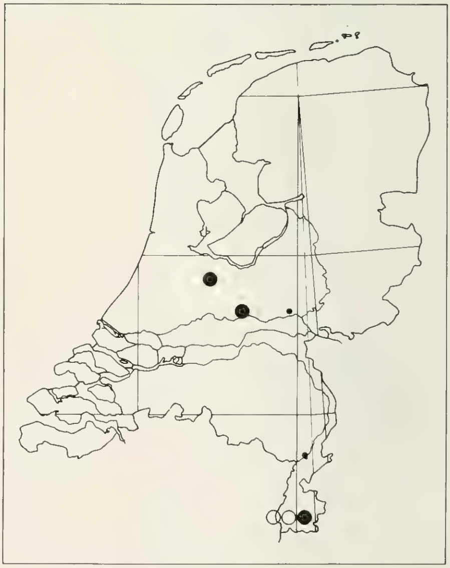


Fig. 19. *Acalypta marginata*.

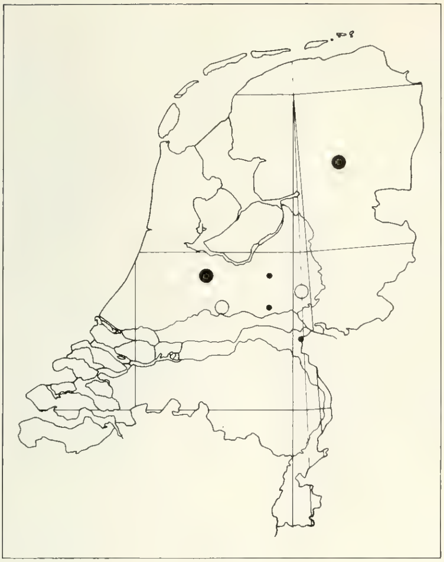


Fig. 20. *Acalypta nigrina.*

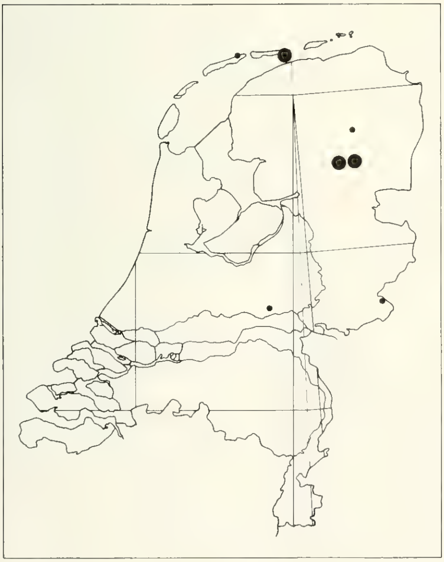


Fig. 21. *Acalypta platycheila.*

97. **Galeatus maculatus**

References. – Fokker (1884: 124).

Published records. – ● Gelderland: Wageningen, 1 ♂, J. Ritzema Bos (RML) (Fokker 1884).

Present status. – Not recorded since 1884.

100. **Lasiacantha capucina**

References. – Reclaire (1936: 250).

Published records. – ● Limburg: Bemelen, 26 & 27.iv.1935, M. van den Boorn & A. M. Scholte (Reclaire 1936).

Unpublished records. – ● Limburg: Bemelen, 2.v.1935 & 16.iv.1936, M. van den Boorn (NMM); Ibid., 1.vi.1944, M. van den Boorn (P); Ibid., 6.viii.1948, 30.vi & 23.vii.1950, P. van der Wiel (ZMA); Ibid., 30.vi.1950, C. Berger (P).

Present status. – Not recorded since 1950.

101. **Tingis reticulata**

References. – Fokker (1884: 124, as *Monanthia ciliata* Fieber); Reclaire (1932: 131-132; 1936: 250; 1948: 43); Cobben (1958: 16)

Published records. – ● Gelderland: Wageningen (Cobben 1958). ● N-Holland: Bloemendaal (Fokker 1884). ● Z-Holland: Meijendel (Reclaire 1932); Wassenaar (Reclaire 1936). ● N-Brabant: Breda, Liesbos (Reclaire 1948).

Unpublished records. – ● N-Holland: Santpoort, Duin en Kruidberg, 18.v, 27.vi, 3 & 6.viii.1974, B. Aukema, 23.v.1974 & 19.v.1975, J. H. Woudstra & 21.ii.1976 & 17.iv.1981, B. Aukema & J. H. Woudstra. ● Z-Holland: Meijendel, Bierlap, 3.x.1944, 1 ♀, M. van den Boorn (P).

102. **Tingis pilosa**

References. – Reclaire (1932: 132; 1940: 109); Blöte (1954: 84).

Published records. – ● Z-Holland: Noordwijk (Reclaire 1932). ● Limburg: Schin op Geul (Reclaire 1940); Eijsden (Blöte 1954).

Unpublished records. – ● Limburg: Cottessen, 26 & 30.viii.1968, J. H. Woudstra; Ibid., 12 & 17.viii.1971, 10.ix.1973, B. Aukema, 17.viii.1974, B. Aukema & J. Beernink; Stramproij, 11.vi.1984, K. den Bieman.

105. **Tingis crispata**

References. – Aukema (1976).

Published records. – ● Limburg: Maastricht, St. Pietersberg (Aukema 1976).

Unpublished records. – ● Limburg: Maastricht, St. Pietersberg, 29.iv, 8-11.viii & 2.ix.1983, B. Aukema; Ibid., 15.x.1984, B. van Aartsen (ZMA). ● N-Brabant: Best, 4.vi.1983 & 19.v.1984, B. Aukema & J. H.Woudstra, 16.v.1985, B. Aukema & H. W. van der Wolf.

107. **Physatocheila costata**

References. – Cobben (1958a: 10-12, as *quadrimaculata*).

Published records. – ● Limburg: Haelen (Nunhem), Maasniel, Susteren (Cobben 1958).

Present status. – Not recorded since 1951: Susteren, 2.viii, R. H. Cobben (CB, AU).

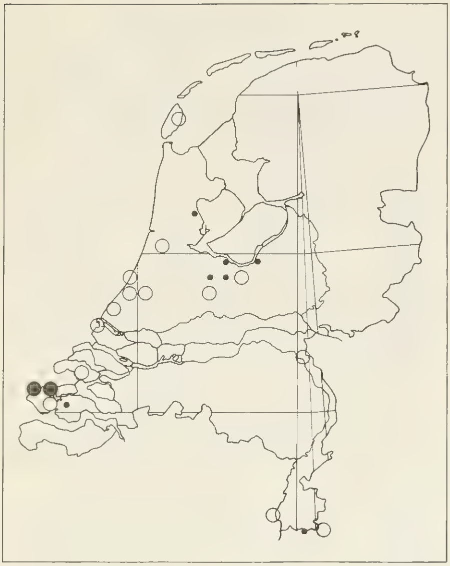


Fig. 22. *Physatocheila dumetorum.*

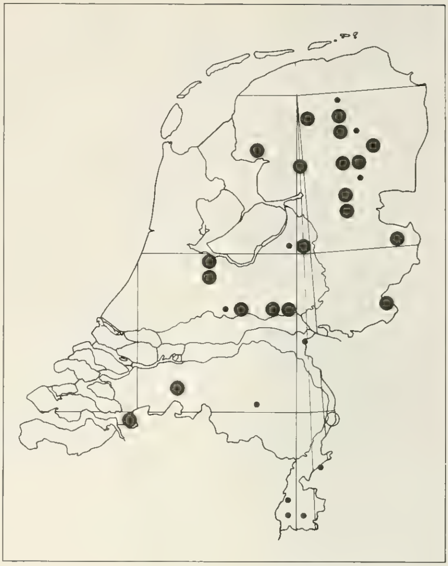


Fig. 23. *Physatocheila smreczynskii.*

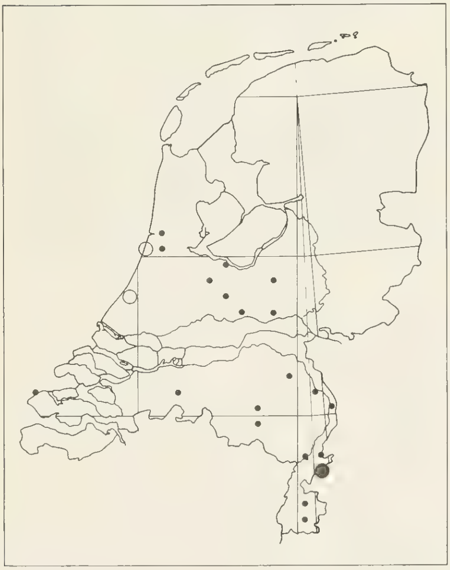


Fig. 24. *Deraeocoris punctulatus.*

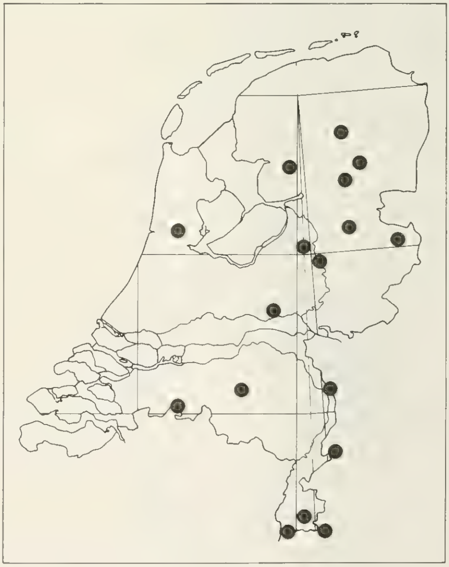


Fig. 25. *Deraeocoris annulipes.*

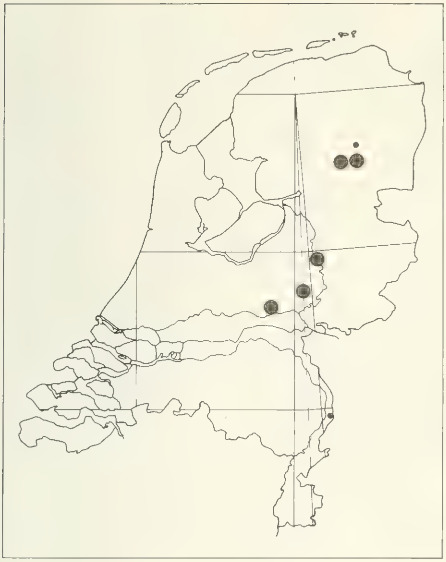


Fig. 26. *Deraeocoris scutellaris.*

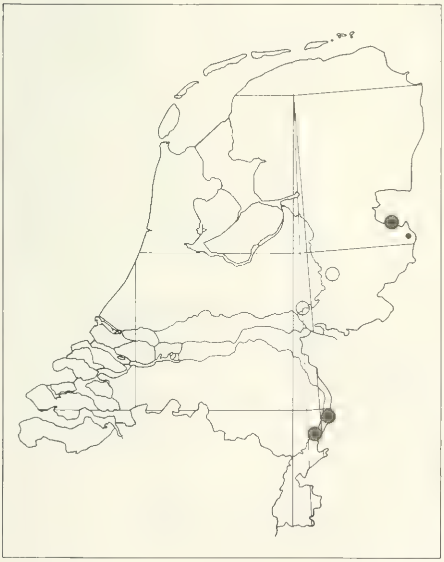


Fig. 27. *Oncotylus punctipes.*

108. **Physatocheila dumetorum** (fig. 22)

Present status. – Formerly a widespread species, but recorded only twice since 1957 from the province of Zeeland: Oostkapelle, 8.ix.1962 & Vrouwenpolder, 14.ix.1962, P. J. Brakman (P).

109. **Physatocheila smreczynskii** (fig. 23)

References. – Cobben (1958: 10-12).

Note. – Most old records of *P. quadrimaculata* (Reclaire 1932, 1934, 1936, 1943, 1948 & 1951) concern this species.

Present status. – Widespread.

110. **Oncochila simplex**

References. – Reclaire (1932: 134); Cobben (1958a: 12-14).

Published records. – • Overijssel: Deventer, viii.1912, Klaassen (Reclaire 1932). • Limburg: Rijkel, 7.vi.1953, 1 ♀, W. H. Gravestein (ZMA); Ibid., 2-7.viii.1955, in numbers, R. H. Cobben (Cobben 1958a).

Unpublished records. – • Gelderland: Winssen, 31.v.1981, 1 ♂, Th. Heijerman; Ibid., 14.v.1982, 1 ♂, K. den Bieman; Ibid., 29.v & 13.vii.1985, 19.v.1986, 24.v.1987 & 2.v.1988, B. Aukema.

119. **Myrmedobia distinguenda**

References. – Fokker (1899: 35); Reclaire (1932: 156).

Published records. – • Gelderland: Rheden, De Steeg (Fokker 1899); Putten, Leuvenum (Reclaire 1932).

Present status. – Not recorded since 1913: Leuvenum, 9.vi, 1 ♀, D. MacGillavry (ZMA).

123. **Bothynotus pilosus**

References. – Fokker (1891: 359); Reclaire (1936: 254; 1948: 47).

Published records. – • Utrecht: Den Dolder (Reclaire 1936). • Gelderland: Groesbeek (Reclaire 1936). • N-Brabant: Breda (Reclaire 1948). • Limburg: locality unknown (Fokker 1891).

Unpublished records. – • N-Brabant: Liempde, De Geelders, 14.vi.1966, 1 macropterous ♂, at light, B. Aukema.

125. **Deraeocoris punctulatus** (fig. 24)

References. – Reclaire (1932: 176; 1936: 254; 1943: 115; 1948: 47; 1951: 15); Meurer (1957: 95); Brakman (1960: 21).

Present status. – Formerly widespread, but recorded only once since 1960: Limburg, Vlodrop, 20.viii.1968, 1 ♂, P. J. Brakman (P).

126. **Deraeocoris annulipes** (fig. 25)

References. – Cobben (1958a: 21-22).

Present status. – Widespread, but rare.

128. **Deraeocoris flavilinea** f. nov. spec.

Since 1985 recorded from Arnhem, Nijmegen and Wageningen from common maple (*Acer campestre* L.) and sycamore (*A.pseudoplatanus* L.).

Records. – • Gelderland: Wageningen, 13-20.vi.1985, 16.vi-6.vii.1987 & 2.vi.1988, B. Aukema (6.vii.1987: B. Aukema & J. H. Woudstra); Ibid., 5.vi.1986, K. den Bieman; Arnhem, 16.vi.1985, B. Aukema; Nijmegen, 16.vi-5.vii.1985, 22.vi.1986, 28.vi-11.ix.1987 & 21.vi-1.vii.1988, B. Aukema.

131. **Deraeocoris scutellaris** (fig. 26)

References. – Fokker (1899: 35, as *Capsus scutellaris*).

Published records. – • Limburg: Venlo (Fokker 1899).

Unpublished records. – • Drenthe: Hooghalen, vi-vii.1944, E. A. M. Speijer (RML); Kraloo, 17.vii.1966, 1 ♀, P. J. den Boer (BSW); Westerbork, 3.x.1968, 1 ♀, J. B. Wolschrijn (ZMA); Wijster, 2, 12-13 & 28.vii.1975, 15-16, 20.vi & 26.vii.1978, B. Aukema; Nuil, 6.viii.1975, B. Aukema; Beilen, 27.vi.1983, 1 ♀, B. van Aartsen (ZMA); Dwingeloo, 25.viii.1984, B. van Aartsen (W). • Overijssel: Diepenveen, 13-14.vii.1967, J. J. Meurer (ZMA). • Gelderland: Terlet, 1.ix.1979, B. Aukema; Ibid., 20.vi.1982, B. van Aartsen (ZMA). Ede, Ginkelse Heide, 3.vii.1985, 1 ♂, B. Aukema.

136. **Oncotylus punctipes** (fig. 27)

References. – Fokker (1891: 360); Reclaire (1932: 200); Gravestein (1949: xxiv).

Published records. – • Overijssel: Denekamp (Gravestein 1949). • Gelderland: Arnhem (Fokker 1891); Warnsveld (Reclaire 1932).

Unpublished records. – • Overijssel: Vasse, 2.vii.1970, B. Aukema; Ibid., 8.vii.1972, B. Aukema & J. H. Woudstra; Ibid, 14.vii.1972 & Ootmarsum, 5.vii.1970, J. H. Woudstra. • Limburg: Swalmen, 1.viii.1980, B. Aukema; Venlo, 3.viii.1983, J. H. Woudstra & B. Aukema.

137. **Oncotylus viridiflavus**

References. – Brakman (1951); Cobben (1953: 194-196; 1958: 20).

Published records. – • Zeeland: Nieuw & St. Joosland (Brakman 1951). • Gelderland: Valburg (Cobben 1953); Wageningen (Cobben 1958).

Unpublished records. – • Zeeland: Vrouwenpolder, 15.viii.1955, P. J. Brakman (P); Nisse, 22.viii.1960, 1 ♂, P. J. Brakman (RML).

139. **Conostethus roseus** (fig. 28)

References. – Snellen van Vollenhoven (1878a: 162-163, as *Lopus subpatellatus* nov. spec.); Fokker (1885: 70); Aukema (1988).

Published records. – • Drenthe: Noordsleen (Aukema 1988). • Flevoland: Biddinghuizen (Aukema 1988). • Gelderland: Velp (Snellen van Vollenhoven 1878); Ede (Fokker 1885; Aukema 1988); 't Harde, Hulshorst, Kootwijk, Otterlo, Hoge Veluwe, Tongeren (Aukema 1988). • N-Holland: Hilversum (Aukema 1988). • Limburg: Velden (Aukema 1988).

Unpublished records. – • Overijssel: Ommen, 3.vi.1987, B. Aukema & D. J. Hermes; Ibid., 4.vi.1988, B. Aukema & G. Morseld. • Gelderland: Wekeromse Zand, 1.v.1988, larvae, B. Aukema.

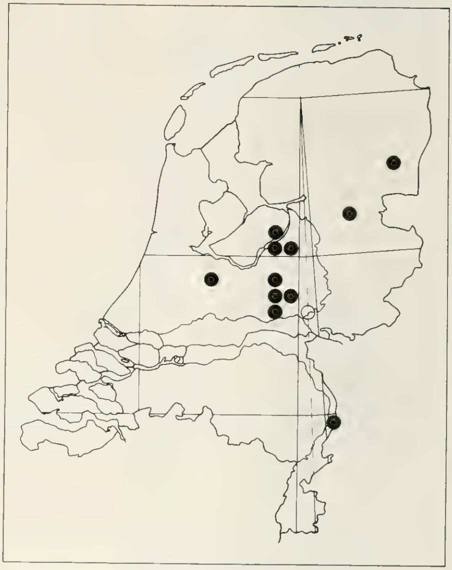


Fig. 28. *Conostethus roseus.*

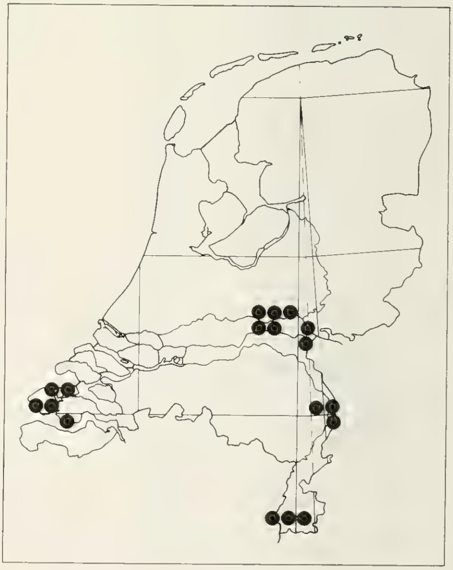


Fig. 29. *Conostethus venustus.*

140. **Conostethus venustus** (fig. 29)

References. – Aukema (1988).

Published records. – • Utrecht: Remmerden, Rhenen (Aukema 1988). • Gelderland: Heelsum, Loenen aan de Waal (Aukema 1988). • Zeeland: Veere, Vlissingen, Westkapelle, Wissenkerke (Aukema 1988). • Limburg: Broekhuizenvorst, Lomm, Lottum, Maastricht, Mechelen, Oost-Maarland, Schandelo, Strucht, Tienray, Velden, Venlo, Wijlre (Aukema 1988).

Unpublished records. – • Gelderland: Berg en Dal, 22.vi & 21.viii.1986, K. den Bieman; Ubbergen, Ooijsche Graaf, 16.vii.1987, B. Aukema; Millingen aan de Rijn, 16.vii.1987, B. Aukema; Doorwerth, Duno, 26.vi & 9.vii.1988, B. Aukema; Wageningen, 15.viii.1988, B. Aukema.

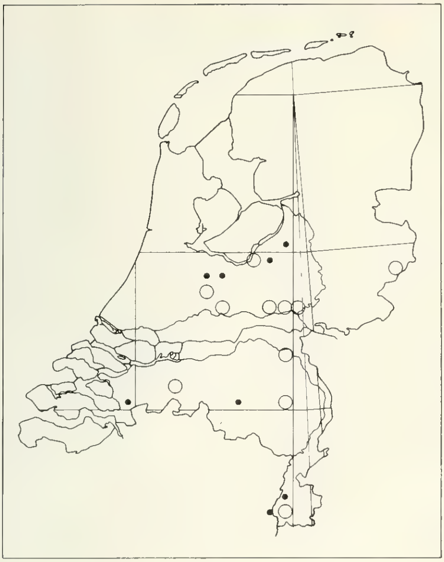


Fig. 30. *Hoplomachus thunbergi.*

141. **Hoplomachus thunbergi** (fig. 30)

References. – Snellen van Vollenhoven (1878a: 216-217, as *Lygus thunbergii*); Fokker (1885: 70); Reclaire (1932: 200-201; 1940: 112; 1943: 117).

Present status. – Formerly widespread, but not recorded since 1951: N-Brabant, Wouw, 17.vi.1951, R. H. Cobben (LUW).

145. **Amblytylus brevicollis**

References. – All records in Fokker (1885: 69) and Reclaire (1932: 202) concern *A. nasutus* (Reclaire 1936: 255-256).

Unpublished records. – • Gelderland: Wolfheze, 8.vii.1882, 1 ♀, A. J. F. Fokker (RML); Vierhouten, 23.vii.1962, 1 ♀, J. Beernink (det. E. Wagner).

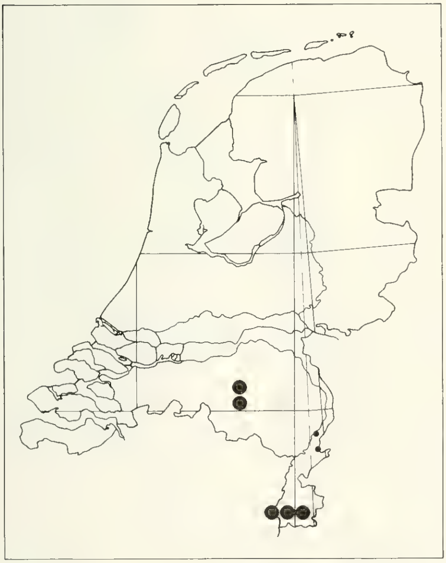


Fig. 31. *Macrotylus solitarius.*

148. **Macrotylus solitarius** (fig. 31)

References. – Reclaire (1943: 118); 1948: 49; 1951: 19); Blöte (1954: 83); Cobben (1958: 20).

Published records. – • Limburg: Bemelen (Reclaire 1943); Maasniel, Boukoul (Reclaire 1948); Geulhem (Reclaire 1951); Maastricht (Blöte 1954); Asselt (Cobben 1958).

Unpublished records. – • N-Brabant: Liempde, De Geelders, 23.vii.1966, B. Aukema; Best, De Mortelen, 31.vii.1977, H. W. van der Wolf (ZMA). • Limburg: Berg, 16.viii.1961, J. H. Woudstra; Bemelen, 20.vii.1965, J. H. Woudstra; Vijlen, 21.vii.1965, J. H. Woudstra; Wijlre, 6 & 12.viii.1983, B. Aukema.

151. **Tytthus geminus** f. nov. spec.

Records. – • Drenthe: Wijster, IJsbaan, 12.ix.1975, 1 brachypterous ♀, B. Aukema.

152. **Tytthus pygmaeus** (fig. 32)

References. – Fokker (1885 : 67, as *Cyrtorrhinus pygmaeus*).

Published records. – • Zeeland: Renesse (Fokker 1885).

Unpublished records. – • Friesland: Vlieland, viii.1956, W. H. Gravestein (ZMA); Terschelling, Oosterend, 27.vii.1958 & 5-12.vii.1959, W. H. Gravestein (ZMA); Ibid., 19.viii.1963 & 12.viii.1964, J. H. Woudstra; Ibid., 12.viii.1964, J. Beernink. Ibid., Noordvaarder,

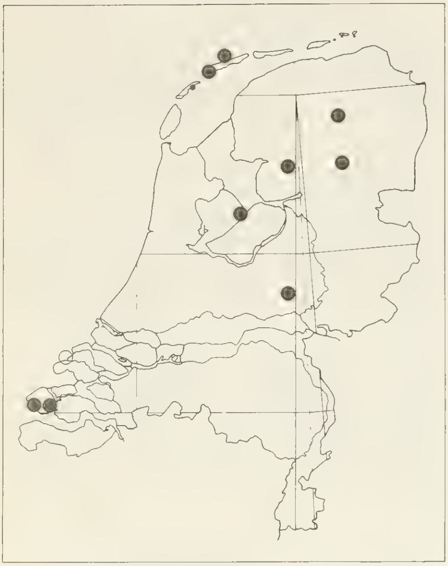


Fig. 32. *Tytthus pygmaeus.*

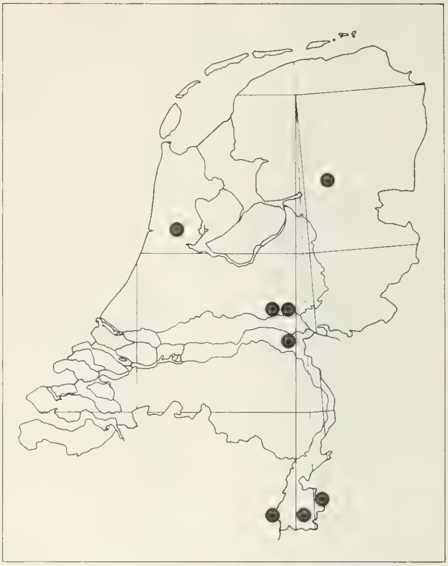


Fig. 33. *Psallus pseudoplatani.*

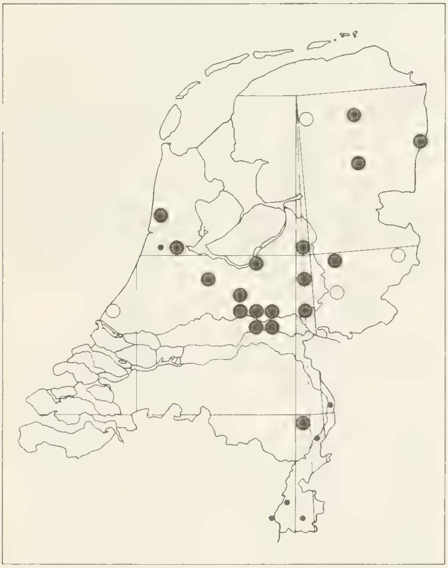


Fig. 34. *Psallus wagneri* (males).

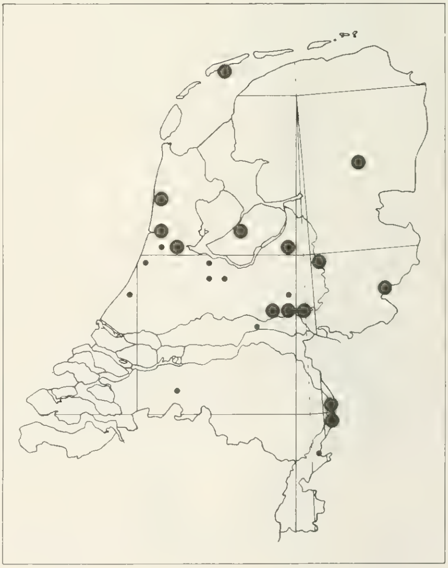


Fig. 35. *Psallus confusus* (males).

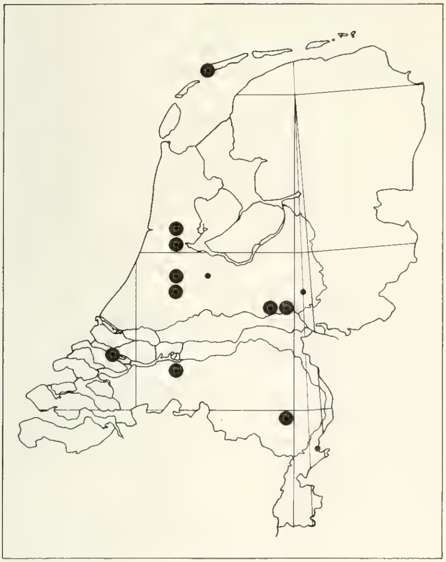


Fig. 36. *Psallus salicis*.

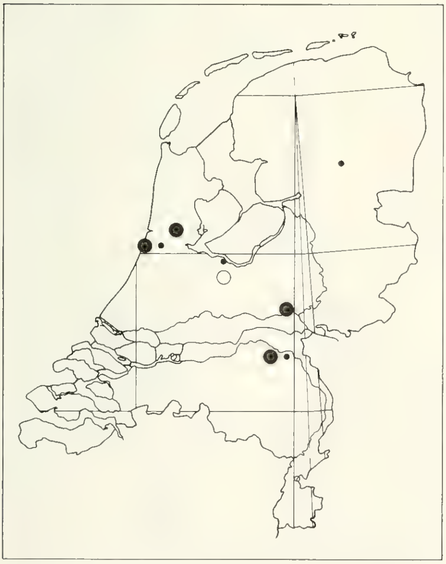


Fig. 37. *Atractotomus parvulus*.

23.viii.1963, J. H. Woudstra; Ibid., Hoorn, 15.viii.1969; Ibid., Koegelwieck, 2-3.viii.1987, B. Aukema; Ibid., 12 & 14.vii.1988, B. Aukema & J. H. Woudstra. • Drenthe: Dwingeloo, 23.vi.1976, 1 ♀, B. Aukema; Norg, Norgerholt, 24.viii.1977, B. Aukema. • Overijssel: Kalenberg, Weerribben, 2.viii.1965, 1 ♀, J. Beernink. • Flevoland: Lelystad, 1.vii.1986, 1 ♀, B. Aukema. • Gelderland: Hoge Veluwe, 3.viii.1983, 1 ♂, R. Ph. Jansen. • Zeeland: Vlissingen, 16.vii.1986 & Westkapelle, 25.vii. 1986, B. Aukema.

153. **Brachyarthrum limitatum** f. nov. spec.

Recorded since 1980 from aspen (*Populus tremula* L.).

Records. – • Gelderland: Doorwerth, Duno, 26-27.vi & 9.vii.1988, B. Aukema & G. Morseld. • Limburg: Venlo, 17.vi.1980 & 10.vi.1982, B. van Aartsen (ZMA); Ibid., 23-25.vi.1981, 13, 15 & 17.vi.1982, B. Aukema; Lomm, Ravenvennen, 8-9.vi.1982, B. Aukema & J. H. Woudstra; Lottum, 14 & 16.vi.1982, B. Aukema.

161. **Psallus assimilis**

References. – Aukema (1986).

Published records. – • Limburg: Maastricht, Mechelen, Wittem (Aukema 1986).

Present status. – Collected in 1985 only.

163. **Psallus pseudoplatani** (fig. 33)

References. – Aukema (1986).

Published records. – • Drenthe: Meppel (Aukema 1986). • Gelderland: Arnhem, Ede, Nijmegen, Oosterbeek, Wageningen (Aukema 1986). • N-Holland : Zaandam (Aukema 1986). • Limburg: Eygelshoven, Maastricht, Mechelen (Aukema 1986).

Present status. – Widespread, collected since 1976.

165. **Psallus wagneri** (fig. 34)

References. – Aukema (1981).

Present status. – Widespread.

167. **Psallus confusus** (fig. 35)

Synonym: *P. diminutus* auct. nec Kirschbaum (Rieger 1981).

References. – Aukema (1989).

Present status. – Widespread.

172. **Psallus mollis**

Synonym: *P. diminutus* Kirschbaum (Rieger 1981).

References. – Aukema (1989).

Published records. – • Overijssel: Delden (Aukema 1988). • N-Brabant: Breda (Aukema 1988).

Unpublished records. – • Gelderland: Doorwerth, 26-27.vi & 9.vii.1988, B. Aukema.

173. **Psallus salicis** (fig. 36)

Synonym: *P. alnicola* Douglas & Scott (Rieger 1981).

References. – Reclaire (1943: 118, as *alnicola*); Cobben (1958: 20, as *alnicola*).

Note. – Nearly all the older records of *P. salicis* (as *P. alnicola*) are based on misidentifications.

Published records. – • Gelderland: Hall, 18.viii.1939,

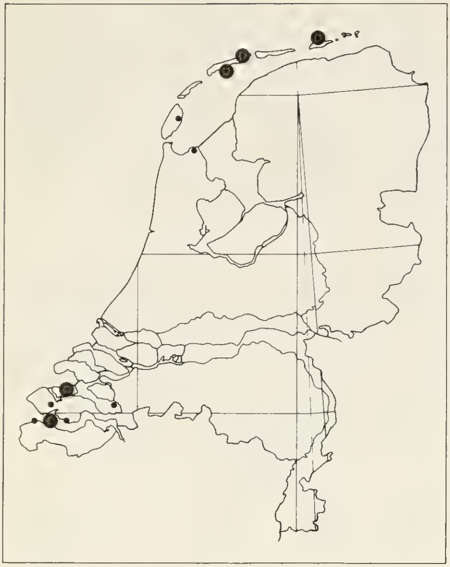


Fig. 38. *Plagiognathus litoralis.*

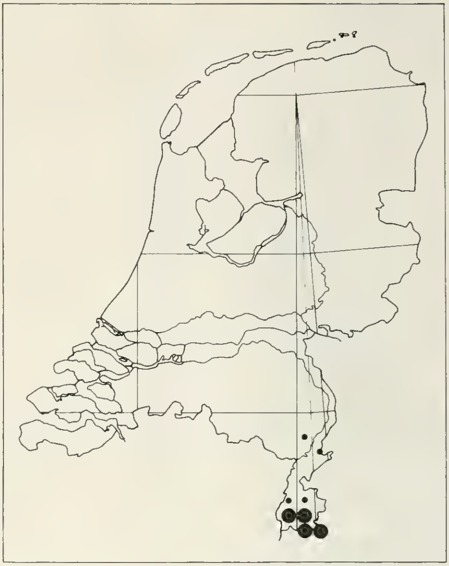


Fig. 39. *Plagiognathus alpinus.*

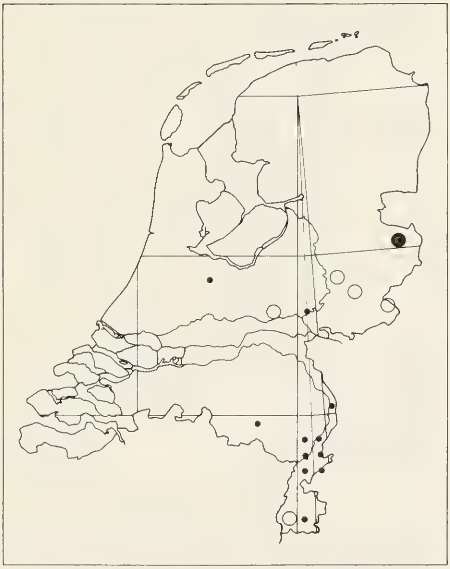


Fig. 40. *Plagiognathus fulvipennis.*

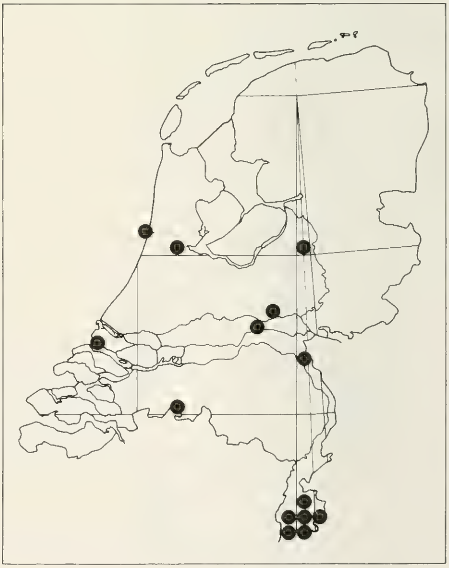


Fig. 41. *Chlamydatus evanescens.*

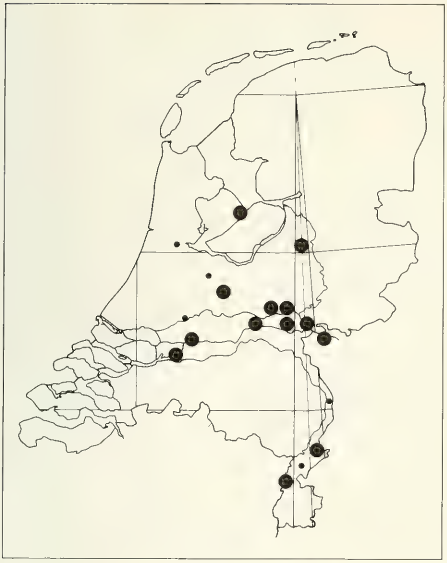


Fig. 42. *Monosynamma sabulicola.*

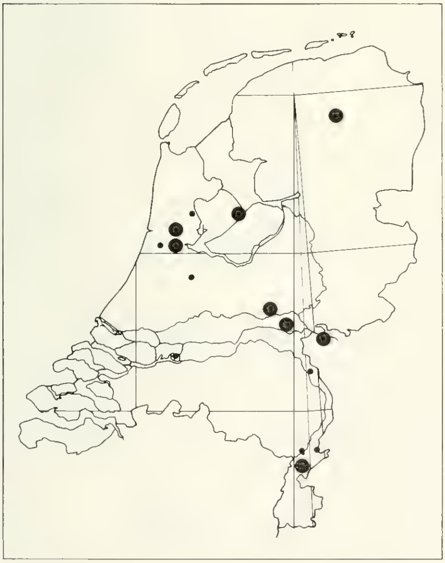


Fig. 43. *Campylomma annulicorne.*

1 ♀, A. Reclaire (ZMA) (Reclaire 1943). • Limburg: Melick-Herkenbosch, viii.1947 & viii.1952, R. H. Cobben (Cobben 1958).

Unpublished records. – • Friesland: Terschelling, West-Terschelling, 30.viii.1986, J. H. Woudstra. • Gelderland: Doorwerth, 22.viii.1985, B. Aukema; Renkum, 29.viii.1987, 1 ♀, K. den Bieman; Wageningen, 30.vii.1986, B. Aukema & J. H. Woudstra. • Utrecht: Loosdrecht, 22.vii.1959, J. H. Woudstra; Kamerik, 10.viii.1974, B. Aukema. • N-Holland: Amsterdam, 1-19.viii.1974, B. Aukema; Zaandam, 9.viii.1974 & 5-6.viii.1975, J. Beernink; Westzaan, 10.viii.1986, J. H. Woudstra. • Z-Holland: Noorden, De Haeck, 24.vii.1974, B. Aukema; Middelharnis, 27.viii.1968, 1 ♂, P. Vroegindeweij (RML). • N-Brabant: Made, 29.viii.1987, 1 ♀, K. den Bieman; Liessel, 9.ix.1987, B. Aukema.

180. **Atractotomus parvulus** (fig. 37)

References. – Reclaire (1943); Meurer (1957: 92).

Note. – The specimen recorded by Cobben (1958: 20) belongs to *A. magnicornis.*

Published records. – • Gelderland: Elden (Reclaire 1943). • Utrecht: Baarn (Reclaire 1943). • N-Holland: Laren (Reclaire 1943); Heemstede (Meurer 1957). • Limburg: Mook (Reclaire 1943).

Unpublished records. – • Drenthe: Dwingeloo, 19.vii.1949, W. H. Gravestein (ZMA). • Gelderland: Schaarsbergen, viii.1968, H. Klomp et al. (CB). • N-Holland: Zaandam, 20.vii.1973 & 17.viii.1981, J. H. Woudstra; Santpoort, 6.viii.1974, B. Aukema. • N-Brabant: Herpen, 31.viii.1962, S. van Heijnsbergen (W).

182. **Plagiognathus litoralis** (fig. 38)

References. – Reclaire (1932: 210-211, as *P. fusciloris*); Gravestein (1951a); Brakman (1960: 21).

Present status. – Widespread, coastal.

183. **Plagiognathus alpinus** (fig. 39)

References. – Fokker (1885: 71); Reclaire (1936: 256; 1951: 20).

Published records. – • Limburg: Valkenburg (Fokker 1885); Geulle (Reclaire 1936); Geulhem, Wijnandsrade, Haelen, St. Odiliënberg, Beek, Meerssen (Reclaire 1951).

Unpublished records. – • Limburg: Camerig, Epen, Vijlen (J. H. Woudstra); Slenaken (P. Poot); Cottessen (J. H. Woudstra & B. Aukema); Holset, St. Geertruid (B. Aukema).

186. **Plagiognathus fulvipennis** (fig. 40)

References. – Reclaire (1932: 211; 1940: 113; 1943: 19; 1951: 20).

Present status. – Many older records, but only one recent capture: Ootmarsum, Springendal, 24.vii.1971, 2 ♂, J. H. Woudstra.

191. **Chlamydatus evanescens** (fig. 41)

References. – Cobben (1960: 195-205).

Present status. – Widespread.

192. **Monosynamma bohemanni**

Synonym: *M. nigritulum* (Zetterstedt) (Josifov 1961).

194. **Monosynamma sabulicola** (fig. 42)

References. – Stichel (1956: 357, no records given).

Unpublished records. – • Flevoland: Lelystad (H. Vallenduuk (ZMA); B. Aukema). • Gelderland: Elden (A. Reclaire A. J. Winkelman (ZMA)); Doornenburg, Epe, Tolkamer, Valburg (B. Aukema); Wageningen (B. Aukema & J. H. Woudstra); Lienden (K. den Bieman). • Utrecht: Zeist (K. den Bieman). • N-Holland: Hilversum (Reclaire ZMA). • Z-Holland: Gorinchem (P. Poot). • N-Brabant: Biesbos (B. v. Aartsen, M. Koning (ZMA); R. H.Cobben). • Limburg: Arcen (W. H. Gravestein); Asselt (W. H. Gravestein; B. Aukema); Echt (P. J. Brakman, P); Urmond (P. Poot).

195. **Campylomma annulicorne** (fig. 43)

References. – Reclaire (1946: 50; 1951: 20); Meurer (1957); Cobben (1958: 21).

Published records. – • Utrecht: Vinkeveen (Reclaire 1946). • N-Holland: Edam (Reclaire 1946); Heemstede (Meurer 1957). • Limburg: Roermond (Reclaire 1950); Boukoul (Cobben 1958).

Present status. – Widespread.

197. **Criocoris crassicornis** (fig. 44)

References. – Fokker (1886: 299); Reclaire (1932: 210); Cobben (1953: 196).

Note. – The specimen from Ommen (vi.1916, D. MacGillavry) mentioned by Reclaire (1932) as questionable, could not be found in any collection.

Published records. – • Limburg: Nuth (Fokker 1886); Haelen, Leeuwen, St. Odiliënberg (Cobben 1953).

Unpublished records. – • Gelderland: Bennekom, 9.viii.1986, K. den Bieman. • Limburg: Epen, Onderste Bos, 29.vii, H. C. Blöte (RML).; Ibid., Bovenste Bos, 16.viii.1971, B. Aukema; Ibid., 17.viii.1974, B. Aukema & J. Beernink.

198. **Criocoris sulcicornis** f. nov. spec.

Records. – • Zeeland: Valkenisse, 26.vii.1967, 1 ♀, B. van Aartsen (ZMA).

201. **Asciodema obsoletum** (fig. 45)

References. – Reclaire (1934: 60; 1940: 130); Cobben (1958: 21).

Published records. – • Limburg: Spaubeek (Reclaire 1934); Epen (Reclaire 1940); Horn, Melick-Herkenbosch (Cobben 1958).

Unpublished records. – • Utrecht: Veenendaal, 30.vi.1988, B. Aukema. • Gelderland: Oosterbeek, 23.vi.1960, R. H. Cobben; Nijmegen, 28.vi & 5.vii.1985, B. Aukema; Berg en Dal, 22.vi.1986, K. den Bieman. • Zeeland: Oostkapelle, 18.vii.1986, B. Aukema. • N-Brabant: Waalre, Treeswijk, 2.viii.1941, H. C. Blöte (RML). • Limburg: Vilt, 22.vii.1965, J. H. Woudstra; Cottessen, 18.vii.1974, B. Aukema & J. Beernink; Herkenbosch, Meijnweg, 31.vii.1980, B. Aukema.

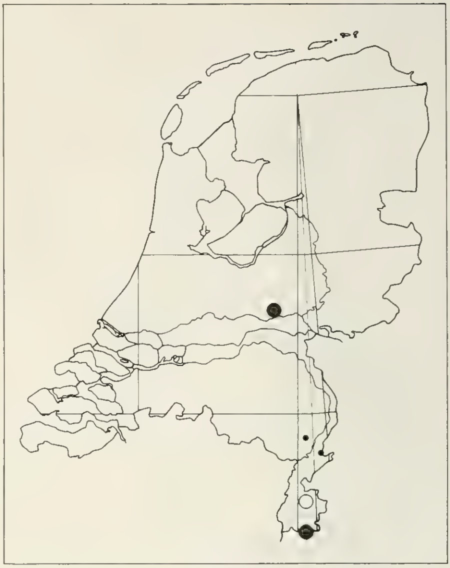


Fig. 44. *Criocoris crassicornis.*

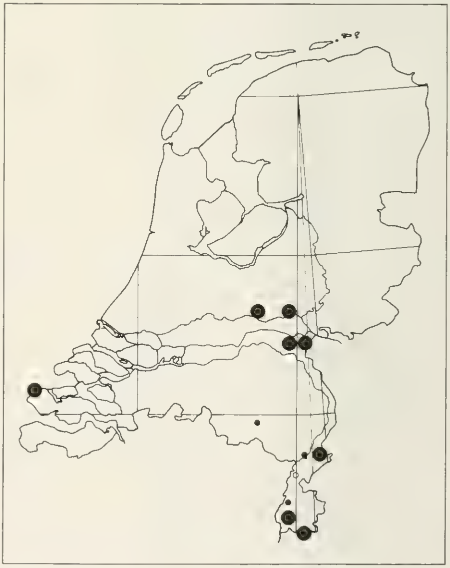


Fig. 45. *Asciodema obsoletum.*

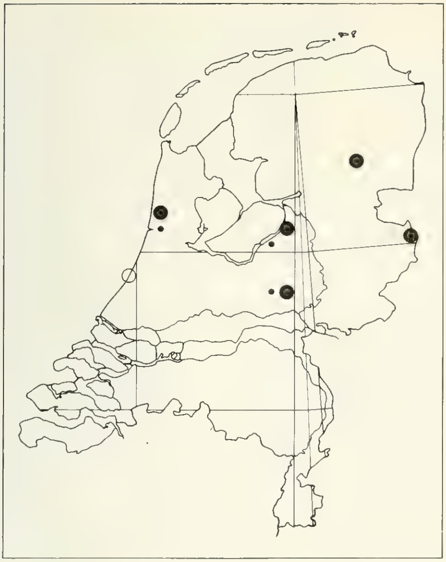


Fig. 46. *Hallodapus rufescens.*

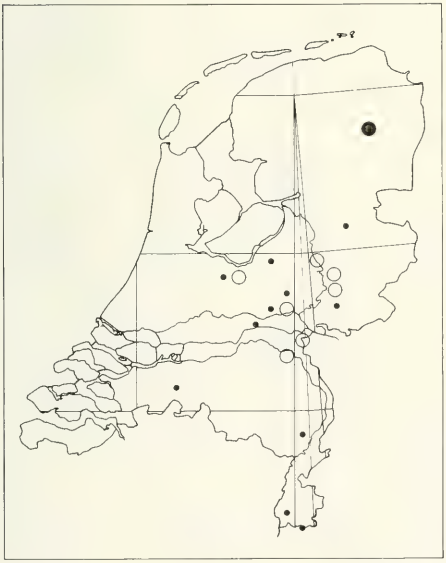


Fig. 47. *Strongylocoris leucocephalus.*

202. **Hallodapus rufescens** (fig. 46)

References. – Gravestein (1952a: cxviii); Cobben (1958: 20); Woudstra (1959: 106).

Published records. – • Gelderland: Otterloo (Gravestein 1952a). • N-Holland: Heemskerk, Bakkum (Woudstra 1959). • Z-Holland: Katwijk (Cobben 1958).

Unpublished records. – • Drenthe: Wijster, vii.1975, 1 macropterous ♀, at light, B. Aukema. • Overijssel: Denekamp, Bergvennen, 29.vi.1970, B. Aukema. • Gelderland: 't Harde, 5.viii.1962, J. H. Woudstra; Imbosch, W. K. R. E. van Wingerden et al. (RINA). • N-Holland: Bakkum, 19.viii.1960, J. H. Woudstra & J. Beernink; Ibid., 9.vii & 20.viii.1969, 3.vii.1965, J. H. Woudstra.

204. **Cremnocephalus albolineatus**

References. – Reclaire (1936: 255).

Published records. – • Overijssel: Denekamp (Reclaire 1936).

Unpublished records. – • Drenthe: Spier, Kibbelhoek, 1.viii.1981 & 28.vii.1984, B. Aukema. • Overijssel: Weerselo, 20.vi.1952, W. H. Gravestein (ZMA); Lutterzand, 18.vi 1960, W. H. Gravestein (ZMA); Ootmarsum, Springendal, 26-27.vi & 4.vii.1970, B. Aukema; Ibid., 5.vii.1970, J. H. Woudstra; Stegeren, 27.vii.1986, H. Vallenduuk; Ommen, Eerderveld, 4.vi.1988, larvae, B. Aukema.

206. **Dicyphus constrictus**

References. – Reclaire (1932: 185).

Published records. – • N-Holland: Wijk aan Zee, viii.1910, 1 ♀, D. MacGillavry (ZMA) (Reclaire 1932).

Present status. – Not recorded since 1910.

214. **Hypseloecus visci**

References. – Arnoud (1958); Cobben & Arnoud (1969).

Published records. – • Limburg: Voerendaal, 22.viii.1958, Br. Arnoud (Arnoud 1958); Mechelen, 15.vi.1960, larvae, Br. Arnoud (Cobben & Arnoud 1969).

Unpublished records. – • Limburg: Geulle, 16.viii.1966, P. J. Brakman (RML) & P. Poot.

220. **Halticus luteicollis**

References. – Fokker (1891: 359); Reclaire (1936: 255; 1940: 112); Blöte (1950: 19).

Published records. – • Limburg: Valkenburg (Fokker 1891); Bemelen (Reclaire 1936), Gronsveld, Schin op Geul (Reclaire 1940); Maastricht (Blöte 1950).

Unpublished records. – • Limburg: Bemelen, 22.vi.1948, P. van der Wiel (P); Schin op Geul, 14.viii.1961 & 29.vii.1964, J. H. Woudstra; Vlodrop, 23.vii.1985, 1 ♀, B. van Aartsen (ZMA).

221. **Halticus saltator**

References. – Fokker (1891: 359, as *H. erythrocephalus*); Reclaire (1932: 198; 1943: 117).

Published records. – • Gelderland: Huissen (Reclaire 1932). • N-Brabant: Cuyk (Fokker 1891). • Limburg: Well (Reclaire 1932). • Zeeland: Hulst (Reclaire 1943).

Unpublished records. – • Limburg: Bemelen, 22.vi.1948, 1 ♀, P. van der Wiel (RML).

Present status. – Not recorded since 1948.

222. Strongylocoris leucocephalus (fig. 47)

References. – Snellen van Vollenhoven (1878a: 171-172, as *Halticus leucocephalus*); Fokker (1885: 63); Reclaire (1932: 197; 1936: 255; 1948: 49; 1951: 18); Cobben (1958: 19).

Published records. – • Gelderland: Wolfheze (Snellen van Vollenhoven 1878); Ede, Oosterbeek, Vorden, Wageningen (Fokker 1885); Bennekom (Cobben 1958). • Utrecht: Eemnes (Reclaire 1948); Rhenen (Cobben 1958). • N-Brabant: Breda (Snellen van Vollenhoven 1878). • Limburg: Epen (Reclaire 1936); Neer (Reclaire 1950).

Unpublished records. – • Drenthe: Rolde, Balloërveld (W. H. Gravestein, ZMA). • Overijssel: Deventer (ZMA), Eerde (RML). • Gelderland: Garderen, Hoge Veluwe, Warnsveld (ZMA); Groesbeek (RML, ZMA); Wageningen (ZMA, CB); Doetinchem (FNM). • Utrecht: Amersfoort (RML). • N-Brabant: Breda (RML, ZMA). • Limburg: Mook (ZMA); Rijckholt (NMM).

Present status. – Formerly widespread, but recorded only once since 1956: Rolde, Balloërveld, 10.vi.1961, 1 ♀ W. H. Gravestein (ZMA).

226. Orthocephalus saltator

Synonym: Tamanini (1977) synonymized *O. ferrarii* Reuter with *O. saltator*.

227. Reuteria marqueti f. nov. spec.

Recorded since 1987 from elm (*Ulmus* sp.) and lime (*Tilia* sp.).

Records. – • N-Holland: Naarden, 31.viii & 2.ix.1987, 31.viii.1988, J. H. Woudstra. • Gelderland: Wageningen, 1, 4 & 27.ix.1987, 4.ix.1988, B. Aukema; Nijmegen, 11.ix.1987, B. Aukema.

229. Fieberocapsus flaveolus (fig. 48)

References. – Gravestein (1952a: cxviii); Brakman (1960: 22).

Published records. – • N-Holland: Texel, Slufter (Gravestein 1952a). • Zeeland: Hoek, Hoofdplaat (Brakman 1960).

Unpublished records. – • Friesland: Ameland, Oerd, 31.vii.1967, B. Aukema; Terschelling, 10.viii.1953, P. F. van Heerdt; Terschelling, Oosterend, 19.viii.1962, J. H. Woudstra; Ibid., Bosplaat, 14-19.viii.1964, J. H. Woudstra & J. Beernink; Ibid., 12 & 19.viii.1966, 6.vii.1967 & 9.viii.1970, J. H. Woudstra; Ibid., 2.viii.1987, B. Aukema; Ibid., Noordvaarder, 14.viii.1965 & 25.viii.1984, J. H. Woudstra; Ibid., Koegelwieck, 3.viii.1987, B. Aukema; West-Vlieland, 12.viii.1956, W. H. Gravestein (ZMA, W). • Z-Holland: Voorne, Rockanje, 1.vii.1970 (ZMA). • Zeeland: Westkapelle, 23 & 25.vii.1986, B. Aukema.

234. Globiceps sphegiformis

References. – Fokker (1885: 67; 1891: 360); Reclaire (1932: 190).

Published records. – • Limburg: Valkenburg, vii, 1 ♀, A. J. F. Fokker (RML) (Fokker 1885); Ibid., vii.1887, 1 ♀, E. Everts (RML) (Fokker 1891); Epen, 20.vii.1916, 1 ♂, D. MacGillavry (ZMA) (Reclaire 1932).

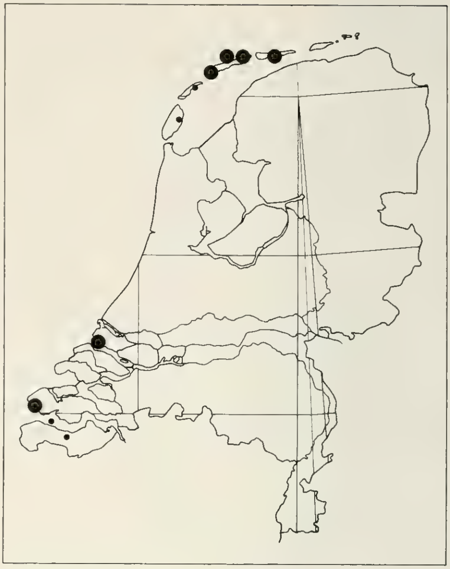


Fig. 48. *Fieberocapsus flaveolus*.

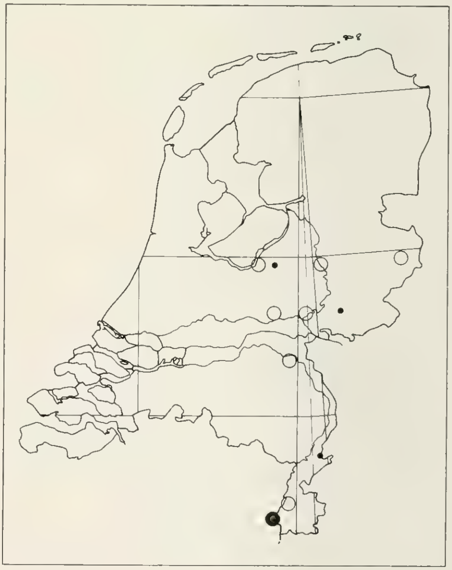


Fig. 49. *Heterocordylus leptocerus*.

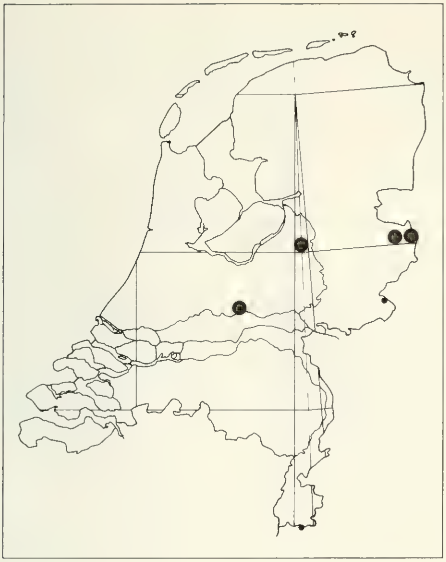


Fig. 50. *Mecomma ambulans*.

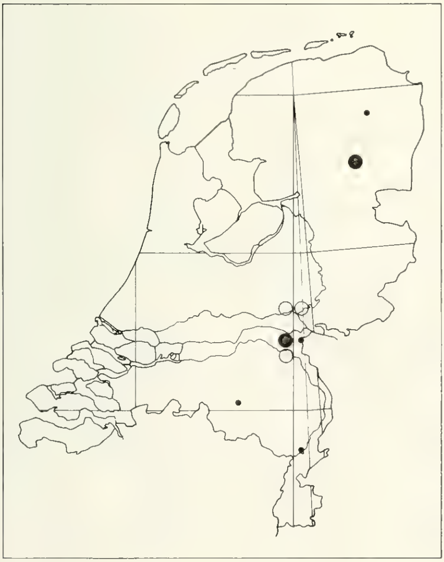


Fig. 51. *Myrmecoris gracilis*.

Unpublished records. – • Limburg: Epen, 5.vii.1924, 1 ♀, H. C. Blöte (RML).

Present status. – Not recorded since 1924.

235. Heterocordylus genistae f. nov. spec.

Note. – The records in Reclaire (1932: 195, Hilversum; 1934: 58, Doetinchem) concern *Orthocephalus saltator* and *H. leptocerus* respectively (Reclaire 1936: 255; 1943: 117).

Records. – • Friesland: Terschelling, 21.vii.1954, W. H. Gravestein (ZMA, P); Ibid., Oosterend, 24.viii.1962 & 3.ix.1969, J. H. Woudstra; Ibid., Bosplaat, 5.viii.1975, J. H. Woudstra; Ibid., Hoorn, 28.vi.1978, J. H. Woudstra. • N-Holland: Bakkum, 28.vi & 19.vii.1969, J. H. Woudstra; Ibid., 12.vii.1969. 29.vi.1971 & 18.vii.1978, B. Aukema. • Limburg: Colmont, 1.vii.1967, 1 ♀, P. Poot.

236. Heterocordylus leptocerus (fig. 49)

References. – Reclaire (1932: 195; 1936: 255; 1943: 117; 1948: 49; 1951: 18).

Published records. – • Overijssel: Deventer (Reclaire 1932). • Gelderland: Arnhem, Beek, Ermelo, Wageningen (Reclaire 1932); Doetinchem (Reclaire 1936); Garderen (Reclaire 1943). • Limburg: Meerssen, Mook (Reclaire 1932); Herkenbosch (Reclaire 1948); Maasniel (Reclaire 1951).

Unpublished records. – • Overijssel: Oldenzaal, vii, 2 ♀, A. J. F. Fokker (RML). • Limburg: Maastrict, St. Pietersberg, 7.vi.1985, B. Aukema.

Present status. – Recorded only once since 1946.

238. Heterocordylus tumidicornis

References. – Reclaire (1940: 112); Blöte (1950: 19).

Published records. – • Limburg: Eijs (ZMA) (Reclaire 1940); Maastricht (RML, NMM) (Blöte 1950).

Present status. – Not recorded since 1949: Maastricht, St. Pietersberg, 13.vii, Blöte et al. (RML, NMM).

239. Heterotoma planicornis Pallas

Synonym: H. *meriopterum* auct. nec Scopoli.

References. – Tamanini (1962) showed that what was formerly considered to be *H. meriopterum* Scopoli in fact is *planicornis* (Pallas) (described from Belgium), whereas the true *meriopterum* occurs east of the line Venice-Graz-Vienna.

241. Blepharidopterus diaphanus

References. – Kerzhner (1977) transferred *diaphanus* from *Orthotylus* to *Blepharidopterus* because of the great similarity in ♂ genitalia between this species and *B. angulatus*.

242. Orthotylus fuscescens

References. – Klomp & Teerink (1973: 332).

Published records. – • Gelderland: Hoge Veluwe (Klomp & Teerink 1973).

Unpublished records. – • Overijssel: Diepenveen, 22-23.vi.1967, 1 ♂, J. J. Meurer, at light (ZMA). • Gelderland: Schaarsbergen, vi.1969, H. Klomp et al. (CB, AU). • Limburg: Lomm, 8.vi.1982, B. Aukema & J. H. Woudstra.

248. **Orthotylus virens**

References. – Arnoud (1958).

Published records. – • Limburg: Eygelshoven, 16.vii.1958, 1 ♂, Br. Arnoud.

Unpublished records. – • Overijssel: Ootmarsum, 2.vii.1970, 1 ♂, at light, B. Aukema.

258. **Cyrtorhinus caricis**

References. – Reclaire (1932: 191).

Published records. – • Friesland: Terschelling (Reclaire 1932).

Unpublished records. – • Friesland: West-Terschelling (Groene Strand), 28-30.viii.1983 & 25.viii.1984, J. H. Woudstra. • Drenthe: Wijster, IJsbaan, 6 & 8.ix.1975 & 12.ix.1982, B. Aukema; Norg, Norgerholt, 24.viii.1977, 10 & 24.viii.1978, B. Aukema. • Gelderland: Tongeren, 16.viii.1983 & 24.vii.1985, K. den Bieman; Ibid., 8.viii.1985, B. Aukema & K. den Bieman.

260. **Mecomma ambulans** (fig. 50)

References. – Reclaire (1932: 191).

Published records. – • Gelderland: Winterswijk (Reclaire 1932).

Unpublished records. – • Overijssel: Denekamp, 18, 19.vi & 17.vii.1960, W. H. Gravestein (ZMA); Ibid., 18.vi.1960, R. H. Cobben; Ootmarsum, 19.vi.1960, R. H. Cobben; Ibid., Springendal, 5.vii.1970 & 24.vii.1974, J. H. Woudstra. • Gelderland: Epe, Zuuk, 29.vii.1978 & Eperholt, 5.vii.1980, B. Aukema. • Utrecht: Leersum, 8.vii.1981, 1 ♂, K. den Bieman. • Limburg: Epen, Onderste Bos, 29.vii.1938, H. C. Blöte (RML).

261. **Myrmecoris gracilis** (fig. 51)

References. – Reclaire (1932: 157; 1936: 253; 1951: 12); Cobben (1958: 18).

Published records. – • Gelderland: Nijmegen, Wolfheze (Reclaire 1932); Groesbeek (Reclaire 1936). • N-Brabant: Oirschot (Reclaire 1951). • Limburg: Horn (Cobben 1958).

Unpublished records. – • Drenthe: Zuidlaren, 18.vi.1950, W. H. Gravestein (ZMA); Wijster, 3 & 8.vii.1977, B. Aukema. • Gelderland: Arnhem, 28.vi.1908, Bierman (ZMA); Nijmegen, 22-23.vii.1933, A. M. Scholte (RML, ZMA); Hatertse Vennen, 5.vii.1979, R. H. Cobben. • N-Brabant: Best, 21.vi.1950, M. van den Boorn (P). • Limburg: Mook, 23.vii.1926, F. T. Valck Lucassen (ZMA).

263. **Lygus adspersus** f. nov. spec. (fig. 52)

References. – Kerzner (1984: 35-37); Rieger (1987: 278-281).

Records. – • Overijssel: Holten, 7.x.1974, B. Aukema. • Gelderland: Wageningen, 3.ix.1950, R. H. Cobben (Cobben 1958a: 32, as. *L. gemellatus*); Ibid., 18.x.1987 & 23.x.1988, B. Aukema; Heelsum, 1.ix.1954, R. H. Cobben; Ibid., 22.viii.1985, B. Aukema; Emst, 23.viii.1974 & Heerde, 23.viii.1974, B. Aukema; Winterwijk, 17.ix.1983, H. Vallenduuk (ZMA); Nijmegen, 6.xi.1987 & 28.x.1988, B. Aukema; Culemborg, 13.x.1988, J. H. Woudstra; Elst, 28.x.1988, B. Aukema. • Utrecht: Remmerden, 1.x.1988,

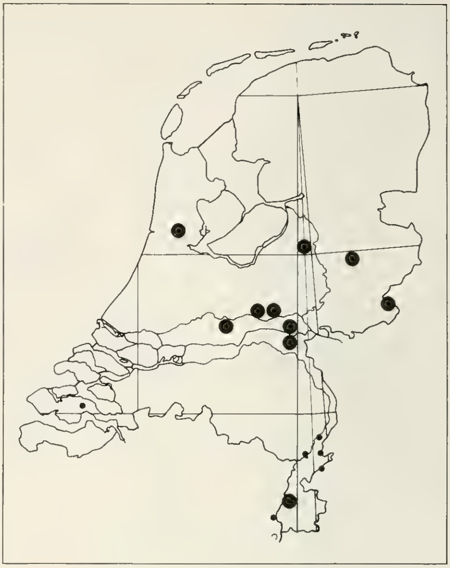


Fig. 52. *Lygus adspersus*.

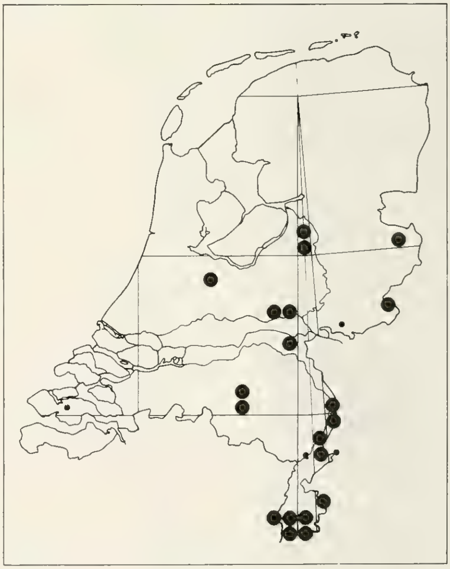


Fig. 53. *Lygus gemellatus*.

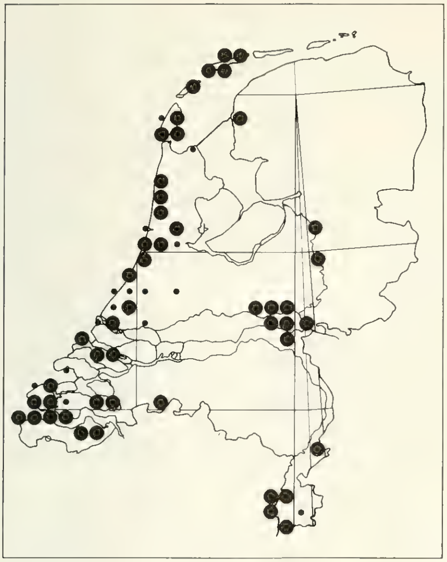


Fig. 54. *Lygus maritimus*.

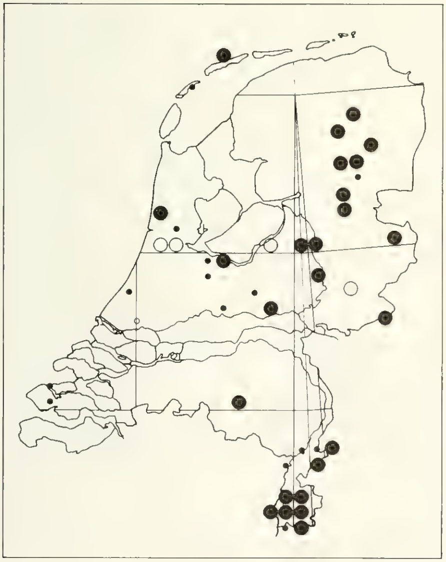


Fig. 55. *Lygus pratensis*.

B. Aukema. ● N-Holland: Zaandam, 21.x.1976, B. Aukema. ● Zeeland: Kloetinge, 10.v.1944, F. Burger (RML). ● Limburg: Spaubeek, St. Odiliënberg, Vlodrop, Wieler, 24-30.ix.1948, H. C. Blöte et al. (RML); Maastricht, St. Pietersberg, 20.ix.1949 & Cannerbos, 20.iii.1950, H. C. Blöte et al. (RML); Elsloo, 12-20.ix.1950, H. C. Blöte et al. (RML); Roermond, 4.x.1952 (Cobben 1958a: 35, as *L. gemellatus*), St. Odiliënberg, 9.viii.1953, Herkenbosch, 10.ix.1954 & Melick-Herkenbosch, 21.viii.1955, R. H. Cobben; Geulle, 21.ix.1975, B. Aukema.

Present status. – Widespread, especially along the larger rivers on *Artemisia vulgaris* L. and *A. campestris* L.

264. **Lygus gemellatus** (fig. 53)

Present status. – Revision of the Dutch material of *Lygus* showed *gemellatus* as being limited to the southeast part of the country.

265. **Lygus maritimus** (fig. 54)

References. – Gravestein (1951a: vi; 1951b: xxxvii-xxxviii).

Present status. – Widespread along the coast and along the large rivers.

266. **Lygus pratensis** (fig. 55)

Present status. – More generally distributed than *gemellatus*, occurring also in the western and northern parts of the country. Rare.

268. **Lygus wagneri** f. nov. spec.

Records. – ● Drenthe: Steenbergen, 6.x.1957, 1 ♂ (ZMA); Norg, Norgerholt, 30.ix.1971, J. Krikken & Ph. Pronk (RML); Ibid., 30.vi.1975, 5 & 7.vi.1976, 3.v, 21.vi & 24.viii.1977, 31.v, 10 & 24.viii.1978 & 16.v.1979, B. Aukema; Ibid., 6.ix.1983, J. van Tol (RML); Vries, Zeijen, 10 & 24.viii.1978 & 16.v.1979, B.Aukema; Norg, Huis ter Heide, 5.ix.1983, Ph. Pronk (RML); Roden, 6.ix.1983, Ph. Pronk (RML).

Present status. – Very local, known only from the boreal region around Norg.

270. **Orthops basalis** (fig. 56)

References. – Meurer (1956: 59); Cobben (1958a: 36-40).

Present status. – Widespread, common.

273. **Pinalitus atomarius**

Note. – Kerzhner (1988) transferred a number of species, including *atomarius* (Meyer-Dür), *cervinus* (Herrich-Schäffer), *rubricatus* (Fallen) and *viscicola* (Puton), from the genus *Orthops* Fieber to *Pinalitus* Kelton.

References. – Cobben (1958a: 41).

Published records. – ● N-Holland: Heemstede, 26.ii.1953, 1 ♀, J. J. Meurer (ZMA).

Present status. – Not recorded since 1953.

276. **Pinalitus viscicola**

References. – Reclaire (1936: 253); Arnoud (1958); Cobben (1958a: 40-41); Cobben & Arnoud (1969).

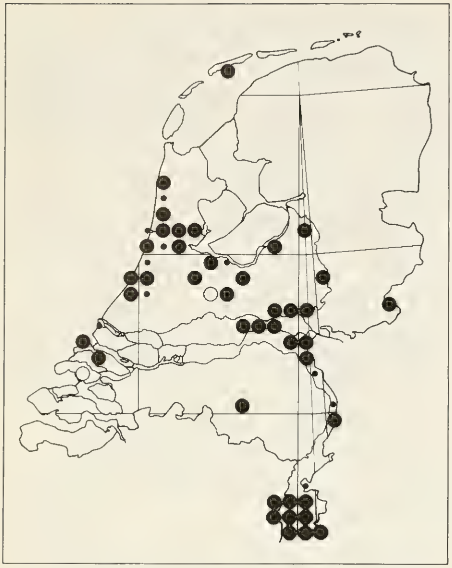


Fig. 56. *Orthops basalis.*

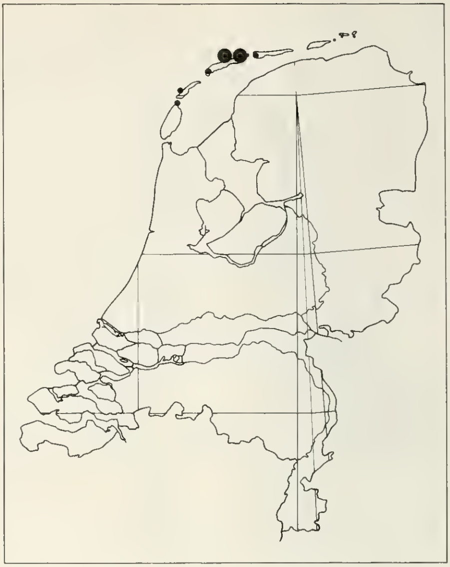


Fig. 57. *Plesiocoris minor.*

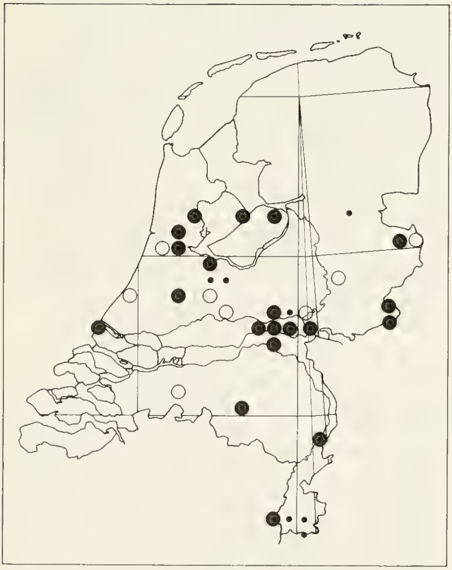


Fig. 58. *Agnocoris reclairei.*

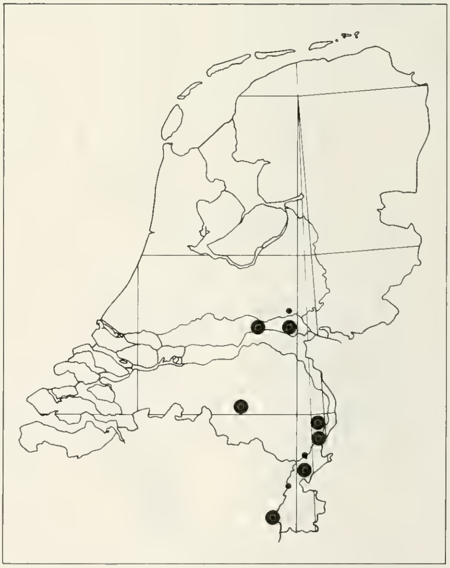


Fig. 59. *Agnocoris rubicundus.*

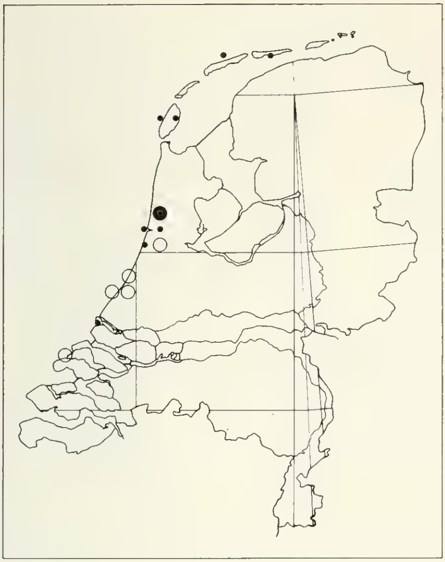


Fig. 60. *Polymerus vulneratus.*

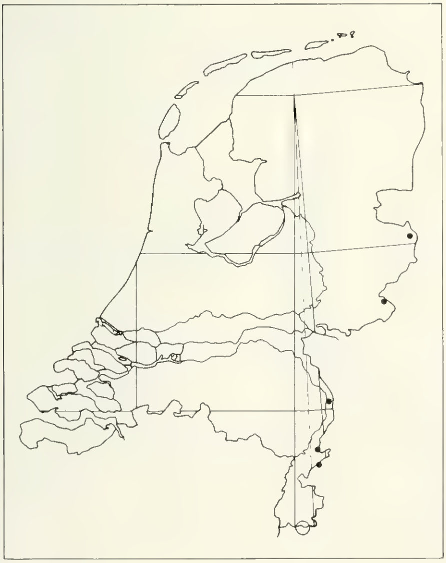


Fig. 61. *Polymerus holosericeus.*

Published records. – • Limburg: Epen, Mechelen (Reclaire 1936; Cobben 1958); Voerendaal (Arnoud 1958); Benzenrade, Nijswiller, Heerlen (Cobben & Arnoud 1969).

Unpublished records. – • Limburg: Geulle, 16.viii & 27.ix.1966, P. J. Brakman (RML); Ibid., 27.ix.1966, P. Poot (ZMA); Camerig, 26.viii.1973, B. Aukema; Ibid., 7.x.1973, B. Aukema & J. H. Woudstra; Noorbeek, 30.viii & 3.ix.1973, B. Aukema; Ibid., 10.ix.1973, B. Aukema & J. H. Woudstra.

277. **Plesiocoris minor** (fig. 57)

References. – Gravestein (1952a: cxvi-cxvii).

Present status. – Restricted to the West Frisian Islands Vlieland, Ameland, Terschelling (Friesland) and Texel (N-Holland).

281. **Lygocoris populi** f. nov. spec.

Records. – • N-Holland: 's Graveland, 4.vii.1943, 1 ♀, A. Reclaire (ZMA); Bakkum, 12.vii.1969, 1 ♀, B. Aukema; Ibid., 14.viii.1981 & 29.viii.1982, J. H. Woudstra; Amsterdam, Bos, 24.vi.1973 & 18.vii.1981, B. Aukema. • Gelderland: Ubbergen, Beek, 16.vii.1987, B. Aukema & D. J. Hermes; Doorwerth, 27.vi & 9.vii.1988, B. Aukema.

Present status. – Rare, on *Populus canescens* (Ait.) Sm.

283. **Lygocoris limbatus**

References. – Reclaire (1932: 170; 1936: 253; 1943: 114).

Published records. – • Gelderland: Leuvenum (Reclaire 1936). • N-Brabant: Oirschot (Reclaire 1932). • Limburg: Broekhuizen (Reclaire 1943).

Unpublished records. – • Overijssel: Losser, 17.vii.1960, W. H. Gravestein (ZMA). • N-Brabant: Biesbos, 8.v.1958, R. H. Cobben.

287. **Agnocoris reclairei** (fig. 58)

References. – Gravestein (1951a: v).

Present status. – Widespread.

288. **Agnocoris rubicundus** (fig. 59)

References. – Cobben (1958a: 41).

Note. – All records in Reclaire (1932: 172; 1934: 56; 1936: 253; 1940: 111; 1943: 115) concern *A. reclairei* (Cobben 1958a).

Published records. – • Limburg: Roermond, 10.v.1953, 1 ♂; Stein, 23.viii.1955, 1 ♀, R. H. Cobben (Cobben 1958a).

Unpublished records. – • Utrecht: Rhenen, Blauwe Kamer, 19.v.1985, B. Aukema; Ibid., 29.viii.1985, J. H. Woudstra. • Gelderland: Oosterbeek, 16.viii.1955, R. H. Cobben; Valburg, Loenen, 2.viii.1985, B. Aukema. • N-Brabant: Best, 15.iv.1977, H. W. van der Wolf (ZMA). • Limburg: Asselt, 2.vii.1974, B. Aukema; Wieler, 4.vii.1974, B. Aukema; Echt, 4.vii.1982, C. J. M. Berger (ZMA); Maastricht, St. Pietersberg, 29.viii.1984, B. Aukema.

292. **Polymerus vulneratus** (fig. 60)

References. – Reclaire (1932: 174; 1943: 115).

Present status. – Before 1957 widespread in the Dune region and on the West Frisian Islands, but recently recorded only once: N-Holland, Heemskerk, 22.viii.1987, 2 ♀ at light, J. H. Woudstra.

293. **Polymerus holosericeus** (fig. 61)

References. – Reclaire (1932: 175; 1948: 47; 1951: 14-15); Gravestein (1943: ix); Cobben (1958: 19).

Published records. – • Overijssel: Denekamp (Reclaire 1951). • Gelderland: Winterswijk (Gravestein 1943). • Limburg: Epen (Reclaire 1932); Arcen (Gravestein 1943); Vlodrop (Reclaire 1948); St. Odiliënberg (Reclaire 1951; Cobben 1958).

Present status. – Not recorded since 1955: St. Odiliënberg, 13.vii, R. H. Cobben (CB, ZMA).

294. **Polymerus nigrita** (fig. 62)

References. – Gravestein (1949: xxiii-xxiv); Reclaire (1951: 15); Cobben (1958: 19).

Published records. – • Overijssel: Denekamp (Gravestein 1949; Reclaire 1951). • Limburg: St. Odiliënberg (Cobben 1958).

Unpublished records. – • Drenthe: Mantinge, 26.vi, 3 & 24.vii.1975, 19.vi.1978, B. Aukema. • Gelderland: Winterswijk, 22.vi.1952, P. J. Brakman (RML); Wamel, 21.vi.1981, 1 ♂, K. den Bieman; Ubbergen, Tiengeboden, 22.vi.1986, 1 ♂, K. den Bieman. • Utrecht: Leersum, Broekhuizen, 22.vi.1971, 1 ♀, M. P. Peerdeman (ZMA). • Limburg: Bergen, De Hamert, 19.vi.1966, P. Poot; Wieler, 4.vii.1973, B. Aukema; Cottessen & Epen, Bovenste Bos, 17.viii.1974, B. Aukema & J. Beernink; Vlodrop, 26.vi.1973, 1 ♀, B. van Aartsen (ZMA).

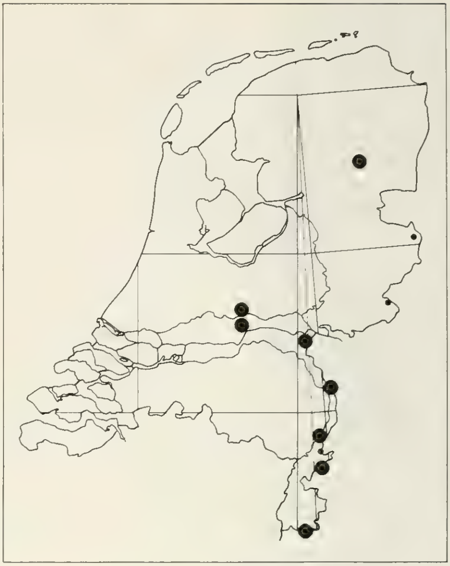


Fig. 62. *Polymerus nigrita.*

296. **Dichrooscytus intermedius** (fig. 63)

References. – Gravestein (1949: xxiii); Reclaire (1951: 14); Cobben (1953: 190-194; 1958: 19).

Published records. – • Overijssel: Vasse (Gravestein 1949; Reclaire 1951). • Gelderland: Wageningen (Cobben 1953, 1958).

Unpublished records. – • Drenthe: Assen, 7.vii.1964, 1 ♂, C. A. Schulz (ZMA). • Overijssel: Hengelo, 2.vii.1952, W. C. Boelens (RML, P); Ootmarsum, Springendal, 4 & 5.vii.1970, B. Aukema & J. H. Woudstra. • Gelderland: Winterswijk, 21.vi.1952, W. H. Gravestein (ZMA); Wekerom, 1.vii.1958, 1 ♂, R. H. Cobben; Garderen, 19.vii.1978, J. H. Woudstra; Epe, Eperholt, 6 & 15.vii.1980, B. Aukema; Ruurlo, 22. vii.1980, B. Aukema; Doorwerth, 27.vi & 9.vii.1988, B. Aukema; Bennekom, 4.vii.1988, K. den Bieman. • Utrecht: Maarn, 9.vii.1969, J. Beernink; Broekhuizen, 5.vii.1973, 1 ♀, M. P. Peerdeman (ZMA); Veenendaal, 30.vi.1988, B. Aukema. • Limburg: Epen, 14.vii.1966, J. H. Woudstra; Arcen, 16.vii.1980, 1 ♂, B. van Aartsen (ZMA).

299. **Hadrodemus m-flavum** (fig. 64)

References. – Fokker (1891: 359, as *Calocoris marginellus* F.); Reclaire (1932: 166, as *Homodemus m-flavum*; 1948: 46; 1950: 13).

Published records. – • Limburg: Nuth (Fokker: 1891); Geulle, Mechelen, Mook and Valkenburg (Reclaire 1932); Wijlre (Reclaire 1948); Epen (Reclaire 1950).

Present status. – Not recorded since 1949: Geulle, 12-16.vi.1949, P. van der Wiel (ZMA).

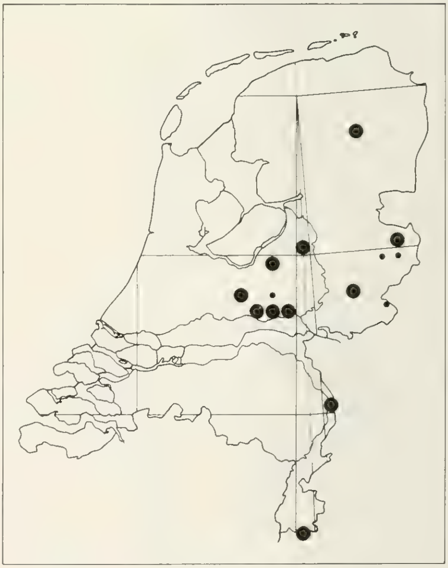


Fig. 63. *Dichrooscytus intermedius.*

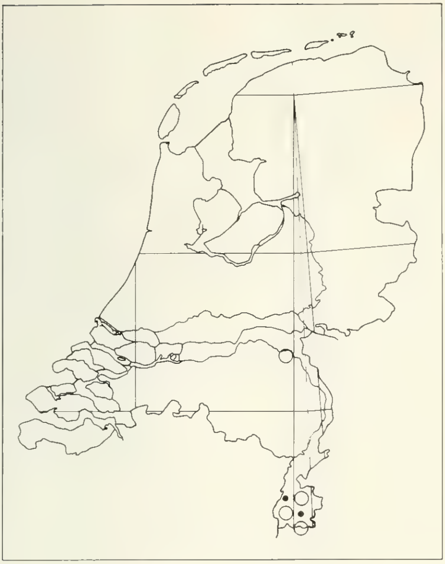


Fig. 64. *Hadrodemus m-flavum.*

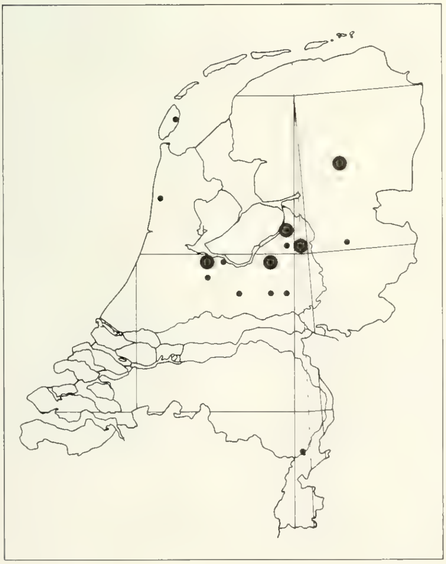


Fig. 65. *Megacoelum beckeri.*

300. **Calocoris pilicornis**

References. – Gravestein (1952a: cxvi).

Published records. – ● Limburg: Rijkel, 1.vii.1951, W. H. Gravestein, R. H. Cobben & P. J. Brakman (Gravestein 1952a).

Present status. – Not recorded since 1953: Rijkel, 7.vi.1953, W. H. Gravestein & P. J. Brakman (RML, ZMA, AU, P & W).

301. **Calocoris schmidtii**

References. – Gravestein (1963).

Published records. – ● Limburg: Gronsveld, 25.vi.1962, 1 ♂, W. H. Gravestein (ZMA) (Gravestein 1963).

Unpublished records. – ● Gelderland: Winterswijk, 't Woold, 20.vi.1975, 1 ♂, B. J. Lempke (ZMA). ● Limburg: Gronsveld, 15.vi.1968, W. H. Gravestein (ZMA); Ibid., 23.vi.1968, P. Poot; Ibid., 4.vi.1969 & 10.vi.1981, J. H. Woudstra; Ibid., 16.vi.1979, B. Aukema.

302. **Calocoris striatellus**

Synonym: *C. quadripunctatus* Villers (Kerzhner 1969).

303. **Calocoris biclavatus**

References. – Reclaire (1951: 13).

Published records. – ● Limburg: Vaals, 24.vi.1948, 1 ♂, P. van der Wiel (ZMA) (Reclaire 1951).

Present status. – Not recorded after the single capture of 1948.

305. **Calocoris affinis**

References. – Reclaire (1943: 114).

Published records. – ● Limburg: Gulpen, 21.vii.1943, 1 ♂, J. Maessen (Reclaire 1943).

Unpublished records. – ● Limburg: Epen, 29.vii.1949, W. H. Gravestein (ZMA); Ibid., 26-27.vii.1943, H. C. Blöte et al. (RML); Ibid., 25-26 & 30-31.vii.1964, 18.vii.1965, J. H. Woudstra; Ibid., 3-4.vii.1971 & 22.viii.1987, B. Aukema; Ibid., Bovenste Bos, 17.viii.1974, B. Aukema; Ibid., Onderste Bos, 3-4.vii.1942, W. Vervoort (RML); Gulpen, 20. viii.1956, C. de Jong (RML); Heerlen, 26.vii.1943, 1 ♀, H. C. Blöte et al. (RML); Wittem, Bissen, 4.vii.1942, 1 ♀, W. Vervoort (RML).

312. **Megacoelum beckeri** (fig. 65)

References. – Cobben (1951: 52); Gravestein (1952a: cxiv-cxvi).

Present status. – Widespread, but rare.

315. **Miridius quadrivirgatus**

References. – Fokker (1885: 56); Brakman (1952: 129).

Published records. – ● Zeeland: Zierikzee (Fokker 1885); Nieuw & St. Joosland (Brakman 1952).

Present status. – Not recorded since 1955: Nieuw & St. Joosland, 15.viii.1955, P. J. Brakman (P).

317. **Phytocoris intricatus** (fig. 66)

References. – Reclaire (1951: 12); Cobben (1953: 190; 1958: 18).

Note. – The record from Nunspeet (Reclaire 1932) concerns *P. pini* (Reclaire 1951).

Published records. – • Drenthe: Norg (Reclaire 1951). • Gelderland: Wageningen (Cobben 1953, 1958). • Overijssel: Vasse (Reclaire 1951).

Unpublished records. – • Drenthe: Wijster, Zuidwolde (B. Aukema). • Overijssel: Ootmarsum (B. Aukema, J. H. Woudstra). • Gelderland: Apeldoorn, Winterswijk (W. H. Gravestein, ZMA); Brummen, Garderen, Nunspeet (J. H. Woudstra); Epe, Ruurlo, Doorwerth (B. Aukema); Bennekom (K. den Bieman). • N-Holland: Naarden, Zaandam (J. H. Woudstra). • Limburg: Swalmen (H. C. Blöte et al., RML); Epen, Schin op Geul (J. H. Woudstra).

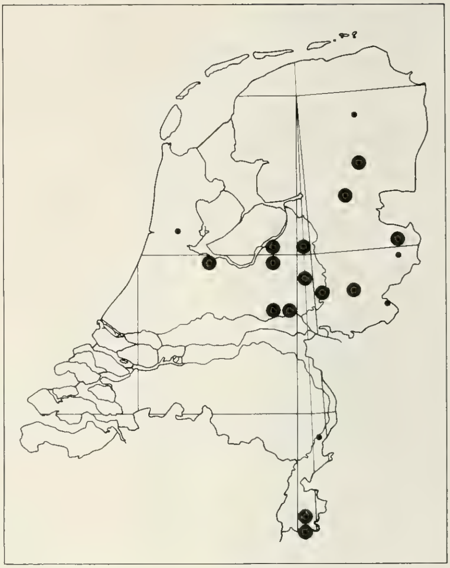


Fig. 66. *Phytocoris intricatus.*

324. **Phytocoris singeri** (fig. 67)

References. – Cobben (1950: 84, as *P. nowickyi* Fieber; 1958: 17-18).

Published records. – • Limburg: Herkenbosch, Posterholt, St. Odiliënberg, Roermond, Neer and Vlodrop (Cobben 1950, 1958).

Unpublished records. – • Limburg: St. Odiliënberg, 9.viii.1953, 1 ♂, R. H. Cobben (LUW); Nuth, 13.viii.1969, 1 ♂, J. H. Woudstra; Herkenbosch, Meijnweg, 24.viii.1968, 1 ♂, A. W. P. Maassen (RML); Cottessen, 26-30.viii.1968 & 10.ix.1973, J. H. Woudstra; Ibid., 17.viii.1971 & 29.viii.1973, B. Aukema; Ibid., 17.viii.1974, B. Aukema & J. Beernink; Epen, 14.viii.1971, 1 ♂, B. Aukema; Colmont, Wrakelberg, 2.ix.1982, 1 ♂, K. den Bieman; Maastricht, St. Pietersberg, 11.viii.1983, 1 ♂, B. Aukema.

328. **Capsus pilifer** f. nov. spec. (fig. 68)

Records. – Revision of the Dutch *Capsus* material resulted in the following localities for *C. pilifer*: • Friesland: Appelscha, Elsloo (FNM); Beetsterzwaag (ZMA) • Drenthe: Echten (RML); Lhee, Mantinge, Norg, Zuidwolde, Wijster (AU); Dwingeloo, Zuidlaren (ZMA). • Overijssel: Haaksbergen (RML); Ootmarsum (W). • Gelderland: Berg & Dal (JA); Ede (AU); Velp (ZMA); Winterswijk (HE). • Utrecht: Baarn (ZMA). • N-Holland: Texel (W).

Present status. – Widespread, but rare. On *Molinia caerulea* (L.) Moench.

329. **Capsus wagneri** (fig. 69)

References. – Gravestein (1952a: cxvii).

Present status. – Widespread, rare.

331. **Capsodes gothicus**

References. – Snellen van Vollenhoven (1878a: 186-187); Reclaire (1932: 179).

Published records. – • ?-Holland: Unknown locality, W. de Haan, 1 ♂ (RML) (Snellen van Vollenhoven 1878). • Limburg: Epen, vi.1911, 1 ♂, 1 ♀, D. MacGillavry (ZMA) (Reclaire 1932).

Present status. – Not recorded since 1911.

332. **Capsodes sulcatus** f. nov. spec.

Records. – • Gelderland: Vorden, Kranenburg, 23.vi.1979, 1 brachypterous ♀, B. J. Lempke (ZMA).

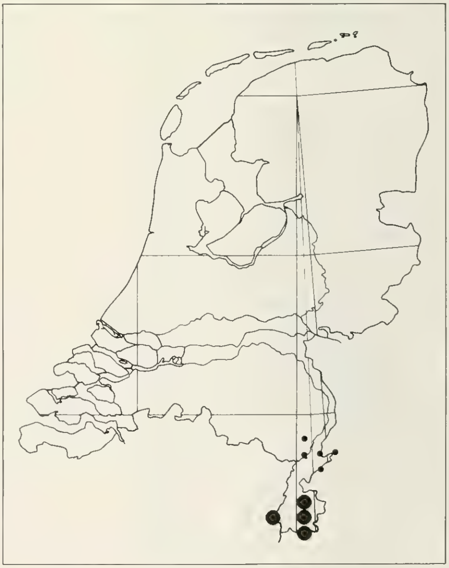


Fig. 67. *Phytocoris singeri.*

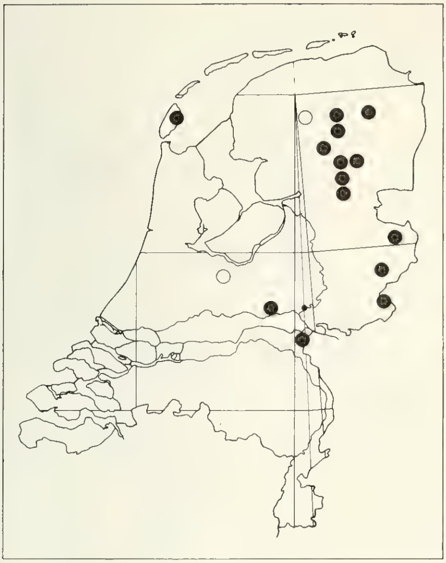


Fig. 68. *Capsus pilifer.*

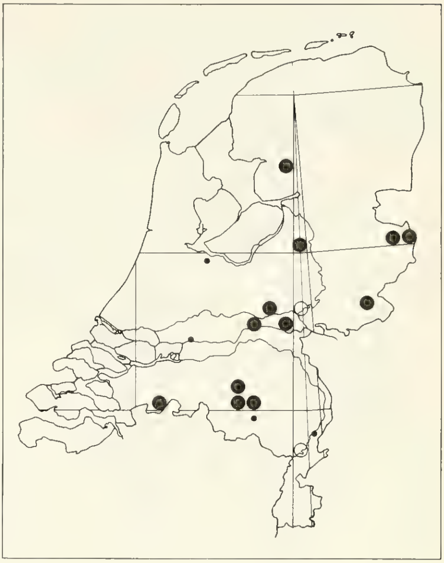


Fig. 69. *Capsus wagneri.*

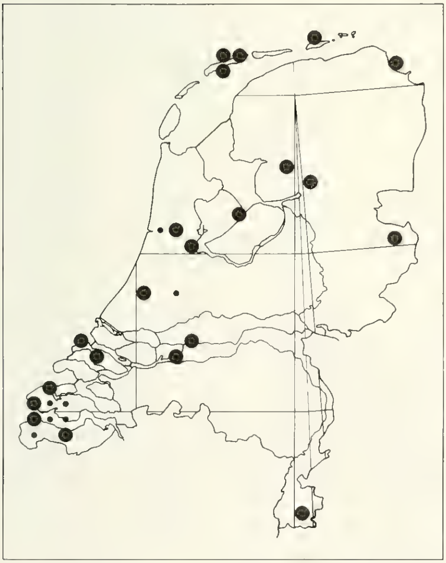


Fig. 70. *Stenodema trispinosa.*

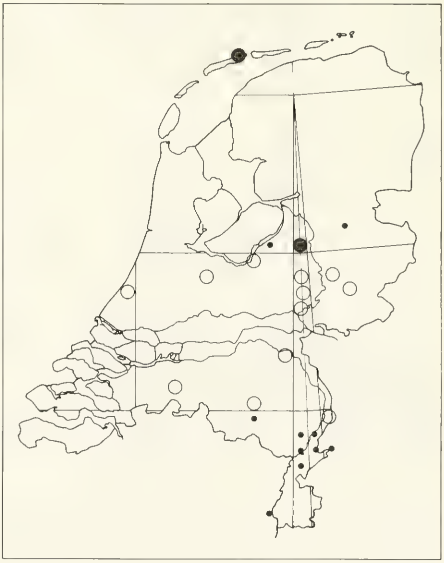


Fig. 71. *Stenodema virens.*

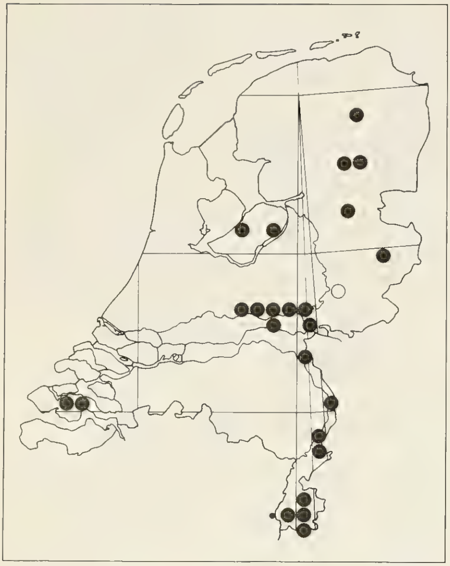


Fig. 72. *Megaloceroea recticornis.*

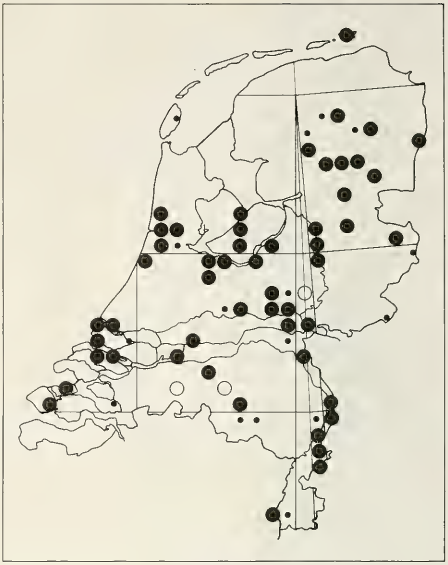


Fig. 73. *Trigonotylus caelestialium.*

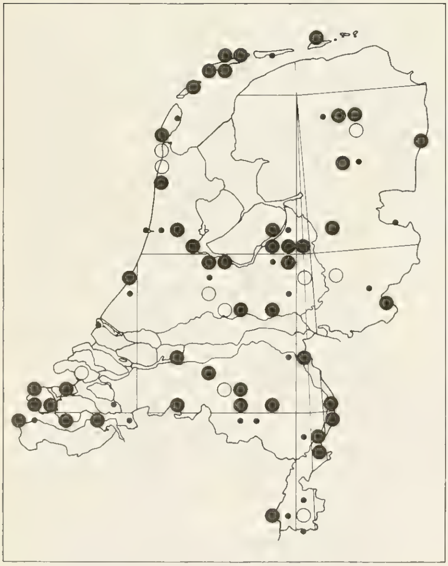


Fig. 74. *Trigonotylus ruficornis.*

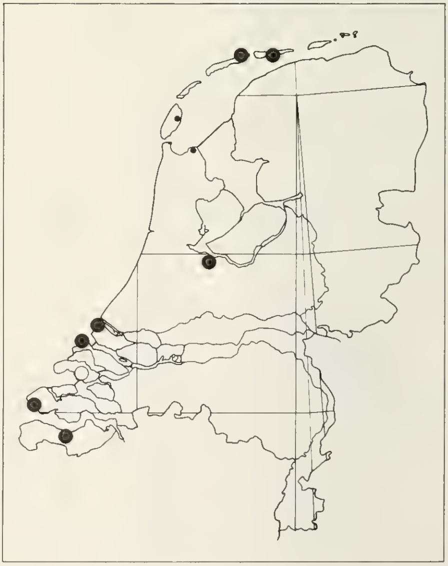
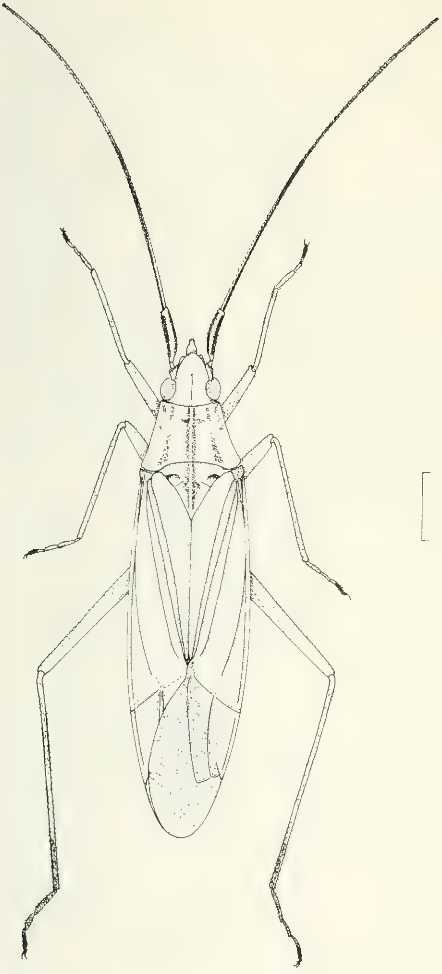


Fig. 75. *Teratocoris saundersi.*



342. *Trigonotylus caelestialium*. Scale: 1 mm.

