

## NAUCORIDAE, NEPIDAE AND NOTONECTIDAE, MAINLY FROM SULAWESI AND PULAU BUTON (INDONESIA)

Notes on Malesian aquatic and semiaquatic bugs (Heteroptera), I.

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Apart from new records for many species, mainly for Sulawesi, P. Buton and Sabah (N. Borneo), eight new species are described. Naucoridae: *Aphelocheirus breviculus* sp. n. (Sabah), *A. robustus* sp. n. (Sulawesi), *Coptocatus stereos* sp. n. (Sabah); Nepidae: *Ranatra sulawesii* sp. n. (Sulawesi); Notonectidae: *Enithares caesaries* sp. n., *E. lansburyi* sp. n., *E. phenakismos* sp. n. (all from Sulawesi) and *E. skutalis* sp. n. (P. Buton).

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Key words. – Sulawesi; Buton; Sabah; Nepomorpha; keys; new species.

During the last decades the study of Nepomorpha and Gerromorpha of Indonesia and Malaysia is making some progress (see e.g. Lansbury 1964-1985, La Rivers 1970, Polhemus 1986, Polhemus & Polhemus 1988). New expeditions to formerly unexplored areas and even rather occasional trips to already explored regions (see e.g. Nieser & Chen 1991), however, are still adding new species and new distributional data to our knowledge. As in many other groups, a high proportion of the species in this region seems to have limited ranges. In water bugs these restricted ranges are usually apparent in stream inhabiting species, whereas many of the widespread species occur in or on ponds in cultivated areas.

The species dealt with in this paper were mainly collected by J. P. Duffels, J. van Tol and N. Nieser on several expeditions to the eastern part of Sulawesi, the nearby island of Buton and Borneo.

Keys to the Malesian genera are included. Keys to species of Sulawesi and Pulau Buton are given for most genera, but they should be used with extreme caution as the fauna of the region is still poorly known.

Measurements are in millimeters and present the range or the (arithmetic) mean based on five randomly chosen specimens, or in case there are less than five, on all specimens available. The width of the head is measured across the eyes.

### MATERIAL

A list of collecting localities of N. Nieser is presented in appendix 1. Sampling stations of J. P. Duffels and J. van Tol are partly connected with 'Project Wallace' and with the '1989 RMNH Expedition to Sulawesi'. Data on the latter expedition will extensively be described in a separate paper (Van Tol et al. in prep.). All other sampling stations of both collectors, including those on Borneo, are summarized in appendix 2.

In addition to these recent collections, miscellaneous Malesian material in the RMNH collection has been included. Specimens collected by J. P. Duffels are deposited in ZMA, those by J. van Tol in RMNH, and those by N. Nieser in his own collection, unless stated otherwise. Deposition of material is specified only with rare or new species.

The areas in Sulawesi used with the localities agree with the Indonesian provinces, viz. Sulawesi Utara for Northern Sulawesi (Celebes), Sulawesi Tengah for Central Sulawesi and Sulawesi Tenggara for Southeastern Sulawesi. Pulau Buton is mentioned separately although it belongs administratively to Sulawesi Tenggara (see Whitten et al. 1988). Localities are in Indonesia, unless stated otherwise.

Collections from which material has been studied (with abbreviations in brackets): Museum



Zoologi Bogor, Bogor, Jawa (MBBJ); Bagian Pertanian, Universitas Haluoleo, Kendari, Sulawesi (BPUH); J. T. Polhemus collection (University of Colorado Museum), Englewood, Co., U. S. A. (JTPC); Snow Entomological Museum, University of Kansas, Lawrence, Kansas, U. S. A. (SEMC); N. Nieser collection, Tiel, The Netherlands (NC); Oxford University Museum, Oxford, United Kingdom (OXUM); National Museum of Natural History (Rijksmuseum van Natuurlijke Historie), Leiden, The Netherlands (RMNH); Zoölogisch Museum, Afdeling Entomologie, Amsterdam, The Netherlands (ZMA).