334. **Acetropis gimmerthalii**

References. – Fokker (1885: 54).

Published records. – • Z-Holland : 's-Gravenzande, Staelduin, 1 ♀, Snellen van Vollenhoven (RML) (Fokker 1885).

Present status. – Not recorded since 1878.

336. **Stenodema trispinosa** (fig. 70)

References. – Gravestein (1951b: xxxviii-xxxix); Brakman (1952: 130); Woudstra (1953); Meurer (1963: 205).

Present status. – Widespread, mainly coastal.

339. **Stenodema virens** (fig. 71)

References. – Reclaire (1932: 180-181; 1936: 254; 1943: 116; 1948: 47; 1951: 16).

Present status. – Until 1946 widespread, but since then only two records: Friesland, Terschelling, Bosplaat, 12.viii.1964, J. Beernink; Gelderland, Emst, 23.viii.1973, B. Aukema.

341. **Megaloceraea recticornis** (fig. 72)

References. – Blöte (1950: 19); Cobben (1953: 194); Brakman (1960: 22).

Present status. – Before 1950 hardly any records outside the southern part of Limburg. At present however widespread.

342. **Trigonotylus caelestialium** f. nov. spec. (fig. 73)

345. **Trigonotylus ruficornis** (fig. 74)

References. – Bozdechová (1973).

Present status. – Revision of Dutch *Trigonotylus ruficornis* revealed that both *T. caelestialium* and *T. ruficornis* are common species in the Netherlands.

347. **Teratocoris paludum**

References. – Cobben (1960: 206-207).

Published records. – • Gelderland: Wageningen (Cobben 1960).

Unpublished records. – • Drenthe: Wijster, IJsbaan, 6.ix.1975, 10 & 11.vi.1976 & 12.ix.1982, B. Aukema; Ibid., 26.viii.1976, B. Aukema & J. H. Woudstra; • Gelderland: Elst, Elden, 20.vii.1947, 1 ♀, A. Reclaire (ZMA); Tongeren, 8.iii.1985, B. Aukema & K. den Bieman; Ibid., 19.ix.1985, K. den Bieman. • Utrecht: Veenendaalse Hel, 7 & 11.viii.1981, G. J. Rozeboom & R. H. Cobben (LUW).

348. **Teratocoris saundersi** (fig. 75)

References. – Fokker (1891: 359); Reclaire (1940: 111); Gravestein (1952a: cxvii-cxviii, as *T. lineatus* Wagner); Cobben (1958: 19); Brakman (1960: 22, as *T. lineatus*).

Published records. – • N-Holland: Wieringen (Reclaire 1940); Texel, Slufter (Gravestein 1952a). • Z-Holland: Oostvoorne (Cobben 1958). • Zeeland: Zierikzee (Fokker 1891); Hoek (Brakman 1960).

Unpublished records. – • Friesland: Terschelling (W. H. Gravestein, J. H. Woudstra, B. Aukema); Ameland (B. Aukema). • N-Holland: Naarden (J.J. Wieringa, M). • Z-Holland: Oostvoorne (ZMA), Goeree (K. J. Huisman, RML). • Zeeland: Walcheren (H. C. Blöte, RML); Westkapelle, Ellewoutsdijk (B. Aukema).

Present status. – Widespread, mainly coastal.

351. **Isometopus intrusus** (fig. 76)

References. – Fokker (1886: 299, as *I. alienus* Fieber; 1891: 360); Reclaire (1940: 113; 1943: 120).

Published records. – • Gelderland: Winterswijk (Fokker 1891). • N-Brabant : Waalwijk (Reclaire 1940). • Limburg: Valkenburg (Fokker 1886); Arcen (Reclaire 1943).

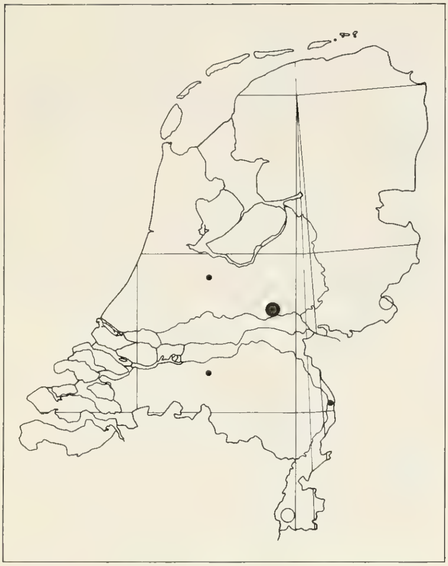


Fig. 76. *Isometopus intrusus.*

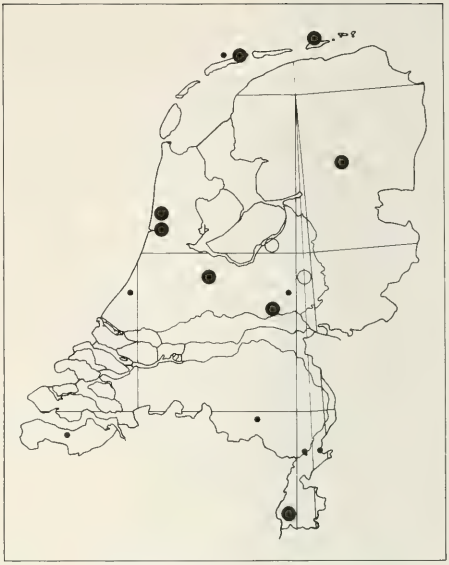


Fig. 77. *Stalia boops.*

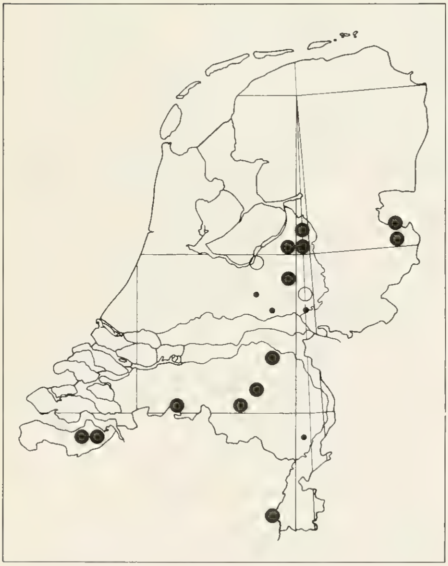


Fig. 78. *Nabis brevis.*

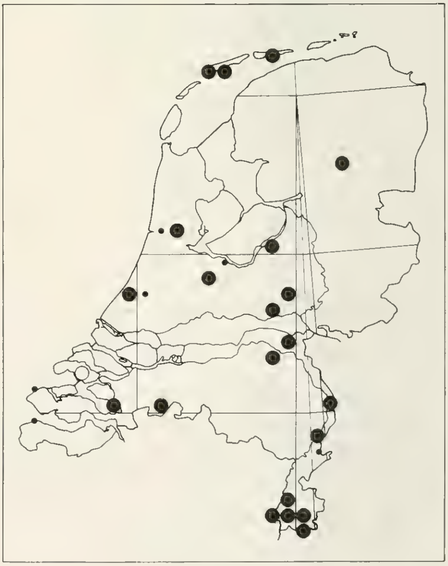


Fig. 79. *Nabis pseudoferus.*

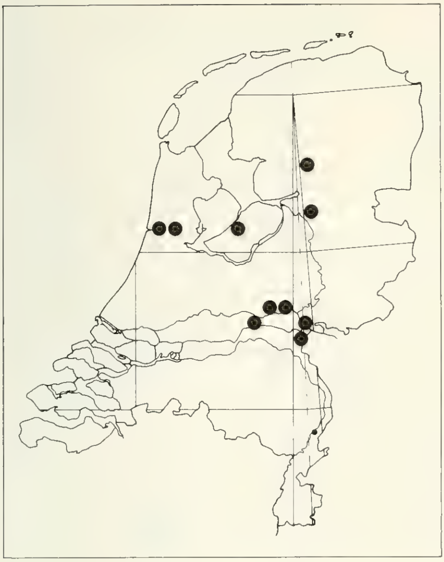


Fig. 80. *Temnostethus longirostris*.

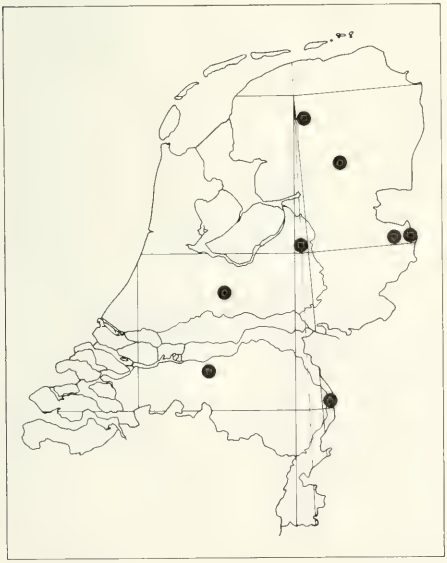


Fig. 81. *Elatophilus nigricornis*.

Unpublished records. – • Gelderland: Wageningen, vii & viii.1960, vii.1961 & viii.1962, R. H. Cobben (CB, LUW, ZMA, AU). • Utrecht: Hollandse Rading, 8.viii.1956, 1 ♀, J. H. Woudstra.

352. **Prostemma guttula**

References. – Snellen van Vollenhoven (1878a: 305-306); Reclaire (1932: 141; 1936: 251); Brakman (1952: 129); Cobben (1958: 16); Péricart (1987: 50).

Published records. – • Limburg: Maastricht (Reclaire 1932; 1936); Echt (Cobben 1958). • Zeeland: Walcheren (Snellen van Vollenhoven 1878); Domburg (Brakman 1952).

Unpublished records. – • Limburg: Maastricht, St. Pietersberg, 20.viii.1983, 1 ♀, ex larva, B. Aukema. • Zeeland: Domburg, 1957.viii.13, P. J. Brakman (RML).

353-364. **Nabini**

Note: Kerzhner (in litt., 1989) after analysis of the world fauna now considers *Aptus*, *Anaptus* and *Stalia* as subgenera of *Himacerus*, and *Limnonabis*, *Dolichonabis* and *Nabicula* as subgenera of *Nabis*. However, since the recent work of Péricart (1987) on this subject probably will remain the standard in Western Europa for many years, I prefer to maintain his classification.

356. **Stalia boops** (fig. 77)

References. – Reclaire (1936: 251); Leston (1952: 86); Gravestein (1955); Cobben (1958a: 17); Brakman (1960: 22); Péricart (1987: 93).

Present status. – Widespread, but rare.

360. **Nabis brevis** (fig. 78)

Note. – Most older identifications are unreliable (Reclaire 1951)

References. – Reclaire (1936: 251; 1948: 44; 1951: 11); Cobben (1958: 16); Péricart (1987: 144-147).

Published records. – • Gelderland: Hoog-Buurlo (Reclaire 1936); Nunspeet (Reclaire 1936, 1951); Hulshorst (Reclaire 1948); Lunteren (Reclaire 1951); Ede (Cobben 1958). • Limburg: Haelen (Reclaire 1951).

Unpublished records. – • Overijssel: Ootmarsum, Vasse (J. H. Woudstra). • Gelderland: Ede (R. H. Cobben); Emst, Gortel, Heerde, Wezep (B. Aukema); Vierhouten (B. Aukema; J. Beernink); Epe (B. Aukema; Ph. van Hooven, RML; C. Scheffer, RML); Putten (C. de Jong, RML); Eerbeek (H. Boschma, RML); Ugchelen (P. J. Hartevelt & Ph. Pronk, RML); Velp (W. H. Gravestein, P). • N-Brabant: Herpen (S. v. Heijnsbergen, W); Best, Strijbeek (B. Aukema; J. H. Woudstra); Best, Nijnsel (H. W. van der Wolf, ZMA). • Zeeland: Axel (C. van Heijningen, RML); Hulst (Ph. Pronk, RML). • Limburg: Maastricht (B. Aukema).

363. **Nabis pseudoferus** (fig. 79)

References. – Gravestein (1956); Péricart (1987: 137).

Present status. – Widespread, rare.

366. **Temnostethus longirostris** f. nov. spec. (fig. 80)

Records. – • Overijssel: Steenwijk, 4.viii.1987, B. Aukema; Zwolle, Schelle, 21.vii.1987. • Flevoland: Lelystad, Oostvaardersplassen, 22.vi.1988, B. Aukema. • Gelderland: Wageningen, 10-20.vii.1987, B. Aukema; Millingen, 16.vii.1987, B. Aukema; Ooij, Groenlanden, 16.vii.1987, B. Aukema; Heelsum, 26.vi.1988, B. Aukema; Doorwerth, 27.vi.1988, B. Aukema; Doornenburg, 2.vii.1988, B. Aukema. • Utrecht: Rhenen, Blauwe Kamer, 20.vii.1987, B. Aukema. • N-Holland: Zaandam, 19.vii-19.viii.1987, 21.vii & 17.viii.1988, J. H. Woudstra (W, ZMA); Zaandijk, 22.vii.1987, J. H. Woudstra; Krommenie, 28.viii.1988, B. Aukema. • Limburg: Swalmen, 1.vii.1951, P. van der Wiel (ZMA).

Present status. – Widespread, on trunks of *Salix* and *Populus*.

368. **Elatophilus nigricornis** (fig. 81)

References. – Cobben & Arnoud (1969: 8).

Published records. – • Friesland: Beetsterzwaag (Cobben & Arnoud 1969). • Overijssel: Lutterzand, Ootmarsum (Cobben & Arnoud 1969).

Unpublished records. – • Drenthe: Spier, Kibbelhoek, 10-14.vi.1977, B. Aukema. • Gelderland: Heerde, 20.vi.1971, 1 ♀, B. Aukema. • Utrecht: Zeist, 14.v.1969, J. Burger (PDW). • N-Brabant: Drunen, 4.vi.1983, A. P. J. A. Teunissen (ZMA). • Limburg: Lomm, Ravenvennen, 6.vi.1982, B. Aukema.

369. **Anthocoris amplicollis**

References. – Aukema (1976).

Published records. – • Limburg: Bunde (Aukema 1976).

Unpublished records. – • Utrecht: Amerongen, 28.ix.1986 & 30.viii.1987, K. den Bieman; Ibid., 15.viii.1987, B. Aukema; Zeist 16.viii.1987, 1 ♂, K. den Bieman.

370. **Anthocoris butleri** (fig. 82)

References. – Cobben & Arnoud (1969: 7-8).

Present status. – Locally common on *Buxus* in Gelderland, Utrecht, N-Holland and Limburg.

374. **Anthocoris minki minki** (fig. 83)

References. – Most older records concern the Ash (*Fraxinus exselsior* L.) inhabiting *A. simulans*, established by Péricart (1972: 139-141) as a good species.

Present status. – The true Poplar (*Populus*) inhabiting *A. minki* is known from a few localities only, but it is undoubtedly a widespread species in the Netherlands.

377. **Anthocoris pilosus** (fig. 84)

Synonym: *A. sibiricus* auct nec Reuter (Elov & Kerzhner 1977)

References. – Reclaire (1932: 149; 1936: 252); Blöte (1950: 19, 1954: 83); Cobben (1953: 190); Péricart (1972: 143-145, as *sibiricus*).

Note. – The specimen recorded as sibiricus from Oisterwijk (Reclaire 1932) was not traceable.

Published records. – • Limburg: Maastricht (Reclaire 1930; Blöte 1950, 1954), Meerssen (Reclaire 1932); Epen, Eygelshoven (Reclaire 1936); Roermond, Echt, Maasniel, Swalmen (Cobben 1953).

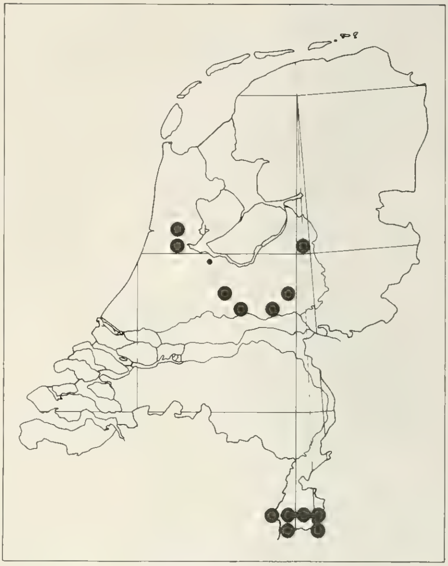


Fig. 82. *Anthocoris butleri.*

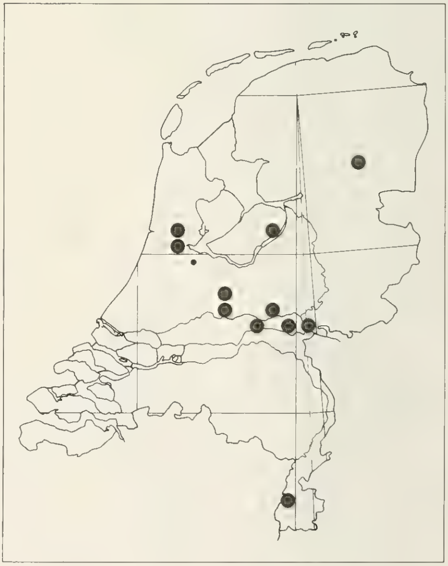


Fig. 83. *Anthocoris minki minki.*

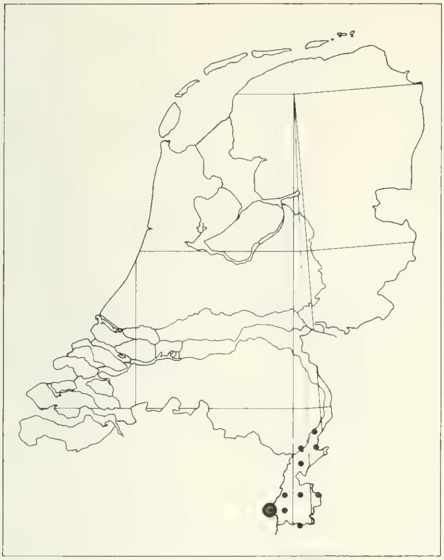


Fig. 84. *Anthocoris pilosus*.

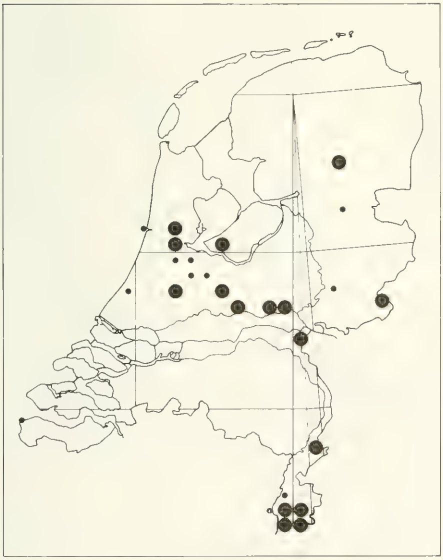


Fig. 85. *Anthocoris simulans*.

Present status. – Recorded only once since 1951: Maastricht, 24.viii.1965, P. Poot.

379. **Anthocoris simulans** (fig. 85)

Note. – see under *A. minki*.

Present status. – Widespread and common.

380. **Anthocoris visci**

References. – Cobben & Arnoud (1969: 5-7).

Published records. – • Limburg: Benzenrade, Holset, Mechelen, Nijswiller, Putberg, Geulle (Cobben & Arnoud 1969).

Unpublished records. – • Limburg: Geulle, 27.ix.1966, P. Poot (ZMA, P); Noorbeek, 30.viii, 3 & 8.ix.1973, B. Aukema. Ibid., 7.ix.1973, B. Aukema.

382. **Acompocoris alpinus** (fig. 86)

References. – Fokker (1885: 75).

Note. – The specimen recorded from Vorden (Fokker 1885) belongs to *Tetraphleps bicuspis* (Herrich-Schäffer).

Published records. – • Utrecht: Driebergen (Fokker 1885).

Unpublished records. – • Friesland: West-Terschelling (J. H. Woudstra); Appelscha (J. H. Woudstra). • Drenthe: Wijster, Spier (B. Aukema). • Gelderland: Epe, Gortel, Heerde (B. Aukema); Garderen, Hulshorst (J. H. Woudstra); Planken Wambuis (K. den Bieman); Nunspeet (R. T. Simon Thomas, ZMA). • Utrecht: Baarn (RML); Hollandse Rading (J. H. Woudstra). • N-Holland: Santpoort (B. Aukema; J. H. Woudstra); Naar-den, Vogelenzang, Zaandam (J. H. Woudstra). • N-Brabant: Strijbeek (J. H. Woudstra); Zundert (J. H. Woudstra; P. Aukema, AU). • Limburg: Brunssum (K. den Bieman); Epen (B. Aukema); Terziet (P. Poot); Vijlen (J. H. Woudstra).

Present status. – *A. alpinus* was collected twice before 1885 (Driebergen, Baarn), whereas all other records are from 1967 onwards.

385. **Orius laticollis** (fig. 87)

References. – Cobben (1958: 17).

Published records. – • Limburg: Roermond (Cobben 1958).

Unpublished records. – • Friesland: Terschelling, Midsland (J. H. Woudstra). • Drenthe: Norg (B. Aukema). • Flevoland: Lelystad (H. Vallenduuk). • Gelderland: Welsum (B. Aukema). • Utrecht: Breukelen (C. van Heijningen, RML); Kamerik, Remmerden (B. Aukema). • N-Holland: Amsterdam, Krommenie (B. Aukema); Ilpendam, Koog aan de Zaan, Westzaan (J. H. Woudstra). Zaandam (J. H. Woudstra; J. Beernink); Heemskerk (J. Beernink). • Limburg: Cottessen, Epen (B. Aukema); Maastricht (P. Poot); Mechelen (J. H. Woudstra).

Present status. – Widespread, but certainly not as rare as the present records may suggest. Much older material, identified as *O. minutus* still has to be checked for the presence of this species and the next one.

388. **Orius vicinus**

References. – Cobben (1958: 17).

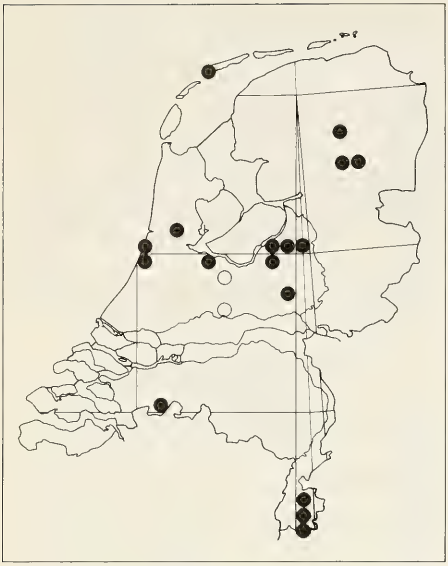


Fig. 86. *Acompocoris alpinus.*

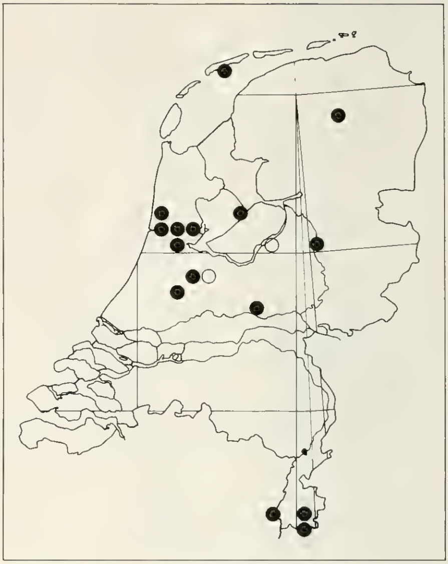


Fig. 87. *Orius laticollis.*

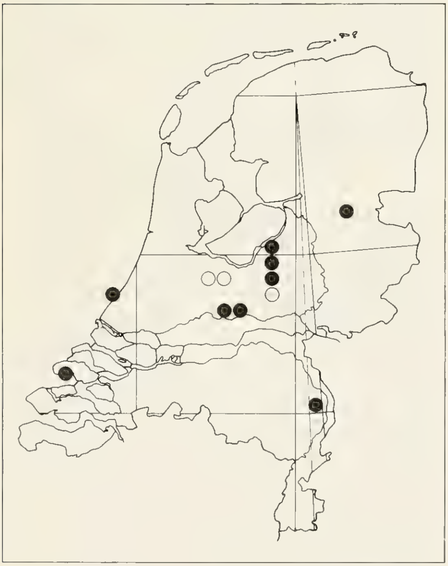


Fig. 88. *Xylocoris formicetorum.*

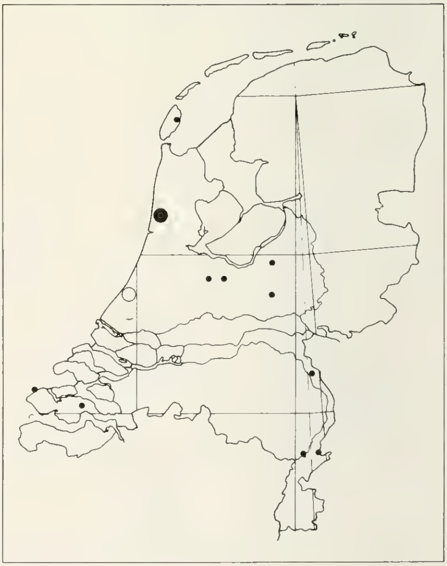


Fig. 89. *Brachysteles parvicornis.*

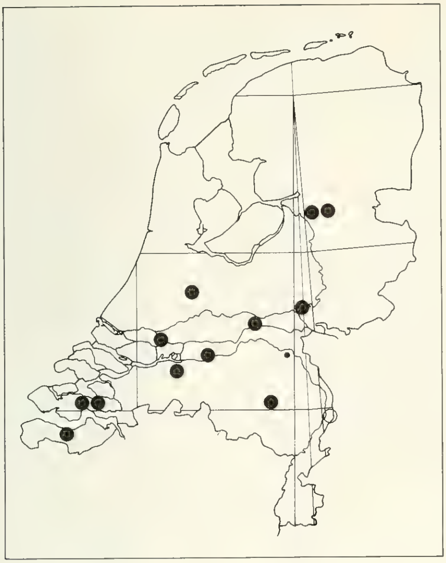


Fig. 90. *Oeciacus hirundinis.*

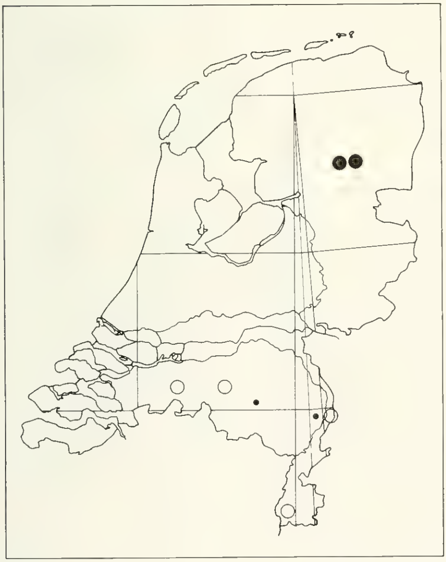


Fig. 91. *Rhynocoris annulatus.*

Published records. – • Gelderland: Wageningen (Cobben 1958).

Unpublished records. – • Gelderland: Ugchelen, 18.ix.1960, 1 ♂, P. J. Hartevelt & Ph. Pronk (RML); Zutphen, ix.1963, P. H. van Doesburg (RML); Bennekom, 25 & 30.viii.1986 & 7.ix.1987, K. den Bieman; Wageningen, 4.ix. 1988, B. Aukema. • N-Holland: Amsterdam, 19.viii.1974 & 11.v.1977, B. Aukema; Ibid., 13 & 23.ix.1985, J. H. Woudstra. • Lim- burg: Epen, 3-4.vii.1971, 1 ♂, & 11.ix.1980, 1 ♂, B. Aukema.

Present status. – Probably widespread, but still very few times recorded with certainty.

392. **Xylocoris formicetorum** (fig. 88)

References. – Reclaire (1932: 153-154).

Published records. – • Gelderland: Otterloo (Reclaire 1932).

• Utrecht: Baarn (Reclaire 1932). • N-Holland: Hilversum (Reclaire 1932).

Unpublished records. – • Overijssel: Ommen, viii.1986 & x.1987, H. Vallenduuk. • Gelderland: Garderen, 8.i.1983, H. Vallenduuk (ZMA); Nunspeet, iv.1987 & Kootwijk, vi.1987, H. Vallenduuk. • Utrecht: Doorn, 28.v.1984, H. Vallenduuk (ZMA); Driebergen, vii.1987, H. Vallenduuk. • Z-Holland: Den Haag, 20.iii.1983, H. Vallenduuk (ZMA). • Zeeland: Haamstede, ix.1987, H. Vallenduuk. • Limburg: Horst, vii & x.1987, H. Vallenduuk.

393. **Brachysteles parvicornis** (fig. 89)

References. – Reclaire (1932: 154; 1934: 53; 1951: 12); Cobben (1958: 17).

Published records. – • Gelderland: Leuvenum (Reclaire 1934). • Utrecht: Soest (Reclaire 1932). • N-Holland: Hilversum (Reclaire 1932); Texel, De Koog (Reclaire 1951). • Z-Holland: Meijendel (Reclaire 1932). • Zeeland: Oostkapelle (Reclaire 1951). • Limburg: Roermond (Reclaire 1951); Boukoul, Roermond, Bergen (Cobben 1958).

Unpublished records. – • Gelderland: Otterlo, 10.viii.1954, 1 ♀, W. H. Gravestein (ZMA). • N-Holland: Hilversum, 19.v.1947, A. Reclaire (P); Bakkum, 5.vi.1975, 1 ♂, J. Beernink. • Zeeland: Vrouwenpolder, 1.v.1949 & 29.vii.1954, P. J. Brakman (RML); Goes, 19.viii.1953, A. Post (ZMA); Oostkapelle, 3.x.1954, P. J. Brakman (P).

Present status. – Formerly a widespread species, but recorded only once since 1954.

394. **Cardiastethus fasciiventris**

References. – Reclaire (1936: 252).

Published records. – • Gelderland: Terborg, 3.viii.1935, 1 ♀, P. van der Wiel (ZMA) (Reclaire 1936).

Present status. – Not recorded since 1937: Terborg, 1-4.viii, P. van der Wiel (ZMA).

396. **Scoloposcelis pulchella** f. nov. spec.

Records. – • N-Holland: 's Graveland, 15.vii.1977, 1 ♀ at light, S. van Heijnsbergen (W).

397. **Oeciacus hirundinis** (fig. 90)

References. – Fokker (1885: 78); Reclaire (1932: 147).

Published records. – : • Gelderland: Arnhem (Reclaire 1932). • Limburg: Venlo (Fokker 1885).

Unpublished records. – • Overijssel: Dalfsen, 11.vi.1977, ABW (AU); Zwolle. 3.v.1977, ABW (AU). • Gelderland: Overasselt, 30.ix.1947, F. Smit (ZMA, P); Echteld, IJzendoorn, 22.v.1974 (PDW); Arnhem, 11.vi.1977, ABW (AU). • Utrecht: Kockengen, 9.vii.1973, W. J. Klok (ZMA, AU). • Z-Holland: Dordrecht, 3.v.1977, ABW (AU). • N-Brabant: Made, 4.vi.1970 (PDW); Helmond, 15.v.1974 (PDW); Andel, 14.vi.1977, ABW (AU). • Zeeland: Philippine, 14.vi.1974, ABW (AU); Goes, Kattendijke, 29.v.1975, B. Bosman (PDW) Wemeldinge, 10.vi.1977, ABW (AU); Yerseke, 10.vi.1977, ABW (AU).

399. **Cimex columbarius**

References. – Fokker (1885: 78); Reclaire (1932: 146; 1936: 251); Péricart (1972: 294-296).

Published records. – • Groningen: Scheemda (Reclaire 1936; Péricart, 1972). • Gelderland: Nijkerk (Reclaire 1936). • Utrecht: Utrecht (Reclaire 1932). • Z-Holland: Giessendam (Fokker 1885).

Unpublished records. – • Groningen: Scheemda, 12.xii.1938 (P). • N-Holland: Aalsmeer, 14.vi.1924, 2 ♀, D. MacGillavry (ZMA).

Present status. – Not recorded since 1938.

400. **Cimex dissimilis.**

References. – Fokker (1885: 78, as *C. pipistrellae* Kolenati); Reclaire (1932: 146, as *pipistrelli*; 1936: 251, as *pipistrelli* and *dissimilis*; 1943: 112, as *pipistrelli*); Péricart (1972: 296-298, as *pipistrelli* and *dissimilis*).

Published records. – • N-Holland: Amsterdam, Aalsmeer, Haarlem (Reclaire 1936 1943).

Unpublished records. – • Utrecht: Driebergen, viii, J. Oudemans (RML, Museum Helsinki) (Fokker 1885 and Péricart 1972, as *pipistrelli*); Groenekan, ix.1936, 2 ♀, H. Vink (ZMA).

Present status. – Not recorded since 1940: Haarlem, De Hout, 19.ix, L. Bels (ZMA).

401. **Cimex pipistrelli**

References. – Fokker (1885: 78); Péricart (1972: 296-297).

Note. – With the exception of Zierikzee (Fokker 1885) all published records of *C. pipistrelli* thusfar (Fokker 1885; Reclaire 1936, 1943; Péricart 1972) concern specimens of *C. dissimilis*.

Published records. – • Zeeland: Zierikzee (Fokker 1985).

Unpublished records. – • Friesland: Berlikum, 28 & 30.vi.1967, P. F. van Heerdt (ZMA); Tjerkwerd, 14.ii.1977, A. M. Voûte et al. (ZMA); Ibid., 29.iii.1977, B. Aukema.

402. **Empicoris baerensprungi**

References. – Reclaire (1932: 139).

Published records. – • Utrecht: Baarn (Reclaire 1932).

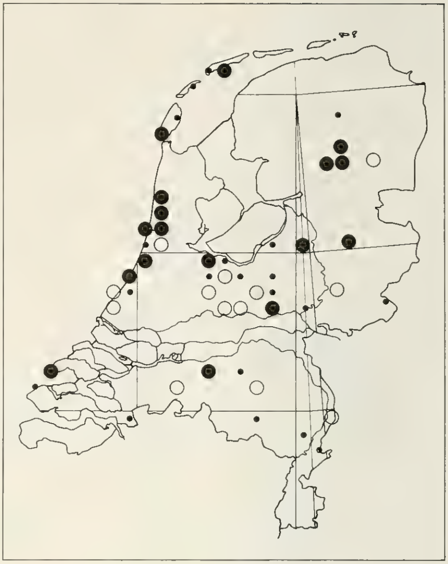


Fig. 92. *Coranus subapterus*.

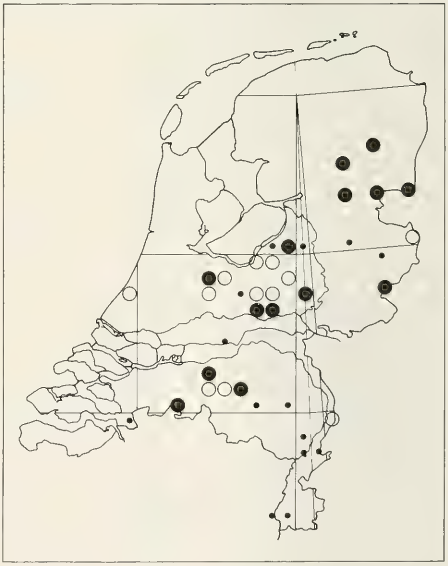


Fig. 93. *Coranus woodroffei*.

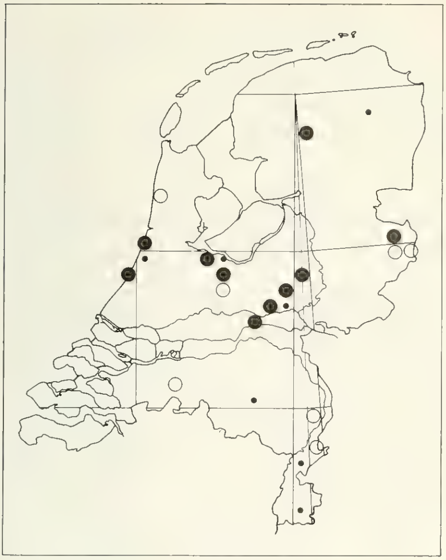


Fig. 94. *Aneurus laevis*.

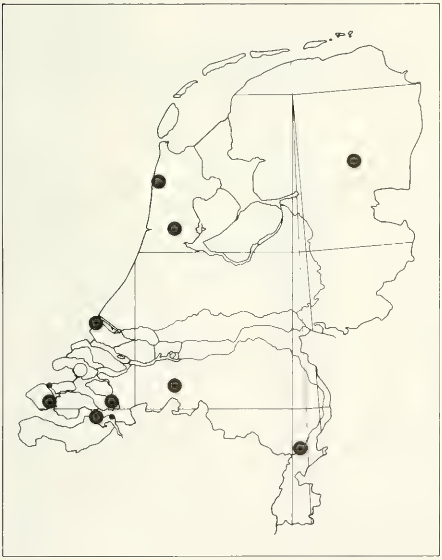


Fig. 95. *Piesma quadratum*.

● Gelderland: Leuvenum (Reclaire ,1932).

Unpublished records. – ● Gelderland: Hall, 5.vii.1987, 1 ♂, B. Aukema.

405. **Pygolampis bidentata**

References. – Fokker (1886: 298); Reclaire (1932: 139); Arnoud (1958); Cobben (1958: 16).

Published records. – ● Gelderland: Vorden, ix, 1 larva, Groll (Fokker 1886). ● N-Brabant: Deurne, 17.vi.1914, 1 ♂, D. MacGillavry (Reclaire 1932). ● Limburg: Linne, 25.v.1944, 1 larva; Herkenbosch, 11.viii.1947, young larvae, R. H. Cobben (Cobben 1958); Colmont, 19.vi.1958, larva, Br. Arnoud (Arnoud 1958).

Unpublished records. – ● N-Brabant: vicinity of Eindhoven, 1 ♂, C. Berger (P).

Present status. – Not recorded since 1958.

407. **Rhynocoris annulatus** (fig. 91)

References. – Snellen van Vollenhoven (1878a: 310, as *Harpactor annulatus*); Fokker (1884: 129; 1899: 35); Reclaire (1932: 140, as *Rhinocoris iracundus* (Poda); 1951: 10).

Published records. – ● Drenthe: Dwingeloo (Reclaire (1951). ● N-Brabant: Ulvenhout (Snellen van Vollenhoven 1878); Eindhoven (Reclaire 1950). ● Limburg: Gronsveld, Venlo (Fokker 1899); Valkenburg (Reclaire 1932).

Unpublished records. – ● Drenthe: Dwingeloo, 11.vi.1967, 1 ♂ (ZMA); Wijster, 28.v.1978, 1 & 8.vi.1979, 28.v, 6 & 10.vi.1980, 6-7.viii.1984, in window traps, B. Aukema (AU, W). ● N-Brabant: Ginneken, 9.vi.1878, 1 ♀, F. J. M. Heylaerts (ZMA); Oisterwijk, 17.v. 1894, 1 ♂ (RML). ● Limburg: Meerlo-Wanssum, Geijsteren, 20.v.1950, M. van den Boorn (P).

408. **Coranus subapterus** (fig. 92)

409. **Coranus woodroffei** f. nov. spec.(fig. 93)

References. – Putshkov (1982).

Revision of material identified as *C. subapterus* revealed both *subapterus* and *woodroffei* as widespread and common species in the Netherlands.

410. **Phymata crassipes**

References. – Fokker (1899: 34).

Published records. – ● Gelderland: Groesbeek, 27.vii.1890, 1 specimen, Groll (RML) (Fokker 1899).

Present status. – Not recorded since 1890.

412. **Aradus corticalis**

References. – Fokker (1899: 35); Cobben (1987).

Published records. – ● Gelderland: Winterswijk, xi.1910, 1 ♀ and exuvium, D. L. Uyttenboogaart (ZMA) (Cobben 1987). ● Z-Holland: Den Haag, vi.1894, Everts (RML) (Fokker 1899).

Present status. – Not recorded since 1910.

414. **Aradus signaticornis**

References. – Cobben (1987).

Published records. – ● Gelderland: Wageningen, 15.v.1985, 1 ♂, R. H. Cobben (Cobben 1987).

Unpublished records. – • N-Brabant: Helenaveen, 10-30.viii.1987, K. Alders (ZMA); Ibid., 9.ix.1987, B. Aukema.

415. **Aneurus avenius**

References. – Aukema (1976b).

Published records. – • Limburg: Epen, Terziet, Valkenburg, Vijlen (Aukema 1976b).

Unpublished records. – • Drenthe: Mantinge, 31.v.1981, 1 ♀, Y. Jongema (AU). • Limburg: Vijlen, 9.iii.1965, 1 ♂, Br. Arnoud.

416. **Aneurus laevis** (fig. 94)

References. – Aukema (1976b).

Present status. – Widespread.

418. **Piesma quadratum** (fig. 95)

References. – Reclaire (1932: 125; 1936: 249; 1940: 108; 1951:9); Woudstra (1959).

Note. – The specimens from Texel (Reclaire 1951) belong to *P. salsolae* (Gravestein 1958).

Published records. – • N-Holland: Zaandam (Woudstra 1959). • Zeeland: Zierikzee, Walcheren (Reclaire 1932); Middelburg (Reclaire 1936); Rilland-Bath (Reclaire 1940); Nieuw en St. Joosland, Vrouwenpolder (Reclaire 1951).

Unpublished records. – • Drenthe: Wijster, 22.i & 6.vii.1976, B. Aukema; Ibid., 31.viii.1977, J. H. Woudstra. • N-Holland: Camperduin, 15.ix.1962 & 19.ix.1967, J. Beernink; Ibid., 2.ix.1967, J. H. Woudstra; Zaandam, 10.ix.1960, J. Beernink. • Z-Holland: Oost-Voorne, 9.vi.1969 & 19.vi.1970 (ZMA). • Zeeland: Vrouwenpolder, 8.vii.1954 & Nieuw- en St. Joosland, 28.ii.1965, P. J. Brakman (P); Krabbendijk, 14.viii.1983, 1 ♂, K. den Bieman; Vlissingen, 21 & 27-28.vii.1986, B. Aukema. • N-Brabant: Breda, 27.vi.1964, H. J. van der Krift (ZMA); Bergen op Zoom, 19.ix.1983, B. van Aartsen (ZMA). • Limburg: Beegden, 29.v.1980, K. den Bieman.

419. **Piesma salsolae**

References. – Gravestein (1959).

Published records. – • N-Holland: Texel, Slufter, 26.viii.1946 & Ibid., De Koog, 26.viii.1946 & 29.vii.1947, W. H. Gravestein (ZMA).

Present status. – Only recorded from the West Frisian Island of Texel, where it was also caught by J. H. Woudstra (6.ix.1972) and B. Aukema (29.viii.1974).

424. **Berytinus montivagus**

References. – Fokker (1883: 248; 1885: 51; 1891: 357).

Note. – The specimen recorded by Fokker (1883) from Utrecht is not traceable and therefore ommitted from the list. The record from Limburg (Heerderberg) in Blöte (1954) concerns *B. minor*.

Published records. – • Zeeland: Zierikzee (Fokker 1885; 1891).

Unpublished records. – • Zeeland: Vlissingen, 15, 16 & 21.vii.1986, B. Aukema.

428. **Metatropis rufescens**

References. – Loof (1955); Cobben (1956a).

Published records. – • Limburg: Valkenburg (Loof 1955); Swalmen (Cobben 1956a).

Unpublished records. – • Overijssel: Ootmarsum, 7-9.vii.1972, J. H. Woudstra & B. Aukema. • Limburg: Bunde, 8.vi.1981, 1 ♂, K. den Bieman.

429. **Lygaeus equestris**

References. – Snellen van Vollenhoven (1878a: 91-92); Reclaire (1936: 246; 1951: 246).

Note. – The record from Amsterdam (Reclaire 1951) most likely concerns an imported specimen.

Published records. – • Friesland: locality unknown (Snellen van Vollenhoven 1878). • Limburg: Maastricht (Reclaire 1936).

Present status. – Not recorded since 1935: Maastricht, 3.vii, Maessen (NMM).

430. **Spilostethus saxatilis**

References. – Fokker (1884: 113, as *Lygaeus saxatilis*).

Published records. – • Limburg: Maastricht, A. H. Maurissen (RML) (Fokker 1884).

Present status. – Not recorded since 1884.

435. **Ortholomus punctipennis**

References. – Brakman (1952: 130, as *Nysius punctipennis*); Gravestein (1952a: cxviii); Cobben (1958: 16); Aukema & Woudstra (1985).

Published records. – • Zeeland: Domburg (Brakman 1952; Gravestein 1952). • Z-Holland: Voorne, 's-Gravenzande (Cobben 1958). • N-Holland: Egmond aan Zee (Aukema & Woudstra 1985).

Unpublished records. – • N-Holland: Egmond aan Zee, 14.viii.1985, J. H. Woudstra; IJmuiden, 14.viii.1986, B. Aukema; Ibid., 21.viii.1986, J. H. Woudstra.

436. **Orsillus depressus**

References. – Aukema (1988a).

Published records. – • Gelderland: Nijmegen, Wageningen (Aukema 1989a). • N-Holland: Naarden (Aukema 1989a).

Present status. – Collected since 1985 on *Chamaecyparis lawsoniana* (Murr) Parl., apparently spreading. Introduced with seeds of *Thuja occidentalis* L. in 1966 (PDW).

437. **Kleidocerys privignus** f. nov. spec. (fig. 96)

Records: • Zeeland: Domburg, Westhoven, 28.vi.1983, B. Aukema; Oostkapelle, 1.vii.1983 & 18.vii.1986, B. Aukema. • N-Brabant: Eindhoven, Bokt, 24.iv & 12.xii.1982, 15.v.1985, H. W. van der Wolf; Ibid., 16.v.1985, B. Aukema & H. W. van der Wolf; Ibid. & De Bochten, 30.xii.1982, B. Aukema, H. W. van der Wolf & J. H. Woudstra; Nederwetten, 2.i.1983, H. W. van der Wolf; Haarsteeg, 27.ii.1983, Oudheusden, 5.iii.1983 & Capelle, 13.iii.1983, A. P. J. A. Teunissen; Soerendonk, 20.ii.1983 & Son, 12.xi.1987, H. W. van der Wolf. • Limburg: Swalmen, Wieler, 29.iv.1983, B. Aukema.

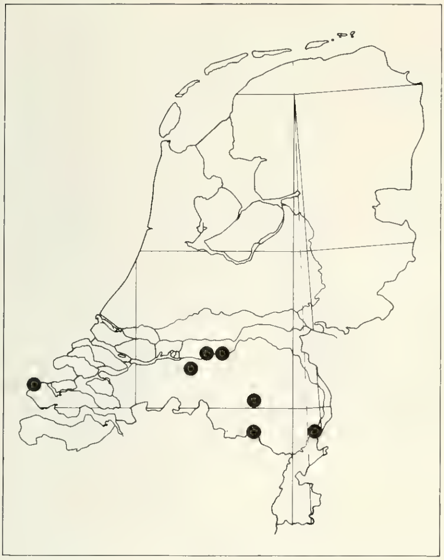


Fig. 96. *Kleidocerys privignus*.

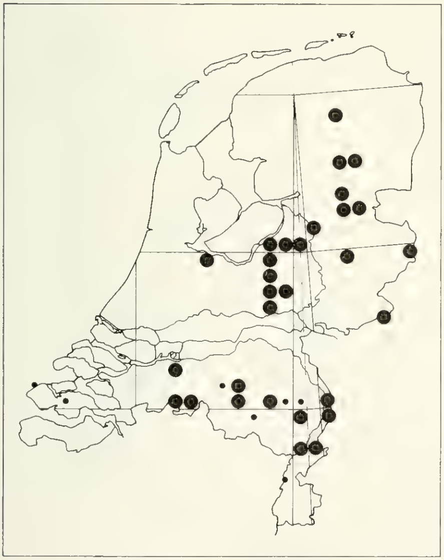


Fig. 97. *Cymus melanocephalus*.

Present status. – Widespread in the southern provinces on alder (*Alnus glutinosa* (L.) Gaertner), especially near and above water. Rare.

439. **Kleidocerys truncatulus ericae** f. nov. spec.

Note. – Slater (1964) erroneously lists *K. truncatulus ericae* for the Netherlands due to misinterpretation of Reclaire (1932).

Records. – ● N-Holland: Texel, 't Mientje, 6.ix.1972, J. H. Woudstra; Ibid., 29.viii.1974, B. Aukema.

Present status. – Collected on *Calluna vulgaris* (L.) Hull on one locality only. Despite some efforts not found there again since 1974.

440. **Cymus aurescens**

Synonym: *C. obliquus* Horvath (Josifov & Kerzhner 1978).

443. **Cymus melanocephalus** (fig. 97)

References. – Cobben (1948: 50); Reclaire (1951: 6).

Present status. – After its discovery in 1947 *C. melanocephalus* has appeared to be widespread and locally common.

445. **Geocoris ater**

References. – Snellen van Vollenhoven (1878a: 134-135).

Published records. – ● Utrecht: Driebergen, vii, 1 ♀, G. A. Six (RML).

Present status. – Not recorded since 1878.

447. **Geocoris megacephalus**

References. – Snellen van Vollenhoven (1878a: 135, as *Ophthalmicus pallidipennis*); Reclaire (1932: 98-99).

Published records. – ● Zeeland: Vlissingen (Snellen van Vollenhoven 1878); Cadzand, Domburg (Reclaire 1932).

Present status. – Not recorded since 1902: Cadzand, vii, A. J. F. Fokker (RML).

448. **Metopoplax ditomoides**

References. – Reclaire (1951).

Published records. – ● Limburg: Gronsveld, 21.vi.1948, 1 ♂, P. van der Wiel (ZMA) (Reclaire 1951).

Present status. – Not recorded since 1948.

449. **Oxycarenus modestus** (fig. 98)

References. – Cobben (1951: 52-53); Aukema (1976a)

Published records. – ● Limburg: Melick-Herkenbosch (Cobben 1951); Wieler, Jabeek (Aukema 1976a).

Unpublished records. – ● Gelderland: Dreumel, 11.iv.1981, 1 ♀, K. den Bieman; Lienden, 27.iii.1983, 1 ♂, R. H. Cobben. ● N-Brabant: Eindhoven, Bokt, 30.x.1977, 1 ♂, H. W. van der Wolf; Ibid., 30.xii.1982; Vlijmen, 15.v.1982, A. P. J. A. Teunissen (ZMA); Ibid., 5.vii.1982, C. J. M. Berger (ZMA, P); Haarsteeg, 13.iii.1983, A. P. J. A. Theunissen (ZMA); Best, 16.v.1985, B. Aukema. ● Limburg: Wieler, 1.viii.1980 & 29.iv.1983, B. Aukema; Epen, 8.vi.1985, B. Aukema.

450. **Tropidophlebia costalis**

References. – Reclaire (1932: 100, as *Camptotelus lineolatus* Schilling; 1943: 109, as *C. costalis*).

Published records. – ● Utrecht: Soest (Reclaire 1943). ● N-Holland: Hilversum (Reclaire 1932).

Present status. – Not recorded since 1943: Soest, 9.vi, A. Reclaire (ZMA).

454. **Plinthisus pusillus** (fig. 99)

References. – Reclaire (1932: 105, 258; 1948: 42; 1951: 7).

Published records. – ● Drenthe: Roden (Reclaire 1948). ● Gelderland: Otterlo (Reclaire 1932). ● N-Holland: Aerdenhout, Hilversum (Reclaire 1932); Texel, De Koog (Reclaire 1951). ● Z-Holland: Wassenaar, Katwijk (Reclaire 1932). ● N-Brabant: Breda (Reclaire 1932).

Unpublished records. – ● N-Holland: Hilversum, 22.ix.1934, 26.v.1935, 3.ix.1938 & 20.viii.1940, A. Reclaire (ZMA); Laren, 3.iii.1935, A. Reclaire (ZMA). ● Z-Holland: Oostvoorne, 24.vii.1956, R. H. Cobben; Noordwijk, 13.ix.1987, 1 ♂, K. den Bieman. ● Gelderland: Hoenderloo, 5.ix.1982, 1 ♀, K. den Bieman.

455. **Tropistethus holosericeus** (fig. 100)

References. – Reclaire (1932: 103; 1934: 50; 1936: 247; 1940: 107); Blöte (1954: 84).

Published records. – ● Utrecht: Rhenen (Reclaire 1940). ● Z-Holland: Wassenaar (Reclaire 1936). ● Limburg: Maastricht (Reclaire 1932 1934; Blöte 1954); Bemelen (Reclaire 1936); Eijs (Reclaire 1940).

Unpublished records. – ● Limburg: Bemelen, 10.ix.1966, P. J. Brakman (P); Colmont, 14.v.1966 & 1.vii.1967, Mheer, 18.vii.1968 & 9.v.1970, P. Poot.

456. **Drymus latus**

References. – Reclaire (1932: 115, as *D. confusus*; 1936: 248).

Published records. – ● Limburg: Maastricht (Reclaire 1932); Bemelen, Eijs, Schin op Geul, Wijlre (Reclaire 1936).

Unpublished records. – ● Limburg: Colmont, 7.iv.1963, 1 ♂, P. J. Brakman (RML).

457. **Drymus pilicornis**

References. – Fokker (1884); Reclaire (1951: 8).

Published records. – ● N-Holland: Haarlem, ix, Groll (RML) (Fokker 1884); Heemstede, 31.vii.1942, 1 ♂, D. L. Uyttenboogaart (ZMA) (Reclaire 1950).

Present status. – Not recorded since 1942.

459. **Drymus pumilio**

References. – Aukema (1986a).

Published records. – ● Zeeland: Cadzand (Aukema 1986a). ● Limburg: Maastricht, Mechelen (Aukema 1986a).

Present status. – Local, very rare. Three ♀ were collected at different localities between 1921 and 1960.

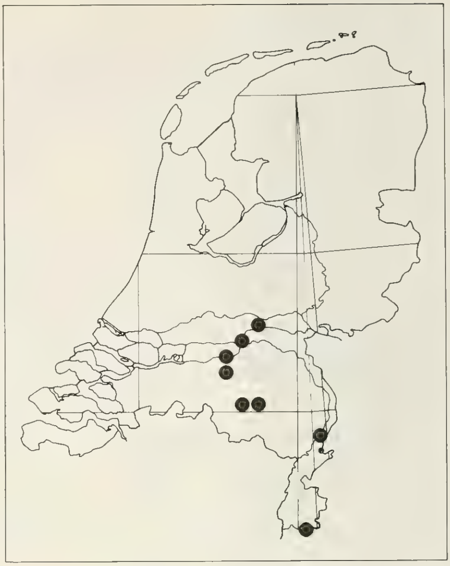


Fig. 98. *Oxycarenus modestus*.

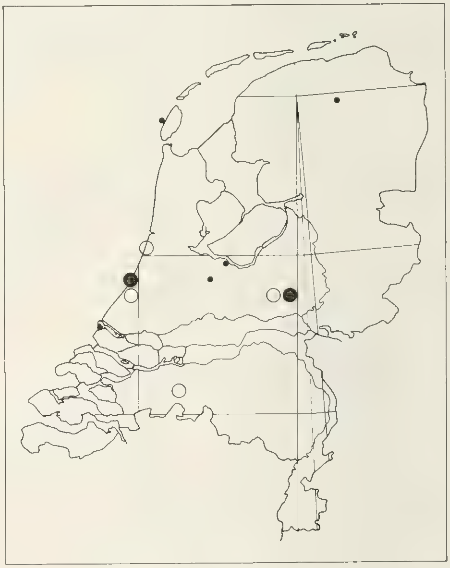


Fig. 99. *Plinthisus pusillus*.

Fig. 100. *Tropistethus holosericeus.*

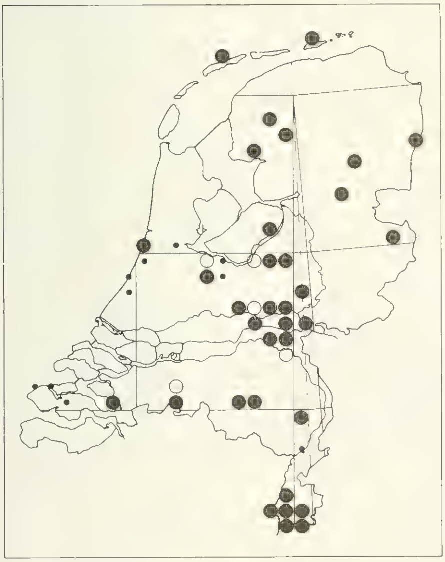


Fig. 101. *Drymus reyii.*

460. **Drymus ryeii** (fig. 101)

References. – Cobben (1958a: 5, as *D. picinus* Rey).
Present status. – Widespread and common.

464. **Eremocoris podagricus**

References. – Reclaire (1932: 117; 1936: 248; 1940: 108; 1948: 42; 1951: 8); Brakman (1952: 130); Blöte (1954).

Published records. – ● Limburg: Maastricht (Reclaire 1932, 1948; Blöte 1954); Valkenburg, Wijlre (Reclaire 1936); Bunde (Reclaire 1940); Bemelen (1951). ● Zeeland: Oostkapelle (Brakman 1952).

Unpublished records. – ● Limburg: Vaals, 10.v.1964 & Bemelen, 10.ix.1966, P. Poot; Oud-Valkenburg, Gerendal, 6.vi, 1.vii & 16.7.1977, C. Dolleman.

468. **Lamproplax picea**

References. – Reclaire (1943: 110, as *Drymus piceus*; 1948: 42); Aukema & Alderweireldt (1989, in press).

Published records. – ● Friesland: Schiermonnikoog (Aukema & Alderweireldt 1989). ● Drenthe: Wijster (Aukema & Alderweireldt 1989). ● Gelderland: Winterswijk (Reclaire 1943). ● Limburg: Haelen (Reclaire 1948); Herkenbosch, Meijnweg (Aukema & Alderweireldt 1989)

472. **Scolopostethus pilosus**

References. – Reclaire (1932: 119; 1943: 110).

Published records. – ● Gelderland: Varsseveld (Reclaire 1932); Winterswijk (Reclaire 1943).

Unpublished records. – ● Overijssel: Kalenberg, Weerribben, 20.v.1978, 1 ♀, C. Dolleman.

473. **Scolopostethus pseudograndis** f. nov. spec.

Note. – Miss B. Berkhout discovered this species revising the *Scolopostethus* material in the Leiden Museum (RML).

Records. – ● Limburg: Maastricht, St. Pietersberg, 16.viii.1950, 1 ♂, 17.x.1950, 2 ♂, 1 ♀ & Gronsveld, Riesenberg, 20.x.1950, 1 ♀, H. C. Blöte et al. (RML).

Present status. – Not recorded since 1950.

477. **Taphropeltus hamulatus**

References. – Reclaire (1932: 119; 1936: 249; 1940: 108).

Note. – the specimen from Hilversum (Reclaire 1940) belongs to *T. contractus.*

Published records. – ● Zeeland: Zierikzee (Reclaire 1932). ● Limburg: Eijs (Reclaire 1932); Schin op Geul (Reclaire 1936).

Unpublished records. – ● Limburg: Wijlre, 11-12.viii.1958 & 10.viii.1959, W. H. Gravestein (ZMA); Colmont, 4.iv.1959, W. Hellinga (ZMA); Ibid., 6.iv.1965, P. Poot (ZMA) & 8-9.iv & 1.vii.1967, P. Poot; Mheer, 9.v.1970, P. Poot.

479. **Lasiosomus enervis**

References. – Reclaire (1940: 107); Brakman (1952: 130).

Published records. – • Zeeland: Oostkapelle, 27.vi.1949, P. J. Brakman (RML) (Brakman 1952). • Limburg: Eijs, 13.ix.1936, 1 ♂, A. Reclaire (ZMA) (Reclaire 1940).

Unpublished records. – • Limburg: Vaals, 13.vi.1956, 1 ♂, 1 ♀, W. H. Gravestein (ZMA).

Present status. – Not recorded since 1956.

484. **Pachybrachius luridus** (fig. 102)

References. – Fokker (1886: 298, as *Plociomerus luridus*; Reclaire (1932: 101; 1936: 247; 1943: 109).

Published records. – • Drenthe: Gasteren (Reclaire 1936); Wijster (Reclaire 1943). • Gelderland: Winterswijk (Fokker 1886); Arnhem (Reclaire 1932). • Utrecht: Baarn, Vinkeveen (Reclaire 1932). • N-Holland: Ankeveen (Reclaire 1932); Kortenhoef (Reclaire 1936).

Unpublished records. – • Gelderland: Tongeren, 22.ix.1983, 1 ♂, 1 ♀, K. den Bieman (AU, BI). • N-Holland: Kortenhoef, 16.vi.1951, H. Smit (ZMA).

485. **Aellopus atratus**

References. – Reclaire (1932: 109); Cobben (1958: 16).

Published records. – • Limburg: Bemelen (Reclaire 1932); Schin op Geul (Reclaire 1936; Cobben 1958).

Unpublished records. – • Limburg: Bemelen, 23.ix.1949, R. Batten (P); Ibid., 15.viii.1966, P. Poot & 10.ix.1966, P. Poot (ZMA); Valkenburg, 22.vi.1965, P. Poot.

488. **Peritrechus angusticollis**

References. – Reclaire (1936: 248).

Published records. – • Limburg: Schinveld, 24.xii.1934, 1 ♀, J. Cremers (NMM) (Reclaire 1936).

Unpublished records. – • Limburg: Belfeld, 22.vi.1985, 1 ♂, H. Peeters (P).

490. **Peritrechus lundii** (fig. 103)

References. – Reclaire (1932: 108, as *P. sylvestris*; 1936: 248; 1940: 107; 1948: 42; 1951: 8).

Present status. – Formerly widespread, but rare. Collected for the last time in 1951: Vogelenzang, Amsterdamse Waterleidingduinen, 19.v (ZMA).

495. **Raglius alboacuminatus**

References. – Cobben (1948: 50; 1953: 186-187).

Published records. – • Limburg: Vlodrop, Roermond (Cobben 1948, 1953).

Present status. – Not recorded since 1951: Vlodrop, St. Ludwig, 17.viii, R. H. Cobben (AU, CB, LUW).

496. **Megalonotus antennatus**

References. – Fokker (1886: 298, as *Rhyparochromus antennatus*); Reclaire (1932: 101, 258, as *Rhyparochromus*); Aukema (1983).

Note. – The specimen mentioned by Fokker (1886) from Vorden (ix, Groll), most likely concerns the specimen from Warnsveld (3.ix.1885, leg. Groll) in the Amsterdam Museum.

Published records. – • Gelderland: Warnsveld (Reclaire 1932). • Limburg: Schin op Geul (Reclaire 1932); Wahlwiller (Aukema 1983).

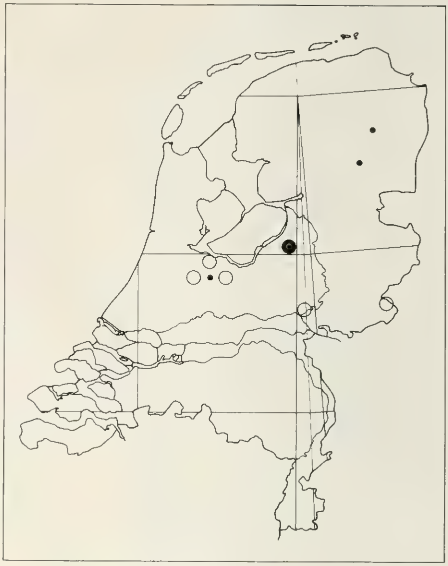


Fig. 102. *Pachybrachius luridus*.

Fig. 103. *Peritrechus lundii*.

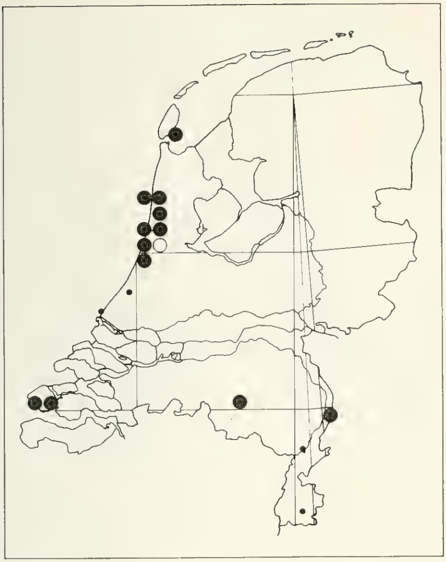


Fig. 104. *Megalonotus sabulicola.*

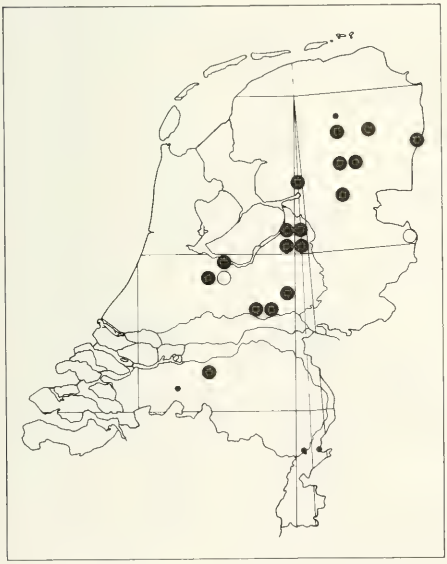


Fig. 105. *Trapezonotus desertus.*

Unpublished records. – • Friesland: Schiermonnikoog, 14.v.1961, G. Stobbe (FNM). • Limburg: Colmont, 3.viii.1960, 11.v.1963 & 11.v.1965, Br. Arnoud (CB); Ibid., 6.iv & 3.vii.1965, 15.x.1968, P. Poot (P, ZMA); Ibid., ix.1969, C. Berger (P); Ibid., Wrakelberg, 6.v.1977 & 7.v.1979, C. Dolleman; Wahlwiller, Kruisberg, 16 & 28.vii.1977, C. Dolleman.

500. **Megalonotus sabulicola** (fig. 104)

References. – Fokker (1884: 117); Reclaire (1932: 103; 1934: 50; 1936: 247; 1951: 7).

Present status. – Widespread, but restricted to sandy soils.

503. **Emblethis griseus**

References. – Snellen van Vollenhoven (1878a: 96-97, as *Pachymerus griseus*); Brakman (1952: 130, as *E. verbasci*).

Published records. – • Zeeland: Walcheren (Snellen van Vollenhoven 1878; Fokker 1884, as *verbasci*; Reclaire 1932, as *verbasci*); Domburg, 6.vii-18.viii.1951, P. J. Brakman (RML, P) (Brakman 1952).

Unpublished records. – • Zeeland: Domburg, 1.vii.1983, 12 & 14.vii.1986, B. Aukema.

Present status. – Uncertain, because in 1987 the locality was destroyed when the dykes were raised.

504. **Emblethis verbasci**

References. – Reclaire (1932: 114).

Published records. – • N-Brabant: Bergen op Zoom (Reclaire 1932). • Limburg: Schin op Geul (Reclaire 1932).

Present status. – Not recorded since 1944: Schin op Geul, vii, 1 ♂, A. Reclaire (ZMA).

510. **Trapezonotus desertus** (fig. 105)

References. – Woodroffe (1960).

Present status. – Common on heather heaths.

513. **Dicranocephalus agilis**

References. – Cobben (1948: 50); Blöte (1954: 84).

Note. – The specimens recorded from Arnhem, cited by Fokker (1883) belong to *D. medius* and the one from Den Haag (Snellen van Vollenhoven 1878) is not traceable (Cobben 1948).

Published records. – • Limburg: Vlodrop (Cobben 1948); Maastricht (Blöte 1954).

Unpublished records. – • N-Holland: Zaandam, 25.vii.1963, 1 ♀, ex larva, J. H. Woudstra (specimen of doubtful origin). • N-Brabant: Woensdrecht, 26.ix.1955, 1 ♀, P. J. Brakman.

514. **Dicranocephalus medius**

References. – Fokker (1883: 246-247, as *D. agilis*); Cobben (1948: 50); Gravestein (1952a: cxvi); Blöte (1954: 84); Loof (1956).

Note. – One unlabelled though probably Dutch specimen in the collection of the Dutch Entomological Society (Fokker 1883).

Published records. – • N-Holland: Vogelenzang (Loof 1956). • Gelderland: Arnhem (Fokker 1883, as *agilis*;

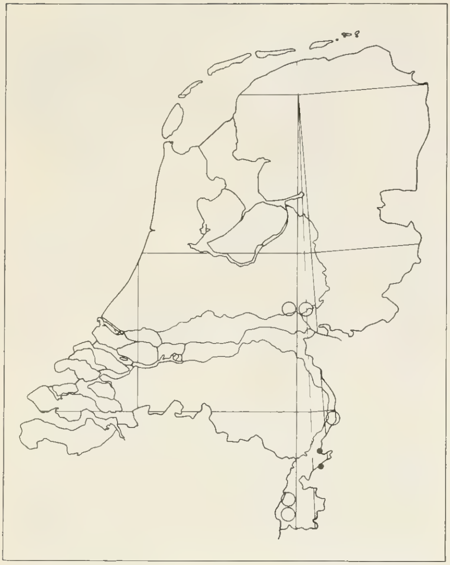


Fig. 106. *Gonocerus acuteangulatus.*

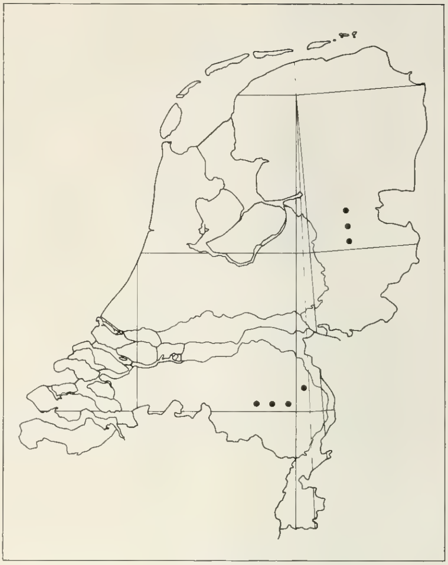


Fig. 107. *Gonocerus juniperi.*

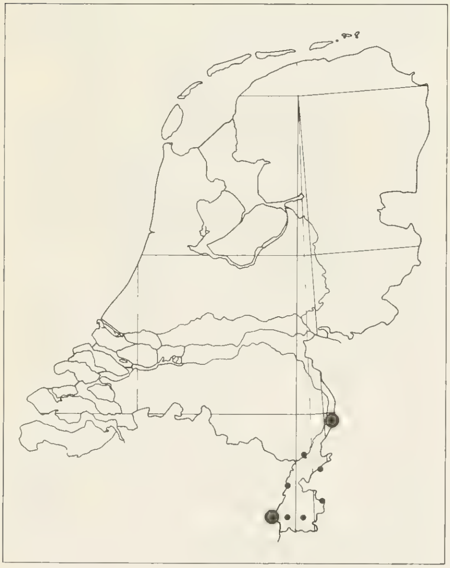


Fig. 108. *Bathysolen nubilus.*

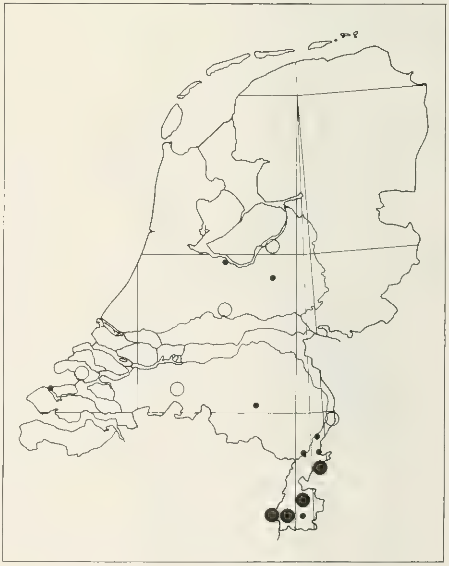


Fig. 109. *Corizus hyoscyami.*

Fig. 110. *Rhopalus subrufus.*

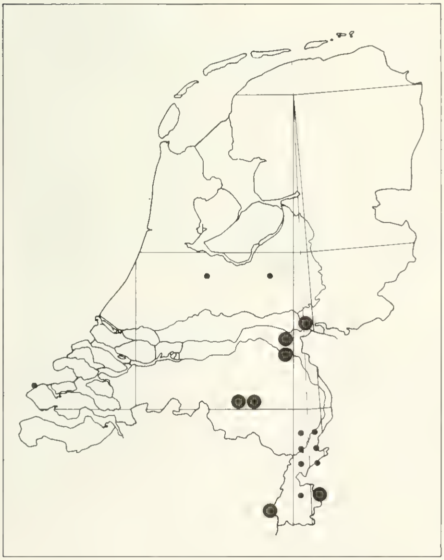


Fig. 111. *Stictopleurus abutilon abutilon.*

Cobben 1948). ● Limburg: Vlodrop (Cobben 1948), Rijkel (Gravestein 1952a), Maastricht (Blöte 1954).

Unpublished records: ● Limburg: Rijkel, 17.vi.1953, P. J. Brakman (P); Swalmen, 20.vi.1965, 1 ♂, P. J. Brakman (P).

515. **Gonocerus acuteangulatus** (fig. 106)

References. – Snellen van Vollenhoven (1878a: 60-61, as *G. venator*); Reclaire (1932: 256; 1951: 4, as *G. juniperi* from Herkenbosch); Cobben (1953: 174; 1958: 15-16).

Published records. – ● Gelderland: Arnhem, Oosterbeek (Snellen van Vollenhoven 1878). ● Limburg: Houthem, Bunde, Venlo (Snellen van Vollenhoven 1878); Herkenbosch, Vlodrop, Boukoul (Cobben 1953); Bunde (Reclaire 1932).

Present status. – Not recorded since 1950: Vlodrop, 27.vii, R. H. Cobben.

516. **Gonocerus juniperi** (fig. 107)

References. – Reclaire (1932: 84; 1951: 4); Gravestein (1943: viii).

Note. – The record from Herkenbosch (Reclaire 1950) concerns *G. acuteangulatus* (Cobben 1958).

Published records. – ● Overijssel: Ommen (Reclaire 1932); Lemelerberg (Gravestein 1943). ● N-Brabant: Lierop, Deurne (Reclaire 1951).

Unpublished records. – ● Limburg: Venray, 28.viii-25.ix.1951, R. H. Cobben (CB, LUW, NMM).

Present status. – Not recorded since 1951.

522. **Arenocoris waltlii**

References. – Snellen van Vollenhoven (1878a: 66-67, as *Pseudophloeus waltlii*); Fokker (1891: 357, as *Pseudophlaeus waltlii*); Reclaire (1932: 86, 256, as *Pseudophloeus waltli*).

Published records. – ● Gelderland: Nijmegen (Fokker 1891); Buren (Reclaire 1932). ● Zeeland: Walcheren (Snellen van Vollenhoven 1878); Vlissingen (Reclaire 1932).

Present status. – Not recorded since 1892: Buren, vii, H. J. Veth (RML).

523. **Bathysolen nubilus** (fig. 108)

References. – Reclaire (1936: 246; 1948: 40); Blöte (1954: 84).

Published records. – ● Limburg: Bemelen, Schin op Geul (Reclaire 1936); Roermond (Reclaire 1948); Maastricht (Blöte 1954).

Unpublished records. – ● Limburg: Kerkrade, 14.viii & 1.ix.1936, Willemse (ZMA); Schinveld, 30.viii.1936, Willemse (ZMA); Schin op Geul, 10.viii.1941, M. van den Boorn (P); Vlodrop, 23.v & 20.vii.1948; Heel, 14.ix.1953, 1 ♂, R. H. Cobben; Venlo, 15.ix.1982, B. van Aartsen (ZMA); Ibid., 17.vi.1982 & 21.v.1983, B. Aukema; Ibid., 3.viii.1983, B. Aukema & J. H. Woudstra; Maastricht, St. Pietersberg, 18.viii & 2.ix.1983, 29.viii.1984, B. Aukema.

527. **Liorhyssus hyalinus**

References. – Reclaire (1936: 246).

Published records. – ● Gelderland: Nunspeet, viii.1923, 1 ♀, D. MacGillavry (ZMA) (Reclaire 1936).

Present status. – Not recorded since 1923.

528. **Corizus hyoscyami** (fig. 109)

References. – Reclaire (1932: 89, as *Therapha hyosciami*; 136: 246; 1948: 41; 1951: 5).

Present status. – Widespread, but rare. Not recorded between 1949 and 1977. Since then only in Limburg: Gronsveld (J. H. Woudstra); Kunrade, Maastricht, Vlodrop (B. van Aartsen, ZMA).

530. **Rhopalus subrufus** (fig. 110)

References. – Reclaire (1932: 90, 257, as *Corizus subrufus*); 1934: 49; 1940: 106; 1943: 108; 1951: 5).

Published records. – • Friesland: locality unknown (Reclaire 1932). • Utrecht: Driebergen (Reclaire 1932). • N-Holland: Velsen (Reclaire 1951). • Limburg: Eijsden, Schin op Geul (Reclaire 1932); Houthem (Reclaire 1932); Gronsveld (Reclaire 1934); Wijlre (Reclaire 1940); Valkenburg (Reclaire 1932, 1943); Geulhem (Reclaire 1951).

Unpublished records. – • N-Holland: Heemskerk, 14.x.1951, J. H. Woudstra; Ibid., 16.v.1959, J. Beernink. • Limburg: Maastricht, St. Pietersberg, 12.vi.1935 (NMM); Ibid., 18.vii.1983 & 29.viii.1984, B. Aukema; Roermond, 15.v.1949, 1 ♀, R. H. Cobben; Vlodrop, 22.ix.1951, R. H. Cobben.

534. **Stictopleurus abutilon abutilon** (fig. 111)

References. – Cobben (1948: 50; 1951: 53); Reclaire (1951: 5); Brakman (1952: 130); Blöte (1954: 84).

Published records. – • Gelderland: Kootwijk (Reclaire 1951). • Zeeland: Oostkapelle (Brakman 1952). • N-Brabant: Eindhoven (Reclaire 1951). • Limburg: Beesel, Boukoul, Linne, Melick, Herkenbosch, Roermond, St. Odiliënberg, Vlodrop (Cobben 1948; Reclaire 1951); Haelen (Cobben 1951); Maastricht (Blöte 1954).

Unpublished records. – • Gelderland: Nijmegen, 31.viii.1986, D. J. Hermes; Pannerden, 19.vi.1977, C. Dolleman. • Utrecht: Maartensdijk, 28.vii.1950, W. H. Gravestein (ZMA). • N-Brabant: Best, 7.ix.1950, M. van den Boorn (P); Ibid., 9.x.1976 & 24.viii.1974, H. W. van der Wolf (AU); Eindhoven, Ekkersrijt, 8.x.1976, H. W. van der Wolf (AU). • Limburg: Heerlen, 25.vi.1949, Br. Arnoldus (ZMA); Echt, 16.viii.1949, R. H. Cobben; Melick-Herkenbosch, 26.viii & 9.ix.1949, 21.ix.1951 & 14.ix. 1953, R. H. Cobben; Koningsbosch, 21.v.1949, R. H. Cobben; Maastricht, St. Pietersberg, 26.ix.1983, 2.ix & 15.x.1984, B. van Aartsen (ZMA); Ibid., 8-11.viii & 2.ix.1983, B. Aukema; Mook, 21.viii.1983, K. den Bieman; Schaesberg, 1.v & 22.vi.1987, G. R. langohr (RML).

Present status. – Widespread, but rare. Collected in two distinct periods: 1947-1953 and since 1976.

535. **Stictopleurus punctatonervosus**
(fig. 112)

References. – Blöte (1950: 19-20; 1954: 84); Cobben (1951: 53); Arnoud (1958).

Published records. – • Limburg: Maastricht (Blöte 1950, 1954); Melick-Herkenbosch (Cobben 1951), Brunssum (Arnoud 1958); Bemelen, Cadier, Keer (Blöte 1954).

Unpublished records. – • Gelderland: Nijmegen,

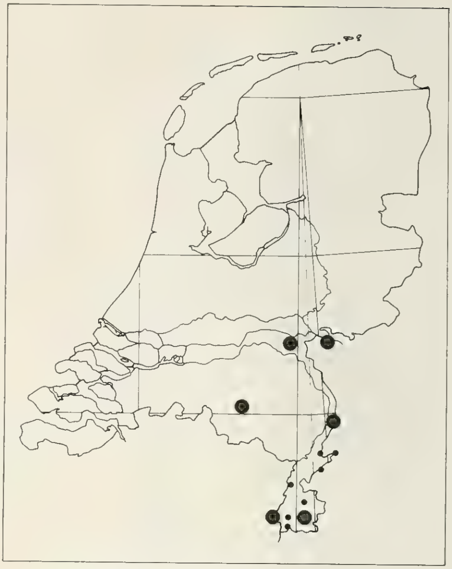


Fig. 112. *Stictopleurus punctatonervosus.*

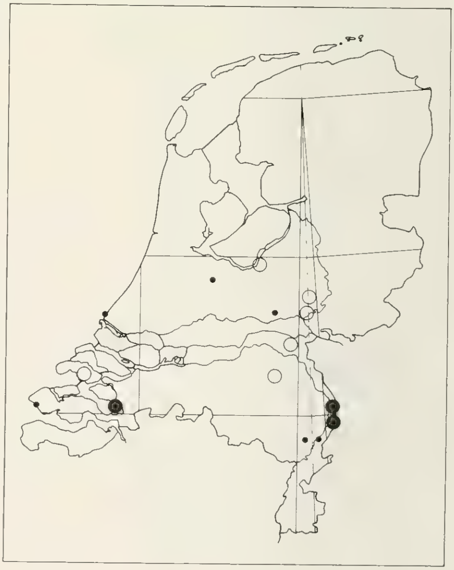
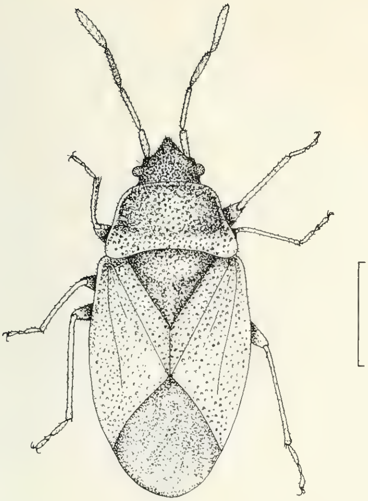


Fig. 113. *Aethus nigrita.*



459. *Drymus pumilio*. Scale: 1 mm.

31.viii.1986, 17.iv & 19.vii.1987, D. J. Hermes; Ibid., 6.xi.1987, B. Aukema; Tolkamer, 9.viii.1988, G. Morseld. • N- Brabant: Best, 4.vi.1983, B. Aukema; Oirschot, 12.x.1985, B. van Aartsen (ZMA). • Limburg: Vlodrop, 22.ix.1951 & 2.viii.1954, R. H. Cobben; Ibid., 10.vii.1981 & 1.ix.1984, B. van Aartsen (ZMA); Maastricht, 1.viii.1972, 26-27.ix.1983, 17 & 21.vii, 18.viii, 2.ix & 15.x.1984, B. van Aartsen (ZMA); Ibid., 22.ix.1975, 24.viii & 14.ix.1983, 29.viii.1984 and 7.vi.1985, B. Aukema; Venlo, 17.vii.1979, 17.vi.1980, 7.vii & 15.ix.1982, 22.vi, 16.vii & 1.xi.1984, B. van Aartsen (ZMA); Ibid., 30.x.1982, B. Aukema & 3.viii.1983, B. Aukema & J. H. Woudstra; Colmont, 27.ix.1983, B. van Aartsen (ZMA); Nijswiller, 19.viii.1987, G. R. langohr (RML).

541. **Sehirus morio**

References. – Fokker (1883: 241); Reclaire (1932: 65); Cobben (1953: 172).

Published records. – • Utrecht: Bilthoven (Reclaire 1932). • Gelderland: Arnhem (Fokker 1883; Reclaire 1932). • Limburg: Montfort (Cobben 1953).

Unpublished records. – • Utrecht: Maartensdijk, Groenekan, 2.vii.1950, W. J. Kabos (ZMA).

Present status. – Not recorded since 1950.

543. **Aethus nigrita** (fig. 113)

References. – Reclaire (1932: 63, as *Cydnus nigrita*; 1936: 244; 1951: 2); Cobben (1953: 172); Brakman (1960: 24).

Published records. – • Gelderland: Nijmegen, Putten, Wageningen (Reclaire 1932); Laag-Soeren (Reclaire 1936). • N-Holland: Hilversum (Reclaire 1932, 1936). • Z-Holland: 's-Gravenzande (Reclaire 1951). • Zeeland: Zierikzee (Reclaire 1932); Zoutelande (Brakman 1960). • N-Brabant: Uden (Reclaire 1932). • Limburg: Maasniel, Melick, Roermond (Reclaire 1951); Rijkel (Cobben 1953).

Unpublished records. – • Gelderland: Arnhem, 19.v.1898 (ZMA); Ibid., 20.iv, G. A. Six (RML); Velp, 21.iv & 2-4.v.1901 (ZMA); Wageningen, 19.vi.1951 (LUW). • N-Brabant: Bergen op Zoom, 2.ix.1962, P. J. Brakman (P). • Limburg: Heijthuizen, 16.iv.1950, C. Berger (P); Lomm, 25.viii.1968, P. Poot; Venlo, 23-25.vi.1981, B. Aukema.

544. **Cydnus aterrimus**

References. – Gravestein (1952a: cxviii); Cobben (1953: 177).

Published records. – • Limburg: Rijkel, 1.vii.1951, W. H. Gravestein, R. H. Cobben & P. J. Brakman (Gravestein 1952a).

Present status. – Not recorded since 1951.

547. **Odontoscelis lineola**

Synonym: *O. dorsalis* auct. nec Fabricius.

References. – Göllner-Scheiding (1986) showed that the West European specimens recorded as *Odontoscelis dorsalis* in fact belong to *O. lineola* Rambur, whereas the true *dorsalis* is a southern species, not occurring on the European continent.

548. **Phimodera humeralis**

References. – Snellen van Vollenhoven (1878a: 19-20, as *P. galgulina*); Reclaire (1932: 68; 1936: 245; 1943: 107).

Published records. – • Utrecht: Soest (Reclaire 1943). • N-Holland: Bergen aan Zee (Reclaire 1936). • Z-Holland: Scheveningen (Snellen van Vollenhoven 1878; Reclaire 1932).

Unpublished records. – • Gelderland: Apeldoorn, 1901, 1 ♀ (ZMA).

Present status. – Not recorded since 1941: Soest, 4.v, R. Tolman (ZMA).

549. **Eurygaster austriaca** (fig. 114)

References. – Snellen van Vollenhoven (1878a: 15, as *Tetyra hottentotta* F.); Fokker (1883: 240, as *E. hottentotta*); Reclaire (1932: 69; 1936: 245).

Published records. – • Gelderland: Velp (Fokker 1883). • Utrecht: Utrecht (Fokker 1883). • N-Holland: Overveen (Snellen van Vollenhoven 1878); Haarlem (Fokker 1883). • Z-Holland: Den Haag (Snellen van Vollenhoven 1878). • Zeeland: Walcheren, Zierikzee (Fokker 1883); Westenschouwen (Reclaire 1936). • Limburg: Venlo (Reclaire 1932); Schin op Geul (Reclaire 1936).

Present status. – Not recorded since 1935: Schin op Geul, 15.ix, A. Reclaire (ZMA).

552. **Graphosoma lineatum** (fig. 115)

References. – Snellen van Vollenhoven (1878a: 17, as *Trigonosoma nigrolineata* Rossi); Blöte (1950a); Cobben (1958: 15); Arnoud (1958).

Published records. – • N-Brabant: without locality (Snellen van Vollenhoven 1878). • Limburg: Amby, Bemelerberg, 1948, D. Piet; Maastricht, Cannerbos, 19.v.1950, 1 ♀, C. v. Heijningen (RML) (Blöte 1950a); Echt,17.vi.1951, 1 ♂, 1 ♀, R. Geurts (CB), Epen, begin vi.1953, V. Westhoff et al. (Cobben 1958); Terwinselen, 15.v.1948 & Heerlen, 28.vii.1951, Br. Arnoud & J. van Loo (Arnoud 1958).

Unpublished records. – • Limburg: Bemelen, 19.viii.1965, Br. Virgilius (P).

560. **Rubiconia intermedia**

References. – Reclaire (1932: 73; 196: 245); Cobben (1958a: 3-4).

Published records. – • Gelderland: Vierhouten (Reclaire 1932); ?Apeldoorn (Reclaire 1936); Ede (Cobben 1958a).

Unpublished records. – • Overijssel: Nijverdal, 5.x.1972, B. van Aartsen (ZMA). • Gelderland: Gortel, 4-6.x.1983, 16 & 23.x.1983, B. van Aartsen (ZMA, P); Ibid., 6.x & 11.xi.1984, B. van Aartsen (P); Hoog Soeren, 2.ix.1984, B. van Aartsen (ZMA, P); Ibid., 15.xi.1984, B. van Aartsen (P); Terlet, 29.vii, 15.viii & 28.ix.1984, B. van Aartsen (P).

561. **Holcostethus sphacelatus**

References. – Reclaire (1932: 74, as *Peribalus sphacelatus*).

Published records. – • Limburg: Zuid-Limburg, vi.1909, 1 ♂, D. L. Uyttenboogaart (ZMA) (Reclaire 1932).

Unpublished records. – • Limburg: Maastricht, St. Pietersberg, 26.ix.1983, 1 specimen, B. van Aartsen (ZMA). Furthermore one ♀ labelled 'Holland, v. Voll.' (RML).

562. **Holcostethus vernalis** (fig. 116)

References. – Reclaire (1932: 74, as *Peribalus vernalis*; 1936: 245; 1940: 105; 1943: 107; 1951: 3); Brakman (1952: 131); Cobben (1953: 173).

Published records. – • Z-Holland: Meijendel (Reclaire 1932). • Zeeland: Oostkapelle (Brakman 1952). • Limburg: Zuid-Limburg (Reclaire 1932); Heek (Reclaire 1936); Schin op Geul (Reclaire 1940); Bemelen (Reclaire 1943); Vlodrop (Reclaire 1951; Cobben 1953).

Unpublished records. – • N-Holland: Vogelenzang, 2.vi.1957, J. van der Wiel (ZMA). • Limburg: Bunde, ix.1936 (NMM); Vlodrop, 30.vi.1951, W. H. Gravestein (ZMA); Ibid., P. J. Brakman (P); Maastricht, St. Pietersberg, 1.vi.1951, A. A. W. Smit (ZMA); Ibid., 2.ix.1983, B. Aukema; Ibid., 26.ix.1983, 2.ix & 15.x.1984, 30.v, 11 & 31.ix.1985, B. van Aartsen; P. Vijlen, 23.v.1953, P. van der Wiel (ZMA); Terziet, 19.v.1966, P. Poot; Schaesberg, 22.vi.1987, G. R. Langohr (RML).

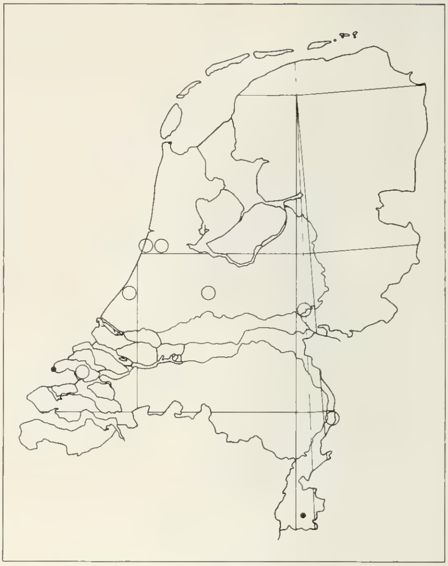


Fig. 114. *Eurygaster austriaca*.

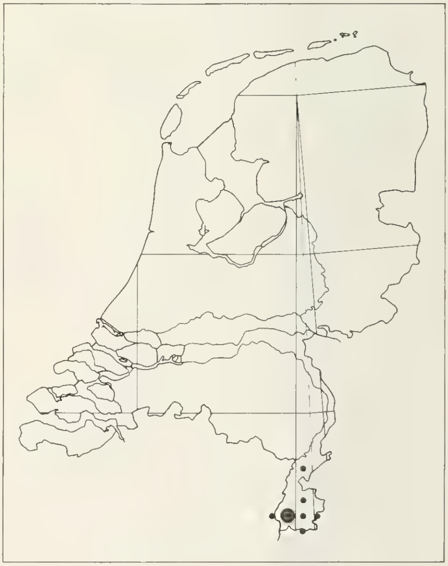


Fig. 115. *Graphosoma lineatum*.

Fig. 116. *Holcostethus vernalis.*

Fig. 117. *Palomena viridissima.*

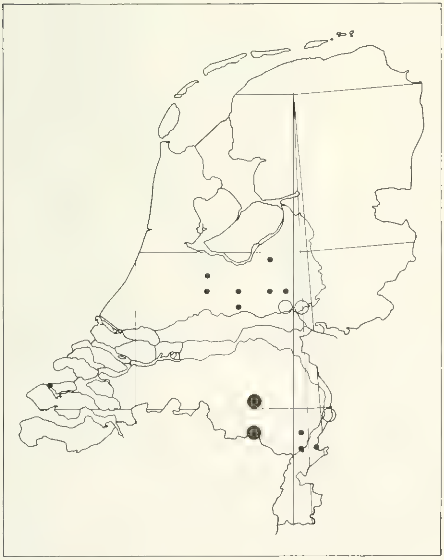


Fig. 118. *Chlorochroa pinicola.*

564. **Palomena viridissima** (fig. 117)

References. – Reclaire (1932: 74, as 'widespread throughout the country').

Present status. – Formerly widespread, but not recorded since 1952: Arnhem, 9.v. (RINA).

565-566. **Chlorochroa**

Synonym: *Pitedia* Reuter. (see Vinukorov et al. 1988).

566. **Chlorochroa pinicola** (fig. 118)

References. – Reclaire (1932: 75; 1940: 105; 1948: 39-40); Gravestein (1952a: cxv); Leston (1952: 84); Brakman (1960: 24); Kleinhout (1962: 39).

Published records. – • Gelderland: Oosterbeek, Arnhem (Reclaire 1932); Leuvenum (Reclaire 1940); Hoge Veluwe (Gravestein 1952; Leston, 1952; Kleinhout 1962). • Utrecht: Doorn, Maarn (Reclaire 1948). • N-Holland: Hilversum (Reclaire 1948). • Limburg: Venlo (Reclaire 1932); Melick-Herkenbosch, Beegden, Heel (Reclaire 1948). • Zeeland: Vrouwenpolder (Brakman 1960).

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Present status. – Recorded only twice since 1953.

567. Carpocoris fuscispinus

References. – Fokker (1883: 242, as *C. nigricornis*); Reclaire (1932: 75-76; 1940: 105; 1943: 107).

Published records. – ● Gelderland: Beekhuizen (Fokker 1883); Oosterbeek (Reclaire 1932). ● N-Brabant: Burgst (Reclaire 1932). ● Limburg: Schin op Geul (Reclaire 1940); Arcen (Reclaire 1943).

Unpublished records. – ● N-Brabant: Best, viii.1950, M. van den Boorn (P).

Present status. – Not recorded since 1950.

572. Eurydema dominulus (fig. 119)

References. – Reclaire (1932: 77; 1936: 246; 1940: 105; 1948: 40); Cobben (1953: 173).

Published records. – ● Overijssel: Denekamp, Ootmarsum (Reclaire 1932); Tubbergen (Reclaire 1948). ● N-Brabant: Breda (Reclaire 1932). ● Limburg: Meerssen, Schinnen, Spaubeek, Venlo, Valkenburg (Reclaire 1932); Maastricht (Reclaire 1936); Houthem (Reclaire 1936, 1940). Vlodrop (Cobben 1953).

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574. Eurydema ventralis

References. – Reclaire (1932: 76, as *E. ornatum* (Linnaeus)).

Published records. – ● N-Brabant: Surroundings of Breda, 1892, 1 ♂ & 1893, 1 ♀, Smits van Burgst (ZMA) (Reclaire 1932).

Present status. – Not recorded since 1893.

579. Jalla dumosa (fig. 120)

References. – Snellen van Vollenhoven (1878a: 25-26, as *Asopus dumosus*); Fokker (1883: 244-245); Reclaire (1943: 108; 1951: 4); Brakman (1960: 24).

Published records. – ● Gelderland: Beekhuizen (Reclaire 1943). ● Utrecht: Baarn (Reclaire 1951). ● N-Holland: Driebergen (Snellen van Vollenhoven 1878). ● Zeeland: Walcheren (Snellen van Vollenhoven 1878); Zierikzee (Fokker 1883); Hoek (Brakman 1960).

Unpublished records. – ● Friesland: Terschelling, 2.viii.1953 & 20r-23.vii.1954, W. H. Gravestein (ZMA); Ibid., 17.viii.1953, P. F. van Heerdt; Ibid., Lies, 20.viii.1957, W. H. Gravestein (ZMA); Ibid., Oosterend, 5-15.viii.1969, F. Meerman. ● Limburg: Montfort, 14.x.1951, 1 ♀ (CB).

Present status. – Recorded only once since 1957.

Concluding Remarks

Despite the relatively low collecting efforts through the years (see for instance figs. 72 and 73, the distribution maps of *Trigonotylus caelestialium* and *T. ruficornis*, two of the very common species) the total number of species (586) recorded from The Netherlands is high in comparison with data from other West European countries: Sweden

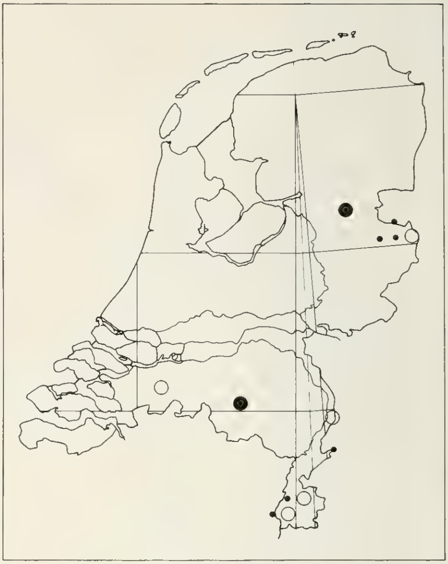

Fig. 119. *Eurydema dominulus*.

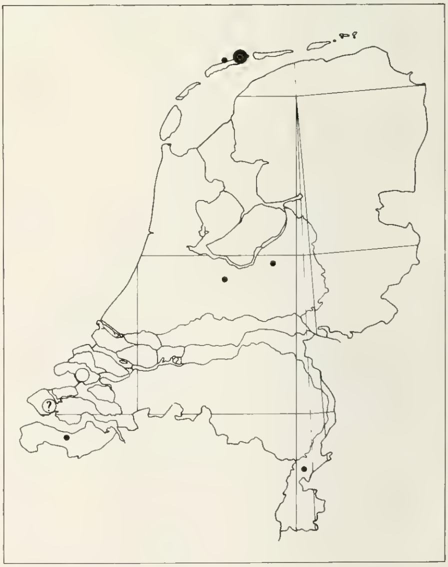

Fig. 120. *Jalla dumosa*.

Table 1. Total number of species per family and per region

	FAMILY	REGION												
		FR	GR	DR	OV	FL	GL	UT	NH	ZH	ZE	NB	LB	NL
1	Dipsocoridae	1	0	1	0	1	1	1	1	1	0	0	2	2
2	Nepidae	2	2	2	2	2	2	2	2	2	2	2	2	2
3	Corixidae	25	16	23	24	16	25	24	23	23	24	29	22	31
4	Naucoridae	1	1	1	1	1	1	2	1	2	1	2	1	2
5	Aphelocheiridae	0	0	0	1	0	0	0	0	0	0	1	1	1
6	Notonectidae	6	4	6	6	3	6	5	5	4	3	5	5	6
7	Pleidae	1	1	1	1	1	1	1	1	1	1	1	1	1
8	Mesoveliidae	1	0	1	1	0	1	1	1	1	1	1	1	1
9	Hebridae	2	2	2	2	2	2	2	2	2	2	2	2	2
10	Hydrometridae	1	2	2	2	1	2	2	2	2	1	2	2	2
11	Veliidae	2	1	2	3	2	4	3	3	3	2	4	5	5
12	Gerridae	5	5	7	8	4	9	7	8	7	6	9	9	9
13	Saldidae	15	8	9	12	8	12	10	14	10	10	13	13	20
14	Tingidae	10	3	12	7	3	23	19	21	13	10	16	23	30
15	Microphysidae	5	1	5	5	0	6	5	5	5	3	3	5	6
16	Miridae	124	53	136	147	66	196	156	174	132	124	144	200	231
17	Nabidae	10	6	10	10	5	12	11	11	10	13	12	13	13
18	Anthocoridae	15	7	20	16	11	27	26	27	17	17	17	30	32
19	Cimicidae	1	1	0	1	0	3	3	3	3	3	2	2	5
20	Reduviidae	3	1	6	4	1	8	5	5	4	4	6	6	9
21	Aradidae	3	0	4	2	1	5	3	3	3	2	4	4	6
22	Piesmatidae	1	0	2	1	0	1	1	3	2	2	2	2	3
23	Berytidae	4	0	3	2	0	6	4	5	5	7	5	8	9
24	Lygaeidae	44	19	42	38	22	61	53	59	45	47	54	70	83
25	Pyrrhocoridae	0	0	0	0	0	1	1	1	1	1	1	1	1
26	Stenocephalidae	0	0	0	0	0	1	0	1	0	0	1	2	2
27	Coreidae	4	1	2	3	1	7	5	6	6	7	7	9	11
28	Alydidae	0	0	0	0	0	1	1	1	0	0	1	1	1
29	Rhopalidae	4	1	4	4	2	9	7	4	3	5	7	8	9
30	Cydnidae	4	1	3	2	0	7	6	7	6	5	5	8	9
31	Thyreocoridae	1	0	0	0	0	1	1	1	1	0	1	1	1
32	Scutelleridae	1	0	0	0	0	6	5	6	5	4	3	4	6
33	Pentatomidae	14	5	13	16	4	23	21	20	15	11	23	27	29
34	Acanthosomatidae	5	3	5	5	3	6	6	5	3	3	6	6	6
	Number of species	315	144	324	326	160	476	399	431	337	321	391	496	586

(577), Norway (395), Denmark (492), North West Germany (585) and the British Isles (532) (Andersen & Gaun 1974; Coulianos & Ossiannilsson 1976; Southwood & Leston 1964; Wagner & Weber 1967).

From table 1 it is also clear that the collecting effort has been different for the various regions. Limburg, Gelderland and Noord-Holland for instance are far ahead concerning number of species collected, whereas Groningen lays back considerably. The number of species collected in the recently reclamed polders of Flevoland (Oostelijk and Zuidelijk Flevoland ran dry in 1957 and 1968 respectively) is still relatively low (151), but rapidly increasing. The number of species collected in Friesland (314) is largely due to the high collection efforts on the West Frisian Islands of Vlieland, Terschelling, Ameland, Terschelling, and Schiermonnikoog, where 258 species were collected. From the Frisian mainland thusfar only 197 species were recorded.

The list contains 48 species which were not recorded since 1960. Of these *Galeatus maculatus*, *Acetropis gimmerthalii*, *Phymata crassipes*, *Spilostethus saxatilis*, *Geocoris ater*, *Arenocoris waltlii* and *Eurydema ventralis* were collected only before 1900. The following 18 species were collected since 1960 only: *Sigara iactans*, *S. longipalis*, *Deraeocoris flavilinea*, *Tytthus geminus*, *Brachyarthrum limitatum*, *Psallus assimilis*, *P. pseudoplatani*, *Criocoris* *sulcicornis*, *Reuteria marqueti*, *Orthotylus fuscescens*, *Capsodes sulcatus*, *Elatophilus nigricornis*, *Anthocoris amplicollis*, *Scoloposcelis pulchella*, *Aradus signaticornis*, *Orsillus depressus*, *Kleidocerys privignis* and *K. truncatulus ericae*.

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ADDENDUM

After finishing the manuscript, two additional species were recorded from The Netherlands:

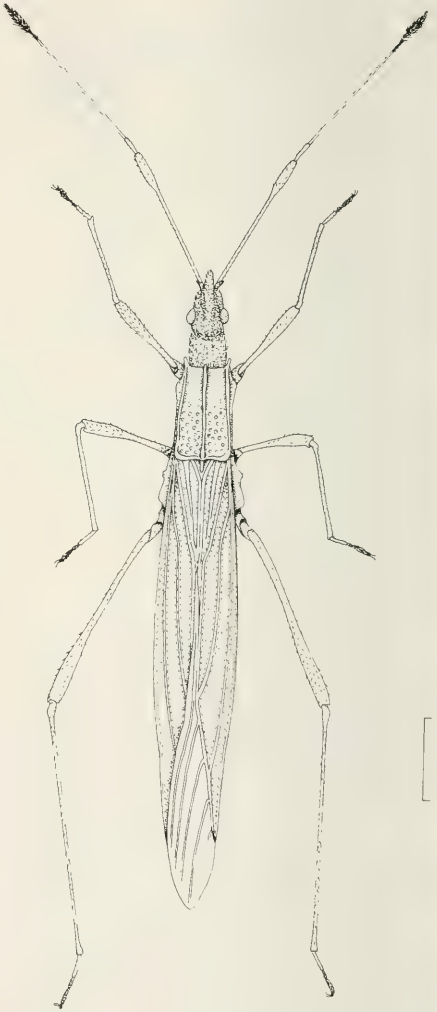
218a. **Psilophorus pusillus** Reuter, f. nov. spec.

Records. – • N-Holland: Hilversum, 8.ix.1946, W. H. Gravestein (ZMA, CB). • N-Brabant: Deurne, Liessel, 9.ix.1987, 1 ♀, B. Aukema.

429a. **Melanocoryphus albomaculatus** Goeze, f. nov. spec.

Records. – • Limburg: Maastricht, 5.iii.1989, 1 ♂, P. Poot.

Both records will be published in more detail elsewhere.



420. *Berytinus clavipes*. Scale: 1 mm.

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128. *Deraeocoris flavilinea*, larva V. Scale: 1 mm.

INDEX

All insect taxa are listed, synonyms in italics. Species numbers are given in brackets.

TWO NEW MORDELLIDAE (COLEOPTERA) FROM KASHMIR AND SUMATRA

by

R. BATTEN

ABSTRACT

Batten, R., 1989. Two new Mordellidae (Coleoptera) from Kashmir and Sumatra. — Tijdschrift voor Entomologie, 132 (1): 105-107, figs. 1-8. [ISSN 0040-7496]. Published 3 July 1989.

Two species, *Mordellistena leveyi* from Kashmir and *Calyce sumatrensis* from North Sumatra, are described as new to science.

Key words. — Mordellidae; taxonomy; oriental region.

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INTRODUCTION

Thanks to the kindness of Mr. B. Levey (London) and Mr. K. Wellschmied (München), who both sent me Mordellidae for identification, I am able to describe two species as new to science.

The following abbreviations are used: l/w – length-width ratio; py/hy – pygidium/hypopygium length ratio; w/l – width/length ratio; RMNH – Rijksmuseum van Natuurlijke Historie, Leiden.

Formula for the ridges: 3-4.3.2.2. means: hind tibia (without apical ridge) 3-4, first segment of hind tarsus 3, second and third segment two ridges each.

Mordellistena leveyi spec. nov.

(figs. 1-5)

Holotype male: Kashmir, Srinigar, 26 June 1984, leg. B. Levey (in RMNH).

Paratypes: 5 males and 4 females, same data as holotype (one female, labelled allotype, in RMNH, other paratypes in collection Levey and Batten).

Description. – Belongs to *Mordellistena* s.s., having each of the first four segments of the antenna narrower and shorter than segment 5. It belongs to the *gemellata*-group, characterised by two short lateral ridges running more or less parallel to the apical end of the hind tibia (apart from the apical ridge) (Batten 1980, Ermisch 1969).

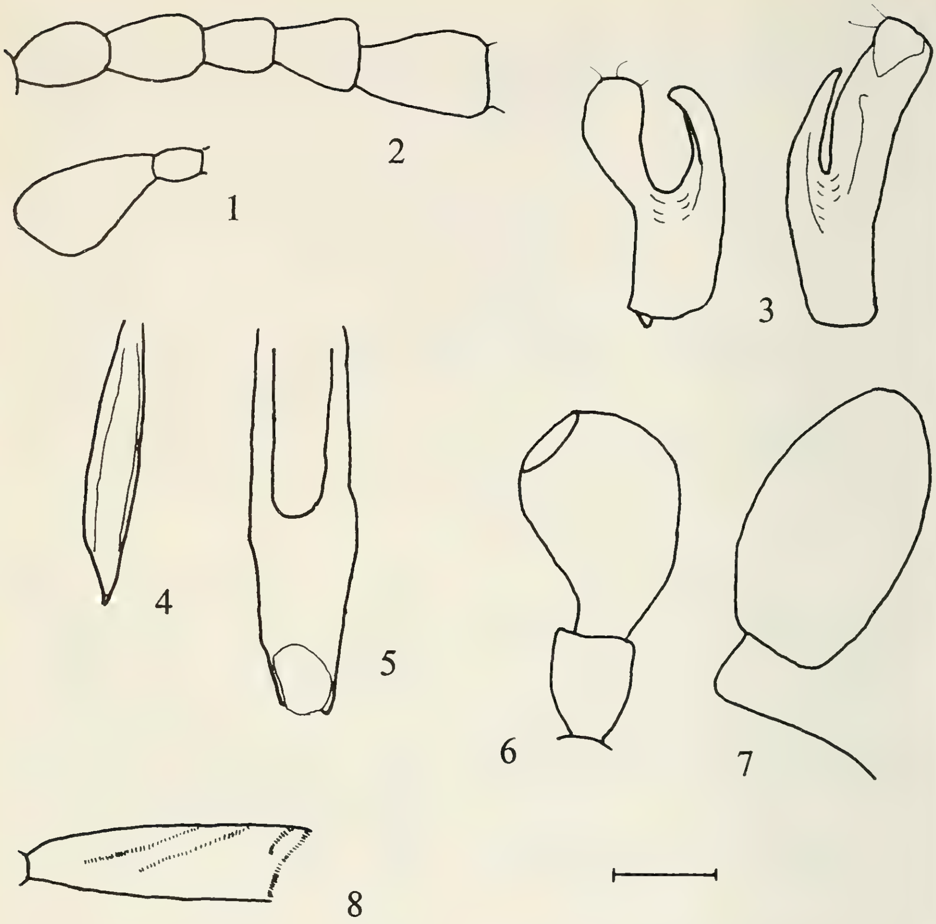
Dimensions in millimeters of holotype and allotype respectively: Length without pygidium 4.1 (4.5), length of elytra 2.6 (2.9), width of elytra together 1.0 (1.2), pygidium 1.6 (1.1) and hypopygium 0.5 (0.3).

General shape elongate, sides convexly attenuated posteriorly. Integument black. Pubescence black with a reddish hue.

Head w/l 1.5. Finely punctate, hind margin slightly convex, maxillary palp of male (fig. 1); the same of female with anterior segment broadly scalene, innerside rounded in middle. Eye finely granulated, hairy, no temporal margin. Antenna length ratio segment 1-5: 10.10.7.10.11 (fig. 2); segment 5-10 l/w in male 1.7, in female 1.1.

Pronotum w/l 1.3, broadest in front of base, anterior lobe protruding, basal lobe prominent, lateral border in dorsal view convex, in lateral view moderately so, basal angles oblique with a rounded edge; punctures shallowly impressed. Scutellum triangular with a rounded point.

Elytra l/w in male 2.6, in female 2.4; sides slightly convex, attenuated from shoulders to apex; apices separately rounded, punctures slightly asperate, pubescence covering integument. Pygidium slender and conical, py/hy in male 3.2, in female 3.3. Legs in male with fore tibia almost straight, without a fringe of hairs; apex of penultimate tarsal segment of fore and middle legs straight, middle tibia shorter than tarsus, hind tibia with two ridges parallel to the apical one. Ridges 2.2.1.0. Spurs yellow, length ratio 1.3; length ratio of tarsal segments: anterior 21.13.11.10.13, middle 35.22.16.10.15, posterior 55.40.20.15. Parameres, apex of penis and phallobase, see figs. 3-5.



Figs. 1-5. *Mordellistena leveyi* spec. nov. – 1, maxillary palp; 2, antennal segments 1-5; 3, parameters; 4, apex of penis; 5, apex of phallobase. Figs. 6-8. *Calyce sumatrensis* spec. nov. – 6, maxillary palp; 7, left temporal margin and eye in lateral view; 8, hind tibia with ridges. Scale bar. Figs. 1-7: 0.1 mm, fig. 8: 0.25 mm.

Discussion. – This new species is the second entirely black species in the *Mordellistena gemellata*-group with two yellow or yellowish red spurs on the hind tibia. *M. lindbergi* Ermisch (1963) differs from *M. leveyi* by the antenna with segments 5-10 almost square in the male (square in female); by a broader pygidium (py/hy 2).

Etymology. – Named after its collector, Mr. B. Levey.

Calyce sumatrensis spec. nov.
(figs. 6-8)

Holotype female: North Sumatra, Dolok Merangir, December 1969, 1050 m, leg. E. Diehl (in RMNH, ex coll. K. Wellschmied).

Description. – Dimensions of holotype: Length without pygidium 4.1 mm, length of elytra 2.9 mm, width of elytra together 1.2 mm, pygidium 0.7 mm, hypopygium 0.5 mm.

General shape broad. Integument of elytra yellowish brown, darkening posteriorly; head with mouth parts, palps, antennal segments 1-3 and legs yellowish red; pronotum, metasternum, metacoxa and antennal segments 4-11 dark brown. Pubescence yellow.

Head w/l 1.5, finely punctate, hind margin convex, maxillary palp club-shaped, apex cup-shaped (fig. 6). Eye finely granulated without hairs, temporal margin very broad, anteriorly ending abruptly (fig. 7). Antenna length ratio of segments 1-5: 10.10.10.11.9, segment 5-10 serrate l/w 1.25, segment 11 elongate to oval.

Pronotum w/l 1.8, broadest just before base, anterior lobe protruding, basal lobe slightly prominent, lateral border convex in dorsal view, abruptly narrowing apically, in lateral view slightly convex (almost straight), basal angles oblique with rounded edge, punctures shallowly impressed. Scutellum triangular with a rounded tip.

Elytra l/w 2.4, sides almost straight, slightly attenuated in the posterior quarter, both apices rounded, punctures slightly asperate; pubescence thin, integument still visible. Pygidium abruptly conical from middle to apex, py/hy 1.4. Legs straight, apex of penultimate tarsal segment of fore and middle legs deeply excised, middle tibia shorter than tarsus, hind tibia with two longitudinal ridges parallel to the tibia (fig. 8); ridges 2.2.1.0; tibia with two yellow spurs almost equal in length (ca. 0.3 mm). Length ratio of tarsal segments: anterior 20.10.7.5.11, middle absent, posterior 50.23.14.20.

Discussion. – This new species has a very broad temporal margin in a right angle, abruptly ending at the eye, which is a generic character of *Calyce*. According to Ermisch (1949-1950) the genus *Calyce* is found in the tropical and subtropical regions of America and Africa. *C. sumatrensis* is the first species of this genus from Asia. It can immediately be distinguished by the presence of two instead of five or more ridges on the hind tibia (cf. Ermisch 1943).

ACKNOWLEDGEMENTS

I am very grateful to Mr. B. Levey and Mr. K. Wellschmied for making this material available for study, to Mr. B. Brugge (Zoölogisch Museum Amsterdam) for material from Java and Sumatra and to Mr. J. Krikken for valuable advise.

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EUMASTACIDAE (ORTHOPTERA) FROM THE PROJECT WALLACE EXPEDITION TO SULAWESI (INDONESIA)

by

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ABSTRACT

Butlin, R. K., R. E. Blackith & R. M. Blackith, 1989. Eumastacidae (Orthoptera) from the Project Wallace Expedition to Sulawesi (Indonesia). — Tijdschrift voor Entomologie 132: 109—113, figs. 1-6, table 1. [ISSN 0040-7496]. Published 3 July 1989.

All six eumastacid species found in or near the Dumoga-Bone National Park (North Sulawesi) belong to the subfamily Mnesicleinae. Four species, in the genera *Pseudomnesicles* Descamps, *Karnydia* C. Bolivar, and *Samariella* Descamps are new to science. The male of *Karnydia celebesica* Ramme, hitherto known only from the female, is described. All the species are endemic to Sulawesi, although *Samariella* is represented in the Philippines.

Key words. — Mnesicleinae; taxonomy; karyotype; ecology.

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INTRODUCTION

Wallace (1869) comments on the general paucity of animal species on Sulawesi, and despite intensive collecting, few individual eumastacids were found. The finding of nymphs of *Karnydia gracilipes* Ramme feeding on *Selaginella* ferns and of adult *Pseudomnesicles* species inhabiting the Gymnosperm *Gnetum* L. was recorded by Blackith (1987). Ramme (1940) described *K. gracilipes* from N. Sulawesi (Minahassa) and C. Bolivar (1930) described *K. celebesica* from the same region. Three species of *Pseudomnesicles* were previously described from Sulawesi; *P. roseosignatus* (Brunner) from Toli-Toli in the north of the island but some 350 km west of the Dumoga-Bone National Park within which Project Wallace operated. *P. plagiator* (Ramme) and *P. milleri* (Ramme) were both described from the south of the island. All three form, as Ramme (1940) notes, a close-knit group of species, and the similarity of their male genitalia as figured by Descamps (1974a) confirms this view; the terminalia are the means by which most eumastacid species can be distinguished.

MATERIALS AND METHODS

Nymphs and some adults were collected by sweeping vegetation near the ground. Eumastacids in rain forest appear to be mainly canopy dwellers and collecting them involved reaching a fallen tree within hours of the crash or picking up specimens brought down from the canopy by fogging with an insect-paralysing solution, organised by a team from the British Museum (Natural History). Both methods yielded meagre numbers of eumastacids. One eumastacid was taken in a Malaise trap run by the same team.

Abbreviation. — BMNH = British Museum (Natural History).

RESULTS

Mnesicleinae

Pseudomnesicles rhodopeplus sp. n.
(fig. 1)

Holotype ♂: Indonesia, Sulawesi Utara, Minahassa, Toraut Forest, 13.ii.1985 (BMNH fogging team) (BMNH). Paratypes 1 ♂: same data, Malaise trap on R. Toraut bank (BMNH fogging team) (Museum Bogoriensis). 2 ♀: same data, swept on forest floor. (Blackith) (National Museum of Ireland; BMNH).

Virtually identical with *P. roseosignatus* Brunner, except for the phallic complex, whose dorsal view is shown in fig. 1 (cf. figs 47, 49 and 54 of Descamps (1974a) for the phallic complexes of the other described species in this genus). The shaft of the penis valves of *P. rhodopeplus* is at least 4 times as long as in other species.

Dimensions. — Elytron length 11.0 mm; pronotum length 2.9 mm; hind femoral length 10.9 mm, width 2.8 mm.

Females almost indistinguishable from those of *P. roseosignatus* figured by Ramme (1940) except that the lateral processes of the trifid subgenital plate extend as far back as the median one, whereas in *P. roseosignatus* they are shorter.

Dimensions of female — elytron length 13.7 mm: pronotum length 4.1 mm; hind femoral length 13.8 mm, width 3.4 mm.

A putative food-plant for this species (*Gnetum* sp.) is noted by Blackith (1987). The name *rhodopeplus* signifies bearing a roseate shroud. The red flush at the base of the elytra, notable in this genus, is much less marked on females in life.

Samariella aulaeiadventa sp. n.

(figs. 2-3)

Holotype ♂: Indonesia, Sulawesi Utara, Toraut Forest, 13.ii.1985 (BMNH fogging team) (BMNH).

Head as in fig. 2, distal 5 antennal segments compressed, pubescent. Scape produced into boss forwards, with clear patch at tip. Face rugged. Elytra reaching genicular region of hind legs. Outer dorsal margin of hind tibiae with ca. 18 strongly unequal teeth; inner margin with ca. 18 more regular teeth. These margins fuse into a wide (ca. 1 mm) tooth subequal to longest tibial teeth. Terminalia as in fig. 3; phallic complex relatively unsclerotised, penis carried at right angles to body as in *S. bakeri* Descamps (cf. Descamps 1974b, fig. 68).

Dimensions. — Elytron length 9 mm; pronotal length 2 mm; hind femoral length 8 mm.

The name *aulaeiadventa* describes one who descends from the canopy, originally of a Roman theatre. The two species previously described in this genus are both endemic to the Philippines. The only specimen of *S. bakeri* known is a male whose phallic complex differs from that of *S. aulaeiadventa*. The other species (*viduata* Descamps) was described from a female. The vertex in *aulaeiadventa* sets it apart from the other two known species.

Karnydia celebesica C. Bolivar, 1930

(fig. 4)

The genus *Karnydia*, of which *K. celebesica* is the type species, is endemic to Sulawesi. It was described from a female, and since specific distinctions depend mainly on the male terminalia we include a description of the male.

Material studied. — 1 ♂: Indonesia, Sulawesi Utara. Gunung Muajat, 29.vii.1985 (BMNH fogging team) (BMNH).

Fastigium truncated distally as in Bolivar's description of the female. Antennae set well below midpoint of eyes, almost as low as unpaired ocellus (i.e. lower than in Ramme's (Ramme 1940) figures for *K. gracilis* Ramme). Antennal organ prominent conical, projecting distally from 10th of 12 segments. Body fulvous, abdominal tergites 1—3 and 8—10, scape, underside of fastigium and genae in subocular region and teeth and dorsal carena of hind femora fuscous. Fragae on hind femora weak. Hind tibiae with 19 teeth (longest 0.15 mm) on outer carena and 15 on inner (longest 0.7 mm). Hind femora with 5 teeth on mid-dorsal carena. Fore- and hind-tibiae clad with at least 50 golden setae. Male terminalia as in fig. 4; subgenital plate and its lateral lobes, seen from rear, enclosing roughly equilateral triangle.

Dimensions. — Pronotum length 1.8 mm; hind femoral length 10.5 mm, width 2.0 mm. Because no material was taken *in copula* we cannot be certain that this male is *K. celebesica*, and even if a pair were obtained identification of the female might be ambiguous.

Karnydia monki sp. n.

(fig. 5)

Holotype ♂: Indonesia, Sulawesi Utara, Gunung Poniki "Ice Station Zebra", 16.x.1985, (K. Monk) (BMNH).

Very similar to *K. celebesica* except for the genitalia, the more compressed and raised dorsal carena of the abdominal tergites, and the red flush on the postero-lateral angle of the episternum, the proximal half of the fore- and mid-femora, and on the distal parts of the hind legs. First two flagellar segments pale, remainder fuscous. Fragae on outer flanks of hind femora more strongly developed than in *K. celebesica*, dorsal carena of hind femora with 7 teeth. Hind tibiae have 19 teeth on outer carenae (longest 0.2 mm) and 5 on inner (longest 0.6 mm).

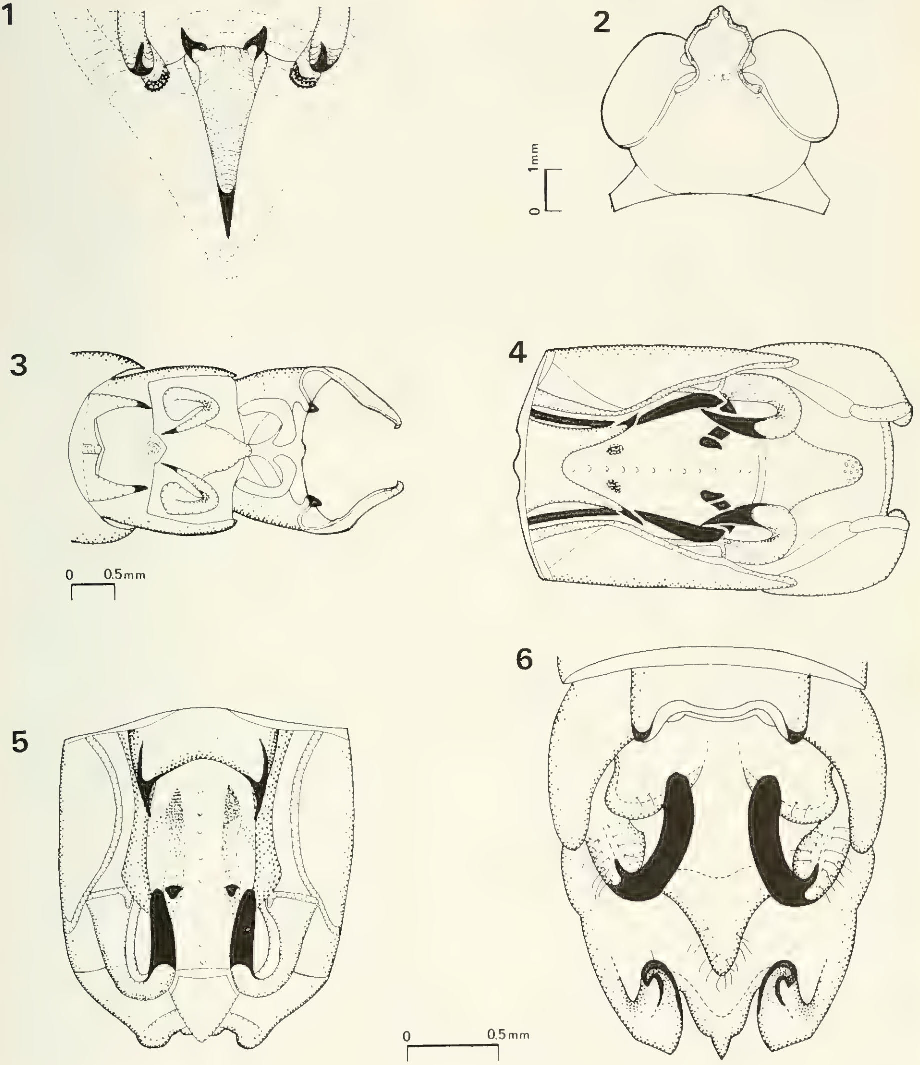
Terminalia as in fig. 5; the subgenital plate, seen from the rear, forms a V-shaped slot or inverted triangle quite distinct from that of *K. celebesica*.

Dimensions. — Pronotum length 2.3 mm; hind femoral length 11.5 mm, width 1.9 mm.

Karnydia laticlava sp. n.

(fig. 6)

Holotype ♂: Indonesia, Sulawesi Utara, Gunung Mua-



Figs. 1—6. — 1. *Pseudomnesicles rhodopeplus* sp.n. Holotype ♂, dorsal view of phallic complex; 2. *Samariella aulaeiadventa* sp. n. Holotype ♂, dorsal view of head; 3. *Samariella aulaeiadventa* sp. n. Holotype ♂, dorsal view of terminalia; 4. *Karnydia celebesica* C. Bolivar. Dorsal view of ♂ terminalia; 5. *Karnydia monki* sp. n. Holotype ♂. Dorsal view of terminalia; 6. *Karnydia laticlava* sp. n. Holotype ♂, dorsal view of terminalia.

Lowest scale bar for figs. 1, 4, 5 and 6.

jat, 4.viii.1985. (R. K. Butlin) (BMNH). Paratype ♀: Indonesia, Sulawesi Utara, Edwards' Camp, 4.viii.1985 (R. K. Butlin) (National Museum of Ireland).

Similar to *K. celebesica*. Antennal organ exceptionally thick and prominent. Flagellar segments dark brown, scape, pedicel, and proximal fifth of first segment white. Integument translucent, except for opaque yellow discs underlying basiconic sensilla. Hind tibiae with 16 teeth (longest 0.8 mm) on inner carena, 17 teeth (longest 0.1 mm) on outer carena. Terminalia as in fig. 6, subgenital plate trifid with 2 hooked lateral process and arrow-head median process.

Dimensions. — Pronotum length 2.4 mm; hind femoral length 10.2 mm, width 2.3 mm.

Female. As for male, but mouthparts, cerci, distal parts of ovipositor valves, subgenital plate, and legs livid green. Lateral carenae of pronotum pink, underlined with fuscous. Hind femora with 11 teeth on dorsal carena, hind tibiae with 19 teeth (longest 0.8 mm) on inner carena, and 19 teeth (longest 0.2 mm) on outer carena.

Dimensions. — Pronotum length 2.8 mm; hind femoral length 14.6 mm, width 2.3 mm.

The name *laticlava* describes the broad, distally spatulate, cerci of the male.

Karnydia gracilipes Ramme, 1940

Nymphs and adults were collected at two localities; Gunung Mogogonipa (altitude 1000 m) and Gunung Ambang (altitude 1200 m). Both mountains have abundant ground cover of mosses and ferns. The species was taken from several ferns including *Cyathea spp.* (Cyathaceae), *Dennstaedtia* sp. (Dennstaedtiaceae), *Nephrolepis* sp. (Nephrolepidaceae) and a species of *Athyrium* or *Diplazium* (Athyriaceae). It was also taken from an angiosperm *Elatostema* sp. (Urticaceae). The role of ferns in the nutrition of tropical grasshoppers has been documented by Rowell et al. (1983). Palatability tests of these tropical plants were conducted in the laboratory at Base Camp using 5 nymphs of *K. gracilipes* for each test, which lasted for 24 hr.

The results are shown in table 1. Nymphs of *K. gracilipes* evidently prefer *Elatostema* but also eat several ferns, though not *Dennstaedtia*. This result accords with feeding tests by Blackith and Blackith (1966) on Australian eumastacid grasshoppers (Morabinae). These are generalist feeders but consume several ferns, as do *K. gracilipes*. Rowell et al. tested the palatability of ferns of the genera *Dennstaedtia, Cyathea* and *Diplazium* for the Costa Rican eumastacid *Homeomastax dentata* (Saussure). Interpretation of their results is complicated by strong specific differences within plant genera. *Diplazium expansum* being highly palatable whereas *D. aff. herbaceum* was among the least palatable. *Cyathea multiflora* and *Dennstaedtia obtusifolia* are also relatively unpalatable. These authors note that even if the grasshoppers prefer a diet of a single plant species, the structure of rain forests makes general feeding almost obligatory.

CARYOTYPIC STUDIES

Although not all the species taken could be examined, testis squash preparations of two of them were made. *K. gracilipes* proved to have a diploid number of 21 ($2n = 20 + X$) which is common in the Eumastacidae. There are ten pairs of acrocentric chromosomes graded in size with a medium sized X. *K. laticlava*, however, proved to have $2n = 19$ ($18 + X$) including a very large autosomal pair, probably by fusion of two of the larger autosomes of the closely related *gracilipes*. As is common in other eumastacid subfamilies, speciation in these Mnesicleinae seems to be accompanied by chromosomal rearrangements (White 1977).

DISCUSSION

Our findings support the view that only one subfamily of the Eumastacidae has reached Su-

Table 1. Feeding preferences of *Karnydia gracilipes*

Plant species	Locality Gunung Mogogonipa Palatability*	 Gunung Ambang Palatability
Elatostema sp.	16	20
Cyathea sp. 1	8	2
Cyathea sp. 2	0	3
Dennstaedtia sp.	0	0
Nephrolepis sp.	9	6

*) Palatability is defined as the percentage of the available leaf consumed by the eumastacids, out of approximately 20 sq. cm offered to batches of 5 nymphs.

lawesi. Speciation in this subfamily, the Mnesicleinae, follows the pattern for the family of close-knit genera, species within genera differing little except in the male genitalia and, where investigated, in the caryotype. As all 9 species known from Sulawesi are endemic, and only one of the 3 genera has representatives elsewhere (on the nearby Philippines) little biogeographic information can be gleaned from Sulawesian eumastacids.

Altough collecting from rain forest canopies is usually difficult, the small number of adults of species other than *K. gracilipes* collected by members of the expedition is striking, amounting to roughly one specimen per person-month of collecting, even when aided by fogging equipment rarely available to collectors. As collecting was spread over most of 1985, seasonal effects are unlikely to be responsible. We are forced to the conclusion that eumastacids occur at very low densities in these rain forests, possibly partly because the great diversity of host plants may mean that acceptable hosts are themselves thinly dispersed.

It is hardly surprising that, under conditions favouring sibling mating for lack of much opportunity to meet unrelated individuals, speciation in this group involves chromosomal rearrangements. Sibling mating has been suggested (White 1977) as a way of allowing such rearrangements to reach homozygosity despite the often demonstrably unfavourable effects on the heterozygote. Virtually all eumastacid species whose caryotype has been investigated differ cytogenetically from one another.

With the discovery of two further species of *Karnydia* a sequence of changes in the structure of the male genitalia becomes apparent. This sequence runs through *celebesica — monki — laticlava — gracilipes* such that the postero-lateral processes of the 9th tergite are reduced, tergite 10 becomes less sclerotised, and the postero-lateral processes of the subgenital plate become elongated and contorted. The terminalia as a whole become broader and the cerci distally more strongly sclerotised and spatulate from *celebesica* to *laticlava* although *gracilipes* has cerci comparable with those of *celebesica*. So far as we can judge, the morphological contrast between *celebesica* and *laticlava* corresponds to the fusion of two autosomes in the caryotype.

ACKNOWLEDGEMENTS

We are grateful to all those concerned with Project Wallace, particularly the support teams, and to Dr. K. Monk and members of the British Museum (Natural History) fogging team for permission to examine their hard-won material. RKB acknowledges with gratitude facilities and advice provided by Prof. G. Hewitt and financial support from the Percy Sladen Memorial Fund. This paper is based on material collected whilst the authors were participants in project Wallace, sponsored by the Royal Entomological Society of London and the Indonesian Institute of Science (Results of Project Wallace no. 24).

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BOOK ANNOUNCEMENTS AND REVIEWS

Williams, D. J. & G. W. Watson, 1988. The scale insects of the tropical South Pacific region. Part 1. The armoured scale insects (Diaspididae). — CAB International Institute of Entomology, Wallingford: 1—290, figs. [ISBN 0 85198 608 0 — Price including postage in UK £ 26.95, in USA US $ 57.00, elsewhere £ 29.95]

All armoured scales are sap-sucking insects and many cause considerably damage to crops, damaging fruit and reducing yields. Scale insects worldwide number about 6,000 species, of which 2,000 are armoured scales.

This taxonomic account of the armoured scales (Diaspididae) of the tropical South Pacific region is the first of three parts planned for all the scale insects (Coccoidea) of the area. Keys to 37 genera and 124 species, including 38 new species, are provided, accompanied by detailed descriptions and illustrations. The main purpose of the work is to provide agricultural staff who are concerned with pest control and quarantine inspection in the South Pacific area with a reliable means of identification of species. Non-specialists can also use it to identify and study this destructive group. The area covered is Melanesia and Polynesia, from Irian Jaya in the west to Easter Island in the east, but Kiribati in Micronesia is also included. The work provides a record of the armoured scales of each territory and of the islands within each territory; knowledge essential for effective quarantine inspection and for export of plant produce. Records are based on material examined from the major world collections of Pacific scale insects and on the economic literature. The work covers all the important pest species of the area including *Aspidiotus destructor* Signoret, *Parlatoria cinerea* Hadden, *P. pergandii* Comstock and *Unaspis citri* (Comstock), and concludes with a comprehensive list of the host-plants and their associated armoured scales.
[From information of the publisher]

Williams, D. J. & G. W. Watson, 1988. The scale insects of the tropical South Pacific. Part 2. The Mealybugs (Pseudococcidae). — CAB International Institute of Entomology, Wallingford: 1—261, figs. 1—95. [ISBN 0 85198 625 0 — Price including postage in UK £ 22.95. in USA US $ 47.95, elsewhere £ 25.25].

The second of three parts planned for the scale insects (Coccoidae) of the tropical South Pacific. Keys to 37 genera and 92 species, including three new genera and 28 new species, are provided with detailed descriptions and illustrations. The work is designed to provide agricultural staff with reliable means of identification of species and to encourage non-specialists to identify the group.
[From information of the publisher].

Brown, R. G. & I. D. Hodkinson, 1988. Taxonomy and ecology of the jumping plant-lice of Panama (Homoptera: Psylloidea). — Entomonograph 9: 1—304, figs. 1—150, tables 1—3. [Published by E. J. Brill, Leiden etc.; **ISSN** 0106—2808; **ISBN** 90 04 08893 8 — Price 136.00 Dutch guilders = appr. US $ 68.00].

The major aim of this study was to provide accurate descriptions of all Panamian psyllid species together with keys for their identification. The Panamian fauna contains a majority of the known Neotropical genera and this revision should therefore provide a more solid foundation for future taxonomic and biological work on the South American fauna. A parallel set of aims was to examine the evolution, host plant relationships, zoogeography and seasonality of the Panamian psyllids.
[From the autors' introduction].

A REPORT ON A COLLECTION OF ODONATA FROM NORTH SULAWESI, INDONESIA

by

R. R. ASKEW, G. G. CLELAND, D. A. L. DAVIES & T. W. HARMAN

Abstract

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Odonata collected in the first quarter of 1985 by two participants in Project Wallace, the Royal Entomological Society of London Expedition to Dumoga-Bone in North Sulawesi, are listed with observations, and distribution of the species is discussed. The dragonfly fauna is principally Oriental in affinities, but primary habitats harbour a high incidence of endemic taxa.

Key words. – Odonata; Sulawesi; Indonesia; Distribution.

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Introduction

As a prelude to his description of *Celebophlebia*, Lieftinck (1936) drew attention to the fact that up to that time no general account of the Odonata of Celebes (now Sulawesi) had been attempted. Although he clearly stated that his intention was to produce such a work, this task remained incomplete at his death in 1985. An opportunity to investigate the little-known odonate fauna of the northern peninsula of Sulawesi (Sulawesi Utara) was afforded by Project Wallace, the Royal Entomological Society of London — Indonesian Institute of Sciences expedition in 1985. Two of us (Askew, Harman) participated in Project Wallace in the early months of 1985 and the material collected has been examined by Cleland and Davies and is reported upon here. Further recent collections, Lieftinck's detailed notes and the bulk of the historical material from Sulawesi are at Leiden Museum where they are being worked on by Dr Jan van Tol (1987a, 1987b). Additional relevant material is in the Hope Collections (Oxford) and the British Museum of Natural History (London) and this, together with descriptions of new taxa collected on Project Wallace, will be dealt with in future publications.

The expedition's base camp was situated in the Dumoga-Bone National Park at 0°33′52″N, 123°54′21″E, some 200 m south of the River (Sungei) Toraut. Most observations were made within 2 km of base camp, a lowland area (alt. *c* 200 m) that included a good diversity of dragonfly biotopes in both the lowland primary rainforest to the north of the Toraut and in the land cleared for agricultural purposes to the south. Records from Sulawesi Utara from the region of Menado, Labuanagi (a village on the north coast), Danau Mooat east of Kotamobagu and Kolintang about 6 km north of Malibagu on the south coast are also included, as are a few from the islands of Sangir Besar (Sangihe) (visited by Askew) and Ternate and Bacan (Batjan) (visited by Harman), and from Maros in south west Sulawesi north of Makassar (material in Davies' collection). Figure 1 illustrates the location of collecting sites.

Annotated list of species

Taxa from the Toraut base camp area are numbered. Details of the three pond sites in this area are as follows:

Riverine ponds. — Temporary rain pools at the edge of the forest on the north bank of S. Toraut.

Base camp pond. — A small, clean pond of recent formation about 5 square metres in area and 40 cm maximum depth almost surrounded by

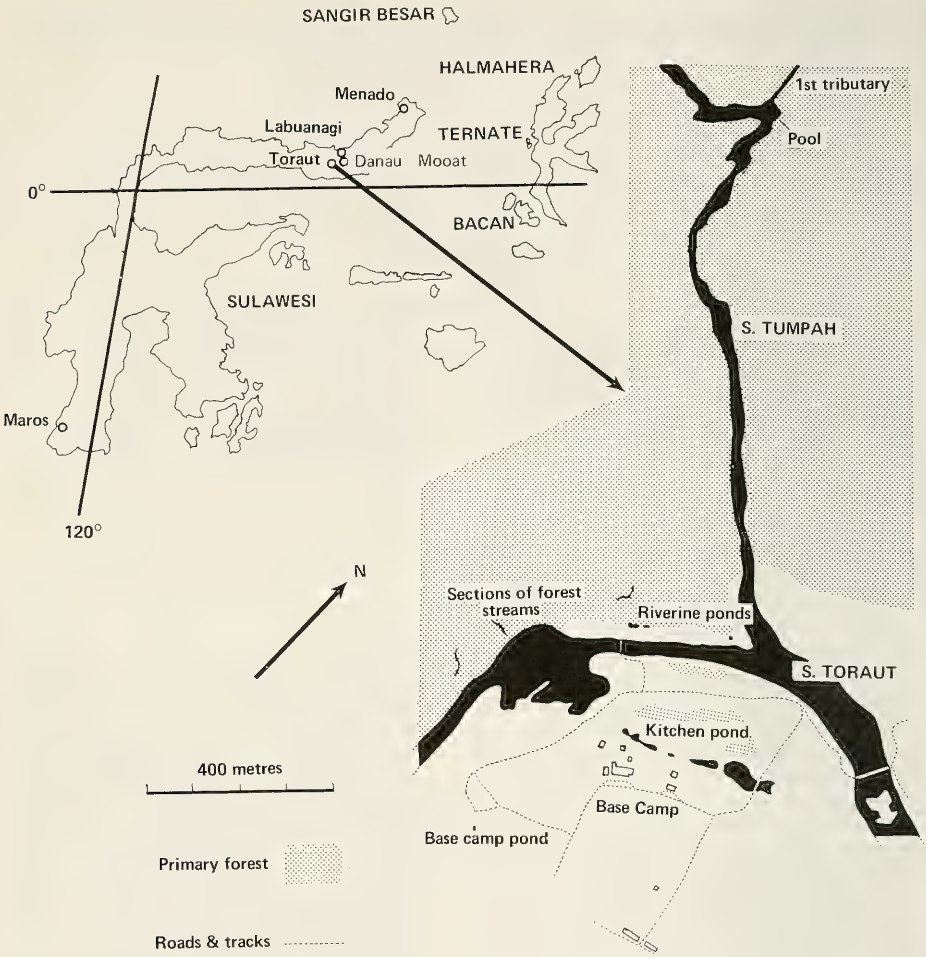

Fig. 1. The principal collecting sites in Sulawesi and Halmahera, and a sketch of the Project Wallace base camp area on Sungei Toraut.

bushy secondary vegetation but with few aquatic or emergent plants.

Kitchen pond. — One of a series of pools in a linear, marshy depression with a slow throughflow. Somewhat polluted by domestic effluent but supported fish.

CALOPTERYGIDAE

Neurobasis kaupi kaupi Brauer (1)

Toraut, S. Tumpah and first tributary. Regularly observed through February and March on this fast-flowing river, a major tributary of S. Toraut. Males make frequent sorties from their perches on rocks in the river, their blue hindwings very conspicuous. Only occasionally rest on vegetation. Females less often seen, usually flying close to water margins. Mostly observed where flow-rate of river reduced.

CHLOROCYPHIDAE

Libellago rufescens (Selys) subsp. nov. (2)

Toraut, S. Tumpah and first tributary. Males seen frequently in February and March, perched upon rocks in fast-flowing sections of the river. Made brief sorties from perch to return after a few seconds. Difficult to follow in flight against ripples. No females noted.

L.r. rufesçens (Selys)

S.W. Sulawesi, Maros. Two males, one female of the nominotypical form, collected 18.ix-9.x.1983, in Davies' collection.

L. xanthocyana (Selys) (3)

Toraut. Observed from 17.ii.1985 through March only at one place on S. Toraut where males perched on rocks and jammed logs in the centre of the broad river. Seventeen counted in an area of about 4 square metres. No intersexual behaviour observed but males display to one another, a flying male hovering in front of and facing a perched male; latter spreads wings and raises abdomen. Only a few females seen, usually near the banks.

Rhinocypha monochroa Selys

S.W. Sulawesi, Maros. A pair in Davies' collection, 18.ix - 9.x.1983.

R. frontalis Selys (4)

Toraut, small forest streams feeding S. Toraut and S. Tumpah. Scarcest of the three Toraut chlorocyphids and noted only on small streams where males perched on bankside vegetation. Females not seen.

R. tincta semitincta (Selys)

Bacan, Fort Bentang and Air Blanda. Three males, one female, 7,8.iii.1985.

LESTIDAE

Lestes (Paralestes) praemorsus (Selys) (5)

Toraut, riverine pond. One male, 25.ii.1985.

COENAGRIONIDAE

Agriocnemis femina femina (Brauer) (6)

Toraut, Labuanagi, Bacan (also Java, Bogor). Common at base camp pond from January to end March and also a few on kitchen pond. In neglected rice paddy at Labuanagi. Polymorphic with male abdomen dorsally all black or with orange-red colouration on segments 8-10 and posterior third of 7 (numbers of captured specimens 7:4 respectively).

One example of an intermediate male form with only segments 9+10 red also taken. Immature females had abdominal segments 1-6 lemon yellow, 7-10 black, whilst mature females had 1-6 bluish, 7 reddish and 8-10 ochreous blackish.

Argiocnemis rubescens Selys (7)

Toraut, base camp pond, two males in February and one female in January. A second female taken in the forest in March.

Ischnura senegalensis Rambur (8)

Toraut, kitchen pond (also Java, Bogor). Only two of each sex taken.

Pseudagrion crocops Selys (9)

Toraut, Menado. At Toraut two of each sex were collected at kitchen pond, base camp pond and in the forest.

P. celebense Lieftinck (10)

Toraut, kitchen pond, single males on 26.ii and 6.iii.1985. A female at Menado, 7.ii.1985.

P. ustum Selys (11)

Toraut, one male at base camp 14.i.1985.

Ceriagrion sp. nov. 1

Danau Mooat, one male 25.iii.1985.

Ceriagrion sp. nov. 2

Bacan, Fort Bentang, a pair 8.iii.1985.

Teinobasis superba (Selys) (12)

Toraut, Ternate, Bacan. This species, with elongated abdomen, was frequently seen flying, sometimes in tandem, in the lowland forest at Toraut. It was usually in the vicinity of small forest streams but often flew up to the canopy. Very variable in size, two males from Toraut being very small but otherwise resembling closely the rest of our material.

T. helvola Lieftinck

One female in a coconut plantation near Doloduo, about 8 km S.E. of base camp, 1.iii.1985. One male, Bacan, Fort Bentang, 8.iii.1985.

ISOSTICTIDAE

Selysioneura sp. nov.?

Sulawesi Utara, Koluntang, one female 29.i.1985. Attributed to this genus with some uncertainty. Most representatives of the family are confined to Australia, New Guinea or small islands off the N.E. Australian coast, but *Selysioneura* is known previously from Halmahera.

PROTONEURIDAE

Nososticta flavipennis (Selys) (13)

Toraut. Two pairs taken in tandem flying in the forest close to S. Toraut, 10.i. and 21.ii.1985. The female of the latter pair was ovipositing in a pool connected with a deep, still section of the river.

Nososticta sp. nov. 1 (14)

Toraut, forest edge. Two males, 20.i.1985.

Nososticta sp. nov. 2 (15)

Toraut, S. Tumpah, one male, i.1985.

PLATYSTICTIDAE

Identification of the following three species pends publication of a revision of Sulawesi Platystictidae by Dr J. van Tol.

Drepanosticta sp. 1 (16)

Toraut, forested W. bank of S. Tumpah, one female 9.iii.1985. Probably conspecific with a male and female taken at Kolintang (19.i. and ii.1985 respectively).

Drepanosticta sp. 2 (17)

Toraut, forest edge, one female, 8.i.1985.

Protosticta sp.

S. Tumpah, altitude 900 m. Two teneral males, 20.iii.1985.

AESHNIDAE

Anaciaeschna jaspidea (Burmeister)

Doloduo, 8 km S.E. of base camp. One male at light, 22.00 h, 20.ii.1985.

Heliaeschna filostyla Martin (18)

S. Tumpah. One male flying slowly downstream near confluence with first tributary, 15.iii.1985. Shortly before his death, M. Lieftinck, in a personal communication to one of us (Davies), suggested that *H. filostyla* should be placed in a new genus. This possibility will be dealt with in a future publication.

Gynacantha basiguttata Selys

Bacan, Air Blanda, one female, 7.iii.1985.

G. bayadera Selys (19)

Toraut. Forest near S. Tumpah, two females, 12.i.1985 and (at rest beneath palm frond) 27.ii.1985. A large, dark dragonfly, seen several times flying low and fast through the forest and always evading capture, may have been the male of this species.

G. penelope Ris

Bacan, Air Blanda and Fort Bentang, one male and two females, 7,8.iii.1985.

G. rosenbergi Brauer (20)

S. Tumpah, one male, i.1985.

An anactine species was seen flying out of reach near the base camp pond on three occasions.

CORDULIIDAE

Hemicordulia assimilis Hagen in Selys

Bacan, Air Blanda. One female, 7.iii.1985.

Macromia irina Lieftinck (21)

S. Tumpah. Two males captured in March, one at altitude 900 m and the other near confluence with first tributary at low altitude (c. 280 m). Three or four observed at latter site, hawking about 2 m above a deep pool in the river but very evasive.

LIBELLULIDAE

Tetrathemis irregularis leptoptera (Selys) (22)

Toraut. Four males caught 21.ii.1985 at pool formed by inlet of river at forest edge, and others seen subsequently at this place. One male by S. Tumpah, 10.i.1985.

Nannophya pygmaea Rambur (23)

Toraut, Danau Mooat, Labuanagi, Menado. At Toraut observed only amongst marginal vegetation of kitchen pond.

Cratilla lineata (Brauer) (24)

Toraut, base camp. One male, 7.i.1985.

Lyriothemis cleis Brauer (25)

Toraut, base camp. One male, 24.i.1985. Larvae of this species develop in water-filled rot-holes and a number were found in the forest adjacent to the base camp (Kitching 1986).

Lathrecista asiatica (Fabricius) (26)

Toraut, base camp. A female (15.ii) and a male (5.iii.1985) taken.

Agrionoptera insignis quatuornotata Brauer (27)

Toraut. Two males at pools in partly dried-up forest stream, 18.ii and 2.iii.1985.

Nesoxenia mysis (Selys) subsp. nov.

Bacan, on coast 15 miles N.W. of Labula, one female, 4.iii.1985.

Diplacina militaris Ris (28)

Toraut, Sangir. Only males found at Toraut, by S. Tumpah and small forest streams.

Diplacina sp. nov. 1 (29)

Toraut. Two males and a female captured flying along the course of a small forest stream, 26.ii and 2.iii.1985. Another female observed ovipositing unaccompanied. One male by S. Tumpah.

Diplacina sp. nov. 2 (30)

Toraut, base camp area. One male, 20.i.1985.

Diplacina sanguinolenta van Tol (31)

Toraut. One male in forest north of river, 12.iii.1985. A distinctive *Diplacina* with abdominal segments 2, 3 and most of 4 blood red, the rest black. Recently described (van Tol 1987b) from material accumulated by Lieftinck from a range of localities in Sulawesi and Banggai Island.

Potamarcha congener (Rambur) (32)

Toraut. Common about base camp area, at riverine ponds and base camp pond.

Orthetrum glaucum (Brauer) (33)

Toraut, Menado (Mt. Lokon). At Toraut one male taken at riverine pond and a female on S. Tumpah.

O. chrysis Selys (34)

Toraut. Males taken in February and March mostly on the banks of S. Toraut but occasionally penetrating a short distance into the forest. One found devouring a large cyclorrhaphous fly.

O. sabina (Drury) (35)

Toraut, Labuanagi, Danau Mooat, Menado (also Java, Bogor). Common at Toraut hawking amongst low vegetation on banks of S. Toraut, at mouth of S. Tumpah and at the very edge of the forest.

Diplacodes trivialis (Rambur) (36)

Toraut, Labuanagi, Danau Mooat, Menado. The most abundant anisopteran at Toraut, hawking low over the ground on the base camp area and especially along paths. A female was observed ovipositing unaccompanied in base camp pond.

Crocothemis servilia (Drury) (37)

Toraut. A single female in field of maize, 11.ii.1985.

Neurothemis stigmatizans manadensis (Boisduval) (38)

Toraut, Labuanagi, Danau Mooat, Menado, Sangir. This conspicuous red-winged insect was common but with a very aggregated distribution in rank secondary vegetation near standing water. Males spent much time perching on vegetation, often only 1-2 m apart. Abundant in rice paddies at Labuanagi.

N. fluctuans (Fabricius) (39)

Toraut. Much scarcer than its congener above and represented in our collections by just one of each sex taken on the base camp area in March.

Neurothemis sp. nov. (40)

Toraut, Bacan. Allied to the above. Four females captured, two on the base camp area, one by S. Tumpah and one on Bacan (Fort Bentang), in January, February and March.

Trithemis festiva (Rambur) (41)

Toraut. A female (22.ii.1985) and a male (6.iii.1985) taken beside S. Toraut.

Zyxomma obtusum Albarda (42)

Toraut. Quite plentiful at kitchen pond and one seen at riverine pond at forest edge, but difficult to catch (only one male taken). It appeared about 18.00 h at kitchen pond where males established territories along lengths (about 10 m) of pond margin which they patrolled by flying back and forth just a few centimetres above the water surface. Their white colouration rendered them conspicuous in the fading light.

Tholymis tillarga (Fabricius) (43)

Toraut, Menado. Males common on kitchen

pond and one observed hovering 50 cm above an ovipositing female. A female came to an electric light at 21.00 h and another was found just in the forest resting beneath a palm frond.

Tramea eurybia (Selys)

Ternate. Two males captured 2.iii.1985 at edge of volcano crater at 1700 m altitude.

T. transmarina (Brauer) subsp. nov. (44)

Toraut. Single male, 27.i.1985, flying in sunshine at base camp. Several specimens of a *Tramea* species were seen flying above the road at Danau Mooat.

Pantala flavescens (Fabricius) (45)

Toraut, Menado. Very common about base camp, hawking in numbers at 2-4 m above the ground. A male came to electric light about 22.00 h.

Celebothemis delecollei Ris (46)

Toraut. Both sexes found throughout March at the pool in S. Tumpah by its confluence with first tributary. Not observed elsewhere.

GEOGRAPHICAL RANGES AND HABITATS OF THE TORAUT TAXA

Of the 46 taxa collected within about 2 km of the Project Wallace base camp on S. Toraut, ten are apparently undescribed, twelve are so far known only from Sulawesi, 16 are found in the Oriental region (in some cases in other zoogeographical regions as well but not in the Australasian region) and eight have ranges that include both the Oriental and Australasian regions. Ranges of the taxa by families are shown in table 1. Most of the Zygoptera (11 of 17) are so far known only from Sulawesi, but the majority of Anisoptera (18 of 29) have considerably broader ranges. The level of endemism in Sulawesi Odonata is high, but the fauna includes many Libellulidae, the dominant family, with a broad distribution in south-east Asia. There are few indications of Australasian elements in the odonate fauna. Only the single species of Isostictidae, which was not found at Toraut, has a probable Australasian derivation. The dragonfly fauna of Sulawesi is therefore predominantly Oriental, a conclusion reached also by van Tol (1987a), but knowledge of dragonfly distribution is insufficiently complete to allow us to indicate narrower geographical affinities. The existence of a small Australian component is not at variance with the suggestion that Sulawesi is a conglomerate of part of an island arc of Oriental origin forming Sangir, the northern peninsula (Sulawesi Utara) and western Sulawesi, and a mass including the eastern and south-eastern peninsulas originating in the Australasian region.

Table 1. Geographical distribution of species and subspecies by families in the Toraut fauna.

	Sulawesi only (+ undescr. taxa)	Oriental	Oriental + Australasian	Total taxa
Zygoptera				
Calopterygidae	1	0	0	1
Chlorocyphidae	2(1)	0	0	3
Lestidae	0	1	0	1
Coenagrionidae	2	3	2	7
Protoneuridae	1(2)	0	0	3
Platystictidae	(2)	0	0	2
Anisoptera				
Aeshnidae	1	1	1	3
Corduliidae	1	0	0	1
Libellulidae	4(5)	11	5	25
Totals	12(10)	16	8	46

Table 2. The distribution by habitats of taxa known only from Sulawesi and of those with a broader distribution.

	Primary habitats	Secondary habitats	Both
Endemic & undescribed taxa	16	4	2
More widespread taxa	3	15	6

Habitats of the Toraut fauna may be classified as primary (those in the rainforest and major rivers) or secondary (those in clearly man-modified situations). The distribution of taxa between these two habitat classes (table 2) shows that the endemic taxa predominate in primary habitats whilst species having a broad geographical range occur principally in secondary habitats. Whilst this is what would be expected, the data are influenced by the absence of permanent ponds, suitable for colonisation by the more widespread Libellulidae, from the forest area surveyed. Van Tol (1987a) similarly found the Odonata of primary forest streams to be nearly all endemic to Sulawesi. He lists (van Tol 1987a, 1987b) the following additional species from Dumoga-Bone: *Celebargiolestes cinctus* (Selys) (*Megapodagrionidae*), ?*Paragomphus capitatus* (Martin) (Gomphidae) — found as larva only, *Nannophlebia aglaia* Lieftinck (Libellulidae) and *Diplacina torrenticola* van Tol which are all endemic, plus *Orthetrum pruinosum* (Burmeister) (Libellulidae).

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ANNOUNCEMENT

Fauna Malesiana Foundation

Fauna Malesiana: surveying one of the world's richest faunas

Zoologists working on the fauna of the Indo-Australian archipelago have long felt the need for a coordinating research body, similar to the Flora Malesiana Project in botany. Both the archipelago and the adjacent continental regions possess a largely unexplored fauna of immense diversity, which is of great scientific and economic interest to the nations in the region and indeed the entire world. Taxonomists, biogeographers and geologists have lately produced many new, exciting ideas about the evolution of life in the archipelago. Taxonomists are also pressing ahead with in-depth studies of animal and plant groups, frequently supported by field work, nowadays facilitated by the enhanced accessibility of poorly explored regions. Since 1980, terrestrial and marine expeditions have contributed to the steep increase in our knowledge of lesser known animal groups inhabiting the archipelago. Clearly, an increased understanding of the composition of the fauna and flora will assist resident policy makers and applied scientists in the rational management of natural and man-made ecosystems. The local scientific community, as well as agriculture, forestry, fisheries and the general public will no doubt profit from forthcoming reviews of our present knowledge of the fauna. It is proposed to publish such reviews under the comprehensive title Fauna Malesiana.

Fauna Malesiana Foundation: starting a new organization

To coordinate and expand the continuing survey of the fauna of the Indo-Australian archipelago a foundation has recently been established, the Fauna Malesiana Foundation, based in Leiden, The Netherlands. This new organization will be advised by scientists from various countries, including those situated in the region. The Foundation is currently seeking financial support for several projects, one being the establishment of a Fauna Malesiana Bureau. The Bureau will produce a Fauna Malesiana Bulletin (in a format similar to the Flora Malesiana Bulletin) and serve as the administrative centre for the Foundation's various activities. Another important project is the production of a new series of publications, the Fauna Malesiana. This series is envisaged to comprise handbooks for the identification of animal groups as well as other documents relating to the fauna of the archipelago.

The permanent address of the Foundation is: *Fauna Malesiana Foundation, P.O.Box 9517, 2300 RA Leiden, The Netherlands.*

THE SULAWESI GENUS *BRACHYLOBOPYGA* (HOMOPTERA: CICADIDAE)

by

J. P. DUFFELS

ABSTRACT

Duffels, J. P., 1989. The Sulawesi genus *Brachylobopyga* (Homoptera: Cicadidae). — Tijdschrift voor Entomologie 132 (1): 123—127, figs. 1-8. [ISSN 0040-7496]. Published 3 July 1989.

The discovery of the new cicada species *Brachylobopyga montana* and the alleged synonymy of *B. decorata* Duffels, the type species of the genus, to *Cicada toradja* Breddin prompted a reconsideration of the genus *Brachylobopyga*. The distribution of this genus is compared with the pattern of endemism displayed by its supposed sister genus *Dilobopyga*.

Key words. — Cicadidae; Brachylobopyga; key; Indonesia; biogeography.

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INTRODUCTION

The genus *Brachylobopyga* was erected for a new species, *B. decorata*, from Sulawesi (Duffels 1982). This species was described from Bua Kraeng (1650 m), a mountain peak NW of Gunung Lompobattang in an isolated massif in the southwestern arm of Sulawesi. Another species of this genus, already mentioned by Duffels (1986), was recently collected at high altitudes (1600-1900 m) in Central Sulawesi. This new species is described here as *Brachylobopyga montana*.

In connection with my current studies of Sulawesi cicadas, I have scrutinized again the species with uncertain systematic position described by Breddin (1901). This led to the conclusion that *Brachylobopyga decorata* is identical to *Cicada toradja* Breddin, 1901.

TAXONOMY

Brachylobopyga Duffels

Brachylobopyga Duffels, 1982: 156; Duffels 1986: 320—322.

Type species: *Brachylobopyga decorata* Duffels, 1982 (= *Brachylobopyga toradja* (Breddin, 1901)).

The genus was characterized (Duffels 1982) by a long, strongly chitinized, apically flattened aedeagus and a narrow pygofer with parallel lateral sides and, apically truncate, lateral processes. *B. montana* is attributed to *Brachylobopyga* because of the very similar structure of the aedeagus, though the pygofer of this species is widest across the middle (fig. 2) and has short, apically rounded, lateral processes (fig. 3). *B. montana* also differs from *B. toradja* in the relatively shorter basal pygofer lobes and in colouration and black body marking. The male opercula are very alike, viz., very long and narrowing to the apices.

The discovery of the new species of *Brachylobopyga* shows that the long, strongly chitinized, apically flattened aedeagus remains a synapomorphy for *Brachylobopyga*, but the short and rounded lateral process of the pygofer makes less certain that *Brachylobopyga* is the sister genus of *Dilobopyga* (cf. cladogram of the subtribe Cosmopsaltriaria in Duffels 1986: fig. 2).

KEY TO THE SPECIES OF *BRACHYLOBOPYGA*

— Underside of postclypeus with small, median, black-brown spot at one third from anterior margin. Ground colour of male abdomen and timbal covering yellowish brown. Pygofer with truncate lateral lobes, long basal lobes and parallel lateral sides (Duffels 1982: figs. 4 & 5). Clasper long, reaching to halfway the length of the pygofer, and narrowing to its apex (Duffels, 1982: figs. 4 & 7). Body length ♂: 25.7—30.2 mm . . . .*toradja*

— Underside of postclypeus with fairly broad, median fascia. Ground colour of male abdomen castaneous brown; timbal covering black-brown. Pygofer with rounded lateral lobes, short basal lobes and widest across the middle (figs. 2 & 3). Clasper short, shaped as in fig. 4. Body length ♂: 30—34.5 mm ....*montana*

Brachylobopyga toradja (Breddin, 1901) comb. n.

Cicada toradja Breddin, 1901: 109—111.
Cosmopsaltria toradja, Sharp 1903: 279.
Cicada (?) *toradja*, Distant 1906: 41; Distant 1912: 31.
Tibicen toradja, Kato 1956: 80; Duffels & van der Laan 1985: 78.
Tibicen toradjus, Metcalf 1963: 320.
Brachylobopyga decorata Duffels, 1982: 156—159, figs. 1—8 **(syn. n.)**.

Synonymy. — Breddin described *Cicada toradja* from South Celebes (= Sulawesi Selatan): "Wawokaraeng, 5000 Fuss, Febr. (Fruhst.)". The description was probably made from one male specimen only, since measurements are given for one specimen. The type should be in the "Institut für Pflanzenschutzforschung der Akademie der Landwirtschaftswissenschaften der DDR" in Eberswalde, like the types of all cicadas described in Breddin's 1901 publication. Unfortunately, the type could not be located in the Eberswalde collection (pers. comm. Dr. G. Petersen, 1.vii.1985). This was not unexpected since the type was not listed in Gaedicke's catalogue of type specimens in the collection of this institute (1971). Earlier study of two other cicada types of Breddin revealed that the original identification labels of Breddin were removed while new labels with identifications of A. Jacobi were added (Duffels 1977: 144, 147). This may have happened also to the type of *Cicada toradja*. Breddin's description of this species perfectly fits *Brachylobopyga decorata* especially in the marking of the body and the characteristic shape of operculum and pygofer lobes. Locality, altitude, month of collecting and collector of Breddin's type of *C. toradja* are identical to those of the type-series of *B. decorata*, of which all specimens have identical labels. It is obvious that these specimens and Breddin's specimen of *C. toradja* are part of the same series. Breddin (1901: 3) mentioned that he studied a part [sic !] of the Hemiptera collections made by H. Fruhstorfer in Minahassa and South Celebes in 1895—1896. The considerations given so far lead to the conclusion that *Brachylobopyga decorata* is a junior synonym of *Cicada toradja*.

Description. — For an extensive description of this species the reader is referred to the original descriptions of *C. toradja* and *B. decorata*.

Distribution. — Bua Kraeng (= Wawokaraeng), a mountain peak in an isolated massif in South-West Sulawesi, SE of Ujung Pandang.

Brachylobopyga montana sp. n. (figs. 1—8)

Description. Ground colour of head and thorax light ochraceous, in some specimens with a greenish tinge. Ground colour of abdomen brownish.

Head. — Male: Supra-antennal plates for the greater part black. Vertex with large, round, black spot enclosing ocelli and reaching from frontoclypeal suture to, or nearly to, anterior pronotum margin, a pair of fairly large triangular spots next to median spot and a pair of small, oval spots medio-proximally of eyes. Anterior part of postclypeus black, this black part encloses a round, pale ochraceous spot at anterior postclypeus margin and continues on underside of postclypeus in a black median fascia, which is anteriorly as wide as anterior ochraceous spot and narrows strongly to clypeal suture. Anteclypeus with, sometimes faint, brown, median spots at mid-length. Medial margin of mandibular plate black along anteclypeus. Rostrum ochraceous, its dark brown apex just reaching trochanter of hind legs.

Female: As in male but spots next to median spot considerably smaller.

Pronotum. — Male: Markings black. Central fasciae either very narrow or extremely thin or lacking in the middle, anteriorly strongly widened into black line along pronotum margin, posterior ends semicircular. Black lines lie above proximal ends of anterior oblique fissures. Two pairs of black marks between both pairs of oblique fissures are broadly connected with black anterior oblique fissures. Posterior oblique fissures and lateral part of ambient fissure filled with broad, irregular, black fasciae. Pronotum collar with weakly developed, very obtuse, latero-distal tooth and a very indistinct, brownish spot on latero-proximal corner.

Female: As in male but spots between oblique fissures smaller and black colouration of fissures much narrower.

Mesonotum. — Male: Fasciae black. Median fascia narrow anteriorly, widening to 4—5 times its anterior width at 3/5 its length and narrowing again towards cruciform elevation. Paramedian fasciae converge slightly from anterior mesonotum margin to half the length of mesonotum disk; they are anteriorly as broad as anterior part of median fascia but widen considerably toward their posterior ends. A pair of fairly large spots is situated in front of anterior angles of cruciform elevation.

Areas between median and paramedian fasciae chocolate brown. Lateral fasciae broad with some irregular black spots next to its anterior part; fasciae embedded in chocolate brown. Cruciform elevation yellow ochraceous, apices of its anterior arms black.

Female: Marking less developed. Anterior half of lateral fasciae clouded with brown.

Legs. — Light brown. Fore femur with a black line along its underridge, which connects a proximal, fairly long, appressed, dark spine and a shorter, more distally placed, erect, dark spine. Uppersides and innersides of femora with longitudinal, brown lines. Underside of fore tibia and its distal end all around dark brown; middle tibia dark brown apically. Tarsi of fore and middle legs blackish brown.

Tegmina and wings. — Hyaline. Venation of tegmen light brown variegated with brown-black parts, and turning brown-black apically. Venation of wing dark brown. Tegmina with fairly broad infuscations at bases of 2nd and 3rd apical areas; two paratypes also very lightly infuscated at apices of veins of 2nd, 3rd (and 4th) apical areas.

Operculum. — Male (fig. 7): Castaneous and long, reaching posterior margin of sixth abdominal segment. Surface of operculum fairly convex and rugose. Operculum at its widest close to its base and tapering to fairly narrow and rounded apex. Medial margin nearly straight but very slightly concave at two thirds of its length in holotype and one paratype. Lateral margin weakly convex.

Female (fig. 8): Light brown, just reaching posterior margin of abdominal segment 2. Lateroproximal corner black. Lateral margin basally sinuate. Latero-distal angle rounded. Posterior margin almost straight, but slightly curved toward meracanthus.

Abdomen. — Male: Ground colour castaneous brown. Timbal coverings blackish brown (fig. 6). Segment 2 with more or less distinct, blackish brown, middorsal triangle at anterior margin. Anterior and posterior margins of segments 2 and 7 dorsally dark brown. Segments 3—6 with a pair of sublateral dark spots at half the segment's height. Distal half of segment 7 ochraceous. Ventral side of abdomen castaneous, posterior margins of segments 3—5 somewhat darker brown.

Female: Brownish with scattered pilosity on dorsal surface. Posterior margin of segment 2 black. Segments 2—4 with black transverse marks at posterior margins and similar but smaller marks on segments 5—7. Segments 4—7 with sublateral, round black spots. Segment 9 with two paramedian obconical black marks.

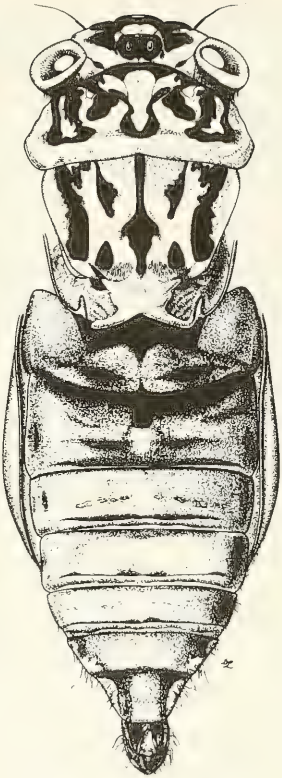
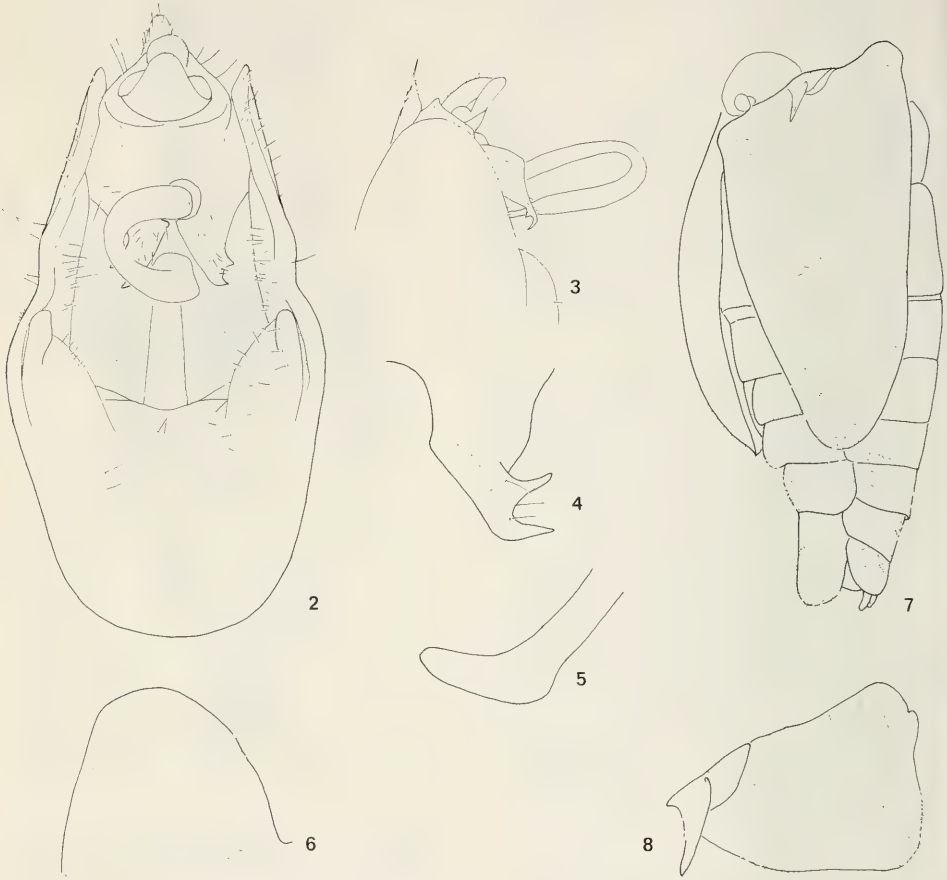


Fig. 1. *Brachylobopyga montana*, holotype.

Male genitalia. — Lateral processes of pygofer short and apically rounded (fig. 3). Cup of pygofer formed by the basal lobes U-shaped; basal pygofer lobes distinctly shorter than in *B. toradja* (fig. 2). Clasper with apical and subapical hooks, both directed laterad (fig. 4). Aedeagus chitinized, very long and strongly curved, apex flattened and pointed (figs. 3 & 5).

Measurements. — Body length ♂ 30—34.5 mm, ♀ 25.0 mm; head width ♂ 9.5—10.0 mm, ♀ 9.1 mm; pronotum width ♂ 9.7—10.7 mm, ♀ 9.6 mm; mesonotum width ♂ 8.7—9.2 mm, ♀ 8.5 mm; tegmen length ♂ 40.6—42.0 mm, ♀ 40.0 mm.

Holotype, ♂, "Indonesia, Sulawesi Tengah / Lore Lindu N.P.", "10 km SE Poloka / 1900 m, 25.iii.1985 / J. P. & M. J. Duffels", "Stat. 55 / Disturbed lower / montane forest ML-light, canopy". **Paratypes**, Indonesia, Sulawesi



Figs. 2—8. *Brachylobopyga montana*. — 2, pygofer in ventral view, holotype; 3, apical part of pygofer in lateral view, holotype; 4, right clasper in lateral view, holotype; 5, apical part of aedeagus, paratype Puncak Dingin; 6, left timbal covering, paratype Puncak Dingin; 7, male abdomen with operculum in ventro-lateral view, holotype; 8, female operculum in ventro-lateral view, paratype.

Tengah: 1 ♂, same data as holotype; 1 ♂, Lore Lindu N.P., Rano Rano, 1600 m, 10 km NE of Gimpu, 15.iii.1985, J. P. & M. J. Duffels, stat. 43, Lower montane forest, ML-light; Puncak Dingin, ca. 1700 m, 15.x.1985, S. Nagai leg., 1 ♀, same data but 21.x.1985, 1 ♂.

Other material (freshly emerged, not fully coloured and somewhat crushed): Puncak Dingin, ca. 1700 m, 15.x.1985, S. Nagai leg., 1 ♂, same data but 21.x.1985, 1 ♂, 15.xi.1985, 1 ♂. The holotype and the paratype from Rano Rano are deposited in the Instituut voor Taxonomische Zoölogie (Zoölogisch Museum), Amsterdam; the other paratype from Poloka is in the Museum Zoologicum Bogoriense, Bogor; the material from Puncak Dingin is in the collection of Dr. M. Hayashi, Urawa, Japan.

Distribution. — The species is recorded from lower montane forest in Sulawesi Tengah. Rano

Rano (1600 m) is situated in the mountain range east of the valley of Salo Palu, 85 km South of Palu and 10 km E of Gimpu. Poloka (1900 m) is situated along the road from Palu to Sedeo, about 65 km SE of Palu. This is very close to, or perhaps about the same locality as, Puncak Dingin (ca. 1700 m), which is on the southern slope of Mt. Rorekaofimbu (M. Hayashi, pers. comm.).

BIOGEOGRAPHY

The supposed sister genus of *Brachylobopyga* is *Dilobopyga*, which is distributed in Sulawesi including Muna and Buton (with 30 species), Sangihe Is. (1 species), Selayar (1), Banggai archipelago (2), Sula Is. (1) and South Maluku (1) (Duffels 1986, in press). Up to now, only ten out of these 36 species of *Dilobopyga* have been described. Species of *Dilobopyga* are found from sea-level to 1600 m mainly in rainforest habitats, though some species are found in other vegetation types and gardens. Preliminary phylogenetic studies of this genus show that monophyletic groups are centred in North and Central Sulawesi, in SW Sulawesi and in East Sulawesi.

The two species of *Brachylobopyga* are found in high altitude rainforest areas (1600—1900 m). *B. toradja* seems to be restricted to the isolated mountain massif of SW Sulawesi. From this area only one endemic *Dilobopyga* species (*D. margarethae* Duffels) and one widespread species (*D. minahassae* (Distant)) have been recorded. *B. montana* is found in Central Sulawesi, where several species of *Dilobopyga* and one or two monophyletic species groups of this genus have a very restricted distribution.

ACKNOWLEDGEMENTS

I am very much indebted to Ir. Syafii Manan (Directorate General of Forest Protection and Nature Conservation, Bogor) for permission to collect in Lore Lindu National Park, Sulawesi Tengah. I am grateful to Mr. Rolex Lameauda and Mr. Julian Sango (Lore Lindu National Park), to Mr. Frans Mamarimbing and Mr. Boy Manopo (Hotel Viscana, Palu), to our porters Jonathan, Kantoro and Obed from the village of Gimpu and to my wife Greet Duffels-van Egmond for their help in the field. Dr. M. Hayashi (Saitama University, Urawa, Japan) kindly sent me his material collected by Mr. S. Nagai. I thank Mr. A. J. de Boer for criticizing the manuscript of this paper, Mr. D. Langerak for the preparation of fig. 1 and Mrs. Annelies Stoel for typing the manuscript. The fieldwork was funded in part by the Netherlands Foundation for the Advancement of Tropical Research (WR 85—197).

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BOOK ANNOUNCEMENTS AND REVIEWS

Holmen, M., 1987. The aquatic Adephaga (Coleoptera) of Fennoscandia and Denmark, I. Gyrinidae, Haliplidae, Hygrobiidae and Noteridae. — Fauna Entomologica Scandinavica 20: 1-168, 288 figs, 1 map. [**ISBN** 90 04 08185 2, E. J. Brill, Leiden, the Netherlands. Price 64 Dutch Guilders/US $ 32.—].

This volume treats the northern European representatives of the small aquatic beetle families mentioned in the title, which together with the large Dytiscidae (the subject of a future volume) and the non-European Amphizoidae, form the aquatic Adephaga. Apart from the 36 species occurring in Northern Europe, the volume treats 5 additional species, so covering most of West and Central Europe. Apart from extensive keys, the book provides concise descriptions, with information on distribution, biology and nomenclature. Some general information on morphology, zoogeography and biology is provided with each family. One colour plate illustrates the general aspect of the genera treated. As in other volumes of the series, the distribution over the provinces of the four northern countries, is listed in a dot catalogue.

This book will be highly welcomed by workers on aquatic beetles and aquatic ecologists, since no recent reliable keys to these small, but difficult families were available. Where previous keys almost all suffer from poor illustrations and absence of detailed information on genitalia, this book is very well illustrated with the use of a wealth of diagnostic characters, including male and female genitalia and stereoscan pictures of elytral sculpture. The information on biology is also much more extensive than one usually finds in identification guides, and includes amongst others information on larva and pupa. The author also indicates where the description of the larva of each species can be found.

One minor point of criticism is that the author, while fixing lectotypes for various species, failes to solve the nomenclatorial confusion around *Haliplus lineolatus* Mannerheim, by designating a lectotype, although he points out himself that this ought to be done.

Mr Holmen's publication is highly recommended, and we can hardly wait to see the volume on Dytiscidae.
[E. J. van Nieukerken]

Duffels, J. P., 1988. The Cicadas of the Fiji, Samoa and Tonga Islands, their Taxonomy and Biogeography (Homoptera, Cicadoidea) with a chapter on the geological history of the area by A. Ewart. — Entomonograph 10: 1—108, figs. 1—207 [E. J. Brill, Leiden, The Netherlands. Price 56 Dutch Guilders = c. US$ 28.00].

With this book the author continues his studies on the cicadas of the oriental and australian region. The adults of 24 (sub) species occurring in the Fiji, Rotuma, Samoa and Tonga Islands are thoroughly described and illustrated. Also descriptions of larvae and exuviae, as far as known, and details on behaviour and distribution are provided. The phylogenetic relationship of the species is extensively discussed also in relation to other taxa of the southwest Pacific. Biogeographic patterns are analysed and compared with the geological history of the area, which is described in a chapter by A. Ewart.

This publication maintains the high standard as was set by the author in his previous publications. The descriptions are concise but fully adequate. I also appreciate the illustrations. Habitats and living insects are photographed, while diagnostic characters are illustrated with line drawings. The quality of the figures of the whole insects (without their wings), prepared by J. Zaagman, is particularly high.

This book is, of course, a must for the specialists in this group of conspicuous Homoptera, but its value for other zoologists working in the Pacific on biogeography should also be stressed. It is a most stimulating addition to our knowledge of this area.
[J. van Tol]

DIE GATTUNG *POLEMIOSILIS* PIC AUF SULAWESI (COLEOPTERA, CANTHARIDAE)

(41. Beitrag zur Kenntnis der indo-malaiischen Cantharidae)

von

W. WITTMER

ABSTRACT

Wittmer, W., 1989. Die Gattung *Poleomiosilis* Pic auf Sulawesi (Coleoptera, Cantharidae). (41. Beitrag zur Kenntnis der indo-malaiischen Cantharidae). — Tijdschrift voor Entomologie 132: 129-134, figs. 1-13. [ISSN 0040-7496]. Published 3 July 1989.

The species of *Polemiosilis* Pic occurring on Sulawesi are revised. Six species and one subspecies are listed of which five species are described as new to science. *Polemiosilis testaceobasalis* Pic is transferred to *Guineapolemius* and *Guineapolemius tolianus* (Pic) is synonymized with *P. testaceobasalis* Pic.

Key words. — Cantharidae, Sulawesi.

Dr. W. Wittmer, Naturhistorisches Museum, CH-4001 Basel, Schweiz.

DIE GATTUNG *POLEMIOSILIS* PIC

Von dieser Gattung sind bisher zwei Arten von Sulawesi beschrieben worden: *P. rufosuta* Pic, 1921 and *P. testaceobasalis* Pic, 1921, sowie *P. saleierensis* Wittmer, 1973 von der Insel Saleier, die zum Faunengebiet von Sulawesi gehört. Die Art *P. testaceobasalis* Pic is zu streichen, sie wird in die Gattung *Guineapolemius* versetzt, siehe letzten Abschnitt.

Das reiche zur Verfügung stehende Material verdanke ich Herrn Dr. Peter Hammond, London; es stammt aus den Aufsammlungen des "Project Wallace" (unterstützt durch die Royal Entomological Society of London und die Lembaga Ilmu Pengetahuan Indonesia), und dasjenige welches mir von Herrn Prof. Dr. Masataka Satô, Nagoya, aus den Aufsammlungen von Herrn Shinji Nagai zugestellt wurde. Beiden Herren danke isch bestens für die Zustellung des Materials. Des weiteren danke ich Herrn G. Hodebert, Paris, für die sorgfältig ausgeführten Zeichnungen.

Verwendete Abkürzungen: BM = British Museum (Natural History), London; MP = Muséum National d'Histoire Naturel, Paris; NHMB = Naturhistorisches Museum, Basel.

Results of Project Wallace, no. 77.

SCHLÜSSEL

Die auf Sulawesi vorkommenden Arten der Gattung *Polemiosilis* ♂ lassen sich wie folgt unterscheiden:

1\. Flügeldecken zum grössten Teil schwarz, höchstens an der Naht ein wenig aufgehellt 2

— Flügeldecken zum grösten Teil gelbbraun, Basis verschwommen angedunkelt, Spitzen nicht sehr breit schwarz, manchmal ist die basale Verdunkelung längs der Seiten schmal mit den Spitzen verbunden, oder die Basis der Flügeldecken ist nicht angedunkelt und lediglich die Seiten unter den Schultern sind schwach dunkel ...... *P. rufosuta* ssp. *saleierensis* Wittmer

2\. Hälfte des letzten Sternits mit 1 oder 2 Dornen oder Verlängerungen. Halsschild einfarbig orange 3

— Hälfte des letzten Sternits ohne Dornen oder Verlängerungen. Halsschild dunkelbraun, nur der Basal- und Vorderrand schmal oder die basale Hälfte aufgehellt, selten ist der Halsschild einfarbig orange. Abb. 2. .... *P. simplex* n.sp.

3\. Hälfte des letzten Sternits mit 2 Dornen oder Verlängerungen 4

— Hälfte des letzten Sternits mit nur 1 Dorn,

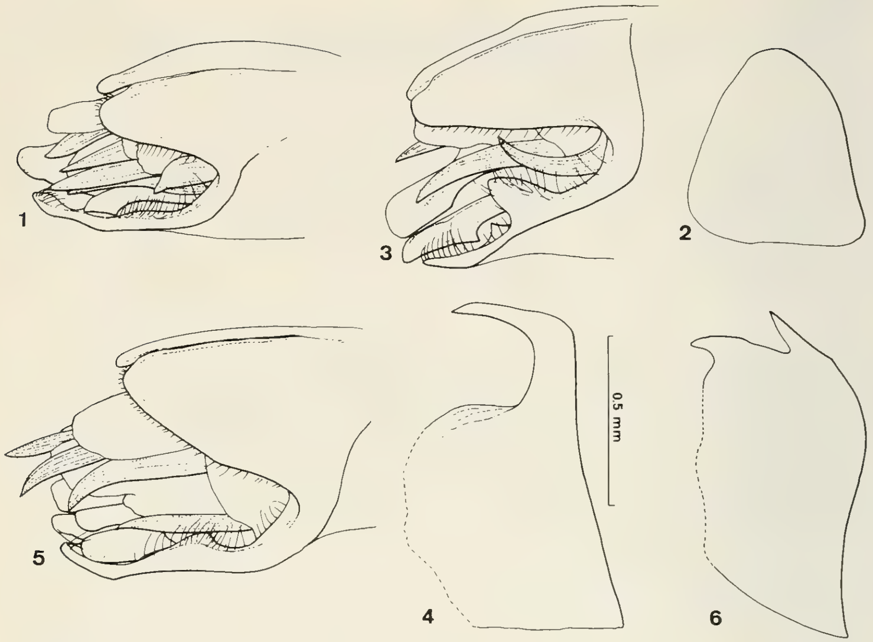

Abb. 1, 3, 5: Kopulationsapparat halb seitlich von *Polemiosilis* ♂: 1, *simplex* n.sp. 3, *rubidiceps* n.sp. 5, *hammondi* n.sp. — Abb. 2, 4, 6: Hälfte des letzten Sternits von *Polemiosilis* ♂: 2, *simplex* n.sp. 4, *rubidiceps* n.sp. 6, *hammondi* n.sp. Massstab für Abb. 1-6.

Kopf einfarbig orange, nur neben den Augen mehr oder weniger angedunkelt. Abb. 4 . . . . *P. rubidiceps* n.sp.

4. Hälfte des letzten Sternits mit 2 ziemlich regelmässig geformten Dornen versehen 5

— Hälfte des letzten Sternits mit 1 Dorn und einer Verlängerung versehen, die auch spitz sein kann 6

5. Die beiden Dorne sind sehr kurz, der obere überragt den äusseren Rand des Seitenteils nicht oder kaum. Abb. 6. . . . . *P. hammondi* n.sp.

— Die beiden Dorne sind sehr lang, auch der obere überragt den aüsseren Rand des Seitenteils. Abb. 9. . . . . *P. rufosuta* Pic

6. Der obere Dorn entspringt am Hinterrand des Sternits und ist hakenartig gekrümmt, die Verlängerung darunter ist sehr breit und bildet einen spitzen Winkel. Abb. 11. . . . . *P. nagaii* n.sp.

— Der obere Dorn entspringt neben der Mitte, er ist nur leicht gekrümmt, die Verlängerung darunter ist breiter als der Dorn, Spitze gerundet. Abb. 13. . . . . *P. nanggalaensis* n.sp.

Polemiosilis simplex sp.n.

(Abb. 1-2)

Holotypus: Indonesia, Sulawesi Utara: Danau Mooat near Kotamobagu, 1200 m, 16.-19.ii.1985 und xi.1985, plants by lake. (BM).

Paratypen: als Holotypus, 1 BM, 2 NHMB; Tondano (Celebes), 1 ♂ NHMB.

Kopf schwarz, vor den Fühlerwurzeln aufgehellt, selten ganz schwarz; Fühler schwarz, oder die beiden Glieder und die Spitze des letzten Gliedes ist leicht aufgehellt; Halsschild dunkelbraun, nur der Basal- und Vorderrand schmal, oder die ganze basale Hälfte ist aufgehellt, selten ist der ganze Halsschild orange; Schildchen orange bis dunkelbraun; Flügeldecken schwarz; Beine dunkel, bei dem Exemplar von Tondano mit orangenem Halsschild sind alle Schenkel und Schienen orange, nur die Knie leicht angedunkelt.

♂. Kopf mit den Augen breiter als der Halsschild, Stirne leicht gewölbt, Basis bis zur Mitte der Augen deutlich und dichter punktiert als weiter vorne. Fühler ungefähr so lang wie die Flügeldecken, von Glied 3 an platt, 3 bis 10 gegen die Spitze verbreitert. Halsschild breiter als lang (47×38), Seiten kurz vor der Mitte am breitesten, hier gerundet, dann gegen die Basis schwach verengt, Basalecken ein wenig vorstehend, schwach stumpfwinklig; Scheibe mit 2 schwachen Beulen, die durch eine feine Längslinie voneinander getrennt sind, die besonders an der Basis gut sichtbar ist, Oberfläche fast glatt, feine Haarpunkte sichtbar (64×). Flügeldecken parallel, körnig gewirkt, mit Spuren von 1 bis 2 Längsrippen, zerstreute Punkte sichtbar. Hälfte des letzten Sternits Abb. 2. Dasselbe fällt durch seine einfache Form auf, da Dorne oder Fortsätze vollständig fehlen.

Kopulationsapparat Abb. 1 fast im Profil. Die Seite des dorsalen Basalstücks ist leicht gerundet vorgezogen, die Basophysen sind kürzer als dasselbe, deren Spitze ist fast eckig, der Zahn darunter liegt verhältnismässig weit vorne.

Länge: 7-8 mm.

Durch die einfache Form des letzten Sternits sehr charakterisierte Art. Die dunkeln Exemplare erinnern in der Färbung an *P. obscuricolor* Pic von Borneo.

Polemiosilis rubidiceps sp.n.
(Abb. 3-4)

Holotypus: Indonesia, Sulawesi Utara: Dumoga Bone N.P., Hog's Back' Camp, lowland forest, 492 m, xi.-xii.1985 (BM).

Paratypen: Als Holotypus, 10 BM, 9 NHMB; und: "Clarke" Camp, lower montane forest, 1140 m, iii.-v.1985, 6 BM, 4 NHMB; idem "Edward's Camp", lowland forest, 664 m, x.1985, 6 BM, 6 NHMB; idem site 1, 200 m, New Base Camp site, 27.-28.i.1985, J. D. Holloway, 1 BM; site 2, 200 m, Toraut Bank, 29.-31.i.1985, J. D. Holloway, 1 BM, 1 NHMB; sites 10 und 11, 664 m, Tumpah Transect, 19.-25.ii.1985, J. D. Holloway, 4 BM, 3 NHMB; idem G. Mogogonipa summit, 1008 m, v.1985, 1 BM, 1 NHMB, (all the material from Project Wallace expedition); Sampraga, 28.x.-5.xi.1985 und 17.vi.1986, S. Nagai, 3 coll. Masataka Satô, 3 NHMB.

Kopf rotorange, nur um die Augen schmal geschwärzt, Maxillarpalpen dunkel, oder nur die Spitze bis das ganze letzte Glied aufgehellt; Fühler schwarz, Glieder 1 und 2 ein wenig aufgehellt, letzte 2 bis 3 weisslich, manchmal auch die Spitze des viertletzten; Halsschild, Schildchen und Beine orange, alle Tarsen dunkel, meistens auch alle Knie und oft die Tibien mehr oder weniger angedunkelt; Flügeldecken schwarz.

♂. Kopf mit den Augen breiter als der Halsschild, an der Basis mit deutlichen Haarpunkten, weiter vorne fast glatt. Fühler kräftig, Glieder von 3 an platt, 3 bis 10 gegen die Spitze verbreitert. Halsschild breiter als lang, Seiten gegen die Basis schwach verengt; Scheibe mit 2 undeutlichen Beulen, die manchmal durch einen Längseindruck getrennt sind, Oberfläche glatt, Haarpunkte zerstreut, sehr fein punktiert. Flügeldecken praktisch parallel, körnig gewirkt, mit Spuren von 1 bis 2 Längsrippen. Hälfte des letzten Sternits Abb. 4.

Kopulationsapparat Abb. 3 fast im Profil. Die Seite des dorsalen Basalstücks ist in einen fast dreieckigen Fortsatz ausgezogen, die Basophysen überragen dasselbe ein wenig.

Länge: 8-9.5 mm.

Neben *P. rufosuta* Pic zu stellen.

Polemiosilis hammondi sp.n.
(Abb. 5-6)

Holotypus: Indonesia, Sulawesi Utara: Dumoga Bone N.P., "Hog's Back" Camp, lowland forest, 492 m, xi.-xii.1985, (BM).

Paratypen: als Holotypus, 7 BM, 8 NHMB; und: idem "Edward's Camp", lowland forest, 664 m, iv.1985, 1 BM, 1 NHMB; "Clarke" Camp, lower montane forest, 1140 m, iii. und v.1985, 1 BM, 1 NHMB; G. Mogogonipa, summit, 1008 m, v. und xi.1985, 1 BM, 1 NHMB; site 7 und 8, Tumpah Transect, 540 m, 9.-11.ii.1985 und 12.-13.ii.1985, J. D. Holloway, 1 BM, 1 NHMB (all the material from Project Wallace expedition).

Färbung wie *P. rubidiceps* mit Ausnahme des einfarbig schwarzen Kopfes, der höchstens am Vorderkopf schwach aufgehellt ist; Fühler ebenfalls dunkler, indem die Glieder 1 und 2 ganz schwarz sind; manchmal ist die Naht an den Flügeldecken schwach aufgehellt.

Sonst wie *P. rubidiceps* gebaut. Hälfte des letzten Sternits Abb. 6.

Kopulationsapparat Abb. 5 fast im Profil. Die Laterophysen erreichen den Rand des dorsalen Basalstücks nicht, die Seiten dieses sind breit, jedoch nicht stark aufgebogen. Der seitliche Zahn auf der Dorsalseite jeder Laterophyse ist fast ganz verdeckt.

Länge: 7.5-8.5 mm.

Meinem werten Kollegen Dr. Peter Hammond, British Museum, London, gewidmet.

Neben *P. rufosuta* Pic zu stellen.

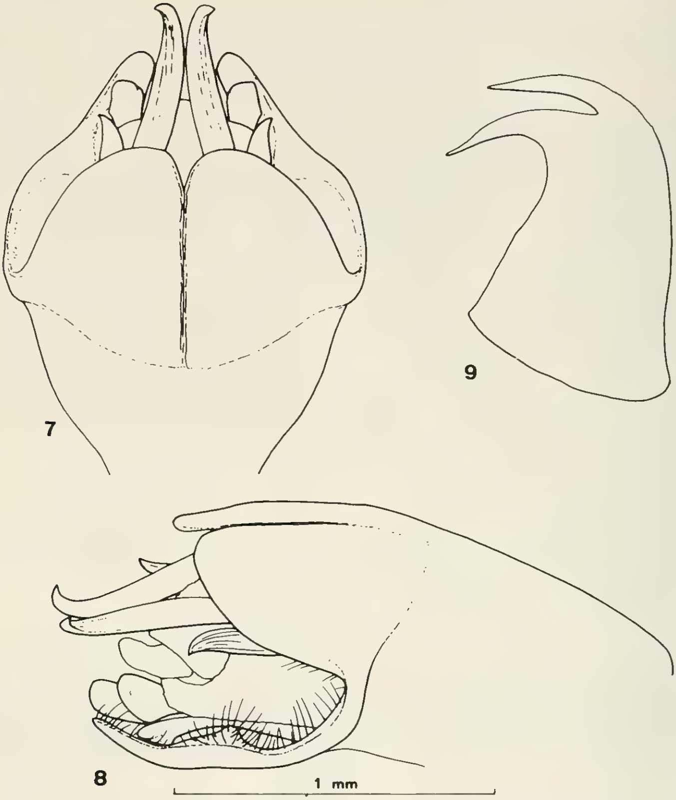

Abb. 7-9: *Polemiosilis rufosuta* (Pic) ♂: 7-8 Kopulationsapparat: 7, von der Ventralseite. 8, half seitlich. 9, Hälfte des letzten Sternits. Massstab für Abb. 7-9.

Polemiosilis rufosuta Pic
(Abb. 7-9)

Polemiosilis rufosuta Pic, 1921: 26. — Wittmer 1957: 570, Abb. 7.

Der Holotypus befindet sich im MP mit Etikette "Samanga, S Celebes, xi.1895, H. Fruhstorfer". Für die Abb. 9 des letzten Sternits (Hälfte) und des Kopulationsapparates (Abb. 7-8) diente der Holotypus. Ich besitze weitere Exemplare von SW Celebes: Bonthain, ix.1938, J. P. A. Kalis und Bantimoeroeng (Maros), ii.-iii.1938, J. P. A. Kalis, jetzt im NHMB.

Weiterer Fundort: Sulawesi Tengah, near Morawali, Ranu River area, 27.i.-20.iv.1980, M. J. D. Brendell, 10 BM, 2 NHMB.

Für die Abbildungen 7-9 wurde 1 ♂ von Bonthain verwendet, das mit dem Holotypus von Samanga (MP) übereinstimmt.

Die von mir (Wittmer 1957) veröffentlichte Abb. 7 des Kopulationsapparates zeigt denselben von der Dorsalseite und nicht wie angegeben von der Ventralseite.

P. rufosuta ssp. **saleierensis** Wittmer **stat.n.**

Polemiosilis saleierensis Wittmer, 1973, Mitt. Schweiz. Ent. Ges. 46: 191, Abb. 25.

Nachdem der Holotypus von *P. rufosuta* Pic aufgefunden wurde, und *saleierensis* hauptsächlich durch die helle Färbung der Flügeldecken abweicht, sehe ich mich veranlasst, die Tiere von der Insel Saleier als Rasse von *P. rufosuta* Pic zu betrachten.

Polemiosilis nagaii sp.n.
(Abb. 10-11)

Holotypus: Sulawesi, Peleng I.: Luksag, ca. 300 m, 25.ii.-4.iii.1986, Shinji Nagai, in coll. Prof. M. Satô, Nagoya.

Paratypen: Als Holotypus, in coll. Satô und NHMB.

Kopf einfarbig schwarz, Fühler ebenso, nur die 3 letzten Glieder sind weisslich; Halsschild und Schildchen orange; Fühler und Beine schwarz, mit Ausnahme der Schenkel, die an der Basis, manchmal bis über die Mitte orange sind.

♂. Kopf mit den halbkugelförmigen Augen breiter als der Halsschild, Stirne zwischen den Augen flach, Oberfläche glatt, zerstreute Haarpunkte vorhanden. Fühler um fast 1/5 länger als die Flügeldecken, von Glied 3 an platt, Glieder 3 bis 10 gegen die Spitze verbreitert, 10 so lang wie 4. Halsschild breiter als lang (47×39); Seiten knapp vor der Mitte am breitesten, nach vorne stärker gerundet als gegen die Basis; Beulen auf der Scheibe nur schwach entwickelt, ohne Längslinie, die sie trennt, glatt, Haarpunkte kaum wahrnehmbar. Flügeldecken parallel, fein körnig gewirkt, Längsrippen kaum angedeutet. Hälfte des letzten Sternits Abb. 11. Der obere Dorn entspringt am Hinterrand des letzten Sternits, er ist hakenartig nach aussen gekrümmt, die Verlängerung darunter ist sehr breit und bildet einen kurzen spitzwinkligen Vorsprung. Kopulationsapparat Abb. 10 fast im Profil. Die Seite des dorsalen Basalstücks ist in einen fast dreieckigen Fortsatz ausgezogen, ähnlich wie bei *rubidiceps* und die Basophysen überragen ebenfalls das dorsale Basalstück.

♀. Fühler ein wenig kürzer, nur ca. 10% länger als die Flügeldecken, Augen ein wenig kleiner.

Länge: 7-8 mm.

Est freut mich, diese Art ihrem Entdecker Herrn Shinji Nagai widmen zu dürfen.

Neben *P. rubidiceps* Wittmer zu stellen.

Polemiosilis nanggalaensis sp.n.
(Abb. 12-13)

Holotypus: S Celebes: Nanggala, Rantepao, 900 m, v.1938, F. C. Drescher (ex. coll. Wittmer in NHMB).

♂. In der Färbung mit *P. rufosuta* Pic übereinstimmend, nur daß alle Schienen schwarz sind und die helle Naht der Flügeldecken fehlt, letztere sind einfarbig schwarz.

Kopf mit normal grossen Augen, Fühler und Halsschild wie bei *rubidiceps*. Hälfte des letzten Sternits Abb. 13, dieselbe ist nach aussen in 2 Fortsätze ausgezogen, die obere ist schmäler, scharf spitzig, die untere breiter mit stumpfer Spitze.

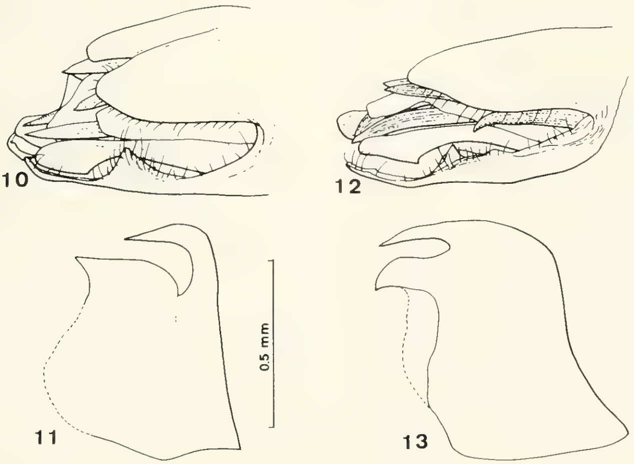

Abb. 10, 12: Kopulationsapparat halb seitlich von *Polemiosilis* ♂: 10, *nagaii* n.sp. 12, *nanggalaensis* n.sp. — Abb. 11, 13: Hälfte des letzten Sternits von *Polemiosilis* ♂: 11, *nagaii* n.sp. 13, *nanggalaensis* n.sp. Massstab für Abb. 10-13.

Kopulationsapparat Abb. 12. Das dorsale Basalstück ist in der Mitte besonders tief gespalten, die Seiten sind sehr flach, nur wenig erhöht. Die Spitzen der Laterophysen erreichen den Apikalrand des dorsalen Basalstücks nicht.

Länge: 8.5 mm.

Neben *P. rubidiceps* Wittmer zu stellen.

Guineapolemius testaceobasalis (Pic) **comb.n.**

Polemiosilis testaceobasalis Pic, 1921: 26.
Guineapolemius tolianus Pic, 1921: 27, **syn.n.**

Bei *G. tolianus* (Pic) handelt es sich um eine Farbvariation von *G. testaceobasalis* (Pic), so dass *tolianus* in Synonymie verfällt. Beide Arten sind von Toli Toli (N Celebes) beschrieben; die Typen sind im MP.

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THE EGG LAYING AND LARVAL DEVELOPMENT OF *PHOLCUS PHALANGIOIDES* (FUESSLIN) (ARANEAE: PHOLCIDAE)

by

TH. G. H. PLATEL

Abstract

Platel, Th. G. H., 1989. The egg laying and larval development of *Pholcus phalangioides* (Fuessling) (Araneae: Pholcidae). — Tijdschrift voor Entomologie 132: 135—147, figs. 1-12, tabs. 1-4. [ISSN 0040-7496]. Published 3 July 1989.

A description is given of the egg-laying of *Pholcus phalangioides* (Fuesslin). The posture of the female, when laying eggs, differs from the resting posture. The eggs appear together with a drop of clear liquid. For a short while the female is kneading this drop after which it is suspended on a thread and spun. After having done so, she takes the egg-batch in her chelicerae and retreats to her resting place. The egg-laying behaviour of *Ph. phalangioides* is compared with that of *Ph. opilionoides* (Schrank) and *Ph. muralicola* Maughan & Fitch.

In captivity the eggs are laid between the end of April and the end of September. A well-fed female lays her first eggs 10-14 days after the first mating. If she has copulated before, the moment of egg-laying is determined by the availability of food. Sperm can be stored by the female. Non-fertilized eggs are removed from the web by the female. The mean number of eggs is 29.8 (7-63). The maximum number of egg-batches is 9. The mean duration of the development until the emergence of the first young is 27.2 days. The duration is temperature-dependent. The female does not hold her eggs continuously in her chelicerae during this period. Ten to fifteen days before hatching the chorions break and the prelarvae are partially visible. The female then starts to loosen the threads around the egg mass and helps the spiderlings to get free. The emerging spiderlings are prenymphs. Their morphology and behaviour are described. The prenymphs moult after 7.9 days, dependent on the temperature.

Key words. — Pholcidae; reproduction; behaviour; development.

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Introduction

Since 1981 specimens of *Pholcus phalangioides* (Fuesslin) were kept in captivity in order to study their mating behaviour and other aspects of the reproduction.

Hardly anything is known in the literature about egg-laying of this species, although the description of this phenomenon by *Pholcus opilionoides* by Pokrowsky (1899) could refer to *Ph. phalangioides*. Maughan (1978) gives a description of the egg laying with *Ph. muralicola* (Maughan & Fitch). As to the development of eggs and young, additions can be given to the observations published so far.

Material and methods

The spiders were individually kept in glass cages (20×15×20 cm) with a wooden lid with an opening that can be closed and a larger one, gauze covered, for air. The cages were placed in a room on the south-side of my house. The room has partially a flat roof and a large window. Thanks to this the temperature in the room is strongly dependent on the outdoor temperature. In summertime and in sunshine temperatures higher than 30 °C are reached. In cold weather conditions the room is heated in the daytime but the temperature is rarely higher than 18 °C and falls back to 10 °C at night and in case of severe frost even to 5 °C.

The temperatures mentioned in this study were calculated by means of the monthly survey of the Koninklijk Nederlands Meteorologisch Instituut (Royal Dutch Meteorological Service) at De Bilt (Province of Utrecht), averaging the day-temperatures from Beek (Province of Limburg) and De Bilt.

The spiders were fed with Tipulid midges, Calliphorid and Muscid flies, queens of the ant *Lasius niger* about to take to the air and, in winter time, with maggots or flies just emerged (Calliphoridae).

Unless stated otherwise, all specimens have been captured at home as adults. Therefore, it was not known if and how often these females already laid eggs before. In the cages mainly females were kept. The males that were put with the female usually stayed with her until their death. Sometimes they were removed after mating.

RESULTS

Egg laying, a case study

The spiders kept in captivity, produced 32 egg-batches, only two of them were produced in the daytime. A description of my only complete observation is given here.

April 21, 1983, 14.45 h. The female hangs upside down in her web. Some time before she starts laying eggs, the abdomen is kept horizontally, but the legs are flexed more strongly than in the normal posture. The tarsi of the corresponding legs are held close to each other, legs I to the front, legs II just above the sternum, legs III just above the epigyne and legs IV more backwards. The tarsi of the legs are all about 0.5 cm apart from the corresponding one in the web.

The female jerks fiercely every now and then with her whole body, alternating with a slow move from left to right, by first tightening the left legs and then the right ones, without shifting the leg position. Again and again she moves her abdomen up and to the front, so that the ventral skin between the epigastric fold and the spinnerets touches a thread kept between the tips of legs III. After that the abdomen is brought back slowly into the horizontal position. This movement strongly resembles the movement the male makes while producing a drop of sperm. All this behaviour of the female is continuously interrupted by spells of total rests.

Then a clear, transparent drop appears from the genital opening in which the white eggs are clearly visible. She holds the drop at the top with legs II and III. It can be seen clearly that she is pressing; at the dorsal side of the abdomen grooves appear in the longitudinal direction. After one minute of pressing the drop is finished and she moves a bit downwards. The drop appears to stick at its top to the thread between legs III. The bottom of the drops rest on the sternum as well as on the abdomen.

The female now begins to move her body backwards and forwards. She holds the drop with her leg II and III, which even sink in it a little bit and seem to stick to it. Light kneading movements are made with legs II and III. It is as if the drop is being massaged. The drop becomes darker in colour. After 4 minutes and about 120 of these kneading movements she stops. The drop now looks greyish and hangs apart from the female loose on a thread, probably the same thread that was first held by legs III. While she holds this thread with the drop with legs II and III, she starts to enswathe it with legs IV. She does this in the same way as wrapping a prey. At first she wraps the lower half of the drop. After 1 minute and 14 seconds she shifts legs II and III upwards along the thread and starts with the upper half. After totally 1 minute and 52 seconds she has spun about 500 threads round the eggs and stops.

During the next 35 seconds the female bites into the bottom of the batch, which she still holds with legs II and III. After this she pivots round her length axis, with the batch in her chelicerae, so that the spot where the batch was attached to the thread, is now below her. Then she lowers herself along the side of the batch and with a quick stroke of her legs she snaps the thread. Next she goes back to a corner of the cage, her resting place, with the egg-batch in her chelicerae (fig. 7). The drop with the eggs still looks greyish and the eggs cannot be distinguished any more.

From the moment of the appearance of the drop till the withdrawal to the corner of the cage, nine minutes have passed. Three quarters of an hour later the drop within the strands of silk has thickend a bit and the eggs are clearly visible as separate globules. The colour of the eggs now is brownish-grey, while being white when appearing in the drop. On June 3rd, 43 days later (in cold weather conditions), 63 young hatched from this egg-batch.