#### ACKNOWLEDGEMENTS

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#### SYSTEMATIC PART

#### NAUCORIDAE

#### Key to Indonesian and East Malaysian genera

1. Rostrum slender, longer than fore femora, reaching to middle coxae (Aphelocheirinae) ..... *Aphelocheirus* Westwood
- Rostrum stout, very broad at base, much shorter than fore femora (Naucorinae) ..... 2
2. Rostrum inserted at anterior margin of head, labrum distinct and well developed ..... 3
- Rostrum inserted in a deep excavation, distinctly posterior to the apical margin of head, labrum often greatly reduced (Cheirochelini) ..... 5
3. Fore tarsi one-segmented, with one single very small claw (Naucorini) ..... *Naucoris* Fabricius
- Fore tarsi two-segmented, with two claws, which are often very inconspicuous (Laccorini) ..... 4
4. Labrum more or less equilaterally triangular with an acute tip ..... *Laccocoris* Stål
- Labrum with sides shorter than base and tip broadly rounded ..... *Heleocoris* Stål
5. Head ventrally with well developed grooves in which fit the antennae ..... *Coptocatus* Montandon
- Antennal grooves absent ..... 6
6. Ventral margin of prothorax with a conspicuous pit covered with a membrane or specialized pilosity (static sense organ), body elongate,

- connexival angles blunt, not spinose, consequently lateral edge of abdomen more or less continuous ..... 7
- Static sense organ on ventral margin of prothorax absent, body oval, connexival angles sharp, usually spinose, consequently lateral edge of abdomen distinctly serrate ..... 9
7. Static sense organ slightly anterior to midway of lateral margin of prothorax, ventral keel of head strongly developed with an anterior spine-like tip, which is at least as long as first rostral segment ..... *Idiocarus* Montandon
  - Static sense organ near or at antero-lateral angle of prothorax, ventral keel of head normal, without a prominent anterior spine ..... 8
  8. Static sense organ rounded, placed at extreme antero-lateral angle of prothorax, which is cup-shaped; anteclypeus short, broadly and evenly rounded ..... *Nesocricos* La Rivers
  - Static sense organ elongate, placed half to three-quarters of its length caudad to antero-lateral angles of prothorax; anteclypeus quite long with sinuate margins producing a medio-anterior lobe ..... *Tanycrios* La Rivers
  9. Mesotibia distally with five or six decreasingly sized, transverse rows of dense, short spines ..... *Cavocoris* La Rivers
  - Mesotibia with at most two of such rows of spines ..... 10
  10. Anteclypeus prolonged, overhanging part being half to three-quarters the length of labral base ..... *Warisia* La Rivers
  - Anteclypeus short, overhang at most one third of the length of labral base ..... 11
  11. Abdominal venter showing only four segments ..... *Quadricoris* La Rivers
  - Abdominal venter showing the usual five segments ..... 12
  12. Larger species, length over 7 mm; abdomen asymmetrical ..... *Sagocoris* Montandon
  - Smaller species, length slightly less than 7 mm; abdomen symmetrical ..... *Aptinocoris* Montandon

Remarks. - Except for *Sagocoris*, which has also one representative in the Philippines, the last mentioned eight genera are restricted to New Guinea.

In the species of Naucoridae described below, the first abdominal segment is not visible. The numbers used are the morphological homologous numbers, thus 'tergites 2-8' are visible as tergites 1-7.

#### *Aphelocheirus* Westwood, 1833

Southeast Asiatic species of the genus were re-



cently revised by Polhemus & Polhemus (1988). About 18 species are known from Malesia, including the Philippines, but more species are to be discovered. Species of *Aphelocheirus* are easily overlooked by the casual collector as most burrow in the bottom of streams. Thanks to their plastron respiration they do not need to surface to refill their air store.