Egg-batches

A. The number of batches per specimen and their spacing in time.

Table 1 shows the dates of egg-laying by the individual spiders, each in its own cage. All batches, except two, were produced at night.

Data per cage.

Cage 0. – In May 1981 a male and a female were put in this cage. During the period in which they were together they repeatedly mated. On October 3 the male ate the female. On November 16 the male died as well.

Cage 1. – On October 5, 1982 a female was put in this cage. On October 26, a male was added, but he was eaten by the female on the same day. On April 14, 1983, again a male was brought in with this female. Mating immediately started, after which the male was removed. The egg-batch of

Table 1. Batches per cage (= spider). Given is the date (day, month, year) and the number of eggs laid on that day (= n).

CAGE	DATE - n	DATE - n	DATE - n	REMARKS
0	21May81-40	01Jul81-12	30Aug81-7	female eaten by male
1	. .	. .	24Aug83-11	no cocoons in '85
	[14May84-*]	. .	[17Aug84-*]	died in April '86
3	?	20Jun84-35	14Aug84-17	2 coc. '85 died Jul85
4	?	17Jun82-30	. .	
	21Apr83-63	30Jun83-46	29Aug83-30	Female died March '85
	[29Apr84-*]	18Jun84-48	05Aug84-32	
5	n.m.	n.m.	18Sep83-17	3 coc. '85 died June '86
6	12Jun83-16	26Jul83-18	01Sep83-17	no cocoons in '85
	15May84-22	. .	06Aug84-25	died October '85
7	04May83-57	26Jul83-18	30Aug83-24	3 cocoons in '85
	16May84-37	11Jul84-26	20Aug84-24	died August '85
9	24May83-41	. .	. .	Also in '84, '85, no coc.
11	04May84-50	04Aug84-46	[11Sept84-12]	2 coc. '85 died Aug.'85

[date-n] = eggs not fertilized and removed by the female.
. . = Female did mate, but laid no eggs.
n.m. = Female did not mate and (thus) laid no eggs.
* = Number of eggs not counted.
? = Female captured whenbeing adult and possibly having laid eggs before.

NB: The female in cage 7 laid eggs in 1985 on May 11, June 30 and August 17. This last batch was not fertilized.

May 14, 1984, appeared to be non-fertilized (solid, yellowish, non globular eggs) and was removed from the web by the female on May 19. The non-fertilized batch of August 17, was sucked by her on August 23, and she removed the remnants the next day. Despite good nourishment she did not produce eggs any more and died the 21st of April 1986.

Cage 3. – On June 18, 1984, a female was put in this cage. This female apparently already mated, no male was introduced.

Cage 4. – On June 8, 1984, a male and a female, captured while they hung in the same web, were put in this cage. On October 20, the weak male was removed. The eggs produced on April 21, 1983, were laid during the afternoon and the description was given above. The eggs still fertile of August 29, were laid 313 days after the removal of the male. A batch laid 577 days later (on April 29, 1984) contained infertile eggs (dark coloured) and was removed by her on May 6. On May 22, 1984, again a male was introduced, mating followed within a few minutes. After recharging his palps with sperm[1]), the male was removed from the cage. In the spring of 1985 she obviously had become very weak, while wrapping prey she inserted long breaks and did not eat them any more. Part of the book lungs appeared to have collapsed or disappeared, while the abdomen had thickened dorsally at the lungs level. She died on March 5, 1985.

Cage 5. – On February 8, 1984, a subadult female was put in this cage. In February she had several maggots for food and moulted to adulthood on April 25. On September 4, 1984, two males were introduced into the cage at the same time. They mated with the female that same afternoon the one after the other. The smaller male was frequently chased by the larger one thus lost a leg and was eaten by this male on October 10.

Cage 6. – On October 25, 1982, a female was put in this cage. On June 2, 1983, a male followed and mating immediately took place. The male died on August 28, 1983. The egg batch of August 6, 1984,

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[1]) A male introduced to a female, already has his palps filled with sperm. After courtship and mating, he will recharge his palps within a few hours.

was laid 344 days after the death of the male and contained about 40% infertile eggs. Afterwards the female did not produce any eggs and died on October 4, 1985.

Cage 7. – On November 22, 1982, a female was put in this cage. On April 8, 1983, a male was introduced and again the mating started within a few minutes. On May 16, 1984, she laid eggs round 12.30 hours, an event I just missed. This couple repeatedly mated in the months of July and August. This is the reason why the female lost her egg-batch of August 20 on August 25, when it fell to the bottom of the cage. This female produced three more batches in 1985 and died early October that year.

Cage 9. – A female was put in this cage on October 15, 1982, followed by a male on October 26. The male was eaten by the female on November 2, 1982. In spite of sufficient nourishment she laid no more eggs and died in 1985.

Cage 10. – On October 22, 1982, a subadult female was put in the cage. On May 11, 1983, this female moulted. No male was introduced. In spite of sufficient nourishment she laid no eggs and died in 1985.

Cage 11. – On June 6, 1983, a female was put in this cage. On September 2 a male was introduced and mating started within half a minute. The eggs, laid on September 11, 1984, appeared to be infertile, despite the presence of the (weak) male; they were removed by the female on September 13. The male died on December 19. During 1985 the female laid two more non-fertilized egg-batches and died in August of that year.

If a batch with infertile eggs gets stuck in the web somewhere, after removal by the female, she cuts it loose again until it lies on the bottom of the cage. Sometimes the eggs are sucked out and the remains then removed.

As shown in table 1, the number of eggs can vary strongly from batch to batch. The mean number of eggs was 29.8 (n=27). The mean number of eggs of the batches in the first column is 40.8; these are in general the first batches of the year. In the second column the mean is 31.0 and in the third one, the last batches of the year, the mean is 19.9. Some of the batches are not used (non-fertilized, difficult to place) for calculating these averages. The infertile eggs in batches otherwise normal have been counted.

B. Influence of food on egg-production.

Table 2 shows the time interval between a meal of protein rich prey, such as queens of *Lasius niger* about to fly out, and the production of eggs: an average of 10 days (the female from cage 7 not counted, see table 2). If also other prey animals (smaller flies, midges, Tipulids) are taken into account the mean number of days between consumption and egg-production was 12.6. In February all spiders were fed with one or more maggots or freshly emerged flies.

Table 2. The laying of eggs after consumption of a *Lasius niger* queen.

Date of cons. L. niger	Cage number	Date of egg production	Days later
19 Aug83	1	24Aug83	5
19Aug83	4	29Aug83	10
20Aug83	6	01Sept83	12
19Aug83	7	30Aug83	11
29Sept83	all	none	—
30Jul84	1	17Aug84	18
30Jul84	3	14Aug84	15
30Jul84	4	05Aug84	6
30Jul84	6	06Aug84	7
30Jul84	7*	20Aug84	21
30Jul84	11	04Aug84	5

* The female in cage 7 still had an egg-batch when consuming a *L. niger*.

The observations described above can be summarized as follows.

In my house *Pholcus phalangioides* produces eggs from the end of April to the end of September and almost always during the night. Only in the case a female is well-fed and mates for the first time, eggs are laid soon after the mating. If a female is less well-fed the eggs are laid only when enough food becomes available.

If a first mating takes place towards the end of the year, the eggs are laid in the following spring. The female of *P. phalangioides* appears to be able to store sperm so that fertilization can still take place 344 days after mating. The amount of sperm received during copulation is sufficient for three egg-batches. After a few days batches only containing infertile eggs are remove from the web by the female.

Food consumption appears to stimulate the production of eggs. Females are able to lay nine egg-batches during the three years they are adult. The mean number of eggs per batch is 29.8. The number of eggs in the first batch of the year usually is larger than in the second batch and lowest in the third batch of the year. Females that did not mate are absolutely unable to produce any eggs.

Table 3. Duration of the development in days of the eggs and the second stage (prenymphs).

A	B	C	D	E	A	B	C	D	E
4	3	30Jun83	16	5	1	1	24Aug83	26	8
7	2	26Jul83	18	6	4	4	29Aug83	28	8
6	2	26Jul83	18	6	9	1	24May83	28	4
3	2	14Aug84	19	10	7	3	30Aug83	30	8
6	5	06Aug84	20	7	6	3	01Sep83	31	9
11	2	04Aug84	20	8	7	4	16May84	36	8
4	7	05Aug84	21	7	6	4	15May84	36	7
7	6	20Aug84	23	12	7	1	04May83	37	8
6	1	12Jun83	23	5	11	1	04May84	39	8
4	6	18Jun84	24	10	5	1	18Sep84	41	14
7	5	11Jul84	24	7	4	2	21Apr83	43	7
3	1	20Jun84	24	9					

A = Cage number; B = egg-batch number of the female concerned; C = date of egg production; D = duration of the development of the eggs in days; E = duration of the development of the prenymphs, in days, till the second moult.

Duration of development of the eggs

All egg-batches studied were laid in 1983 and 1984 by eight females (table 3). The time needed for development in days, from the moment of laying until the hatching of the young, can vary considerably (table 3).

Figure 1 shows the duration of the development of 23 egg-batches put against the mean outdoor temperature during that period. It shows to be strongly temperature-dependent. The mean duration of the development is 27.2 days (S.D. 8.0) with a mean outdoor temperature over this period of 15.5 °C (S.D. 2.7).

Female behaviour while carrying eggs

It was observed regularly that an egg batch carrying female attached it to the web in order to be able to eat, mate or to clean herself, but only a few days after laying the eggs. The female therefore attaches a thread to the web and brings it, with the aid of both legs III, slowly to the batch, the tarsi touching each other. She then takes the batch in her legs II and III and attaches a thread to it by touching the batch a few times with her spinnerets at the point where it is kept by legs III. Then she looses the batch, and by now it is suspended from the web.

A prey can be wrapped by the female while she carries the batch in her chelicerae, but more often she attaches the batch to the web first. If a female carries an egg-batch a male has to exert himself more than usually to obtain a mating, which in most cases meets with success. When a male tries to insert his palps while the female still holds the eggs in her chelicerae, he does not succeed. When after elaborate courtship by the male, the female is willing to mate (the epigyneal region has swollen), she first attaches the batch to the web, mates and then returns to her eggs immediately afterwards. She snaps the supporting lines with her legs III and takes them back into her chelicerae again, sometimes after first having cleaned herself.

When disturbed the female always immediately returns to her eggs and takes them, in case of a serious disturbance, back in her chelicerae, or resumes after a short while, in case of a less serious interference, eating prey, cleaning, but never mating.

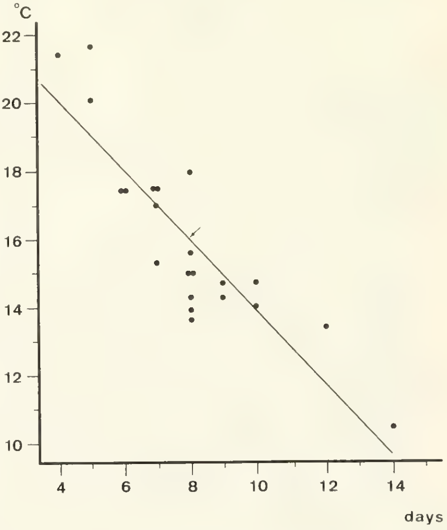
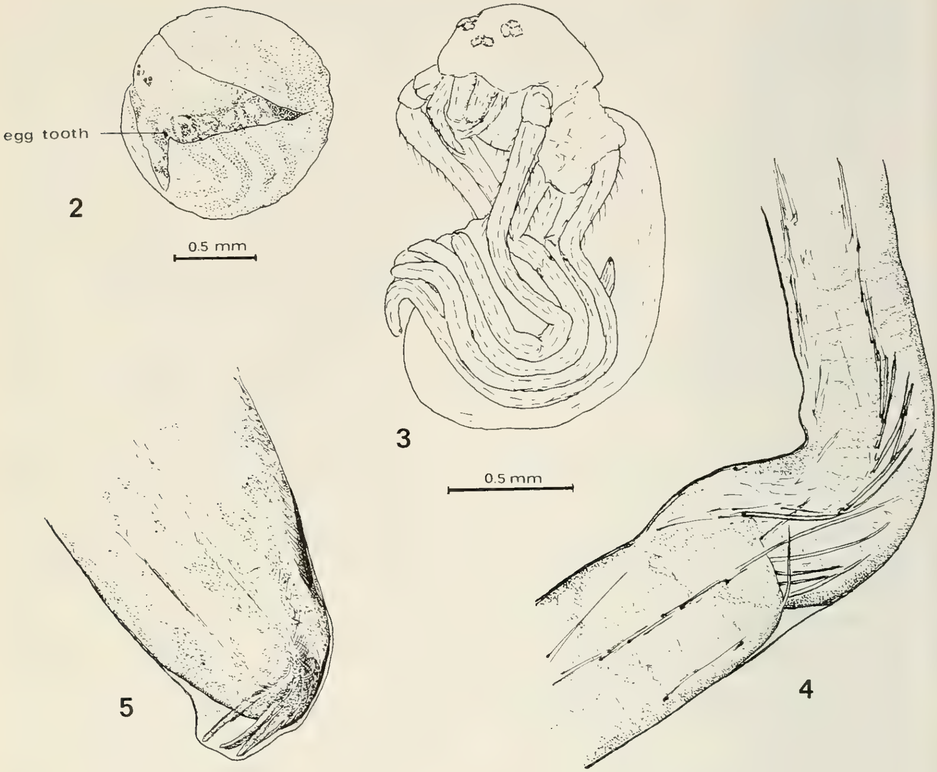


Fig. 1. Duration of the development of eggs in relation to the outdoor temperature. ↓ = indicates the average; __ = linear regression-line: $y = -0.327x + 24.351$; $r = -0.977$; $p \ll 0.001$; $n = 23$.



Figs. 2—5. *Pholcus phalangioides*. Fig. 2. Young in ruptured chorion. (Drawn from a slide.) Fig. 3. Young stuck in the remainder of the prelarval integument. Hairs no longer covered by the prelarval integument stand erect, others, still covered shine through the skin and lie flat. Fig. 4. Part of a leg (femur-tibia joint) still within the prelarval integument. (Drawn from a slide.) Fig. 5. Tarsus of a leg still within the prelarval integument. The tarsal claws can be seen within it. (Drawn from a slide.)

Dispersal of the young

Some 10 to 15 days before hatching a breach in the chorion is visible (fig. 8), leading from the frontal side, just below the clypeus of the young spider, backwards to the side of the abdomen which is folded forwards against the sternum (fig. 2). The eyes which are already discernible, and part of the carapace and the palps as well as the coxae of the legs show through the crack (fig. 9).

About this time the female starts to loosen the batch a bit, which is necessary because there is an increase in the diameter of the batch (approximately 0.5 mm, as was later measured with other eggs). She does this by biting through the threads round the eggs. She attaches the batch to the web as previously described, holds it with legs II and III with which she turns the batch in order to reach other threads. She then picks up the threads very carefully with the cheliceral fangs without touching the eggs and bites them through or pulls them free. Afterwards she takes the batch in her chelicerae again.

This behaviour was observed 13 days before hatching at the earliest. If she has once started this behaviour, she shows it regularly and with increasing frequency and duration at each bout, as the time of hatching approaches. Towards the time the young hatch, one can perceive a regular indenting of their carapace, just behind the eyes. After a while the spiderling starts stretching its legs and con-

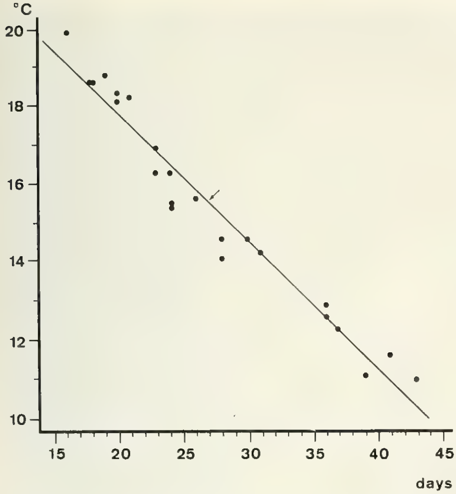


Fig. 6. Number of days between hatching and the second moult (= the first moult outside the chorion), in relation to the outdoor temperature. ↓ = gives the average; ___ = linear regression-line; $y = -1.055x + 24.334$ $r = -0.876$: $p \ll 0.001$; $n = 22$.

tinues to do so until it has freed itself and has reached the outside of the batch. Soon all the spiderlings are on the outside.

Often the female still holds the batch in her chelicerae and after a while she then has a cluster of spiderlings hanging on her jaws (fig. 10). It also occurs that the female attaches the batch to the web when the young are about to emerge or just after the emergence of the first young. Shortly after hatching, till some hours hereafter, the young crawl along the webstrands and disperse just above the remnants of the batch, within a circle with a diameter of about 5 cm, depending on the number of spiderlings. When some spiderlings have remained in the batch, the female is seen to brush the batch, carefully but quickly, with legs II and III and sometimes also legs IV (fig. 12). She also goes on biting the threads, besides carefully evading the bodies of the young spiders. She may be engaged with this behaviour up to three days, with intervals. The young that are still caught in the strands as well as the undeveloped eggs are sucked out, so that only a skin remains, after which she removes the remnants from the web.

As an experiment some batches were filched from the female, at an early stage and not without some effort. They were suspended on a tiny needle in a jar. The eggs developed quite normally, with the exception of a few that were damaged. During hatching it was obvious that those young had great difficulties to free themselves from the spinnings (fig. 11). Even a single thread could give insurmountable troubles. In general the young which were more on the outside succeeded most of the time in freeing themselves after some hours of hard labour. As to the young more to the centre of the batch this effort took much longer. Some of those young did not manage to free themselves even after three to four days of continuous struggle. These young died. Spiderlings near the outside, but caught in the threads with one or more legs, can sometimes free themselves during the first moult outside the chorion. When this does not meet with success they die after all.

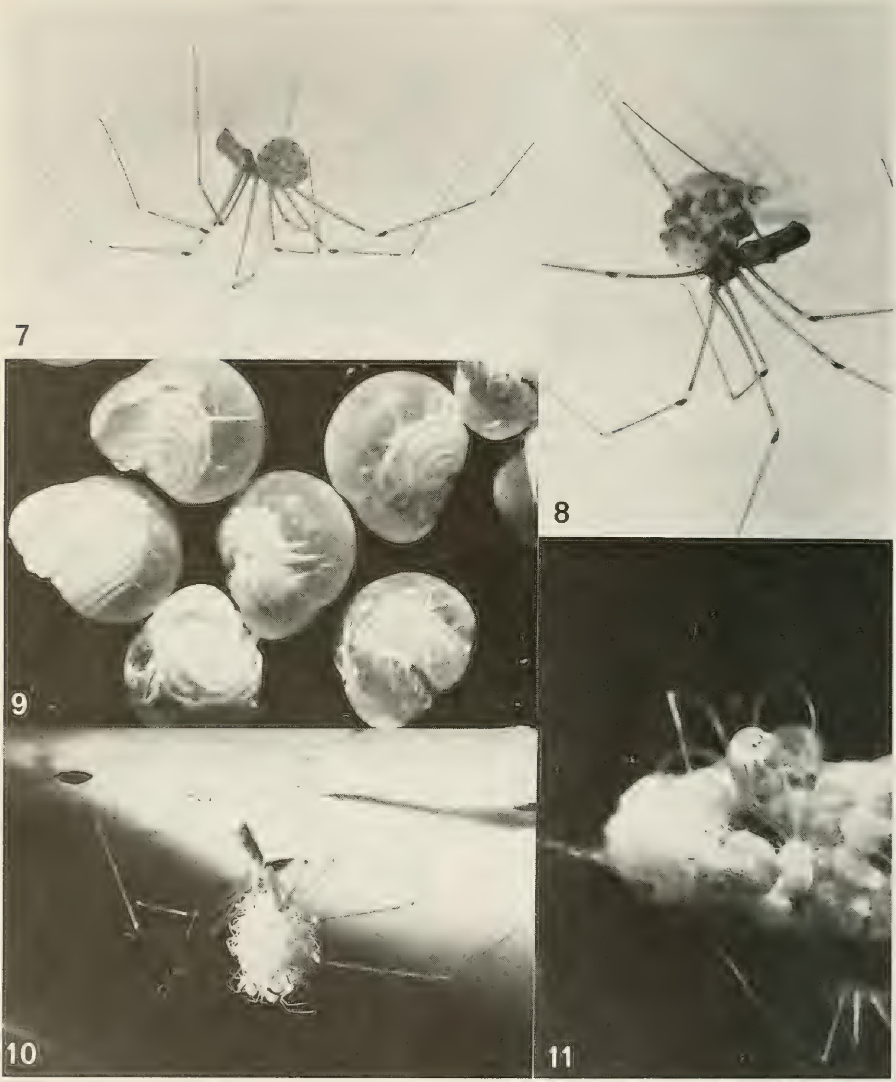
Summarizing we may state that 10 to 16 days before hatching the chorions break. From 13 days onwards before hatching the female loosens the batch more and more by cutting the threads around the eggs. The young emerge quickly, whereby the stragglers are being helped by the mother: she brushes the batch with her legs and cuts threads. The batch is then still held with the chelicerae or attached to the web. Young that stuck are sucked. In an experimental situation, with no female present, the young clearly have more difficulties freeing themselves.

Development of young

By closer investigation part of the young proves to have died in the remainder of the batch while still sitting partly in the chorion. It reveals that the part that still sticks, the legs, is enveloped by a very thin skin. The hairs on the free part of the leg stand erect, while the hairs on the part still covered lie completely flat (fig. 3). The skin that envelopes the legs, contains neither hairs nor tarsal claws and is not segmented either. Through this very transparent skin the characteristics of the next stage can be seen, i.e. the new skin still wrinkled, with hairs and tarsal claws (figs. 4 and 5). Hence it appears that the young that comes free nog only frees itself from the chorion but also from the first prelarval integument. Some of the young that died, stuck in this moult (fig. 3). The prelarval integument is so thin and transparent, that nothing recognizable can be found after hatching.

The most remarkable characteristics of the emerging spiderlings are given below.

Mobility: The spiders move little, disperse inside a small region in the web around the mother and move away when touched.



Figs. 7—11. *Pholcus phalangioides*. Fig. 7. Female with eggs. Fig. 8. Female with loosened batch of eggs, a few days before the dispersal of the young. Fig. 9. Prelarvae after the rupture of the chorion; in the two prelarvae on the left the blackish egg-tooth on the palp is visible. Fig. 10. Female with freshly hatched spiderlings. Fig. 11. A spiderling struggling to get free.

Cuticle: Not pigmented and with fewer hairs than with the nymph.

Legs: all joints are present. Hairs are present, but less than with the nymph. One trichobothrium on each metatarsus. The foot claws are toothed.

Chelicerae: The fang is present and looks nor-

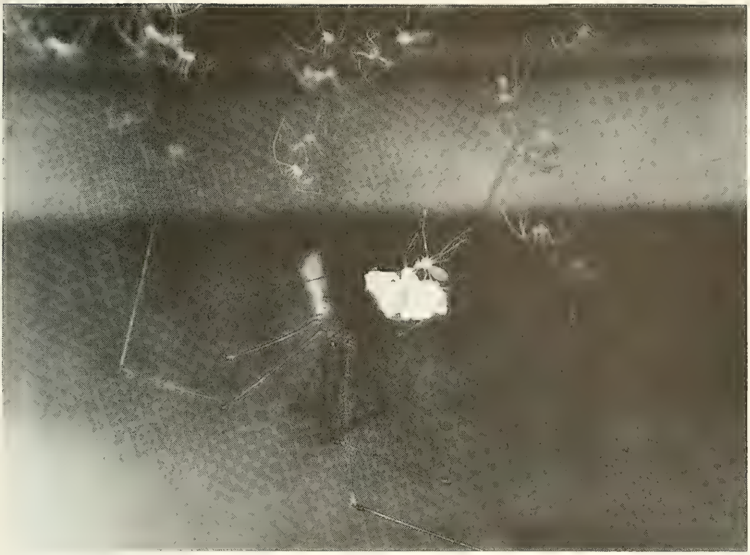


Fig. 12. Female of *Pholcus phlangioides* assisting the spiderlings to free themselves from the webstrands.

mal, but the poison-duct is not clearly visible (a poison-duct is not necessary; they still live on their yolk reserves).

Spinnerets: Spinnerets and silk glands are present. The young are able to spin threads.

Eyes: The eyes look normal, but are surrounded by a brown pigmented area and not by a black area as in older spiders. The eyes are not elevated and lie flat on the carapace.

I have never seen prenymphs spin threads themselves, if they had webstrands of their mother at their disposal (normal situation). I only observed the latter with spiderlings that hatched from eggs suspended from a needle. One day after emergence the spiderlings are able to spin threads themselves. These lines are double and thin and are sometimes drawn out of the spinnerets with the aid of the tarsal claws of legs IV. They are able to attach these lines efficiently, and the fast movements of the spinnerets are then clearly visible. When seriously disturbed they partly drop on a thread spun by themselves. Later they climb back along the same thread. The prenymphs in the mother's web do not yet show the characteristic rapid whirling movements of this family. They pull themselves up a bit between their legs at most, while the mother indeed vehemently whirls. In the first nymphal stage the young do sometimes show this behaviour.

After a period of a few days the young sit very still. When they place the tarsi of the legs close to or against each other the second moult begins.

The time that passes between hatching and this second moult is, as with the development of the eggs, strongly temperature-dependent (fig. 6). On the average moulting starts 7.9 days after hatching (S.D.=2.3; n=22; table 3), with a mean outdoor temperature during this period of 16.0 °C (S.D.=2.7).

A period of 15 days was noted with young that developed in a batch taken away from the female (November 8, 1983).

DISCUSSION

Egg laying, a case study

Egg laying with Pholcids has been described earlier by Pokrowsky (1899) for *Pholcus opilionoides* and by Maughan (1978) for *Ph. muralicola*. Pokrowsky possibly had *Ph. phalangioides* in mind. In the past century these two names were use as synonyms (Simon, 1866). Van Hasselt (1870) also mentioned *Ph. opilionoides* while in view of the size of his specimens he clearly had *Ph. phalangioides* in mind. Nowadays both names are used for different species.

In a few lines Maughan (1978) describes egg laying with *Ph. muralicola*, a species resembling *opilionoides* and *phalangioides* but being a little bit smaller. Both Pokrowsky and Maughan describe the female's posture before laying eggs as a resting posture. They do not mention the tarsi placed close to each other which is not the case in the resting posture. Observations in the literature on egg laying with *Ph. phalangioides* are possible lacking because most of the eggs are not laid in the daytime and the proper laying is only of short duration. Montgomery (1903) "...watched pregnant females for long intervals in the hope of seeing it...", but without success. With *Ph. muralicola* eggs were extruded by pulsating movements of the abdomen (Maughan, 1978). Pokrowsky (1899) describes the female making strange movements with the abdomen extruding the eggs with the aid of abdominal muscles. These movements may correspond with the female's movements observed by me. The action of the abdominal muscles can be seen: the grooves in the longitudinal direction which arise when squeezing. Pholcids do not possess dorsoventral muscles (Kaston, 1981) so that these grooves must be caused by the longitudinal muscles.

The colour of the eggs when laid is in accordance with the observations of Pokrowsky and Maughan. With *Ph. Muralicola* eggs became brown or black as development proceeded (Maughan), while Pokrowsky only describes that the eggs become dry and lose their lustre after a few minutes. Maughan (1978) writes nothing about the presence of a fluid during laying, while Pokrowsky (1899) only mentions that they are "made wet by a fluid". However, I clearly observed a drop in which the eggs appeared. The presence of such a viscid drop was described with more species. In those cases it was observed that the viscosity of the fluid is such that the egg mass largely retains its globular shape. This drop also contains sperms (Gertsch, 1979) or possibly sperms (Montgomery, 1903). The viscosity of the drop with *Ph. phalangioides* is so strong that this, without being wrapped in silk, keeps hanging from a thread all by itself, so that the spider can start throwing silk around it. Assuming that the drop contained sperms, it might be possible that the function of the 4 minutes kneading movements by the female is to produce a better contact of the sperms with the eggs. However, it is also possible that the female checks the viscosity of the drop and waits until this is strong enough by drying up. In doing so the female can leave the drop hanging on a line without the danger of its flowing out and next she can start wrapping it. The former assumption does not exclude the other. The kneading movements were not observed by Pokrowsky and Maughan. Mention is made of the help of legs while laying (legs III, according to Maughan; with one of her legs, according to Pokrowsky). Pokrowsky already saw some threads around the eggs, before the female started enswathing them. In whatever way this is possible is not clear to me. Pokrowsky's observation about the female enswathing the eggs with her front pair of legs must be wrong.

The snapping of the thread on which the egg-batch hangs with the aid of the legs was observed more frequently by me with females that temporarily hung the batch in the web and took it back in the chelicerae after eating, mating or cleaning. Montgomery (1903) also described this behaviour. It is clear by now that *Pholcus* enswathes the eggs with silk. Earlier it was believed that the eggs were merely glued together (Bonizzi, 1869; Becker, 1892), but in what way can the female carry the eggs without damaging them? However, in those days there were authors who did mention a thin silk covering around the eggs (among others: van Hasselt, 1870). Later it was confirmed by more authors (Montgomery, 1903; Bonnet, 1930b; Chrysanthus, 1950; Wiehle, 1953; Bristowe, 1941, 1958; Gertsch, 1979; Kaston, 1981). Carrying the egg-batch in the chelicerae, probably to protect it, is a thing that is mostly mentioned with the descriptions of this species. The silk threads around the eggs are very thin and probably this is the reason why they were not observed by some authors. Yet the number calculated of about 500 lines around the eggs is more than expected.

Egg-batches

The dates for the first batch given in literature are not widely spread. Chrysanthus (1950) saw the first egg-batch on April 26. Montgomery (1903) and Bristowe indicated the month of May for this. The last batches were seen in August (Bristowe, 1958). Montgomery (1903) even saw a female lay eggs in November. However, Schaefer (1976) observed *Ph. phalangioides* laying eggs the whole year through, with a maximum in May. The population investigated by him lived in cellars, where the temperature, in winter, too, did not fall below 20 °C. Schaefer calculated a zero point of development with about 14 °C and also mentioned that females are able either to mate or lay eggs and young are not able to hatch at temperatures below 10 °C. The lower temperatures in winter causes the periodicity found in this and other researches. Bonnet (1930b) in this aspect also mentions; "that spiders do not moult at temperatures lower than

13 °C, one can assume that this temperature at least is necessary, because tissues have to be formed which also applies to the development of the young in the eggs".

Bonnet (1930b) and Schaefer (1976) mention that a condition for the female to lay eggs is that she must have mated, which also appears from this research. Mating does not necessarily have taken place just before laying. Bristowe (1958) already stated that a female is able to produce eggs in May or June, after having mated in the previous summer. Schaefer (1976) mentions a period of 17 to 36 weeks. Now it was even observed that fertile eggs can be laid after a period of 11 months after mating. Some of the eggs in this batch were infertile, probably because of a shortage of (vital) semen. Eggs are laid under good conditions indeed, rather soon after the first mating. This was also observed by Bonnet (1930b) and Chrysanthus (1950). In that case the period between mating and laying is roughly in accordance with the two weeks Seitz (cited in Foelix, 1979) mentions and which are necessary for the increase of the volume of the eggs in the second stage, which starts after mating. An increase in diameter of the female's abdomen was not noticed by me and was not measured either. This again is in accordance with the observations of Gerhardt (1921). Montgomery (1903) and Kaston (1981) wrote that females did not produce more than three cocoons. He probably means: not more than three cocoons per year. It appears that females are able to produce at least six batches with a maximum of nine.

Egg-batches falling on the bottom of the cage only contain infertile eggs in all cases and are removed by the female herself, sometimes after they were first sucked by the female. Van Hasselt (1870) saw up to two times the complete disappearance of a cocoon and then supposed them to be sucked by the female. Montgomery (1903) noticed that from the 12 cocoons observed by him 4 had dropped and did not hatch. He writes that these cocoons dropped by accident when hung in the web. Of the 32 batches observed by me, only one has dropped by accident, apart from the 4 clearly nonfertilized ones, which were removed by the female herself. This was the last egg-batch – in this research – of the female in cage 7. She had to hang the batch in the web many times because of the many matings. On the fifth day after laying she fished up a remainder of an earlier prey in her chelicerae instead of the batch which lay on the bottom. An egg-batch does nog simply fall out of the chelicerae. If one wants to take away the batch from a female, a relatively great force has to be used. It takes a lot of trouble and it will not go without destroying a large number of eggs. Bonizzi (1869) and Montgomery (1903) already stated that the female will not quit the egg-batch even if treated roughly. I assume that the 4 cocoons "lost" by Montgomery's spiders, contained infertile eggs and were removed by the female herself, because none of them produced any young. The egg-batch lost by the female in cage 7, which could be saved, did produce young. Yet a dozen eggs did not survive the fall and treatment afterwards.

A connection between the moment of food consumption and the time of egg production is not mentioned in the literature.

The number of eggs for *Ph. phalangioides* given in the literature lies between 13 and 60 (Bonnet, 1930b; Chrysanthus, 1950; Wiehle, 1953; Kaston, 1981). But these are incidental observations. Only Schaefer (1976) gives a mean number of 33.2 eggs per batch (n = 16, 28-46 eggs).

The diameter of the batches was not measured by me. Locket & Millidge (1951) give about 5 mm for this, and Wiehle (1953) 4 mm. Kaston (1981) even gives the diameter in relation to the number of eggs: a batch of 4.7 mm contained 29 eggs; an other of 3.6 mm had 25 eggs. The size of the eggs was also given by him: 1.2 to 1.3 mm long and 0.94 to 1.2 mm thick. On other cocoons of *Ph. phalangioides* I ascertained later the following diameters and egg numbers: diameter 3.6 mm – 36 eggs; 4.5 mm – 42 eggs; 5.4 mm – 60 eggs. The greater part of the time the first egg-batches are bigger than the next, as with many more spider species that lay eggs more than once (Chrysanthus, 1950; Gertsch, 1979; Foelix, 1979). In addition Gertsch mentions that some of the later eggs may be infertile, owing to the exhaustion of the semen supply stored in the receptacles, and perhaps also to its gradual loss of viability (see also Montgomery, 1908). With *Ph. phalangioides* the latter only seldom happens because the females nearly always are susceptible to the males, this in contrast with the observations of Montgomery (1903) and Gerhardt (1921, on *Ph. opilionoides*). If with *Ph. phalangioides* the male stays away after a copulation, the phenomenon of infertile eggs does occur, but only if afterwards several batches are produced. In general the number of eggs in spring is again larger than the number in the autumn of the previous year, but smaller than in the first batch laid by the female. But as is already mentioned the number of eggs also depends on the supply of food so that differences can also arise because of this.

Duration of development of the eggs

It is only Schaefer (1976) that gives the duration of the development of the eggs in relation to the temperature: 18.1 days with 23 °C (n = 8) and 54.7 days with 16 °C (n = 6). This is in accordance with the data of this research. Other authors only mention the duration of the development observed by them, which most of the time lies between two and three weeks (Bonizzi, 1869; Montgomery, 1903; Bristowe, 1958). Chrysanthus (1950) mentions a very long duration of 52 days for eggs laid in spring.

Female behaviour while carrying eggs

According to most authors the females of *Ph. phalangioides* carry the eggs in their chelicerae from laying up to, or up to and including, the emergence of the young (van Hasselt, 1870; Becker, 1892; Wiehle, 1953; Vachon, 1965; van Katwijk, 1976; Gertsch, 1979; Kaston, 1981; Nentwig, 1985). It was also observed that the female hung the batch in the web, in order to eat, clean herself (Bonizzi, 1869; Montgomery, 1903; Chrysanthus, 1950), or to copulate with an insistent male (Bristowe, 1958). My observations about the way in which the female hangs the eggs in the web and looses them again, is in accordance with Montgomery's observations (1903).

Dispersal of the young

Bonizzi (1869) described the female trying to break the egg shells with her mandibles one day before hatching. He probably observed the breaking of the threads around the eggs. Bonizzi did not observe these threads. For the rest Bonizzi is the only author mentioning this kind of behaviour before the emerging of the young. However, *Ph. phalangioides* starts biting these threads already sooner, probably as soon as the chorions rupture by an increase of volume of the embryo (Bonnet, 1930a; Gertsch, 1979; Foelix, 1979) and with the aid of the sharp egg- teeth at the basis of the palps (Vachon, 1965; Gertsch, 1979). This biting of the threads also occurs with other spiders, particularly wolf-spiders (among others: Montgomery, 1903; Bonnet, 1930a; Foelix, 1979). The fact that females still bite threads after the emergence of the first young, was also observed by Montgomery (1903). This aid appeared to be indispensable for many young. There are clearly individual differences, for some of the females have repeatedly worse results than others.

The time during which the young, after hatching, stay together in a cluster before dispersing in the web to some extent, can vary from some hours (Bonizzi, 1869; Montgomery, 1903) up to some days (Becker, 1892); Chrysanthus, 1950), as also became clear from this research.

Development of the young

The development and morphology of the young of *Ph. phalangioides* after the rupture of the chorion, the presence of a prelarva and a prenymph, are excellently described by Vachon (1965). Emerit (1984 and in a pers. comm., 1985) also emphasizes the presence of a prelarva. The characteristics summed up by me clearly show that the spiderling described is a prenymph (Vachon, 1957, 1965; Emerit, 1984). Canard (1984) uses a different terminology in which these differences with Vachon in relation to *Ph. phalangioides* are given in table 4 (drawn up by Canard, 1985 in a pers. comm.). His terminology shows the different stages in development better, but it is difficult to see when the first period (pullus) ends (with the rupture of the first integument). Accurate observation of the young still partially present in the chorion is necessary.

The duration between the rupture of the chorion and the emergence of the prenymph amounts from 5 tot 10 days according to Vachon (1965), but in this research from 10 to 15 days. Other authors do not mentioned this period, because in general it was assumed that the young did only moult for the first time a few days after hatching.

In the literature the duration of this prenymphal stage is given as 6 to 7 days (Bonnet, 1930b); 10 days (Vachon, 1965) or 7 to 14 days (Bristowe, 1958). Schaefer (1976) again gives the duration in relation to the temperature: 17.3 days with a constant temperature of 16 °C (n = 21) and 7.9 days with a constant temperature of 23 °C (n = 26). In this period the young live on their yolk reserves and are not able to take food themselves (Vachon, 1965), so that the assertion of Bonizzi (1869), that a female spun a fly for them ("...when the more robust of the young animals ran to suck the insects thus prepared for them...") must be questioned. The possibility exists that these "more robust of the young animals" were prenymphs already moulted. A first nymph sometimes carefully tries to suck a prey spun by the female together with her. However, the young was repeatedly spun by the female with the prey. A young that was noticed when sharing in the profit, was simply swept away with a leg each time.

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THE TAXONOMIC POSITION OF THE PACHYNEURINI (CHALCIDOIDEA, PTEROMALIDAE) AS JUDGED BY CHARACTERISTICS OF COURTSHIP BEHAVIOUR

by

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ABSTRACT

Assem, J. van den & M. J. Gijswijt, 1989. The taxonomic position of the Pachyneurini (Chalcidoidea, Pteromalidae) as judged by characteristics of courtship behaviour. — Tijdschrift voor Entomologie 132: 149-154, tabs 1-2. [ISSN 0040-7496]. Published 3 July 1989.

Characteristics of courtship behaviour seem to be of considerable interest from a comparative point of view. A syndrome of behavioural features was used for separating a group of pteromalids (*viz.* the Pachyneurini) from the Pteromalinae, a subfamily to which they were formerly assigned.

Key words. – Pteromalidae; Pachyneurini; taxonomy; behaviour.

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INTRODUCTION

Current classification of the Chalcidoidea is still far from what must be the ultimate aim: an arrangement of taxa reflecting the group's phylogeny. Comparative studies of chalcidoid mating behaviour can make a contribution to this end (Gauld 1986) because they provide, in principle, independent tests of classifications that were based on morphological criteria only (the usual practice). Features of behaviour may serve as characters on different levels. Such features are often species-characteristic; sibling species in particular may be identified more easily on characteristics of mating behaviour than of morphology (e.g. Van den Assem & Povel 1973). Just as well, behaviour elements can serve to separate genera or families (e.g. Van den Assem et al. 1982b). Actually, the use of behavioural features as criteria of classification is of a long standing (e.g. the classification of Anatidae – ducks and relatives –: Heinroth 1910, Lorenz 1941). In the entomological practice severe limitations abound since living specimens are not usually the kind of material at the disposal of taxonomists and, moreover, far from all species will "behave" under laboratory conditions. However, this is no excuse; phylogenetic classifications require supportive evidence from various biological sources.

Those components of courtship repertoires which function as intra-specific signals qualify as useful characters in the first place. They are supposed to have acquired their more or less fixed quality during evolution in a process called ritualisation. Fixation means minimal variation in performance – a necessary quality of unambiguous signals and, likewise, of reliable diagnostic characters. Courtship signals produced by chalcidoid males are, at least partly, of a chemical and/or of an acoustic nature, and cannot be recorded or analysed without sophisticated equipment (Van den Assem 1986). On the other hand, signal emission usually coincides with overt movements of one or more limbs, and these movements can be described and quantified in a simple way (in terms of number of occurrences or of durations; e.g. Barrass 1960; Martin & Bateson 1986).

Previous studies of chalcidoid mating behaviour have corroborated current classifications (e.g. Kogan & Legner 1970, Van den Assem & Povel 1973), or suggested changes (e.g. Van den Assem et al. 1982a, Dahms 1984, In den Bosch & Van den Assem 1986). In the present paper we want to point out an apparent discrepancy, and suggest a change.

MATERIAL AND METHOD

Parasitized hosts were collected in the field and individual parasitoids were isolated prior to emergence, as far as possible, to obtain virgin specimens. (Females of several species are known to mate only once in a lifetime; in some species they appear no longer attractive to males following mating. Obviously, virgin specimens are necessary for studying courtship and mating behaviour in such cases). A list of the material that was used for the observations mentioned in this paper is given in the appendix.

All observations were made with a low-power binocular microscope. Prior to the observations, a male and a female specimen were introduced into a small, perspex cell that was closed with a glass cover slip. The cell's diameter (ca 2.5 cm) corresponded to the visual field of the microscope. Magnifications of 10 or 15 × proved to be sufficient. Many sequences of courtship and mating behaviour were recorded on video tape.

Courtship behaviour of Pteromalinae

Among taxonomists there is consensus that several large families of Chalcidoidea (e.g. Encyrtidae, Eulophidae, Eurytomidae) represent monophyletic entities while others do not (e.g. Pteromalidae, Torymidae). Many lower ranking taxa appear to be non-holophyletic assemblages: the Pteromalinae, a sub-family of Pteromalidae, may serve as an example. Clearly, the Pteromalinae are a "rest" group. Positive morphological criteria for separating Pteromalinae from alternative groups do not exist. Unifying behavioural characteristics do not exist either. Yet, within this group, several clusters of distinctly related genera can be defined, some of which were already recognized by Thomson (1878). Similar clusters are apparent in the checklist of Chalcidoidea by Bouček & Graham (1978): genera are arranged in a non-random order, suggestive of varying degrees of relatedness (never explicitly stated by the authors). Examples are: *Psilonotus-Anogmus-Mesopolobus; Nasonia-Trichomalopsis (= Eupteromalus); Caenasis-Cecidostiba-Hobbya-Ablaxia-Aggelma.* Details of courtship and mating procedures give support to these assumed relationships (unpubl. data).

For the Pteromalinae as a whole, unifying features of courtship and mating behaviour cannot be defined. Yet, for what seems to be a large majority, an assemblage that we refer to as the Pteromalinae s.s., such features do exist. Earlier (Van den Assem 1974), this group has been characterized as "those pteromalids in which the male takes up a frontal position on the female for courtship (by placing his front feet on her head) and produces a sequence of motor coordinations in which the antennae are moved synchronously as each other's mirror image, the general direction of these movements being up and down; the female indicates her readiness to copulate by a special antennal signal (she draws her flagellae tightly to her head capsule) and maintains a frozen posture for some time". This definition – which was based on observations of 14 species – may still serve, although the importance of mouthpart extrusions (see below) as taxonomic criteria was not appreciated at the time.

The elements of courtship and mating which characterize the Pteromalinae s.s. are mentioned below. Actually, it is the syndrome of elements that is characteristic; taken separately, alle features can be found in many other groups as well. Our observations now refer to 37 species (mentioned in the appendix) belonging to the 20 genera enumerated in table 1. We assume that many more can be added to the Pteromalinae s.s. once courtship and mating procedures are known. Our prediction is that the rules which refer to general characteristics of movements, temporal structure, and frontal position of the male (see below) will apply to all near-relatives of the genera mentioned in table 1.

Characteristic behaviour patterns

Courtship position. – The male courts from a frontal position on top of the female, with its fore tarsi placed on the female's head. The precise placement differs between species (e.g. laterally on the female's eyes, on its nape, near the base of its scapes, etc.). By necessity, a male has to back up from its courtship position before it can copulate.

Antennal movements. – The male's antennae, whatever the precise motor coordinations, move as each other's mirror image. The details of these movements, and the corresponding temporal patterns, are usually characteristic for a species or for a group of species. Several kinds of movements are involved; one of them is most conspicuous: the antennal sweep, a swift up-and-down large amplitude movement, and performed just before or synchronously with a mouthpart extrusion (below).

Extrusion of the mouthparts. – The male extrudes (lowers) its mouthparts periodically in a conspicuous way (as if "vomitting"). Extrusions may be combined with head-nodding movements. If so, an extrusion coincides with the upstroke of a nod.

Female receptivity signal. – At the onset of sexual receptivity (i.e. coinciding with the exposure of the genital orifice) the female lowers its antennae (previously held horizontally). It draws the flagellae tightly in to the front of its head (flagellae pointing downwards).

Table 1. Genera of Pteromalinae s.s.; courtship and mating procedures were observed in one or more species

Anisopteromalus Ruschka, 1912
Anogmus Förster, 1856
Caenasis Förster, 1856
Cecidostiba Thomson, 1878
Dibrachys Förster, 1856
Dinarmus Thomson, 1878
Hobbya Delucchi, 1957
Hypopteromalus Ashmead, 1900
Lariophagus Crawford, 1909
Meraporus Walker, 1834
Mesopolobus Westwood, 1833
Muscidifurax Girault & Sanders, 1910
Nasonia Ashmead, 1903
Peridesmia Förster, 1856
Psilonotus Walker, 1834
Pteromalus Swederus, 1795 (including the subgenus *Habrocytus* Thomson, 1878)
Stenomalina Ghesquière, 1946
Trichomalopsis Crawford, 1913
Trichomalus Thomson, 1878
Trychnosoma Graham, 1957

Duration of genital contact. – In Pteromalinae s.s. the duration of genital contact (at 20 °C) is relatively long, ranging between 10 secs (in e.g. *Nasonia*) and ca 1 minute (in e.g. *Lariophagus*).

An experimental analysis of the displays of a few species of Pteromalinae s.s. has revealed (Van den Assem 1986) that mouthpart extrusions are associated with the release of chemical stimuli (pheromones). Head-noddings probably enhance the effects of pheromone release. There are (slight) differences in the precise motor coordinations between clusters of related genera (e.g. the nodding movements of *Anogmus* – *Mesopolobus* species differ from those of *Nasonia vitripennis* and relatives). Several clusters include genera with nodding and non-nodding species. Also, within certain genera (e.g. *Habrocytus*) species may differ in the extent of nodding. Apparently, nodding has been "invented" a number of times, which means that not all nods are truly homologous.

COURTSHIP BEHAVIOUR OF PACHYNEURINI

Courtship displays in one section of Pteromalinae (i.e. the Pachyneurini sensu Ashmead, 1904) do not correspond to those of the Pteromalinae s.s. We believe that the differences are of a fundamental kind (see Discussion), and we suggest to separate the Pachyneurini from the Pteromalinae and preferably raise it to sub-family rank, the Pachyneurinae. Ours is not the only argument: Copland & King (1972) found consistent differences in the structure of the female reproductive system of *Pachyneuron* versus other species of Pteromalinae. Moreover, Bouček and Graham (1978) placed the Pachyneurini at the end of the Pteromalinae in their checklist; not because they believed it to be the most apomorphic section, but because it was unclear where to place it at all (Bouček, pers. comm.). Earlier, Bouček (1961) has suggested that the (then newly described) genus *Vrestovia* was close to *Synedrus* Graham, 1956, *Ablaxia* Delucchi, 1957 or *Caenasis* Förster, 1856, but this suggestion was dropped later. Features of courtship would not support such a relationship either: *Caenasis* males court in the way of Pteromalinae s.s.; males of the two *Vrestovia* species we have seen do not.

Judged by general characteristics of their mating behaviour, the Pachyneurini represent a natural unit. The diagnostic syndrome comprises the following features:

Characteristic behaviour patterns

Courtship position. – The male's fore tarsi are placed at the frontal edge of the female's pronotum (on its "shoulders") or on top of its thorax. In *Pachycrepoideus vindemmiae* the placement is variable: sometimes on the female's thorax, sometimes on its head (but never stereotypical on the head).

Phase shifts. – There are periodic shifts in the orientation of the courting male with respect to the female below. Foreward-backward movements with the entire body occur which coincide with bending-stretching movements of the fore legs while the fore tarsi remain in the same place throughout. (These postural changes are the equivalents of the periodic low phase-high phase shifts described by Van den Assem et al. 1982b.)

Antennal movements. – All displays include movements with the antennae; however, not in all phases are the antennae moved as each other's mirror image. There is no antennal sweep of the kind seen in Pteromalinae s.s., but there is a more distinct forward-backward component in the antennal motions.

Mouthpart movements by the male. – Forward-backward movements are always present, but of an inconspicuous kind which is easily overlooked. There are no real extrusions which suggest "licking" actions, as in the Pteromalinae s.s., and the motor patterns involved differ greatly. (In the Pteromalinae s.s. mouthpart extrusion is a prominent element of a male's display.)

Position of the female antennae. – During courtship, females point their antennae more or less vertically upward, forming an acute figure V. This posture never occurs in female Pteromalinae s.s.

Mouthparts female. – Typically, females hold their mandibles agape as soon as they are mounted.

Female antennal signal and duration of genital contact. – Antennal movements made by the female at the onset of receptivity occur in some species, but judged from direct observations it seems doubtful that they serve a signal function as found in Pteromalinae s.s. Backing up by courting males may involve considerable delays. Antennal movements by the female were absent in *Vrestovia* and *Pachyneuron* species (antennae remain in the upright position throughout) and of a variable quality in *Pachycrepoideus*, from upright to horizontal or below. In *Toxeumorpha* the antennae go into a low position. But even when low, the ensuing posture is less "complete" than in the Pteromalinae s.s. (the flagellae are not tightly drawn in to the front of the head) (table 2).

The duration of genital contact varies between species. In most it is very short (a matter of a few seconds only); in *Toxeumorpha* contacts may last for over a minute.

Table 2. Genera and species (in alphabetical order) which were observed to deviate from the courtship and mating procedures of the Pteromalinae s.s.

Pachycrepoideus Ashmead, 1904; *Pachyneuron* Walker, 1833; *Toxeumorpha* Girault, 1915; *Vrestovia* Bouček, 1961.

Pachycrepoideus vindemmiae (Rondani): Curepe, Trinidad, from pupae of an antomid fly September 1971; Hanoi, Vietnam, from pupae of *Drosophila* spec. Laboratory culture on *D. melanogaster*.

Pachyneuron muscarum (L.): Vleuten, The Netherlands, parasite of *Leptomastix dactylopii* Girault, on *Planococcus citri* in a glasshouse; May 1988.

Pachyneuron planiscuta Thomson: Leiden, The Netherlands, emerged from reed stalks, host unknown, March 1974.

Toxeumorpha nigricola (Ferriere): Natal, Rep S Africa, from pupae of *Zaprionius* spec. in tomato fields, 1980. Laboratory stock on *D. melanogaster*.

Vrestovia fidenas (Walker). Zuidwijk, Wassenaar The Netherlands, on pupae of *Drosophila* spec.; April 1987.

Vrestovia spec.: Amherst. Mass USA, on pupae of *Drosophila* spec.; October 1979. (Bouček in litt).

DISCUSSION

The courtship procedures of species of Pteromalinae s.s. have many features in common. Species of Pachyneurini were found to be different in this respect, not just in a matter of degree but in a fundamental way because they lack a number of what we consider to be synapomorphic features.

By examining the display behaviour of many species, it is possible to uncover phylogenetic trends (i.e. successively more advanced combinations of behavioural traits). Similar trends can be traced in several large families of Chalcidoidea, suggestive of parallel developments. Two of these are relevant in the context of this paper: the switch of the male's courtship position from the rear to the front, in connection with the development of a (secondary) receptivity signal, and the omission of periodic shifts in the position of the courting male relative to the female (Van den Assem 1986). In this respect the Pteromalinae s.s. qualify as synapomorphic: the position of the courting male has moved to the extreme front, the male's head is just above the female's antennae and the male releases a necessary, receptivity inducing stimulus periodically – probably a product of its mandibular glands – by means of extruding its mouthparts. Head-noddings enhance the effectiveness of stimulus release. Females have developed a secondary receptivity signal which is a sufficient stimulus for the male to stop courting and back up (Van den Assem & Jachmann 1982). Phase-shifts in the male's position are absent, males court in a low-phase position throughout. Pachyneurini give evidence of a less advanced condition. The position of the courting male is less extreme; males change their posture periodically during a display (without shifting the position of the forefeet); there is no evidence for pheromonal stimulation by way of specialized movements with the mouthparts. A secondary antennal signal is absent, or, where antennal movements occur, evidence that males take them as a cue for switching to copulatory behaviour is missing. Actually, we often observed a delay between the moment of overt receptivety (the moment the female exposes its genital orifice) and the male backing up, and it seems to be longer, on average, than in the Pteromalinae s.s., although in this group as well males are variable in this respect. To delay backing up to copulate may have serious consequences for a courting male because sneaking competitors may take precedence and mate first (which always means: inseminate more successfully). In this respect the procedures of *Pachyneuron muscarum* are of interest. Males produce a single courtship cycle, back up immediately and attempt to copulate. If the female is not yet receptive then the frontal courtship position is taken up again, a new cycle follows, etc. A similar organization of the courtship display has been observed in *Pteromalus* *puparum*; it was hypothesized that it might be understood as an adaptation to a high level of competition (Van den Assem 1974). *Pteromalus* is a parasitoid of the chrysalids of butterflies from which hundreds of wasps may emerge more or less synchronously. The same explanation may hold for the *Pachyneuron muscarum* display. Moreover, males hold their wings low while backing up, in a cape-like fashion (as do some tetrastichids in an attempt to ward off competitors) thus providing an additional argument. This rapid-pendulum type of temporal organization will prolong the time required to induce receptivity in a female but this loss will probably be more than evened out by losing a copulation to a competitor less often.

For *Pteromalus*, it was argued that the pendulum procedures were probably not an original feature (*Pteromalus* females have a fully developed antennal signal), but for *Pachyneuron* it may be different. Courting males provide conspecific females with stimuli that may induce sexual receptivity. In probably genuinely primitive groups (such as Cerocephalinae) males stay in a caudal position throughout, and a successful courter can thus perceive the onset of receptivity immediately (it receives a tactile stimulus, the effect of the female's abdomen-raising). Pachyneurini males are small enough, and the position on the female is enough to the front to make a direct perception of receptivity unlikely. The most effective strategy would then be to make an inspection on the spot repeatedly, which is what *Pachyneuron muscarum* males do. However, males of other species, which likewise lack a secondary signal, do produce a sequence of cycles before backing up. We have no idea on what cues they might act.

We have argued that the Pachyneurini should be separated from the Pteromalinae and be made a sub-family in its own right. Judged by characteristics of display behaviour, the Pteromalidae comprise an array of subfamilies which combine original character states (e.g. Cerocephalinae, Spalanginae), highly derived character states (Pteromalinae s.s.), or intermediate conditions (e.g. Miscogastrinae, Asaphinae). The Pachyneurini belong to the latter category but they do not fit into one of the existing subfamilies. The conspicuous position of the females' antennae offers no cues (similar positions are observed in many groups throughout the Chalcidoidae). The movements of the males' mouthparts do not provide cues either, nor do characteristics of the respective repertoires. For the time being the Pachyneurini should be kept apart from other groups, awaiting a more profound analysis of mutual relationships.

ACKNOWLEDGEMENTS

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Appendix

Anisopteromalus calandrae (Howard): Savannah Georgia USA, on weevils in wheat stored in warehouse; January 1971. Laboratory culture on *Sitophilus*.

Anogmus hohenheimensis (Ratzeburg): Oberstdorf BRD, on cecidomyids in cones of *Picea abies*; January 1979.

Anogmus piceae (Ruschka): Kiental Switzerland, on idem; August 1978.

Anogmus strobilorum Thomson: Oberstdorf BRD, on idem; February 1977.

Anogmus vala (Walker): Oberstdorf BRD, on idem; February 1977.

Caenasis lauta (Walker): Leiden The Netherlands, from galls of *Cynips divisa*; February 1986.

Cecidostiba semifascia (Walker): Mt Ventoux France, from galls on *Quercus* spec.; August 1978.

Dibrachys boarmiae (Walker): Meyendel Wassenaar The Netherlands, parasitic on a dipterous parasite of an earwig inside stems of *Asparagus* spec.; April 1978; laboratory culture on *Calliphora*.

Dibrachys cavus (Walker): Wageningen The Netherlands, from *Apantheles* pupae on *Pieris* spec.; March 1972.

Dinarmus basalis (Rondani): Slough England, from a laboratory culture on *Callosobruchus chinensis* in beans; May 1981.

Habrocytus bedeguaris Thomson: Bentheim BRD, from galls on *Rosa* spec.; April 1974.

Habrocytus elevatus (Walker): Oberstdorf BRD, on trypetids in flowerheads of *Centaurea* spec.; February 1978; Oegstgeest The Netherlands, on idem in flowerheads of *Arctia* spec.; June 1978.

Habrocytus sequester (Walker): Wijster The Netherlands, from seedpods of *Linaria vulgaris*; September 1977.

Hobbya stenonota (Ratzeburg): Mt Ventoux France, from galls on *Quercus* spec.; August 1978.

Hypopteromalus tabacum Ashmead: McNeil in litt 1974.

Lariophagus distinguendus (Förster): Leiden The Netherlands, obtained as an infection of our laboratory culture of *Sitophilus granarius* on wheat.

Meraporus graminicola Walker: quoted by Barrass (1976).

Mesopolobus rhabdophagae (Graham): Wassenaar The Netherlands, from galls on *Salix repens*; July 1983.

Mesopolobus dubius (Walker): Antequera Spain, from galls of *Plagiotrochus* on *Quercus* spec.; March 1978.

Mesopolobus mediterraneus (Mayr): Antequera Spain, idem.

Mesopolobus fasciiventris Westwood: Bunde The Netherlands, from galls of *Pediaspis aceris* on *Acer*; June 1974.

Muscidifurax raptor Girault & Sanders Riverside California USA, obtained from laboratory cultures on *Musca domestica*, details quoted in Kogan & Legner (1970).

Muscidifurax raptorellus Kogan & Legner: idem.

Muscidifurax uniraptor Kogan & Legner: idem; September 1975.

Muscidifurax zaraptor Kogan & Legner: idem, as *M. raptor*.

Nasonia vitripennis (Walker): Leiden The Netherlands, on pupae of *Calliphora* spec.; August 1971.

Nasonia spec. nov.: Rochester NY USA, from bird nests in nestboxes; August 1987 (this species has long-winged males).

Peridesmia discus (Walker): in Miller, White & Smith (1973), and Miller in litt, 1974.

Psilonotus achaeus Walker: Meyendel Wassenaar The Netherlands, from *Semudobia* galls on *Betula* spec.; October 1976; Oberstdorf BRD, idem; March 1978; 's Graveland The Netherlands, idem; April 1985.

Psilonotus adamas Walker: Meyendel Wassenaar The Netherlands, idem; August 1976.

Pteromalus puparum (L): Ales France, from chrysalids of *Pieris* spec.; August 1971.

Pteromalus venustus Walker: Lethbridge Alberta Canada, from pupae of *Megachile rotundata*; November 1974.

Stenomalina liparae (Walker): Leiden The Netherlands, from galls of *Lipara lucens* in *Phragmites* spec. January 1971.

Trichomalopsis (Eupteromalus) micropterus (Lindemann): Oegstgeest The Netherlands, on drosophilids in apple orchard, August 1986.

Trichomalopsis (Eupteromalus) spec.: Riverside California USA, from a laboratory culture on *Drosophila* spec. from locally collected material.

Trichomalopsis (Eupteromalus) tigasis (Walker): De Lemmer The Netherlands, collected as adults on a window; October 1973.

Trychnosoma punctipleura (Thomson): Oberstdorf BRD, from cecidomyids in cones of *Picea abies*; February 1977.

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PHYLLOGOMPHOIDES INDICATRIX, A NEW DRAGONFLY FROM MEXICO (ODONATA: GOMPHIDAE)

by

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Abstract

Belle, J., 1989. *Phyllogomphoides indicatrix*, a new dragonfly from Mexico (Odonata: Gomphidae). — Tijdschrift voor Entomologie 132: 155—157, figs 1-7. [ISSN 0040-7496]. Published 3 July 1989.

Phyllogomphoides indicatrix spec. nov. from Mexico (state of Chiapas, Ixhuatan) is described and illustrated after a unique male. Corrections on some earlier papers are provided as well.

Key words. — Gomphidae; *Phyllogomphoides* new species; Mexico.

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Introduction

In the State of Chiapas, Mexico, Dr. Rosser W. Garrison collected a male of *Phyllogomphoides* which he recognized as belonging to a new species. He kindly offered me to describe it and for this privilege I herewith wish to thank him very much. In this paper I present a description and illustrations of this dragonfly under the name *Phyllogomphoides indicatrix*, the specific name being suggested by Dr. Garrison himself.

The new taxon belongs to the *semicircularis* species group (cf. Belle 1984), having the superior anal appendages semicircular-forcipate. However, it is very distinct from all other members of the group in the form of the anterior genital hamule which in complexity is nearest to that of *Phyllogomphoides pacificus* (Selys). The thoracic colour pattern resembles that of *Phyllogomphoides suasillus* Donnelly by the well-developed (first and second) pale antehumeral stripes and the (three) pale lateral stripes.

Phyllogomphoides indicatrix spec. nov.
(figs. 1-7)

Holotype ♂: Mexico, State of Chiapas, Ixhuatan (Teapa-Chiapa de Corzo Rd, 400 m), 26 September 1983, R. W. Garrison leg. (National Museum of Natural History, Smithsonian Institution, Washington, D.C.).

Description of male. — Measurements: total length 60 mm; abdomen 45 mm (incl. appendages 3.1 mm); hind wing 36 mm; costal edge of pterostigma in fore wing 4.5 mm.

Head: face brown with conspicuous pale (= bright yellow) markings as follows: labrum with two large pale lateral spots, base of mandibles and genae pale, anteclypeus pale, and postclypeus with two large pale lateral spots. Upper part of frons basally dark brown, anteriorly with a broad bluish grey band which is narrowed in middle. Vertex dark brown, the depressed central area bright yellow. Occipital plate bright yellow with dark brown borders.

Prothorax: dark brown but middle lobe with a yellow spot on either lateral side and a yellow middorsal twin-spot.

Pterothorax: dark brown with bright yellow antehumeral stripes and greenish yellow lateral stripes; its colour pattern shaped as shown in fig. 1.

Legs: femora dark brown but inner sides of first pair of femora greenish yellow. Tibiae, tarsi and claws black.

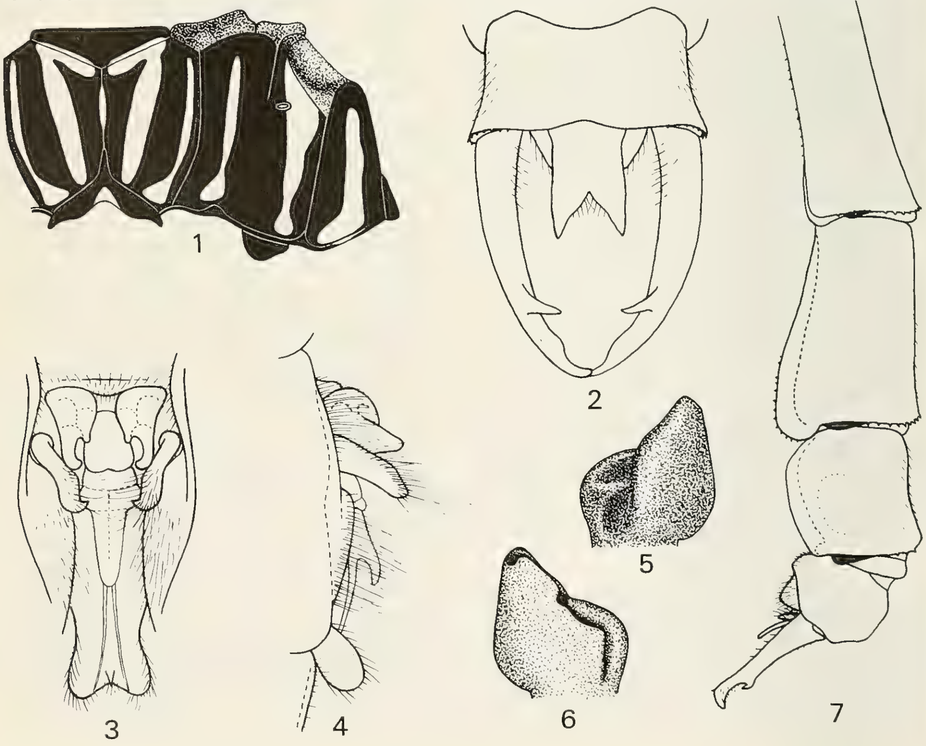
Wings: slightly brown tinged, its venation black but frontal margin of costae with a fine yellow line. Pterostigma reddish dark brown. Basal subcostal cross-vein present. Discoidal triangles, subtriangles and supratriangles three-celled but subtriangle and supratriangle in left fore wing four-celled. Nodal index 14:22—22:14/17:16—15:15. Second primary antenodal cross-vein the seventh. Intermedian cross-veins 12—10/7—8. Hind wings width four-celled anal triangle, a three-celled anal loop, six (left) and five (right) paranal cells, a single row of five cells in second anal interspace but in left hind wing with an extra small paranal cell, and area posterior to Cu2 four (proximal) to five (distal) cells wide.

Abdomen: dark colours on basal segments dark brown, on other segments black. Pale colours on basal segments greenish yellow, on other segments yellow. Segment 1 pale on middorsum and lateral sides. Segment 2 with pale auricles, a pale posterolateral spot, pale ventral tergal margins, and a pale middorsal stripe which is rather broad and parallel-side on the basal two-thirds and very narrow on the apical third. Segments 3 and 4 with an interrupted pale middorsal line and pale basal side spots. Segments 5 and 6 with pale basal spots on middorsum and on sides. Segment 7 pale for its basal third and along ventral tergal margins. Segment 8 pale on proximal half of lateral dilatations; the greatest width of these foliations about 0.3 mm. Segments 9 and 10 without pale markings. Superior appendages brown-yellow but black on the basal fourth and at tips of projections. Inferior appendage brown. Accessory genitalia and anal appendages shaped as shown in figs. 2—7.

ERRATA

I take the opportunity of publishing four corrections of errors, noticed in some of my previous papers.

1964. A new dragon fly of the genus *Rhodopygia*. — Studies on the fauna of Suriname and other Guyanas 7, p. 51. The legend of fig. 23 seminal vesicle should be "glans of penis".



Figs. 1—7. *Phyllogomphoides indicatrix* spec. nov., holotype ♂: 1, thoracic colour pattern; 2, tenth abdominal segment and appendages, dorsal view; 3, accessory genitalia, ventral view; 4, the same, right profile view; 5, anterior genital hamule, right profile view; 6, the same, left profile view; 7, apical segments of abdomen and anal appendages, left profile view.

1972. Further studies on South American Gomphidae (Odonata). — Tijdschrift voor Entomologie 115, p. 223. The legend of fig. 15 *dentata* should read "*edentata*"

1973. A revision of the New World genus *Progomphus* Selys, 1854 (Anisoptera, Gomphidae). — Odonatologica 2, table 1 (p. 198). The type location of *anomalus* spec. nov., MNHW should be "MZM".

1988. A synopsis of the species *Phyllocycla* Calvert, with descriptions of four new taxa and a key to the genera of Neotropical Gomphidae (Odonata, Gomphidae). — Tijdschrift voor Entomologie 131, p. 96. The numbers of the figures 74 and 75 should be interchanged.

REFERENCE

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Received: 11 October 1988
Accepted: 20 January 1989

EPIGOMPHUS CORNICULATUS, A NEW DRAGONFLY FROM COSTA RICA (ODONATA: GOMPHIDAE)

by

JEAN BELLE

Abstract

Belle, J., 1989. *Epigomphus corniculatus*, a new dragonfly from Costa Rica (Odonata: Gomphidae). — Tijdschrift voor Entomologie 132: 158-160, figs. 1-6. [ISSN 0040-7496]. Published 3 July 1989.

Epigomphus corniculatus is described from Costa Rica. The nearest relative of this species is *E. armatus* Ris.

Key words. — *Epigomphus*; taxonomy; Costa Rica.

Dr. J. Belle, Onder de Beumkes 35, 6883 HC Velp, The Netherlands.

Introduction

During his field work in Costa Rica, Mr Carlos Esquivel of the Universitdad Nacional at Heredia (Costa Rica) collected a male and two females of an undescribed species of *Epigomphus*. He kindly placed this material at my disposal, for description and reporting, and for this privilege I herewith wish to thank him very much.

The nearest relative is *Epigomphus armatus* Ris, 1918. Ris' figure 93 is somewhat misleading. It shows the male inferior anal appendage in an oblique ventral view from the rear. In a strictly ventral (or dorsal) view the posterior margin of the inferior appendage is widely V-shaped with stout branches (fig. 1). The male of the new taxon is readily distinguished by the very widely U-shaped posterior margin of the inferior appendage (fig. 2) while the corresponding female differs in having the postocellar tubercles produced backward to a pair of well-developed "horns" (fig. 4).

All figures have been drawn with the camera lucida by the author. The details were added by freehand.

Epigomphus corniculatus spec. nov.

(figs. 2-6)

Material. — Prov. Limón: Suretka, 23 April 1988, 1 ♂ 1 ♀ (in cop.; holotype and allotype, respectively), 1 ♀ (somewhat teneral; paratype). All three specimens preserved dry in clear plastic envelopes. The holotype and allotype are deposited in the Florida State Collection of Arthropods (FSCA), Gainesville. The paratype is in the Museo de Insectos, Universidad de Costa Rica, San José.

Description of the male holotype (abdomen broken between segments 2-4).

Measurements. Total length 54 mm; abdomen (incl. app.) 41.5 mm; hind wing 34 mm; costal edge of pterostigma of fore wing 3.3 mm.

Head. Dark brown with pale markings as follows. Genae green; labrum with a symmetric pair of large, round, grey-green lateral spots; postclypeus with grey-green facial lobes; superior surface of frons with an anterior grey band that is narrowly interrupted in middle; vertex yellowish brown between each lateral ocellus and compound eye. Dorsal surface of occiput with two shallow transversely elongated concavities occupying each of its lateral two-fifths, and there is a development of an occipital ridge which, however, is not fringed with hairs.

Prothorax. Dark brown, the middle lobe green-yellow on sides and on middorsum.

Pterothorax. Dark brown with pale (= greyish green) markings. Pale mesothoracic "half collar" interrupted in middle and not connected with first pale antehumeral stripe. Second pale antehumeral stripe narrow but complete. Pale mesepimeral and metepisternal stripes well-developed. Posterior to the dark metapleural stripe the metepimeron is pale except for an obscure brown area on center line. Pectus pale.

Legs. Femora brown, the third pair blackish at knees, the first and second pair blackish on outer sides. Tibiae, tarsi and claws blackish brown. Antero-inferior row of spines on third tibiae consisting of 10-11 modified spines, that of first and se-

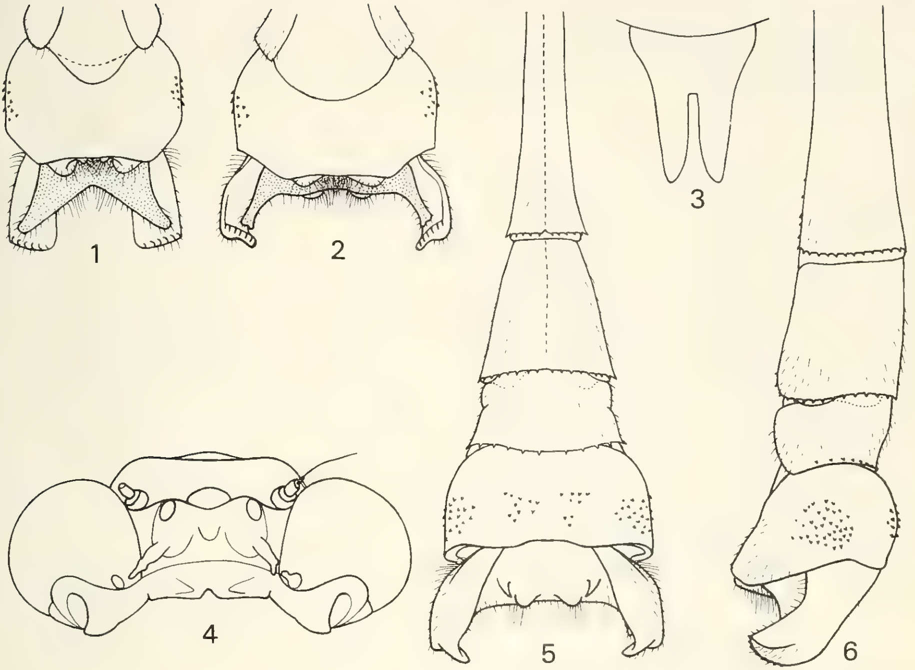

Fig. 1. *Epigomphus armatus* Ris, 1918. Tenth abdominal segment and anal appendages of male, ventral view. — Figs 2-6. *Epigomphus corniculatus* spec. nov.: 2, tenth abdominal segment and anal appendages of male holotype, ventral view; 3, vulvar lamina of female allotype, ventral view; 4, head of female allotype, dorsal view; 5, apical abdominal segments and anal appendages of male holotype, dorsal view; 6, the same, left profile view.

cond joints of third tarsi also with modified spines.

Abdomen. Dark brown with pale (= green-yellow) markings on segments 1 to 8 as follows. Segments 1 and 2 pale on lateral sides and with a pale middorsal stripe. Segments 3 to 6 with a pale basal spot on each lateral side. Segments 3 and 4 with a pale basal middorsal stripe. Segments 5 and 6 with a small pale basal middorsal spot, the one on segment 6 much smaller than that on segment 5. Segment 7 pale on basal two-thirds portion. Segment 8 with a small pale basal spot on each lateral side. Abdomen narrow on segments 3 to 6, becoming wider successively on apex of segment 7 and on segments 8 to 10, being on segment 10 five times as wide as on base of segment 7 (fig. 5). Superior appendages somewhat longer than inferior appendage, widely distended but not enough to give a dorsal view of the inferior appendage. Apex of each superior appendage rounded and crenulated, the outer margin angled. Inferior appendage with two widely separated slender branches, each branch with a bifid apex, the mesal tooth small (fig. 2). Dorsal surface of inferior appendage with a posterior pair of submedian humps and more basally with a pair of stout acute teeth.

Description of the female allotype (left hind wing broken off, left anal appendage broken away).

Measurements. Total length 57 mm; abdomen (incl. app.) 43 mm; hind wing 39 mm; costal edge of pterostigma of fore wing 4.0 mm.

Coloration resembling that of male holotype but pale colour on superior surface of frons consisting of two widely separated anterior spots. Dark colour of vertex and top of head reddish brown. Dark colour of prothorax brown. Spines on outer row of third femora widely spaced and in length about half the diameter of femur. Abdominal segment 8 without pale basal side spots. Abdominal segment 7 pale for slightly more than its basal half. Abdomen becoming successively narrower on apical segments. Lamina supra-analis slightly shorter than anal appendages, the latters about three-quarters the length of segment 10. Vulvar lamina subtriangular, reaching to a point about halfway the ninth sternum, medially cleft for its apical three-fifths (fig. 3).

Except for the pair of long post-ocellar "horns" the most striking mating adaptations resemble those of *Epigomphus armatus* as described by Calvert, 1920 (page 342). There is a very deep pit on the rear of the head behind each compound eye and the top of the head (occiput) has a symmetric pair of transversely elongated, submedian, dorsal pits. The posterior margin of the occiput has a small but distinct median excision (fig. 4) contrary to *Epigomphus armatus* which has the rear margin medially slightly concave. Each compound eye has a striking large superior ocular scar near the angle of the mesal margin of the eyes caused by the tips of the branches of the male inferior appendage during the copulation (the female paratype has not such a pair of ocular scars apparently because, seen the teneral condition of the specimen, it has not yet paired).

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INHOUD *CONTENS*

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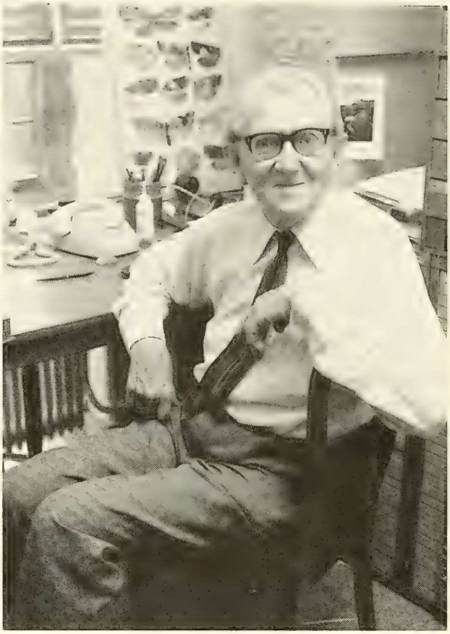
ISSN 0040-7496

ALEXEY DIAKONOFF, 1907-1989

The editors of the Tijdschrift voor Entomologie recently received the sad news that our former editor, Dr A. N. Diakonoff, passed away at the age of 82 on September the 20th, 1989. We share our feelings of sadness with the Dutch Entomological Society, of which he has been an active member for very many years, and with his family, that so much took part in his life as an entomologist.

Alexey Diakonoff was born in Saint Petersburg (now Leningrad) in 1907 and experienced all the miseries of a country going through a revolution. In 1923, by a circuitous way, he was able to join his parents who, according to plan, had reached the Netherlands East Indies. There he finished his elementary education and left for Amsterdam for a university study in biology. As a trained entomologist, his thesis on Indo-Malayan Tortricidae completed, he returned to Java in 1939 to become an entomologist at a research station of the sugar plantations and industries. Just when he had obtained, in 1941, a position of entomologist at the Zoological Museum at Bogor, Java, fate, in the shape of World War II, prisoner of war camps and deportation, prevented him from starting a scientific museum career. In 1945 he returned to The Netherlands for recuperation, most of the time staying at the Leiden Museum and working in the Lepidoptera collection. In 1947 he returned to Bogor, but not for long. The political situation changed very rapidly and the future looked uncertain. In 1951 he returned to The Netherlands to become curator of Lepidoptera at the Rijksmuseum van Natuurlijke Historie in Leiden.

Back in The Netherlands he at once became an active member of the Dutch Entomological Society. Already at the summer meeting in June 1953 it was reported that Diakonoff had joined the editorial board of the Society publications. In fact the last issue of 1952 of the "Tijdschrift" and the wrapper of the completed volume carried his name. And what is more, the journal changed in several aspects, in external appearance as well as in the internal lay-out. First of all the "Tijdschrift" was freed of the reports of the society's meetings and the Annual Report, which from then on would be published in the "Entomologische Berichten". The "Tijdschrift voor Entomologie" thus became a scientific journal in its purest form. At the same time the lay-out was modified. Distinct page headings with the journal's name on one page and a running title of the article on the opposite page were introduced. The size of the pages became larger, a new letter-type (Times Roman) was selected, indeed the whole format of the journal was modernized. If one opens the 1953 volume one recognizes the familiar make-up of recent decades, which indeed stood its ground up till now. Each page is proof of the strong preference Diakonoff had for symmetry in the text. The only change made was the recent shift to a two-column distribution of the text, and that only for economical reasons and not on aesthetic grounds, and after Diakonoff had left the editorial board.


Dr. Alexey Diakonoff in his working room, 1982.
Photo: E. L. M. van Esch.

In 1953 there also appears an emblem on the wrapper and title-page: *Lycaena dispar batavus* Oberthür, the Dutch subspecies of the Large Copper, on top of a strongly enlarged egg of the same species, surrounded by the name of the Society. The emblem was modified after the vignette used at the occasion of the 9th International Congress of Entomology at Amsterdam (1951). Although we are not absolutely certain, we have a strong feeling that Diakonoff had a firm hand in all these developments, could convince the board with his aesthetic arguments and obtained a mandate to reshape the "Tijdschrift".

In the early sixties Diakonoff plead for the creation of another series of publications, the "Monografieën van de Nederlandse Entomologische Vereniging". They were intended to serve as a medium for longer articles, which otherwise would surpass the size of a yearly volume of the Tijdschrift. In 1964 the first volume was published, while in 1968 a monograph on the Dutch Tortricidae, written by him in cooperation with Count Bentinck, appeared as volume 3 of this series.

Many other papers by his hand appeared in our journal, amidst a total of about 250 scientific papers, in which he – amongst others – described hundreds of species and genera of Microlepidoptera, in particular from the Indonesian archipelago.

In 1970, at the occasion of the 125th anniversary of the society, Diakonoff was granted the honorary membership of the society because of his long and highly appreciated efforts to improve upon the international standing of the society's publications. In 1974 he left editorship after more than twenty years of service, because he wanted to devote all his time to scientific work. His successors on the editorial board call themselves happy to have been trained by him, to have received his lessons in the printing trade, to have benefited from his long experience. Modesty kept him from ever criticizing our work on the later volumes, but we know he followed all developments. He couldn't set aside his interest in "his" Tijdschrift after so many years of involvement, or could he?

Only two weeks before his death, Alexey Diakonoff sent us a book review for publication in this journal. Below we publish this review, apparently one of Diakonoff's last manuscripts, as a homage to this great predecessor of us.

P. J van Helsdingen (former editor)
E. J. van Nieukerken (editor)

BOOK REVIEW

Medvedev, G. S. (ed.), 1987 [1988]. Keys to the Insects of the European part of the U. S. S. R., vol. iv, Lepidoptera, part 1. – Published for the United States Dept. of Agriculture and the National Sciences Foundation, Washington, by Amerind Publ. Co., New Delhi, xxvi + 991 pp, 578 figs. – Translated from Russian by D. R. Sharma. – [Distributed by E. J. Brill, Leiden, Netherlands, price US $ 97.50]

This book covers the most archaic groups of Lepidoptera: the suborders Micro- and Macrojugatae and several minor families of the suborder Frenatae, including the economically so important Tortricidae, 17 families in all, the other 16 being: Micropterygidae, Eriocraniidae, Hepialidae, Nepticulidae, Opostegidae, Tischeriidae, Heliozelidae, Incurvariidae, Adelidae, Psychidae, Heterogynidae, Limacodidae, Zygaenidae, Sesiidae, Cossidae and Atychiidae. The species composition of the European part of the USSR is almost completely reviewed (about 1200 species). Identification keys are (mostly) at the species level. Illustrations of the genitalia of both sexes are given for all species, with notes on morphology, biology and distribution of families and genera. Phenology and food plants of most species are discussed. Finally bibliography and indices of insect and hostplant names conclude this book.

This important translation represents a part of the Russian "Opredelitel" (=Keys) series, written by leading specialists of the insect-fauna of the European part of the USSR. The original series is very popular among international Lepidopterists, in spite of the barrier of the language. I even know some colleagues, who taught themselves Russian, in order to be able to read the text. Others acquired the Russian edition, only to study the illustrations of wing neuration and genitalia, and often also of the wing pattern. Now that the language problem is overcome, the translated edition will fill a most important gap in the western bibliography on Lepidoptera.

[A. Diakonoff]

NEW DRAGONFLIES (ODONATA) FROM COSTA RICA

by

STEPHEN J. BROOKS

ABSTRACT

Brooks, S. J., 1989. New dragonflies (Odonata) from Costa Rica. — Tijdschrift voor Entomologie 132: 163-176, figs. 1-24. [ISSN 0040-7496]. Published 1 December 1989.

Palaemnema baltodanoi (Platystictidae), *Philogenia peacocki* (Megapodagrionidae), *Phyllogomphoides burgosi* and *Epigomphus echeverrii* (Gomphidae) are described from a collection of Odonata made in Guanacaste National Park, north-west Costa Rica. A fifth new species, *Epigomphus houghtoni* from eastern Costa Rica, is also recorded. The possible affinities of the new species are discussed.

Key words. — Odonata, Costa Rica, Guanacaste, new species.

Mr. Stephen J. Brooks, Department of Entomology, British Museum (Natural History), Cromwell Road, London SW7 5BD

INTRODUCTION

This paper forms the first part of a larger project to make an inventory of the Odonata of Guanacaste National Park, in north-west Costa Rica, and ultimately to produce a field-guide to the dragonflies of Costa Rica. Four of the five species described below were part of a collection that I made in Guanacaste National Park during July 1988. The fifth species was collected by Mr. John Paul in eastern Costa Rica and for convenience it is also recorded here.

Most of the 700 km² of Guanacaste National Park comprises tropical dry forest (Janzen 1986), although all of the new species were collected in the rain-forest covering the western slopes of two volcanoes at the northern end of the Cordillera de Guanacaste. Here there are many permanent rivers and streams which support large assemblages of Odonata. Some of these species are wide-ranging throughout much of Mesoamerica but some genera, and particularly those in which the new species are described, include species which have more restricted distributions. The odonate fauna of Costa Rica is probably the best known in all of Central America and comprises about 250 species (Paulson 1982). However, until I visited Guanacaste National Park there had been no major collection of Odonata on Volcan Orosi or Volcan Cacao. Several of the species that I collected on the volcanoes, such as *Erpetogomphus tristani* Calvert, *Perigomphus pallidistylus* (Belle), *Neocordulia batesi longipolex* Calvert and *Argia rogersi* Calvert, had rarely been collected before. Of a total of 15 species collected on Volcan Cacao, three were undescribed. Therefore, it is possible that the new species are endemic to the river systems on the volcanoes or are at least restricted to the surviving remnants of upland rain-forest in the northern part of the country.

TAXONOMY

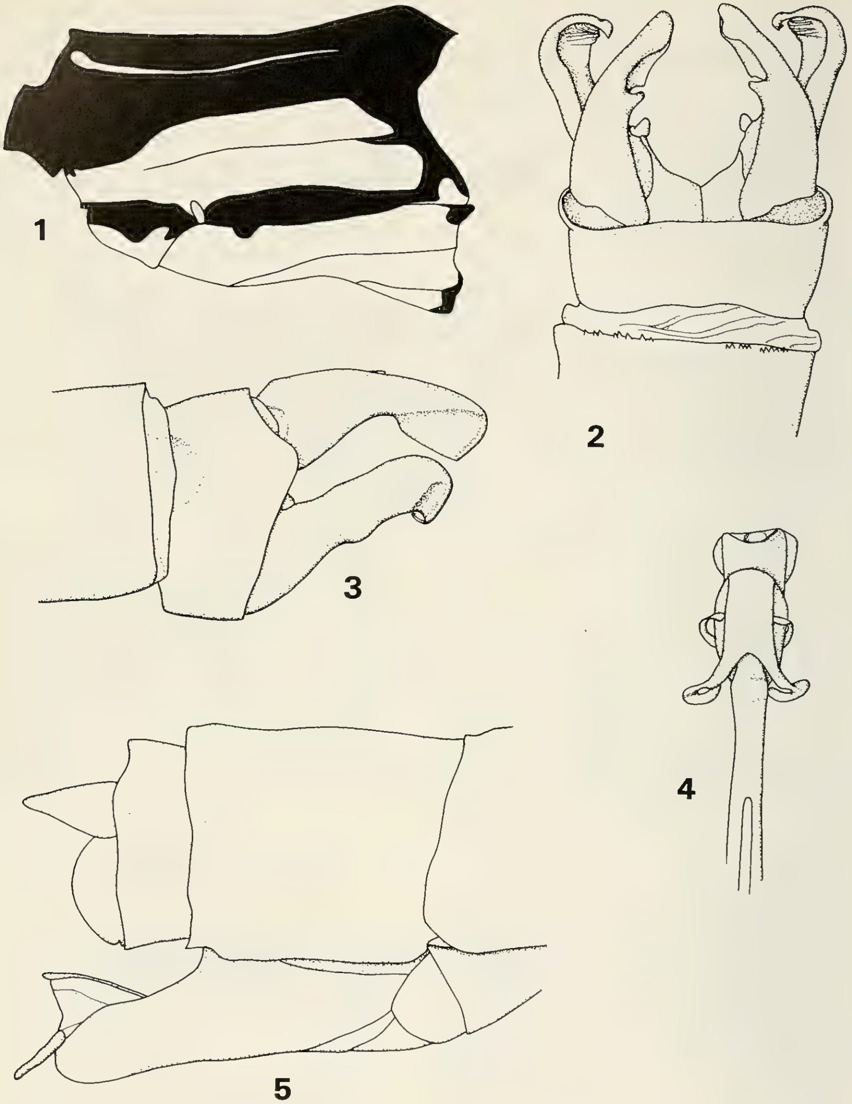
Palaemnema baltodanoi sp.n.
(figs. 1—5)

Material examined. — Holotype ♂: Costa Rica, Guanacaste Province, SW side Volcan Cacao, Estacion Mengo, 1100 m, July 1988, S. J. Brooks. Paratypes 14 ♂, 3 ♀: same data as holotype. Holotype and paratypes deposited in BMNH.

Description of male holotype.

Head: width across eyes 4.7 mm. Eyes dark brown in life. Labrum pale blue with black stripe across anterior margin; base of mandible pale blue; gena pale blue; anteclypeus pale blue; postclypeus black; frons and area between eye and antenna from lateral ocellus to gena metallic dark blue; vertex black with small pale brown spot adjacent to lateral ocellus; occiput black; labium pale brown.

Prothorax: anterior lobe apple green, black medially; propleuron black; median lobe with large apple green lateral spot; posterior lobe black.



Figs. 1—5. *Palaemnema baltodanoi* sp.n. — 1, Pterothorax, left lateral view. 2, Male anal appendages and apex of abdomen, dorsal view. 3, Male anal appendages and apex of abdomen, lateral view. 4, Penis, ventral view. 5, Female apex of abdomen, lateral view.

Pterothorax (fig. 1): bronze-black on dorsum with narrow (width 10% of episternum 2) apple green antehumeral stripe extending from collar carina to within 10% of antealar carina; mesepimeron black in dorsal half, apple green below, this pale area tapering anteriorly with broad black stripe adjacent to antealar carina; metepisternum apple green in dorsal half, black ventrally; metepimeron apple green, becoming pale yellow ventrally, with narrow black stripe adjacent to second lateral suture.

Legs: white with black stripe on dorsum of femur and fore tibia; coxa white; tarsus black.

Wings: hyaline with yellow-brown suffusion along costal margin, darkest at apex. Venation black. Pterostigma red-brown with narrow pale border; 1.4 mm in fore wing, 1.7 mm in hind wing; 2–2.5 cells below pterostigma in fore wing, 1.75 in hind wing. 25 postnodals in fore wing, 20–22 in hind wing. R^3 arises at 8th postnodal in fore wing, 7th in hind wing.

Measurements: hind wing 28.0 mm; 5.0 mm at greatest width.

Abdomen: black with the following pale yellow ventro-lateral markings: S1 with large square spot; S2 with longitudinal stripe, tapering apically, in basal three-quarters; S3–S7 with tapering longitudinal stripe in basal quarter; S8 with rounded spot in basal quarter; S9–S10 unmarked. Penis filament tips (fig. 4) form A of Calvert (1931).

Superior appendages (figs. 2–3): black; about same length as inferiors, three times as long as S10; parallel in basal half, converging apically with short, blunt submedian (53% of length) tooth on inner dorsal margin; appendage abruptly widened ventrally at 70% of length with ventral margin of this portion straight; apex straight.

Inferior appendages (figs. 2–3): black with white ventro-lateral subapical spot; diverging basally but strongly incurved in apical 20%, this latter section with transverse ridges on inner surface; abruptly constricted at apex to give short, curled apical tooth; ventral margin with slight swelling present just proximal to apical tooth; short, blunt, apically projecting tooth present on inner margin at 25% of length; dorsum of basal 25% concave; in lateral view appendage angled dorsally at about 45°.

Measurements: total length 47.5 mm; abdomen 39.5 mm (including appendages 1.3 mm).

Description of female.

As male except the following:

Prothorax: pale markings dull yellow-green.

Pterothorax: pale markings dull yellow-green, mesepimeron entirely black.

Wings: hind wing 26.0–27.5 mm. Pterostigma 1.4 mm in fore wing, 1.5 mm in hind wing; 25–27 postnodals in fore wing, 21–23 in hind wing.

Abdomen: pale markings yellow-brown, triangular, broader and shorter than in male; S9 with large lateral blue-grey spot in basal two-thirds extending dorsally in basal half. Ovipositor extending 0.4 mm beyond apex of abdomen; straight ventrally, untoothed (fig. 5).

Anal appendages: short, conical, 0.4 mm in length.

Measurements: total length 40.5–44.0 mm; abdominal length 32.5–36.0 mm.

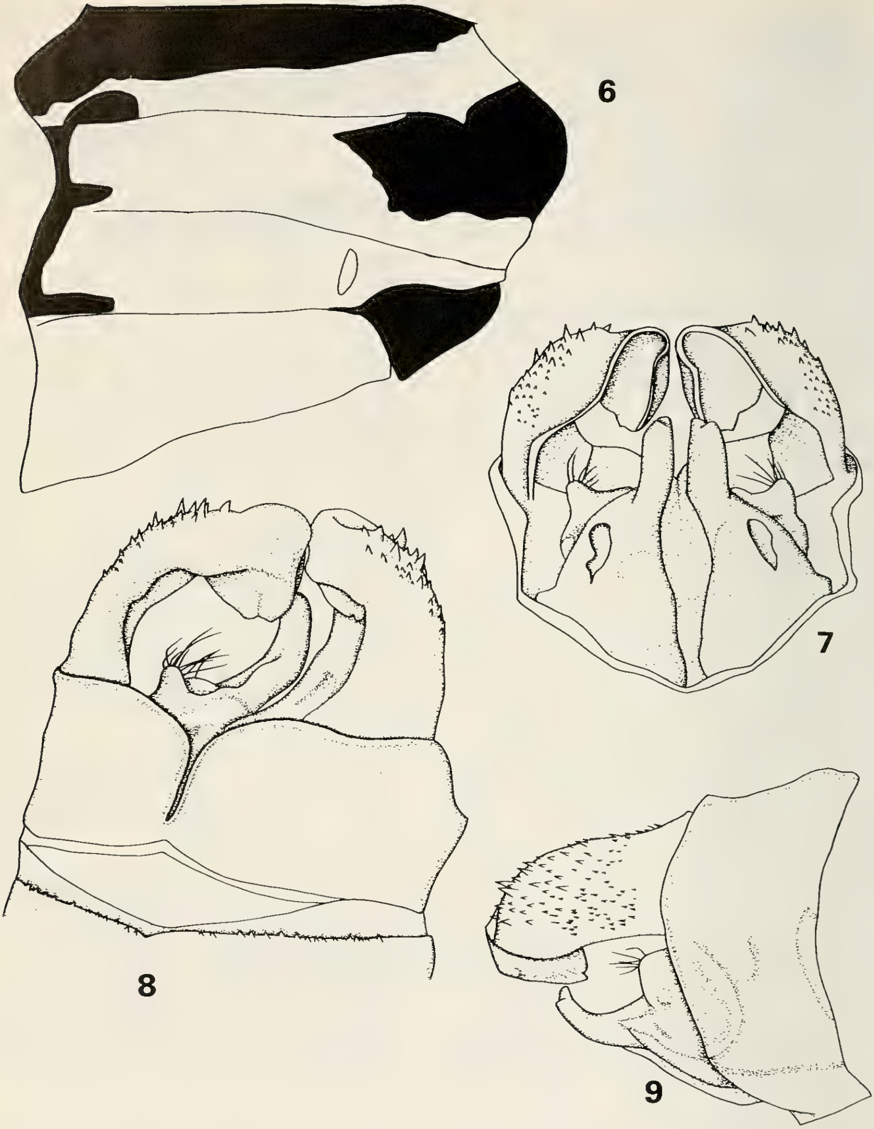
Variation in male paratypes. — Total length 43.0–55.0 mm; hind wing 25.5–30.5 mm; pterostigma 1.2–1.4 mm; fore wing postnodals 24–27. Antehumeral stripe sometimes longer than in holotype but never confluent with antealar carina.

Habits. — All specimens were collected over the riffle reach of a shallow, narrow stream on a steep incline in densely shaded rain-forest. Their dark coloration made them difficult to locate in the gloom. Specimens were numerous and were the commonest odonate at the locality. Other species present were *Cora chirripa* Calvert, *Hetaerina majuscula* Selys, *Philogenia peacocki* sp.n., *Epigomphus* sp. indet. and *Brechmorhoga rapax* Calvert.

The species was reluctant to fly and was usually encountered hanging from the leaves and branches of trees and bushes adjacent to the stream from which they could be removed by hand. The flight was weak, slow and of short duration. Two males were seen to display to one another. A perched male took off and confronted a second male which had attempted to land on the same perch. Both hovered at a height of about 1 m facing each other, with the pale blue clypeal stripe clearly visible, slowly moving backwards and forwards in unison keeping about 0.3 m apart. After about one minute the intruder retired and the first male returned to the perch. Females were never seen *in tandem* with males but were found perching nearby.

Remarks. — Paulson (1982) lists 17 species of *Palaemnema* from Central America of which seven are known from Costa Rica. There is a high degree of endemism with six of the seven Costa Rican species being endemics. Typically these species inhabit shady streams in dense forest although the more widely distributed species occur in more open, lowland localities.

Males of *Palaemnema baltodanoi* sp.n. can be



Figs. 6—9 *Philogenia peacocki* sp.n., male holotype. — 6, Pterothorax right lateral view. 7, Anal appendages, ventral view. 8, Apex of abdomen and anal appendages, interno-dorsal view. 9, Apex of abdomen and anal appendages, lateral view.

distinguished from most of the other species in the genus by the lack of blue markings at the apex of the abdomen. Also, the abrupt median swelling of the ventral margin of the superior appendages is distinctive since in most species this gradually widens. In the keys to the genus provided by Calvert (1931) the new species comes out to *apicalis* Calvert. However, unlike *baltodanoi*, there is no antehumeral stripe in *apicalis* and the medio-dorsal tooth of the superior appendage is not as prominent in lateral view. The apical tooth of the inferior appendage in *apicalis* is long and abruptly curved dorsally (like a hairpin) to form a narrow dorsal notch but in *baltodanoi* it is shorter, more rounded and curves inwards with no notch on the dorsal margin. The inferior margin of the superior appendage, where it expands in the apical half, is not angulate in *apicalis* and is narrower than in *baltodanoi*. At the apex of the penis filament there is a basal lobe in *apicalis* which is absent in *baltodanoi*.

The anal appendages of *baltodanoi* are similar morphologically to *P. paulirica* Calvert and *distadens* Calvert and in particular there is a swelling on the ventral margin of the inferior appendage just proximal to the apical hook in both *distadens* and *baltodanoi*. However, *paulirica* differs from *baltodanoi* in possessing a slight invagination at the apex of the superior appendages and in *distadens* the apical tooth on the inferiors is not curled. The thoracic markings of *baltodanoi* are also similar to *distadens* but in *distadens* and *paulirica* the abdominal segments 8 and 9 are marked blue dorsally.

This species is named in honour of Sr Jorge Baltodano who very kindly allowed his ranch to be purchased by Guanacaste National Park.

Philogenia peacocki sp. n.

(figs. 6—9)

Material examined. — Holotype ♂: Costa Rica, Guanacaste Province, SW side Volcan Cacao, Estacion Mengo, 1100 m, July 1988, S. J. Brooks. Paratype ♂: Costa Rica, Puntarenas Province, Monteverde, Rio Guacimal and small streams in biological reserve, 1600 m, 7 June 1986, T. W. Donnelly. Holotype deposited in BMNH, paratype in Donnelly collection.

Description of male holotype.

Head: width across eyes 6.7 mm. Eyes black in life. Labrum pale blue; base of mandible pale blue; gena pale blue; anteclypeus and postclypeus black; frons black with small pale blue spot below scape; vertex black with pale blue spot between lateral ocellus and eye; labium and occiput black.

Prothorax: anterior lobe with blue medio-lateral spot; median lobe with large blue lateral spot; posterior lobe with small blue lateral spot.

Pterothorax (fig. 6): azure blue with the following black markings: broad antehumeral stripe extending over dorsal carina; small spot at posterior end of humeral suture; narrow black stripe adjacent to antealar carina with short stripe extending onto first and second lateral suture; katepisternum 2 black; broad black stripe at anterior end of mesepimeron; katepisternite 3 black. Minute blue spots on antealar sinus. Notum of thorax with pale blue/grey pruinescence.

Legs: femur blue with black stripe on posterior side; tibia and tarsus black with pale brown stripe on posterior side of mid and hind leg.

Wings: hayline with yellow-brown suffusion especially around margins. Venation black. Pterostigma dark reddish brown, 2.2 mm in fore wing, 2.5 mm in hind wing. 24–25 postnodals in fore wing, 22–23 in hind wing. 4–5 cells below pterostigma; R^3 arises between 10th and 11th postnodal in fore wing, between 8th and 9th in hind wing.

Measurements: hind wing 34 mm, greatest width 6 mm.

Abdomen: black with the following markings: S1 with broad lateral blue spot, S2–S7 with small blue oval baso-lateral spot and yellowish tapering stripe in basal quarter; blue-grey pruinosity on dorsum and laterally on S1–S2 and S9–S10.

Superior appendages (figs. 7–9): black with dorsal blue-grey pruinosity; strongly convergent in dorsal view; apical half downcurved in lateral view; meso-ventral process absent; apex swollen with shallow median indentation.

Inferior appendages (figs. 7–9): 0.7 times length of superiors; parallel not diverging; strongly curving dorsally in lateral view, tapering to blunt apex with a small subapical notch; setose, dorsally projecting, basal tubercle present.

Measurements: total length 51 mm; abdomen 40.5 mm (including anal appendages 1.4 mm).

Female unknown.

Variation in paratype. — 25–26 postnodals in fore wing; 23–24 postnodals in hind wing. Hind wing 36 mm, 6.5 mm at widest. Total length 53 mm; abdomen 42 mm. When viewed laterally the internal apical lobe of the superor appendages extends further ventrad. The superiors, on the interno-dorso-lateral margin, have a more prominent lobe just proximal of the ventral expansion. The subapical tooth on the inferiors is smaller. In dorsal view, the median dog-leg curve of the inferior appendage is more angulated.

Habits. — The holotype was perched on the branch of a bush at about 2 m, overhanging a riffle reach on a narrow (1 m), shallow (0.2 m) stream in densely shaded rain-forest. It was the only specimen seen.

Remarks. — Six species of *Philogenia* are known from Central America of which three occur in Costa Rica (Bick & Bick 1988, May 1989). Only one of these is endemic to the country but the other two species occur only in Costa Rica and Panama. In fact, as Bick & Bick (1988) point out, only one of the 28 known species of *Philogenia* has anything like a widespread distribution. The distribution of the genus is centred on northern South American with Costa Rica being its northern limit.

The new species belongs to the *helena* (Hagen)-group of species (Bick & Bick 1988). It seems closest to *P. berenice* Higgins, described from Peru, but the superior appendages are relatively longer and more abruptly downcurved in *berenice* and the meso-ventral process is broader in the latter species. The inferior appendages of *berenice* lack the ventral cavity and dorso-basal tubercle, although the dorso-basal ridge is more developed. In addition, at the apex of the inferior appendages of *berenice* are a pair of small, subequal tubercles, rather than a subapical notch which is present in *peacocki*.

This species is named in honour of Mr. Harold Peacock who very kindly allowed his ranch to be purchased by Guanacaste National Park.

Phyllogomphoides burgosi sp.n.

(figs. 10—13)

Material examined. — Holotype ♀: Costa Rica, Alajuela Province, 8 km S Santa Cecilia, Estacion Pitilla, 680 m, July 1988, S. J. Brooks. Holotype deposited in BMNH.

Male: Unknown.

Description of female holotype.

Head (fig. 10): width across eyes 10.2 mm. Eyes blue-grey in life. Labrum black with medio-lateral yellow-green spot; mandible black, yellow-green at base; gena brown with small yellow-green ventral spot; anteclypeus yellow-green; postclypeus brown with yellow-green lateral spot; frons brown with prominent lateral, dorsally projecting horn 2.8 mm in height, 1.5 mm wide at base, 0.4 mm at apex; horn brown with pale yellow-green stripe on inner and front surface and tuft of short, posteriorly projecting setae at apex; vertex red-brown with steep M-shaped ridge behind lateral ocelli; dorsum of occiput dark brown with shallow median depression and fringe of long setae on upturned posterior margin; occiput red-brown with shallow groove extending from occipital tubercle to sinus of premandibular suture, crossed at right angles by numerous short striae.

Prothorax: red-brown with yellow lateral spot on anterior lobe, yellow median and lateral spot on middle lobe.

Pterothorax (fig. 11): red-brown with the following yellow markings: narrow stripe on dorsal carina; collar carina with broad stripe; antehumeral stripe short and narrow; humeral stripe broadening posteriorly; broad mesepimeral stripe; metepisternal stripe broad, interrupted at spiracle with isolated spot anterior of spiracle; katepisternite with large spot; metepimeral stripe narrowly margined with brown; sternites with median stripe.

Legs: tibia and tarsus black; femur yellow-brown but fore femur black on outer surface.

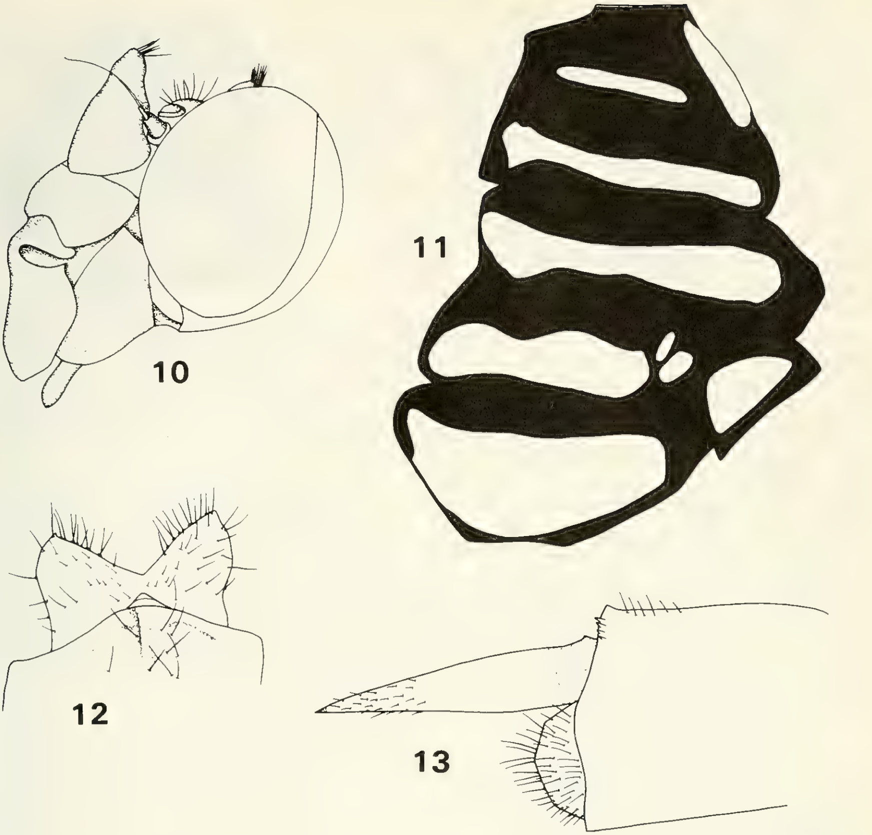
Wings: hyaline with amber suffusion around veins, becoming darker at wing base. Venation black. Pterostigma dark red-brown, 5.4 mm in fore wing, 5.9 mm in hind wing. Basal subcostal crossvein present. Nodal index 17 : 25 : 23 : 16/15 : 18 : 18 : 17. Secondary primary antenodal 8th or 9th crossvein in fore wing, 8th in hind wing. Intermedian crossveins 14 : 13/11 : 10. Supratriangle 2-celled in fore wing, 2-3 celled in hind wing. Discoidal triangle 3-celled; subtriangle 3-celled. One cubitoanal crossvein in all wings. Anal loop 3-celled.

Measurements; hind wing 47 mm, greatest width 12 mm.

Abdomen: black with the following yellow markings: S1 dorsum with small medio-apical spot and lateral spot in ventral half; S2 dorsum with basal T-shaped marking extending to second carina, laterally with spot in ventral half; S3 with lateral semicircular spot almost extending to transverse carina, dorsum marked with fine mid-dorsal stripe broadening slightly at base; S4 marked dorsally with small basal spot and laterally with small dome-shaped spot terminating before transverse carina; S5–S6 marked similarly to S4 but spots progressively smaller; S7 with basal band extending to transverse carina; S8 with wedge-shaped medio-ventral lateral spot and minute isolated spot beyond apex of wedge; S9–S10 unmarked. Foliations absent. Vulvar scale (fig. 12) broadly U-shaped, arms broad with small apical tubercle, 0.56 mm in length.

Anal appendages (fig. 13): black in basal 0.15% then yellow, lanceolate with black tip.

Measurements: total length 70 mm; abdomen 51 mm (including anal appendages 3.1 mm).



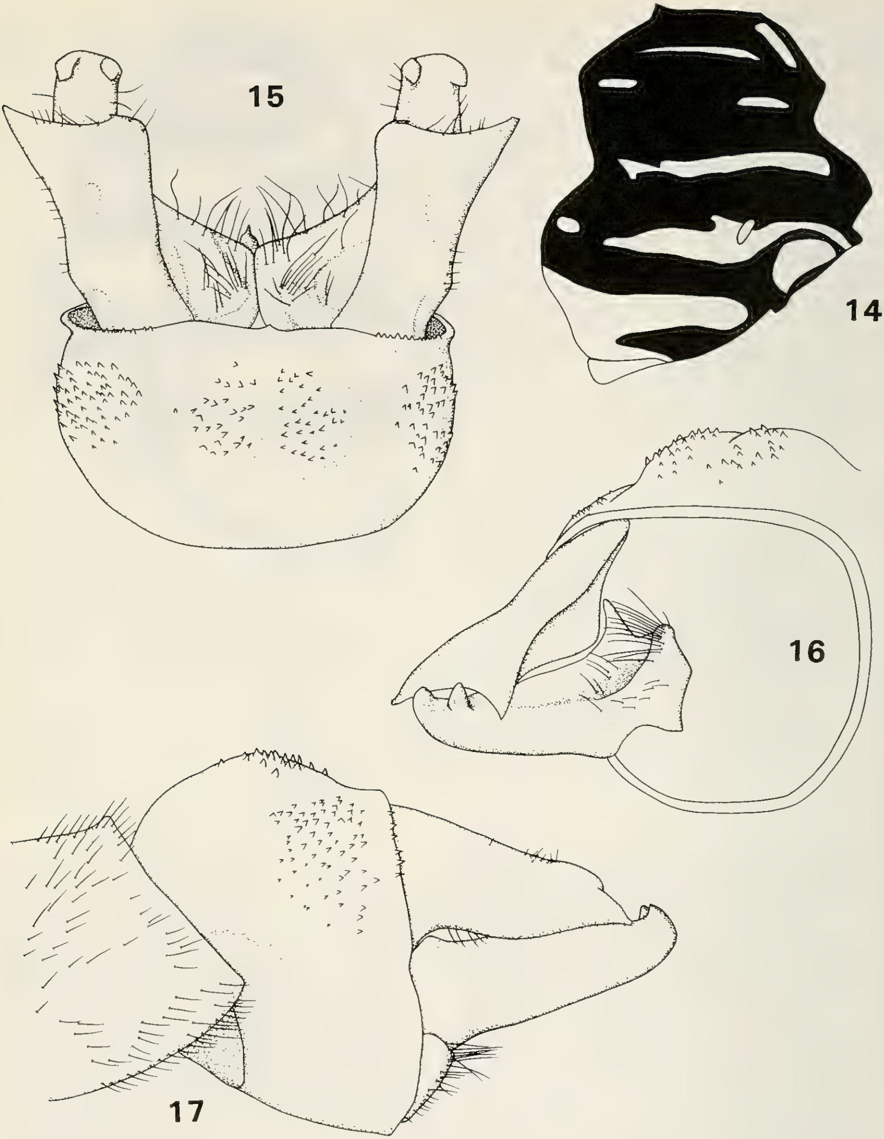
Figs. 10—13, *Phyllogomphoides burgosi* sp.n., female holotype. — 10, Head, lateral view. 11, Pterothorax, right lateral view. 12, Vulvar scale, ventral view. 13, Apex of abdomen, lateral view.

Habits. — The specimen was collected flying in rain-forest over a narrow slow-flowing, shaded stream and was the only specimen seen.

Remarks. — A total of ten species of *Phyllogomphoides* have been recorded from Central America (Paulson 1982) of wich four are known from Costa Rica. Most of the Central American species are quite widespread and only three are restricted to just one country. None of the previously described species is restricted to Costa Rica but *P. appendiculatus* Kirby occurs only in Costa Rica and Panama.

The new species appears to belong to the *bifasciatus* (Hagen)-group (Donnelly 1979) in which the vulvar scale is simple without lateral spines or protrusions. It is apparently related to the Trinidadian species *P. cornutifrons* (Needham) which is the only other known *Phyllogomphoides* species to have frontal horns in females. However, in *P. cornutifrons* the frontal horns are much more slender and elongate, and the branches of the vulvar scale are more rounded apically than in the new species. In addition *P. burgosi* is considerably larger than *cornutifrons*. Although the male of *burgosi* is still unknown there can be little doubt concerning the identity of the species because of the possession of the extraordinary frontal horns. I feel that it is justifiable to describe the species based on a single female specimen in order to draw attention to the existence of second *Phyllogomphoides* species with frontal horns.

Of the Central American species only the female of *P. pugnifer* Donnelly is unknown. However, this



Figs. 14—17. *Epigomphus echeverrii* sp.n., male holotype. — 14, Pterothorax, right lateral view. 15, Apex of abdomen and anal appendages, dorsal view. 16, Left anal appendages, interno-caudal view (right appendages not shown). 17, Apex of abdomen and anal appendages, lateral view.

species is considerably smaller than *burgosi* and the male pterothoracic markings differ. In *pugnifer* the antehumeral stripe is confluent with the stripe near the collar carina and the humeral and mesepimeral stripes are narrower than in *burgosi*.

This species is named in honour of Sr. Mario Burgos who very kindly allowed his ranch to be purchased by Guanacaste National Park.

Epigomphus echeverrii sp. n.
(figs. 14—21)

Material examined. — Holotype ♂: Costa Rica, Guanacaste Province, SW side Volcan Cacao, Estacion Mengo, 1100 m, July 1988, S. J. Brooks. Paratypes 1 ♂, 2 ♀ data same as holotype; 1 ♀ Costa Rica, Guanacaste Province, W side of Volcan Orosi, Estacion Maritza, 600 m, July 1988, S. J. Brooks. All specimens deposited in BMNH.

Description of male holotype.

Head: width across eyes 8.1 mm. Eyes turquoise in life. Labrum black; base of mandible yellow with small brown basal spot; gena pale blue; anteclypeus and postclypeus brown; frons brown anteriorly, pale blue-green dorsally with narrow basal and broad median brown stripe; vertex and dorsum of occiput dark brown; labium and occiput pale blue-green.

Prothorax: dark brown with small lateral, median and anterior blue-green spots on median lobe.

Pterothorax (fig. 14): black with the following pale blue-green markings: stripe adjacent and parallel to collar carina; short, narrow antehumeral stripe; two elongate humeral spots close to humeral suture, one near anterior suture, the second near the antealar carina; narrow mesepimeral stripe; metepisternal stripe interrupted posteriorly leaving small isolated spot near antealar carina; metepimeron with broad stripe concurrent posteriorly with narrow ventral stripe.

Legs: tibia and tarsus black, femur dark brown, paler on posterior edge and internal face of fore femur yellow-green. Hind leg with spines on outer row of tibia and first two tarsal segments short, thick, rounded apically; apical spines on outer edge of fore tibia elongate.

Wings: hyaline with yellowish tinge. Venation black. Pterostigma dark red-brown, 3.5 mm in fore wing, 4.0 mm in hind wing. Basal subcostal crossvein present. Nodal index 16 : 20 : 20 : 16/16 : 15 : 15 : 16. Second primary antenodal 8th crossvein in fore wing, 7th in hind wing. Intermedian crossveins 7 : 8/4 : 5. Supratriangle one-celled. Discoidal triangle free in left fore wing, crossed in other wings; subtriangle free. 3–4 cubitoanal crossveins in fore wing, 3 in hind wing. Hind wing with 5 paranal cells, 4 postanal cells, 4 rows of cells posterior to Cu_2.

Measurements: hind wing 36 mm, greatest width 9.5 mm.

Abdomen: black with the following pale blue-green markings: S1 pale laterally; S2 with narrow mid-dorsal stripe, pale laterally; S3 with narrow mid-dorsal stripe and lateral spot in basal three-quarters; S4–S6 with narrow dorsal band at base of each segment, and lateral spot tapering to transverse carina; S7 entirely pale in basal two-thirds; S8–S9 unmarked; S10 pale brown in basal half, darker apically with tapering ventral spot.

Anal appendages (figs. 15–17): black; superior appendages triangular in cross-section, about three times as long as broad when viewed dorsally, 1.8 times as long as broad when viewed laterally, bifurcate apically, outer branch bending laterally tapering to narrow point, inner branch curving ventrally with blunt apex; inferior appendage 0.6 mm longer than superiors, deeply bifurcate with branches divergent at base, parallel in apical half, apices of branches with a pair of short upturned teeth, base of branches with transverse ridge, terminating in low dorsal projection at each end, outer projection elongate, inner projection short, broad with numerous apical setae.

Measurements: total length 58.4 mm; abdomen 43.8 mm (including anal appendages 2.4 mm).

Description of female.

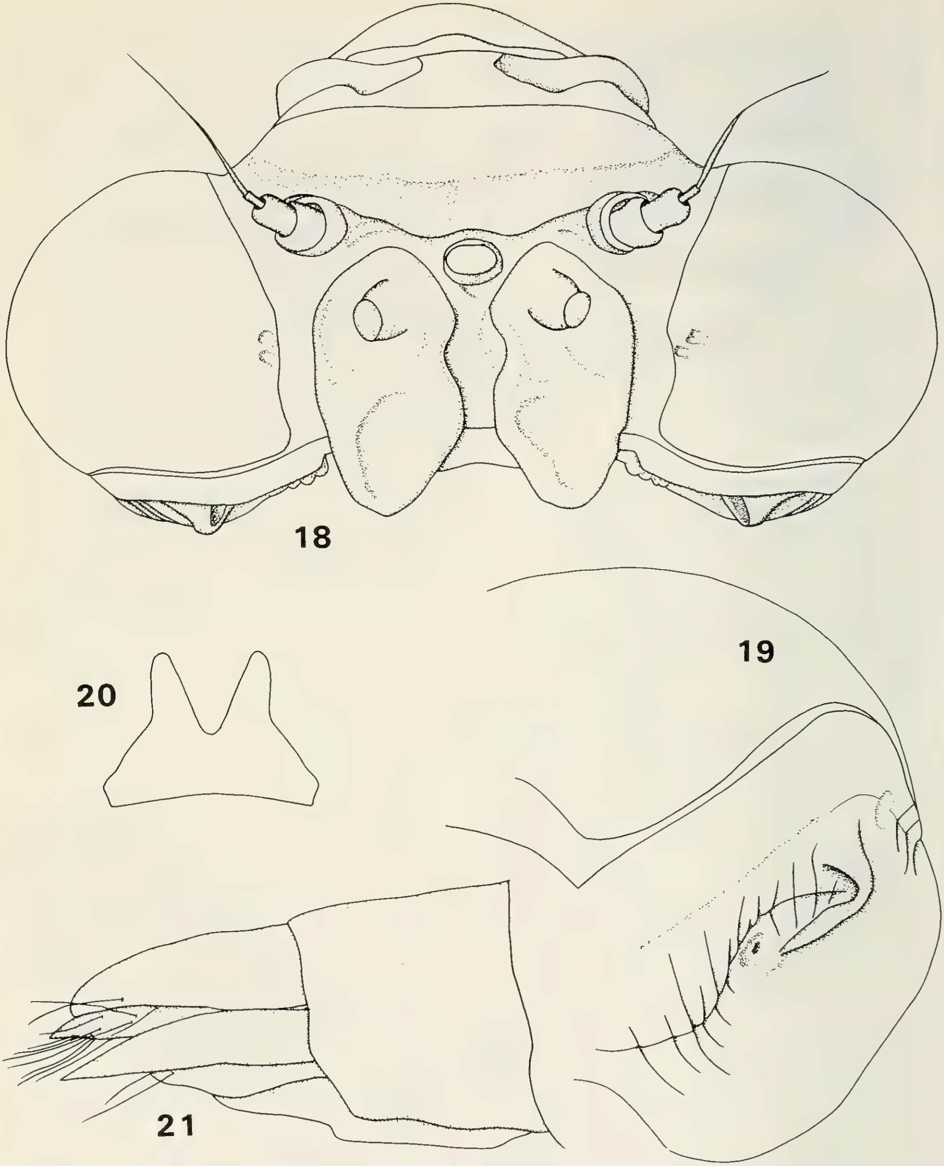
As male except: head (figs. 18–19), width across eyes 9.4 mm. Labrum dark brown with black anterior margin; vertex with pair of large ovate plates projecting beyond posterior margin of head; occiput with sinuous transverse groove extending from postocciput to sinus in premandibular suture, this groove crossed at right angles by several short, shallow striae and about halfway along groove is low, rounded projection (fig. 19).

Pterothorax: pale lateral stripes yellower than male.

Legs: femur almost entirely yellow-brown. Setae on tibia and tarsus of hind legs unmodified.

Wings: hyaline with yellowish suffusion at base and in antenodal area. Pterostigma 4.4 mm in fore wing, 4.7 mm in hind wing. Nodal index 13 : 20 : 19 : 15/14 : 15 : 15 : 13. Second primary antenodal crossvein seventh crossvein in all wings. Intermedian crossveins 6 : 6/4 : 4. Discoidal triangle free. All wings with 3 cubitoanal crossveins. Hind wing with 3 postanal cells.

Measurements: hind wing 40.5 mm, 10.5 mm at greatest width.



Figs. 18—21. *Epigomphus echeverrii* sp.n., female. — 18, Head, dorsal view. Note puncture marks near inner margin of eyes. 19, Right eye, rear view. 20, Vulvar scale, ventral view. 21, Apex of abdomen, lateral view.

Abdomen: black with yellow-green markings; S3 with lateral pale marking narrowing beyond transverse carina; S7 pale only in basal third; S10 entirely black; abdomen with greyish pruinesence ventrally. Vulvar scale (fig. 20) narrowly V-shaped with narrow arms, 0.78 mm in length. Dried ova ovate, 0.52 × 0.3 mm.

Anal appendages (fig. 21) lanceolate.

Measurements: total length 62 mm; abdomen 41 mm (including anal appendages 1.4 mm).

Variation in paratypes. — Labrum with postero-lateral blue-green spot and antero-lateral lobes of postclypeus black in male. Wings with distinct amber suffusion in male and females, possibly older specimens.

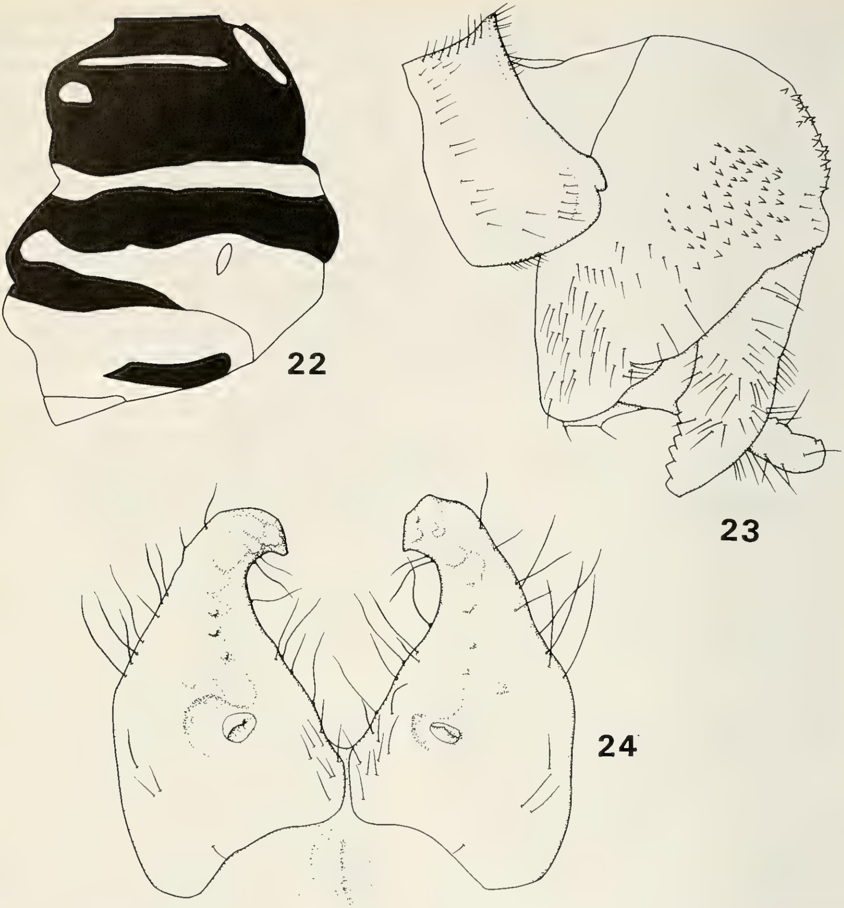
Habits. — I collected two males and one female near Estacion Mengo by the riffle reach of a shallow stream in semi-shaded rain-forest with a broken canopy. They were flying in the company of *Epigomphus subobtusus* Selys and were quite common at the locality while the sun was shining but disappeared when it became overcast. In flight the males characteristically curved the apical segments of the abdomen ventrally. Like other *Epigomphus* species, the males frequently perched on low horizontal sticks at the edge of the stream and flew close to the surface of the water. The female was seen flying low over the stream in a pool of sunlight. The other Mengo female was collected at the side of a track in a field cleared of trees about 2 km from the edge of the forest. The insect was perched in long grass, probably sheltering from the wind which was blowing very strongly at the time, and may have been blown there from the forest. The Maritza female was discovered dead in the web of an orb-web spider next to a riffle reach on a large river in forest with broken canopy.

In all three females there was damage to the inner dorsal margin of the eyes (fig. 18) which was probably inflicted by the apical spines on the inferior appendages of males during mating. These mating marks or ocular cicatrices are usually superficial in Odonata (Dunkle 1979) but more extensive damage has been described in species of *Ophiogomphus* (Dunkle 1984) and in three species of *Epigomphus* (Calvert 1920). In the three females of *E. echeverrii* the ocular cicatrices took the form of at least two rounded holes which had sometimes coalesced to form a longitudinal groove. The spines at the apex of the inferior appendage in males of *echeverrii* are positioned transversely about 0.5 mm apart but the holes in the eyes are situated one above the other about 0.2 mm apart. This suggests that the hole in the eye was caused by only the outer spine of the inferior appendage and that the inner spine fits into the depression in the vertex lobe between the lateral ocellus and the outer lateral margin of the lobe. In one female specimen a hole had been punctured in the vertex lobe in this position. The presence of more than one hole in each eye implies that each female had mated at least twice.

Remarks. — Twelve species of *Epigomphus* have been recorded from Central America (Paulson 1982, Donnelly 1986) of which seven occur in Costa Rica, five as endemics. Most of the species have a limited distribution and are confined to forested streams.

Although none of the female specimens was collected *in copula* with a male, it is very likely that they are conspecific since the pterothoracic markings of both sexes are very similar. Also, one of the females was collected flying on the same stretch of stream at the two males where the only other *Epigomphus* species was *subobtusus*. Females of *subobtusus* do not possess the large plates on the vertex which are characteristic of *echeverrii*. Additionally, the females here described do not resemble the females of *E. armatus* Ris or *E. tumefactus* Calvert which were the only other species of *Epigomphus* collected during my stay in Guanacaste National Park. The females are unknown in *E. clavatus* Belle, *E. pechumani* Belle and *E. paulsoni* Belle but none of these species has been recorded from Costa Rica and the pterothoracic markings are different from *echeverrii*.

Epigomphus echeverrii sp.n. is probably closely related to the *crepidus-pechumani-subsimilis* group of species, all of which have broad superior appendages which bifurcate apically and long, narrow, deeply bifurcate inferiors which project beyond the apex of the superiors and bear a pair of short teeth at the apex of each branch. However, in all the latter species, unlike *echeverrii*, one of the teeth at the apex of the branches of the inferior appendage is positioned slightly subapically. *E. echeverrii* differs from *subsimilis* Calvert in which the branches of the inferior appendages are relatively short and the outer apical projection of the superior appendage curls ventrally. *E. pechumani* Belle has a basal internal spine on the superiors, which is absent in *echeverrii*, and the inner apical fork is toothed. In addition, the inferiors are shorter than those of *echeverrii*. In *crepidus* Kennedy the outer apical branch of the superior appendage is very short and blunt and, although the inferiors are morphologically similar to *echeverrii*, the inner



Figs. 22-24. *Epigomphus houghtoni* sp.n., male holotype. — 22, Pterothorax, rigth lateral view. 23, Apex of abdomen and anal appendages, lateral view. 24, Inferior appendage, dorsal view.

tooth at the apex of the branch of the inferiors is about twice the length of the outer and the apex is more acutely pointed. Although some specimens of *crepidus* have two antehumeral stripes, in other individuals the lower stripe is interrupted medially as it is in *echeverrii.*

The females of *E. echeverrii* are easily distinguished from other species in the genus by the large flattened lobes on the vertex which project considerably from the rear of the head. There are no similar structures in any of the species of the genus in which the females are known. In females of *crepidus* and *subsimilis* (the female of *pechumani* is unknown) there is a longitudinal groove adjacent to the lateral ocellus and a pair of small tubercles on the vertex.

This species is named in honour of Sr Gustavo Echeverri who very kindly donated his ranches to the Guanacaste National Park.

Epigomphus houghtoni sp.n.
(figs. 22—24)

Material examined. — Holotype: ♂, Costa Rica, Limon, Siquirres, 5.iv.1988. J. Paul. Holotype deposited in BMNH.

Description of male holotype.

Head: width across eyes 7.8 mm. Colour of eyes in life unknown (probably blue). Labrum black with postero-lateral yellow-green spot and small pale brown median spot; base of mandibles yellow-green; genae yellow-green; postclypeus dark brown, marked black medially and on antero-lateral lobes; frons dark brown anteriorly, pale yellow-green dorsally with basal and median black stripe; vertex and occiput black; labium and back of eyes yellow-green.

Prothorax: black with median and lateral pale green spot on middle lobe.

Pterothorax (fig. 22): black dorsally, dark brown laterally; marked dorsally with pale green transverse stripe adjacent to collar carina, short pale green antehumeral stripe and pale green posterior spot positioned between antehumeral stripe and humeral suture; marked laterally with narrow yellow mesepimeral stripe, yellow metepisternal stripe broad anteriorly narrowing posteriorly, metepimeron almost entirely yellow with narrow brown stripe adjacent to posterior half of second lateral suture and ventral brown stripe in anterior half.

Legs: almost entirely dark brown-black with pale brown stripe on posterior side of femur. Hind leg with spines on outer row of tibia and first two tarsal segments short, thick, rounded apically.

Wings: membrane hyaline with slight yellow-brown suffusion at base of wings and along posterior margin of hind wing. Venation black. Pterostigma dark reddish brown, 3.7 mm in fore wing, 4.2 mm in hind wing. Basal subcostal crossvein present. Nodal index 15 : 19 : 18 : 14/14 : 13 : 14 : 14. Second primary antenodal crossvein seventh in fore wing and hind wing. Intermedian crossveins 5–6/3–3. Supratriangle one celled. Discoidal and sub-triangle uncrossed. 3–4 cubitoanal crossveins in fore wing, 2 in hind wing. Hind wing with 5 paranal cells, 3 postanal cells, 3 rows of cells posterior of Cu_2.

Measurements: hind wing 34.5 mm, greatest width 9.5 mm.

Abdomen: dark brown with the following yellow markings: S1 and S2 with narrow medio-dorsal stripe and entirely yellow laterally; S3 with narrow median dorsal stripe restricted to basal half, large lateral spot in lower half occupying basal three-quarters of segment; S4–S6 with lateral spot in lower half of segment extending to lateral carina and small mid-dorsal basal spot; S7 entirely yellow in basal two-thirds; S8–S9 with small spot on baso-lateral membrane; S10 marked with tapering ventral spot.

Anal appendages (fig. 23–24): black; superior appendages rectangular, about 2½ times as long as broad, dorsal edge cuving ventrally in apical half with seven short teeth on ventro-apical margin; inferior appendage with dorso-basal depression; deeply bifurcate; each branch with low medio-dorsal ridge and small median spine in shallow depression; apices hooked and curving inwards.

Measurements: total length 53.6 mm; abdomen 39.5 mm (including anal appendages 2.7 mm)

Remarks. — *E. houghtoni* belongs to the largest species group in *Epigomphus* all of which have the superior appendages rounded apically, bearing a row of short subapical teeth or crenellations. Most of these species, such as *armatus* Ris and *subobtusus* Selys, have two antehumeral stripes but a few, like *occipitalis* Belle and *tumefactus* Calvert, have only one. Of this latter group *houghtoni* seems to be closest to *occipitalis* since this is the only other species in the genus which has a horseshoe-shaped inferior appendage. However, *occipitalis* (which was described from Peru) can be readily distinguished from *houghtoni* by the presence of a strong median tooth on each branch of the inferior appendage which is absent in *houghtoni*.

This species is named after Mr Greg Houghton who accompanied John Paul in Costa Rica but who was tragically killed shortly afterwards.

ACKNOWLEDGEMENTS

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GENETIC DISTANCE IN THE GENUS *EPHIPPIGER* (ORTHOPTERA, TETTIGONIOIDEA) - A RECONNAISSANCE

by

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Abstract

Oudman, L., W. Landman & M. Duijm, 1989. Genetic distance in the genus *Ephippiger* (Orthoptera, Tettigonioidea). – a reconnaissance. – Tijdschrift voor Entomologie 132: 177-181, figs 1-2, tabs 1-3. [ISSN 0040-7496]. Published 1 December 1989.

Genetic distances were determined by means of enzyme electrophoresis for a number of *Ephippiger* (sub)species, mainly from southern France and northern Italy. For each (sub)species and form one 'typical' location was selected. The results are summarized in a dendrogram. The three groups distinguished by Duijm & Oudman (1983) on the base of copulatory behaviour and morphological characters are confirmed. Nei's genetic distances between *E. ephippiger*, *E. cruciger* and *E. cunii* appeared to be low for genuine species. A comparison with *Uromenus rugosicollis* is included.

Keywords. – *Ephippiger*, enzyme electrophoresis, genetic distance, dendrogram.

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Introduction

In France, the northern part of Spain and NW Italy a number of *Ephippiger* (sub)species occur (e.g. Chopard 1951; Harz 1969). For this region Duijm & Oudman (1983) recognised three groups of (sub)spieces, viz. 1 – *Ephippiger provincialis* (Yersin, 1854), 2 – *E. terrestris* (Yersin, 1854) with the three (sub)species *E .t. terrestris*, *E. t. bormansi* (Brunner von Wattenwyl, 1882) and *E. t. caprai* Nadig, 1980, 3 – *E. ephippiger* (Fieber, 1853) (the subspieces *E. e. vitium* (Serville, 1831)[1]) and *E. e. vicheti* Harz, 1966) *E. cunii* (Bolivar, 1877) and *E. cruciger* (Fieber, 1853). Between these groups no mating is possible. Within group 2 no mating barriers were found, whereas mating between species of group 3 is possible (Hartley & Warne 1984), but not in all cases (Duijm & Oudman 1983). Identification of single specimens and even populations belonging to group 3 often meets with considerable difficulties owing to the large variability of the morphological characters. The present study is an attempt to elucidate the relations between these *Ephippiger* taxa by the investigation of enzyme polymorphism. For comparison the Ephippigerid *Uromenus rugosicollis* (Serville, 1839) is used.

Materials and methods

The insects were collected during field trips in August and September of 1979, 1980, 1981, 1982 and 1983. Generally we succeeded in collecting a sufficient number (*c* 20) from a restricted area of a few acres. This area had to be small to limit ourselves to one population (or part of it) and so to avoid the mixing of different populations. The animals were killed, measured, photographed and frozen in solid carbon dioxide (-79°C).

For this "reconnaissance" it appeared desirable to omit the intra- (sub)specifical variation in order to get a clearer picture. For each taxon we therefore selected one locality that we considered sufficiently typical. In this selection we used – if possible – the type locality or our nearest collecting site and otherwise a locality that was in good concordance with the morphological description and/or in the neighbourhood of the centre of distribution[2]). The

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[1]) According to Kruseman (1988) the correct name for this subspecies is *E. ephippiger diurnus* Dufour, 1841.

[2]) Later work (Landman et al. 1989) showed that the population used in this study as representative for *E. t. terrestris* (Col de Castillon, No. 2), though in many respects very close to the nominate form cannot be regarded as entirely "pure".

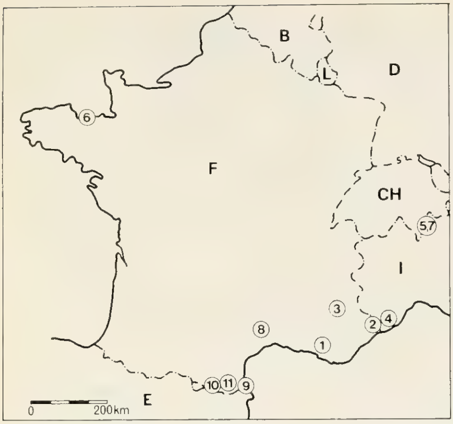

Fig. 1. Collection sites of *Ephippiger* and *Uromenus* species in SW Europe. Numbers denote the sites, see table 1.

sites selected are summarised in table 1 and fig. 1.

For preparation of the samples, electrophoretic techniques and the preparation of the horizontal polyacrylamide gels we refer to Van Dijk & Van Delden (1981).

The following loci were analysed: Alcohol dehydrogenase (Adh), Tetrazolium oxidase (To), two Phosphoglucomutases (Pgm-2 and Pgm-3), Malic enzyme (Me), Fructosediphosphate aldolase (Ald), Esterase-2 (Est-2), Hexokinase-3 (Hk-3), Fumarate hydratase (Fum), Xanthine dehydrogenase (Xdh), Isocitrate dehydrogenase (Idh), Glucose oxidase-3 (Gluo-3), α-Glycerophosphate dehydrogenase (α-Gpdh). For polymorphic loci Mendelian inheritance was assumed on base of enzyme band patterns and checked by testing genotype frequencies for every location for Hardy-Weinberg equilibrium.

Between populations Nei's genetic distances were calculated (Nei 1975). From the matrix of

Table 1. Sites of collection of the selected populations of *Ephippiger* and *Uromenus* species.

No.	(Sub)species	Location	Country/dept.	Alt. m.	Date
1.	*E. provincialis*	Plan d'Aups	F 84	680	24-viii-80
2.	*E.t. terrestris*	Col de Castillon	F 06	700	31-viii-81
3.	*E.t. terr.* f *minor*	Col de Maure	F 04	1350	24-viii-81
4.	*E.t. caprai*	Cle. Scravaion	I Liguria	820	3-ix-81
5.	*E.t. bormansi*	Naggio (L. di Como)	I Lombardia	800	5/6-ix-81
6.	*E.e. diurnus*	Cap Fréhel	F 22	70	9-ix-83
7.	*E.e. vicheti*	Naggio (L. di Como)	I Lombardia	750	5/6-ix-81
8.	*E. cruciger*	Gignac	F 34	60	3-vii-82
9.	*E. cunii*	Cerbère	F 66	10	9-vii-82
10.	*E. cunii* f. *jugicola*	Val d'Eyne	F 66	1600	22-viii-82
11.	*Uromenus rugosicollis*	Canigou	F 66	840	31-viii-79

Table 2. Allele frequencies of the polymorphic loci of *Ephippiger* and *Uromenus* species.

	(sub)species	n	Pgm-2				Pgm-3			
			12	14	16	20	26	29	32	35
1	*E. provincialis*	16	0	0	0	1.00	0	.14	.86	0
2	*E.t. terrestris*	18	.50	.50	0	0	.27	.67	0	.07
3	*E.t.t.*f. *minor*	13	.23	.77	0	0	0	0	.69	.31
4	*E.t. caprai*	23	.28	.65	.07	0	0	.96	.04	0
5	*E.t. bormansi*	18	.69	.31	0	0	0	0	1.00	0
6	*E.e. diurnus*	20	0	0	0	1.00	.70	.30	0	0
7	*E.e. vicheti*	21	0	0	0	1.00	1.00	0	0	0
8	*E. cruciger*	26	0	0	0	1.00	.35	.23	.31	.11
9	*E. cunii*	20	0	0	0	1.00	.20	.80	0	0
10	*E. cunii* f. *jugicola*	24	0	0	0	1.00	0	1.00	0	0
11	*Uromenus rugosicollis*	15	–	–	–	–	.13	.53	.33	0

genetic distances a dendrogram was constructed following the UPGMA method (Sneath and Sokal 1973).

Samples of collected (sub)spieces from all localities, including tips of abdomens used for electrophoresis, will be deposited in the Entomological collection of the Institute for Taxonomical Zoology (Zoological Museum) in Amsterdam.

RESULTS

Thirteen loci were investigated of which eight were monomorphic. Five loci showed polymorphism: Est-2, Pgm-2, Pgm-3, To and Adh, with respectively 4, 4, 4, 3 and 2 alleles. The allozyme frequencies are given in table 2. To is fixed in most populations. Adh is only polymorphic in *E. t. caprai*. Pgm-2 is only variable in *E. terrestris*. The most variable enzymes are Pgm-3 and Est-2.

The genetic distances are shown in table 3 and the dendrogram, calculated from these distances, in fig. 2.

Based on a preliminary investigation (Landman, 1981) we determined the genetic distance between *Uromenus rugosicollis* and a number of *Ephippiger* (sub)spieces (18 populations, 9 loci, 18 alleles) at 0.3473. An indication of this distance is added to the dendrogram.

DISCUSSION

The genetic distance (0.35) between the closely related genera *Uromenus* and *Ephippiger* appears to be very low in view of the range for genera mentioned in reviews (e. g. Thorpe 1982, Menken & Ulenberg 1987). The distance between genera generally is 1, in the mean 1.30, and minimally 0.62.

The distance found by us between *E. provincialis* and the other *Ephippiger* species (0.20) as well as the distance between our groups 2 and 3 (0.16) are very low for congeneric species. According to Thorpe (1982) only in 3% of the cases studied distances below 0.16 are found for congeneric species.

The distances between the subspecies of *E. terrestris* (0.015 – 0.11) are within the range generally found between subspecies: 0.02 – 0.22 (Menken & Ulenberg 1987) except one: the distance (0.015) between *E.t. caprai* and *E.t. terrestris* from Col de Castillon. This very small distance is one of the indications that the population of Castillon is not quite representative for the nominate form of *E. t. terrestris*.

The distances between the species within our group 3 are strikingly small (0.03); they lie in the range for subspecies. This is in accordance with the results of Hartley and Warne (1984).

The dendrogram of fig. 2 offers a picture that is mainly in accordance with current taxonomical opinion. It also conforms to our grouping (Duijm & Oudman 1983) based on morphological data and on the existence of mating barriers. Within group 3, however, *E. e. vicheti* occupies a rather separate position [1]). The relations between *E. e. diurnus*, *E. cruciger* and *E. cunii* as well as those within the *terrestris*-group will be dealt with in later publications.

ACKNOWLEDGEMENTS

We would like to thank the Uyttenboogaart-Eliasen Stichting in Amsterdam for financial support. We are particularly indebted to Marten Zijlstra and Klaas Vrieling who helped us with the

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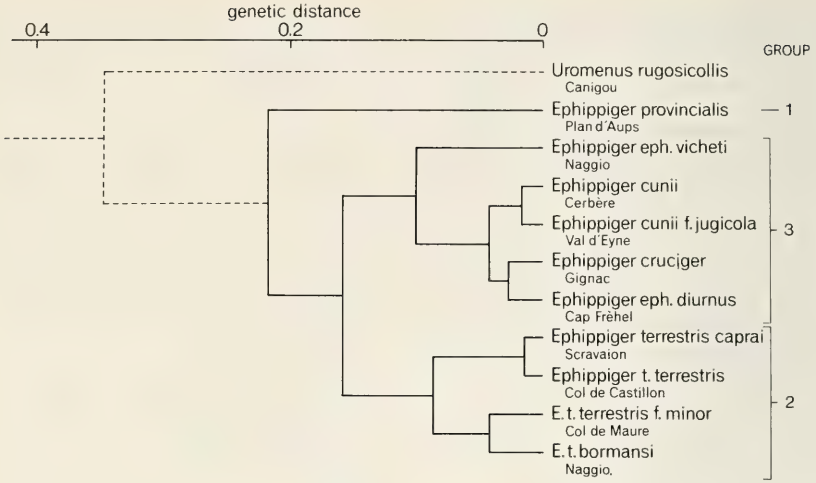
[1]) Nadig (1987,p.331) raises this taxon to species-level: *E. vicheti* Harz, 1966.

(Table 2 continued)

Est-2				To				Adh	
15	17	20	23	40	63	65	67	18	22
.78	.22	0	0	0	1.00	0	0	1.00	0
.08	.67	.25	0	0	0	0	1.00	1.00	0
.42	.23	.35	0	0	0	0	1.00	1.00	0
.10	.57	.33	0	0	0	0	1.00	.80	.20
0	.24	.76	0	0	0	0	1.00	1.00	0
0	1.00	0	0	0	0	0	1.00	1.00	0
0	0	.08	.92	0	0	0	1.00	1.00	0
.04	.50	.46	0	.06	0	0	.94	1.00	0
.25	.67	.08	0	0	0	0	1.00	1.00	0
.08	.33	.54	.04	0	0	0	1.00	1.00	0
0	.02	.90	.08	0	0	1.00	0	1.00	0



computing work. We thank Prof. W. van Delden for providing laboratory facilities and for valuable discussions and continued interest. Our thanks are due to H. van Dijk for his instruction in electrophoretic techniques. We are very grateful to Dr. A. Nadig (Chur), who generously supplied us with information about his collecting sites. We thank A. Decae, G. J. van Klinken, H. Hidding and G. Overkamp, who assisted in collecting the insects. We are grateful to Dr. M. G. Ritchie for critically reading the manuscript and for correcting the English. Furthermore we thank Mrs. J. Poelstra for typing the manuscript and D. Visser for making the drawings.

Fig. 2. Dendrogram of Ephippigeridae based on the genetic distances of table 3. An estimation of the distance between *Uromenus* and the *Ephippiger* (sub)species is added on the base of preliminary work (Landman, not published).

Table 3. Genetic distances based on allozyme frequencies of thirteen loci of *Ephippiger* species.

Group	(sub)species	1	2	3	4	5	6	7	8	9	10
1	1 *E. provincialis*	–	.2522	.1840	.2668	.2167	.1971	.2337	.1408	.1631	.1890
2	2 *E.t. terrestris*		–	.0680	.0147	.0899	.0858	.1687	.0846	.0687	.0815
	3 *E.t.t.* f. *minor*			–	.0792	.0409	.1649	.1956	.1016	.1439	.1514
	4 *E.t. caprai*				–	.1115	.1232	.2152	.1073	.0761	.0726
	5 *E.t. bormansi*					–	.1908	.2192	.1059	.1771	.1598
3	6 *E.e. diurnus*						–	.0832	.0288	.0276	.0717
	7 *E.e. vicheti*							–	.0766	.1109	.1309
	8 *E. cruciger*								–	.0287	.0363
	9 *E. cunii*									–	.0179
	10 *E. cunii* f. *jugicola*										–

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BOOK ANNOUNCEMENTS AND REVIEWS

Böcher, J., 1988. The Coleoptera of Greenland. – Meddelelser om Grønland, Bioscience 26: 1–100, figs. 1–55. [ISBN 87-17-05572-5]. E. J. Brill, Leiden.

During a time that many entomologists focus on the warmer parts of the world under the banner of Biodiversity, it is good to see that the study of polar regions on both sides of the globe is far from neglected – and rightly so. This is undoubtedly due in part to the increasing accessibility of these regions and to the increasing recognition of their global ecological indicator value.

In the respected Danish series on Greenlandic scientific research, Meddelelser om Grønland, an interesting survey of the beetles of this largest island of the world has recently appeared. It includes an extensively annotated, illustrated list of the species (33 indigenous), with detailed biogeographical and ecological data and discussion. This is all supported by maps, habitat descriptions, and numerous references. Most of the species are qualified as Lateglacial invaders from northern and western Europe – probably passive invaders, as several are flightless, but this view may be somewhat controversial. Genuine nearctic elements are rare (one byrrhid species only). Most of the species are distributed along the southern coasts. Of course there are also synanthropic species and other introductions; in fact about half of the total of nearly 70 is introduced by man, and includes such familiar pests as species of *Anthrenus, Attagenus, Ptinus, Tribolium* and *Oryzaephilus*.

The paleo-ecological implications of the recent and fossil Greenlandic and other arctic beetle faunas are amply discussed and compared with the results of Coope and other workers on the Quaternary history of the European, Siberian and North American faunas. Judged from "in press" references further reports on Plio-Pleistocene beetle fossils are to be expected. Extreme environments like those of Greenland provide valuable information on the tolerance of species to various ecological factors, and highlight their suitability as ecological indicators elsewhere in their range.

All in all, this survey of the Greenlandic Coleoptera will prove to be extremely useful to ecologists, biogeographers, or the increasing number of arctic naturalist travellers.

[J. Krikken]

Wirth, W. W. & W. L. Grogan, Jr., 1988. The predaceous midges of the world (Diptera: Ceratopogonidae; Tribe Ceratopogonini). – Flora and Fauna Handbook 4: i–xvi + 1–160, figs. 1–49. [ISBN 0-916846-43-1]. E. J. Brill, Leiden. Price Hfl. 58.00.

The diagnostic characters of the genera previously assigned to the tribes Ceratopogonini and Stilobezziini are reviewed and found not to support a division into separate tribes. Forty-five genera are combined into one tribe, the Ceratopogonini, for which a diagnosis and a key to genera are given. A diagnosis, illustrations, synonymy, and a list of species are given for each genus and subgenus, but for the larger genera, species lists are restricted to changes since the last published catalogues or check lists.

[From the abstract by the authors].

ALLOZYMIC AND MORPHOLOGICAL VARIATION IN *EPHIPPIGER TERRESTRIS* (YERSIN, 1854) (INSECTA, ORTHOPTERA, TETTIGONIOIDEA)

by

W. LANDMAN, L. OUDMAN & M. DUIJM

ABSTRACT

Landman, W., L. Oudman, & M. Duijm, 1989. Allozymic and morphological variation in *Ephippiger terrestris* (Yersin, 1854) (Insecta, Orthoptera, Tettigonioidea). – Tijdschrift voor Entomologie 132: 183-198, figs. 1-13, tabs. 1-11. [ISSN 0040-7496]. Published 1 December 1989.

Based on allozyme frequencies the genetic distances between seventeen populations of *Ephippiger terrestris* are determined and compared with biometrics of epiproct, cerci and titillators. The distinction of three subspecies, viz. *terrestris*, *bormansi* and *caprai* is confirmed. As a result of the large variability of all characters within populations, distinction between subspecies generally is not sharp. At the boundaries of the species distribution area the subspecies characters are clearest, whereas in the centre an extensive area with intermediate populations is present, generally exhibiting clinal differences. Such gradients are described for several characters for a number of populations along a transect near Tende in the French Alps.

Key words. – *Ephippiger terrestris*, subspecies, biosystematics, enzyme electrophoresis, male appendages, intermediates, clines.

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INTRODUCTION

Ephippiger terrestris (Yersin, 1854) occurs in the French Alps, in the neighbouring Italian Alps and also around the Italian-Swiss lakes. Nadig (1980) argued that *E. bormansi* (Brunner von Wattenwyl, 1882) has to be regarded as a subspecies of *E. terrestris* and described a new subspecies, *E. t. caprai*. Furthermore, he found intermediates between *E. t. terrestris* and *E. t. bormansi* in a broad area in the department Alpes Maritimes (Fig. 1). Duijm and Oudman (1983) confirmed these results; they showed that between *bormansi*, *caprai* and *terrestris* no mating barriers occur. Mating attempts between these *terrestris* subspecies and *E. ephippiger* failed, however, apparently due to differences in cerci and epiproct in the male and the place of the copulatory sockets in the female partner. Hartley and Warne (1984) confirmed these findings by measurements of male cercal reach and the corresponding female intersocket distances.

In this study morphometric characters are investigated, primarily to consider the relations between the three subspecies mentioned and the position of intermediates, mainly from a transect near Tende. Allozyme analysis is used to get an independent character set. The allozyme frequencies in *E. terrestris* are compared with those in *E. ephippiger vicheti*, the latter being chosen as it occurs sympatrically with *E. t. bormansi* at site 14 near the Lago di Como.

MATERIALS AND METHODS

Collection. – Specimens were collected during field trips in 1980 and 1981. For locations see table 1 and figs. 1 and 2. In 1981 special attention was given to a transect near Tende (sites 1-11), where intermediates might be found according to Nadig (1980) and our own preliminary observations in 1980. The collecting area varied from one to several acres, depending on the population density. The animals were killed, measured, photographed and frozen in solid carbondioxide (-79° C) within one day of capture.

Table 1. Collection sites of *Ephippiger* species.

No.	Location	Country/dept.	Altitude (m)		Date
Ephippiger terrestris					
1.	Mézel/Majastres	F 04	1200	A)	20-viii-80
				B)	24/28-viii-81
2.	Col de Maure	F 04	1350		24-viii-81
3.	Gréolières/Plan de Peyron	F 06	1100		29-viii-81
4.	Col de Braus	F 06	1000		30-viii-81
5.	Col de Castillon	F 06	700		31-viii-81
6.	Cle. Scravaion	It Liguria	820		3-ix-81
7.	Tende	F 06	830	A)	29/31-viii-80
				B)	1/3-xi-81
8.	Vievola 1	F 06	915		2-ix-81
9.	Vievola 2	F 06	1050		2-ix-81
10.	Col de Tende 1	F 06	1200		2/5-ix-81
11A.	Col de Tende 2	F 06	1400		2-ix-81
11B.	Col de Tende	F 06	1350/1420		30-viii-80
12.	Col de Tende 3	F 06	1600		2-ix-81
13.	Vallone del Arma	It Piemonte	1600		31-viii-81
14A.	Naggio (L. di Como)	It Lombardia	800		5/6-ix-81
15.	Mt. Grona (Lago di Como)	It Lombardia	1400		6-ix-81
17.	Collobrières	F 84	135		26-viii-80
18.	Fayence	F 84	250		28-viii-80
19.	Aiguines (Verdon)	F 84	850		23-viii-80
Ephippiger ephippiger vicheti					
14B.	Naggio (L. di Como)	It Lombardia	750		5/6-ix-81
16.	Miglieglia/Mt. Lema	CH Ticino	720		7-ix-81

Electrophoresis. – Preparation of samples, electrophoretic techniques and the preparation of the horizontal polyacrylamide gells were carried out as in Van Dijk & Van Delden (1981). The following eighteen enzyme loci were analysed: Alcohol dehydrogenase (Adh), Tetrazolium oxidase (To), two Phosphoglucomutases (Pgm-2 and -3), three Esterases (Est-1, -2 and -5), Aldehyde dehydrogenase (Aldox-2), two Hexokinases (Hk-2 and -3), Fumarate hydratase (Fum), Xanthine dehydrogenase (Xdh), Glucose oxidase (Gluo-3), Aldolase (Ald), Malic enzyme (Me), Isocitrate dehydrogenase (Idh), α-Glycerophosphate dehydrogenase (α-Gpdh) and Glycerine dehydrogenase (Glydh).

A preliminary electrophoretic survey was made in 1980 (Landman 1981). In this study ten of the above mentioned loci were examined for *E. terrestris* from six localities (Nos. 1, 7, 11B, 17, 18 and 19). For polymorphic loci Mendelian inheritance was assumed on the basis of enzyme band patterns and checked by testing genotype frequencies for every location for Hardy-Weinberg equilibrium.

Between populations Nei's genetic distances were calculated (Nei 1975). From the matrix of genetic distances a dendrogram was constructed according to the UPGMA method (Sneath and Sokal 1973). Principal component analysis was carried out with the allele frequencies (arcsin $\sqrt{p}$ transformed). The principal component scores of each population were calculated and the first and second represented in a diagram.

Morphology. – Five characters of body and legs were measured in the field: body weight (BW), body length (LB), length of pronotum (LP), length of hind femur (LF) and length of fore tibia (LT). Weight was determined by means of a Pesola pocket spring balance (0 – 5 g in 0.1 g). Length was measured with sliding calipers. In a number of samples one character of the pronotum and one of the head was scored. Nadig (1980) distinguished a shield-shaped field medially in the metazona of the pronotum and named it *campus medianus*; he showed that the lateral limitation of this field is sharper in *E. t. bormansi* than in *E. t. terrestris* and *E. t. caprai*. Moreover, this field is smooth in *E. t. bormansi* and more or less granular in the other subspecies. We scored the surface texture with: 0 – smooth, 1 – granular, and 2 – rough, but we did not find the latter character-state represented in our samples. Furthermore we paid attention to the "fastigium verticis" on the head, the profile of which, according to Nadig (l.c.) varies from very steep to receding, a steep fastigium being characteristic for *E. t. bormansi*. We scored: 0 – steep, 1 – rather steep, 2 – receding.

Colours of pronotum and abdomen were also noted in the field.

Cerci and epiproct of freshly killed specimens were photographed with a Medical Nikkor (2 : 1). From the projected diapositives drawings with an end magnification of 40x were made. Measurements were carried out on these drawings. To characterise the form of the epiproct the following dimensions were measured (fig. 3A): apical, central and basal width (EA, EC and EB, respectively), lateral and medial length (EL and EM).

Fig. 3B shows the way in which the cerci were measured: total length (CL = CA + CB) and its division by the place of the inner tooth in length of apex (CA) and basal length (CB), basal width (CE) and apical width (CF) and finally, a measure (CD) for the form of the outer lateral side of the cercus, CD taken negative when this side is convex and positive when concave.

Titillators were removed from the body and measured with a stereomicroscope (20x) using an ocular micrometer. Figure 3C shows the way in which they were measured. TL indicates the total length of the apical part of the titillator, TT the length of the toothed part of it and TN the number of teeth. The width of the apical part is measured as TA, so that the ratio TA/TT indicates its slenderness.

Samples of collected specimens from all localities, including tips of abdomens of the specimens used for electrophoresis, will be deposited in the Entomological collection of the Institute for Taxonomical Zoology (Zoological Museum) in Amsterdam.

RESULTS

Allozymes

Eighteen loci were surveyed of which six were polymorphic: Pgm-2, Pgm-3, Est-1, Est-2, Est-5 and Adh, with 3, 5, 2, 4, 2 and 2 alleles, respectively.

Fig. 1. Collection sites and distribution of *Ephippiger* species in S. France, S. Switzerland and NW. Italy.

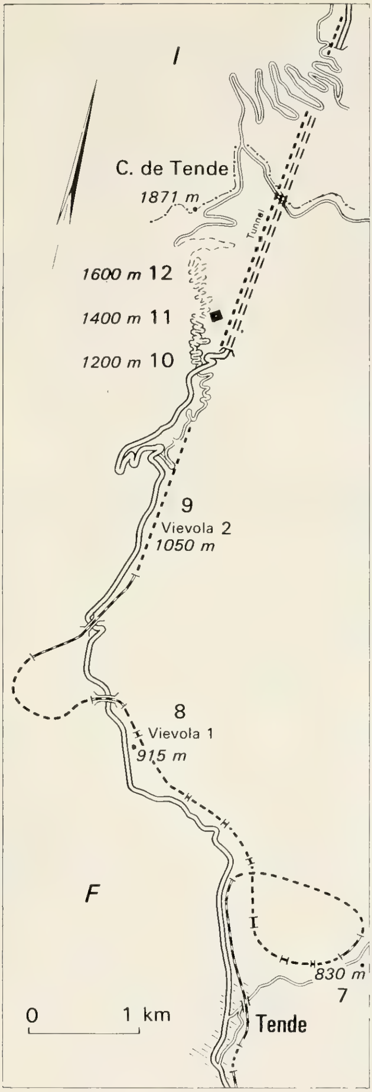

Fig. 2. Collection sites along the Tende transect (locations 7 -12) in Southeast France.

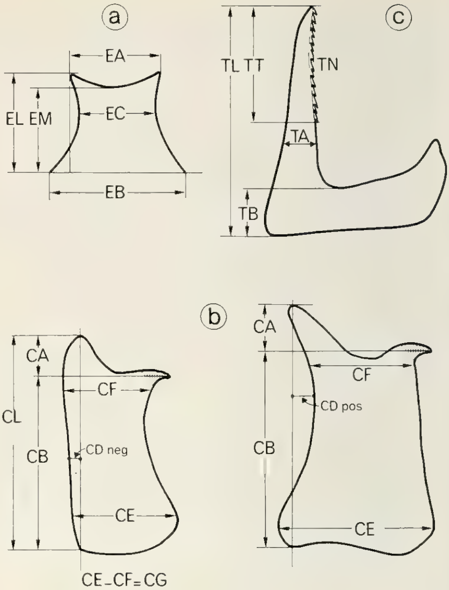

Fig. 3. Method of measurement of (a) epiproct, (b) cerci, (c) titillators. For abbreviations see text.

The allozyme frequencies are shown in table 2. The genetic distances are summarized in table 3 and the dendrogram calculated from these distances is given in fig. 4.

The aggregate of all *E. terrestris* populations appears to be well separated from *E. ephippiger vicheti* (distance 0.1713). For *E. t. caprai* the separate position is also clear. The distance between *E. t. bormansi* and *E. t. terrestris* is less. The populations along the Tende transect together form a separate group.

The results of the 1980 study – as far as *E. terrestris* is concerned – are summarized in table 4, in which the distances for six populations are given. In these data the sites 17 and 18 represent with certainty the nominate form, whereas this may be doubted with regard to the site 5 in the former series. The 1980 and 1981 distances are combined in the semi-geographical representation of fig. 5. Comparison of these data appears to be justified, because the distances between the populations 1 and 7, determined both in 1980 and 1981, were quite similar: 0.0742 and 0.0785 respectively.

Principal component analysis was carried out for 14 populations of *E. terrestris* and for 18 allozymes. Fig. 6 shows the relation between the principal components 1 and 2. PC 1 and PC 2 together explain 55% of the total variance. The distribution of the 14 populations in this diagram is similar to their position in the dendrogram (fig. 4), though the methods used are quite different.

Morphology

The measurements of body and legs are summarized in table 5. The means of these measurements are generally linearly interrelated as appears from table 6. By way of illustration the relation between body weight and body length is shown in fig. 7. The *E. t. bormansi* populations are on average the smallest ones, even smaller than our *minor* samples. Specimens of the nominate form, represented by the localities 17 and 18 and perhaps also no. 5 (Col du Castillon) are the biggest ones. *E. t. caprai* occupies an intermediate position and the samples along the Tende transect are intermediate between *caprai* and *bormansi.*

Table 7 shows that the mean body measurements are negatively correlated with the altitude of the collection site; especially for LT and LF the correlation is rather close. This is illustrated in fig. 8 for the relation between LT and altitude. The distribution of the samples is rather similar to that in fig. 7, only the mean length of the tibia in Naggio (No. 14A) is too short for the altitude of this site.

To compare the form of the epiproct in the various populations only mean ratios are used (table 8) and not absolute measurements, because these strongly depend on body dimensions. The variation in the ratios EL/EM and EA/EC is represented in the diagram of fig. 9. The three subspecies *caprai, terrestris* and *bormansi* appear to be well separated. In the nominate subspecies EL/EM is larger than in the other two subspecies. This means that the hind margin of the epiproct is bent inside so that the hind corners are protruding. The ratio EL/EM in *bormansi* is the same as in *caprai,* and significantly smaller than in *terrestris*, indicating that the hind corners are not prolonged and may even be rounded. There is a clear difference in the ratio EA/EC between *bormansi* and *caprai*: the higher value in *bormansi* points to the often laterally projecting hind corners, whereas the low value in *caprai* indicates the rounded hind corners of the epiproct in this subspecies. The forma *minor* has the same high EL/EM ratio as the nominate form, whereas its EA/EC ratio is higher. So in the mean the hind corners are in *minor* somewhat more laterally protruding than in the nominate form; in this respect *minor* resembles *bormansi.*

Our measurements of the cerci are summarized in table 9. Cercal dimensions are correlated with the dimensions of other parts of the body. The mean total length of the cercus (CL) is moderately correlated with mean length of the tibia ($r = 0.486$), the measurements CD and CE closely ($r = 0.916$ and 0.949, respectively). Therefore we characterize the cercal form by means of the ratios. In fig. 10 the relative length of the apex (CA) is compared with the relative deviation of a straight outer margin (CD). The nominate form has the longest apical part and a strongly concave outer margin. *E.t. bormansi* has a shorter apical part and a slightly convex outer margin. *E.t. caprai* has a rather short apical part and a slightly concave outer side. The forma *minor* is intermediate between *t. terrestris* and *t. bormansi*, the populations along

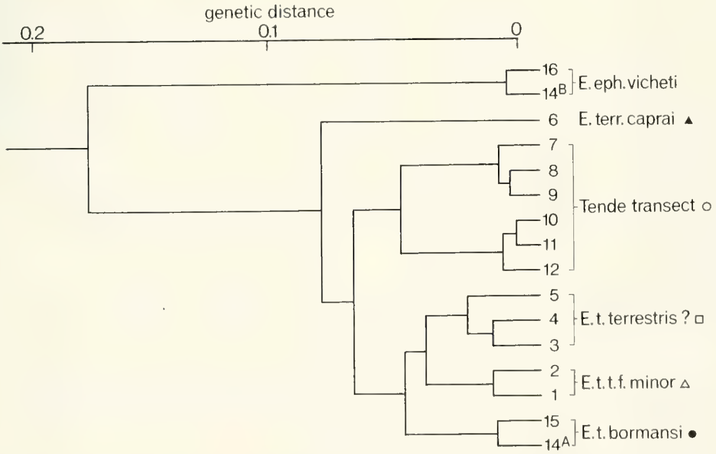

Fig. 4. Dendrogram of *Ephippiger terrestris* populations, based on genetic distance, calculated from table 3 (1981 data).

Table 2. Allozyme frequencies of *Ephippiger* populations (n.m. = not measured).

			Pgm-2			Pgm-3				
No.	Locality	n	a	b	c	a	b	c	d	e
E. terrestris										
1B.	Mézel/Majastres	28	.38	.62	–	–	–	.91	.09	–
2.	Col de Maure	13	.23	.77	–	–	–	.69	.31	–
3.	Gréolières	20	.50	.40	.10	–	.25	.38	.38	–
4.	Col de Braus	20	.43	.40	.18	–	.39	.33	.28	–
5.	Col de Castillon	18	.50	.50	–	.27	.67	–	.07	–
6.	Cle. Scravaion	23	.28	.65	.07	–	.96	.04	–	–
7.	Tende	20	.10	.90	–	–	.60	.40	–	–
8.	Vievola 1	20	–	1.00	–	–	.70	.25	–	.05
9.	Vievola 2	16	–	1.00	–	–	.69	.31	–	–
10.	Col de Tende 1	15	–	1.00	–	–	.11	.79	.05	.05
11.	Col de Tende 2	7	–	1.00	–	–	–	1.00	–	–
12.	Col de Tende 3	8	–	1.00	–	–	–	.88	–	.13
14A.	Naggio	18	.69	.31	–	–	–	1.00	–	–
15.	Mt. Groma	10	.60	.40	–	–	.10	.80	.10	–
E. e. vicheti										
14B.	Naggio	21	1.00	–	–	1.00	–	–	–	–
16.	Miglieglia/Mt. Lema	18	1.00	–	–	1.00	–	–	–	–

Table 3. Genetic distances between populations of *Ephippiger* species.

		E. terrestris						
No.	Localities	1B	2	3	4	5	6	7
1B.	Mézel/Majastres	–	.0102	.0243	.0276	.0555	.0822	.0785
2.	Col de Maure		–	.0253	.0299	.0604	.0829	.0540
3.	Gréolières			–	.0126	.0304	.0555	.0627
4.	Col de Braus				–	.0128	.0637	.0611
5.	Col de Castillon					–	.0535	.0779
6.	Cle. Scravaion						–	.0823
7.	Tende							–
8.	Vievola 1							
9.	Vievola 2							
10.	Col de Tende 1							
11.	Col de Tende 2							
12.	Col de Tende 3							
14A.	Naggio							
15.	Mt. Grona							
14B.	Naggio							
16.	Miglieglia							

(Table 2, continued).

Est-1		Est-2				Est-5		Adh	
a	b	a	b	c	d	a	b	a	b
.040	.60	.13	.53	.33	–	1.00	–	1.00	–
.038	.62	.42	.23	.35	–	1.00	–	1.00	–
.069	.31	.03	.35	.42	.20	.94	.06	1.00	–
.055	.44	.22	.58	.18	.02	.69	.31	1.00	–
.054	.46	.08	.67	.25	–	.62	.38	1.00	–
1.00	–	.10	.57	.33	–	.94	.06	.80	.20
1.00	–	.95	.03	.03	–	1.00	–	.97	.03
.92	.08	.72	.03	.25	–	.78	.22	1.00	–
.89	.11	.79	–	.21	–	.88	.12	1.00	–
.96	.04	.37	.03	.60	–	.37	.63	1.00	–
.88	.12	.33	–	.67	–	.42	.58	1.00	–
1.00	–	.50	–	.50	–	.67	.33	1.00	–
.83	.17	–	.24	.76	–	.79	.21	1.00	–
1.00	–	–	.25	.75	–	1.00	–	1.00	–
.67	.33	–	–	.08	.92	n.m.		n.m.	
.44	.56	–	–	–	1.00	n.m.		n.m.	

(Table 3, continued)

							E.e. vicheti		
8	9	10	11	12	14A	15	14B	16	No.
.0784	.0749	.0672	.0587	.0532	.0297	.0344	.1946	.1960	1B.
.0534	.0489	.0555	.0506	.0407	.0454	.0470	.1993	.2000	2.
.0566	.0575	.0639	.0675	.0571	.0278	.0198	.1464	.1566	3.
.0508	.0536	.0628	.0701	.0648	.0462	.0460	.1744	.1798	4.
.0570	.0632	.0840	.0971	-0941	.0729	.0698	.1678	.1734	5.
.0771	.0804	.0929	.1034	.0832	.0852	.0659	.1153	.1352	6.
.0078	.0044	.0570	.0680	.0380	.0943	.0729	.2257	.2455	7.
–	.0010	.0367	.0504	.0316	.0895	.0719	.2362	.2549	8.
	–	.0437	.0549	.0332	.0911	.0722	.2354	.2527	9.
		–	.0026	.0072	.0496	.0532	.2625	.2853	10.
			–	.0072	.0429	.0505	.2682	.2885	11.
				–	.0442	.0411	.2469	.2701	12.
					–	.0067	.1831	.2010	14A.
						–	.1770	.2002	15.
							–	.0034	14B.
								–	16.

Table 4. Genetic distances, calculated from allozyme frequencies determined by Landman (unpublished) for six samples of *Ephippiger terrestris* collected in 1980.

No.	Location	17	18	19	1A	11B	7
17.	Collobrières	–	.0233	.0634	.0482	.0789	.0709
18.	Fayence		–	.0278	.0477	.0553	.0912
19.	Aiguines			–	.0480	.0518	.1090
1A.	Mézel/Majastres				–	.0341	.0742
11B.	Col de Tende					–	.1247
7.	Tende						–

the Tende transect are approximately intermediate between *t. caprai* and *t. bormansi*. Strikingly apart is the position of the populations 4 and 5 owing to their relatively very short apices.

The basal part of the cercus tapers somewhat towards the apex; this tapering is measured by CG, the difference between CE and CF. Figure 11 shows the relative measure of tapering. This is least in *bormansi* and strongest at the sites 4 and 5. The nominate and the *minor* form occupy an intermediate position, as does *caprai*. The three sites at the Col de Tende (10 – 12) are intermediate between *terrestris* and *bormansi*.

According to Nadig (1980) the apical parts of the titillators vary in slenderness. Our observations (Table 10) confirm this statement; we determined the ratio TL/TA for caprai at 5.8, whereas the values for the three *bormansi* sites were 11.8, 10.5 and 12.2 (mean 11.5). The *bormansi* titillators are therefore evidently more slender than those of *caprai*. Those of the forma *minor* were similar to *bormansi*. Along the Tende transect we found for the sites 7 – 12 the ratios 6.4, 6.9, 8.05, 10.7, 11.0 and 10.7 respectively. So there is a clear gradient between *caprai* and *bormansi*, respecially along the first part of the transect.

The relative scores for the texture of the campus medianus and the form of the fastigium verticis are shown in fig. 12. With regard to the campus medianus (fig. 12A) the character states as specified by

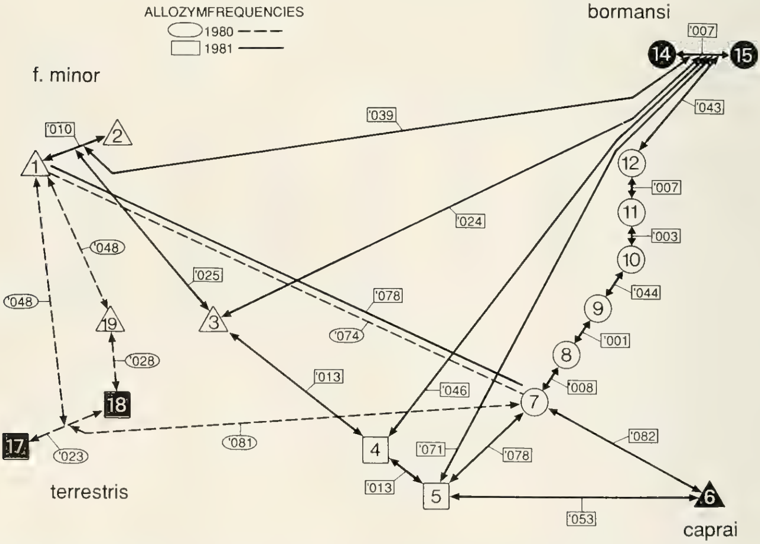

Fig. 5. Semigeographical representation (not on scale) of genetic distances between adjacent populations of *Ephippiger terrestris* (1981 and 1980 data).

Nadig (l.c.) are clearly confirmed: the surface is smooth on sites 13 and 14 and therefore in *bormansi*, whereas the granular state is apparently characteristic for *caprai* (sites 6 – 9). The situation at the three sampling sites along the Col de Tende (10 – 12) is intermediate with the *bormansi* state prevailing at sites 11 and 12, whereas at site 10 the *caprai* state predominates, indicating a rather steep transition with regard to this character over an altitude difference of 200 m.

The steepness of the fastigium verticis shows also a gradual transition (fig. 12B). A steep fastigium appears to be characteristic for *E.t. bormansi* and a less steep or even receding one for *E. t. caprai*; a transitional situation is found along the Tende transect.

It has to be stressed that all the above morphological results have been obtained by using the means of rather variable series of measurements; the statements do, therefore, not necessarily apply to the form of the various parts in individuals belonging to the populations studied.

Figure 13 gives an overall picture of the colour of the abdomen. The various shades noted were here combined into three categories only, viz. green, brown and grey. The predominance of grey (in fact yellowish grey) in the nominate form (sites 17 and 18) is remarkable. At other places shades of green and brown were most common, whereas grey was rather rare. There appears to exist a gradient along the Tende transect with the percentage of green individuals changing from 100% to 45%. Table 11 gives a more detailed picture of this situation by also giving the shades of green observed. One sees that in *caprai* (site 6) only plain-green specimens were found, whereas at the sites along the transect other shades of green occurred, though in small numbers. The decrease of the relative numbers of plain-green specimens along the transect is obvious. In the same time the occurrence of three rows of dark spots on the abdomen (a *bormansi* character) increases along this transect, as appears from Table 11. Very interestingly also at site 3 a sizeable percentage of this character was observed (32%, n = 28).

Discussion

As typical representatives of the nominate form, *E. t. terrestris*, we consider our samples from Fayence (18) and Collobrières (17) from the lower parts of the department Var. Here one finds the biggest specimens. The epiproct usually has markedly protruding hind corners. The cerci have a long apex, a concave outer margin and the basal part tapers somewhat towards the apex. Unfortunately these populations are missing in our 1981 collections. The 1980 data indicate a distance D = 0.048 to the *minor* population of site 1.

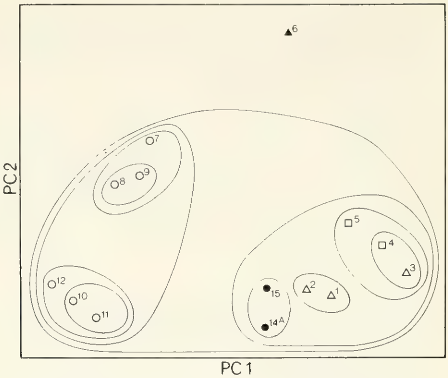

Fig. 6. Diagram of scores for Principal Components 1 and 2, based on allozyme frequencies for 14 locations of *Ephippiger terrestris*.

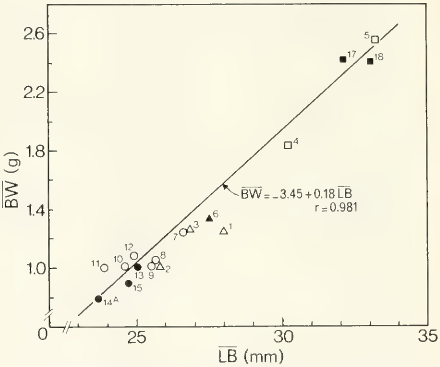

Fig. 7. The relation between mean body weight (BW) and mean length of body (LB) in *Ephippiger terrestris*.

Nadig (1980) described *E. t. caprai* as a new subspecies from the Ligurian Alps, close to *E. t. terrestris*, but differing in form of epiproct and titillators and in colour; the fresh grassgreen body-colour is an important character in living *caprai* specimens. For the *caprai* population studied we can confirm his results: epiproct with rounded corners, titillators with rather thick apical part. Moreover, our results indicate differences in the form of the cerci: the apical part is on average rather short and the outer margin less concave than

Table 5. Mean body dimensions with standard deviations and ranges for 17 localities of *Ephippiger terrestris*. BW – Body weight, LB – length of body, LP – length of pronotum, LT – length of protibia, LF – length of hind femur.

No.	Locality	n	BW (g)	LB (mm)	LP (mm)	LT (mm)	F (mm)
1A.	Mézel	21	1.27 ± 0.13 1.1 − 1.5	28.0 ± 1.36 25 − 29	7.40 ± 0.42 6.8 − 8.7	7.75 ± 0.28 7.3 − 8.2	15.1 ± 0.55 14.1 − 16.5
2.	C. d. Maure	28	1.01 ± 0.13 0.7 − 1.2	25.8 ± 1.43 23 − 28	6.92 ± 0.24 6.4 − 7.3	7.32 ± 0.28 6.8 − 7.8	13.8 ± 0.47 13.2 − 15.1
3.	Gréolières	23	1.27 ± 0.18 0.8 − 1.6	26.8 ± 1.53 22 − 29	7.26 ± 0.41 6.4 − 8.0	7.51 ± 0.35 6.9 − 8.0	15.0 ± 0.60 13.4 − 16.0
4.	C. de Braus	20	1.82 ± 0.16 1.5 − 2.2	30.2 ± 0.87 29 − 355	7.93 ± 0.43 7.2 − 8.5	8.36 ± 0.26 7.8 − 8.8	16.3 ± 0.53 15.0 − 17.1
5.	C. de Castill.	20	2.56 ± 0.42 1.5 − 3.3	33.2 ± 1.64 31 − 37	8.79 ± 0.50 8.1 − 10.0	9.18 ± 0.40 8.2 − 9.7	17.9 ± 0.76 16.8 − 19.5
6.	Scravaion	20	1.34 ± 0.12 1.1 − 1.5	27.5 ± 1.23 26 − 30	7.59 ± 0.40 6.6 − 8.3	7.89 ± 0.38 6.9 − 8.3	15.1 ± 0.51 13.9 − 15.9
7A.	Tende	18	1.25 ± 0.12 1.0 − 1.5	26.6 ± 1.04 25 − 28	7.44 ± 0.40 6.8 − 8.2	7.76 ± 0.35 7.1 − 8.3	15.3 ± 0.71 14.6 − 16.2
8.	Vievola 1	21	1.04 ± 0.15 0.8 − 1.4	25.7 ± 0.86 24 − 28	7.19 ± 0.51 6.4 − 8.2	7.39 ± 0.32 6.8 − 7.9	14.4 ± 0.68 13.2 − 15.5
9.	Vievola 2	19	1.02 ± 0.10 0.8 − 1.2	25.5 ± 0.90 23 − 27	7.10 ± 0.26 6.6 − 7.6	7.39 ± 0.33 6.8 − 8.2	14.4 ± 0.45 13.4 − 15.1
10.	C. d. Tende 1	17	1.01 ± 0.13 0.7 − 1.2	24.7 ± 1.50 20 − 26	7.26 ± 0.43 6.6 − 8.1	7.25 ± 0.32 6.8 − 7.8	14.0 ± 0.62 13.1 − 15.1
11.	C. d. Tende 2	19	1.00 ± 0.10 0.8 − 1.2	24.0 ± 0.70 23 − 25	7.12 ± 0.28 6.7 − 7.6	7.01 ± 0.24 6.7 − 7.7	13.5 ± 0.59 11.9 − 14.2
12.	C. d. Tende 3	23	1.07 ± 0.09 0.9 − 1.2	24.9 ± 0.97 23 − 26	7.27 ± 0.47 6.1 − 8.1	7.13 ± 0.28 6.7 − 7.6	13.7 ± 0.57 12.8 − 15.3
13.	Vall. d. Arma	24	1.01 ± 0.09 0.8 − 1.2	25.0 ± 0.86 23 − 27	6.81 ± 0.39 6.3 − 7.7	6.97 ± 0.24 6.7 − 7.4	13.4 ± 0.45 12.0 − 14.4
14A.	Naggio	23	0.79 ± 0.10 0.7 − 1.0	23.7 ± 1.11 20 − 25	6.40 ± 0.12 6.2 − 6.6	6.85 ± 0.18 6.6 − 7.2	13.0 ± 0.44 12.2 − 14.1
15.	Mt. Grona	17	0.89 ± 0.11 0.7 − 1.1	24.3 ± 1.18 23 − 27	7.15 ± 0.43 6.4 − 8.0	7.07 ± 0.41 5.9 − 7.7	13.4 ± 0.58 12.4 − 14.2
17.	Collobr.	17	2.42 ± 0.26 2.1 − 3.0	32.1 ± 1.73 29 − 36	8.84 ± 0.53 8.0 − 9.3	9.72 ± 0.46 8.9 − 10.5	18.8 ± 0.75 18.0 − 20.4
18.	Fayence	25	2.41 ± 0.28 1.8 − 3.1	33.0 ± 1.37 30 − 36	8.27 ± 0.48 7.6 − 9.5	9.41 ± 0.46 8.8 − 10.6	18.5 ± 0.77 16.6 − 19.8

Table 6. Interrelations between mean body dimensions of *Ephippiger terrestris* (17 localities).

	regression	correlation
body weight/body length	LB = 0.18 BW − 3.45	r = 0.98
pronotum length/body length	LB = 0.18 LP × 2.22	r = 0.93
tibia length/femur length	LF = 0.49 LT + 0.45	r = 0.99
pronotum length/femur length	LF = 0.34 LP + 2.29	r = 0.95

Table 7. Relations between mean body dimensions (table 5) and altitude (H in km) for *Ephippiger terrestris* (17 localities).

	regression	correlation
body weight/altitude	BW = − 1.04 H + 2.4	r = − 0.75
body length/altitude	LB = − 5.74 H + 33.0	r = − 0.74
pronotum length/altitude	LP = − 1.11 H + 8.6	r = − 0.69
tibia length/altitude	LT = − 1.79 H + 9.6	r = − 0.83
femur length/altitude	LF = − 3.65 H + 18.8	r = − 0.82

Table 8. Ratios between some measures of the epiproct (cf. Fig. 3A) in *Ephippiger terrestris*.

No.	Locality	n	EB/EA	EA/EC	EL/EM
1B.	Mézel	21	0.82 ± 0.08	1.26 ± 0.12	1.29 ± 0.20
2.	C. d. Maure	28	0.83 ± 0.09	1.25 ± 0.09	1.10 ± 0.10
3.	Gréolières	23	0.77 ± 0.05	1.34 ± 0.13	1.06 ± 0.13
4.	C. d. Braus	20	1.08 ± 0.09	0.98 ± 0.07	1.02 ± 0.15
5.	C. d. Castill.	20	1.15 ± 0.11	0.96 ± 0.07	0.94 ± 0.10
6.	Scravaion	20	1.25 ± 0.13	0.86 ± 0.07	0.82 ± 0.10
7.	Tende	18	1.13 ± 0.11	0.92 ± 0.08	0.95 ± 0.09
8.	Vievola 1	21	1.14 ± 0.17	0.94 ± 0.10	0.88 ± 0.06
9.	Vievola 2	19	1.10 ± 0.14	0.98 ± 0.09	0.88 ± 0.06
10.	C. d. Tende 1	17	0.97 ± 0.13	1.10 ± 0.13	0.84 ± 0.12
11.	C. d. Tende 2	19	0.96 ± 0.10	1.15 ± 0.09	0.84 ± 0.10
12.	C. d. Tende 3	23	0.99 ± 0.13	1.12 ± 0.07	0.83 ± 0.09
13.	Vall. d. Arma	24	0.93 ± 0.13	1.19 ± 0.13	0.74 ± 0.11
14A.	Naggio	23	0.82 ± 0.08	1.25 ± 0.06	0.78 ± 0.05
15.	Mt. Grona	20	0.86 ± 0.05	1.22 ± 0.05	0.79 ± 0.07
17.	Collobr.	17	0.97 ± 0.10	1.13 ± 0.09	1.21 ± 0.09
18.	Fayence	25	0.99 ± 0.10	1.09 ± 0.08	1.11 ± 0.09

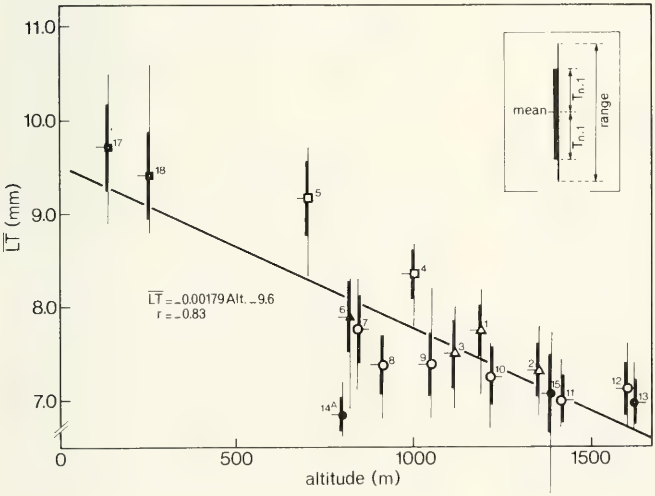

Fig. 8. The relation between mean length of tibia (LT) and altitude (H) in *Ephippiger terrestris*.

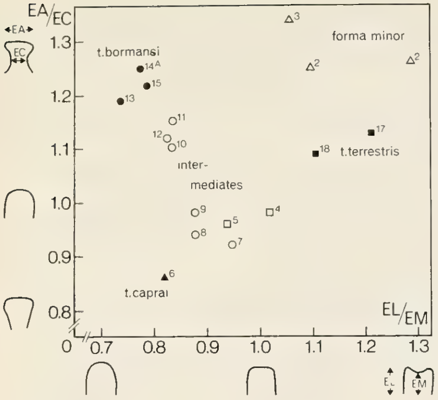

Fig. 9. The form of the epiproct in *Ephippiger terrestris*: relation between the ratios EA/EC and EL/EM (see text).

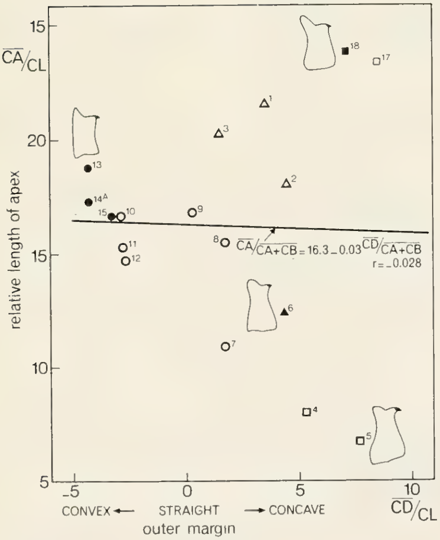

Fig. 10. Diagram of the relation between the relative length of the cercal apex (CA) and the value CD (see text).

in the nominate form. Furthermore, we confirm Nadig's description of the granular campus medianus and the receding fastigium verticis in *caprai*. Our allozyme analysis showed an evidently distinct position of *caprai* with a genetical distance D = 0.068 for *E. t. terrestris* and D = 0.076 for *E. t. bormansi*. Such distances are rather low, but still in the normal range for subspecies, for which Menken & Ulenberg (1987) give a general range of 0.02-0.22.

Our study of three populations of *E. t. bormansi* confirmed Nadig's (1980) observations. The animals were generally very small and the abdomen is often marked with three rows of dark spots and a lateral yellow band. The epiproct has in the average rather small, laterally protruding, hind corners. The cerci have a short apex with a straight or even slightly convex outer margin. The basal part of the cerci tapers only slightly towards the apex; this character corresponds with Nadig's not or hardly thickened cercal base. The apical part of the titillator is slender. The campus medianus is smooth and the fastigium verticis steep. In our allozyme analysis the distance to the *E. t. terrestris* populations is rather small: D = 0.0439, but this is probably an underestimation because we did not determine the distance to the populations no. 17 and/or 18 that were unfortunately not included in the 1981 series.

The forma *minor* is obviously characterized by small body dimensions. We consider our samples 1 and 2 as typical. Table 5 and fig. 7 show that these samples are in the mean much smaller than the other *E. t. terrestris* populations, but somewhat larger than *E. t. bormansi*.

As mean body dimensions are closely correlated with altitude for the whole range of populations studied (table 7, fig. 8) these dimensions cannot be used as a distinctive character state for *minor*. Grandcolas (1986) offered a similar biometrical analysis and found the same relation with altitude for ten populations ranging from 390 to 1264 m. However, we found some small morphological differences: usually the hind corners of the epiproct are somewhat more prolonged (fig. 8) and therefore more similar to *bormansi*. Furthermore the cercal apex is somewhat shorter than in the nominate form. In our 1980 allozyme analysis the genetical distance to *terrestris* amounts to 0.048, rather high for closely related local forms (fig. 5), whereas our 1981 analysis indicates a distance to *bormansi* of 0.039. Though these values are not entirely comparable, we suspect some *bormansi* influence in our *minor* populations. Apparently gene flow both in *terrestris* and in *bormansi* direc-

Table 9. Mean dimensions of the cerci of *Ephippiger terrestris*, cf. Fig. 3B (one unit = 1/40 th mm).

No.	Locality	n	CA	CB	CD	CL	CF	CE	CA / CL × 100	CD / CL × 100	CF / CE × 100
1B.	Mézel	21	14.5 ± 3.75	52.6 ± 4.22	2.40 ± 1.85	67.1 ± 4.00	32.8 ± 1.80	41.3 ± 2.57	21.5 ± 5.31	3.6 ± 2.74	79.6 ± 6.12
2.	Col de Maure	29	11.2 ± 3.12	50.3 ± 4.37	2.83 ± 1.26	61.5 ± 5.74	32.7 ± 1.75	40.9 ± 2.41	18.0 ± 4.36	4.5 ± 2.21	80.2 ± 4.50
3.	Gréolières	23	13.9 ± 2.62	54.6 ± 4.02	0.85 ± 1.31	68.4 ± 4.28	32.9 ± 2.11	41.0 ± 2.84	20.2 ± 3.52	1.3 ± 1.90	80.6 ± 4.65
4.	Col de Braus	20	5.7 ± 2.54	65.2 ± 3.04	3.75 ± 2.42	70.8 ± 3.53	28.5 ± 2.37	45.2 ± 2.49	8.0 ± 3.46	5.3 ± 3.50	63.3 ± 6.06
5.	C. d. Castillon	20	5.0 ± 3.05	69.7 ± 4.10	5.52 ± 1.79	74.9 ± 4.79	30.8 ± 2.48	49.2 ± 2.27	6.7 ± 3.92	7.7 ± 2.68	62.6 ± 4.50
6.	C. Scravaion	20	8.3 ± 2.66	58.5 ± 3.20	2.90 ± 1.42	66.9 ± 3.20	29.2 ± 1.48	41.3 ± 2.13	12.4 ± 3.70	4.4 ± 2.16	70.9 ± 4.31
7.	Tende	29	7.0 ± 3.41	56.1 ± 2.34	1.12 ± 1.65	63.1 ± 5.04	29.6 ± 1.81	41.1 ± 3.15	10.9 ± 4.51	1.8 ± 2.58	71.9 ± 4.62
8.	Vievola 1	19	10.6 ± 2.93	53.7 ± 4.12	1.16 ± 1.63	64.3 ± 3.63	29.4 ± 2.41	41.2 ± 1.63	15.5 ± 5.41	1.8 ± 2.47	71.5 ± 4.43
9.	Vievola 2	19	11.1 ± 2.62	55.2 ± 4.34	0.24 ± 1.29	66.1 ± 4.59	29.4 ± 1.64	40.1 ± 3.07	16.8 ± 3.75	0.4 ± 1.94	73.6 ± 4.20
10.	C. d. Tende 1	17	12.4 ± 3.57	61.6 ± 3.44	− 2.06 ± 1.21	74.1 ± 3.86	32.3 ± 2.20	41.2 ± 3.07	16.6 ± 4.45	− 2.8 ± 1.56	78.9 ± 5.63
11A.	C. d. Tende 2	20	11.0 ± 3.21	60.4 ± 3.23	− 1.92 ± 1.53	71.4 ± 3.53	32.5 ± 1.76	40.1 ± 2.76	15.3 ± 4.16	− 2.7 ± 2.14	81.3 ± 5.49
12.	C. d. Tende 3	23	10.5 ± 3.13	60.8 ± 4.83	− 1.85 ± 1.22	71.3 ± 4.29	32.9 ± 1.82	40.5 ± 2.25	14.7 ± 4.28	− 2.6 ± 1.74	80.6 ± 5.25
13.	Vall. del Arma	25	13.8 ± 3.11	66.2 ± 6.22	− 2.90 ± 1.01	74.0 ± 4.50	32.1 ± 2.02	39.1 ± 3.60	18.8 ± 4.23	− 4.2 ± 1.50	82.7 ± 8.59
14A.	Naggio	23	11.6 ± 1.69	55.6 ± 2.67	− 2.83 ± 1.14	67.3 ± 3.63	31.1 ± 1.65	34.3 ± 1.79	17.3 ± 1.93	− 4.2 ± 1.71	91.5 ± 6.40
15.	Mt. Grona	20	12.2 ± 3.01	60.5 ± 3.89	− 2.35 ± 0.99	72.7 ± 5.77	32.9 ± 2.57	38.8 ± 2.43	16.7 ± 3.25	− 3.2 ± 1.34	84.7 ± 5.36
17.	Collobr.	17	18.2 ± 2.75	58.5 ± 4.80	6.70 ± 2.17	76.7 ± 4.28	38.1 ± 2.54	49.8 ± 2.81	23.3 ± 4.38	8.6 ± 2.64	76.5 ± 4.70
18.	Fayence	25	18.2 ± 4.20	58.5 ± 5.55	5.60 ± 1.87	76.7 ± 5.19	35.0 ± 2.59	48.7 ± 3.82	23.8 ± 5.10	7.3 ± 2.27	72.1 ± 6.34

tion is rather low, but nevertheless we think – with Grandcolas (1986) – that the differences are too small and too gradual for the designation *minor* to be used as an indication for any real taxonomical unit. This term might only be used as a short-hand for indicating the assembly of populations of *terrestris* living at higher altitudes, but without any boundary.

The population near Gréolières (3) has many small resemblances with the *minor* populations, viz. form of epiproct, cerci and titillators. Its body dimensions are in accordance with the altitude at which it lives (fig. 8). In the allozyme analysis, however, it is more closely related to populations 4 and 5 (figs. 4 and 5) than to the *minor* populations, to which the genetic distance is the same as to *bormansi*. The occurrence of dark spot markings in a significant number of individuals also indicates a relation with *bormansi*. Nadig (1980) incorporated his specimens from Gréolières (Cheiron) with the hybrids between *terrestris* and *bormansi* on the basis of a great number of morphological characters.

The populations 4 and 5 also offer some difficulties with regard to their position. The form of their epiproct is usually intermediate between *caprai* and *terrestris*. Their cerci differ conspicuously from the nominate form by the very short apex (fig. 10) and the strongly tapering form of the basal part (fig. 11). In the allozyme analysis their distance to po-

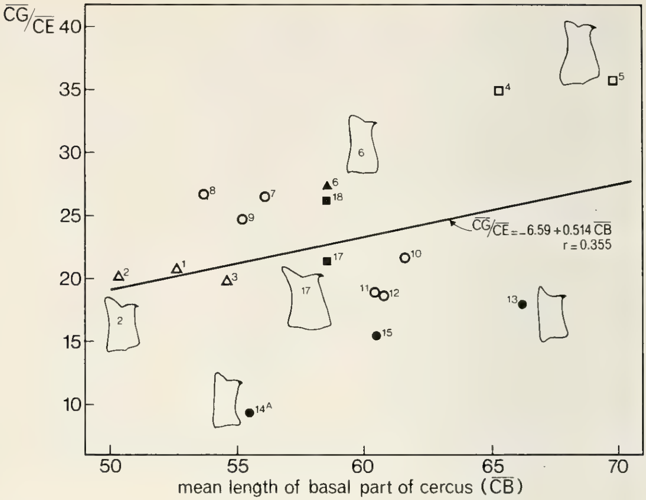

Fig. 11. Relative measure of tapering of the basal part of the cercus.

pulation 3 is small (fig. 5), much smaller than to the populations 6 and 7. Population no. 5 is judged by Nadig (l.c.) as belonging to the nominate form. We add the remark that these populations show some differences with the more western populations from the *terra typica* and exhibit probably some influence from *caprai*.

One of the aims of this study was to investigate the populations along the Tende transect (sites 7-12). Nadig (1980) collected specimens from the Col de Tende which he judged to be hybrids between the subspecies *terrestris* and *bormansi*. Our allozyme analysis shows all six populations along the transect to be closely related (figs. 4 and 5). The distances of this group to *caprai* and *terrestris* are of the same order, those to *bormansi* are smaller. In concordance with the geographical situation the sites 7-9 form one subgroup and the sites at the south side of the Col de Tende (10-12) another one, the genetic distance of the latter group to *bormansi* being significantly smaller. The form of the epiproct is intermediate between *bormansi*, *terrestris* and *caprai* with the sites 7-9 closest to *caprai* and the sites 10-12 closest to *bormansi*. In the form of the cerci *bormansi* influences are generally evident, but site 7 approaches *caprai*. With regard to the slenderness of the apical part of the titillators a gradient between *caprai* and *bormansi* was found especially at the sites 7-9. The populations resembled the *bormansi* character state. However, this also appears to prevail in the *minor* populations. Nadig (l.c., fig. 36) showed the existence of a continuous transition in slenderness from the *caprai*- towards the *bormansi*-state with the *terres-*

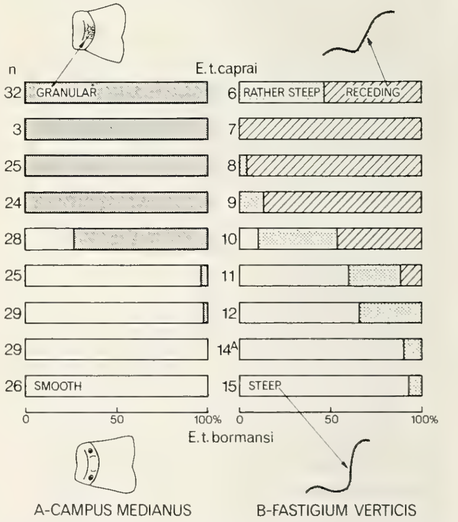

Fig. 12. A (left): Distribution of the character states granular and smooth of the campus medianus on the pronotum in *Ephippiger terrestris* along the Tende transect. B(right): Distribution of the character states steep – rather steep – receding of the fastigium verticis of the head of *E. terrestris*.

Table 10. The ratio TL/TA as a measure of the slenderness of titillators in *Ephippiger terrestris*.

No.	Location	n	TL/TA
2.	Col de Maure	30	10.9 ± 1.22
3.	Gréolières	21	11.0 ± 1.88
6.	Scravaion	10	5.8 ± 0.61
7.	Tende	20	6.4 ± 0.83
8.	Vievola 1	20	6.9 ± 1.03
9.	Vievola 2	14	8.1 ± 1.35
10.	C. d. Tende 1	10	10.7 ± 1.26
11A.	C. d. Tende 2	7	11.0 ± 1.73
12.	C. d. Tende 3	5	10.7 ± 2.24
13.	Vall. d. Arma	21	12.2 ± 2.40
14A.	Naggio	19	10.5 ± 1.25
15.	Mt. Grona	19	11.8 ± 1.18

tris form at an intermediate and overlapping position. However, he did not relate these data to geographical positions.

At sites 7-9 the campus medianus is granular, as in *caprai*. At the sites along the Col de Tende this state changes towards the smooth condition characteristic for *bormansi*. A gradual transition is also found with regard to the fastigium verticis: receding in *caprai* and predominanty receding at sites 7-9, with a gradual transition along the Col de Tende sites towards the steep condition in *bormansi*.

With regard to the colour of the abdomen a gradient was established in the occurrence of (plain)-green and the abdominal marking with rows of black spots.

Where Nadig (1980) doubted if *caprai* was involved in the origin of the intermediate populations and thought the mountain ridge forms a sharp boundary for *caprai*, we think we have sufficient evidence suggesting *caprai* influences existing in the region of intermediate populations, especially in the neighbourhood of Tende (where the colour of the abdomen also resembles *caprai*), but perhaps also in a wider area (viz. site 5).

The *bormansi* influence is quite clear at the Col de Tende sites, but is – according to Nadig – much more widespread. It is probable that this influence is also present in the *minor* areas and is responsible for the finding of supposed *bormansi* specimens as mentioned in literature (viz. at the Col de la Cine).

Summarizing: it is fruitfull to consider *Ephippiger terrestris* – with Nadig – as a species occupying an extensive area in SE France and N. Italy.

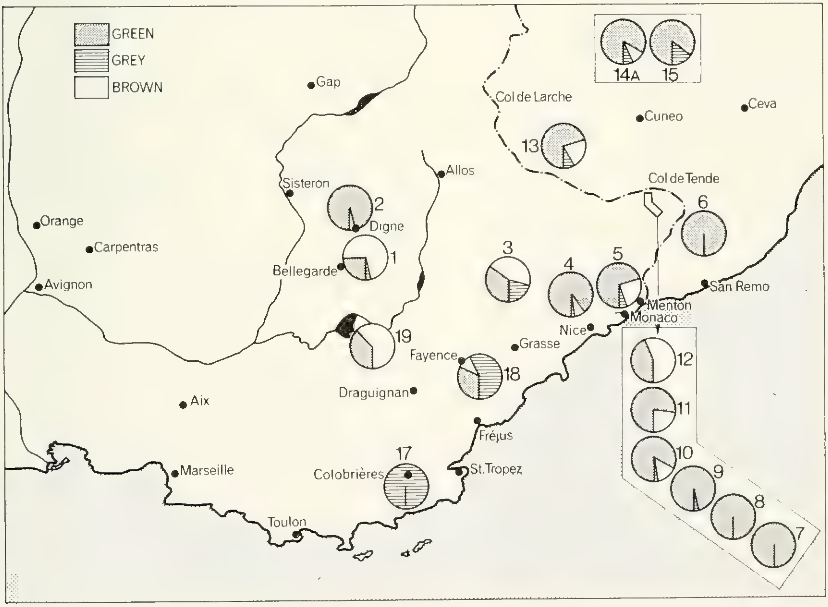

Fig. 13. The colour of the abdomen in *Ephippiger terrestris*.

Table 11. Colour and abdomen marking in *Ephippiger terrestris* (percentages).

No.	Locality	n	light green	plain green	dark green	greyish green	grey	brown	rows of dark spots
6.	Scravaion	32	–	100	–	–	–	–	–
7.	Tende	25	5	93	–	3	–	–	–
8.	Vievola 1	25	–	72	4	24	–	–	–
9	Vievola 2	24	4	92	–	–	4	–	–
10.	C. d. Tende 1	28	–	64	4	15	4	15	11
11A.	C. d. Tende 2	25	4	64	–	8	–	24	29
12.	C. d. Tende 3	29	–	31	–	14	–	55	49
13.	Vall. d. Arma	41	3	40	–	12	8	23	–
14A.	Naggio	29	4	21	–	48	7	11	52
15.	Mt. Grona	26	12	35	–	39	16	–	–

It is possible to distinguish the three subspecies *terrestris*, *caprai* and *bormansi*, but only at the outer margins of this area. All local populations exhibit great variability in their characters, so that it is often impossible to identify individuals to their subspecies. No clear boundaries nor narrow hybridisation zones exist between the subspecies, but there is a large transitional field: in the centre of the distribution area lies a quadrangular area (approximately 50 x 70 km) with intermediate populations, containing characters of all three subspecies. Their influences manifest themselves often in clinal characters, as was demonstrated by Nadig and herein. No distinction between allopatric or parapatric hybridization (e.g. Woodruff 1973) or between primary and secondary intergradation appears possible, as long as no independent clues about the history of the various taxa are available.

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A TAXONOMIC REVIEW OF THE COLEOPHORIDAE (LEPIDOPTERA) OF CHINA.

Contribution to the knowledge of the Coleophoridae, LIII

by

GIORGIO BALDIZZONE

Abstract

Baldizzone, G., 1989. A taxonomic review of the Coleophoridae (Lepidoptera) of China. Contribution to the knowledge of the Coleophoridae, LIII. — Tijdschrift voor Entomologie 132: 199-240, figs. 1-120. [ISSN 0040-7496]. Published 1 December 1989.

The present taxonomic knowledge of the Coleophoridae of China is reviewed. Thirty-one species are recorded here, of which fourteen species are described as new: *Coleophora lucida, C. buteella, C. caradjai, C. plurispinella, C. hoeneella, C. tibetana, C. cristata, C. alecturella, C. sittella, C. falcipenella, C. yunnanica, C. denticulata, C. tuberculata* and *C. batangica.* The genitalia of *C. seminalis* Meyrick and *C. summivola* Meyrick are illustrated for the first time. Two new synonymies are established: *C. immortalis* Meyrick, 1922, a junior subjective synonym of *C. seminalis* Meyrick, 1921 and *C. nivifera* Meyrick, 1930, a junior subjective synonym of *C. versurella* Zeller, 1849.

Key words. — Coleophoridae; China; taxonomy; new species.

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Introduction

The actual knowledge of the Chinese Coleophoridae is very limited: up till now only the following eight species have been reported from this vast country: *Coleophora neviusella* Busck (Busck 1904), *C. melanograpta* Meyrick (Caradja & Meyrick 1935), *C. vibicigerella* Zeller (= *C. mandschuriae* Toll), *C. hsiaolingensis* Toll (Toll 1942), *C. nivifera* Meyrick, *C. summivola* Meyrick (Meyrick 1930), *C. scioleuca* Meyrick (Meyrick 1938) and *C. sinensis* Yang (Yang 1983).

Judging from the important works by Falkovitsh (1972b, 1974, 1975, 1976, 1977 and 1978), Falkovitsh & Reznik (1980) and Reznik (1974, 1976 and 1977) the Coleophoridae are well represented in Eastern Asia. They described many new species from the rich material, representing about 100 species of Coleophoridae, collected by Z. Kaszab in Mongolia. Their works on the fauna of Mongolia and the region of Primorye (Southeast USSR) form the basis of the study of Eastern Asiatic Coleophoridae. The fauna of Japan should also be taken into consideration. Currently 31 species are known from Japan (Baldizzone & Oku 1988a, 1988b) and many more new species, together with a considerable number of species known from Europe, will be added to the Japanese list (Baldizzone & Oku *in press*, in preparation). Finally, I have just completed a paper on two new species from Korea (Baldizzone 1989), whereas a list of the twelve species known from that region will be published later in collaboration with K. T. Park.