#### Key to *Aphelocheirus* of Sulawesi

1. Lateroposterior spines of connexiva 4-5 short and broad; body length of male 8.9-9.1 mm, of female 8.5-8.8 mm (Sulawesi Selatan) ..... *A. celebensis* Polh. & Polh.
- Lateroposterior spines of connexiva 4-5 rather long and acute; body length of male c. 10 mm, of female more than 9.2 mm ..... 2
2. Male: Left paramere with a broad hooked apex (fig. 5). Female: Genital operculum short and broad with convex caudo-lateral angles (fig. 3) (Sulawesi Tenggara) ..... *A. robustus* sp. n.
- Male: Left paramere with a slender curved apical part. Female: Genital operculum rather long and slender with apical lateral margins very slightly concave (Sulawesi Tengah) ..... *A. lorelindu* Polh. & Polh.

#### *Aphelocheirus lorelindu* Polhemus & Polhemus

*Aphelocheirus lorelindu* Polhemus & Polhemus, 1988: 190-192, figs. 18-21, 164.

Material. - Sulawesi Tengah: Palu, 50 km SE of: Lore Lindu NP, Sopo river near Dongi Dongi, 950 m, SJ 86, 8 Dec 1985, J. van Tol, 3 ♀, (RMNH).

Distribution. - Known only from the Lore Lindu N. P. in Central Sulawesi, and surrounding areas.

#### *Aphelocheirus breviculus* sp. n. (figs. 1-2)

Type material. - Holotype ♀: Malaysia: S. Sabah: 105 km S of Beaufort, Long Pasia area, Sungai Ritan, 4° 24' N 115° 42' E, 1160 m, undisturbed evergreen tropical rainforest, 9.IV.1987, J. van Tol & J. Huisman (RMNH). - Paratypes: 2 ♀ with same data (RMNH, NC).

#### Description

Brachypterous female. - Rather small species, form elongate oval, length 7.7-8.1 mm, width of head 1.8-1.9 mm, maximum width across abdomen 4.9-5.1 mm.

Colour greyish brown, head on dorsal side yellow to light brown, posteriorly darker, with black eyes; pronotum, hemielytra and tergites greyish to brown, margins and scutellum paler; legs and ven-

ter yellowish to light brown, central part of thoracic and abdominal sternites greyish, pruinose, with sparse golden pubescence.

Head. Shining, coarsely punctate, produced ahead of eyes for distance equal to 0.5 the length of an eye; eyes twice as long as wide, outer margins sinuate, due to weakly developed antero-lateral flange; anterior / posterior interoculus = 1.3/1.0 mm.

Thorax. Pronotum shining, roughly punctate, antero-medially rugose; very sparsely set with inconspicuous short fine pale setae, width / length 3.5; lateral margins bearing about twelve stout minute erect setae. Scutellum shining, rugose, width / length 2.5, lateral margin hardly sinuate, shallow transverse sulcus present along anterior margin (to fit the posterior margin of pronotum). Hemielytra not touching medially, leaving an area 0.4 mm wide of metanotum uncovered; posteriorly not reaching the hind margin of abdominal tergite 2, surface punctate-rugose, claval area shining, dull in remainder, clavus not delineated; embolar margin evenly curving anteriorly, its posterior angle strongly produced laterally (fig. 1).

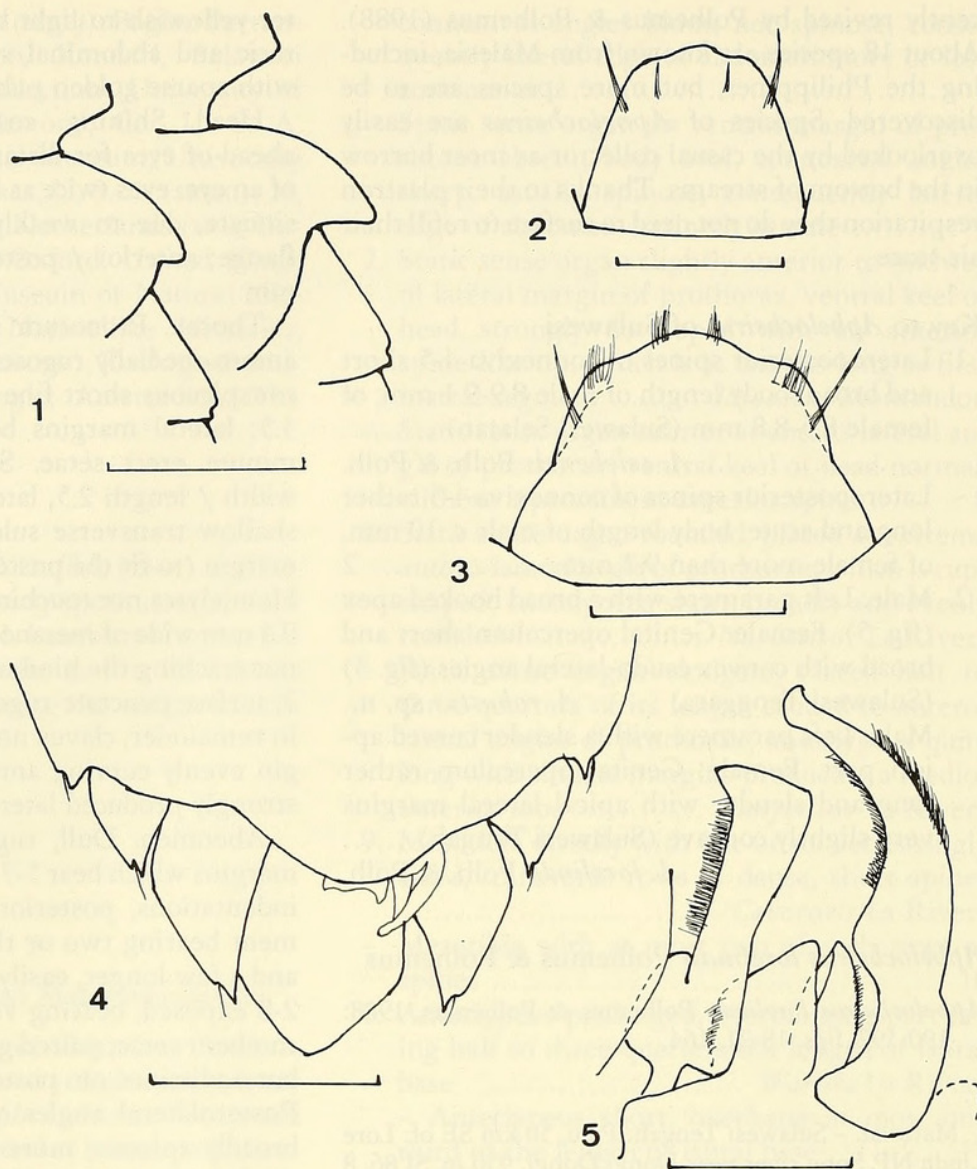
Abdomen. Dull, rugose with narrow shining margins which bear 5-7 minute erect setae in small indentations, posterior indentation of each segment bearing two or three of these minute setae and a few longer, easily detachable, setae. Tergites 2-8 exposed, bearing very few short thin pale recumbent setae, paired glandular openings present, but indistinct on posterior margin of tergite 3. Posterolateral angles of tergites 3-7 bluntly and broadly spinose, more distinctly produced posteriorly.

Ventral side. Length of antennal segments 1-4 is 0.09, 0.23, 0.23 and 0.42 mm. Labrum shining, anterior margin evenly rounded, rostrum shining, length 3.2-3.4 mm, reaching middle trochanters. Prosternum with weak median carina, propleura with inner projections notched; mesosternum pruinose with a median carina, tumescent posteromedially; metasternum pruinose, metaxiphus small, apically pointed. Abdomen pruinose, sternites 3 and 4 bearing rounded projections medially on posterior margins, posterior margins of sternites 4 and 5 lacking rearwardly directed stout setae medially; genital operculum with posterolateral angles developed, resulting in a sinuate posterior margin; narrow tufts of long setae at lateral margins and intermedially in apical third (fig. 2).