The aim of the present paper is to review the taxonomic information on Chinese Coleophoridae that is actually available. For that purpose I have examined all material — wich is, unfortunately, very little — that is kept in the museums of Europe and the United States. The greater portion of this material formed part of the well-known Höne collection; the specimens that fortunately escaped from the destructions of the second world war have found their way to the Museum of Natural History "Grigore Antipa" in Bucharest and the Zoologische Forschungsinstitut und Museum Alexander Koenig in Bonn. A small number of specimens examined are kept in the Issiki collection of the National Museum of Natural History in Washington, whereas the majority of the Meyrick types are in the British Museum (Natural History) in London. Unfortunately I have not been able to study specimens recently taken in China or material from collections within China. In the material studied, 23 species were found in addition to the eight mentioned above, making a total of 31. Of these, 14 are here described as new.

I hope that this paper may form the basis for future studies on the Coleophoridae of China, and will enlarge our knowledge of this vast and complicated family.

Concerning the systematics of the species treated: I have followed Toll's system, as expounded in his publications of 1952b and 1962. Undoubtedly this system is due for a revision, based on our present-day knowledge: according to my opinion (and here I agree with Sattler & Tremewan 1978) the system proposed by Căpuşe (1971, 1975) and Falkovitsh (1972a, 1987) is not useful and complicates, instead of simplifies, the problems in this family. Probably, instead of erecting a great number of new genera, it is necessary to rearrange the species within *Coleophora* into several species groups. However, before one can succeed in such an operation, the exact status of the species described by the authors of the past should be assessed, and modern methods should be employed to establish the phylogenies of and the relations among the different groups.

I have not prepared a key to the species treated in this paper, as their number is too small in relation to what can be expected to be the ultimate fauna of China. The 31 species treated here often belong to groups that are, systematically speaking, far from related, and it is to be expected that many unknown species should be placed in between these groups. In this case a comparison of the size of Italy, where more than 240 species of Coleophoridae occur, with that of China is relevant.

Locality names are spelled according to the latest edition (1986) of the "Times Atlas of the World, comprehensive edition". In this edition the Chinese names are transcribed with the now widely accepted pinyin romanization. Where the original spelling on labels is deviating, this is added between square brackets. Information on the localities visited by Höne and cooperators is provided by Niethammer (1963). A gazetteer of localities is provided here as an appendix.

Abbreviations for museums:

BMNH	British Museum (Natural History), London, U.K.
IZPC	Institute of Systematic and Experimental Zoology PAS, Cracow, Poland
LNK	Landessamlungen für Naturkunde, Karlsruhe, West Germany
MGAB	Museum für Naturkunde der Humboldt-Universität, Berlin, East Germany
RMNH	Rijksmuseum van Natuurlijke Historie, Leiden, Netherlands
USNM	U.S. National Museum of Natural History, Smithsonian Institution, Washington, USA
ZFMK	Zoologisches Forschungsinstitut und Museum Alexander Koenig, Bonn, West Germany

Checklist of the Coleophoridae of China

Coleophora Hübner, 1822
lucida n. sp.
neviusiella Busck, 1904
eurasiatica Baldizzone, in press
buteella n. sp.
melanograpta Meyrick, 1935
caradjai n. sp.
changaica Reznik, 1975
vibicigerella Zeller, 1839
  mandschuriae Toll, 1942
hoeneella n. sp.
tibetana n. sp.
sinensis Yang, 1983
citrarga Meyrick, 1934
seminalis Meyrick, 1921
  immortalis Meyrick, 1922 n. syn.
cristata n. sp.
scioleuca Meyrick, 1938
alecturella n. sp.
sittella n. sp.
versurella Zeller, 1839
  nivifera Meyrick, 1930 n. syn.
hsiaolingensis Toll, 1942
vestianella (Linnaeus, 1758)
summivola Meyrick, 1930
bagorella Falkovitsh, 1977
yomogiella Oku, 1974
kurokoi Oku, 1974
falcipenella n. sp.
yunnanica n. sp.
artemisiella Scott, 1861
denticulata n. sp.
tuberculata n. sp.
weymarni Toll, 1942
batangica n. sp.

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On this occasion I wish to express my gratitude to all those who have helped me, either by sending material, or by giving me information. In particular I would like to thank: Dr. Aurelian Popescu-Gorj

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A special word of thanks is due to my Dutch friends Dr. Erik van Nieukerken (RMNH) and Hugo van der Wolf (Nuenen) for their assistance in realising this publication.

Coleophora lucida sp. n.

(figs. 1, 22, 40, 41)

Type material. — Holotype ♂, China: Prov. Zhejiang [Chekiang], West Tienmushan, 24.v.1932, H. Höne, genitalia slide Bldz 6892 (ZFMK).

Description. — Male (fig. 22) (Female unknown). Wingspan 10 mm. Head (fig. 1), thorax and abdomen nut-brown. Head with white scales above the eye; labial palps white on inner surface and suffused with brown scales on outer surface: the second segment approximately half the length of the third. Antenna with very thick tuft of nut-brown short hairs at the base of the first segment; flagellum ringed white and light brown. Forewing with a uniform light nut-brown colour with a nacreous lustre; a thin ochreous costal streak from base to three quarts; fringes concolorous with wing, but lighter. Hind wing dark pearl-grey; fringes light yellow-grey.

Male genitalia (fig. 40). — Gnathos very big, oval. Tegumen cylindrical, with two broad and short arms. Transtilla narrow and stretched, triangular. Valva short and thick, broader at the base than at the top which is rounded. Valvula broad, irregularly oval, covered with short bristles. Sacculus with an almost straight ventral edge, the lateral edge curved to the inside, forming an angle of nearly 45° with the ventro-caudal angle. Aedeagus slightly curved, long, dorsally more sclerotised. No cornuti.

Structure of abdominal supports (fig. 41). — No posterior lateral struts, transverse strut almost straight, with a thicker distal edge. Tergal disks (3rd tergite) oval, each with about twenty small conical spines.

Diagnosis. — This species is difficult to place in Toll's system, as it differs much from all known *Coleophora* species. It may belong to the second group because of its habitus and the form of its tegumen and aedeagus. *C. lucida* is closely related to *C. eteropennella* Baldizzone & Oku, 1988a from Japan. However, the following differences can be observed: in *C. lucida* the transtilla is narrower and longer; the valva is narrower at the apex, the sacculus forms a more acute angle than that of *eteropennella*, which is exactly 45°; the aedeagus is longer and more curved, and also the vesica is longer; *C. lucida* is without any cornuti, whereas *eteropennella* has a single big one, in the form of a nail.

Biology. — Unknown.

Distribution. — Eastern China.

Coleophora neviusiella Busck, 1904

Coleophora neviusiella Busck, 1904: 45. Lectotype ♂ (Selected by Baldizzone, 1986: 140) China, [Prov. Shandong], Yantai [Che-foo], 24.vi.1903, on apple, genitalia slide Bldz 7797 (USNM) [examined].

Coleophora eothina Falkovitsh 1974: 233 (Synonymized by Baldizzone, 1986: 140).

Other material examined. — Paralectotype ♀, same data as lectotype, Mrs. Nevius, genitalia slide Bldz 7798 (USNM)

Diagnosis. — The species belongs to the 7th group of Toll's system. When publishing the synonymy of *C. eothina* Falkovitsh, 1974 I dealt with this species, and illustrated the female genitalia (Baldizzone 1986).

Biology. — The species lives on apple (*Malus* spp.) and Bramble (*Rubus* spp.). The case was described by Falkovitsh (1974).

Distribution. — Eastern China and USSR, Primorye.

Coleophora eurasiatica Baldizzone, 1989

Coleophora eurasiatica Baldizzone, 1989. Holotype, ♂, China, Shanghai [Schangai, Prov. Kiangsu], 28.viii.1944, H. Höne (ZFMK) [examined].

Diagnosis. — The species, of which the female is unknown, belongs to the 8th group of Toll's system and should be placed near *C. algeriensis* Toll.

Biology. — Unknown.

Distribution. — China, Korea, Hungary.

Coleophora buteella sp. n

(figs. 3, 23, 44, 45)

Type material. — Holotype ♂, China: prov. Yunnan [Provinz Nord-Yuennan], Lijiang [Li-kiang], 6.vii.1934, H. Höne, genitalia slide Bldz 6887 (ZFMK). Paratype 1 ♂, data as holotype, but 30.vii.1935, genitalia slide Bldz 6884 (LNK).

Description. — Male (fig. 23) (Female unknown). Wingspan 10-11 mm. Head (fig. 3) dorsally fulvous brown, laterally white. Thorax and abdomen light brown. Labial palps white on inner surface, almost completely covered with brown scales on outer surface; the second segment is about twice the length of the third.

Antenna with a big tuft of short fulvous hairs at the base of the first segment; flagellum ringed white and dark brown. Fore wing uniformly fulvous brown, with a thin lighter costal streak; fringes of the same colour.

Male genitalia (fig. 44). — Gnathos globular. Tegumen cylindrical, narrowing at two-thirds, with two short arms. Transtilla narrow, long, rounded at the apex, where it is wider than at the base. Valvula broad, the ventral edge rounded, covered with short bristles. Sacculus heavily sclerotised, its ventral edge almost straight and its lateral edge oblique; it is rounded towards the ventrocaudal angle and ends in the dorso-caudal angle with a crooked point which reaches the middle of the valve. Aedeagus conical, long, simply formed. Number of cornuti 4-5, in the form of needles of different lengths, united at the base.

Structure of abdominal supports (fig. 45). — Posterior lateral struts about half the length of the anterior ones. Transverse strut straight and thin, with a thicker distal edge. Tergal disks (3rd tergite) about four times longer than wide.

Diagnosis. — This species belongs to the 9th group of Toll's system and should be placed in the section of *C. discordella* Zeller. *C. buteella* can easily be distinguished from *discordella* by the shape of the process in the dorso-caudal angle of the sacculus, which is shorter and stouter, and by the cornuti which are more numerous and shorter than those of *discordella*.

Biology. — Unknown.

Distribution. — Only known from Yunnan, in Southern China.

Coleophora melanograpta Meyrick, 1935
(fig. 24)

Coleophora melanograpta Meyrick, in Caradja & Meyrick, 1935: 90. Holotype ♂, China, Prov. Jiangsu [Kiangsu], Longtan [Lungtan bei Nanking], 16.vi.1933, H. Höne, genitalia slide Bldz 8054 (MGAB) [examined].

Other Material examined. — 1 ♂, Prov. Zhejiang [Chekiang], West Tienmushan, 28.viii.1932, H. Höne, genitalia slide Bldz 6889 (ZFMK). 1 ♂, [USSR], Amur, genitalia slide Toll 232 (MGAB).

Diagnosis. — The species belongs to the 16th group of Toll's system and should be placed in the section of *zelleriella* Heinemann. This species is treated by Baldizzone & Oku (in press).

Biology. — *C. melanograpta* lives on Oak (*Quercus* sp.) and the larva occupies a pistol-shaped case. Dr. Oku is studying the biology of the species, following information I have found in the Issiki collection in the USNM.

Distribution. — Eastern China, Korea and Japan.

Coleophora caradjai sp. n.
(figs. 11, 25, 48-54)

Type material. — Holotype ♂, China, Prov. Shandong [Pr. Shantung], Taishan, mountain top [Gipfelhöhe], ca 1550 m., 29.viii.1934, H. Höne, genitalia slide Bldz 8053 (MGAB). Paratype 1 ♀, data as holotype, but 12.viii.1934, genitalia slide Bldz 6873 (ZFMK).

Description. — Imago (fig. 25). Wing span 14 mm. Head (fig. 11), thorax and abdomen white. Labial palps white: the second segment about 2.5 times longer than the third. Antenna completely white, with some long hairs at the base. Fore wing with various shades of ochre towards the dorsal margin and light brown towards the costal margin. A thin white costal streak reaches the apex, where the wing is completely brown. Fringes brown near the apex and light yellow elsewhere. Hind wings brown; fringes light brown-grey.

Male genitalia (fig. 48). — Gnathos small, oval. Tegumen long, trapezoid, with two short and broad arms. Transtilla very small and short, triangular, rounded. Valva narrow and long, less curved at the base than at the apex, club-shaped. Valvula very big and sclerotised, triangular, covered with bristles. Sacculus heavily sclerotised, curved, widening from the base towards the dorso-caudal angle, where it narrows into a small and sharp point which reaches the middle of the valva. Aedeagus big, conical, dorsally more sclerotised. Numerous cornuti of different lengths, united into a long, curved tress.

Structure of the abdominal supports (fig. 49). — No posterior lateral struts. Transverse strut with a straight proximal edge and a convex distal one. Tergal disks (3rd tergite) about three times longer than wide.

Female genitalia (fig. 53). — Papillae anales small, oval. Apophyses posteriores almost twice as long as apophyses anteriores. Lamella antevaginalis trapezoid, distal margin convex. It is deeply excavated in the middle at the level of the ostium bursae, which is wide, in the form of a cup. Infundibulum long, funnel-shaped, with sclerotised median line as long as the ductus bursae. The ductus bursae is very long, about 14 times longer than the lamella antevaginalis: the upper part, which is 8 times longer than the lamella antevaginalis, is entirely covered with many very small conical spines; below that the ductus is transparent, with the exception of the median line, and ends in a wide curve, at the end of which it is partially covered with small spines towards the beginning of the ductus seminalis. Bursa very wide, bag-shaped with a leaf-shaped signum.

Diagnosis. — The species belongs to the 18th group of Toll's system and should be placed in the section of *stramentella* Zeller. *C. caradjai* n. sp. is not difficult to identify because of its habitus — its fore wings are two-colloured and because of the following characteristics of the genitalia: In the male, the gnathos is smaller and longer, the tegumen is wide and stout, the transtilla is longer, the sacculus has a wider edge and ends in a shorter point, there are fewer cornuti, united into a shorter formation. With regard to the female genitalia it can be observed that the lamella antevaginalis is shorter, which is also the case with the apophyses anteriores and posteriores. The ostium bursae is wider and the spines of the ductus bursae are smaller.

Biology. — Unknown.

Distribution. — The species has only been taken in Eastern China.

Coleophora changaica Reznik, 1975

Coleophora changaica Reznik, 1975: 372.

Material examined. — 1 ♂, China, Prov. Shaanxi [Sued-Shensi], Taibai Shan, Qin Ling [Tapaisan im Tsinling], 28.v.1935, H. Höne, genitalia slide Bldz 8512 (MGAB).

Biology. — The species lives on different species of *Artemisia*.

Distribution. — China, Mongolia, Central Asia, the Crimea, Jordan, Spain and Algeria.

Coleophora vibicigerella Zeller

Coleophora vibicigerella Zeller, 1839: 206.

Coleophora mandschuriae Toll, 1942: 291. Holotype ♂, China, Zalantun, in Nei Mongol Zizhiqu [Djalantun, Manchuria, prov. Kirin], 1127 ', 7.vii.1938 (IZPC) [examined].

Biology. — The species lives on *Achillea* and *Artemisia* sp.

Distribution. — China, Korea, North Africa and Europe.

Coleophora plurispinella sp. n.
(figs. 2, 26, 55-57)

Type material. — Holotype ♂, China, Prov. Shandong [Shantung], Taishan (1550 m.), 11.ix.1934, H. Höne, genitalia slide Bldz 6888 (ZFMK).

Description. — Male (fig. 26) (Female unknown). Wing span 13 mm. Head (fig. 2), thorax and abdomen white. The second segment of the labial palps is about twice the length of the third. Antenna with a big bush of ochreous hairs at the base of the first segment, which is white. Flagellum light brown. Fore wing light ochreous, with a triangular brown part along the radial veins. There are silver lines along the costa, the medial, cubital and anal veins. Fringes brown at the apex, yellow-grey elsewhere. Hind wing light brown; fringes light brown-grey.

Male genitalia (fig. 55). — Gnathos big, oval. Subscaphium stout, narrowed at two thirds, with two short and stout arms. Transtilla triangular, pointed. Valva short, broad at the apex, narrowed at the base, much curved. Valvula large, irregularly trapezoid, the lateral edge sclerotised, covered with bristles. Sacculus very much rounded, the edge quite sclerotised, covered with bristles, on the lateral edge below the dorso-caudal angle a big triangular dent. Aedeagus short and conical, much sclerotised basically and dorsally. A great number of cornuti (more than 25), spines of different lengths united into a long formation.

Structure of abdominal supports (fig. 56). — No posterior lateral struts. Transverse strut thick, its proximal edge straight and thin, the distal edge thicker, convex. Tergal disks (3rd tergite) almost 4 times longer than wide.

Diagnosis. — The species belongs to the 18th group of Toll's system and, because of the structure of the male genitalia, should be placed in the section of *C. astragalella* Zeller. The most obvious differences are: in *astragalella* (fig. 58) the valva is longer, the lateral process of the sacculus is shorter and sharper, the number of cornuti is only 5-6, whereas *plurispinella* has more than 25.

Biology. — Unknown.

Distribution. — The species has only been taken in Eastern China.

Coleophora hoeneella sp. n.
(figs. 12, 27, 59-61)

Type material. — Holotype ♀, China, Tibet, Batang, Jinsha Jiang Valley [Im Tal des Yangtze] ca. 2800 m, 11.vi.1936, H. Höne, genitalia slide Bldz 8895 (MGAB).

Description. — Female (fig. 27) (Male unknown). Wing span 15 mm. Head (fig. 12), thorax and abdomen white. Labial palps entirely white: the second segment is about three times longer than the third. Antenna with a long, ochreous hair-tuft at the base of the first segment; flagellum ringed white and brown. Fore wing nut-brown, a broad, white costal band, a long, white streak along the cubital vein and a shorter one along the medial vein. Fringes light grey-brown. Hind wing light brown with light grey-brown fringes.

Female genitalia (fig. 59). — Papillae anales broad and oval. Apophyses posteriores widenend to a club-shape below the papilles, they are about 2.5 times longer than the apophyses anteriores. Lamella antevaginalis trapezoid with many horizontal folds in the distal part. Lamella postvaginalis trapezoid, very simple. Ostium bursae wide, oval. Infundibulum cup-shaped. Ductus bursae massive, oval, covered with very thick conical spines, forming two bands along its first part, whereas the second part is completely transparent, with the exception of a small, curved part, which is weakly spotted with chitine. Bursa wide, bag-shaped, with a leaf-shaped signum.

Structure of abdominal supports (fig. 61). — Posterior lateral struts about half the length of the anterior ones. Transverse strut, almost straight, with a proximal edge sclerotised in the middle and a distal edge more sclerotised at the sides. Tergal disks (3rd tergite) about 3 times longer than wide.

Diagnosis. — The species belongs to the 18th group of Toll's system. Because of the structure of the female genitalia, it should be placed in the section of *ditella* Zeller. The following differences with that species can be observed: the subgenital plate of *hoeneella* is narrower and longer; the ductus bursae is covered with spines over a shorter distance than that of *ditella*; the signum bursae is smaller.

Biology. — Unknown.

Distribution. — Only known from the type locality.

Coleophora tibetana sp. n.
(figs. 13, 28, 62-65)

Type material. — Holotype ♂, China, Tibet, Batang, Jinsha Jiang Valley [Im Tal des Yangtze] ca. 2800 m, 28.vii.1936, H. Höne, genitalia slide Bldz 8892 (MGAB). Paratypes 2 ♂, data as holotype, but 1.vii.1936, genitalia slide Bldz 8894, and 12.vii.1936, genitalia slide Bldz 8896.

Description. — Male (fig. 28) (Female unknown). Wing span 18-19 mm. Head (fig. 13), thorax and abdomen white. Labial palps white, partially suffused with brown on outer surface: the second segment is about twice the length of the third. Antenna with a tuft of reddish hairs at the base. Flagellum ringed white and light brown. Fore wing ochreous in the dorsal and brown in the costal half. Pearly-white streaks on the surface of the wing: the longest along the costa from base to four-fifths; two short, triangular streaks at the apex along veins R3 and R5; a broad band along vein M1, from the centre of the wing to the margin; another broad streak along the cubital vein; the last streak in the area of veins A(1+2). Fringes light yellow-grey. Hind wing and fringes light yellow-grey.

Male genitalia (fig. 62). — Gnathos big, oval. Tegumen narrow and long, cylindrical, with two short arms. Transtilla small and short, triangular. Valva narrow and long, narrower at the base than at the apex, club-shaped. Valvula large, irregularly trapezoid, covered with bristles. Sacculus small, its ventral margin weakly curved and its lateral margin straight, in the dorso-caudal angle ending in a sharp traingular point, which reaches the base of the valva. Aedeagus short and conical, only dorsally sclerotised. The cornuti are numerous, in the form of spines of different lengths, united into a shape that resembles a brush.

Structure of abdominal supports (fig. 63). — Posterior lateral struts about half the length of the anterior ones. Transverse strut very thick, its proximal edge convex and its distal edge almost straight. Tergal disks (3rd tergite) about 4 times longer than wide.

Diagnosis. — The species belongs to the 18th group of Toll's system, but it is difficult to place it in any known section because of the very characteristic genitalia. It may be close to *C. canariipennella* Toll, a species of Iran, which can easily be distinguished from *tibetana* because of the following characteristics: in *canariipennella* the aedeagus and the valva are considerably shorter, the cornuti are fewer in number, united into a long row, whereas the lateral margin of sacculus is fully crenated.

Biology. — Unknown.

Distribution. — Only known from the type locality.

Coleophora sinensis Yang

Coleophora sinensis Yang, 1983: 107. Holotype ♀, China, Prov. Shanxi [Shansi], 13.vi.1979. (North-Eastern College of Forestry, China). [not examined].

Diagnosis. — The species, described on the basis of 21 specimens, belongs to the 25th group of Toll's system and should be placed near *C. laricella* Hübner.

Biology. — The species is recorded to live on *Larix principis-rupprechtii* Mayr.

Distribution. — Only reported from Shanxi and Hebei provinces.

Coleophora citrarga Meyrick
(fig. 10)

Coleophora citrarga Meyrick, 1934: 460.

Material examined. — 1 ♀, Taiwan, Taihoku, 27.vi.1946, leg. Issiki (USNM).

Diagnosis. — The species belongs to the 30th group of Toll's system and should be placed in the section of *glaucicolella* Wood. It is treated in a paper on some species of Japan (Baldizzone & Oku, in press).

Biology. — Unknown.

Distribution. — Japan and Taiwan.

Coleophora seminalis Meyrick
(figs. 16, 29, 66-73)

Coleophora seminalis Meyrick, 1921: 189. Holotype ♂, Java, Pekalongan, van Deventer, Coll. Piepers-Snellen, "M.525", genitalia slide Bldz 9247 (RMNH) [examined].

Coleophora immortalis Meyrick, 1922: 556. Holotype ♂, Fiji Islands, Lautoka, 24.iv. on flower of *Amaranthus paniculatus*, W. Greenwood (BMNH) [examined]. **Syn. n.**

Material examined. — China, 2 ♂, Shanghai [Schangai, Prov. Kiangsu], 19.viii.1942 and 21.viii.1943, H. Höne (ZFMK).

Male genitalia (fig. 66). — Gnathos big, oval. Tegumen trapezoid, considerably narrowed towards three quarters, with two long and broad arms. Transtilla broad and flattened, irregularly oval. Valva large, very broad, its dorsal margin curved. Valvula small, heavily sclerotised, irregularly oval. Sacculus broad, characterised by two triangular points at the angles: the point at the ventro-caudal angle is longer than that at the dorso-caudal angle. Aedeagus narrow and long, consisting of two sclerotised bands, of which one is thinner and sharp at the apex, the other thicker, with a curved tooth at the apex in ventral position. Cornuti numbering 6—7, of different lengths, united into an irregular row.

Structure of abdominal supports (fig. 67). — No posterior lateral struts. Transverse strut straight, its proximal edge thicker than the distal one. Tergal disks (3rd tergite) about twice longer than broad.

Female genitalia (fig. 70). — Papilles anales narrow and long. Apophyses posteriores about twice the length of the anterior ones. Subgenital plate trapezoid, its distal margin convex with some bristles; it shows two folds, symmetrical with the sides of the ostium bursae. Ostium bursae oval, opening at three quarters of the subgenital plate. Infundibulum tube-shaped, medially expanded. Ductus bursae with a median line in its first half as far as the central curve; ductus covered with conical spines over a section about twice the length of the subgenital plate. The remainder of the ductus is almost transparent. Bursa oval, with a signum of a singular shape: a small irregularly oval plate crowned by an abrupt upper edge. This signum varies considerably and can also have numerous rounded spines.

Diagnosis. — The species belongs to the 30th group of Toll's system and might be placed in the section of *glaucicolella* Wood. I have frequently had the opportunity to observe considerable variations in the colouring of the wings, and even more in the genitalia: in the male, the valva and the valvula, the triangular processes of the sacculus, the point of the aedeagus and the cornuti; in the female the form of the signum bursae.

Biology. — Meyrick's descriptions were based on specimens reared from different species of *Amaranthus*.

Distribution. — Fiji Islands, Java, Eastern China, Australia, New Guinea, Sumatra (material recently examined by me.)

Coleophora cristata sp. n.
(figs. 5, 30, 74-77)

Type material. — Holotype ♂, China, Prov. Zhejiang [Chekiang], West Tianmu Shan [Tien-mu-shan], 8.ix.1932, H. Höne, genitalia slide Bldz 6888 (ZFMK).

Description. — Male (fig. 30) (Female unknown). Wing span 13 mm. Head (fig. 5), thorax and abdomen white. Labial palps white, suffused with reddish scales on outer surface: the second segment is almost half as long as the third. Antenna entirely white, with the exception of a short tuft of reddish hairs at the base of the first segment. Fore wing completely white, weakly streaked reddish along the veins, with some brown scales in the apical area. Fringes white at apex and light brown at the dorsal costa. Hind wing and fringes light brown.

Male genitalia (fig. 74). — Gnathos globular. Tegumen narrowed towards three quarters with two long, flattened arms. Transtilla broad, irregularly trapezoid, its distal margin curved and pointed. Valva large, wider at the apex than at the base. Valvula small, trapezoid, covered with bristles. Sacculus with curved ventral margin and straight lateral margin: a small rounded tooth in the ventro-caudal angle, and in the dorso-caudal angle four triangular teeth of different sizes, having the shape of a cock's comb. Aedeagus long, forming two sclerotised bands, the thin one ending in a sharp apex, the thick one in a triangular point, surmounted by a long, curved protuberance. There are five cornuti, of which four are curved, in the form of spines of different lengths, whereas the fifth is quite long, together with the others forming a kind of talon.

Structure of abdominal supports (fig. 57). — No posterior lateral struts. Transverse strut with a convex proximal edge and an almost straight distal one. Tergal disks (3rd tergite) about twice longer than broad.

Diagnosis. — The species belongs to the 30th group of Toll's system and should be placed in the section of *C. virgaureae* Stainton. The two species can easily be separated by the following characteristics of the male genitalia: in *C. cristata* n. sp. the transtilla is larger with a sharper point in the dorsal margin; the sacculus is narrower and the teeth in the dorso-caudal angle are shorter and stouter: the aedeagus is longer and the dorsal protuberance is thicker and longer than that in *virgaureae*; the cornuti are longer and have a different shape.

Biology. — Unknown.

Distribution. — Eastern China.

Coleophora scioleuca Meyrick
(figs. 4, 31, 78-81)

Coleophora scioleuca Meyrick, in Caradja & Meyrick, 1938: 20. Lectotype ♂ (here designated) China, [Prov. North Yunnan], Lijiang [Likiang], H.6-34, genitalia slide BMNH 24443 (BMNH) [examined].

Other material examined. — Paralectotype ♂ (abdomen missing), data as lectotype but 10.vi.1934, H. Höne, (MGAB).

Male genitalia (fig. 78). — Gnathos oval. Tegumen triangular, considerably narrowed towards three quarters, with two long and flattened arms. Transtilla straight, curved at the apex, which has a point curved backwards. Valva long, slightly curved, rounded at the apex, very oblique. Valvula irregularly triangular, heavily sclerotised, covered with long setae. Sacculus narrow, with a large, triangular fold at the base; the lateral margin is curved, heavily sclerotised, and the dorso-caudal angle has two big, rounded teeth. Aedeagus long, curved, forming two bands, more sclerotised dorsally, of which the thin one ends in a narrow, sharp point, whereas the thicker one is broader at the apex, which is curved and ends in a sharp point. Only one cornutus, which is very long, curved, and fine in the form of a needle.

Structure of abdominal supports (fig. 79). — No posterior lateral struts; transverse strut thick, with a convex proximal edge and an almost straight distal edge. Tergal disks (3rd tergite) about five times longer than broad.

Diagnosis. — The species belongs to the 30th group of Toll's system and should probably be placed in the section of *therinella* Tengström. As the female is not known, it is impossible for me at the moment to give it a more precise position.

Biology. — Unknown.

Distribution. — Southern China, Nepal.

Coleophora alecturella sp. n.
(figs. 15, 32, 82-85)

Type material. — Holotype ♂, China, Tibet, Batang, Jinsha Jiang Valley [Im Tal des Yangtze] ca. 2800 m, 3.viii.1936, H. Höne, genitalia slide Bldz 8913 (MGAB).

Description. — Male (fig. 32) (Female unknown). Wing span 11 mm. Head (fig. 15), thorax and abdomen light brown. Labial palps entirely white on inner surface and almost entirely suffused with nut-brown scales on outer surface: the second segment is about twice the length of the third. Antenna without hairtuft at the base. Flagellum ringed white and brown. Fore wing uniformly pearly light brown. Fringes brown. Hind wing and fringes uniformly pearly brown.

Male genitalia (fig. 82). — Gnathos oval. Tegumen trapezoid, with two long arms. Transtilla large, flattened, oval. Valva short and stout, oblique. Valvula small, triangular, heavily sclerotised. Sacculus small, strongly curved and thick on the ventral and lateral margin, which ends in the dorso-caudal angle in a structure covered with small, rounded teeth of different sizes. Aedeagus stout, consisting of two sclerotised bands, of which one is shorter with a triangular point, the other longer, surmounted by a triangular tooth on the dorsal half, and with a small, rounded tooth at the apex. Cornuti 7-8, of different lengths, united into a long formation, thicker at the base.

Structure of abdominal supports: (fig. 83). — No posterior lateral struts. Transverse strut slightly convex. thinner in the middle. Tergal disks (3rd tergite) about twice longer than broad.

Diagnosis. — The species belongs to the 30th group of Toll's system and should, because of the structure of the male genitalia, be placed in the section of *sternipennella* Zetterstedt, near *monoceros* Falkovitsh. C. *alecturella* can be distinguished by the following characteristics: the aedeagus has a triangular tooth, the transtilla is oval and the cornuti are long.

Biology. — unknown.

Distribution. — Only known from the type locality.

Coleophora sittella sp. n.

(figs. 18, 33, 86-89)

Type material. — Holotype ♂, China, Prov. Yunnan [Nord-Yuennan], Lijiang [Li-kiang], 9.vii.1934, H. Höne, genitalia slide Bldz 6900 (ZFMK). Paratypes 2 ♂, data as holotype, but 19.viii.1934, genitalia slide Bldz 6893 and 26.vii.1935, genitalia slide Bldz 6875; 1 ♂, Shanghai [Schangai, Prov. Kiangsu], 19.v.1932, H. Höne, genitalia slide Bldz 6869 (ZFMK, LNK).

Description. — Male (fig. 33) (Female unknown). Wing span 12-13 mm. Head (fig. 18), thorax and abdomen nut-brown. Labial palps white, suffused with light brown scales on outer surface: the second segment about half the length of the third. Antenna with some reddish hairs at the base of the first segment; flagellum ringed white and nut-brown. Fore wing nut-brown streaked with white along the main veins; fringes pearly light brown. Hind wing uniformly brown, with pearly light brown fringes.

Male genitalia (fig. 86). — Gnathos oval. Tegumen big, triangular, considerably narrowed towards three quarters, with two long and very broad arms. Transtilla very large, irregularly trapezoid. Valva short and stout, wider at the base than at the apex, which is rounded. Valvula oval, narrow and long, heavily sclerotised. Sacculus with curved ventral margin and straight lateral margin, with many small teeth of different sizes in the dorso-caudal angle. Aedeagus with a rather complicated structure, consisting of two sclerotised bands of widely differing shapes: the shorter one ends in a rounded apex and is surmounted by a long, curved and serrated horn in its dorsal middle, the longer one is rather thick and ends in a curved and bifurcated apex, with two rounded points. Cornuti numerous, shaped like curved needles of different lengths, united at the base into a long structure.

Structure of abdominal supports (fig. 87). — No posterior lateral struts; transverse strut wide, almost straight, its proximal edge thicker in the middle and the distal one thicker at the sides. Tergal disks (3rd tergite) about three times longer than broad.

Diagnosis. — The species belongs to the 30th group of Toll's system and should be placed in the section of *sternipennella* Zetterstedt. Because of the structure of the male genitalia it is probably closely related to *C. lunensis* Falkovitsh and *C. pseudolinosyris* Kasy. *C. sittella* n. sp. can easily be distinguished by the following characteristics: the valva is shorter; the transtilla is wider; the sacculus is different, mainly because of the straight lateral margin; the aedeagus is stouter with a differently shaped tooth in the middle, and a bifurcate point which does not occur in other species; the cornuti are more numerous and longer.

Biology. — Unknown.

Distribution. — South-western and Eastern China.

Coleophora versurella Zeller

Coleophora versurella Zeller, 1849: 352. Lectotype ♀ (here designated) Poland, Glogów [Glogau], genitalia slide BMNH 4417 (BMNH) [examined].

Coleophora nivifera Meyrick, 1930: 625. Holotype (♂ according to original description; abdomen and hindwings missing when examined), China, Tibet Yadong [Yatung], B.10000′, 6.viii (BMNH) [examined] **syn.n.**

Material examined. — China, Shanghai [Schanghai, Prov. Kiangsu], 4 ♂, 13 ♀, 2.vi, 30.vii and 10-28.viii.1936; 10.vii and 18-19.viii.1942, H. Höne (LNK, MGAB).

Biology. — The species lives on the seeds of *Atriplex* sp., *Amaranthus* sp. and *Chenopodium* sp.

Distribution. — Widely distributed over the entire Palaearctic region and North and South America.

Coleophora hsiaolingensis Toll

(fig. 7)

Coleophora hsiaolingensis Toll, 1942: 296. — Holotype ♂, China, Xiaoling [Manchuria, Hsiaoling, Prov. Kirin], 13.viii.1939, genitalia slide Toll 837 (IZPC) [examined]. Allotype ♀, data as holotype, but 20.viii.1939, genitalia slide Toll 838 (IZPC) [examined].

Biology. — Unknown.

Distribution. — The species is known from China and Japan. Recently I have studied a male from Siberia (MGAB).

Coleophora vestianella (Linnaeus)

Phalaena (Tinea) vestianella Linnaeus, 1758: 536.

Material examined. — 1 ♀, China, Prov. North Yunnan, Lijiang [Likiang] ca. 3000 m., 7.ix.1934, H. Höne, genitalia slide Bldz 6871 (LNK), 2 ♂, China, Prov. Shanxi [Shansi], Mian Shan [Mien-shan], upland plain [Obere Höhe], ca. 2000 m., 6.viii.1937, H. Höne, genitalia slide Bldz 8515, and 10.viii.1937 (MGAB).

Biology. — The species lives on the seeds of *Atriplex* sp. and *Chenopodium* sp.

Distribution. — Europe, Asia Minor, Iran, Afghanistan, China and Japan.

Coleophora summivola Meyrick
(figs. 14, 34, 90-96)

Coleophora summivola Meyrick, 1930: 625. — Holotype ♂, China, Tibet, Gyangzê [Giantse] B.14500 ′ J. 28″, genitalia slide BMNH 24442 (BMNH) [examined].

Material examined. — 3 ♀, China, Prov. North Yunnan, Lijiang, 22.vi., 4.viii.1934 and 17.viii.1935, H. Höne (LNK); 1 ♀, Prov. North Yunnan, Dêqên [A-tun-tse], upland plain [obere Höhe] ca. 4500 m., 10.viii.1936, H. Höne (MGAB); 3 ♂, 2 ♀, Tibet, Batang, Jinsha Jiang Valley [Im Tal des Yangtze] ca. 2800 m, 6 vii, 16.vii, 4.viii, 14-15.viii.1936, H. Höne (MGAB).

Male genitalia (fig. 90). — Comparison with *parenthella* shows that the lateral margin of the sacculus has no big, rounded tooth, which in *parenthella* is present on the inner side of the dorso-caudal angle. The aedeagus of *summivola* is formed by two sclerotised rods of almost equal lengths, both with a triangular tooth at the apex, whereas in *parenthella* one of the two rods is one quarter shorter than the other, and only the longer one has a tooth at the apex. The group of cornuti in the form of a talon in *summivola* is longer than that of *parenthella*. The male genitalia of *C. aequigesa* Falkovitsh also resemble those of *summivola*. I have had the opportunity to study the holotype of *aequigesa*, a species from Mongolia, kept in the Museum of Natural History, Budapest, and I have observed the following differences, which are obvious in the aedeagus: the aedeagus of *aequigesa* is formed by two rods that are perfectly symmetrical, smaller than those of *summivola*, and they have no teeth at the apex. The male genitalia of *aequigesa* have no ductus ejaculatorius, which was probably lost during the preparation of the genitalia.

Female genitalia (fig. 94). — Compared with *parenthella* the subgenital plate of *summivola* is rather longer and more chitinous; the ostium bursae is smaller, opening closer to the distal edge of the plate; the infundibulum is longer and wider than that of *parenthella* and the section of the ductus bursae which is covered with spines is also longer.

Diagnosis. — The species belongs to the 30th group of Toll's system, and should be placed in the section of *vestianella* (Linnaeus), near *parenthella* Toll.

Biology. — Unknown.

Distribution. — The species has only been taken in China.

Coleophora bagorella Falkovitsh

Coleophora bagorella Falkovitsh, 1977: 592.

Material examined. — 1 ♂, China, Prov. North Yunnan, Dêqên [A-tun-tse], upland plain [obere Höhe] c. 4500 m., 13.viii.1936., H. Höne, genitalia slide Bldz 8517 (MGAB).

Biology. — Unknown.

Distribution. — China and Mongolia.

Coleophora yomogiella Oku
(fig. 8)

Coleophora yomogiella Oku, 1974: 254.

Material examined. — 2 ♂, China, Prov. North Yunnan, Lijiang [Likiang], 1.vii.1934, H. Höne, genitalia slides Bldz 6886 and 6897 (LNK).

Biology. — The species lives on *Artemisia princeps* and *Artemisia montana*.

Distribution. — Japan, Korea and China.

Coleophora kurokoi Oku
(fig. 9)

Coleophora kurokoi Oku, 1974: 256.

Material examined. — 2 ♂, 1 ♀, China, Prov. North Yunnan, Lijiang [Likiang], 17.vi, 7.ix.1934 and 25.vii.1935, H. Höne, genitalia slides Bldz 6898, 6870 and 6899 (LNK), 1 ♀, Prov. Zhejiang [Chekiang], West Tianmu Shan [Tien-mu-shan], 18.viii.1932, H. Höne, genitalia slide Bldz 6891 (LNK).

Biology. — The species lives on *Chrysanthemum morifolium* var. *sinense* and *Artemisia princeps*.

Distribution. — Japan and China.

Coleophora falcipenella sp. n.
(figs. 6, 35, 97-100)

Type material. — Holotype ♂, China, Prov. North Yunnan [Nord-Yuennan], Lijiang [Li-kiang], 10.vii.1934, H. Höne, genitalia slide Bldz 7080 (ZFMK).

Description. — Male (fig. 35) (Female unknown). Wing span 15 mm. Head (fig. 6) and thorax white, suffused with reddish-brown scales on dorsal surface. Labial palps white, suffused with reddish-brown scales on outer surface: the second segment is about 2.5 times longer than the third. Antenna without hairtuft at the base; flagellum ringed white and brown. Abdomen light brown. Fore wing reddish-brown with numerous white streaks along the costa and the main veins. Fringes pearly brown-yellow. Hind wing light brown; fringes brown-yellow.

Male genitalia (fig. 97). — Gnathos oval. Tegumen narrowed towards three quarters, with two long arms. Transtilla flattened and curved, club-shaped. Valvula irregularly oval, covered with thin bristles. Valva short and stout, narrower at the base than at the apex. Sacculus with curved ventral margin, ending in the ventro-caudal angle, forming a right angle; the lateral margin is almost straight and ends in the dorso-caudal angle, which goes beyond the dorsal margin of the valva; a big, rounded tooth can be found on the inside of the lateral margin of the sacculus. Aedeagus very long, certainly one of the longest of the family of Coleophoridae; it is formed by two sclerotised bands, very asymmetrical, of which the longer has two curves and ends in a scythe-shaped apex. The shorter band is about half the length of the other. It has a triangular tooth a short distance from the apex. A single long and curved cornutus, needle-shaped.

Structure of abdominal supports (fig. 98). — No posterior lateral struts. Transverse strut thick, its proximal edge straight, the distal one convex. Tergal disks (3rd tergite) about 5 times longer than wide.

Diagnosis. — The species belongs to the 30th group of Toll's system, but because of the peculiar shape of the male genitalia it is impossible for me to place it with certainty into a section already known. For the same reason this new species cannot be mistaken for any other species already known: the structure of the sacculus and of the aedeagus allow an immediate identification.

Biology. — Unknown.

Distribution. — Only known from the type locality.

Coleophora yunnanica sp. n.
(figs. 20, 36, 101-108)

Type material. — Holotype ♂, China, Prov. North Yunnan [Nord-Yuennan], Lijiang [Li-kiang], 9.vii.1934, H. Höne, genitalia slide Bldz 7084 (ZFMK). Paratypes 3 ♀, data as holotype, but 22.vi., 10.vii. and 17.vii.1934, genitalia slides Bldz 6894, 7083 and 7081 (ZFMK, LNK).

Description. — Male and female (fig. 35). Wing span 12-13 mm. Head (fig. 20), thorax and abdomen ochreous. Labial palps white, suffused reddish-brown on outer surface: the second segment about twice the length of the third. The ochreous antenna has no hairtuft at its base. Fore wing uniformly ochreous, streaked with reddish-brown along the main veins and suffused with some scattered dark brown scales, mainly towards the apex. Fringes light pearly brown-grey. Hind wing light brown-grey; fringes concolorous with those of fore wing.

Male genitalia (fig. 101). — Gnathos oval. Tegumen considerably narrowed towards three quarters, with two very long and broad arms. Transtilla short and small, triangular. Valva short and stout, rounded at the apex. Valvula long, narrow, heavily sclerotised, covered with long bristles. Sacculus broad, heavily sclerotised, with curved ventral margin, with a long, triangular protuberance in the ventro-caudal angle and an irregular process in the dorso-caudal angle, resembling a spiral tooth. Vinculum with a conspicuous formation in its middle, resembling a conical tooth. Aedeagus long, formed by two highly symmetrical sclerotised bands: the shorter and thinner one narrowing from the base to the apex, where it ends in a point; the longer one widening from the base to the apex, where it forks into a longer and a shorter protuberance. Only one cornutus, big and long, broad at the base, talon-shaped.

Structure of abdominal supports (fig. 102). — No posterior lateral struts; transverse strut weakly convex at its distal edge, which is thicker than the proximal one. Tergal disks (3rd tergite) about three times longer than wide.

Female genitalia (figs. 105, 106). — Papillae anales small and oval. Apophyses posteriores about twice the length of the anterior ones. Lamella antevaginalis trapezoid, its proximal margin convex and its distal one concave, with long bristles; it has a small, triangular tooth in each of the two corners of its distal margin, and two broad, symmetrical, transverse folds in the middle. Ostium bursae oval, narrow and long, opening at the distal margin, and reaching halfway down the subgenital plate. Infundibulum very long and sclerotised, in the form of a narrow bag, about four times longer than the subgenital plate. The ductus bursae is undoubtedly the longest so far known in the family of the Coleophoridae: about twenty times longer than the subgenital plate; in its first part it is covered with tiny conical spines in two bands, over about twice the length of the subgenital plate; the remainder of the ductus bursae is transparent and shows many coils in its middle section. The bursa is of normal size, bag-shaped, with a leaf-shaped signum.

Diagnosis. — The new species belongs to the 30th group of Toll's system, but because of the unique shape of the genitalia it is really impossible for me to place it into a known section. The male genitalia slightly resemble those of *C. pandionella* Baldizzone (1988), a species from Siberia and those of *C. issikii* Baldizonne & Oku (1988a), a species from Japan but there are rather obvious differences, mainly in the aedeagus and the protuberances of the sacculus. The genitalia of the female, however, resemble those of species in the section of *galbulipennella* Zeller (= *otitae* Zeller), such as *microtitae* Toll & Amsel and *treskaensis* Toll & Amsel, but there structure of the subgenital plate, the infundibulum and the enormous length of the ductus bursae allow an immediate determination.

Biology. — Unknown.

Distribution. — Only known from the type locality.

Coleophora artemisiella Scott

Coleophora artemisiella Scott, 1861: 409.

Material examined. — 2 ♂, China, Tibet, Batang, Jinsha Jiang Valley [Im Tal des Yangtze] ca. 2800 m., 22.v. and 13.vii.1936, H. Höne, genitalia slides Bldz 8903, 8904 (MGAB).

Biology. — The species lives on *Artemisia* sp.

Distribution. — So far the species was only known from Europe. The specimens from the Jinsha Jiang Valley indicate a much wider Palaearctic distribution.

Coleophora denticulata sp. n
(figs. 19, 37, 109-112)

Type material. — Holotype ♂, China, Tibet, Batang, Jinsha Jiang Valley [Im Tal des Yangtze] ca. 2800 m., 1.ix.1936, H. Höne, genitalia slide Bldz 8910 (MGAB).

Description. — Male (fig. 37) (Female unknown). Wing span 14 mm. Head (fig. 19) brown dorsally and white laterally. Labial palps white, almost completely suffused with brown scales on outer surface: the second segment is about twice the length of the third. Antenna without hairtuft at the base; flagellum ringed white and brown. Fore wing uniformly pearly light brown, suffused with scattered white scales towards the apex; a broad, white band along the costa, with gradations towards dorsum. Fringes chocolate-brown. Hind wing uniformly brown-grey; fringes chocolate-brown.

Male genitalia (fig. 109). — Gnathos small, pear-shaped. Tegumen narrowed towards two thirds, with two long arms. Transtilla short, irregularly triangular. Valvula oval, with thick ventral margin, covered with long bristles. Valva small, rounded at the apex. Sacculus broad, heavily sclerotised, its almost straight ventral margin extended in the ventro-caudal angle into a triangular, serrated formation; its lateral margin almost perpendicular, serrated up to the dorso-caudal margin, which ends in a big formation, curved and serrated at the external and straight at the internal margin: the point of that formation reaches beyond the dorsal margin of the valva. Aedeagus long and curved, consisting of two sclerotised bands, of which one is narrower at the base than at the apex, where it ends in a point, and the other is broader at the base and ends at the apex in a big, triangular tooth, serrated at the proximal margin. Numerous cornuti of different lengths, united into a curved formation resembling a tress.

Structure of abdominal supports (fig. 110). — No posterior lateral struts; transverse strut convex, thicker at the sides than in the middle. Tergal disks (3rd tergite) oval, about twice as long as wide.

Diagnosis. — The species belongs to the 30th group of Toll's system and can be placed near *C. pseudociconiella* Toll and *C. hungariae* (Gozmány), because of the structure of its male genitalia. *C. denticulata* can be distinguished by the following characteristics: the rather small and short valva and the serrated process of the dorso-caudal angle of the sacculus, which is considerably bigger than that of the other species.

Biology. — Unknown.

Distribution. — Only known from the type locality.

Coleophora tuberculata sp. n.
(figs. 17, 38, 113-116)

Type material. — Holotype ♂, China, Tibet, Batang, Jinsha Jiang Valley [Im Tal des Yangtze] ca. 2800 m., 3.viii.1936, H. Höne, genitalia slide Bldz 8901 (MGAB).

Description. — Male (fig. 38) (Female unknown). Wing span 14 mm. Head (fig. 17) white laterally and reddish-brown dorsally. Labial palps white, partially suffused with reddish-brown scales on outer surface: the second segment is about twice the length of the third. Antenna without hairtuft at the base: the first segment is white, suffused with brown scales dorsally; flagellum ringed white and brown. Thorax and abdomen brown. Fore wing light ochreous, with brown scales scattered along the main veins. Fringes grey-brown. Hind wing grey-brown. Fringes of hind wing brown.

Male genitalia (fig. 113). — Gnathos oval. Tegumen triangular, narrowed towards two thirds with two long, flattened arms. Transtilla broad and flattened, hatchet-shaped. In the middle of the transtilla a sclerotised formation of an extremely singular shape: a stalk widening into an inverted cone, with lots of sclerotised spines of different lengths in the widest part; this structure, whose purpose is quite unknown to me, is highly remarkable and is absent in all other species of Coleophoridae so far known. Valvula tiny and long, highly sclerotised in an irregular form, covered with long bristles. Valva long, its dorsal margin undulating, the ventral one curved; wider at the base than at the apex. Sacculus straight, heavily sclerotised, its ventral margin curved, the lateral one straight: in the ventro-caudal angle a small, triangular tooth; in the dorso-caudal angle another bigger and longer tooth, rounded at the apex, curved towards the inside. Aedeagus consisting of two asymmetrical sclerotised bands, wider at the apex than at the base: they are slightly different in length, ending in sharp points. Only one long cornutus with a widened base, in the form of a spine.

Structure of abdominal supports (fig. 114). — No anterior lateral struts; transverse strut has a thin proximal edge, slightly convex, and a distal one, almost straight, laterally more sclerotised than in the middle. Tergal disks (3rd tergite) about four times longer than wide.

Diagnosis. — The species belongs to the 30th group of Toll's system and might be placed in the section of *C. adspersella* Benander. *C. tuberculata* n. sp. can easily be identified by the remarkable formation in the middle of the transtilla, by the tooth in the dorso-caudal angle of a sacculus which is considerably shorter than in *adspersella*, by the aedeagus consisting of bands without teeth at the apex, and by a cornutus which is shorter than in *adspersella*.

Biology. — Unknown.

Distribution. — Only known from the type locality.

Coleophora weymarni Toll

Coleophora weymarni Toll, 1942: 289. — Holotype ♂, China, Zalantun, in Nei Mongol Zizhiqu [Djalantun, Manchuria, prov. Kirin] 1127′, 10.vi.1938, genitalia slide Toll 834 (IZPC) [examined].

Other material examined. — Paratype ♀, data as holotype, but 26.vi.1939, genitalia slide Toll 835 (IZPC) [examined].

Biology. — Unknown.

Distribution. — Only known from the type locality.

Coleophora batangica sp. n.
(figs. 21, 39, 117-120)

Type material. — Holotype ♂, China, Tibet, Batang, Jinsha Jiang Valley [Im Tal des Yangtze] ca. 2800 m, 7.ix.1936, H. Höhe, genitalia slide Bldz 8909 (MGAB).

Description. — Male (fig. 39) (Female unknown). Wing span 13 mm. Head (fig. 21), thorax and abdomen entirely white. Labial palps ochreous, with white scales mainly on inner surface: the second segment about 1.5 times longer than the third. The first segment of the antenna is white, suffused with scattered brown scales, with a short, ochreous hairtuft; flagellum ringed white and brown. Fore wing reddish-brown, with broad costal streak, narrowed towards two thirds and a white dorsal streak, reaching the apex of the wing. The entire surface of the wing has a pearly gloss. Fringes brown. Hind wing brown-grey. Fringes brown.

Male genitalia (fig. 117). — Gnathos very small, globular. Tegumen considerably narrowed at the base of the socii, with two very broad triangular arms. Transtilla united in the middle, broad and triangular. Valvula tiny and long, heavily sclerotised. Valva very long and curved, at the base considerably narrower than at the apex, on the dorsal margin covered with bristles. Sacculus small, heavily sclerotised, covered with long bristles, extending into a triangular form, obtuse at the lateral margin, with two spines of unequal lengths in the dorso-caudal angle. Aedeagus of medium length, conical, consisting of two sclerotised symmetrical rods, narrower at the base than at the apex, where they are rounded. Numerous cornuti of different lengths, united into a long formation resembling a curved brush.

Structure of abdominal supports (fig. 118). — No lateral posterior struts; transverse strut very tiny, convex in its central part. Tergal disks (3rd tergite) about twice as wide as long, covered with short, very sharp, conical spines.

Diagnosis. — The species belongs to the 34th group of Toll's system, and because of the structure of its male genitalia should be placed in the section of *C. unipunctella* Zeller, a species from which *C. batangica* can easily be separated by means of its habitus, or by the following obvious differences in the genitalia: the valva of *batangica* is narrower at the base, longer and more curved; the transtilla is bigger, with a large, central triangular widening, which is not present in *unipunctella*; the sacculus of *batangica* is wider, its lateral margin longer, and the spines in the dorso-caudal angle are close to each other, whereas in *unipunctella* they are far apart; the aedeagus of *batangica* is shorter and stouter, and the cornuti are longer and more numerous.

Biology. — Unknown.

Distribution. — Only known from the type locality.

Résumé

La connaissance taxonimique actuelle sur les Coleophoridae de la Chine est revue. Trente-et-un espèces sont reconnues ici. Quatorze espèces sont décrites comme nouvelles: *Coleophora lucida, C. buteella, C. caradjai, C. plurispinella, C. hoeneella, C. tibetana, C. cristata, C. alecturella, C. sittella, C. falcipenella, C. yunnanica, C. denticulata, C. tuberculata* et *C. batangica*. Les genitalia des espèces suivantes sont illustrés pour la première fois: *C. seminalis* Meyrick et *C. summivola* Meyrick. Les nouvelles synonymies suivantes sont établies: *C. immortalis* Meyrick, 1922 est synonyme de *C. seminalis* Meyrick, 1921, et *C. nivifera* Meyrick, 1930 est synonyme de *C. versurella* Zeller, 1849.

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APPENDIX

Gazetteer of place names

Names are listed alphabetically with their pinyin romanization. Province names are given in brackets after the locality names. Sources for the spelling and coordinates were the "Times Atlas of the World, Comprehensive Edition, 7th ed., 1986" and the "Gazetteer of the People's Republic of China, 2 vols, 1979".

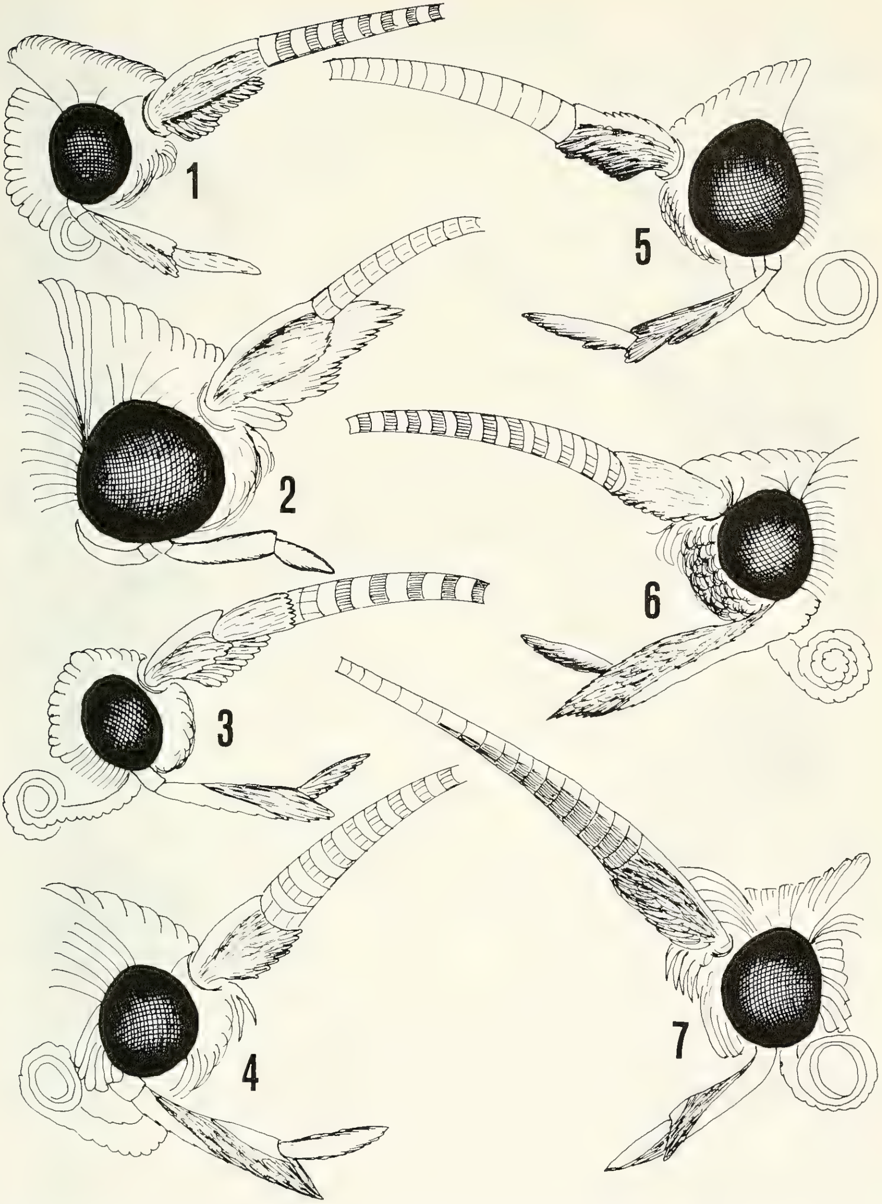
Pinyin transcription	Older transcriptions	Coordinates
Batang (Tibet) [1]	Batang (also Pa-an)	30.02 N, 99.01 E
Dêqên (Yunnan)	A-tun-tse; Tehtsin	28.28 N, 98.48 E
Gyangzê (Tibet)	Giantse, Chiang-tzu	28.57 N, 89.38 E
Jiangsu (prov.)	Kiang-su, Chiang-su	
Jilin (prov.)	Kirin	
Jinsha Jiang (river)	Yangtze Kiang (part)	
Lijiang (Yunnan)	Li-kiang, Li-chiang	26.51 N, 100.16 E
Longtan (Jiangsu)	Lungtan	32.10 N, 119.03 E
Mian Shan (mount) (Shanxi)	Mienshan	ca 37 N, 113 E
Nanjing (Jiangsu)	Nan-ching, Nanking	32.03 N, 118.47 E
Nei Mongol Zizhiqu (prov.)	Inner Mongolia auton. region	
Qin Ling (range) (Shaanxi)	Tsinling	34.00 N, 108.00 E
Shaanxi (prov.)	Shensi	
Shandong (prov.)	Shantung	
Shanghai (Shanghai) [2]	Schangai	31.13 N, 121.25 E
Shanxi (prov.)	Shansi	
Taibai Shan (mount) (Shaanxi)	Tapaisan	33.57 N, 107.40 E
Taihoku (Taiwan)		not traced
Taishan (mount) (Shandong)	Tai-shan	36.20 N, 117.10 E
Tianmu Shan (mount) (Zhejiang)	Tien-mu-shan	30.31 N, 119.36 E
Xiaoling (Jilin) [3]	Hsiaoling	not traced
Xizang Zizhiqu	Tibet autonomous region	
Yadong (Tibet)	Yatung	27.29 N, 88.54 E
Yantai (Shandong)	Yen-tai, Che-fou	37.30 N, 121.22 E
Yunnan (prov.)	Yuen-nan, Yün-nan	
Zalantun (Nei Mongol Z.)	Djalantun, Cha-lan-tun	48.00 N, 122.43 E
Zhejiang (prov.)	Che-kiang, Che-chiang	

Notes

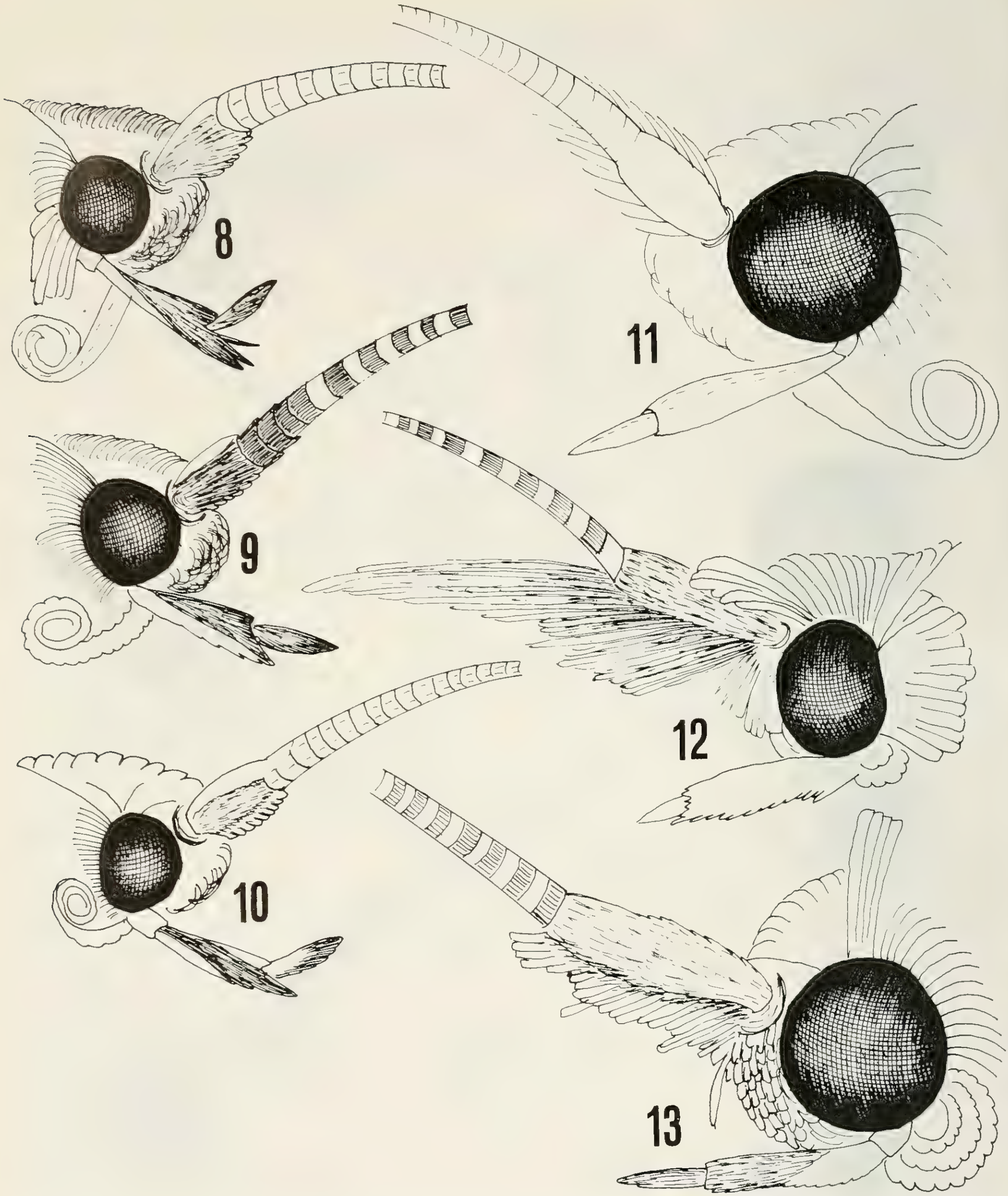
[1] Batang itself is situated in the province of Sichuan, but the nearby valley of the Jinsha Jiang forms the border with Tibet. From the labelling with "Tibet, Batang, Im Tal des Yangtze" it follows that the specimens were probably taken on the Tibet side of the river, or the border was not so distinct in those days.

[2] Specimens from Shanghai are labelled as "Schangai, Prov. Kiangsu". However, Shanghai forms nowadays a province of its own.

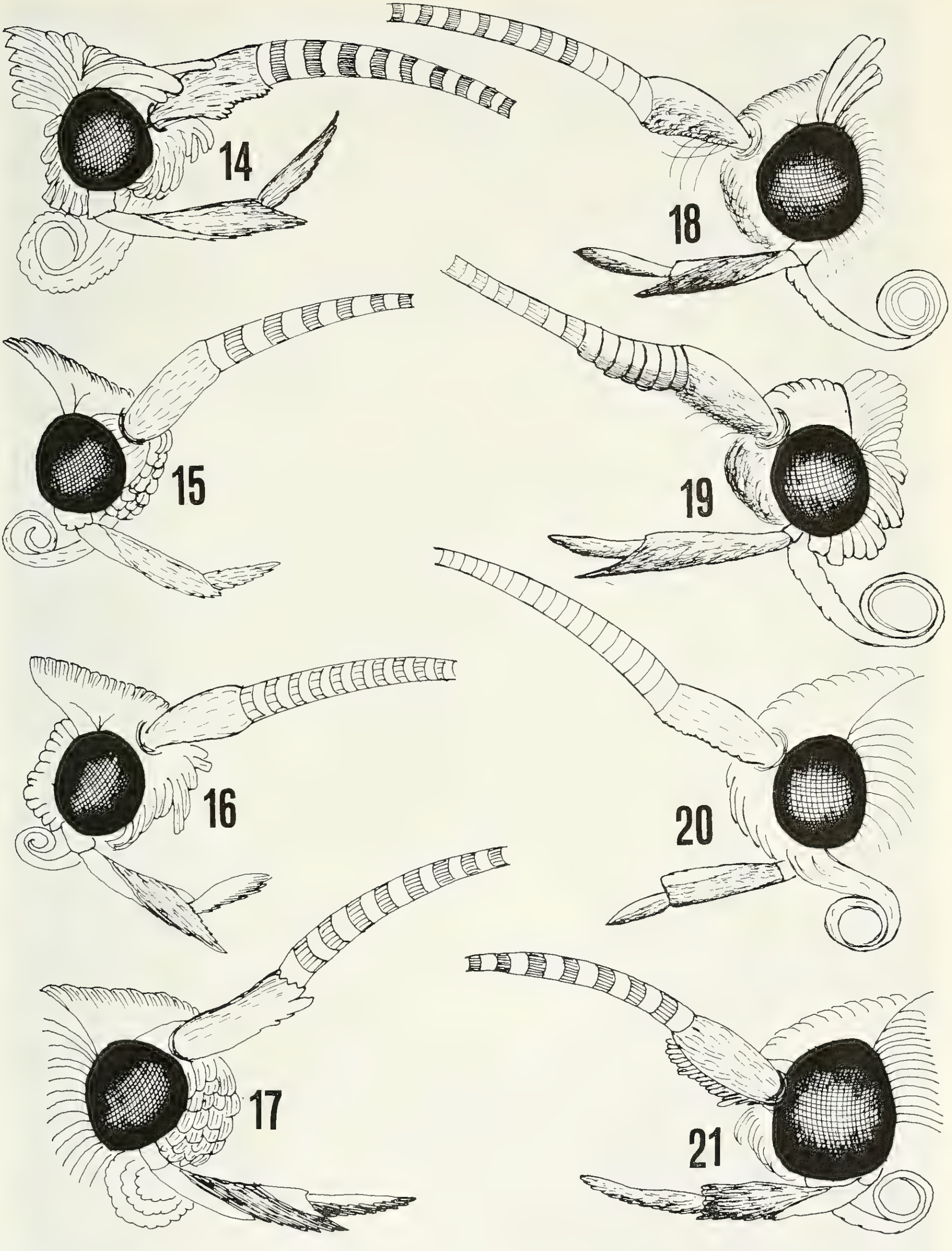
[3] There are various localities with the name Xiaoling (=Hsiaoling), but none was traced in the province of Jilin (= Kirin). There is one located in the nearby province of Heilongjiang at 45.22 N, 127.17E.



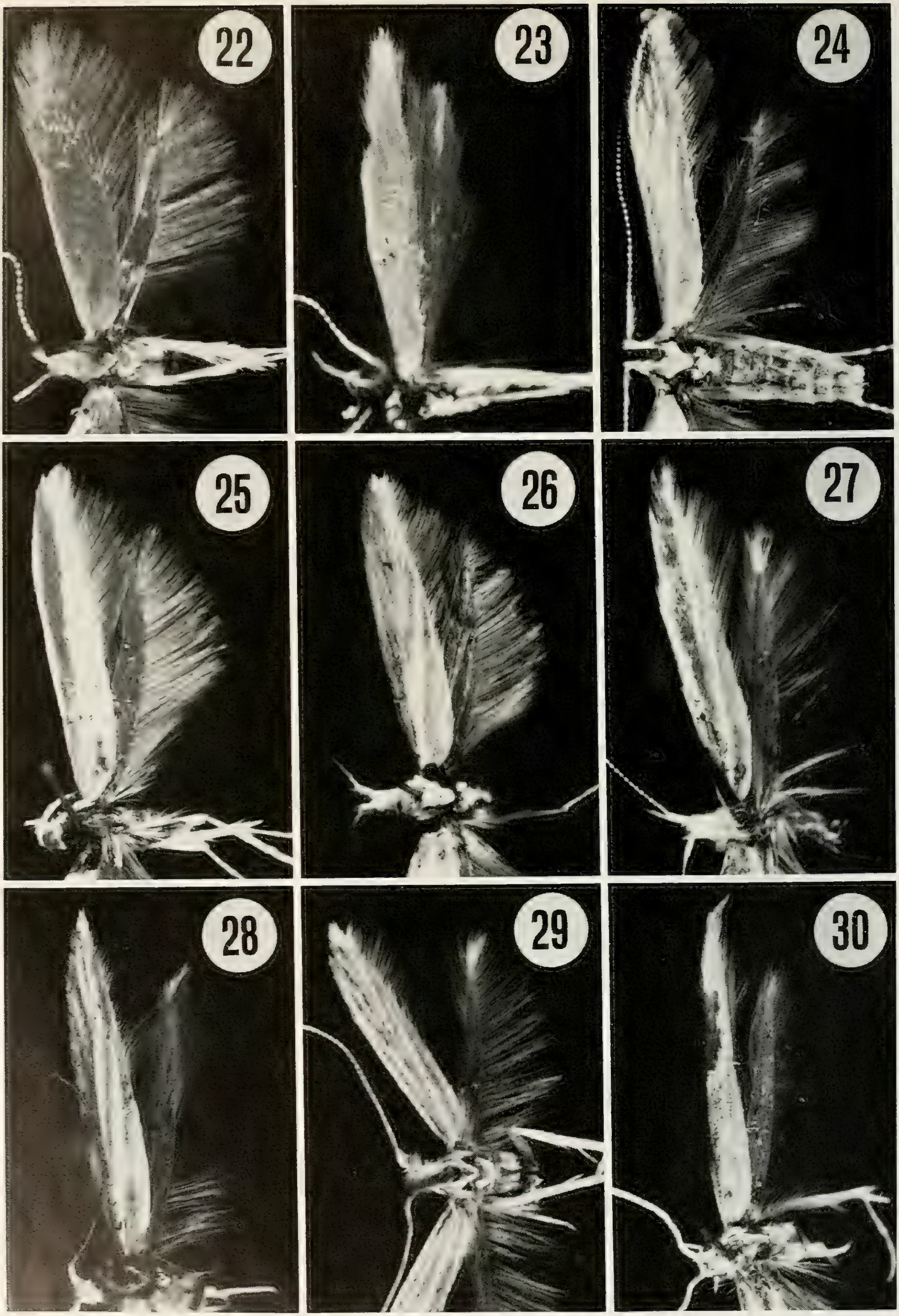
Figs. 1-7. Heads of *Coleophora*. 1, *C. lucida*; 2, *C. plurispinella*; 3, *C. buteella*; 4, *C. scioleuca*; 5, *C. cristata*; 6, *C. falcipenella*; 7, *C. hsiaolingensis*.



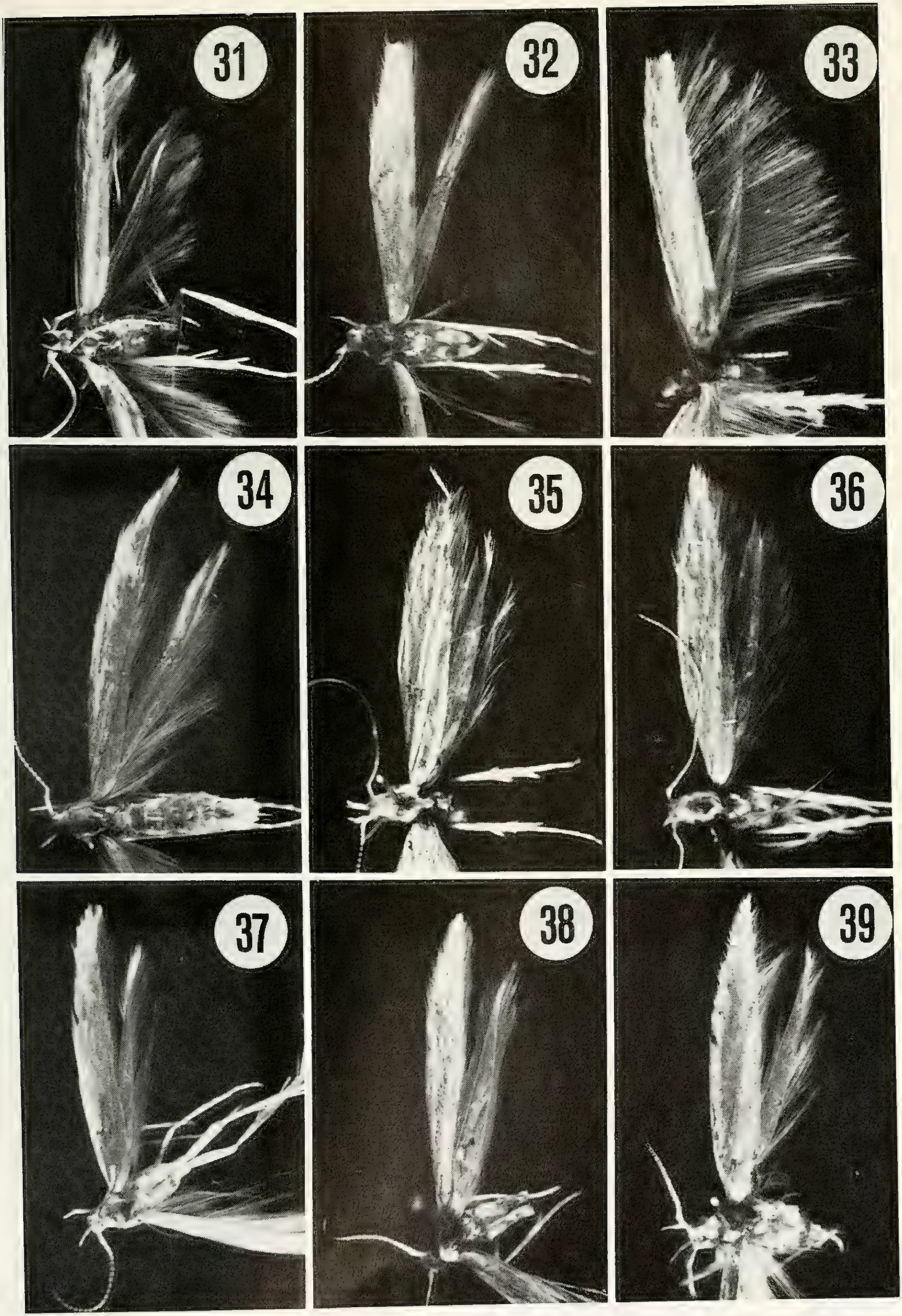
Figs. 8-13. Heads of *Coleophora*. 8, *C. yomogiella*; 9, *C. kurokoi*; 10, *C. citrarga*; 11, *C. caradjai*; 12, *C. hoeneella*; 13, *C. tibetana*.



Figs. 14-21. Heads of *Coleophora*. 14, *C. summivola*; 15, *C. alecturella*; 16, *C. seminalis*; 17, *C. tuberculata*; 18, *C. sittella*; 19, *C. denticulata*; 20, *C. yunnanica*; 21. *C. bantagica*.



Figs. 22-30. *Coleophora* spp. 22, *C. lucida*, ♂, holotype; 23, *C. buteella*, ♂, holotype; 24, *C. melanograpta*, ♂; 25, *C. caradjai*, ♂, holotype; 26, *C. plurispinella*, ♂, holotype; 27, *C. hoeneella*, ♀, holotype; 28, *C. tibetana*, ♂, holotype; 29, *C. seminalis*, ♂; 30, *C. cristata*, ♂, holotype.



Figs. 31-39. *Coleophora* spp. 31, *C. scioleuca*, ♂; 32, *C. alecturella*, ♂, holotype; 33, *C. sittella*, ♂, holotype; 34, *C. summivola*, ♂; 35, *C. falcipenella*, ♂, holotype; 36, *C. yunnanica*, ♂, holotype; 37, *C. denticulata*, ♂, holotype; 38, *C. tuberculata*, ♂, holotype; 39, *C. batangica*, ♂, holotype.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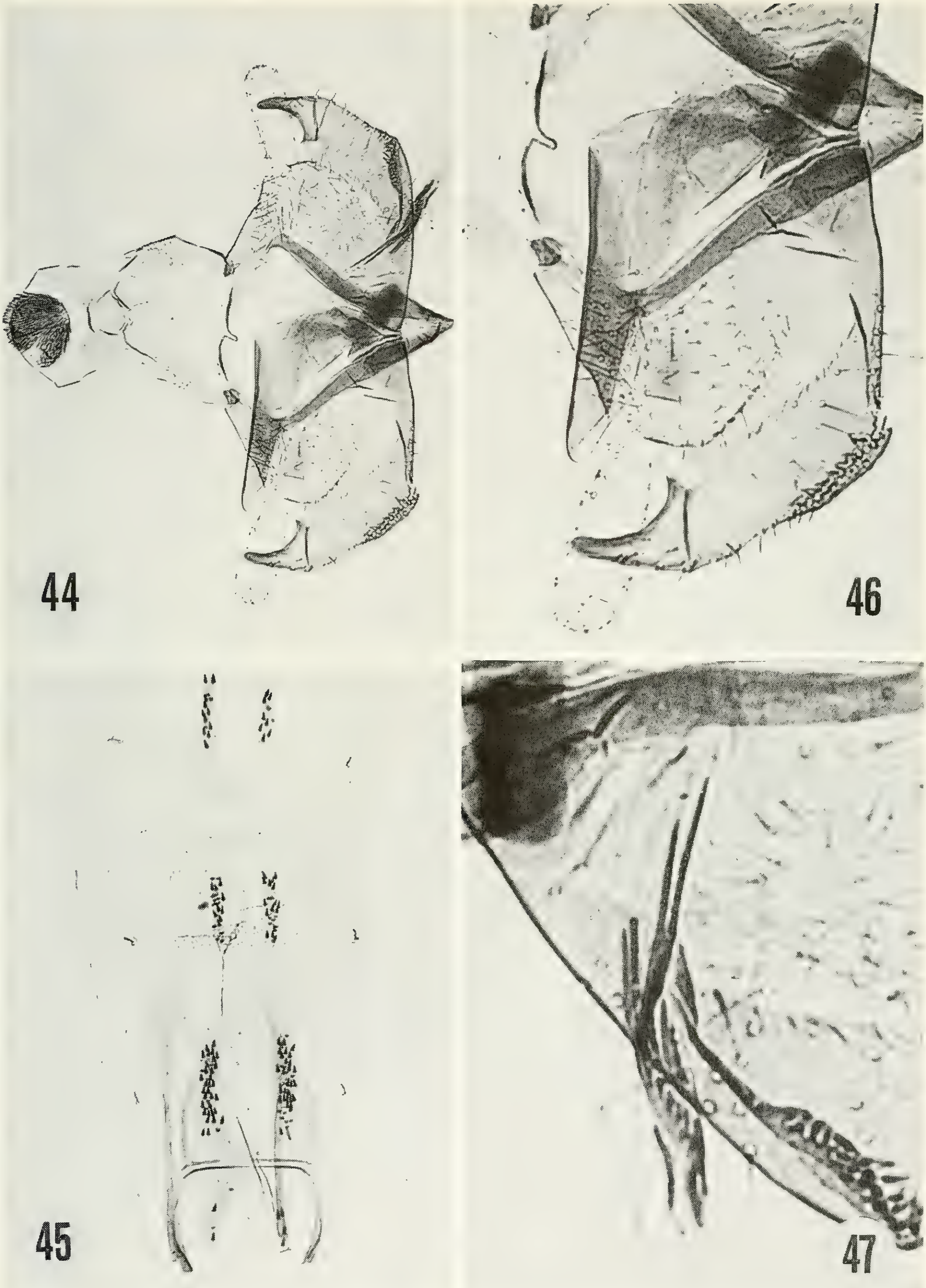
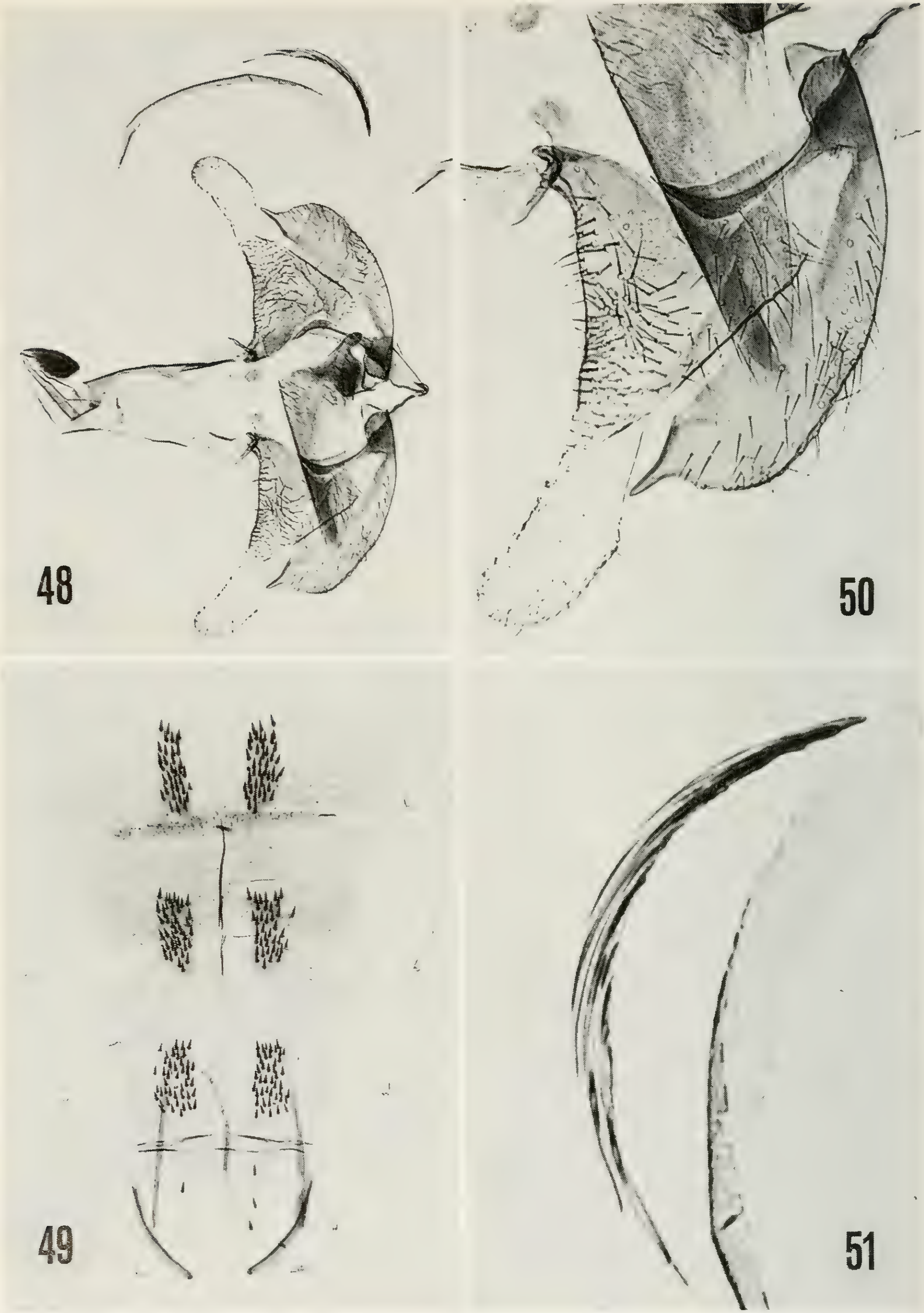
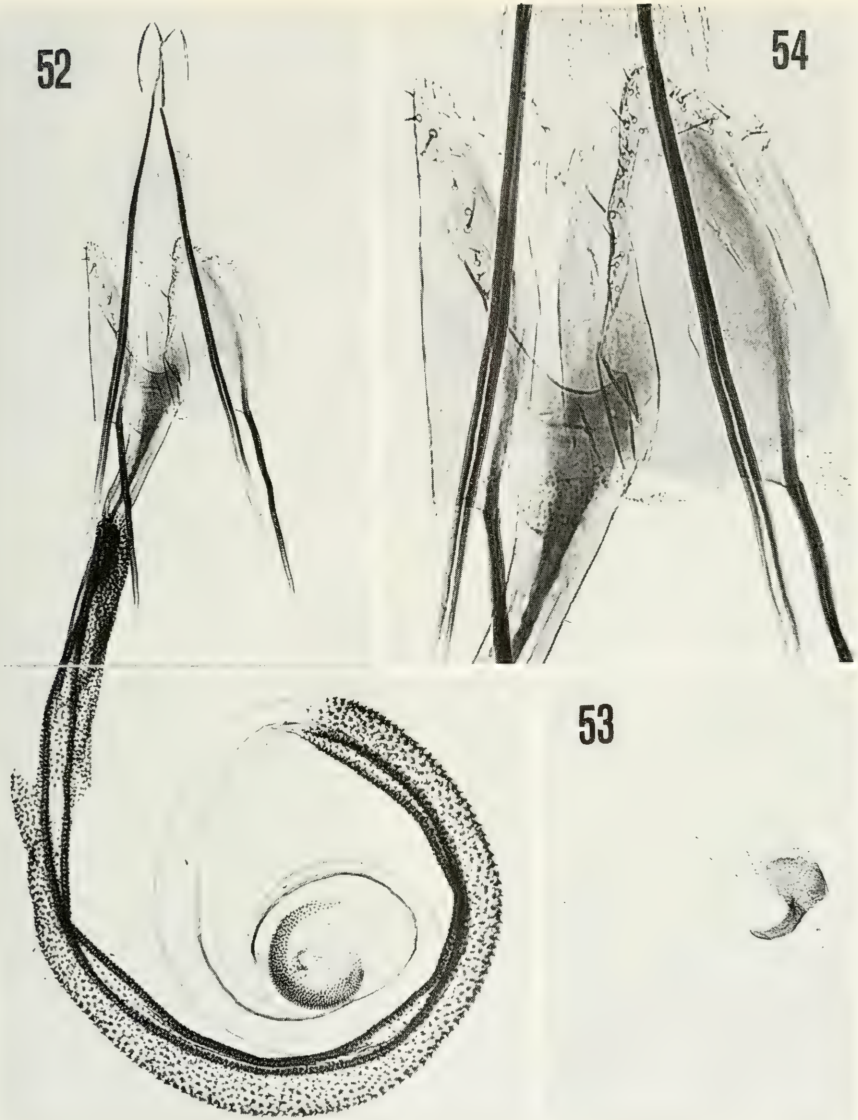
Figs. 40-42. *C. lucida*, holotype, slide Bldz 6892. 40, male genitalia; 41, abdomen; 42, detail of genitalia at high magnification. Fig. 43. *C. eteropennella*, slide Bldz 8329, male genitalia, detail.



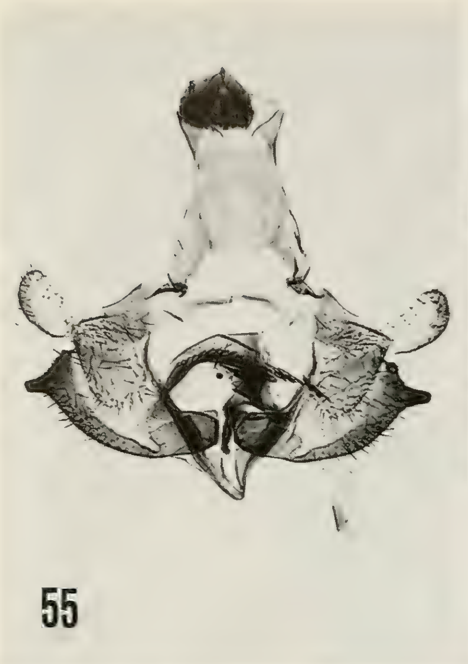
Figs. 44-47. *C. buteella*, holotype, slide Bldz 6885. 44, male genitalia; 45, abdomen; 46, detail of genitalia at high magnification; 47, cornuti at high magnification.



Figs. 48-51. *C. caradjai*, holotype, slide Bldz 8053. 48, male genitalia; 49, abdomen; 50, detail of genitalia at high magnification; 51, cornuti at high magnification.



Figs. 52-54. *C. caradjai*, paratype, slide Bldz 6873. 52-53, female genitalia; 54, subgenital plate at high magnification.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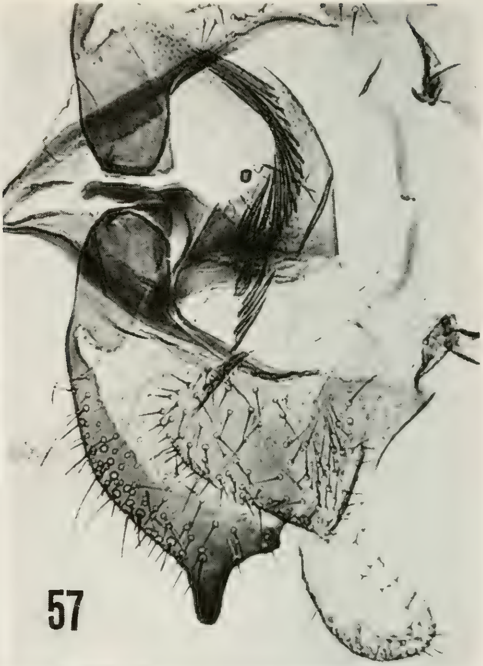
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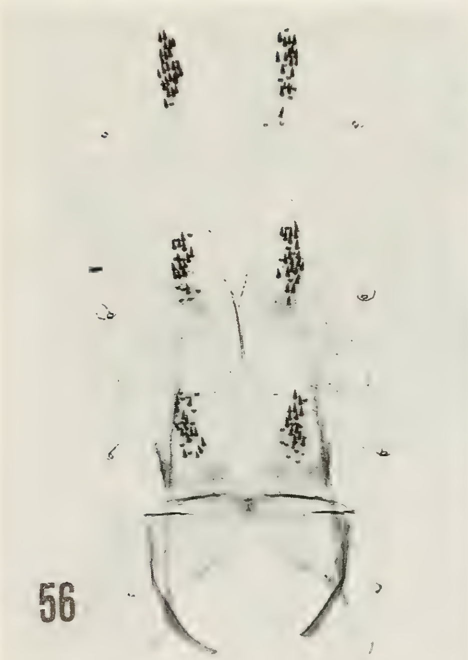
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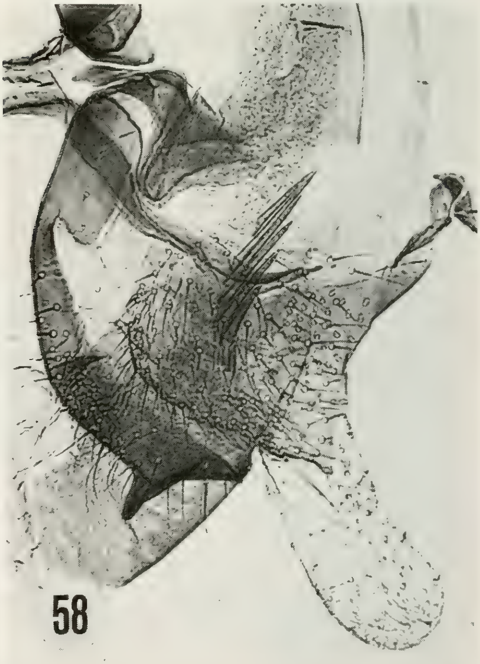
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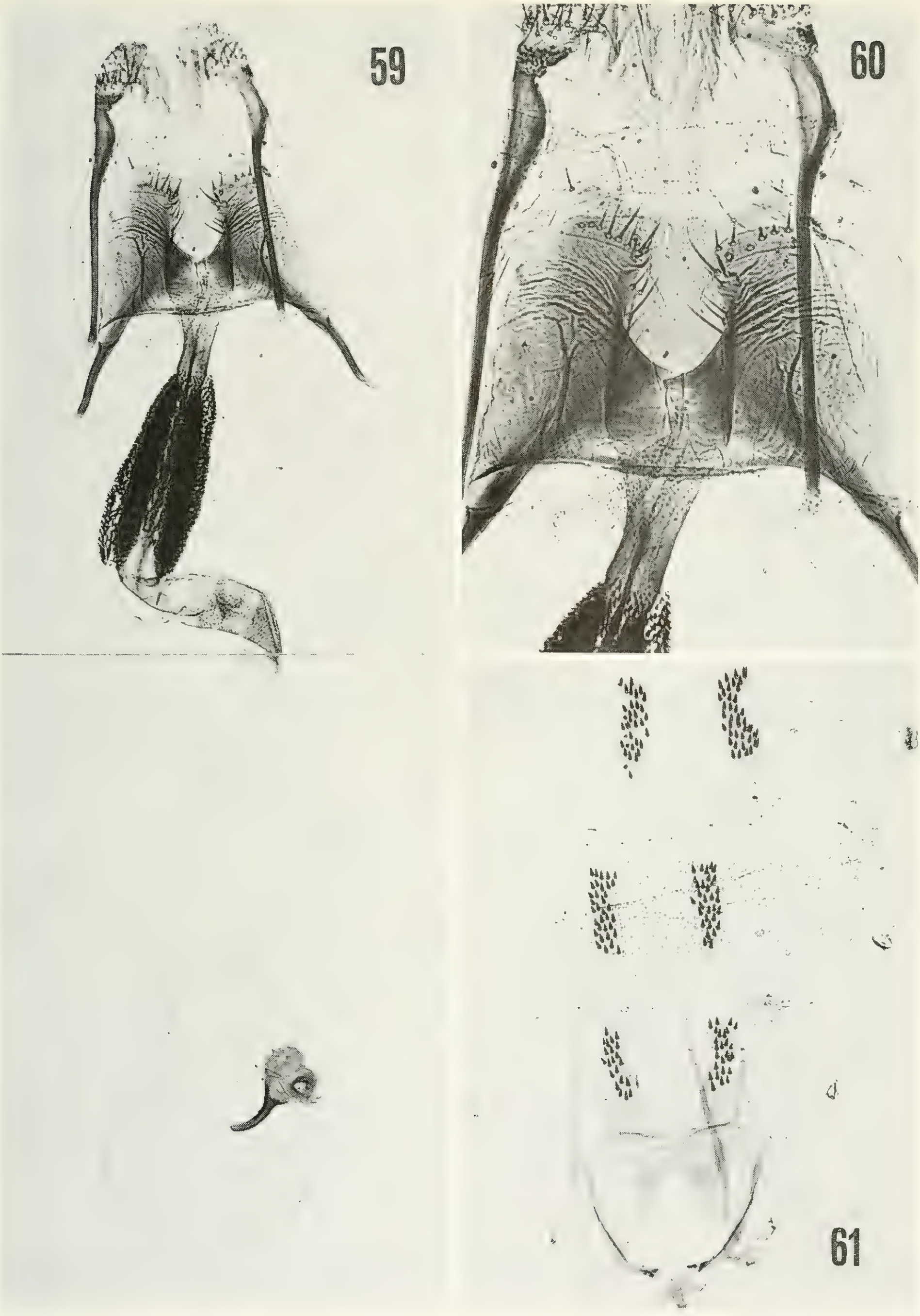
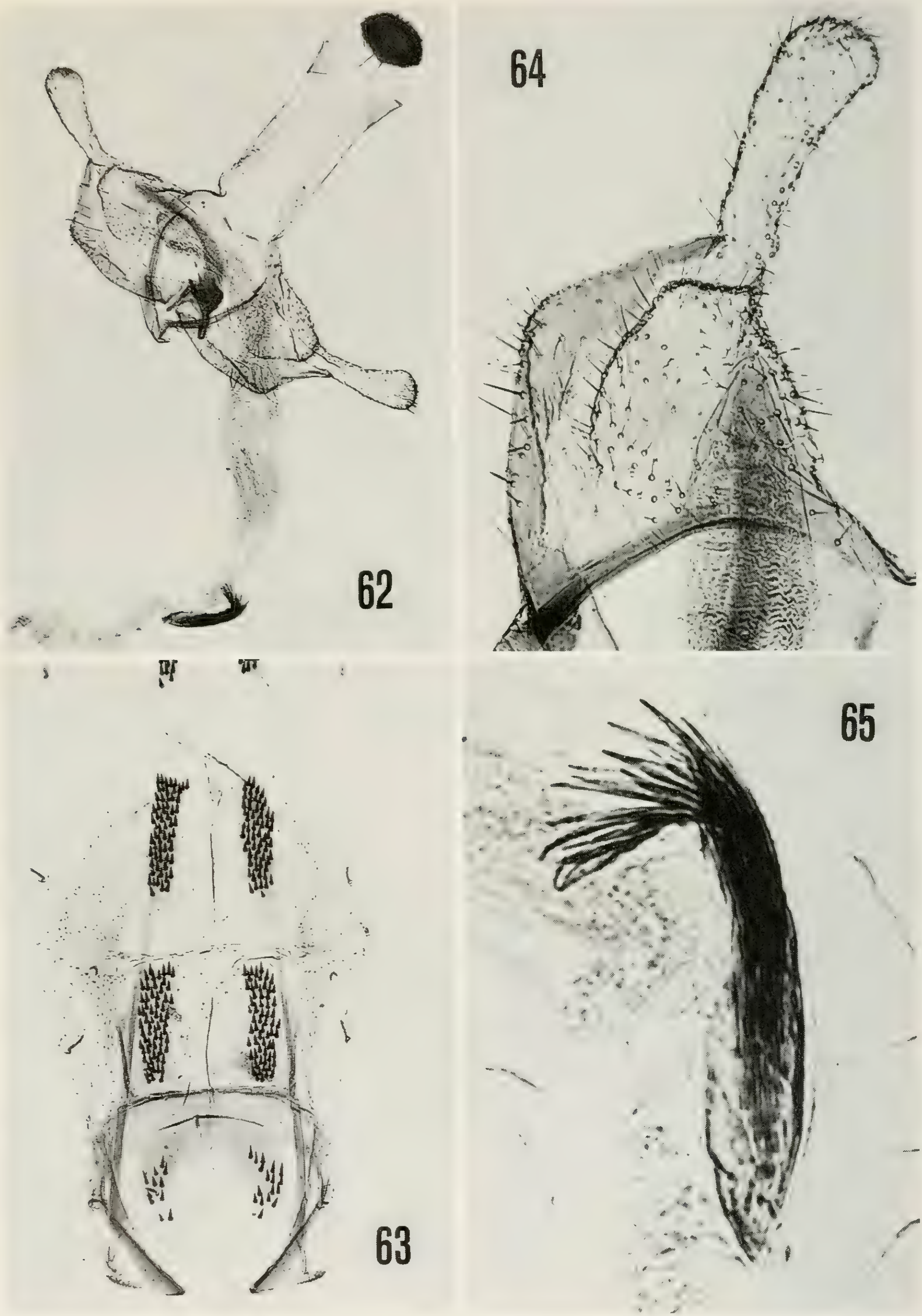
Figs. 55-57. *C. plurispinella*, holotype, slide Bldz 6872. 55, male genitalia; 56, abdomen; 57, detail of genitalia at high magnification. Fig. 58, *C. astragalella*, slide Bldz 8709, male genitalia, detail.

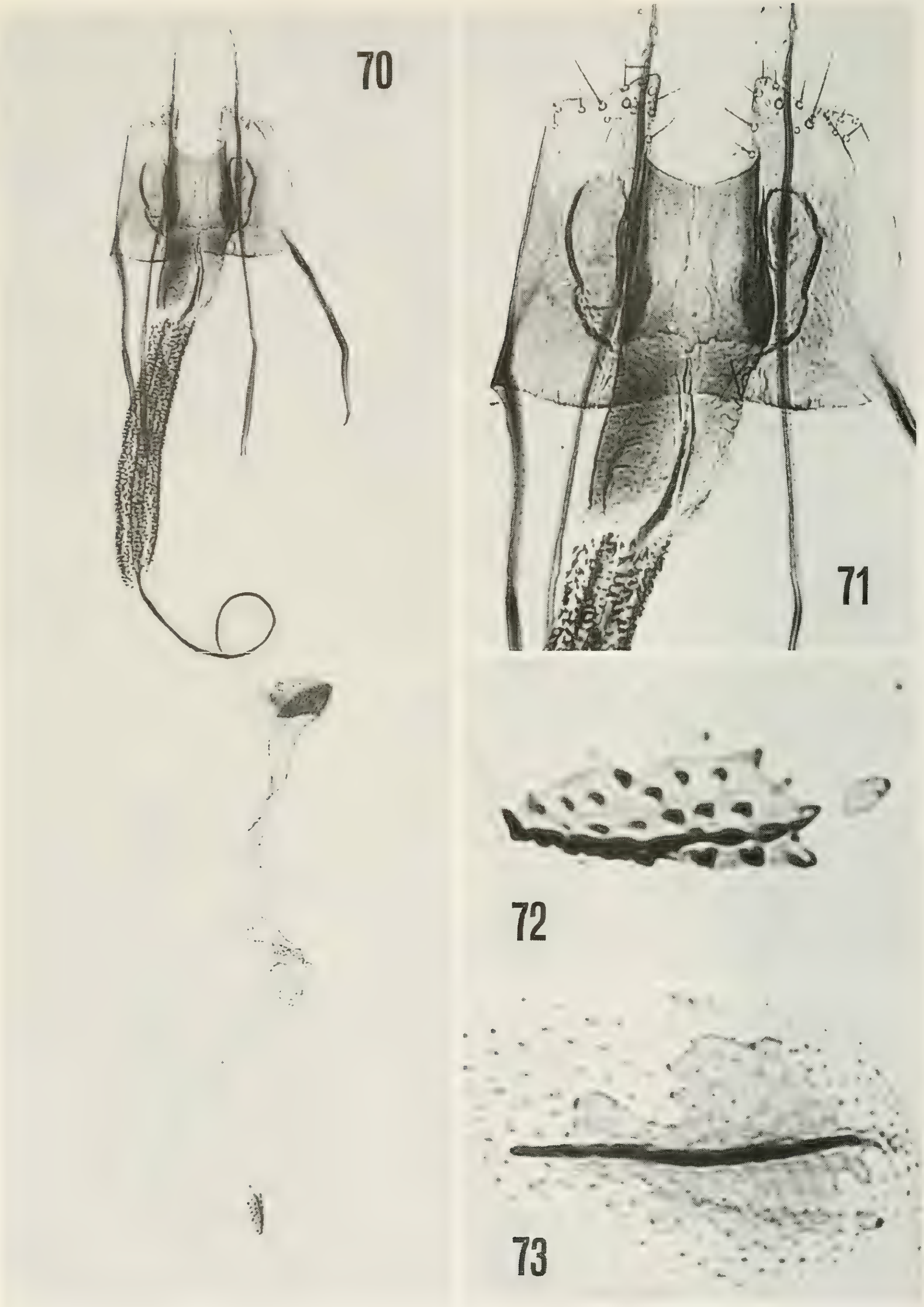


Figs. 59-61. *C. hoeneella*, holotype, slide Bldz 8895. 59, female genitalia; 60, subgenital plate at high magnification; 61, abdomen.