Legs. Set with fine gold setae, fore femur, tibia and tarsi with thick hair pads on inner surface. Fore, middle and hind coxae with combs of long light brown setae on interior margins. Middle leg, trochanter, femur, tibia and tarsi with thick yellow hair pads on ventral faces; femur sparsely set with



Figs. 1-5. *Aphelocheirus* species. - 1, Apex of embolium of *A. minor* (left) and *A. breviculus* (right); 2, Genital operculum of ♀ *A. breviculus*; 3, idem, *A. robustus*; 4, *A. robustus*, apex of abdomen of brachypterous ♂, dorsal view; 5, *A. robustus*, parameres, ventral view. Scales: 1 mm (1-3), 2 mm (4), 0.5 mm (5).



short stout reddish spines, bearing 6-8 long erect setae on posterior margin; tibia rather densely set with short stout reddish spines, bearing about four long setae on anterior margin and one row of red spines apically. Hind leg, femur and tibia sparsely set with short stout reddish spines, tibia also with an apical transverse row of reddish spines, tibia and tarsi bearing long swimming hairs on ventral surface. Claws of all tarsi shining, curved, with darker, reddish brown apices.

#### Comparative notes

This species runs to *A. labu* Polhemus & Polhemus and *A. minor* Polhemus & Polhemus in the key of Polhemus & Polhemus (1988). It shares with *A. minor*, which is also from Sabah, abdominal segments 3 and 4 bearing rounded projections medially on the posterior margins. *A. breviculus*, however, is one millimeter longer on average, has the angle of the embolium more produced (fig. 1), and

the ratio width / length of the pronotum greater than in *A. minor*, viz. 3.6 and 3.2 respectively. The eyes of *A. minor* are narrower, about three times as long as wide, while *A. breviculus* has its eyes twice as long as wide.

#### Etymology

*Breviculus*, a Latin adjective, meaning rather short, refers to the small size of the species.

#### *Aphelocheirus robustus* sp. n.

(figs. 3-5)

Type material. - Holotype ♂ (brachypterous): Sulawesi Tenggara, K. Kolaka. Sungai Mowewe, 28. II. 1989, leg. N. Nieser, N8922 (RMNH). - Paratypes: 9 ♂ 14 ♀ (incl. 1 labelled allotype) brachypterous, 16 ♂ 7 ♀ macropterous, same data as holotype, deposited as follows 3 ♂ 3 ♀ brach., 3 ♂ 3 ♀ macr. (NC); 1 ♀ brach., 1 ♂ macr. (MBJ); 1 ♂ 2 ♀ brach., 2 ♂ 1 ♀ macr. (JTPC); 1 ♀ brach.,



2 ♂ macr. (SEMC); 1 ♂ macr., 1 ♀ brach. (OXUM); 1 ♀ brach., 1 ♂ 1 ♀ macr. (RMNH); 1 ♂ 1 ♀ brach., 1 ♂ 1 ♀ macr. (ZMA).

Additional material. – 18 larvae IV/V, with same data as holotype.

## Description

Brachypterous male. – Large species for this genus, form elongate oval, length 9.8–10.5 mm; width of head 2.2–2.3 mm; maximum width (across abdomen) 5.9–6.2 mm.

Colour. Somewhat variable. Dorsal side: head yellow with black eyes, pronotum yellow with anterior and posterior transverse dull brown band, scutellum yellow (most specimens) to brown, hemielytra brown with variable part posteriorly yellow, abdominal tergites dull brown with yellow posterolateral angles, genital segments yellow. Ventral side: head, including antennae yellow, rostrum pale brown, sternites brown with yellow lateral margins, legs and genital segments yellow.

Head. Shining, finely rugose, produced ahead of eyes for distance equal to  $0.4 \times$  the length of an eye; eyes length / width = 2.4–2.5, outer margin sinuate due to weakly developed anterolateral flange; anterior / posterior interoculus = 1.35–1.40.

Thorax. Pronotum rugose, sparsely set with short fine pale setae laterally, apparently glabrous medially, width / length = 3.7–4.0; lateral margins bearing c. 10 stout minute erect setae. Scutellum rugose, appearing glabrous, width / length = 2.3–2.5, lateral margin hardly sinuate, shallow transverse sulcus present along anterior margin (to fit the posterior margin of pronotum). Hemielytra touching medially, reaching posteriorly to or just beyond base of abdominal tergite 3, surface rugose, set with sparse fine pale setae, embolar margin evenly curving anteriorly, bluntly terminated posteriorly in most specimens.

Abdomen. Weakly rugose, set with fine pale setae, tergites 2–8 exposed, paired glandular openings present medially on posterior margin of tergite 3, posterior margin of tergite 5 asymmetrical, with a medioposterior hump-like projection, which is delimited more clearly on the left than on the right (fig. 4), lateral margin of all segments with short stout setae, posterolateral angles of all tergites 3–7 spinose, with a few long pale setae at base of spinose angles.

Ventral surface. Length of antennal segments 1 to 4: 0.10, 0.20, 0.35 and 0.45 mm; rostrum glabrous, length 3.2–3.4 mm, reaching to middle coxae. Labrum yellow, shining, anterior margin evenly rounded. Prosternum with weak median carina, propleura with inner projections notched; mesosternum pruinose with a median carina, tumescent posteromedially; metasternum pruinose,

metaxiphus small and narrowly pointed. Abdomen pruinose, posterior margins of sternites 4 and 5 with six rearwardly directed stout setae medially; genital segments glabrous, shining.

Legs. Set with fine golden setae, fore femur, tibia and tarsi with thick hair pads on inner surface, claws well developed and curved in most specimens but in several short, stunted and not curved. Fore, middle and hind coxae with combs of long light brown setae on anterior margins. Middle legs, trochanter, femur, tibia and tarsi with thick yellow hair pads on ventral faces; femur sparsely set with short stout reddish spines bearing 6–8 long erect setae on posterior margin; tibia sparsely set with short stout reddish spines, bearing three long setae basally on anterior margin and one row of red spines apically. Hind leg, femur sparsely set with short stout reddish spines, tibia with reddish spines along interior margin, tibia and tarsi bearing long silvery swimming hairs on ventral surface, claws shining, curved. In several specimens middle and hind claws and sometimes tarsi stunted.

Male genitalia. Right paramere longest with long golden pubescence on right margin, apex rounded, left paramere hooked with thick golden pilosity on left margin. (fig. 5).

Brachypterous female. – Length 9.5–10.1 mm; width of head 2.2–2.3 mm; maximum width 5.8–6.0 mm. Subgenital plate triangular with narrow lateral earlike structure (fig. 3), longer lateral setae and shorter posterior setae spread out, not in narrow tufts.

Macropterous form. – As brachypterous, except length ♂ 10.6–11.0 mm, ♀ 10.0–10.6 mm. Pronotum well developed, subequal to maximum width of abdomen; scutellum larger and somewhat inflated; mesosternum inflated with broad rounded carina medially; hemielytra well developed (membrane broken off in some females), blackish in most fully mature specimens, leaving lateral part of connexiva uncovered; embolium with a blunt but distinct angle midway.

## Comparative notes

This species runs to *A. lorelindu* Polhemus & Polhemus in the key to brachypterous specimens of Polhemus & Polhemus (1988); both species are very similar in general shape and size. The female subgenital plate of *A. robustus* differs from larger Southeast Asiatic *Aphelocheirus* by its small lateral 'ears'. The right paramere is narrower at base than *A. lorelindu* and *A. celebensis* Polhemus & Polhemus, its closest relatives. See also the key to the Sulawesi species.