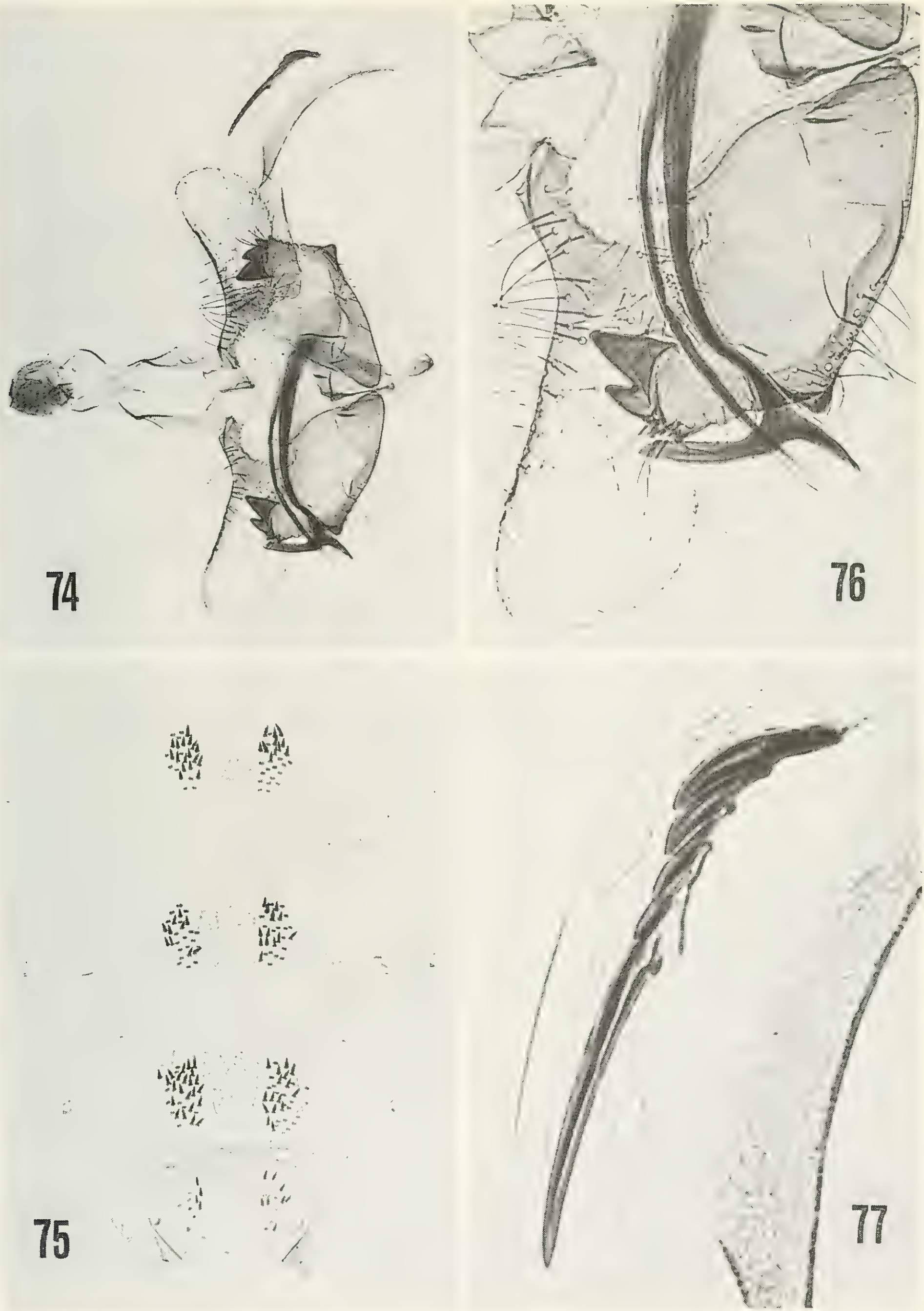


Figs. 62-65. *C. tibetana*; 62—63, 65, paratype, slide Bldz 8896; 64, holotype, slide Bldz 8892; 62, male genitalia; 63, abdomen; 64, detail of genitalia at high magnification; 65, cornuti at high magnification.

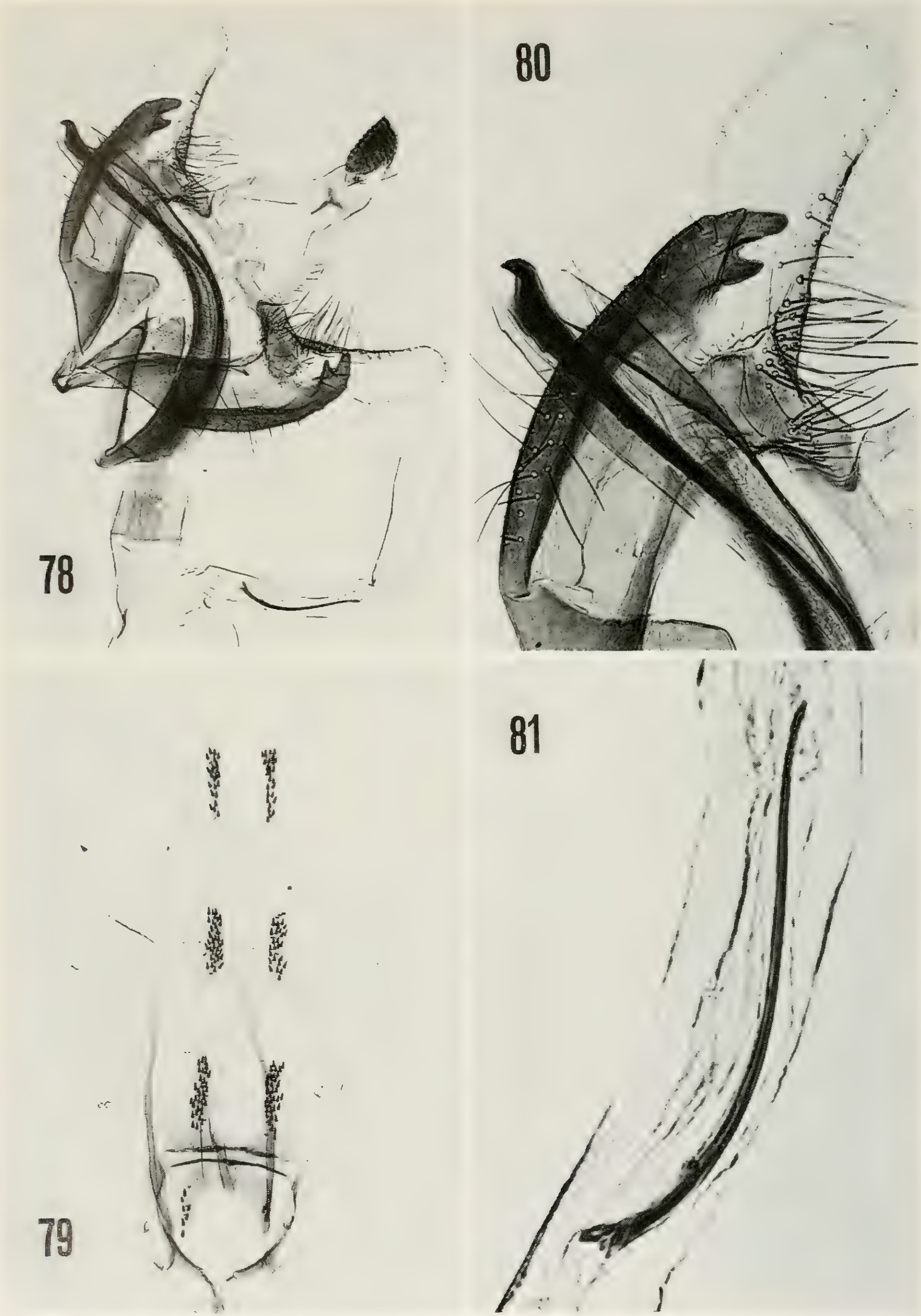
Figs. 66-69. *C. seminalis*, slide Bldz 6879. 66, male genitalia; 67, abdomen; 68, detail of genitalia at high magnification; 69, cornuti at high magnification.



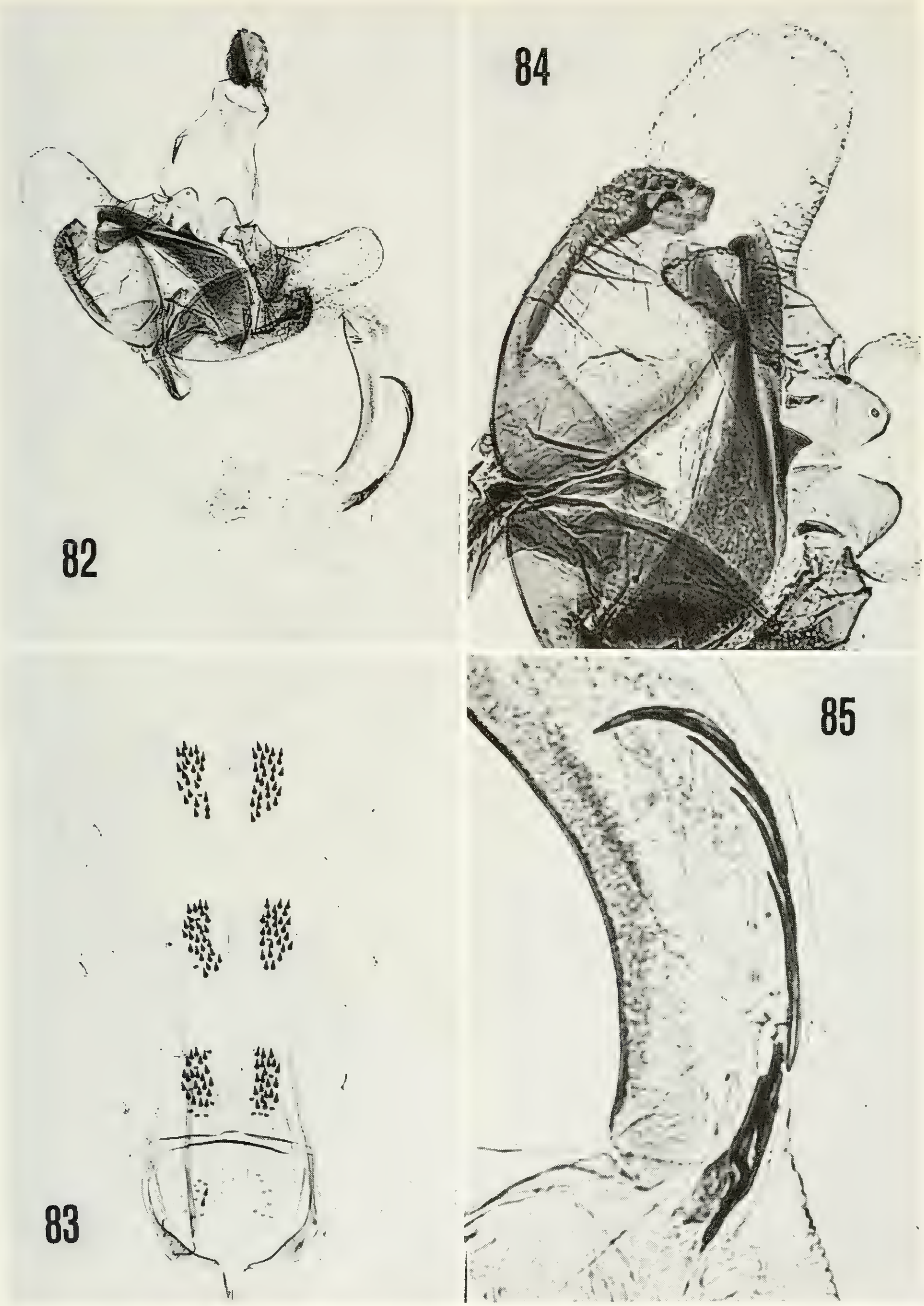
Figs. 70-73. *C. seminalis*. 70—72, slide Bldz 7886. 70, female genitalia; 71, subgenital plate at high magnification; 72, signum at high magnification; 73, slide Bldz 7888, signum at high magnification.



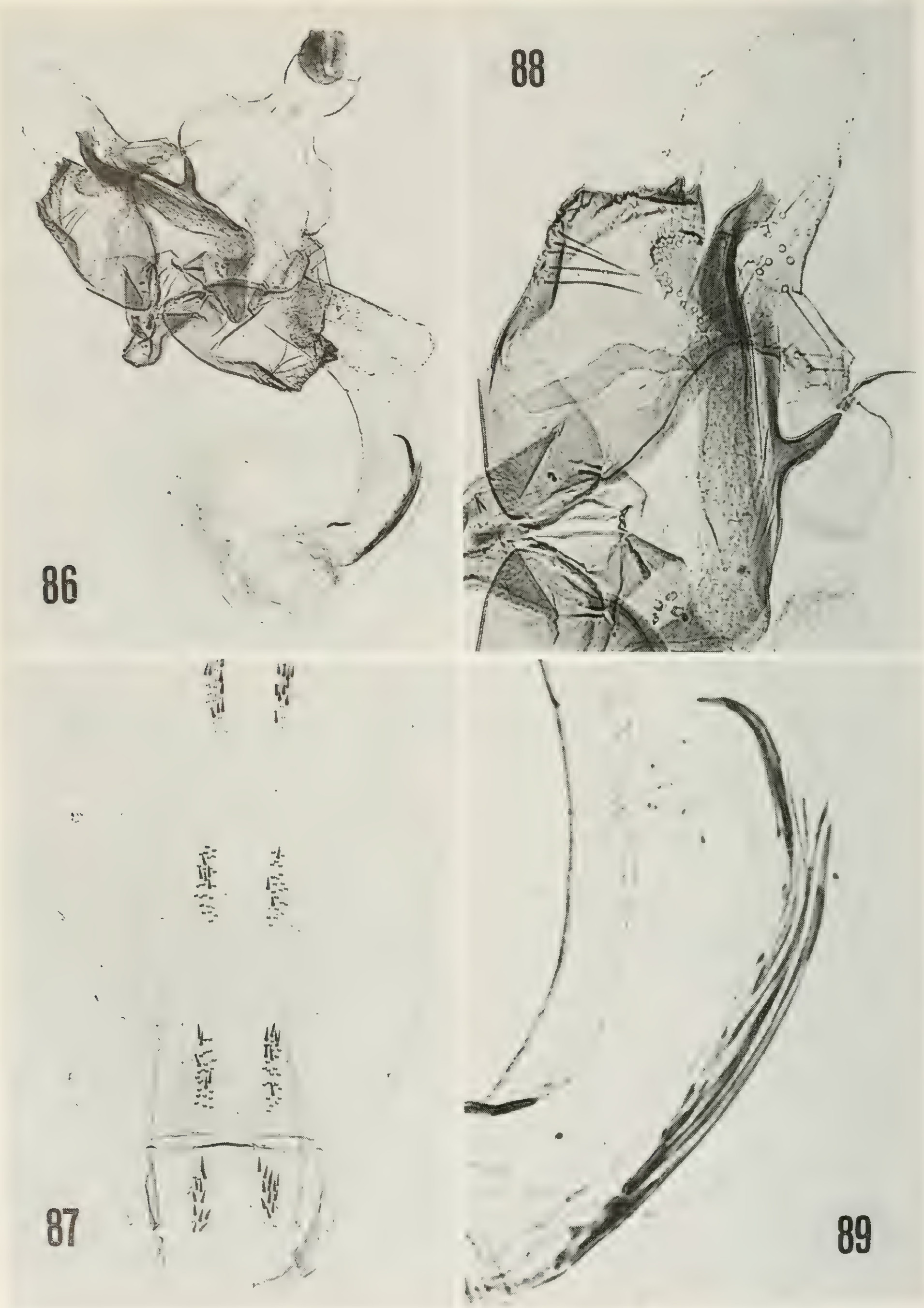
Figs. 74-77. *C. cristata*, holotype, slide Bldz 6888. 74, male genitalia; 75, abdomen; 76, detail of genitalia at high magnification; 77, cornuti at high magnification.



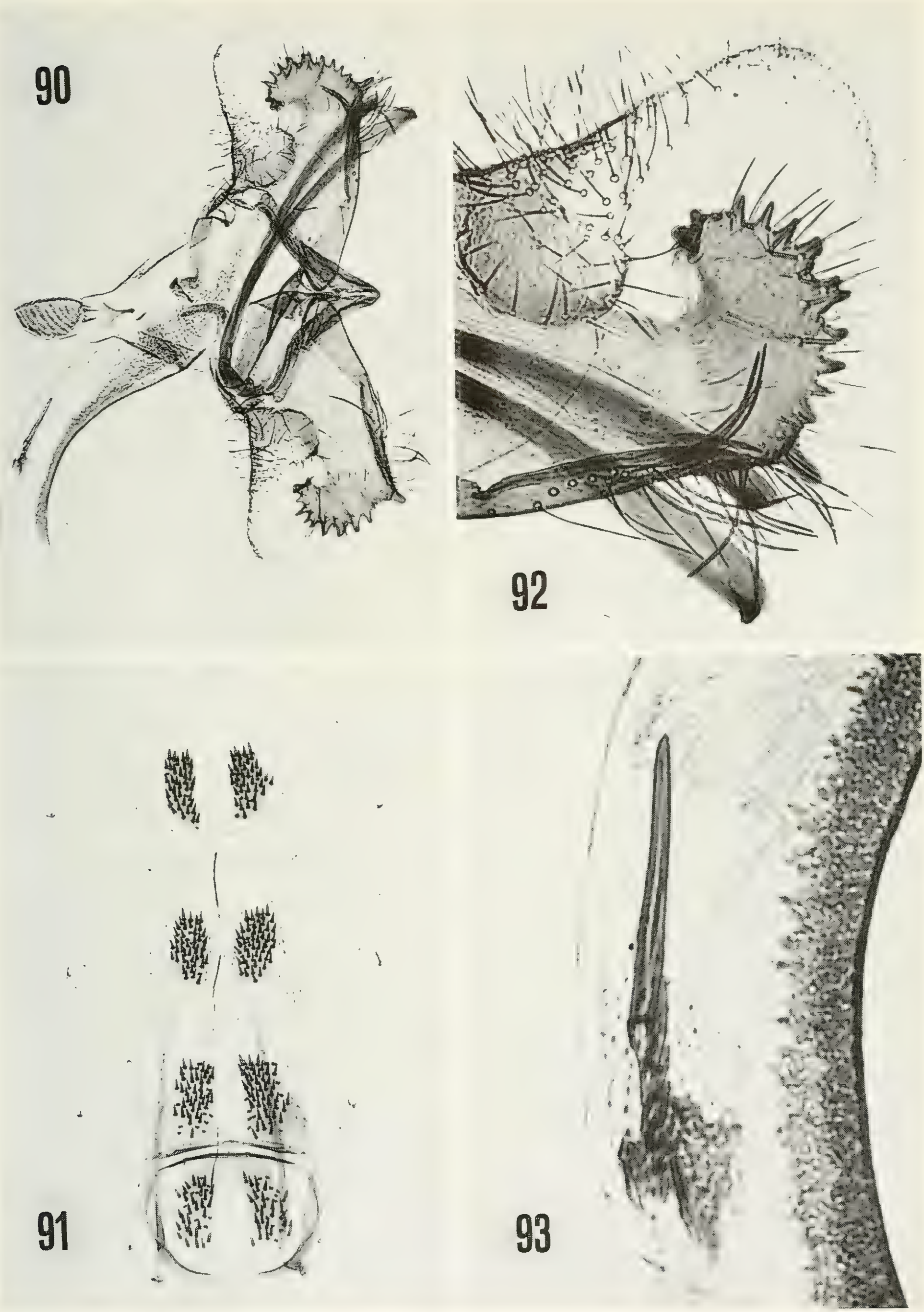
Figs. 78-81. *C. scioleuca*, lectotype, slide BMNH 24443. 78, Male genitalia; 79, abdomen; 80, detail of genitalia at high magnification; 81, cornutus at high magnification.



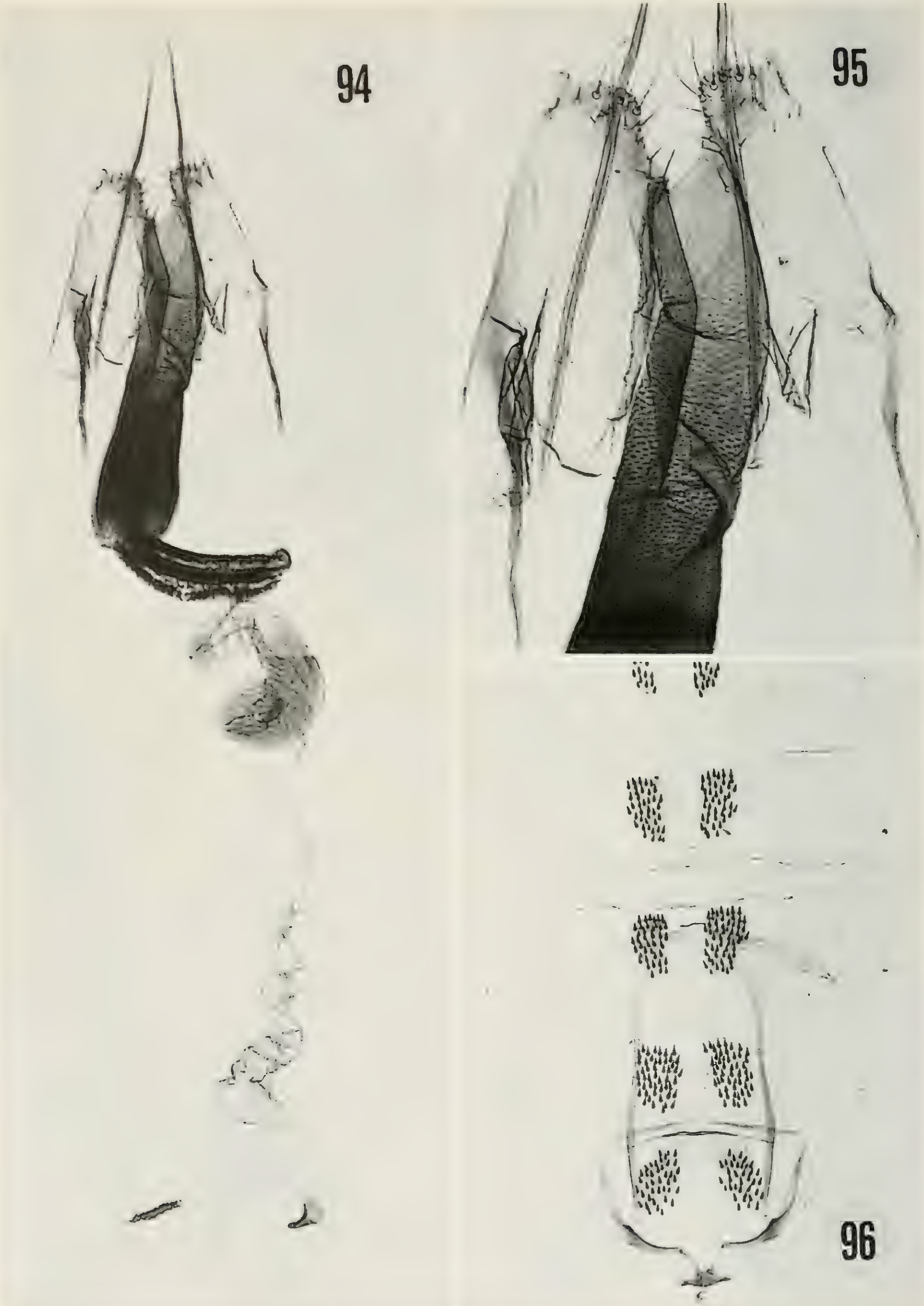
Figs. 82-85. *C. alecturella*, holotype, slide Bldz 8913. 82, male genitalia; 83, abdomen; 84, detail of genitalia at high magnification; 85, cornuti at high magnification.



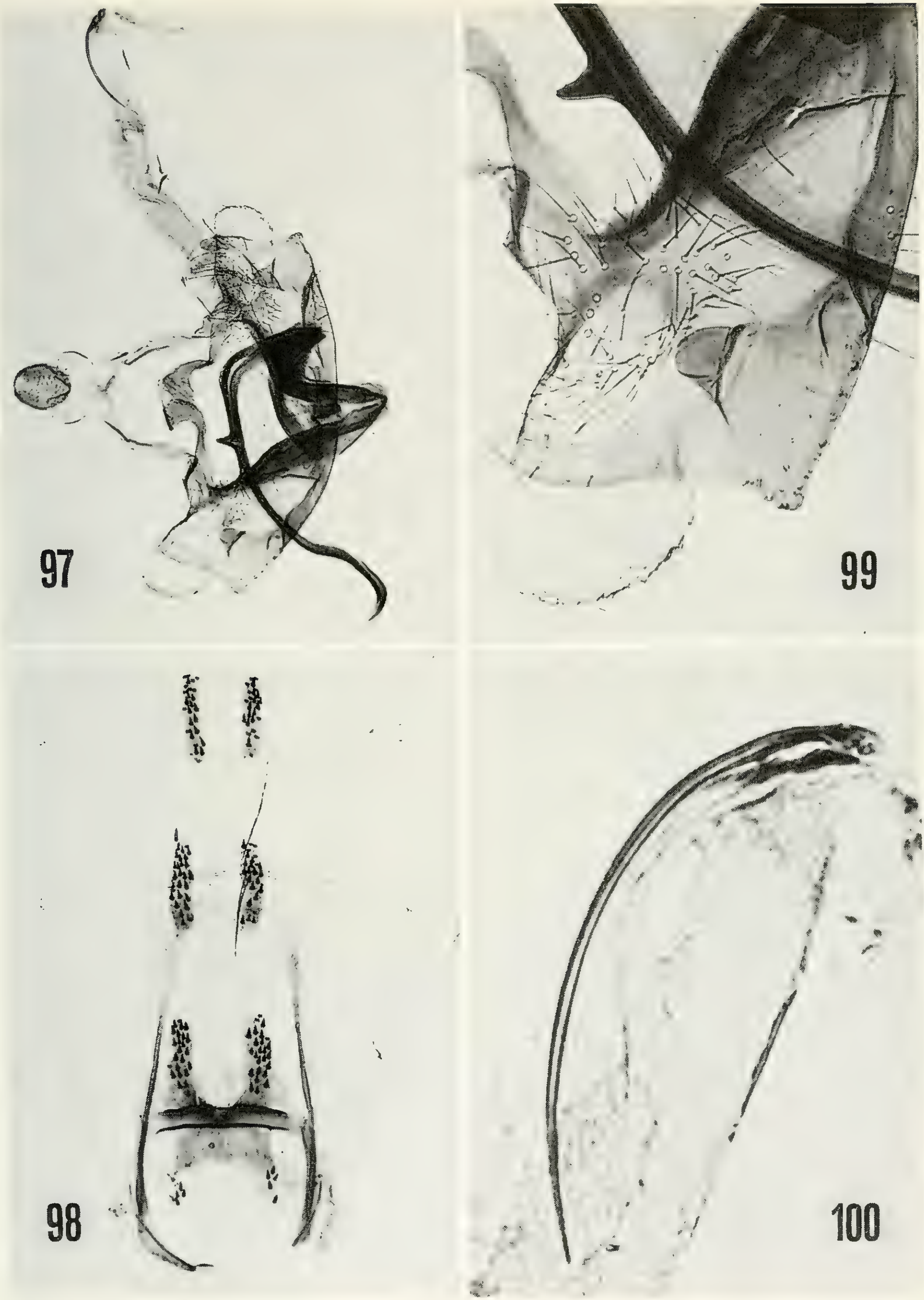
Figs. 86-89. *C. sittella*, paratype, slide Bldz 6893. 86, male genitalia; 87, abdomen; 88, detail of genitalia at high magnification; 89, cornuti at high magnification.



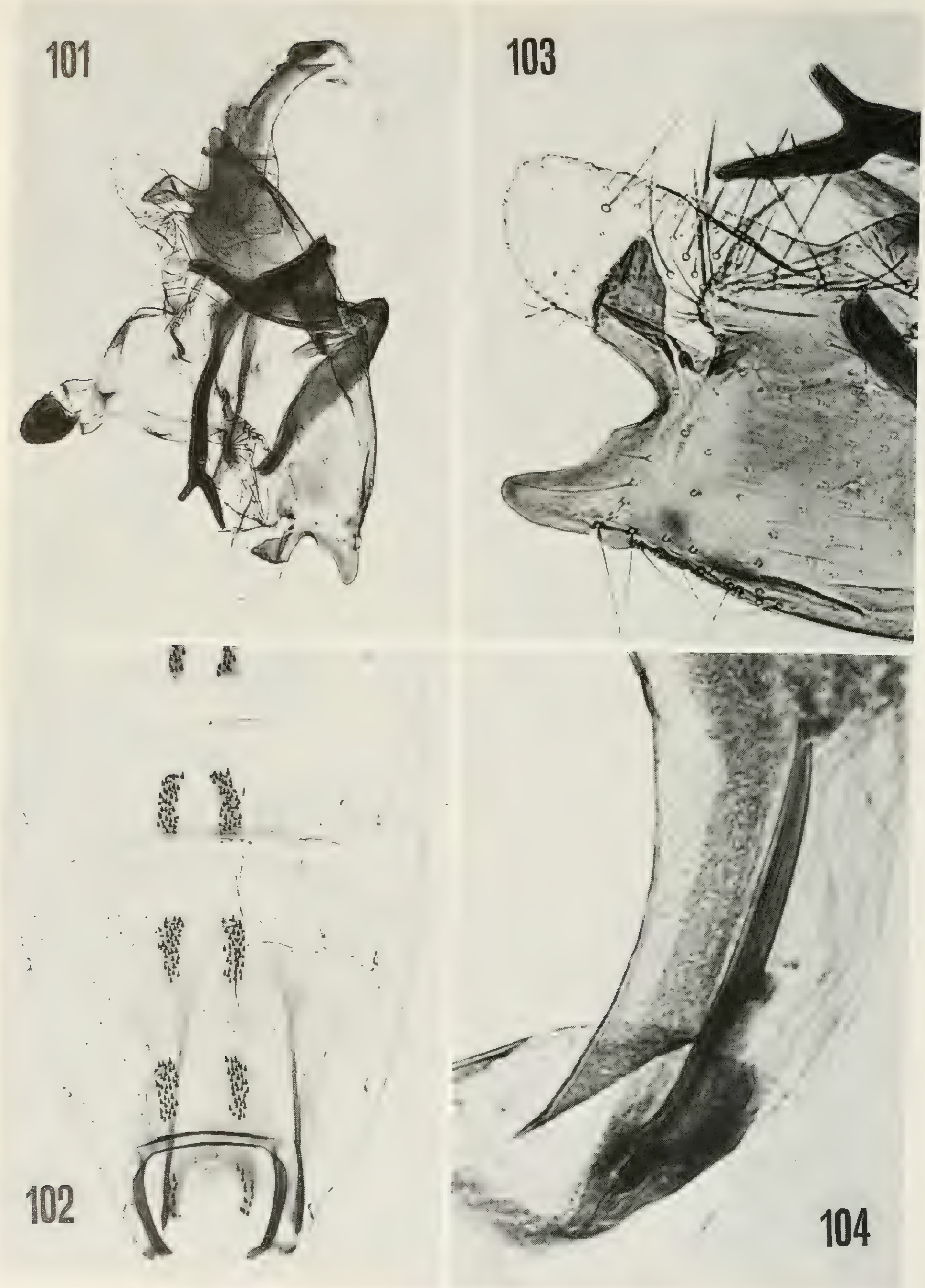
Figs. 90-93. *C. summivola*, slide Bldz 8897. 90, male genitalia; 91, abdomen; 92, detail of genitalia at high magnification; 93, cornuti at high magnification.



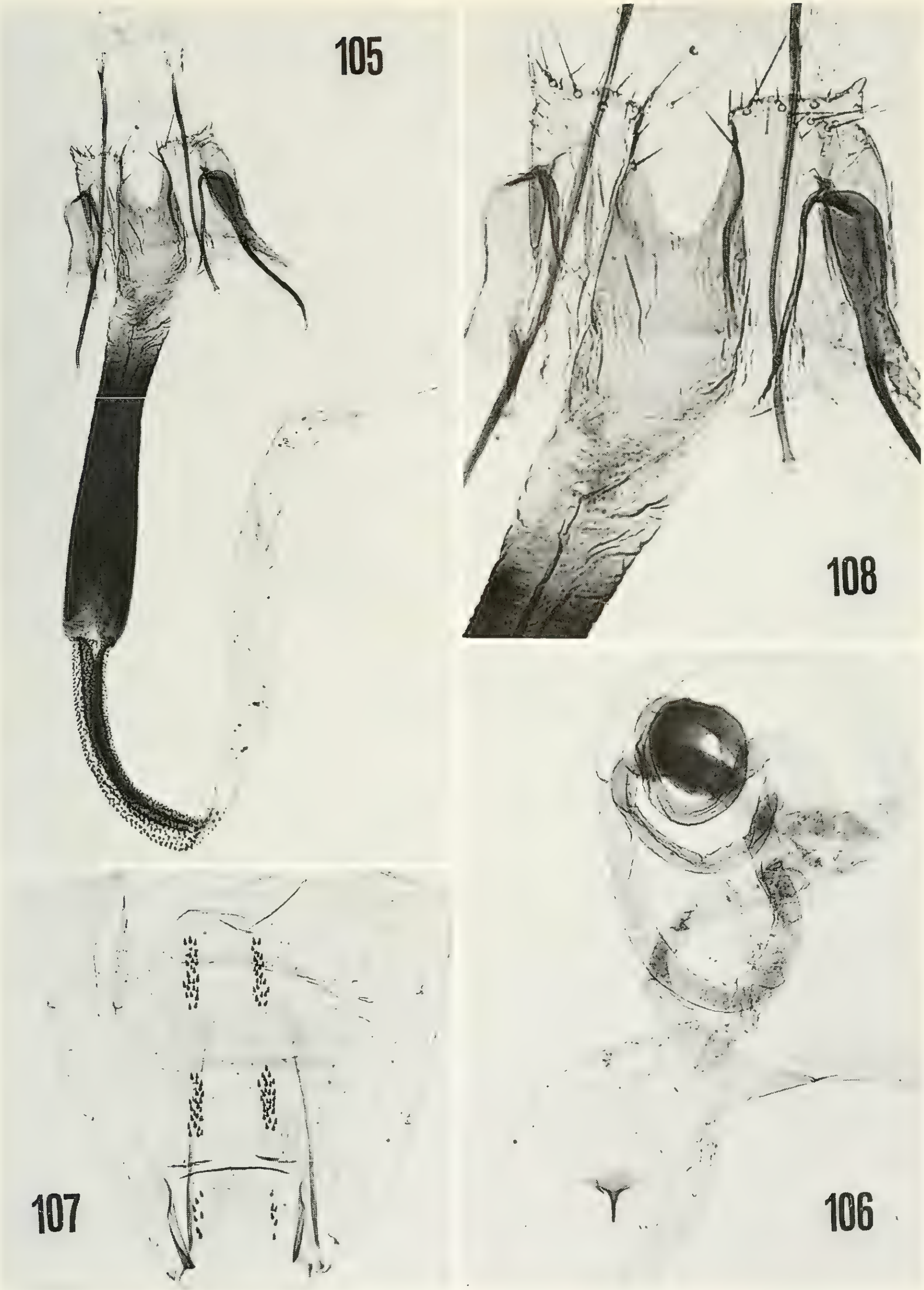
Figs 94-96. *C. sammicola*, slide Bldz 8911. 94, female genitalia; 95, subgenital plate at high magnification; 96, abdomen.



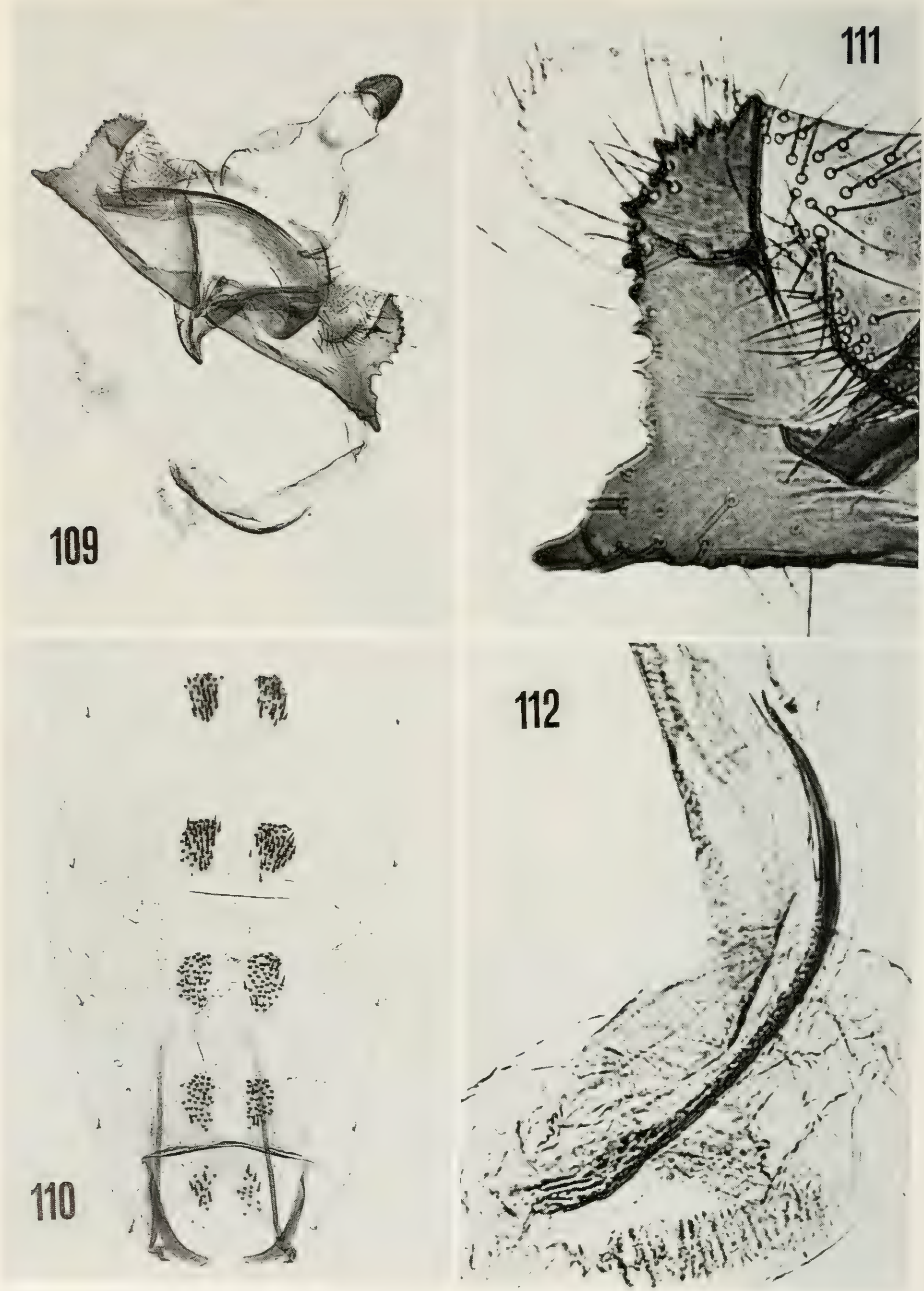
Figs. 97-100. *C. falcipenella*, holotype, slide Bldz 7080. 97, male genitalia; 98, abdomen; 99, detail of genitalia at high magnification; 100, cornutus at high magnification.



Figs. 101-104. *C. yunnanica*, holotype, slide Bldz 7084. 101, male genitalia; 102, abdomen; 103, detail of genitalia at high magnification; 104, cornutus at high magnification.

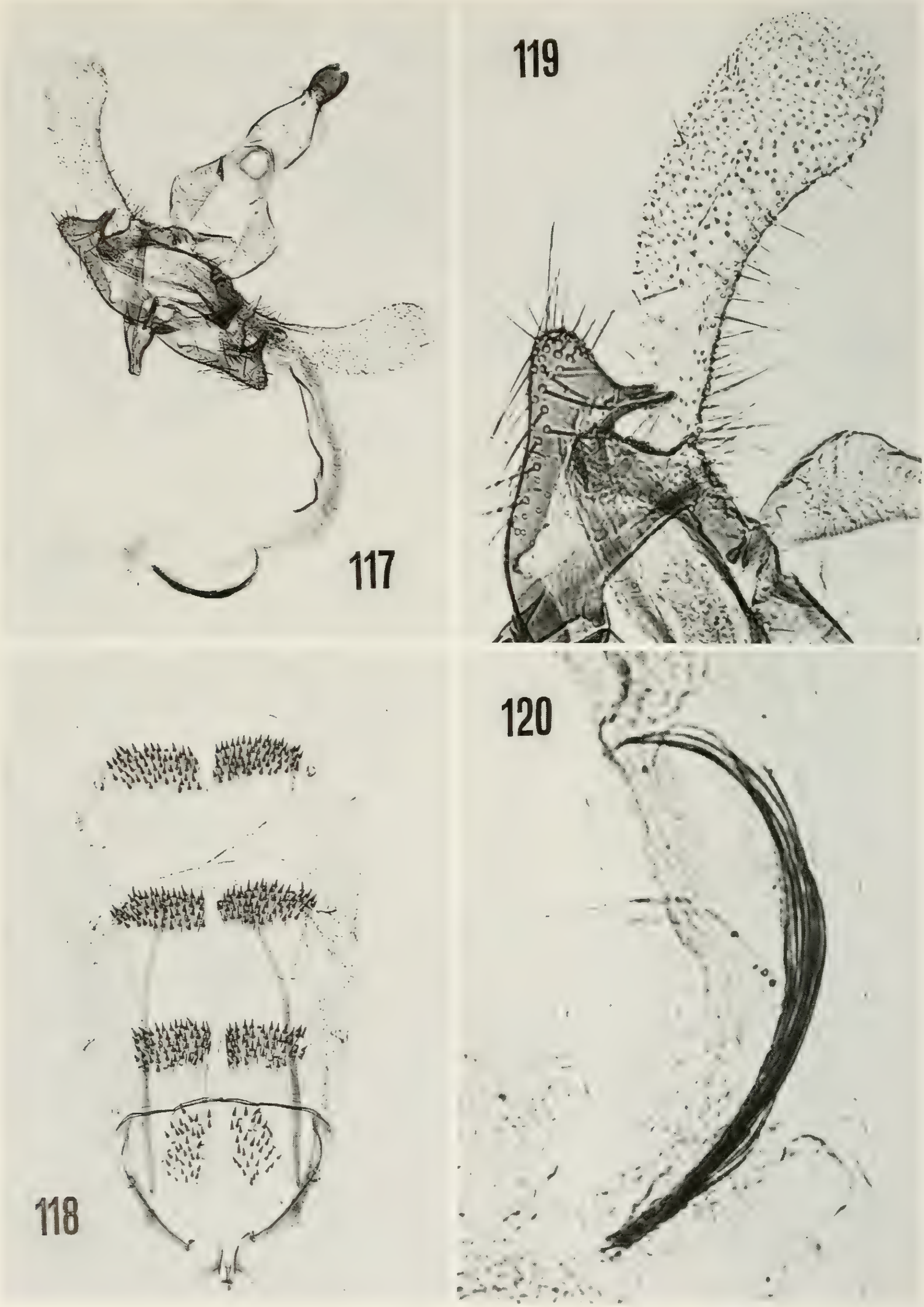


Figs. 105-108. *C. yunnanica*, paratype, slide Bldz 6894. 105-106, female genitalia; 107, abdomen; 108, subgenital plate at high magnification.



Figs. 109-112. *C. denticulata*, holotype, slide Bldz 8910. 109, male genitalia; 110, abdomen; 111, detail of genitalia at high magnification; 112, cornuti at high magnification.

Figs. 113-116. *C. tuberculata*, holotype, slide Bldz 8901. 113, male genitalia; 114, abdomen; 115, detail of genitalia at high magnification; 116, cornuti at high magnification.



Figs. 117-120. *C. batangica*, holotype, slide Bldz 8909. 117, male genitalia; 118, abdomen; 119, detail of genitalia at high magnification; 120, cornuti at high magnification.

CARABID FAUNA OF SOME TYPES OF FOREST IN THE NETHERLANDS (COLEOPTERA: CARABIDAE)

by

THEODOOR HEIJERMAN & HANS TURIN

ABSTRACT

Heijerman, Th. & H. Turin, 1989. Carabid fauna of some types of forest in the Netherlands (Coleoptera: Carabidae). – Tijdschrift voor Entomologie 132: 241–250, figs. 1–3, tables 1–3 [ISSN 0040-7496]. Published 1 December 1989.

Continuous pitfall trapping data were collected, consisting of year-samples of carabid beetles from 48 sites in different types of forest located in several geographic parts of the Netherlands. More than 18,000 carabids were caught. Numerical classification techniques were applied and these revealed that clusters of sites, classified on their carabid species composition, could be interpreted better in terms of their geographical position in the Netherlands, rather than in terms of forest type. Moreover, the carabid faunas of the coniferous forests investigated, appeared to be impoverished nor poor in species when compared with the faunas of deciduous forests.

Key words. – Carabidae; forest types; The Netherlands.

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INTRODUCTION

If one were to try to record as many species of forest carabids as possible from a single locality, one would probably prefer to sample a mixed deciduous forest, and certainly not a monotonous coniferous plantation, where all trees are approximately of the same age, size and are equidistant.

Den Boer (1963) studied the carabid faunas of several types of forest in the province of Drenthe (The Netherlands), and indeed concluded that the carabid faunas of coniferous forests are only poor sub-samples from those of dry deciduous forests. Coniferous forests in Drenthe not only contain lower densities of fewer carabid species, but also lack the characteristic species.

Between 1835 en 1945, the Dutch forest area increased from 170,000 to about 300,000 ha, which is about 8.5% of the total area of the Netherlands. This increase was due to the planting of various coniferous tree species. The area covered with deciduous forests thus decreased from 81% of the total forest area to about 30%. At present about 80% of the total forest area is covered with coniferous trees, and only 20% with deciduous tree species including scrubs. Deciduous forests often alternate with coniferous plantations in the same areas.

The patches of deciduous forests may therefore be regarded as more or less isolated ecological "islands", surrounded by inaccessible areas. This hypothesis would imply that not only agricultural fields and meadows may function as barriers to the exchange of carabid beetles between discontinuous (spatially separated) habitats, but also that conifer plantations may hamper dispersal to some extent. Of course, this isolating effect would drastically affect the distribution of stenotopic species, and of species with poor powers of dispersal.

The possible effects of fragmentation and isolation of the distribution of carabid species that differ in their powers of dispersal, were recently studied (Turin & Den Boer 1988).

In the present study the carabid faunas of several forest types are described, the sampling sites are classified, and the general applicability of the conclusion of Den Boer (1963), as mentioned above, is tested. The results of our study seem relevant in evaluating the possible role of conifer plantations as ecological barriers, and therefore in interpreting some of the results of the project of Turin & Den Boer (1988).

Turin and Heijerman (1988) classified the Dutch carabid species according to their association with forest habitats, and where we speak of "true forest carabids" we refer to the stenotopic and eurytopic forest species as distinghuished in that paper.

METHODS

Sampling technique and location of sampling sites

We selected 14 sampling areas, distributed over five geographical regions in the Netherlands (fig. 1). Each sampling area consisted of a forest area containing patches of different types of woodland: oak-birch, larch, spruce, and/or douglas-fir. Sets of 5 pitfall traps were placed in each of these different forest types. In total 48 pitfall series were used, covering 48 different sampling localities. Within each pitfall series, traps were placed at a distance of 6 to 10 m from each other. The traps were provided with 4% formalin as a preservative. Table 1 gives a listing of the sampling localities for each sampling area.

The traps were emptied at irregular time intervals during continuous operation for a whole year, from spring 1983 to spring 1984. All those carabid specimens taken from the five pitfall traps of a set together during a year, constitute a "year- sample".

Statistical analysis

A data set was constructed containing the year-samples of each species for each of the sampling localities. Another data set was produced for only those species that were classified as true forest species by Turin and Heijerman (1988). In order to simplify, visualize and to investigate the internal structure of such data matrices and to obtain information about the presence of clusters, two types of multivariate analyses were performed on these data sets. Both ordination and cluster analysis were used. For information about the exact principles and presuppositions of these methods, we will refer to the literature.

Ordination and cluster analysis. – As an ordination technique we have used DECORANA to perform Detrended Correspondence Analysis (DCA) (e.g. Hill 1979a). This technique can be applied to investigate whether the sample sites can be arranged

Fig. 1. Location of the forest sampling sites in The Netherlands.

Table 1. The 48 sampling sites, classified according to forest type and forest area. Given are the numbers of samples (pitfall series) for the different kinds of forests and the serial numbers.

Geographical group	forest area	1)	forest type				serial number
			oak-birch	larch	spruce	douglas	
Southern part of Limburg	1. Vijlen	TH+KA	2	2	3	–	L1,2,5,7,8,11,13
	2. Epen	TH+KA	1	–	2	–	L3,4,10
	3. Eys	TH+KA	1	1	–	–	L6,9
	4. Wijlre	TH+KA	–	–	1	–	L12
Beek, Gelderland	5. Beek	TH	1	2	–	1	B1,2,3,4
Lievelde, Achterhoek	6. Lievelde	EP	2	1	2	–	A1,2,3,4,5
Southern Veluwe	7. Wageningen	TH	1	2	2	1	M18,19,20,21,22,23
	8. Planken Wambuis	KB	–	2	2	–	M1,2,3,4
	9. Warnsborn	KA	–	2	1	–	M5,6,9
	10. Hoge Veluwe	KA	–	1	1	–	M7,10
	11. Kemperberg	KA	1	–	1	–	M8,11
	12. Renkum	HT	–	2	–	2	M12,13,14,15
	13. Doorwerth	HT	2	–	–	–	M16,17
Brabant	14. Valkenhorst	FS	1	1	1	–	NB1,2,3
Total			12	16	16	4	48

1) Investigators: EP = E. Penterman; FS = F. Smulders; HT = H. Turin; KA = K. Alders; KB = K. Booij and TH = Th. Heijerman

along one or more hypothetical axes. These axes are constructed from the data matrix itself and may or may not coincide with gradients of real environmental variables. Subsequent consideration of the ecological requirements of the species may be of help to interpret the hypothetical gradient in terms of real environmental variables. Two Way Indicator Species Analysis was also carried out, using the TWINSPAN program (Hill 1979b). This method can be classified as a divisive, polythetic technique, and groups sample sites into hierarchical clusters, on a basis of the common presence of indicator species and/or preferentials.

Diversity aspects. – The individual sample sites were described in terms of (1) total number of species and (2) total number of individuals. These parameters were calculated for the total data matrix and for the matrix containing the forest species separately. They were used to investigate whether or not the carabid species composition of the various types of coniferous forests constituted a poor reflection of the communities of the deciduous sites. The significance of differences found were tested by the WILCOXON test.

Results

The data matrices

The total carabid sample consisted of 18,522 specimens of 88 species (0.21 specimens trap* day^{-1}), twelve of them belonging to the stenotopic forest species, ten eurytopic forest species (sensu Turin & Heijerman 1988), and the others being non-forest species. The total number of specimens of true forest species was 17,281.

It is not practicable to present the complete data set; table 2 gives the abundances of only the 22 true forest species. The complete data set, however, is available on request.

Table 2. The total numbers of specimens (year-samples) of "true forest species" for each of the 48 pitfall series. The upper part of the table shows the stenotopic forest species and the lower part the eurytopic forest species (sensu Turin & Heijerman 1988).

Serial number	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	B1	B2	B3	B4	A1	A2	A3	A4	A5	M1	M2	M3	M4
Abax parallelepipedus	169	287	25	8	44	13	51	145	368	135	519		165	6	4	32	6						24	19	46	64
Abax parallelus	2	1								4																
Amara brunnea																										
Calathus rotundicollis								1	1	9	2	3					1	102	5	1	165	41	2	3		1
Carabus nemoralis			4									1	1	4	18	49	24	1		7	14	1	7		7	1
Cychrus caraboides		8			1		8	4			14						10		3	3				1		
Harpalus quadripunctatus																										
Leistus rufomarginatus			1			1	1	2	1	3		2			1	2	153	2	3	1	7	7		2		1
Notiophilus rufipes																	29									
Pterostichus cristatus				1						8																
Pterostichus oblongopunctatus	53	64	100	73	15	13	100	299	48	6	198		89	8	11	13	15	13	3	38	367	43	7	19	4	6
Trichotichnus nitens	1	2				5			46		72															
Agonum assimile											1							1			285					
Calathus micropterus																									10	
Carabus coriaceus	9	7	7	3	45		95	63		12	50		2	4	4	12	31									
Carabus problematicus	941	750	213	452	204	137	515	588	30	17	729		352	12	16	55	4						119	187	10	20
Carabus violaceus	26	10	3	3	21	30	4	20	80		31		16	6	1	41	20						10	6	9	4
Leistus spinibarbis																										
Nebria brevicollis				1						4		8					4	1		1	83	1				
Notiophilus biguttatus	2					2			1	1			2		4				3		19	10	1	8		5
Stomis pumicatus									1								8			2						
Trichocellus placidus																					1					
Forest type	sp	sp	sp	sp	la	la	la	ob	ob	ob	ob	sp	sp	la	la	do	ob	sp	sp	ob	ob	la	sp	sp	la	la

(Table 2 continued)

Serial number	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15	M16	M17	M18	M19	M20	M21	M22	M23	NB1	NB2	NB3	Total
Abax parallelepipedus	82	81	15	42	24	123	103	38	94	85	6	4	4	5	7	2	8	9					2862
Abax parallelus	10			1	7		1																26
Amara brunnea																	6						6
Calathus rotundicollis		1			1	2	4	71	27	25	1			1	2			1	27		17	2	566
Carabus nemoralis	65	20	12		25	41	17	5	6	26	45	1	12	19	29	4	16	13	1			16	512
Cychrus caraboides		1								1		3	2	3		1	4		4				71
Harpalus quadripunctatus												1	6										7
Leistus rufomarginatus	2	4		8	12		4	6	2	2		10	10	2	15		3		34	13	15	4	336
Notiophilus rufipes		3			1		3		1	1	2	12	7	7	4	1	41	11	25		45	2	195
Pterostichus cristatus																							9
Pterostichus oblongopunctatus	90	85	3	37	81	9	21	96	22	8	9	18	295	15	5	1	17	36	106	99	237	125	3020
Trichotichnus nitens																							126
Agonum assimile							3	1															291
Calathus micropterus								6		10										1	39	9	75
Carabus coriaceus																							344
Carabus problematicus	346	160	97	186	518	293	81	155	136	85	38	26	147	23	87	9	27	24	7	25	31	128	7980
Carabus violaceus	18	14	1	4	23	6	1	10	3	6	7			8	14	5	21	7	1				490
Leistus spinibarbis																					1	3	4
Nebria brevicollis	5			3	26		2	7	6	1			4	2					5				164
Notiophilus biguttatus	1	1	3	1	2	5	3	5	2	7	6	1	5	12	3	3	18	19	7			1	163
Stomis pumicatus								1				1	7	2	1			2	8				33
Trichocellus placidus																							1
Forest type	la	la	la	sp	sp	sp	ob	do	do	la	la	ob	ob	sp	do	la	la	sp	ob	sp	ob	la	17281

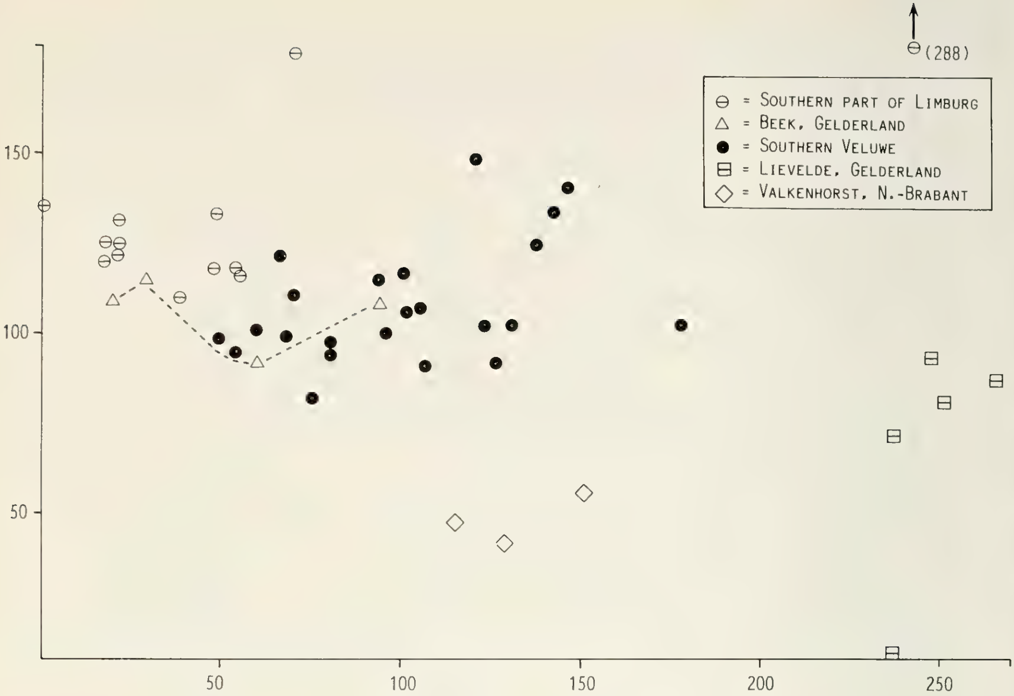

Fig. 2a. DCA-ordination (Detrended Correspondence Analysis). The sampling sites are marked according to their geographical position in the Netherlands.

Statistical analysis

Ordination and cluster analysis. – The results of the DCA-ordination are presented in fig. 2. The analysis was performed using all species and all sampling sites, and the original numbers of specimens were transformed to their logarithms. In fig. 2a the sampling sites have been marked according to their geographical position in the Netherlands. In fig. 2b again the same sampling sites are shown, but now the forest type is indicated. The positions of sampling sites along the axes, representing hypothetical gradients, obviously are not determined by the type of forest habitat, but rather by their geographical position. This seems particularly obvious where it concerns the localities from Midden-Nederland, Lievelde, Valkenswaard and the Southern part of Limburg (Zuid-Limburg), exclusive of Wijlre. The Beek sample sites do not form a coherent cluster, but are scattered among those from Zuid-Limburg and Midden-Nederland. Wijlre constitutes a very exceptional sampling site, being situated in a douglas-fir stand very close to the river Geul. Within Midden-Nederland clusters of forest sites are rather obsolete. Clusters within the main geographical regions are not indicated in the figures. Similar results were obtained using the forest species alone, and are therefore not presented here.

Fig. 3a and fig. 3b show the results obtained by TWINSPAN, based respectively on all carabid species and on the forest species alone. Sampling sites are marked according to their geographical position as well as to the forest type. The main geographical regions again appear to constitute more or less concrete clusters; the Zuid-Limburg localities, exclusive of Wijlre and inclusive of two Beek sites, are grouped together in fig. 3a. Also the five sites of Lievelde constitute a clear cluster. The Beek sites are again distributed among the Zuid-Limburg and the Midden-Nederland groups. The Valkenswaard sites and the Midden-Nederland sites themselves do not fall into clear clusters. Fig. 3b shows a rather similar, though somewhat less clear picture.

From both the ordination and the TWINSPAN analyses it can be concluded that the geographical position, and not the forest type, is the important factor determining the species composition of a sampling site. It therefore seems impossible to characterize the different types of forest in terms of the presence of particular carabid species.

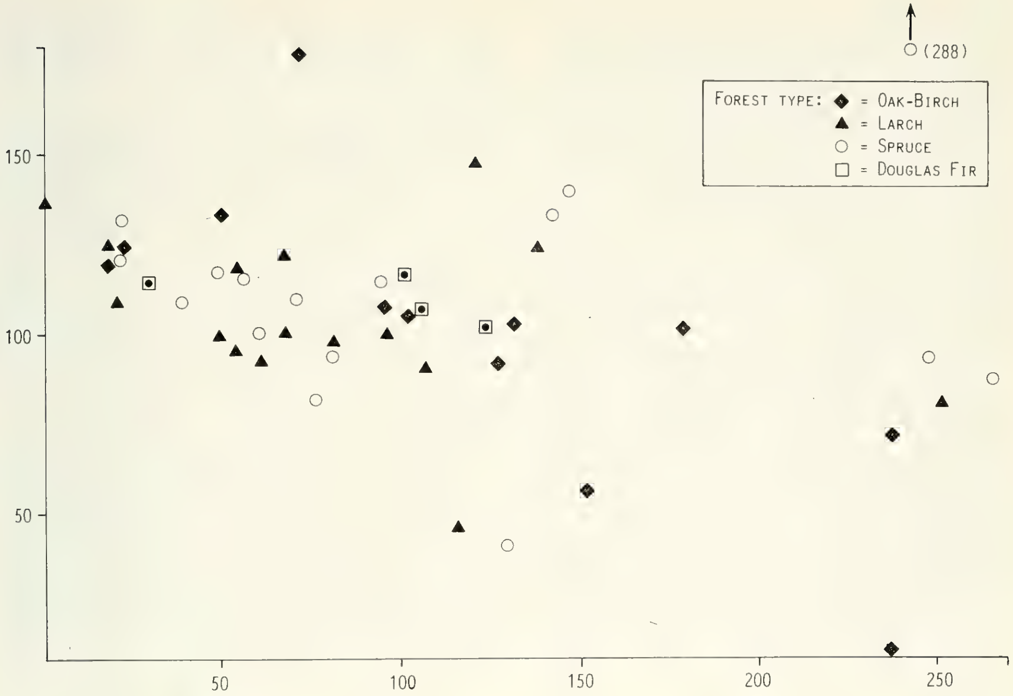

Fig. 2b. DCA-ordination, but the sites are now marked according to the forest type.

Diversity

The results of the diversity analysis are presented in tables 3a and 3b; in the first table all species were considered and in the latter table only the forest species were used in the calculations. In these tables sites were grouped according to forest type. The WILCOXON-test was used to test for differences in the mean values of the diversity statistics, between forest types. For all species together, it can be concluded that there are more specimens of carabids in deciduous forests as compared with larch forests. Regarding the forest species, more species of carabids were caught in deciduous forests as compared with both larch and spruce forests.

Geographical clusters

Species abundance data can be used to define the geographical clusters of sites that were detected. We will not present all the indicator species and preferentials as recognized by TWINSPAN for each cluster, but only try to characterize the clusters making use of the most important indicator species as well as the abundance data from table 2.

Zuid-Limburg. From table 2 it can be seen that *Carabus coriaceus* occurs on almost all Zuid-Limburg sites, and also in all Beek sites. Thiele (1977) summarized the data from a great number of investigations of carabids of the central European forest communities of several associations of the Fagetalia and the Quercetalia (see his table 5). *C. coriaceus* appears to be an important species of several forest types in mountains. All Zuid-Limburg sites except Wijlre, are situated at least 180 m above sea level, and the sites near Beek are situated on a lateral moraine (40 m above NAP [sea level]). However, this species is also known from dikeslopes and forests in the Betuwe (< 10 m above NAP). The most dominant species in Zuid-Limburg are *Abax parallelepipedus, Pterostichus oblongopunctatus, Carabus violaceus* and *C. problematicus*, which are also among the most abundant ones on many other sites. *C. problematicus* is characterized by Thiele (1977) as a species of mountains with no strict affinity to a particular type of forest. The three other species mentioned also occur in central Europe, independent of type of forest habitat. Rather striking is the absence of *C. nemoralis*, also a species not characteristic of a specific forest habitat, and common in all other geographical clusters. Also *N. rufipes*, a species with a peak occurrence in lowland Quercetalia, has not been caught. Geographical cluster 4 (fig. 3a) contains all Zuid-Limburg sites but one (Wijlre) and two Beek sites, and is defined by the indicator species *C. coriaceus* and the non-forest species *P. vernalis* and *P. madidus*. *T. nitens* and *P. cristatus* are restricted to Zuid-Limburg. The last three species mentioned are important species of the Fagetum forests in central Europe (Thiele 1977).

Midden-Nederland. Cluster 5 (fig. 3b) containing all but three Midden-Nederland sites, is defined by TWINSPAN by the indicator species *C. nemoralis*. This species is indeed less abundant in the other geographical clusters except for the Beek sites. Cluster 5 (fig. 3a) is characterized not only by *C. nemoralis* but also by *N. biguttatus* and the stenotopic forest species *N. rufipes*. True forest species restricted to one or more Midden-Nederland sites are *A. brunnea* and *H. quadripunctatus*. These two species are not menitoned by Thiele (1977) in his table 5. *N. biguttatus* appears to be an important forest species with no strict affinity to a particular forest type.

Beek. The Beek sites do not constitute a homogenous geographical cluster; the sites intermingle with Zuid-Limburg (through the occurrence of *C. coriaceus*) and with Midden-Nederland (through the occurrence of *C. nemoralis*). Also Beek has no unique true forest species.

Valkenswaard. The Valkenswaard sites are mainly characterized through the (almost) complete absence of a number of forest species that are abundant in the other areas: *C. nemoralis, A. parallelepipedus* and *C. violaceus*. There is one unique forest species: *L. spinibarbis*, a species not mentioned by Thiele.

Lievelde. Again *A. parellelepipedus* is totally absent, as are *C. violaceus* and *C. problematicus*. *Calathus rotundicollus* is the most dominant species and is much more abundant here than in the other areas. *C. rotundicollis* is not mentioned by Thiele as an important species of central European for-

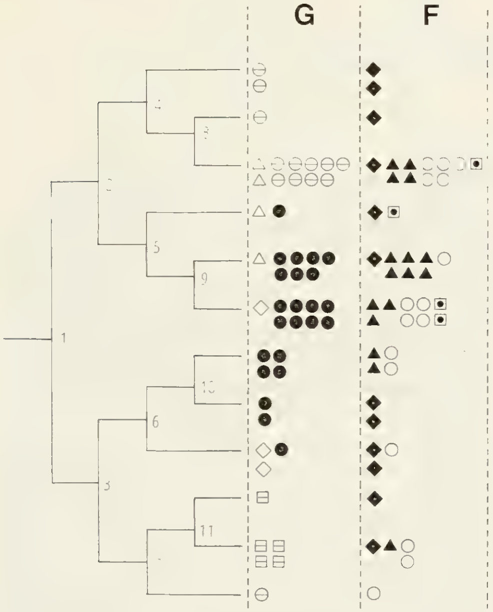

Fig. 3a. Dendrogram showing the results of the TWINSPAN cluster method, for all sampled species. G: sites are marked according to their geographical position. F: sites are marked according to the forest type. For meaning of the symbols see fig. 2.

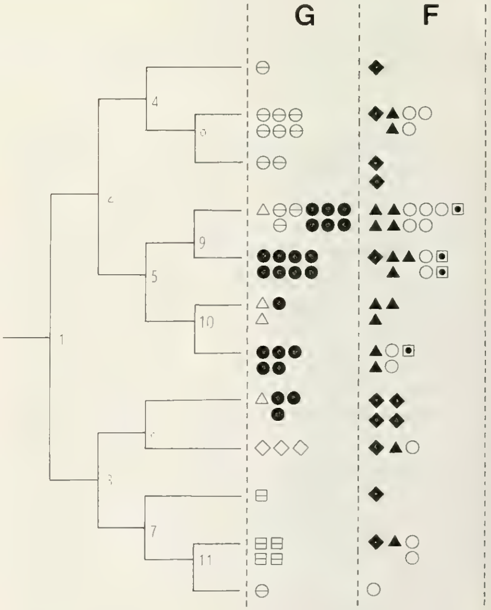

Fig. 3b. Dendrogram showing the results of the TWINSPAN cluster method for the forest species alone. Details as in fig. 2a.

Table 3. Diversity statistics per forest type. 3a: calculated for all species, 3b: only true forest species. X: mean number, SD: standard deviation. N-tot: total number of specimens per pitfall series, S-tot: number of species.

3a.		N-tot		S-tot		H-tot	
Forest type	N	X	SD	X	SD	X	SD
oak-birch	12	572	491	15.6	5.4	1.5	0.3
larch	16	240	208	12.3	5.0	1.6	0.5
spruce	16	421	305	13.4	7.2	1.3	0.6
douglas	4	271	106	12.5	4.7	1.6	0.1

3b.		N-tot		S-tot		H-tot	
Forest type	N	X	SD	X	SD	X	SD
oak-birch	12	537	495	9.5	1.8	1.4	0.2
larch	16	229	211	7.8	1.8	1.4	0.3
spruce	16	394	368	7.4	2.2	1.0	0.4
douglas	4	268	105	9.8	2.1	1.6	0.1

ests, but this species is recorded as the most dominant species in a mixed forest in Hall (DDR) (Heckendorf et al. 1986) and in a mixed forest in Foljuif (France) (Lecordier & Benest 1982). *T. placidus* is the only unique true forest species.

DISCUSSION AND CONCLUSIONS

Loreau (1984) studied the carabid communities of a pine wood and a beech forest in Lembek (Belgium). He found the beech forest to be inhabited by more forest species compared with the pine wood, to possess more characteristic species and to have a higher species diversity. Inspection of the values of the three components of diversity as calculated by Loreau, however, reveals that differences are very small (l.c. Tableau V). Amongst other things he finally concluded that the pine wood is characterized by an impoverished carabid community. Recently Heckendorf et al. (1986) studied the carabid communities of four types of forests near Halle (DDR). The beech forest and the pine forest communities were characterized as rather poor in species as well as individuals.

These two examples confirm the findings of Den Boer (1963) that coniferous forest types in general can be regarded as marginal habitats for true forest species, and that conifer plantations may indeed act as barriers to the dispersal of carabids between deciduous forest patches. These conclusions, however, are not really supported by our data. No differences were found in the composition of the carabid faunas of the forest types investigated, nor are there any overall differences in the number of species or the total number of specimens between deciduous forests on the one hand and conifer forests on the other. Our data strongly indicate that the geographical position of the forest within the Netherlands, constitutes a very important factor determining the faunal composition. Also the idea that coniferous forests may act as barriers that may hamper dispersal of forest carabids between deciduous forests needs reconsideration.

ACKNOWLEDGEMENTS

We want to thank several colleagues who kindly provided us with the data of their pitfall series (see table 1): K. Alders, K. Booij, F. Smulders and the late E. Penterman. Further we are grateful to P. J. den Boer, P. H. van Tienderen and M. L. Luff for their valuable suggestions. M. L. Luff also kindly corrected the English.

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THE GENUS *CRYPTUS* FABRICIUS, 1804 OF THE CANARY ISLANDS (HYMENOPTERA, ICHNEUMONIDAE)

by

G. VAN ROSSEM

ABSTRACT

Rossem, G. van, 1989. The genus *Cryptus* Fabricius, 1804 of the Canary Islands (Hymenoptera, Ichneumonidae). – Tijdschrift voor Entomologie 132: 251–258, tables 1–7. [ISSN 0040-7496]. Published 1 December 1989.

Cryptus dianae Gravenhorst, 1829 *solivagus* subsp. nov. is described from Tenerife. A redescription of the holotype of *Cryptus obscuripes* Zetterstedt, 1838 is given and the species is acknowledged to be distinct. *C. obscuripes impeditus* subsp. nov. is described from Tenerife, Palma and Gomera. The lectotype of *Cryptus nigritarsis* Kriechbaumer, 1894 from Tenerife is redescribed. More specimens from Tenerife, only males, were found. Four new species are described, viz., *Cryptus praefortis* from Tenerife and Gomera. *Cryptus ultramondanus* from Lanzarote, *Cryptus insularis* from Fuerteventura and *Cryptus furvus* from Gran Canaria. Keys to the *Cryptus* males and females from the Canary Islands are given.

Key words. – *Cryptus*, Canary Islands; new species.

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INTRODUCTION

Two consignments of material from the Canary Islands, received from Dr G. Ortega (Museo Insular Ciencias Naturales, Tenerife) gave me the opportunity to study Canarian specimens of the genus *Cryptus* Fabricius, 1804. Dr Kl. Horstmann (Zoologisches Institut III, Würzburg) kindly offered me to insert specimens from his collection and one specimen from the Museo Insular at Tenerife. Dr Horstmann also acted in my interest by asking for the loan of the type material of *Cryptus nigritarsis* Kriechbaumer at the Transvaal Museum at Pretoria (RSA). Dr Max Fischer (Naturhistorisches Museum Wien) sent the type specimen of *Cryptus verutus* and Dr F. Koch (Museum für Naturkunde, Berlin, DDR) put the type specimen of *C. verutus* subsp. *hierroensis* at my disposal. Dr Roy Danielsson (Universitetets Zoologiska Institutionen, Lund, Sverige) granted me the permission to study the type of *Cryptus obscuripes* Zetterstedt and several other specimens of that species and of *Cryptus dianae* Gravenhorst as well.

With respect to the use of the name *Cryptus* the author refers to Van Rossem (1987). Townes (1970: 193) provides a description and a figure (fig. 165) of *Itamoplex* Förster, a junior synonym of *Cryptus* Fabricius.

In due time the collection Van Rossem will be placed in the Rijksmuseum van Natuurlijke Historie at Leiden.

KEY TO THE CRYPTUS MALES OF THE CANARY ISLANDS

The males of *C. praefortis, C. furvus* and *C. verutus* are unknown.

1. All femora orange coloured. Frons not concave. Tyloids on flagellar segments 14–19. Inner orbits of face with broad ivory margin. Outer orbit with narrow ivory margin. Face with short pilosity. Mesoscutum widely and weakly punctured .... *Cryptus dianae solivagus* subsp. nov.
– Hind femur black 2
2. Face with conspicuous, long pilosity, the length of which is reaching the width of mandibular base 3
– Face with pilosity, but not conspicuously long 4
3. Front, middle femora and tibiae orange coloured. Hind femur fuscous, laterally ferruginous. Tyloids on flagellar segments 13(14)–17(18)(19). Face and gena with long grey setae. Frons not concave ....

.... *Cryptus nigritarsis* Kriechbaumer

– Front and middle femora fuscous, brownish at the extremity. Hind femur fuscous. Front and middle tibiae brownish. Tyloids on flagellar segments 12(13)–17(18). Face and gena with long setae .... *Cryptus ultramondanus* spec. nov.

4. Basal area, first lateral area, areola and second lateral area polished. Mesoscutum polished, with fine punctation. Frons not concave. Tyloids on flagellar segments 15(16)–19 .... *Cryptus insularis* spec. nov.

– Basal area, first lateral area, areola and second lateral area with sculpture. Punctation of mesoscutum closer and coarse. Frons slightly concave (not in a specimen from Palma). Tyloids on flagellar segments 16(17)–19(20). Face and gena with grey pilosity, but in length not reaching the width of mandibular base .... *Cryptus obscuripes impeditus* subsp. nov.

KEY TO THE CRYPTUS FEMALES OF THE CANARY ISLANDS

The females of *C. insularis* and *C. nigritarsis* are unknown.

1. Hind femur orange coloured 2

– Hind femur black coloured 3

2. Ovipositor exceptionally long, 0.96–1.0 of the length of the front wing .... *Cryptus verutus* Van Rossem

– Ovipositor of moderate length, 0.48–0.60 of the length of the front wing (see remark on page 253) .... *Cryptus dianae solivagus* subsp. nov.

3. Ovipositor exceptionally long, 1.13 of the length of the front wing. Entire abdomen, with all tergites highly polished .... *Cryptus furvus* spec. nov.

– Ovipositor shorter 4

4. The apical transverse carina with strong apophyses. All abdominal tergites red in colour and highly polished. Ovipositor 0.44–0.47 of the length of the front wing .... *Cryptus praefortis* spec. nov.

– The apical transverse carina without apophyses 5

5. Basitarsus of front leg 0.69 of the length of front tibia. Ovipositor 0.86–0.98 of the length of the front wing .... *Cryptus ultramondanus* spec. nov.

– Basitarsus of front leg 0.58 of the length of front tibia. Ovipositor 0.53 of the length of the front wing (see remark on page 254) .... *Cryptus obscuripes impeditus* subsp. nov.

Cryptus dianae dianae Gravenhorst

Cryptus dianae Gravenhorst, 1829: 545, ♀.
Cryptus dianae dianae; Van Rossem 1969: 333–338. Compare table 1.
Cryptus dianae dianae; Ortega & Báez 1980: 44–47.

Cryptus dianae solivagus subsp. nov.

Material. – Holotype: Tenerife, San Andres, 27.ii.1966, 10 m, leg. R. T. Simon Thomas, 1 ♂ (coll. Van Rossem). Holotype label of the present author.

Description of male holotype. – Front wing 5.91 mm long. Palpi brown. Mandible black. Inner orbit with ivory margin. Outer orbit with slight ivory margin. Face black, pilosity short. Tyloids on flagellar segments 14–19. Mesoscutum more widely

Table 1. *Cryptus dianae dianae* Gravenhorst

locality	tyloids	colour inner orbits	colour outer orbits	colour femur 3	colour abdomen	colour mandible
Netherlands Grollo 18.v.1960	15-20	broadly ivory	ivory marked	orange	postpetiole and terg. 2, 3 and 4 orange; rest fuscous	ivory; teeth fuscous
Denmark Löjt Kirkeby vi.71	15-20	broadly ivory	ivory marked	orange	postpetiole and terg. 2, 3, 4 orange; rest fuscous	ivory; teeth fuscous
Italy Funes 20.vii.1968	15-21	broadly ivory	ivory marked	orange	postpetiole and terg. 2, 3 and 4 orange; rest fuscous	ivory; teeth fuscous
Sverige Palsjö Skåne	15-19	broadly ivory	ivory marked	orange	postpetiole and terg. 2, 3 and 4 orange; rest fuscous	ivory; teeth fuscous

Table 2. *Cryptus dianae solivagus* subsp. nov.

locality	tyloids	colour inner orbits	colour outer orbits	colour femur 3	colour abdomen	colour mandible
Tenerife San Andres 27.ii.66	14-19	ivory margin of face	narrow ivory margin	orange	tergites 2 and 3 orange; rest fuscous	black

punctured than in continental specimens. All femora orange coloured. First abdominal segment black. Tergites two and three reddish, other tergites black (third tergite orange in continental specimens). Compare table 1 and 2.

Characteristics of the female. I did not see a female from the Canary Islands of this subspecies. Some important characters of the continental female follow here. Antenna with segments 4–7(8) marked white, or without marking. Postanellus slender 7.0–8.0 X as long as wide. Frons rather concave. Inner and outer orbits with ivory margin. All femora orange coloured. Abdominal segments 2–4 orange. Ovipositor in larger specimens 0.55–0.60 of the length of the front wing, 0.48–0.53 in small specimens.

Female. – Unknown.

Etymology. – "Solivagus" is the Latin for "standing solitary".

Cryptus obscuripes Zetterstedt

Cryptus obscuripes Zetterstedt, 1838: 370.
Cryptus obscuripes; Horstman 1968: 311.
Cryptus dianae obscuripes; Van Rossem 1969: 336–337.
Cryptus dianae obscuripes; Ortega & Báez 1980: 47–49.

In my paper of 1969 I included Zetterstedt's species, *Cryptus obscuripes* as a subspecies of *Cryptus dianae* Gravenhorst. Reconsidering some more or less stable features, I think this point of view can not be maintained. It seems that *C. obscuripes* represents a boreal – montane species. It occurs in Scandinavia and Finland and also it is known from mountainous localities in central Europe.

Description of male holotype. – Labels: an original label *C. obscuripes* ♂, Talvig (Sverige, coll. Zetterstedt). Holotype label of Horstmann (1966). Front wing 7.33 mm long. Palpi, mandible, clypeus, inner orbits, face below antennae, frontal orbit next to antennal scrobes, upper inner orbit at OOL, outer orbit (narrow), yellow to ivory in colour. Face with grey pilosity. Frons, including scrobes, concave. Upper frons with wrinkled sculpture. Antennae, rather broken, with tyloids on flagellar segments 15–20 (left) and 15–19 (right). Prothorax with rough sculpture and strong epomia. Mesoscutum with rough punctures. Propodeum with coarse wrinkled sculpture, both transverse carinae present, the apical carina with weak apophyses. Mesopleurum with rough sculpture (greater part invisible by pin). Front and middle coxae fuscous with ivory spot. Hind coxae black, with conspicuous setae. Front and middle femur brownish. Hind femur brown with a ferruginous tendency. Front and middle tibiae brownish with yellow streak, slender. Hind tibia and basitarsus brown, the second, third and fourth tarsal segments white. Abdomen with petiole, seventh tergite and claspers fuscous. Other parts orange in colour. Compare table 3.

In all I have studied one other male from The Netherlands, Ede, 28.vii.1970, leg. C. J. Zwakhals (coll. Van Rossem). It closely agrees with the holotype. Tyloids on flagellar segments 15–20 (on 20th segment very weak).

Description of female. – Sweden: D1r (Dalarna), 4.vii.1937, leg. A. Roman. Finland: ♀, Fennia, Ks, Salla, leg. Krogerus, 1936 (three specimens Universitetes Zoologiska Institutionen, Lund).

Front wing 6.66 mm long. Palpi fuscous. Entire head black, except for ivory margins of upper inner orbit, outer orbit and spot at OOL. Frons concave, including antennal scrobes. There is some sculpture around the median ocellus. OOL with microsculpture. Antenna long and slender. Prothorax with rough, longitudinal and wrinkled sculpture, epomia strong. Mesoscutum polished, with scattered, weak punctures. Propodeum with coarse, wrinkled sculpture, both transverse carinae present. Mesopleurum coarsely sculptured. All legs brown. Abdomen with petiole fuscous, postpetiole and all tergites orange. Ovipositor 0.53 of the length of the front wing.

It seems to be unlikely that the species occurs in the Canary Islands, though the mountainous character of that locality would make it acceptable.

I encountered three male specimens which I consider to represent the species, although there are some differences with the type, namely the posi-

Table 3. *Cryptus obscuripes* Zetterstedt

locality	tyloids	colour inner orbits	colour outer orbits	colour femur 3	colour abdomen	colour mandible
holotype Sverige Talvig	l 15-20 r 15-19	broadly ivory	ivory marked	fuscous	all tergites bright orange tip somewhat fuscous	ivory; teeth fuscous
Netherlands Ede 28.vii.70	15-20	broadly ivory	ivory marked	black	postpet. terg. 2, 3, 4, 5 orange 6 & 7 somewhat fuscous	ivory; teeth fuscous

tion of the tyloids: 16(17)–19(20) versus 15–19(20) in the type; clypeus and face fuscous and with ivory marking in the type; hind tarsal segments 2, 3 and 4 fuscous and ivory coloured in the type.

Eventually the best thing to do is to propose a subspecies for the Canary Islands specimens.

Cryptus obscuripes impeditus subsp. nov.

Material. – Holotype male: Tenerife, Montana Bermeja, 1.iii.1966, 1500 m, leg. R. T. Simon Thomas (Coll. Van Rossem). Holotype label of the present author. Paratypes: Palma, La Rosa (Mazo), 4.viii.1981, 1 ♂, leg. G. Ortega (Mus. Ins. Cienc. Nat. HY 1347); Isl. Can. Gomera, Laguna Grande, 16.viii.1977, 1 ♂, leg. M. Baéz. (Mus. Ins. Cien. Nat. HY 1339).

Description of male holotype. – Front wing 6.88 mm long. Palpi pale brown. Mandible ivory, teeth fuscous. Clypeus convex, punctured, with a wide polished margin. Face closely punctured, with grey pilosity. Frons somewhat concave, transversely wrinkled. Inner orbits with conspicuous yellow margin. Outer orbits with narrow yellow margin up to vertex. Malar space wide, with microsculpture. Gena polished, with minute punctation, implantations of grey pilosity. Tyloids on flagellar segments 17–20. Prothorax with coarse sculpture and robust epomia. Mesoscutum with rather fine punctation, notaulus strong. Postscutellum with yellow mark. Propodeum, with coarse sculpture, both transverse carinae present, the apical carina with small apophyses. Mesopleurum with coarse punctation. All coxae black. Front and middle femora robust and brownish in colour. Front and middle tibiae brown and with a yellow streak. Hind femur, tibia and basitarsus brown, third and fourth tarsal segments paler. Entire gaster orange to reddish, claspers black.

There are two specimens from two islands, viz., Palma and Gomera. The position of the tyloids is slightly different from the holotype of Tenerife. The other characters are worth to accept.

Male, paratype. Palma, La Rosa. Front wing 5.77 mm long. Base of mandible ivory. Face with pilosity (spoilt). Sculpture of frons agreeing with holotype. Inner and outer orbits in part with ivory margin. Tyloids on flagellar segments 16–19. Colour of legs and abdomen agreeing with holotype.

Male, paratype. Gomera, Laguna Grande. Front wing 6.66 mm long. Ivory spot on upper margin of mandible. Face with grey pilosity. Sculpture of frons agreeing with holotype. Inner and outer orbits in part with ivory margin. Tyloids on flagellar segments 17–19 (16 minute) left antenna; 16–19 right antenna. Colour of legs and abdomen corresponding with holotype. Compare table 4.

No additional material found. I did not see the Canary Islands female. The characters given in the key are based on the continental female of *Cryptus obscuripes*.

Etymology. – "Impeditus" is the Latin for "difficult to approach", relating to the difficulty to place the specimens taxonomically.

The main characters of the male of *C. obscuripes* and the subspecies *impeditus* are shown on the tables 3 and 4.

Cryptus nigritarsis Kriechbaumer

Cryptus nigritarsis Kriechbaumer, 1894: 45–46.
Cryptus nigritarsis; Ortega & Báez 1980: 49–50.

Material examined. – Lectotype by present designation: Santa Cruz, Teneriffa, 19.ii.92, Dr. Brauns leg. / Cryptus nigritarsus ♂, m. [handwriting of Kriechbaumer] / Lectotype label of present author. Paralectotype: Santa Cruz, Teneriffa, 19.ii.1892, leg. Dr. Brauns / *Itamoplex* sp. 14 [label of Townes 1971] / Paralectotype label of present author. Both types in Transvaal Museum, Pretoria.

Other material: Two males: Tenerife, P. del Hidalgo, 2.v.1971, leg. Teunissen (coll. Van Rossem). Male. Tenerife, Las Cañodas, 5.vi.1970 ? (date illegible), leg. G. Ortega (Museo Insular Ciencias Nat. HY 1349).

Table 4. *Cryptus obscuripes impeditus* subsp. nov.

locality	tyloids	colour inner orbits	colour outer orbits	colour femur 3	colour abdomen	colour mandible
Tenerife I.iii.66	17-20	ivory marked	upper orbit ivory	brown	entirely orange-red; clasper black	yellow; teeth fuscous
Palma 4.viii.81	16-19	ivory marked	ivory marked	black	entirely orange claspers black	ivory; teeth fuscous
Gomera 16.viii.77	l 17-19 r 16-19	ivory marked	ivory marked	black	entirely orange claspers black	ivory spot on upper margin

Description of male lectotype. – Front wing 8.0 mm long. Palpi black. Base of mandible with yellow spot. Labrum with white spots. Base of mandible, gena, temple, frons and face with long silvery hairs. Clypeus with a broad polished front part. Face closely punctured to coriaceous towards eye margin. Frons coarsely wrinkled. Inner orbits with yellow margin. Temporal orbits with yellow marking. Antenna with tyloids on flagellar segments 14–18. Antennal scrobes developed. Pronotum coarsely wrinkled, epomia present, black in colour with ivory spot on upper margin opposite notaulus. Mesoscutum with rough sculpture on front part of median lobe and transverse wrinkling along notaulus. Lateral lobe with strong punctures. Notaulus well developed. Scutellum with widely placed rough punctures. Propodeum with basal and apical transverse carina present, coarsely wrinkled. Apical carina with very small apophyses. Mesopleurum with rough and regular sculpture. All coxae and trochanters black. Front and middle tibiae and femora orange in colour, tarsi brown. Hind femur fuscous, laterally reddish brown. Hind tibiae and tarsi black. First abdominal segment black, margin of postpetiole orange. Other segments bright orange. All tergites polished, with microsculpture. Male claspers black.

Description of male paralectotype. – Tyloids on flagellar segments 14–18. Petiole and postpetiole black, margin of postpetiole red. Other tergites orange-reddish in colour. Male claspers black. Colour of hind femur fuscous, laterally somewhat ferruginous.

The main characters of *C. nigritarsis* are shown on Table 5.

Cryptus praefortis spec. nov.

Material examined. – Holotype female: Tenerife, Ijuana, 11.vii.1986, leg. G. Ortega / Museo Insular Ciencias Nat. HY 6842 / Holotype label of present author. Paratype female: Gomera (Isl. Can.), Llanos Crispin, 13.viii.1977, leg. M. Baéz / Museo Ins. Cienc. Nat. HY 1374.

Two female specimens from the islands of Tenerife and Gomera respectively, belong to an undescribed species of the genus *Cryptus* showing affinity with *C. spinosus* Gravenhorst and *C. subspinosus* Smits van Burgst. The difference with *C. spinosus* lies in the coriaceous sculpture of the tergites in *C. spinosus* while in *C. subspinosus* the ovipositor is longer, 0.50–0.60 of the length of the front wing and the second, third and fourth tergites show a close and fine alutaceous sculpture.

Description of female holotype. – Front wing 6.35 mm long. Palpi, mandible and entire head black, except for minute yellow margins of inner and outer orbits. Clypeus convex, with a flattened front margin. Face coriaceous, medially with a circular protuberance. Lower frons rather strongly concave, transversely wrinkled. Antenna black, postanellus 5.6 × as long as apically wide. Malar space wide. Pronotum coarsely wrinkled, epomia strong. Mesoscutum polished, widely punctured, notaulus strong and long, transversely wrinkled along the sides of the median lobe. Scutellum polished, with fine punctures. Propodeum with coarse sculpture, both transverse carinae present, the apical carina with strong apophyses, reminding of *C. subspinosus* and *C. spinosus*. Mesopleurum strongly sculptured. All coxae black and all other parts of legs fuscous. The abdomen shows a main character of the species, namely all tergites highly polished and red in colour. Ovipositor 0.44 of the length of the front wing.

The paratype closely resembles the holotype. The ovipositor measures 0.47 of the length of the front wing.

Table 5. *Cryptus nigritarsis* Kriechbaumer

locality	tyloids	colour inner orbits	colour outer orbits	colour femur 3	colour abdomen	colour mandible
lectotype Tenerife Santa Cruz	14-18	yellow line	tempor. orbit yellow	fuscous; lateral. reddish	petiole black tergites orange	base with yellow spot
paratype Tenerife Santa Cruz	14-18			fuscous; lateral. ferruginous	first tergite black, other tergites orange	
Tenerife P. del Hid. 2.v.1977	14-18	yellow line	tempor. orbit yellow	fuscous; tip somewhat ferruginous	first tergite black; other tergites reddish	black
Tenerife P. del Hid. 2.v.1977	14-17	yellow line	tempor. orbit yellow	fuscous ferruginous	first tergite black, terg. 2 & 3 red, tip black	black
Tenerife las Cañodas	14-17	yellow spot at anten. base	black	fuscous	first tergite black, terg. 2 & 3 red, others ferruginous	black

Etymology. – "Praefortis" is Latin for "very brave".

Cryptus ultramondanus spec. nov.

Material examined. – Holotype female: Lanzarote (Isl. Can.), Yaiza, 19.ii.1979, leg. W. Perraudin (coll. Horstmann, Würzburg) / Holotype label of the present author. Paratypes: Same data as holotype, 1 ♂; Lanzarote, Los Valles, 20.ii.1979, leg. M. Baéz, 1 ♀ (Museo Insul. Cienc., Nat HY 1327), 1 ♂ (idem, HY 1346).

Description of female holotype. – Front wing 7.33 mm long. Palpi and mandible black. Clypeus sparcely punctured, with a wide polished margin. Face closely punctured. Malar space wide. Frons wrinkled in front of anterior ocellus. Antennal scrobes polished and somewhat concave. Inner orbit with yellow mark next to antennal socket. Upper outer orbit with a small yellow spot. Gena polished. Postanellus slender, 7.6 × as long as apically wide. Antenna with segments 5–9 white coloured. Pronotum coarsely punctured. Epomia present. Mesoscutum and scutellum regularly punctured. Notaulus strong. Mesopleurum with coarse sculpture. Propodeum also coarsely sculptured. Anterior transverse carina obsolete. The apical carina present, with weakly developed apophyses. All coxae black. Front femur and tibia and middle tibia brownish in colour. Middle femur and hind leg fuscous. Tarsi of all legs conspicuously slender. Nervulus proximad of basal vein. Petiole black, apical part of postpetiole red. All other tergites red coloured. Tergites subpolished, with microsculpture. Ovipositor 0.86 of the length of the front wing.

Description of the male paratype from Yaiza. – The male agrees with the female. Not all characters are recapitulated. Front wing 7.11 mm long. The entire head, including the mandible, with long grey setae. Right antenna missing beyond second flagellar segment. Tyloids on flagellar segments 12–17. Anterior transverse carina absent. The apical carina with weakly developed apophyses. Margin of postpetiole and all tergites orange in colour. Male claspers black. Left hind leg lacking behind trochanter.

Remark. – The male shows suspect resemblance with the male of *C. nigritarsis*. The most important difference lies in the colour of the front and middle femora and tibiae, but it should be admitted, in specimens from different islands. A definite decision about conformity of the two species can only be taken after the female of *C. nigritarsis* turns up.

Etymology. – "Ultramondanus" is Latin for "on the other side of the world".

The main characters of the male are shown on tabel 6.

Cryptus insularis spec. nov.

Material examined. – Holotype male: Isl. Can., Fuertev (= Fuerteventura), Vallebrin, 7.iii.1984, leg. G. Ortega /

Table 6. *Cryptus ultramondanus* spec. nov.

locality	tyloids	colour inner orbits	colour outer orbits	colour femur 3	colour abdomen	colour mandible
Lanzarote Yaiza 19.ii.79	12-17	yellow spot at ant. scrobes	yellow margin temp. orbit	black	first tergite fuscous; other tergites red	black

Museo Ins. Cienc. Nat. HY 2162 / Holotype label of the present author. Paratype: Same data, no. HY 2163.

Description of male holotype. – Front wing 5.06 mm long. Palpi and mandible fuscous. The entire head black, only a minute marking of ivory on inner orbit next to antennal socket and on temporal orbit. Face with close small punctures, implantations of grey pilosity. Antennal scrobes polished and somewhat concave. Upper frons not concave (compare *C. obscuripes*), with weak sculpture around anterior ocellus. OOL region, vertex and gena polished. Tyloids on flagellar segments 15–19. Lower 0.6 part of prothorax with wrinkled sculpture. Epomia present. There is a vague light spot opposite the notaulus. Mesoscutum polished with inconsiderable punctation. Scutellum polished. Basal area and first lateral area, areola and second lateral area polished (compare *C. obscuripes*). Both transverse carinae present. Petiolar area wrinkled. Mesopleurum with widely placed small punctures. All coxae, including middle femur and entire hind leg black. Front femur somewhat brownish. Front and middle tibia brownish, with an ivory streak. Entire abdomen reddish, except for fuscous seventh tergite and claspers.

The paratype agrees with the holotype. Tyloids on flagellar segments 16–19. Orbits not marked. Fifth, sixth and seventh tergites fuscous.

Etymology. – "Insularis" is Latin for "belonging to the island".

The main characters of the male are shown on table 7.

Cryptus furvus spec. nov.

Material examined. – Holotype female: Gran Canaria, Caldera Tejecta, Las Palmas, La Roche, 2.iv.1983 / Museo Ins. Cienc. Nat. no. HY 1483 / Holotype label of the present author.

Only one specimen of this species is available. Within the genus *Cryptus* it takes an exceptional position with its long ovipositor, 1.13 of the length of the front wing.

Description of female holotype. – Front wing 7.33 mm long. Head including the mandibles black, except for slight yellow marking on inner orbit next to antennal socket. There is also a spot on the outer orbit. Face with close punctation and coriaceous sculpture. Antennal scrobes polished, somewhat concave. Frons with coarse wrinkled sculpture. Gena with widely placed fine punctures, implantations of grey pilosity. Antenna long and slender, sixth, seventh and eighth flagellar segments marked white. Pronotum with coarse sculpture, the epomia robust. Lateral lobes of mesoscutum polished, with weak punctures. The median lobe proximally more closely punctured. The notaulus strong, with close transverse striation across. Propodeum with coarsely wrinkled sculpture. The basal transverse carina obsolete, the apical transverse carina present with weak apophyses. Mesopleurum coarsely sculptured. Legs, including all coxae, fuscous. The front tibia slightly swollen. The entire gaster black, with all tergites highly polished, hairs almost obsolete. The highly polished tergites offer a principal character. The very long ovipositor, 1.13 of the length of the front wing is another main character.

Etymology. – "Furvus" is the Latin for "dressed in black", relating to the entire black colour of the specimen.

Cryptus verutus Van Rossem

Cryptus verutus Van Rossem, 1971: 209–211.
Cryptus verutus; Ortega & Báez 1980: 53–55.

Material examined. – Isl. Can. Tenerife, Güimar, 3.v.1965, leg. I. Klimesh, female. Holotype Van Rossem (Naturhistorisches Museum, Wien), Isl. Can., Hierro, 9.iv.1898, leg. Hinz V, Female. Holotype of *C. verutus hierroensis* Van Rossem (Museum für Naturkunde, Berlin, DDR). Female, Tenerife, Tahodio, 25.ii.1951, leg. R. Arozena (Museo Ins. Cienc. Nat. no. HY 1357).

Description of female. – Front wing 7.5 mm long. Head black with ivory lining of inner and outer orbits. Postanellus 6.0–7.4 × as long as apically lining of inner and outer orbits. Postanellus 6.0–7.4 × as long as apically wide. Frons rugosely wrinkled. Thorax roughly sculptured. Propodeum

Table 7. *Cryptus insularis* spec. nov.

locality	tyloids	colour inner orbits	colour outer orbits	colour femur 3	colour abdomen	colour mandible
holotype Fuerteventura 1984	15-19	marked yellow next ant.scrob.	minute yell. spot temp.orb.	black	tergite 1-6 orange-red terg. 7 fuscous	base light coloured
paratype Fuerteventura 1984	16-19	minute yellow spot vertex	black	black	tergites 1-4 red; other terg. fuscous	vague light spot at base

with anterior transverse carina obsolete. Posterior transverse carina present with weak apophyses. All femora orange. Abdomen with petiole fuscous, all other tergites orange coloured. Ovipositor long, 0.96–1.0 of the length of the front wing.

Male unknown to me.

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A REVISION OF THE NEW WORLD GENUS *NEURAESCHNA* HAGEN, 1867 (ODONATA: AESHNIDAE)

by

JEAN BELLE

Abstract

Belle, J., 1989. A revision of the New World genus *Neuraeschna* Hagen, 1867 (Odonata: Aeshnidae). – Tijdschrift voor Entomologie 132: 259–284, figs. 1–75, tab. 1. [ISSN 0040–7496]. Published 1 December 1989.

A synopsis is given of the twelve representatives of the genus *Neuraeschna* Hagen. The species are classified into groups. Separate keys to the males and females are constructed. *N. inarmata* is synonymized with *N. dentigera* Martin, and *N. rostrifera* Martin is considered to be a synonym of *Heliaeschna simplicia* (Karsch), a species confined to SE Asia. Five new taxa are described and illustrated, viz. *N. cornuta* (male holotype: Suriname, Distr. Nickerie, Sipaliwini), *N. maya* (male holotype: Costa Rica, Prov. Limón, Barra de Tortuguero), *N.mayoruna* (female holotype: Peru, Dept. Loreto, Iquitos), *N. maxima* (male holotype: Brazil, State of Pará, Belem), and *N. titania* (male holotype: Ecuador, Prov. of Pichincha, Jaruqui). Lectotypes are designated for three species described by Martin, viz. *N. claviforcipata, N. dentigera* and *N. harpya*. The larva type of *Neuraeschna* is determined by a reared individual of *N. harpya*.

Key words. – South and Central America; *Neuraeschna*; new species.

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Contents

Introduction

The New World genus *Neuraeschna* Hagen, 1867 includes at least twelve species of small to very large Aeshnidae which are instantly recognizable in the venation of the wing by the presence of cross-veins in the midbasal space and in having the subcosta prolonged through and beyond the nodus.

The species of *Neuraeschna* are mainly Neotropical in distribution but one specimen is here recorded from the subtropical region of Brazil. They haunt in woodlands. Their breeding places seem mainly to be swampy areas but the only larva of *Neuraeschna* was taken in a bush creek. At sunset the adults suddenly appear, sometimes in troupes, to hunt in the dusk along the edges of the woods and along the river banks near over bush and water plants. Due to this crepuscular habit and the fact that their flight is very erratic and rather swift, these dragonflies are rarely collected. As soon as the darkness falls more intensively, they disappear again.

Davies and Tobin (1985) listed nine species of *Neuraeschna* but two species should be discarded since *Neuraeschna rostrifera* Martin proves to fall beyond the limits of the genus while *Neuraeschna* *inarmata* Kimmins is found to be a junior synonym of *Neuraeschna dentigera* Martin. Here five more taxa of *Neuraeschna* are introduced under the names *N. cornuta, N. maya, N. mayoruna, N. maxima* and *N. titania* bringing the total number of *Neuraeschna* species to twelve.

Lectotypes are designated for the three Martin species *Neuraeschna claviforcipata, N. dentigera* and *N. harpya*. These three species are redescribed in common with the type-species *N. costalis* (Burmeister). The hitherto unknown larva-type of *Neuraeschna* could be determined by a reared individual of *N. harpya*.

An attempt is undertaken to divide the genus *Neuraeschna* into species-groups. Separate keys for the males and females have been prepared. Unless otherwise indicated, the illustrations are camera lucida drawings made by me (details completed by free-hand). The photographs have been made by the museum photographers of the Rijksmuseum van Natuurlijke Historie, Leiden, and the British Museum (Natural History), London. The reproductions of these photographs are at three-quarters of the full size of the dragonflies. The Comstock-Needham terminology of the wing-veins is used.

Dispositon of material studied and acknowledgements

The material on which the present review is based, belongs to the institutions and personal collections listed below; the names are preceded by the acronyms used throughout the text of this paper; they are followed by the names of the persons who made this material accessible for this study. These persons are most gratefully acknowledged here.

ANSP – Academy of Natural Sciences, Philadelphia; Mr. Donald Azuma.
BMNH – British Museum (Natural History), London; Mr. D. E. Kimmins (†) and Mr. Stephen J. Brooks.
CG – Collection Garrison, Azusa; Dr. Rosser W. Garrison.
CH – Collection Hellebuyck, Sherbrooke; Mr. Victor Hellebuyck.
CM – Collection Machado, Belo Horizonte; Prof. Dr. Angelo B. M. Machado.
FSCA – Florida State Collection of Arthropods, Gainesville; Prof. Dr. Minter J. Westfall, Jr.
IRSN – Institut Royal des Sciences Naturelles, Brussels; Dr. Georges Demoulin and Dr. P. Grootaert.
MNHP – Muséum National d'Histoire Naturelle, Paris; Dr. Jean Legrand.
NHMV – Naturhistorisches Museum, Vienna; Dr. A. Kaltenbach.
RNHL – Rijksmuseum van Natuurlijke Historie, Leiden; Mr. J. van Tol.
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UMAA – University of Michigan, Ann Arbor; Mrs. L. K. Gloyd.
USNM – National Museum of Natural History, Smithsonian Institution, Washington, D. C.; Dr. Oliver S. Flint, Jr.
ZMHB – Zoologisches Museum, Humboldt Universität, East Berlin; Dr. Kurt K. Günther.

Systematic section

The name *Neuraeschna* was proposed by Selys but the genus was firstly characterized by Hagen (1867: 54) and therefore it must be credited to Hagen. Hagen compared *Neuraeschna* with its closest relative *Staurophlebia* Brauer which has also the subcosta prolonged through and beyond the nodus but the midbasal space of *Staurophlebia* is free from cross-veins.

In addition to the characteristics given *antea* in the introduction, the species of *Neuraeschna* are characterized by the following features:

Head. Superior surface of frons generally dark brown in anterior part and pale brown in basal part but one species has a well-marked brown T-spot. Rear of head light brown with a narrow black stripe bordering posterior margin of eyes from occipital triangle to lateral emargination in eye border.

Pterothorax. Predominantly brown with pale markings as follows: On each lateral side of dorsum a pale antehumeral marking representing a more or less ovoid spot prolonged below in a narrow point at lateral end of transverse mesepisternal ridge or representing a more or less stripe-shaped marking which tapers below and which generally abruptly widens at upper edge. Lateral sides of pterothorax with two complete pale stripes parallel to the sutures and more or less of even breadth throughout, one pale stripe on the mesepimeron and the other on the metepimeron. Posterior to these pale stripes the two sclerites are often blackish brown to black. Metepisternum with a more or less subtriangular pale dorsal spot, and there is a small pale spot close above the spiracle.

Wings. Contrary to *Staurophlebia* the costal and subcostal interspaces posses accessory cross-veins proximal to the first primary antenodal. Some species, however, lack the basal costal cross-veins and have only basal subcostal cross-veins. A marked brown costal stripe is often present, especially in the larger species. Membranule well-developed and pale dirty white. Male anal triangle in hind wing three-celled but there is sometimes an interpolated cell.

Abdomen of male. Swollen at base and constricted on segment 3, then, in dorsal view, gradually widening to rear of segment 8, 9 or 10. Dorsum of segment 9 raised convex and generally denticulated in basal half, depressed concave and not denticulated on apical half. Accessory genitalia of similar type to those of *Staurophlebia*. Base of inferior anal appendage with a dorsal prolongation that is notably bulbous in the larger species (fig. 34).

Abdomen of female. Also swollen at base but in general moderately constricted on segment 3, then, in dorsal view, almost parallel-sided or gradually narrowing to segment seven. Ventral process on tenth segment two-pronged and usually with subsidiary teeth at anterior side of base of fork, the subsidiary teeth often discernible in a caudal view of the fork.

The larva of *Neuraeschna* is easily distinguished from that of *Staurophlebia* by the marked protruding eyes, by the lack of knobs on head and thorax, and by the lack of a comb-like external prominence on either mandible.

Treatment of the species

There are excellent characters available in the structure of the male anal appendages for separating species of *Neuraeschna*. The accessory genitalia are conversely of little importance since they show no or hardly differences in closely allied species. The tenth sternite of the female abdomen exhibits characters which can be used sometimes for the determination of species. The features of the thoracic colour pattern are kept off in the keys because this pattern often disappear completely or almost completely through post mortem discoloration and this applies especially to the females. Table 1 is an alphabetic list of all valid taxa. The genus *Neuraeschna* is provisionally divided into six species groups which show some overlapping.

Within each group the species are treated chronologically. For each species is given a list of the main references, the new material and a description or descriptive notes.

KEY TO THE MALES OF NEURAESCHNA

(The male of *N. mayoruna* is unknown)

1. Superior surface of frons with a well-marked brown T-spot (fig. 14) (*N. harpya* group) . . . . . . *N. harpya*
- Superior surface of frons without well-marked brown T-spot but largely or anteriorly dark brown shading to pale light brown at base . . . 2
2. Small species. Hind wing < 54 mm 3
- Large species. Hind wing > 54 mm 6
3. Superior appendages with a stout, submedian, dentiform dorsal process. Inferior appendage about three-fourths the length of superiors (*N. dentigera* group) 4
- Superior appendages without such a dorsal process. Inferior appendage half as long as superiors (*N. claviforcipata* group) . . . . *N. claviforcipata*
4. Dentiform process of superior appendage very large, its base about one-third the length of appendage. Inferior appendage in profile view nearly straight for its proximal two-thirds, than curved slightly dorsad and again straight in its distal third (fig. 53, 54) . . . . . . *N. mina*
- Dentiform process much smaller. Inferior appendage in profile view bent throughout its whole length 5

Table 1. – Alphabetic list of names of the species of *Neuraeschna*, with type locality, type status and type location.

Species	Type locality	Type			
		holo	lecto	sex	location
1. *calverti* Kimmins, 1951	Peru (eastern)	X		♂	BMNH
2. *claviforcipata* Martin, 1909	"Amazon region"		X	♂	IRSN
3. *cornuta* spec. nov.	Sipaliwini, Surinam	X		♂	RNHL
4. *costalis* (Burmeister, 1839)	Bahia, Brazil	X		♀	NHMV
5. *dentigera* Martin, 1909	Turuty, Brazil		X	♂	IRSN
6. *harpya* Martin, 1909	"Amazon region"		X	♂	IRSN
7. *maya* spec. nov.	Barra de Tortuguero, Costa Rica	X		♂	FSCA
8. *mayoruna* spec. nov.	Iquitos, Peru	X		♀	UMAA
9. *maxima* spec. nov.	Belem, Brazil	X		♂	RNHL
10. *mina* Williamson & Williamson, 1930	Porto Velho, Brazil	X		♂	UMAA
11. *producta* Kimmins, 1933	Iquitos, Peru	X		♂	BMNH
12. *titania* spec. nov.	Jaruqui, Ecuador	X		♂	BMNH

5. Superior appendages with a truncated apex. Dorsum of base of inferior appendage inflated and discernible in dorsal view of abdomen (fig. 41) . . . . *N. dentigera*
– Apex of superior appendages tapering off to a point. Dorsum of base of inferior appendage not inflated (fig. 55) . . . . *N. cornuta*
6. Superior appendages more or less flattened and widened; in dorsal view the outer margin of each appendage almost straight (*N. costalis* group) 7
– Superior appendages long, slender and forcipate; in dorsal view the outer margin of each appendage strongly convex from base to apex (fig. 57) (*N. maxima* group) . . . . *N. maxima*
7. Superior appendage in profile view with the upper edge of the raised apical portion produced in a long robust point (figs. 36, 43) . . . . *N. costalis*
– Superior appendage in profile view with the raised apical portion appearing more or less as a rhomboidal projection with round angles 8
8. First angulation of inner margin of superior appendage with a peg-like or spine-like projection (figs. 45–47) . . . . *N. calverti*
– First angulation of inner margin of superior appendage rounded and smooth 9
9. Dorsal prolongation of base of inferior appendage in profile view not projecting above superior appendage. Superior appendage with outer apical margin angled and sometimes bearing a distinct point 10
– Dorsal prolongation of base of inferior appendage in profile view projecting above superior appendage. Superior appendage with outer apical margin broadly rounded (figs. 48, 49) . . . . *N. producta*
10. Outer apical angle of superior appendage bearing a small but distinct laterally directed sharp point (fig. 51). Wings with well-developed brown costal stripes, the brown colour of the stripes extending over interspace behind R1, between arculus and subnodus. Costal edge of pterostigma in fore wing 5.5–5.8 mm, in hind wing 4.1–4.5 mm . . . . *N. titania*
– Outer apical angle of superior appendage without sharp point, at the most with a small tubercle at inferior margin. Wings without or with rather weakly developed brown costal stripes, the brown colour of the stripes not extending over interspace behind R1, between arculus and subnodus. Costal edge of pterostigma in fore wing 4.2–5.0 mm, in hind wing 3.2–4.0 mm . . . . *N. maya*

KEY TO THE FEMALES OF NEURAESCHNA

(The females of *N. cornuta* and *N. mina* are unknown)

1. Superior surface of frons with a well-marked brown T-spot (fig. 14). Hind wing 55–60 mm (*N. harpya* group) . . . . *N. harpya*
– Superior surface of frons without well-marked brown T-spot but anteriorly pale or brown shading to light brown at base 2
2. Small species. Hind wing < 54 mm 3
– Larger species. Hind wing > 54 mm 4
3. Wings with diffuse brown basal patches which in antenodal interspaces are sometimes extended nearly to second primary antenodal. Hind wing 50–51 mm; width of hind wing at nodus 14 mm. Costal edge of pterostigma in fore wing 4.0–4.5 mm (*N. claviforcipata* group) . . . . *N. claviforcipata*
– Wings without basal spots. Hind wing 46–48 mm; width of hind wing at nodus 13 mm. Costal edge of pterostigma in fore wing 3.5–4.0 mm (*N. dentigera* group) . . . . . *N. dentigera*
4. No basal costal cross-vein, only basal subcostal cross-veins present. Fork of tenth sternite in profile view distinctly rising before the line of posterior margin of sternite (fig. 22). Hind wing 61 mm; width of hind wing at nodus 17.5 mm. Costal edge of pterostigma in fore wing 4.5 mm (*N. mayoruna* group) . . . . *N. mayoruna*
– Basal costal and subcostal cross-veins present. Fork of tenth sternite in profile view not or not notably rising before the line of posterior margin of sternite 5
5. Abdomen swollen on segments 1 and 2, then strongly constricted on segment 3; in dorsal (or ventral) view the abdomen is three times as wide at segment 2 as it is in the middle of segment 3 (fig. 59). Hind wing 70 mm; width of hind wing at nodus 19 mm. Costal edge of pterostigma in fore wing 6 mm (*N. maxima* group) . . . . *N. maxima*
– Abdomen also swollen on segments 1 and 2 but moderately or slightly constricted on segment 3 (*N. costalis* group) 6
6. Superior surface of frons largely pale and with a weakly developed brown central spot (fig. 15). Hind wing 66 mm; width of hind wing at nodus 18.5 mm. Costal edge of pterostigma in fore wing 6.3 mm. Specimen from subtropical region of southern Brazil . . . . *N.* spec. indet.
– Superior surface of frons with a brown anterior marking extending over the whole breadth of the frons 7

7. Vertex brown. Hind wing 59 mm; width of hind wing at nodus 16.5 mm. Costal edge of pterostigma in fore wing 5 mm. Wings without or with weakly developed brown costal stripes .... *N. calverti*
– Vertex black. Hind wing larger and broader 8
8. Fork of tenth sternite in profile view strongly angled caudad, the prongs notably slender and long, and curved at two-thirds length (figs. 18, 26). Hind wing 65 mm; width of hind wing at nodus 17–18.5 mm. Costal edge of pterostigma in fore wing 5.5–6 mm .... *N. producta*
– Fork of tenth sternite not or not so strongly curved caudad, the prongs not as in the preceding species 9
9. Large species with relative short pterostigma. Hind wing 66–68 mm; width of hind wing at nodus 18–19.5 mm. Costal edge of pterostigma in fore wing 4.9–5.4 mm (= 7.7%–8.1% of fore wing length). Central American species .... *N. maya*
– Pterostigma relatively longer, that of fore wing 9%–10% of fore wing length 10
10. Large species with well-developed brown costal stripes, the brown colour of the costal stripe extending over adjoining interspace behind R1, between arculus and subnodus (figs. 72, 73). Tenth sternite robust, the fork in profile view generally continuing the line of posterior margin of sternite (figs. 20, 28). Hind wing 63–68 mm; width of hind wing at nodus 18–19.5 mm. Costal edge of pterostigma in fore wing 5.5–6 mm .... *N. titania*
– Somewhat smaller species. The brown costal stripes generally not so well-developed as in the preceding species. Tenth sternite less robust, the fork in profile view generally angled caudad (figs. 17, 24). Hind wing 59–64 mm; width of hind wing at nodus 17–18 mm. Costal edge of pterostigma in fore wing 5–6.3 mm .... *N. costalis*

THE N. DENTIGERA GROUP

In this group I place *N. dentigera*, *N. mina* and *N. cornuta* which are bound together by the following characters: (1) small species (hind wing < 54 mm); (2) no basal costal cross-veins but at least one basal subcostal cross-vein present; (3) Superior surface of frons without well-marked brown T-spot; (4) pale antehumeral marking stripe-shaped with pointed lower end and generally widened upper end: (5) male superior appendage blade-shaped and provided with a stout dentiform process at or slightly before mid-length.

Species of the *N. dentigera* group: *N. dentigera* Martin, *N. mina* Williamson & Williamson and *N. cornuta* spec. nov.

Neuraeschna dentigera Martin, 1909
(figs. 1, 41, 42, 64)

Neuraeschna dentigera Martin, 1909: 207, 208, fig. 213 (♂ app.) – ♂♀ Surinam; Williamson & Williamson 1930: 15 (♂, ♀ Guyana); Kimmins 1951: 48.
Neuraeschna inarmata Kimmins, 1951: 46–48, figs. 8, 9 (♂ app.). – ♂ New River, Guyana. **Syn. nov.**

Material. – Brazil: state of Para; Rio Xingu Camp, ca. 60 km S. of Altamira (52° 22′ W., 3° 39′ S.), 8 October 1986, 1 ♀ (Igarape, mist nets at dusk); 9 October 1986, 1 ♀ (1st jungle stream, trail 1); 9 October 1986, 1 ♀ (mist net at dusk), all P. Spangler & O. Flint, USNM. – Guyana: Essequibo River, Rockstone, 1 February 1912, 1 ♂, 1 ♀, L. A. & E. B. Williamson & B. J. Rainey, UMAA. – Peru: Dept. Loreto, Prov. Maynas, Iquitos, 8 July 1931, 1 ♂ (teneral), from Paul Nagel, FSCA.

Lectotype designation of *Neuraeschna dentigera* Martin, 1909. – According to Martin (1909) the original series of *Neuraeschna dentigera* is in the Selysian collection and consists of two males and two females from "Surinam". However, I found three males and one female while, from the pin labels, these specimens appeared to be secured in Turuty at the Amazon River by Bates. The chosen lectotype is the male which has served for fig. 213 in Martin's monograph of 1909. This male is distinguished from the other two of the original series by the somewhat more strongly curved inferior appendage. The pin labels are "31", "Turuty", "Neuraeschna dentigera Bates ♂ Turuty" (in Selys' hand; the words "modesta Selys" deleted and changed into "dentigera Bates"), "Collection Selys Type Neuraeschna dentigera Bates Revision Martin 190 Neuraeschna dentigera Martin" (text partly printed) and "Type Neuraeschna dentigera Martin" (the word "Type" printed in red). I have added the yellow pin label "LECTOTYPE Rev. J. Belle, 1988".

The lectotype is in fairly good condition but the tips of the right pair of wings are broken off distal to the pterostigmata.

At the end of the description of *Neuraeschna inarmata*, Kimmins (1951) stated that his species is closely related to *Neuraeschna dentigera* Martin but readily separable from it by the form of the male superior anal appendage "unless his (= Martin's) figure is very inaccurate". Because fig. 213 in Martin's monograph shows the superior anal appendage with a second tooth-like projection on the inner margin of each appendage in contrast to Kimmin's male which has not such an extra (second) tooth.

On 19 April 1961 I visited the Brussels Museum in order to check fig. 213 in Martin's monograph. The depiction proved to be very inaccurate, indeed. In stead of a second tooth-like projection there was a broad rounded lobe. Also the inferior appendage appeared not so strongly curved as depicted. At my visit of the British Museum (Natural History) on 20 June 1961 I was able to compare the males of *Neuraeschna dentigera* from the Selysian collection with the holotype male of *Neuraeschna inarmata*. No character was found that would justify a specific distinctness of the two species. Thus we consider *Neuraeschna inarmata* Kimmins a junior synonym of *Neuraeschna dentigera* Martin.

Male. – Total length 64–69 mm; abdomen 49–53 mm (incl. app. 5.0–5.2 mm); hind wing 43–46 mm; costal edge of pterostigma in fore wing 3.9–4.0 mm, in hind wing 2.9–3.0 mm.

Head. Face orange-brown, the anteclypeus with greyish tinge. Superior surface of frons dark brown anteriorly, fading to pale light brown basally. Vertex dark brown. Antennae light brown. Occipital triangle brown. Upper part of rear of head black.

Pterothorax: Dark brown with pale (= green) stripes. Pale antehumeral markings stripe-shaped, the upper part widened mesad, the lower third tapering to lateral end of transverse mesepisternal ridge (fig. 1). Pale mesepimeral and metepimeral stripes about equal in width. A small pale dorsal spot on metepisternum. Wing articulations with pale spots.

Legs. Reddish brown but dark brown at knees.

Wings. Clear, in old specimens faintly brown tinged. Pterostigma light brown. Membranule dirty white, that of hind wing extending along posterior wing margin to a point about two-fifths the way along first paranal cell. Antenodals in fore wing 23–28, in hind wing 19–21.

Abdomen. Dark brown but segment 2 with green middorsal stripe. In dorsal view constricted on segment 3, then gradually wider on segments 4 to 9 with the segments 6 to 9 becoming more depressed successively. Upper surface of segment 10 flat and elevated at apex. Appendages dark brown and shaped as shown in figs. 41 and 42.

Female. – Total length 65–67 mm (excl. app.); abdomen 50–54 mm (excl. app.); hind wing 46–48 mm; width of hind wing at nodus 12.5–13.5 mm; costal edge of pterostigma in fore wing 4.0–5.0 mm, in hind wing 2.7–3.0 mm.

Similar to male regarding stature and general coloration but dark brown colour of pterostigma less dark and abdominal segment 2 not constricted. Antenodals in fore wing 23–30, in hind wing 19–22. Fork of tenth sternite in profile view continuing the line of posterior margin of sternite. Anterior surface of sternite at base of fork with two or three small subsidiary teeth on either side.

Save the deviations in the curving of the inferior appendage the males also differ in the development of the tooth-like projection and the conformation of the apical portions of the superior appendages. These have or have not a small acute tooth on the outer apical end.

Neuraeschna mina Williamson & Williamson, 1930
(fig. 53, 54)

Neuraeschna mina Williamson & Williamson, 1930: 9–15, figs. 1, 2 (♂ app.) – ♂, Brazil (Território de Rondônia).

Neuraeschna cornuta spec. nov.
(figs. 2, 55, 56)

Material. – Holotype: Suriname: Distr. Nickerie, Sipaliwini (at a small creek along a patch to the airstrip), 14 February 1961, 1 ♂, D. C. Geijskes, RNHL.

Male (holotype; a pinned specimen in perfect condition). – Total length 67 mm; abdomen 51.5 mm (incl. app. 4.9 mm); hind wing 44 mm; costal edge of pterostigma in fore wing 3.3 mm, in hind wing 2.5 mm.

Head. Face light brown but upper half of vertical part of frons dark brown. Superior surface of frons dark brown on anterior half with convex posterior margin (no T-spot), the basal half pale light brown. Antennae light brown. Vertex black. Occipital triangle dark brown.

Pterothorax. Dark brown with pale (= green) markings. Antehumeral markings stripe-shaped, the lower end tapering and directed to lateral edge of anterior mesepisternal ridge, the upper end slightly widened mesad but much widened laterad (fig. 2). Pale mesepimeral stripe rather narrow. Pale metepimeral stripe as wide as pale mesepimeral stripe at its upper end, becoming gradually narrower toward below.

Wings. With a faint brown tinge, the costal margins slightly darker. Pterostigma brown-yellow. Membranule reaching to a point about one-third the way along first paranal cell. Antenodals in fore wings 28–30, in hind wings 22–23.

Abdomen. Dark brown with pale (= yellow to yellow-green) markings on segments 2 and 3. Segment 2 with a broad pale streak along ventral tergal margins and behind auricles; middorsum of segment with a pale stripe over whole length of segment, not connected with the pair of two short, transverse pale stripes at posterior border of segment. Segment 3 with large pale basal side spots extending along ventral tergal margin to halfway the segment, and with a pair of small, transversely elongated, dorsal posterior pale spots. Segment 3 constricted. Apical segments depressed. Anal appendages shaped as shown in figs. 55 and 56, the superiors being a trifle longer than segments 9 and 10 together.

THE N. CLAVIFORCIPATA GROUP

N. claviforcipata shows the features listed for the *N. dentigera* group except for point (6). In *N. claviforcipata* the dorsal dentiform process is replaced by a mere raised outer edge of the superior appendage on the basal half.

Species of the *N. claviforcipata* group: *N. claviforcipata* Martin.

Neuraeschna claviforcipata Martin, 1909
(figs. 3, 4, 16, 33, 39, 40, 65)

Neuraeschna claviforcipata Martin, 1909: 206, 207, fig. 212 (♂ app.) – ♂ ♀ Amazon region; Williamson & Williamson 1930: 15 (♂ Brazil, State of Pará); Racenis 1970: 29 (♂ Venezuela); Geijskes 1971: 664 (♂ French Guiana).

Material. – Brazil: State of Amazonas, Rio Negro (at Manaus), 2 ♂, ex coll. Lacroix, MNHP; State of Pará, 1 ♂; State of Pará, June 1935, 1 ♂, G. V. Vredenburg, BMNH; State of Pará, Belem, 5 August 1922, 1 ♂ (teneral), J. H. Williamson, UMAA. – Ecuador: Prov. Napo, Río Napo, Limoncocha (300 m), 5 November 1980, 1 ♀ (teneral), M. J. Westfall, Jr. & David Robinson, FSCA. – Suriname: Distr. Marowijne, Tapanahoni River, Drietabbetje (in forest), 8 October 1952, 1 ♀, D. C. Geijskes, RNHL. – Venezuela: Est. Bolívar, Guayaraca-Auyantequi, 16 April 1956, 1 ♂, J. Rácenis, UCV.

Lectotype designation of *Neuraeschna claviforcipata* Martin, 1909. – For this purpose the best preserved male of the original series of this species in the Selysian collection (IRSN) has been taken. The pin labels are "109", "Bates", "Neuraeschna claviforceps Bates ♂ Amazone" (in Selys' hand), "Collection Selys Type Neuraeschna claviforcipata Bates Revision Martin 190 Neuraeschna claviforcipata Martin" (text partly printed) and "Type Neuraeschna claviforcipata Martin" (the word "Type" printed in red). I have added the yellow pin label "LECTOTYPE Rev. J. Belle, 1988".

The wings of the lectotype are not perfect. The tip of the right fore wing is broken off proximal to the pterostigma while the hind border of the hind wings displays some damages.

Male. – Total length 70–75 mm; abdomen 56–58 mm (incl. app. 4.5–5.0 mm); hind wing 49–51 mm; costal edge of pterostigma in fore wing 3.2–4.0 mm, in hind wing 2.5–3.0 mm.

Head. Face light brown. Superior surface of frons dark brown anteriorly, fading to pale light brown basally. Antennae brown, the first antennal segment darker. Vertex black. Occipital triangle black.

Pterothorax. Dark brown with pale stripes. Antehumeral markings green to bluish-green, stripe-shaped, the upper part widened mesad, the lower third tapering to lateral end of transverse episternal ridge (figs. 3, 4). A moderately wide green stripe on mesepimeron and an equal one on metepimeron. A small green dorsal spot on metepisternum. Wing articulations green.

Legs. Red-brown, darker at knees and on tarsi and claws.

Wings. Clear, in aged individuals slightly brown tinged with faintly discernible brown costal stripes. Pterostigma light brown. Membranule of hind wing extending along posterior margin of wing to a point nearly halfway along first paranal cell. Antenodals in fore wing 27–36, in hind wing 19–25.

Abdomen. Long and slender. Segment 3 constricted. Segments 7 to 10 distinctly depressed. Dark brown with pale (= yellow to yellow-green) markings on segments 1 to 4. Segment 1 with two connected pale dorsolateral spots. Segment 2 pale behind auricles and along ventral tergal margins, with a fine pale middorsal stripe from base to a point three-fourths the way along segment, and with a submedian dorsal pair and a more posterior dorsal pair of transversely elongated pale spots. Dorsum of segment 3 with two small pale spots at transverse carinae and another pair of small pale spots at posterior margin. Dorsum of segment 4 with two small pale spots near posterior margin. Appendages dark brown, about as long as segments 9 and 10 together, shaped as shown in figs. 39 and 40.

Female. – Total length 67–69 mm (excl. app.); abdomen 51–54 mm (excl. app.); hind wing 50–51 mm; width of hind wing at nodus 14 mm; costal edge of pterostigma in fore wing 3.8–4.5 mm, in hind wing 2.8–3.1 mm.

Similar to male but abdominal segment 3 not constricted and end segments of abdomen not depressed. Wings clear with diffuse brown basal patches which in antenodal interspaces are sometimes extended to second primary antenodal (fig. 65). Antenodals in fore wing 29–32, in hind wing 21–23. Fork of sternite of abdominal segment 10 shaped as shown in fig. 16.

The measurements here mentioned are those of fully mature specimens. They are smaller in the teneral specimens. The teneral male from Belem has the dimensions: total length 64 mm, abdomen 50 mm (incl. app. 4.5 mm) and hind wing 46 mm; those of the teneral female from Limoncocha are: total length 64 mm (excl. app.), abdomen 50 mm (excl. app. 5.5 mm) and hind wing 47 mm.

The teneral female from Limoncocha is the only female with intact anal appendages. Each appendage is slender and narrow on the basal third; the apical two-thirds portion is blade-shaped and has a rounded median keel on the upper surface (fig. 33). The fork of the tenth sternite has on its anterior surface a relatively large central supplementary tooth which is discernible in caudal view. There is not such a supplementary tooth in the other females.

The prongs of the fork of the tenth sternite are more divergent in the complete syntype female than in the other females. The fork of the other syntype female is broken away.

THE N. COSTALIS GROUP

The characters of this groupe are: (1) large species (hind wing > 54 mm); (2) basal costal and subcostal cross-veins present; (3) superior surface of frons without well-marked brown T-spot; (4) pale antehumeral marking more or less ovoid, the lower end pointed, the upper end sometimes slightly constricted; (5) male superior appendages blade-shaped without any kind of a dorsal process on basal half.

The members composing the *N. costalis* group: *N. costalis* (Burmeister), *N. producta* Kimmins, *N. calverti* Kimmins, *N. titania* spec. nov. and *N. maya* spec. nov.

Neuraeschna costalis (Burmeister, 1839)
(figs. 5, 17, 24, 31, 34, 35, 36, 43, 66–68)

Aeschna costalis Burmeister, 1839: 837 – ♀ Brazil, State of Bahia.
Gynacantha ferox Erichson, 1848: 585 (♂ Guiana, holotype in ZMHB); Hagen 1867: 54.
Neuraeschna costalis; Hagen 1867: 55, 56; Selys 1883: 748 (40 sep.); Kirby 1890: 95; Martin 1909: 205, fig. 210 (♂ app.); Kimmins 1933: 226; Rácenis 1970: 29, 30 (♂ Venezuela); Geijskes 1971: 663 (♀ French Guiana); Davies & Tobin 1985: 15.

Material. – Brazil: State of Pará, Óbidos, 1 ♂, ANSP (ex coll. Calvert); Óbidos, March 1971, 1 ♂, B. Ferreira; Distrito Federal, Brasilia, May 1970, 1 ♀, Frits, CM. State of São Paulo, Rio Guaratuba (Varjão), 7 March 1969, 3 ♂, 1 ♀; 29–30 April 1969, 9 ♂, 5 ♀; 21 April, 2 ♂, 1 ♀; 23 April 1970 (at 6 p.m.), 1 ♀; 15 April 1971 (at 5.30 p.m.; riverbank), 1 ♂; 19 April 1971 (at 5.30 p.m.; riverbank), 2 ♂; 19 March 1972, 2 ♀, all E. Dente, CM but 2 ♂, 1 ♀ in RNHL. – Ecuador, Prov. Pastaza, Río Napo, Puyo-Oriente (elev. 1000 m), 29 November 1936 (at 5.30 p.m.), 1 ♂, W. Clark-Macintyre, UMAA. – Guyana: Mazaruni-Potario Dist.; Kartabo Point; Earthwatch Research Exped. 21 December 1983, 1 ♀, W. E. Steiner, USNM. – Suriname: Distr. Suriname, Paramaribo (Cultuurtuin), 9 November 1938, 1 ♀; Distr. Saramaca, Coesewijne River (at light), 25 October 1945, 1 ♀; Distr. Marowijne, between Moengotapoe and Wia Wia (trail 19, at swamp), October 1948, 2 ♂; Marowijne River (first island), 23 October 1948, 1 ♂, all D. C. Geijskes; Distr. Saramacca, Garnizoenspad (km 20, at 6.30 p.m.), 7 September 1955, 2 ♂; Distr. Suriname, Fernandesweg naar Zee, 9 September 1955, 1 ♂, 1 ♀; Para River (along road to Domburg, at 6.15 p.m.), 21 September 1955, 1 ♂, Rijsdijkweg, 4 March 1957, 1 ♂, Paramaribo (Zorg en Hoop), 19 August 1958, 1 ♀; 17 August 1959, 1 ♀, all J. Belle; Distr. Marowijne, Albina, August 1973, 1 ♂ (teneral); 28 September 1973, 1 ♀; Distr. Suriname, Zanderij, 13 September 1973, 1 ♀, all J. J. Belle, RNHL. Distr. Suriname, Paramaribo (Zorg en Hoop), 22 August 1958, 1 ♀; Zanderij (Weg naar Matta), 28 July 1963, 1 ♂; both J. Belle, ZMHB. – Venezuela: 1899, 1 ♂, F. Gray, MHNP. Est. Amazonas, Simarawochi, 30 March 1973, 1 ♂, W. Perez (No. 13892). Est. Bolívar, Uruyen, 11 April 1956, 1 ♂, Foldat (No. JR-06637); El Bochinche, 5–8 December 1985, 1 ♀, L. D. Otero & A. Chacón, UCV.

Male. – Total length 82–91 mm; abdomen 62–71 mm (incl. app. 5.9–6.5 mm); hind wing 56–62 mm; costal edge of pterostigma in fore wing 5.0–5.8 mm, in hind wing 3.6–4.6 mm.

Head. Face yellow-brown to brown but anteclypeus with a tinge of green. Frons granulous. Superior surface of frons dark brown anteriorly, fading to pale light brown basally; the posterior margin of the dark brown marking straight or convex. Vertex dark brown to black. Antennae light brown. Occipital triangle dark brown and tufted with brown hairs. Eyes in freshly killed specimens dark green on upper half and yellow-green on lower half.

Pterothorax. Dark brown with pale markings. Antehumeral pale markings blue-green, ovoid, its antero-lateral corner prolonged in a narrowed point reaching to lateral end of transverse mesepisternal ridge (fig. 5). The two pale lateral stripes rather narrow and green, followed by a dark brown to black stripe. Wing articulations dark blue.

Legs. Red-brown, darker at knees.

Wings. Clear, the brown costal band variable, in some specimens developed only at base of wings, in other specimens well-developed and extending over adjoining interspaces behind R1. In aged individuals the wings becoming dark brown tinged, often firstly in the middle from discoidal triangle to pterostigma. Venation dark brown. Pterostigma brownish yellow. Membranule dirty white, that of hind wing extending to a point halfway along first paranal cell. Antenodals in fore wing 31–36, in hind 23–26.

Abdomen: Dark brown. Constricted on segment 3, becoming gradually wider and more depressed on segments 4 to 10. Anal appendages shaped as shown in figs. 35 and 36.

Female. – Total length 81–85 mm (excl. app.); abdomen 61–64 mm (excl. app. 3.5–4.0 mm); hind wing 59–64 mm; width of hind wing at nodus 17–18 mm; costal edge of pterostigma in fore wing 5.0–6.2 mm, in hind wing 4.0–5.3 mm.

Coloration similar to male. Abdomen slightly constricted on segment 3, then in dorsal view almost parallel-sided on segments 4 to 7, slightly wider on segments 8 and 9. Fork of tenth sternite in profile view generally distinctly angled caudad (fig. 17) and with one to four subsidiary teeth on anterior basal side of fork. Anal appendages antenna-shaped and short, about as long as abdominal segment 9 (fig. 31). Antenodals in fore wing 30–37, in hind wing 23–27.

Infraspecific variation. – The specimens from Suriname are the smallest of the series, those from southern Brazil the largest.

The male anal appendages show some interesting morphological variations. In some males the raised apical portion of the superior appendage in profile view appears as a rhomboidal projection with an upper apical point but in other males more or less as a triangular projection (fig. 43). The male from Óbidos in the Machado collection has the upper apical points of the superiors notably converging; they are generally parallel or diverging. The inferior appendage shows variation in its curvature and in the degree of swollenness of its basal dorsal prolongation. The tip of the interior appendage reaches to a point between two-thirds and four-fifths of the way along the superiors as the base of the inferior may be more or less hidden between the superiors and the anal tubercles.

The thoracic colour pattern is variable and especially the pale antehumeral markings can considerably vary in size. The males from Venezuela have a relatively small pale antehumeral spot in the centre of each lateral side of the thoracic dorsum. In other specimens the pale antehumeral marking occupies almost the whole lateral side of the thoracic dorsum.

The specimens of *Neuraeschna* exhibit also a typical colour-heteromorphism with regard to the brown costal stripes. I distinguish:

Type. This is of course the form in the holotype (fig. 66). The brown colour of the stripe is not extended over the adjoining interspace behind R1, between arculus and subnodus.

Var. *hyalinata* **nov.** Here the brown costal stripe is absent or reduced to a mere diffuse brown basal patch. Specimens pertaining to var. *hyalinata* seem only to occur in the Guianas and Venezuela (fig. 67, 68).

Var. *marginata* **nov.** Specimens of this variation have definite brown costal stripes with the brown colour of the stripes extended over the adjoining interspace behind R1, between arculus and subnodus. In the material before me the two males from Bolívar, Venezuela and the female from Brasilia, Brazil belong to var. *marginata*. The brown costal stripes of these examples approach in development those of *N. titania* spec. nov. (figs. 72, 73).

Neuraeschna producta Kimmins, 1933
(figs. 6, 18, 26, 48, 49)

Neuraeschna producta Kimmins, 1933: 226–228, figs. 1, 2 (♂ app.) – ♂ ♀ Peru; 1951: 45, 46, figs. 5–7 (♂ hw-base & tip of app., fork of ♀ 10th sternite).

Material. – Brazil: State of Pará. Tapajós River (Barreira), 1 ♂, IRSN.

One of the male paratypes (dated 25 September 1930) ex coll. Hincks in the Manchester Museum has been carried over to the Rijksmuseum van Natuurlijke Historie at Leiden. This male has weakly developed brown costal stripes with the brown colour of the stripe not extended over the interspace behind R1, between arculus and subnodus. The present male from Barreira, however, has hyaline wings with well-developed brown costal stripes, the brown of the stripe being extended over the interspace behind R1, between arculus and subnodus.

The female allotype is notably larger than the males, has relatively broader wings and well-developed brown costal stripes with the brown colour of the stripe extended over the interspace behind R1, between arculus and subnodus. The colour pattern of the pterothorax is lost through post mortem discoloration. The hind margin of the brown anterior marking on the superior surface of the frons is strongly convex in the female allotype; it is straight in the males. In the Selysian collection there is an Amazonian female collected by Bates which possibly belongs to *N. producta*. This female, with relatively narrower wings (hind wing 65 mm; width of hind wing at nodus 17.5 mm), has the posterior margin of the brown anterior marking of the frons straight. Unfortunately the fork of the tenth sternite is broken away and due to this damage the specimen cannot well be compared with the female allotype.

Neuraeschna calverti Kimmins, 1951
(figs. 7, 8, 19, 27, 45–47, 70, 71)

Neuraeschna calverti Kimmins, 1951: 43–46, figs. 1–4 (♂ app. & hw base, fork of ♀ 10th sternite) – ♂ ♀ Peru.

Material. – Brazil: State of Amazonas, Manaus, no date, 1 ♂, Vieira leg., CM. – Suriname: Distr. Suriname, Zanderij, 18 December 1973, 1 ♂, J. J. Belle, RNHL.

Two illustrations in the original description of *N. calverti* are inaccurate. In the figure of the male appendages in dorsal view (Kimmins' fig. 1) the dorsal prolongation of the lamina supra-analis is not depicted while in the figure of the fork of the tenth sternite of the female (Kimmins' fig. 4) the subsidiary teeth are missing. The present figures 47 and 19 are improved versions of these figures.

Only three males of *N. calverti* are known. The differences noticed between them and listed below seem to me not of specific value.

(1) Peg-like projection on inner margin of superior anal appendage small and very acutely pointed in the male from Suriname (fig. 45).

(2) Inner apical projection of superior appendage longer in the male from Manaus (fig. 46).

(3) Pterostigma different in size; costal edge of pterostigma of fore wing 4.5 mm in the male holotype, 5.0 mm in the male from Manaus, and 5.5 mm in the male from Suriname.

(4) Pale antehumeral marking smallest and very similar to that of the males of *N. costalis* from Venezuela in the male from Suriname (fig. 7); the pale antehumeral marking is largest and almost completely occupying the lateral half of the thoracic dorsum in the male from Manaus (fig. 8).

(5) Anterior lamina of accessory genitalia stouter in the male from Manaus.

Neuraeschna titania spec. nov.
(figs. 9, 20, 28, 50–52, 72, 73)

Material. – Holotype: Ecuador, Prov. Pichincha, Jaruqui, 1 ♂ (from Staudinger) in BMNH. Paratypes: Ecuador: Prov. Napo, Archidona (675 m), May 1977 (at light), 1 ♀, Herman G. Real, CG; Prov. Pastaza, Puyo (watershed Río Pastaza-Río Napo, 1000 m), 21 November 1936 (at twilight), 1 ♀ (teneral); 28 November 1936, 1 ♀ (allotype); watershed Río Arajuno-Río Napo (headwaters, 1000 m), 29 April 1941, 1 ♀, all W. Clark-Macintyre; Prov. Zamora-Chinchipe, Amora (700 m), 3 December 1941, 1 ♂ David B. Laddey, UMAA; Prov. Pinchincha, Jaruqui, ,1 ♀, from Staudinger, BMNH – Peru: Prov. Lima, vicinity of San Pedro (900 m), 26 May 1935, 1 ♂ (flying at dusk), Felix Woytkowski, UMAA.

Male (holotype; an aged individual; tip of right fore wing broken away; fig. 72). – Total length 90 mm; abdomen 70 mm (incl. app. 5.5 mm); hind wing 64 mm; costal edge of pterostigma in fore wing 5.5 mm, in hind wing 4.5 mm.

Head. Face largely pale brownish yellow shading to pale brown above. Superior surface of frons anteriorly dark brown shading to pale light brown basally, the posterior margin of the dark brown margin strongly convex and reaching nearly to base. Vertex black. Antennae brown. Occipital triangle brown, provided with brown hairs.

Pterothorax. Dark chocolate brown, the brown colour darkest immediately posterior to the two greenish yellow lateral stripes. On each lateral side of the thoracic dorsum a large, bluish green ovoid spot prolonged below in a narrowed point at lateral end of transverse mesepisternal ridge (fig. 9). The two pale lateral stripes slender and about equal in width.

Legs. Third femur brown, second femur darker brown, first femur blackish brown with brown-yellow inner side. Tibiae reddish brown. Knees and tarsi darker brown.

Wings. Brown tinged with a marked brown costal stripe, the brown colour of the costal stripe extending over adjoining interspace behind R1, between arculus and subnodus. Venation dark brown but costa pale brown anteriorly. Pterostigma brown-yellow. Membranule extending along hind wing margin to a point half way the first paranal cell. Antenodals in fore wings 36–37, in hind wings 25–30.

Abdomen. Dark brown with some indefinite pale areas on lower part of sides of segments 1 and 2 and basal three-fourths of segment 3. Broad at base. Segment 3 moderately constricted. Segments 4 to 9 gradually widening. Segments 7 to 9 gradually more depressed. Dorsum of segment 9 strongly convex and densely denticulated in basal half, depressed concave and not denticulated on apical half. Anal appendages shaped as shown in figs. 51 and 52, the superiors a little shorter than segments 9 and 10 together.

Female (allotype; an aged individual; anal appendages broken away; tip of fore wings broken off but not lost). – Total length 90 mm (excl. app.);

abdomen 67 mm (excl. app.); hind wing 68 mm; greatest width of hind wing 19.5 mm; costal edge of pterostigma in fore wing 6.4 mm, in hind wing 5.9 mm.

Similar to male holotype but abdomen slightly constricted on segment 3, then gradually narrowing to apex of segment 7. Fork of tenth sternite continuing the line of the hind margin of the sternite. Base of fork with a relatively large supplementary tooth each side and well-developed minor teeth on anterior surface (fig. 20, 28). Antenodals in fore wings 38–39, in hind wings 27.

The male from Peru and the female from Archidona (Ecuador) are younger than the type specimen. Their wings are hyaline and have definite brown costal stripes. The male from Peru is also the smallest male of the series (abdomen 67 mm; hind wing 60 mm) and has a paler thoracic colour pattern. Especially the anterior streaks of the two pale lateral stripes are notably lighter. Like in the males of the other species of the *N. costalis* group the raised apical portion (comb) of the superior appendages varies in height and length.

The apices of the anal appendages of the female allotype are, like in the other females, broken away; the remaining pieces are parallel-sided, 2 mm long and 0.6 mm wide. The anal appendages are highly probable antenna-shaped, like in *N. costalis* and *N. harpya*. The fork of the tenth sternite of the female paratype in the British Museum (Natural History) is damaged, the right prong being broken away.

Neuraeschna maya spec. nov.
(figs. 10, 21, 25, 44, 74)

Material. — Holotype: Costa Rica: Prov. Limón, Barra de Tortuguero, 17 July 1985, 1 ♂ (Victor Hellebuyck) in FSCA. Paratypes: Costa Rica: Prov. Limón, Tortuguero, 17 July 1985, 1 ♂; Barra de Tortuguero, 17 July 1985, 2 ♂, 1 ♀ (allotype); 18 July 1985, 6 ♂; 19 July 1985, 2 ♂, all Victor Hellebuyck, CH, but 1 ♂ in RNHL. – Honduras: 1 ♀, IRSN; Puerto Cortez, 30 May 1917, 1 ♀, F. J. Dyer, USNM.

Male (holotype; an aged individual; head broken off but not lost; distalia of antennae lost). – Total length 88 mm; abdomen 67 mm (incl. app. 5.8 mm); hind wing 59 mm; costal edge of pterostigma in fore wing 4.5 mm, in hind wing 3.5 mm.

Head. Face dull olive green. Dark anterior marking of superior surface of frons developed, its posterior margin convex in middle. Base of superior surface of frons pale light brown. Vertex black. Scape of antenna black, pedicel yellowish brown. Occipital triangle yellowish brown anteriorly, dark brown posteriorly.

Pterothorax. Blackish brown white pale markings. On each lateral side of thoracic dorsum a bluish-green ovoid spot which is not distinctly prolonged below on lateral side (fig. 10). Meso-paraptera (antealar sinus) largely yellow-green. Mes- and metepimeral pale stripes rather narrow and yellow-green.

Legs. Third femur brown, black at knees. Second and first femora very dark brown. Tibiae brown, tarsi and claws darker brown.

Wings. Brown tinged with faint brown costal stripe. Venation dark brown but costae light brown anteriorly. Pterostigma light brown. Membranule rather broad and along posterior wing margin reaching to a point nearly halfway the first paranal cell. Antenodals in fore wings 32–33, in hind wings 23.

Abdomen. Dark brown with some indefinite paler areas on lower part of sides of segments 1 and 2 and base of segment 3. Broad on basal segments 1 and 2, constricted on segment 3, almost parallel from apex of segment 3 to base of segment 7, than gradually widening to apex of segment 8 and more depressed to segment 9. Segments 9 and 10 equal in width. Dorsum of segment 9 strongly convex and denticulated on basal half, depressed concave and not denticulated on apical half. Anal appendages very resembling those of *N. titania* but outer apical angle of each superior appendage without a sharp point. Instead there is a small tubercle on inferior margin at the outer apical angle of the superior appendages (fig. 44).

Female (allotype; a very aged individual; apices of anal appendages broken away). – Total length 87 mm (excl. app.); abdomen 68 mm (excl. app.); hind wing 65 mm; width of hind wing at nodus 18 mm; costal edge of pterostigma in fore wing 4.9 mm, in hind wing 3.8 mm.

Similar to male but abdomen not constricted on segment 3 and then gradually narrowing to apex of segment 7. Fork of sternite of tenth abdominal segment angled caudad; anterior surface of base of fork with two small subsidiary teeth on left side only (fig. 21). Wings very dark brown tinged with weakly discernible brown costal stripes. Antenodals in fore wing 36, in hind wing 26.

All Costa Rican specimens are aged to very aged individuals and due to their brown tinged wings the brown costal stripes are not well discernible. The two females from Honduras, however, are young specimens (one teneral). The wings of these females are hyaline and the brown costal stripes can well be studied (fig. 74). The brown colour of the costal stripe is not extended over the interspace behind R1, between arculus and subnodus.

THE N. HARPYA GROUP

Although evidently related to the members of the *N. costalis* group, *N. harpya* is aberrant from its members and from all other species of the genus by the presence of a well-marked brown T-spot on the top of the frons. With a hind wing length of 52–60 mm, *N. harpya* belongs to the moderately large species of the genus.

It is classified here as a separate group: *N. harpya* Martin.

Neuraeschna harpya Martin, 1909

(figs. 11, 14, 32, 37, 38, 60–63, 69)

Neuraeschna harpya Martin, 1909: 206, fig. 211 (♂ app.) – ♂ ♀ Amazon region, Suriname; Williamson & Williamson 1930: 15 (♀ Guiana); Kimmins 1933: 226, 227; 1951: 48; Geijskes 1971: (♂ ♀ French Guiana).

Material. – Brazil: State of Pará, Tapajós (53 27), 1 ♂, BMNH; State of Pará, Rio Xingu Camp (52° 22′ W 3° 39′ S, ca. 60 km S. of Altamira, 1 October 1986 (at dusk), 1 ♀; same camp, Igarape (N. of camp, trail 4), 9 October 1986, 1 ♂, P. Spangler & O. Flint, USNM; same camp and collectors, 3 October 1986, 1 ♂, CG. Rio Negro, 20 August 1951, 1 ♀, Pe. J. Falco; Rio Uaupés (Taracua), 14 August 1964, 1 ♀, CM. – French Guiana: Camopi (on light), 19 November 1969, 1 ♂, Balachowski & Grüner, CM. – Guiana: Essequibo River, Rockstone, 1 February 1912, 1 ♀, L.A. & E.B. Williamson & B. J. Rainey, UMAA. – Peru: Dept. Loreto, Río Ampi Yaco, Estiron, 29 March-9 April 1970, 1 ♀ (teneral), B. Malkin, RNHL. – Surinam: 1 ♂, H. Fruhstorfer (99–103); Distr. Marowijne, Litani River (Feti Creek), 17 August 1939, 1 ♀, D. C. Geijskes, BMNH. Distr. Marowijne, Litani River (Feti Creek), 16–22 July 1939, 2 ♂ 5 ♀. Distr. Suriname: Coropina Creek, Republiek, 27 May 1951, 2 ♂ (teneral), all D. C. Geijskes. Distr. Nickerie, Corantijn River, Wonotobo Falls, 1 February 1956, 1 ♂ 1 ♀; Kabalebo River, 26 August 1963, 1 ♀; Distr. Suriname, Zanderij, Troelinde Creek (Bos Beheer), 20 July 1958, 1 ♀; Zanderij, Pontji Creek, Dauwdropkamp, 2 September 1958, 1 ♂; Zanderij, Pontjibrug, 19 November 1958, 1 ♀, all J. Belle; Distr. Nickerie, Wilhelmina Mountain Range, camp at Lucie River, 21 August 1963 (6.30 p.m.), 1 ♂, S. Ligorie; Corantijn River, Wonotobo Falls, 23 July 1959, 1 ♀ (reared), D. C. Geijskes, RNHL.

Lectotype designation of *Neuraeschna harpya* Martin, 1909. – In the Selysian collection there are three syntypes of *Neuraeschna harpya*, two males and one female. The male, which bears the pin labels "Santarem", "149 Æ. harpya B." and "Collection Selys Neuraeschna harpya Bates ♂ Revision Martin 190 Neuraeschna harpya Bates" (partly printed), is here designated as the lectotype of *Neuraeschna harpya* Martin, 1909. To the pin of this specimen I have added the yellow label "LECTOTYPE Rev. J. Belle, 1988".

The lectotype is in fairly good condition. The costae of the fore wings are broken just proximal to the pterostigma but restored. The pterothorax is broken between the second and third pair of legs but otherwise all critical details are intact and can well be studied.

Male. – Total length 73–74 mm; abdomen 57–58 mm (incl. app. 5 mm); hind wing 52–54 mm; costal edge of pterostigma in fore wing 3.9–4.3 mm, in hind wing 2.8–3.0 mm.

Head. Face yellow-brown. Superior surface of frons with dark brown to black T-spot, the area next to the stem of the T-spot raised convex and pale light brown. Vertex black. Antennae brown. Occipital triangle black. Eyes in freshly killed specimens green above, becoming yellowish below and bluish along black hind border.

Pterothorax. Brown with broad pale (= light green) stripes. Pale antehumeral markings stripe-shaped, the upper end widened on both sides, the lower part becoming narrower and reaching lateral end of transverse mesepimeral ridge (fig. 11). Pale mes- and metepimeral stripes very broad and equal in width, each pale lateral stripe posteriorly bordered by a very dark brown stripe. A small green dorsal spot on metepisternum. Wing articulations with green to bluish green spots.

Legs. Dark brown, the inner side of first femur green for the basal three-fourths portion.

Wings. Clear, sometimes with a faintly developed brown costal band. Venation dark brown but frontal margin of costa lighter. Pterostigma light brown. Antenodals in fore wing 28–36, in hind wing 21–25. Membranule of hind wing extending to a point one-third the way along first paranal cell.

Abdomen. Brown, the posterior margin of each segment almost black. Segments 1 and 2 with light green side spots. Segment 3 to 7 with a yellowish green lateral spot at transverse carina, the one of segment 3 extending on basal half of segment along ventral tergal margin. Segment 3 somewhat constricted, slightly wider on segments 4 to 9, successively. Segment 10 narrower, its upper surface flat and elevated at apex. Segments 6 to 9 becoming more depressed, successively. Anal appendages dark brown, shaped as shown in figs. 37 and 38.

Female. – Total length 73–78 mm (excl. app.); abdomen 57–61 mm (excl. app. 3.5 mm), hind wing 55–60 mm; costal edge of pterostigma in fore wing 4.6–5.0 mm, in hind wing 3.0–3.5 mm.

Coloration similar to male. Abdomen very slightly constricted on segment 3, in dorsal view almost parallel-sided on segment 4 to 9, narrower on segment 10. Anal appendage antenna-like, as long as segment 9, in dorsal view almost parallel-sided, slightly tapering at apex, the apical two-fifths portion superiorly keeled (fig. 32). Fork of tenth sternite in profile view almost continuing the line of posterior margin of sternite, but sometimes slightly curved caudad. There are often no subsidiary teeth on the anterior surface of the base of the fork. Antenodals in fore wing 30–36, in hind wing 21–25.

Larva (described from a larval cast-off skin of a reared female). – Total length 38.5 mm; abdomen 26.5 mm (incl. app. 3.7 mm); greatest width of abdomen 8 mm; width of head over the eyes 9 mm; third femur 7.5 mm.

Larval skin clean and practically hairless. It is light brown, almost without colour pattern but there are conspicuous dark markings on the femora.

Head. Flat above. Eyes very prominent. Posterior portion of occiput produced laterally with tapering sides. Antennae 7-jointed, the first two basal segments short and rounded, the third segment longest and the fourth segment shortest (fig. 62). Labium brown, its basal hinge reaching to third coxae. Front margin of mentum with a pair of rather long spines, each spine slightly curved outward and located in the middle of the part between the small median cleft and the base of the lateral lobe. End hook of lateral lobe terminating in a strong acute spine, its inner border nearly semicircular. Movable hook strong, two and a half times as long as outer border of lateral lobe (fig. 61).

Prothorax. Flat above. Dorsal disc with prominent rounded lateral margins. Supracoxal armature with the first proces conical and twice as small as the second one.

Synthorax. Without knobs. Tips of wing-cases reaching to well upon segment 4.

Legs. Femora flattened, distal third black, proximal two-thirds of inner and outer surface with a row of small black roundish spots. Claws simple.

Abdomen. Base of segment 7 with a middorsal pair of black dashes. Widest on segments 6 and 7. No dorsal hooks. Lateral spines on segments 5 to 10, the ones on segment 5 minute but distinct, the ones on segments 8 and 9 largest, the ones on segment 10 small. Inferior anal appendages slightly shorter than segments 9 and 10 together, the superiors about two-thirds as long as inferiors, the middorsal appendage a trifle shorter than inferiors (fig. 63). Gonapophyses reaching backward to well beyond segment 9.

The larva of *Neuraeschna harpya* was found in a small bush creek near the Wonotobo Falls by Dr. D. C. Geijskes. It was in the transformation period climbing up a grass stem at 9 a.m. After it was taken to the camp at the Wonotobo Falls, the imago appeared in the following night (Dr. Geijskes 1959, personal communication).

THE N. MAXIMA GROUP

N. maxima is characterized in both sexes by the strongly constricted abdomen on the third segment, and in the male sex by the very long, slender and forcipate superior anal appendages. Otherwise the species agrees with the characters of the *N. costalis* group.

Species of the *N. maxima* group: *N. maxima* spec. nov.

Neuraeschna maxima spec. nov.

(figs. 12, 57–59, 75)

Material. – Holotype: Brazil; State of Pará, Belem, Val-de-Can airport (5.30 a.m.), 11 September 1963, 1 ♂ (B. Malkin) in RNHL. Paratypes: Brazil: State of Pará, Belem (Utinga Forest), 10 October 1954, 1 ♂ 1 ♀ (allotype), both Inacio, CM; Belem, December 1954, 1 ♂, ex coll. Agriculture Station (D. C. Geijskes).

Male (holotype) – Total length 100 mm; abdomen 78 mm (incl. app. 9 mm); hind wing 67 mm; costal edge of pterostigma in fore wing 6 mm, in hind wing 4.5 mm.

Head. Face brown but anteclypeus darker and vertical part of frons blackish brown. Superior surface of frons blackish brown on anterior half, pale brown on basal half. Vertex black-brown. Scape of antenna black, the pedicel and distalia brown. Occipital triangle brown-yellow.

Pterothorax. Dark colour brown. On each lateral side of dorsum a large ovoid bluish green spot prolonged below in a narrow point at lateral end of transverse mesepisternal ridge (fig. 12). Mes- and metepimeral pale stripes greenish yellow, the area anterior to each pale lateral stripe lighter brown and the area posterior to each pale lateral stripe very dark brown.

Legs. Femora dark brown. Second and third tibiae red-brown, first tibia dark red-brown. Tarsi and claws blackish brown.

Wings. Hyaline with a distinct brown costal stripe extending from base to pterostigma, the brown colour of the costal stripe extending over adjoining interspace behind R1, between arculus and subnodus. Pterostigma, light yellow. Antenodals in fore wings 39, in hind wings 28–30.

Abdomen. Swollen on segments 1 and 2,

strongly constricted on segment 3, then gradually widening to apex of segment 10. Convex basal half of segment 9 nearly devoid of denticles. Anal appendages shaped as shown in figs. 57 and 58. Dorsal prolongation of base of inferior appendage moderately developed, not rising above superior appendages and not discernible in dorsal view of abdomen.

Female (allotype; much broken but details well-preserved; apices of anal appendages broken away). – Total length 97 mm (excl. app.); abdomen 75 mm (excl. app.); hind wing 70 mm; width of hind wing at nodus 18 mm; costal edge of pterostigma in fore wing 6.0 mm, in hind wing 4.8 mm.

Very similar to male regarding stature and coloration. Wings also very similar to those of holotype. Antenodals in fore wings 33–44, in hind wings 30–31. Fork of sternite of abdominal segment 10 shaped as in *N. costalis*. Anterior surface of base of fork with three (left side) and four (right side) small subsidiary teeth.

THE N. MAYORUNA GROUP

The unique specimen of *N. mayoruna* is a female which agrees with the characters of the *N. costalis* group except for point (2). *N. mayoruna* has no basal costal cross-veins, only basal subcostal cross-veins. In this respect it agrees with the members of the *N. dentigera* group and *N. claviforcipata* group. Further the female is distinguished from all other species of the genus in having the fork of the sternite of the tenth abdominal segment distinctly rising before the posterior side of the sternite (fig. 22).

Species of the *N. mayoruna* group: *N. mayoruna* spec. nov.

Neuraeschna mayoruna spec. nov.

(figs. 13, 22, 29)

Material. – Holotype: Peru: Dept. Loreto, Mishquiyacu (15 km from Iquitos), 29 July 1931, 1 ♀ (from Paul Nagel) in UMAA.

Female (holotype; apices of anal appendages broken away; wings slightly damaged). – Total length 85 mm (excl. app.); abdomen 65 mm (excl. app.); hind wing 61 mm; width of hind wing at nodus 17.5 mm; costal edge of pterostigma in fore wing 4.7 mm, in hind wing 3.5 mm.

Head. Face reddish brown-yellow. Superior surface of frons dark brown on anterior half, pale brown on basal half (fig. 13). Vertex black. Antennae with black scapes, the pedicels and distalia brown. Occipital triangle black.

Pterothorax. Obscured through post mortem discolouration but there is something like a pale stripe discernible on mes- and metepimeron.

Legs. Femora reddish brown. Dark brown at knees, on tibiae, tarsi and claws.

Wings. Brown tinged with a distinct brown costal stripe extending from base to pterostigma; the brown colour of the stripe faintly developed in adjoining interspace behind R1, between arculus and subnodus. Pterostigma yellow. Antenodals in fore wing 41–45, in hind wing 32–33. Wings with only a single basal subcostal cross-vein. Area between Cu1 and Cu2 with two rows of cells for its proximal one-fourth portion (in left hind wing with an extra third cell) followed by one row of cells; Cu2 sagged out on this proximal one-fourth portion.

Abdomen. Very dark brown, moderately swollen on segments 1 and 2, not constricted on segment 3, then gradually narrowing to apex of segment 7. Fork of sternite of tenth segment shaped as shown in figs. 22 and 29; anterior surface of base of fork with a subsidiary tooth on each side.

Neuraeschna spec. indet.

(figs. 15, 23, 30)

Material. – Brazil: State of Santa Catarina, Joinville, 1 ♀, Staudinger & Bang-Haas vend., BMNH (ex coll. Cowley, No. 9994).

Female (frons above transversely crushed; apices of anal appendages broken away; wings slightly damaged). – Total length 86.5 mm (excl. app.); abdomen 66.5 mm (excl. app.); hind wing 66 mm; width of hind wing at nodus 18.5 mm; costal edge of pterostigma in fore wing 6.3 mm; in hind wing 5.0 mm.

Head. Face brown-yellow. Superior surface of frons predominantly pale brown, the central portion becoming darker brown, the anterior border broadly brown-yellow (fig. 15). Vertex laterally brown-yellow, in middle darker brown. Scape of antenna dark brown, pedicel brown-yellow, distalia brown.

Pterothorax. Due to post mortem discoloration there are no pale markings discernible on the dorsum. Posterior half of mes- and metepimeron blackish brown; each of these dark streaks preceded by brown areas (the usual pale lateral stripes being apparently discoloured).

Legs. Femora brown, dark brown at knees. Second and third tibiae red-brown. Tarsi, claws and first tibia dark to very dark red-brown.

Wings. Hyaline proximal to nodus, brown

tinged distal to nodus. There are distinct brown costal stripes extending from base to pterostigma, the brown colour of the stripe not extending over adjoining interspace behind R1, between arculus and subnodus. Pterostigma yellow. Antenodals in fore wings 36–37, in hindwings 24–26.

Abdomen: Dark brown. Moderately swollen on segments 1 and 2, then gradually narrowing to apex of segment 7. Fork of tenth sternite shaped as shown in figs. 23 and 30; anterior surface of base of fork with six small subsidiary teeth.

This female is the only specimen of *Neuraeschna* reported from the subtropical region. It highly probable belongs to a member of the *N. costalis* group. Though very closely allied with *N. costalis* it seems to be inconspecific with it unless the subtropical representatives of this species have a paler frons and larger proportions. By the absence of sufficient clear distinguishing characters I have refrained from giving it a name.

THE STATUS OF NEURAESCHNA ROSTRIFERA MARTIN

In his monograph of 1909 (pag. 208, 209; fig. 214), Martin described *Neuraeschna rostrifera* on the basis of a unique male from Suriname. The late lamented Dr. D. C. Geijskes, who was most interested in the odonate fauna of Suriname, located and studied (June 1966) the male holotype of *Neuraeschna rostrifera* in René Martin's collection. On his return from Paris he communicated me that the type fell beyond the limits of the genus *Neuraeschna* simply because the subcosta was not prolonged through and after the nodus.

In my opinion the holotype of *N. rostrifera* is no more than a variation of *Heliaeschna simplicia* (Karsch) **syn. nov.**, an Old World species described and figured in Martin's same monograph (pag. 160, 161; fig. 161). The reference to the locality "Surinam" on the pin label of the holotype of *N. rostrifera* may be an *error pro* Sumatra, an island where *H. simplicia* occurs (cf. Lieftinck, 1954: 104, 105).

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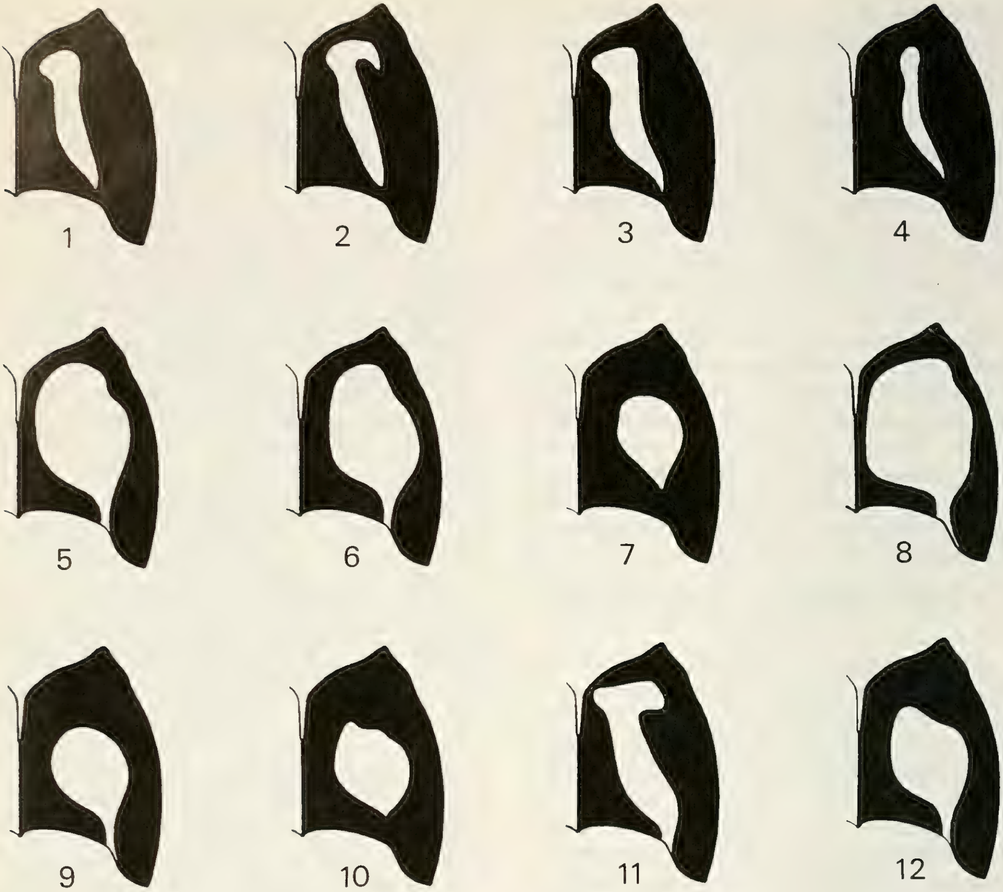
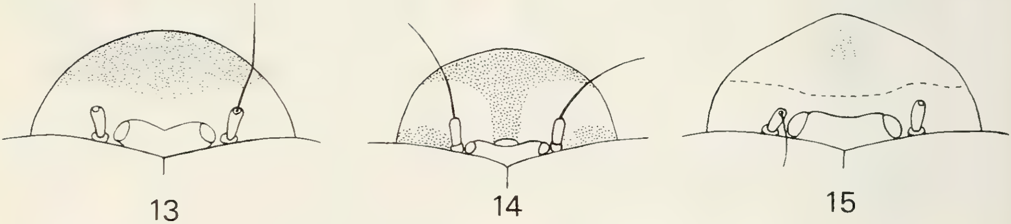




Figs. 1–12. Diagram of colour pattern of left lateral side of thoracic dorsum of males in *Neuraeschna*: 1, *dentigera* (lectotype); 2, *cornuta* (holotype); 3, *claviforcipata* (lectotype); 4, *claviforcipata* (Venezuela); 5, *costalis* (Surinam); 6, *producta* (paratype); 7, *calverti* (Surinam); 8, *calverti* (Brazil); 9, *titania* (paratype, Peru); 10 *maya* (holotype); 11, *harpya* (lectotype); 12, *maxima* (holotype).

Figs. 13–15. Colour pattern of superior surface of frons in *Neuraeschna*: 13, *mayoruna* (holotype); 14 *harpya* (♂ Suriname); 15 spec. indet.

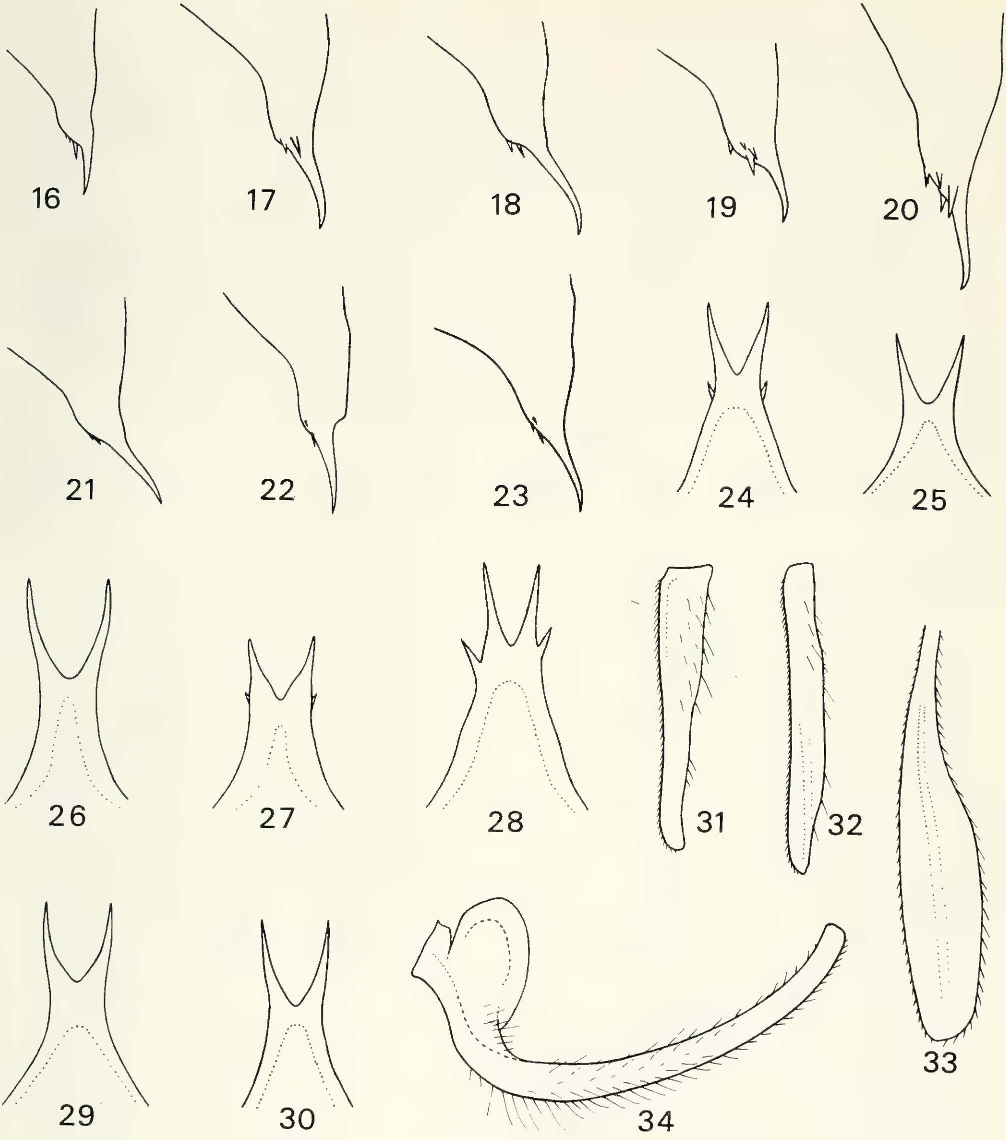
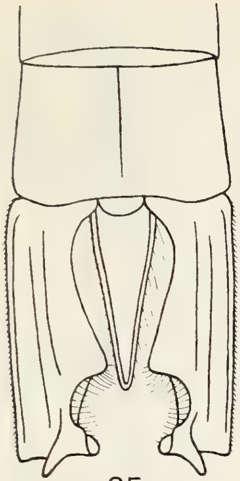


Fig. 16–23. Left profile view of ventral process on abdominal segment 10 of female in *Neuraeschna*: 16, *claviforcipata* (Ecuador); 17, *costalis* (Brazil); 18, *producta* (paratype); 19, *calverti* (allotype); 20, *titania* (allotype); 21, *maya* (allotype); 22, *mayoruna* (holotype); 23, spec. indet.

Figs. 24–30. view of ventral process on abdominal segment 10 of female in *Neuraeschna*: 24, *costalis* (Brazil); 25, *maya* (allotype); 26, *producta* (paratype); 27, *calverti* (allotype); 28, *titania* (allotype); 29, *mayoruna* (holotype); 30, spec. indet.

Figs. 31–33. Dorsal view of left anal appendage of female in *Neuraeschna*: 31, *costalis* (Suriname); 32, *harpya* (Surinam); 33, *claviforcipata* (Ecuador. Basal one-tenth portion of distorted appendage not depicted).

Fig. 34. Left profile view of lamina supra-analis (inferior appendages) of male in *Neuraeschna costalis* (Brazil).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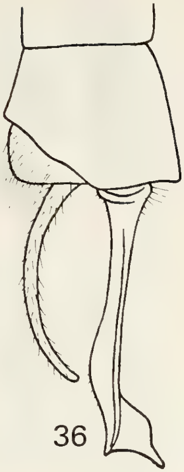
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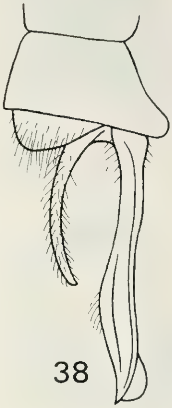
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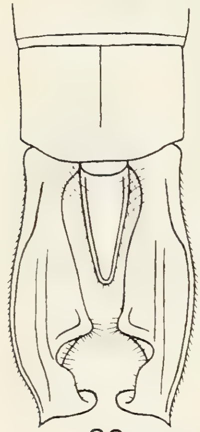
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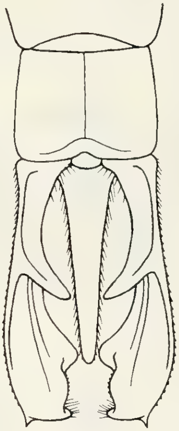
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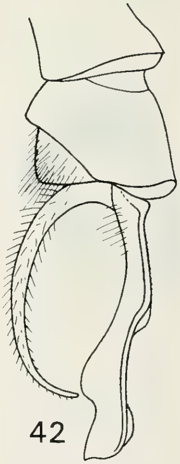
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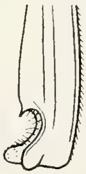
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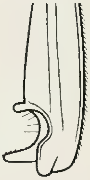
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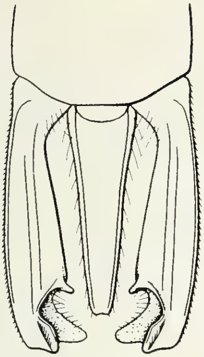
Figs. 35–42. Improved versions of figs. 210–213 in Martin, 1909. *Neuraeschna costalis*, ♂: 35, tenth abdominal segment and anal appendages, dorsal; 36, the same, left profile. *Neuraeschna harpya*, ♂: 37, tenth abdominal segment and anal appendages, dorsal; 38, the same, left profile. *Neuraeschna claviforcipata*, ♂: 39, tenth abdominal segment and anal appendages, dorsal; 40, the same, left profile. *Neuraeschna dentigera*, ♂: 41, tenth abdominal segment and anal appendages, dorsal; 42, the same, left profile.

Fig. 43. *Neuraeschna costalis*, ♂. Apex of left superior appendage, left profile (BMNH).

Figs. 44–46. Dorsal view of apex of left superior appendage of male in *Neuraeschna*: 44, *maya* (holotype); 45, *calverti* (Suriname); 46, *calverti* (Brazil).



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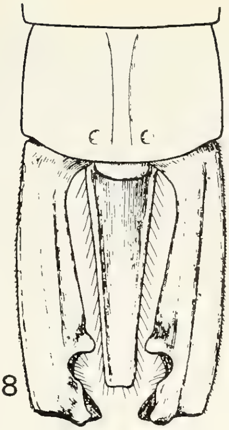

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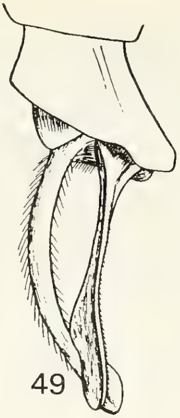

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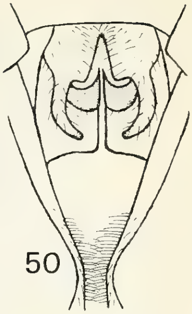

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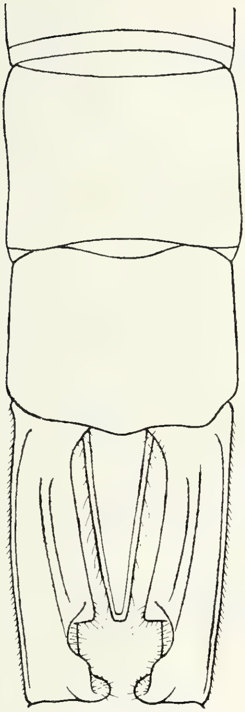

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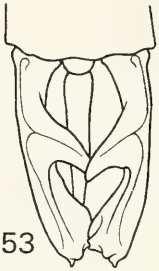

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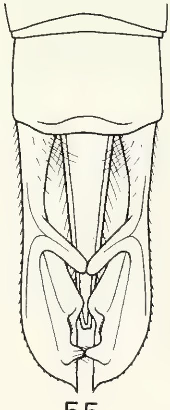

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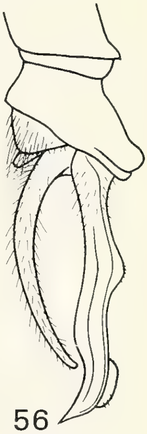

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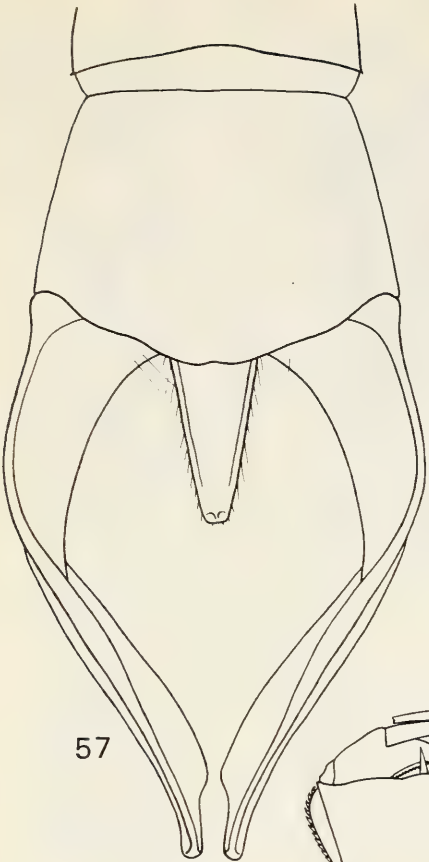
Fig. 47. *Neuraeschna calverti*, ♂. Anal appendages, dorsal (improved version of fig. 1 in Kimmins, 1951). Figs. 48, 49. *Neuraeschna producta*, ♂ (after Kimmins, 1933): 48, tenth abdominal segment and anal appendages, dorsal; 49, the same, left profile.

Figs. 50–52. *Neuraeschna titania*, ♂ holotype: 50, accessory genitalia, ventral; 51, apical segments of abdomen with anal appendages, dorsal; 52, the same, left profile. Figs. 53, 54. *Neuraeschna mina*, ♂ holotype (after Williamson & Williamson, 1930): 53, anal appendages, dorsal; 54, tenth abdominal segment and anal appendagesin left profile. Figs. 55, 56. *Neuraeschna cornuta*, ♂ holotype: 55, tenth abdominal segment and anal appendages, dorsal; 56, the same, left profile.



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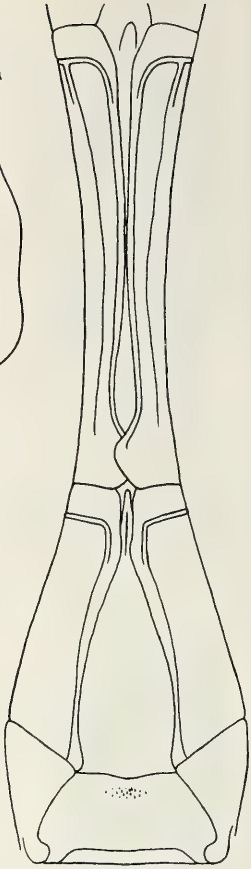

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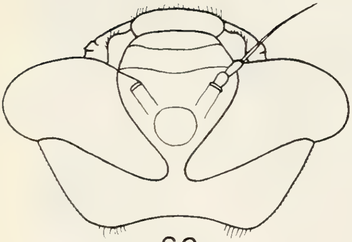

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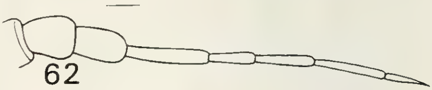

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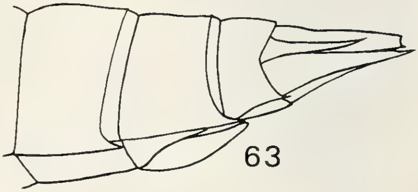

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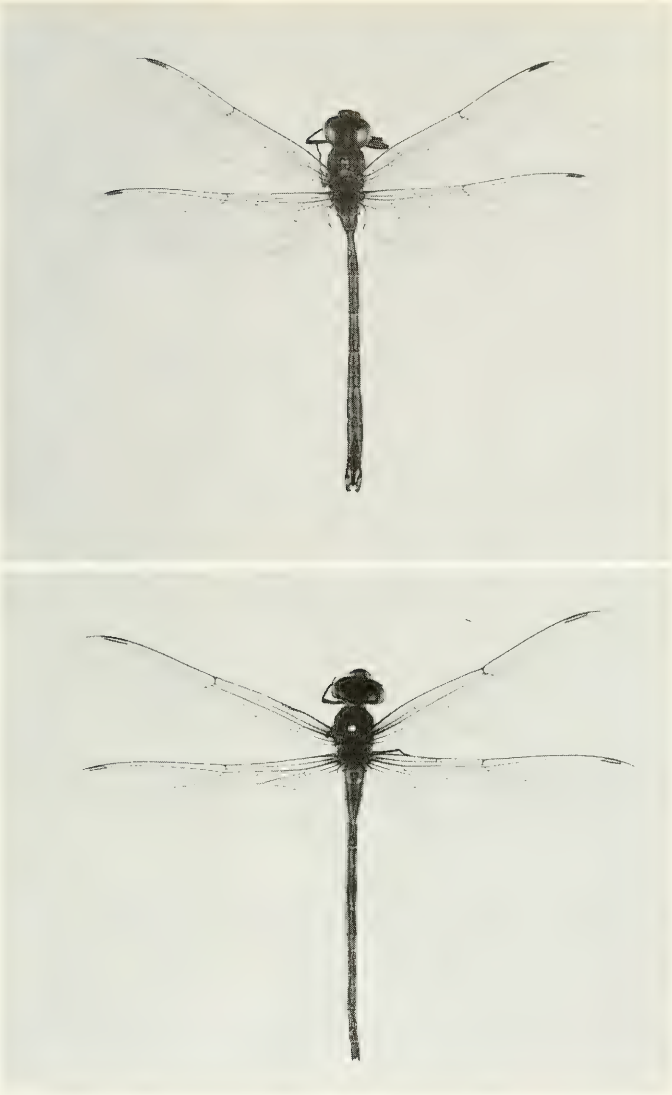
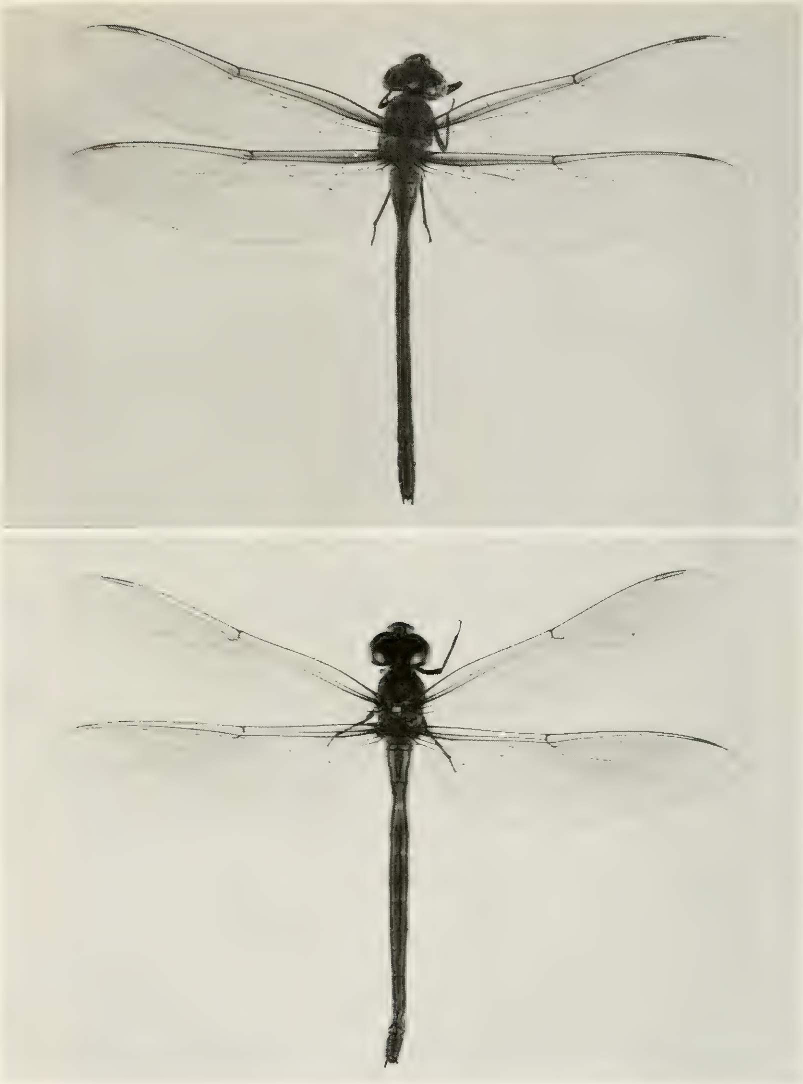
Figs. 57–59. *Neuraeschna maxima*: 57, tenth abdominal segment and anal appendages of ♂ paratype, dorsal; 58, the same, left profile; 59, basal segments of abdomen of ♀ allotype, ventral.

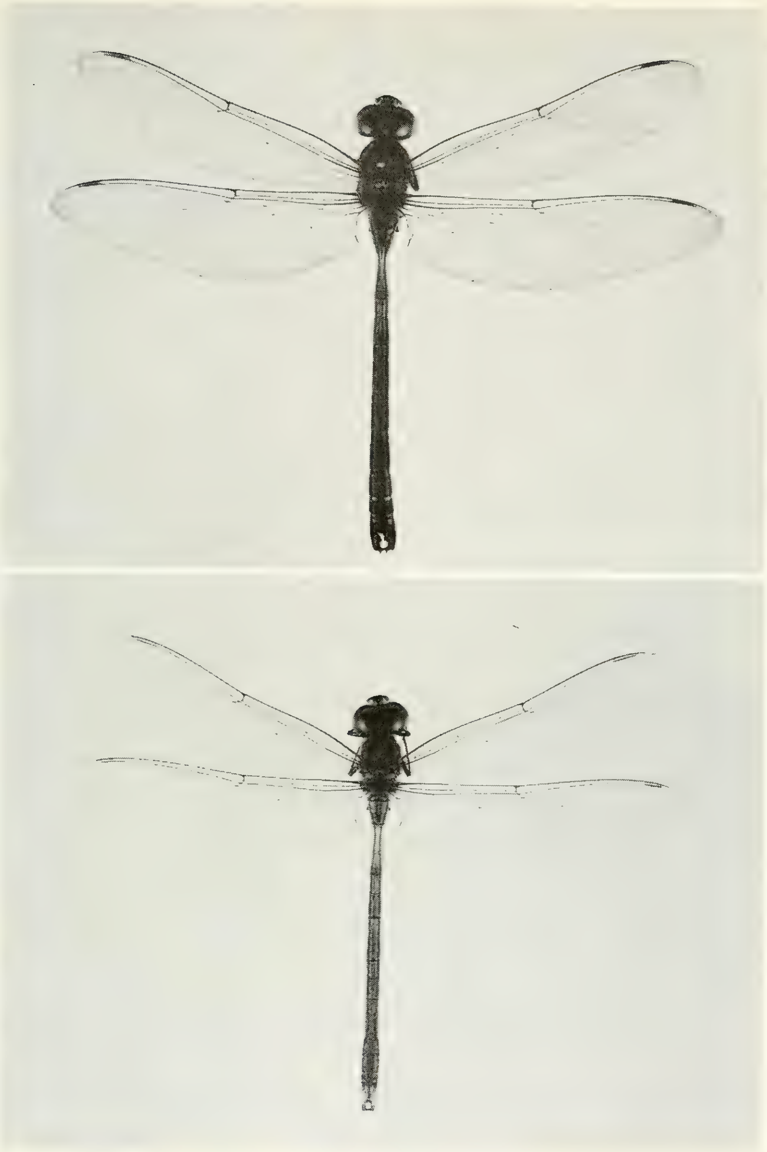
Figs. 60–63. *Neuraeschna harpya*, ♀ exuviae: 60, head, dorsal; 61, mentum, ventral; 62, right antenna, dorsal; 63, apical segments of abdomen with anal appendages, left profile.



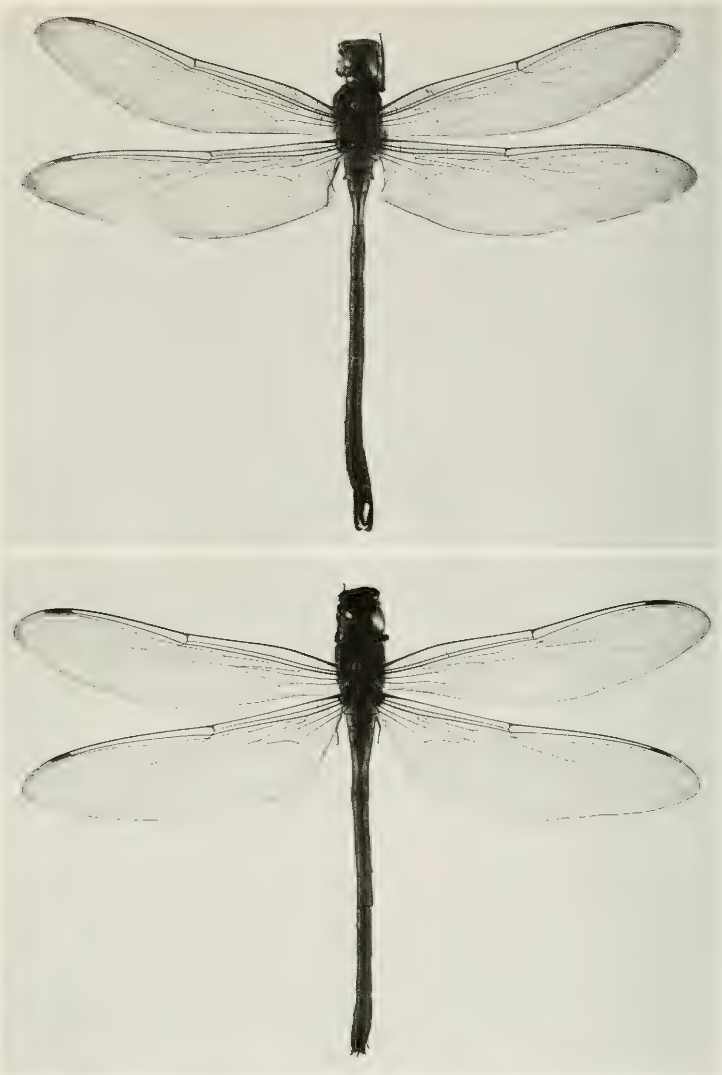
Figs. 64–65.—64, *Neuraeschna dentigera* Martin, ♂ syntype; 65, *Neuraeschna claviforcipata* Martin, ♀ Suriname.



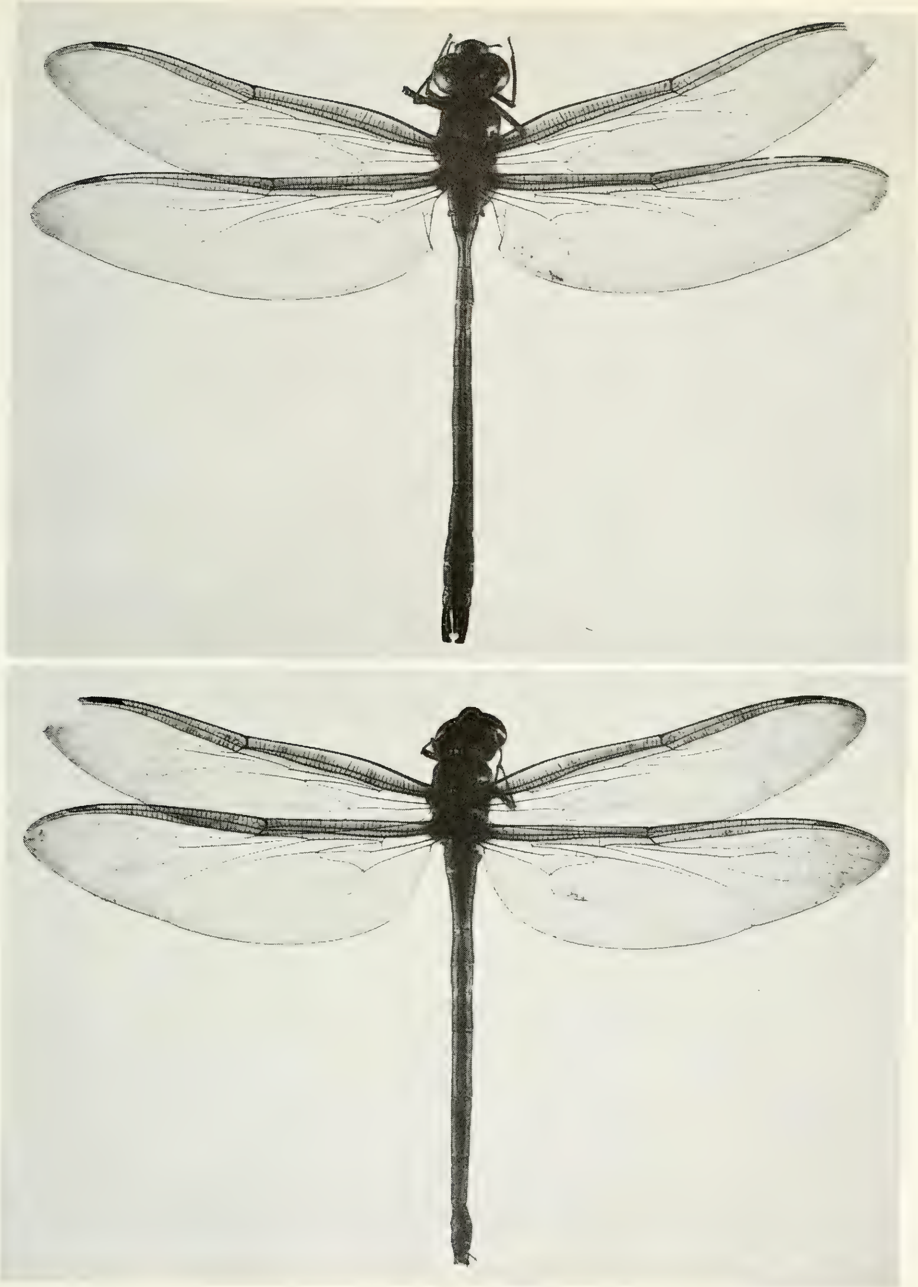
Figs. 66–67.—66, *Neuraeschna costalis* (Burmeister), ♀ holotype; 67, *Neuraeschna costalis* (Burmeister), var. *hyalinata* nov., ♀ Suriname.



Figs. 68–69.—68, *Neuraeschna costalis* (Burmeister), var *hyalinata* nov., ♂ Suriname; 69, *Neuraeschna harpya* Martin, ♂ Suriname.



Figs. 70–71.—70, *Neuraeschna calverti* Kimmins, ♂ holotype; 71, *Neuraeschna calverti* Kimmins, ♀ allotype.



Figs. 72–73.—72, *Neuraeschna titania* spec. nov., ♂ holotype; 73, *Neuraeschna titania* spec. nov., ♀ paratype from same locality as holotype.

Figs. 74–75.—74, *Neuraeschna maya* spec. nov., ♀ paratype, Honduras (IRSN); 75, *Neuraeschna maxima* spec. nov., ♂ paratype (RNHL).

A NEW *SAPRINUS* FROM IRIAN JAYA (COLEOPTERA: HISTERIDAE)

by

P. KANAAR

ABSTRACT

Kanaar, P., 1989. A new *Saprinus* from Irian Jaya (Coleoptera, Histeridae). — Tijdschrift voor Entomologie 132: 285-287, figs. 1-5 [ISSN 0040—7496]. Published 1 December 1989.

Saprinus grandiclava sp.n. is described from Irian Jaya. It belongs to the primitive group of Australian and Pacific *Saprinus*-species with non-fused paramera.

Key words. — Histeridae, new species, Irian Jaya, Oriental region.

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INTRODUCTION

In 1973 the Rijksmuseum van Natuurlijke Historie in Leiden obtained the beetle collection of the late P. H. van Doesburg Sr. This collection contains predominantly beetles collected in the former Dutch East Indies. Among the unidentified Histeridae in this collection I found some specimens of a new *Saprinus*-species from Hollandia in the former Dutch New Guinea (present name: Jayapura, Irian Jaya, Indonesia). The description is as follows:

Saprinus grandiclava sp.n.

(figs. 1—5)

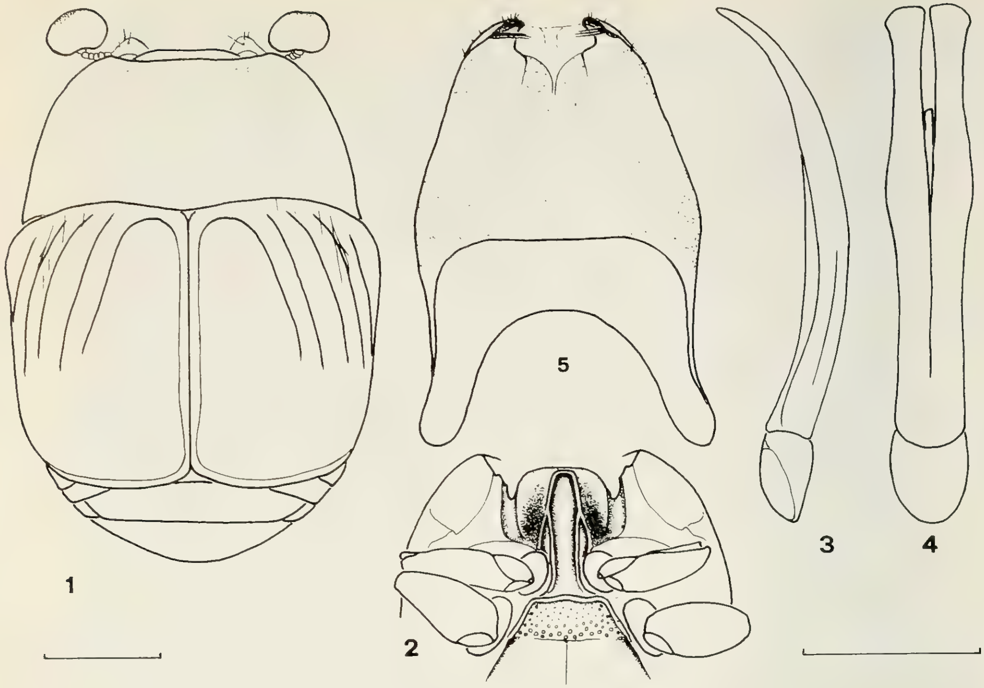
Description

Body outline (fig. 1) broadly oval, moderately convex. Length of body (head, propygidium and pygidium excluded): 4.0 mm., width of body: 3.3 mm. Colour brownish black, shiny; vertex and elytra metallic blue, pronotum with cupreous metallic lustre.

Head: Mandibulae regularly bent, convex, punctured, tip sharply pointed. Labrum transverse, emarginate. Clypeus continuous with front, hardly convex, finely punctate. Front flat, moderately and scarcely punctate. Frontal stria interrupted, continuous with supraorbicular striae. Eyes reniform, of normal size and prominence. Antennae: Segment 1 clubshaped, bent, with 3 setae and fine microsculpture of parallel lines; segment 2 about as long as wide, segment 3 longer than wide, segments 4-7 transverse. Antennal clubs very large, transverse reniform, entirely pubescent, their greatest (transverse) length 0.65 × the distance between the eyes on the vertex; no sutures visible by pubescence, undersides with a large reniform, flaccid impression; no sensorial plaques or pits visible.

Pronotum: Two times wider than long in median line; base bisinuate, lateral sides moderately convergent, near apex bent interiorly, anterolateral angles blunt, emargination for the head moderately deep. Marginal stria complete, though very fine behind head. Foveolae behind eyes well-developed; disk punctulate, along both sides a band of coarse punctures, slightly impressed at apical onethird. Coarse punctures along base; epipleura not fimbriate. Scutellum triangular.

Elytra: Together 1.3 times wider than long, disk and lateral sides punctulate, apical half moderately punctate, punctation reaching humeral bosses in interstria 1, and slightly entering interstriae 2-4. Punctation towards apex smaller and denser, reaching apical stria. Humeral bosses prominent. Sides moderately convergent posteriorly, straight, near the apex bent interiorly, apex of each elytron roundedly truncate. Marginal epipleural stria distinct, ending shortly before posterolateral angle. Marginal elytral stria distinct, continuous with complete apical stria. Outer subhumeral stria short, basal. Inner subhumeral stria medial, punctate, reaching a little beyond dorsal stria 1, continuous with distinct oblique humeral stria. Four dorsal striae, punctate, ending a little beyond elytral mid-



Figs. 1—5: *Saprinus grandiclava* nov.spec. 1: Body outline. 2: Pro- and mesosternum. 3: Aedeagus, right lateral view. 4: Aedeagus, dorsal view. 5: Eight sternite, ventral view. Scale lines: Left 1 mm. (figs. 1, 2), right 0.5 mm. (figs. 3—5).

dle, striae 1 and 3 a little longer than striae 2 and 4. Stria 4 connected in an arch with complete sutural stria, these continuous with apical stria. Interstrial distance 2 wider than interstrial distances 1 and 3. Longitudinal strioles near base of stria 1 and 2.

Propygidium: Short, moderately punctate with few punctules intermixed, finely microsculptured between punctures; faint impressions laterally.

Pygidium: Punctured and microsculptured as propygidium, punctures near apex smaller.

Prosternum (fig. 2): Internal prosternal striae convergent between procoxae, next slightly divergent anteriorly, then bent with blunt angles and slightly convergent, at the apex united in a short transverse arch. These striae gradually deeper anteriorly, sulciform, giving margins of prosternal keel a convex ridgelike appearance. Prosternal keel between striae slightly convex, minutely punculate. No true lateral prosternal striae, these replaced by descending ridges, which are deeply delimited behind, and fuse with margins of prosternal keel at position of the blunt angles. Antennal grooves large and deep, encroaching upon prosternal keel, prosteriorly delimited by the descending lateral prosternal ridges, anteriorly not delimited by a ridge. Grooves for the antennal funicles wide and deep.

Mesosternum (fig. 2): Fine marginal stria complete; anterior part finely punctate, posterior part with coarse punctures, meso-metasternal suture barely visible, straight, laterally obsolete.

Metasternum: Disk finely punctulate, before posterior margin and along oblique lateral striae with coarser punctures. Slightly impressed along median line, especially anteriorly and posteriorly; median line ending a little before hind margin. Oblique lateral metasternal striae ending amply before hind coxae, slightly sulciform anteriorly.

Abdomen: First visible abdominal sternite with coarse punctures along anterior margin, smaller punctures laterally and behind, disc finely punctulate. Oblique postcoxal striae ending a little before hindmargin. Other sternites moderately punctate.

Legs: Protibiae with six teeth at outer margin, 4 additional minute denticles proximally, and 3 small apical teeth. Meso- and metatibiae spinulate at superior edge. Tarsae fimbriate inferiorly.

Genitalia: Aedeagus (figs. 3, 4): Slightly curved, parameres not fused with penis, their tips roundedly truncate. Eighth sternite: fig. 5.

Holotype: "HOLLANDIA / NW. GUINEA / P. H. V. DOESBURG"; "Museum Leiden / collectie / Van Doesburg / rec. 1973"; red label: "Holotype ♂ / Saprinus / grandiclava / P. Kanaar des. 1989".

Holotype missing right mesotarsus, and 3 distal lids of left mesotarsus and right metatarsus respectively. The alae are stretched out. Allotype: Same data as holotype, length: 4.3 mm. Width: 3.6 mm. Metasternum without impression. Vaginal palpes deeply triangularly emarginate at apex, styli long. Paratypes: 1 male, 2 females, same data as holotype.

Variability: The divergency of the prosternal striae varies a little; in one of the female paratypes the striae are parallel, the blunt angles barely indicated.

Holotype, allotype and one paratype in the collection of the Rijksmuseum van Natuurlijke Historie in Leiden, two paratypes in the author's private collection, which has been legated to the same museum.

DISCUSSION

According to P. H. van Doesburg Jr. his father has never been in Dutch New Guinea himself (personal communication). The beetles from Hollandia and surroundings were collected on his request and sent to him by one of his friends, Mr. W. Stüber. Nothing is known about the date of the capture or the circumstances under which the beetles were found. Details concerning the collecting-activities of Mr. Stüber are given by Lieftinck (1932).

The new species belongs to a group of Australian and Pacific species, in which the paramera are not fused with the penis. This is considered to be a primitive feature (Dahlgren 1971). The absence of sensorial plaques or pits on the antennal clubs might be a primitive character too. *Saprinus grandiclava* differs among other things from all other members of this group by the different form of the paramera and 8th sternites, which were pictured by Dahlgren (1962, 1968, 1971). The antennal clubs are unusually big; in the other members of this group the clubs are of normal proportions in *Saprinus pseudocyaneus* White, *S. australis* Boisduval (syn.: *S. tasmanicus* Marseul) and *S. detritus* Fabricius (syn. *S. antipodus* Dahlgren); in the descriptions of the other species of the group, not known to me (*S. amethystinus* Lewis and *S. tyrrhenus* Blackburn), nothing is said about the dimension of the clubs, apparently being of normal proportions.

Note: The name of the species is based on the strikingly big antennal clubs.

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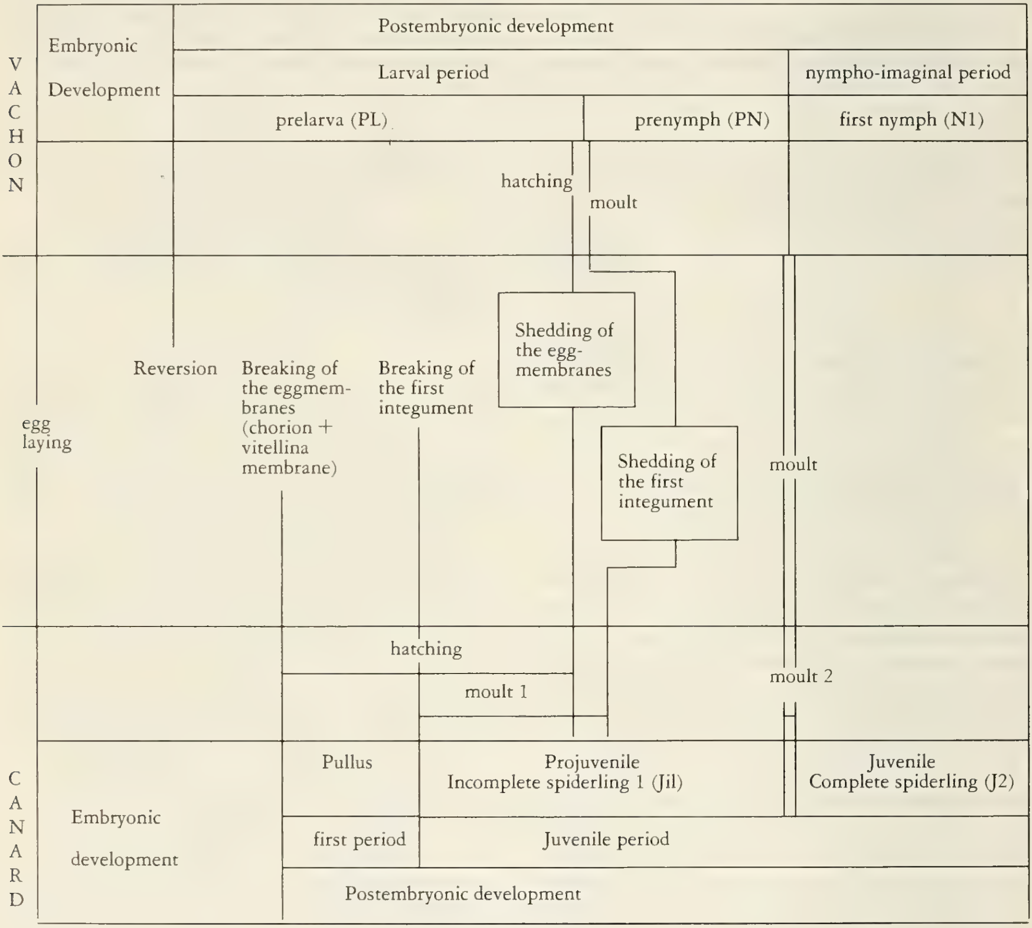
RECTIFICATION

The editors regret that the following table was accidentally omitted in the previous issue from: Th. G. H. Platel, The egg laying and larval development of *Pholcus phalangioides* (Fuessling) (Araneae: Pholcidae), Volume 132: 135–147.

Table 4. Characteristics of the first post-embryonic stages with *Pholcus phalangioides*. A comparison of the terminology of Vachon (1957) and Canard (1984, personal statement 1985).



TIJDSCHRIFT VOOR ENTOMOLOGIE

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DE NEDERLANDSE ENTOMOLOGISCHE VERENIGING

REGISTER VAN DEEL 132 / *Index to volume 132*

Een sterretje duidt een naam aan die nieuw is voor de wetenschap; cursieve paginanummers verwijzen naar de beschrijvingen van nieuwe taxa.
An asterisk denotes a name new to science; numbers in italics refer to descriptions of new taxa.