*Coptocatus stereos* sp. n.

(figs. 6-7)

Type material. – Holotype ♂ (brachypterous): Malaysia: S. Sabah. 105 km S of Beaufort: Long Pasia area, Sg. Maga near confluence Sg. Pasia. 4° 26' N 115° 40' E, 1210 m asl., larger fast running stream in untouched lower montane evergreen rain forest, large boulders, rapids. 3 Apr. 1987. Leg. J. van Tol (RMNH).

Additional material. – 3 larvae instar V and 1 instar III / IV, same data as holotype (RMNH).

**Description**

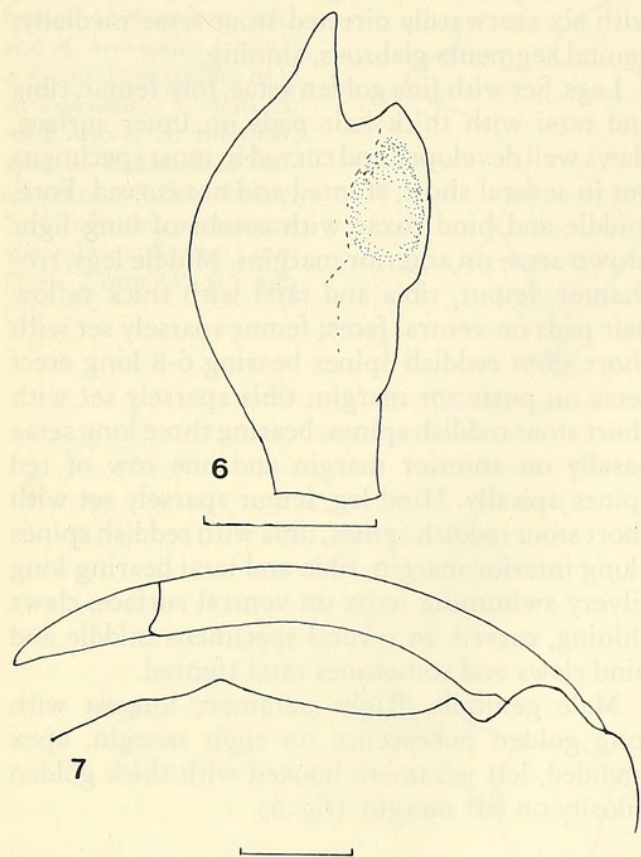
Holotype ♂. – Large, robust, highly streamlined and dorsoventrally flattened; general colour medium brown with yellowish spots. Length 20.4 mm, width of head 5.4 mm; width of pronotum 10.6 mm, maximal width 12.2 mm.

Head. Width / length 5.4 / 4.2 mm. Anteclypeus greatly produced, apex evenly rounded, projecting beyond rostrum for a distance greater than exposed rostral length when viewed laterally; eyes blackish, convex, roughly rectangular, length / width 1.8 / 1.2 mm, raised above level of vertex and separated from it by wide shallow sulci, lateral margins bearing a weakly developed flange; anterior / posterior interoculus 3.2 / 3.2 mm; vertex greatly produced posteriorly, extending rearwardly about one half the length of an eye; anteriorly with a pair of broad shallow sublateral depressions, tapering posteriorly.

Thorax. Pronotum width / median length 10.4 / 3.0 mm; lateral margins with narrow, raised darker and slightly crenulate ridge, posterolateral angles strongly produced, rounded. Scutellum width / length 5.0 / 2.8 mm, anterior margin strongly reflexed downward. Hemelytra brachypterous, extending to posterior margin of abdominal tergite 3 only, tips broadly rounded, surface set with fine yellowish granular microstructure (also present on other parts of body, although far less dense and less distinct), embolium anteriorly defined by a broad carina, explanate, lateral margin irregularly and shallowly crenulate, set with long recumbent light brown setae; hemelytral commissure with a small projecting tooth on left hemelytron distally, fitting into corresponding indentation of right hemelytron.

Abdomen. Medio- and latero-caudal parts of tergite 3 and all of tergites 4-8 exposed. Lateral margins with narrow ridges and a dense row of long light brown setae lying flat on tergites. Medially some patches of shorter setae at base of tergites, especially the lobes of tergite 8. Lateroposterior angles indented with blunt projections and a tuft of hairs in the indentation.

Ventral surface. Sternites pruinose. Gula and part of prosternum anterior to fore coxae with a



Figs. 6-7. *Coptocatus stereos*. – 6, Left paramere n. Scale 0.5 mm; 7, Tibiotarsus and anterior margin of femur of fore leg. Scale 1 mm.

**Etymology**

*Robustus*, a Latin adjective, refers to the large size of the species within the genus.

**Remarks**

The type locality is a lowland stream, 2.5 to 10 m wide, flowing through woodland with fields and small settlements close by. *Aphelocheirus* was found at shallow, partly shaded places, with moderate current and coarse sand bottom. Benthic fauna, present in rather low density, included mainly Ephemeroptera, with a few Odonata and Trichoptera.

The stunted claws and tarsi may be the results of wear and tear in older specimens, but this phenomenon is mentioned in the description, since quite a few specimens are strikingly affected.

*Coptocatus* Montandon, 1909

The genus *Coptocatus* was recently revised by Polhemus (1986). Including the species described below, four species are known from the eastern states of Malaysia (Sabah and Sarawak).



blunt carina, posterior part of prosternum without carina. Mesosternum with a shallow median groove and a distinct xiphus on posterior margin. Metasternum anteriorly with a strongly dorsally declivent carina, posterior part flat with a short broad blunt xiphus. Abdominal sternites with large stigmata halfway of lateral third; sternites 4, 7 and 8 with small tufts of short golden hairs medially, sternite six medially produced, sternites 5-8 medially glabrous.

Legs. Fore leg with massive femur, length 6.5 mm, width 4.3 mm; suture between tibia and tarsus shallow, claw short, blunt, hardly differentiated; anterior face of tibiotarsus and femur with golden pubescence distally becoming thicker and longer and extending onto trochanter; anterior margin of femur with a median hump and a subapical tooth (fig. 7). Posterior margin of all femora with a fringe of long hairs. Middle leg and hind femur without spines. Middle and hind tibia ventrally with a thick pad of golden brown pilosity (looks like a adhesive pad; already fully developed in larva V, and partly so in larva III/IV). Middle tibia broadened apically. Hind tibia with short spines along inner and outer faces, inner (posterior) faces with a dense fringe of long swimming hairs.

Genitalia. Parameres symmetrical, bilobed, outer lobe swollen (fig. 6). Aedeagus symmetrical, basally and centrally chitinized, apically and laterally fleshy.

### Comparative notes

The same size and similar anterior margin of fore femur as *C. kinabalu* D. Polhemus, also from Sabah, which has, however, the inner lobe of paramere much shorter and the lateroposterior angles of abdominal segments not distinctly indented. The other two species in the genus known from Sabah and Sarawak do not exceed 15 mm in length.

### Etymology

*Stereos*, a greek adjective, meaning: strong, solid, cruel, refers to the size and solid build of the species.

### Remark

The holotype has a case, probably of a chironomid larva on the left hemielytron against the inner embolar ridge.

### *Laccocoris* Stål, 1856

Seven species are known from Malesia, but none has been reported from Sulawesi (La Rivers 1971). The same is true for the genus *Heleocoris* Stål with six Malesian species. The last revision of both genera is Montandon (1897).

### *Laccocoris staudingeri* Montandon

*Laccocoris staudingeri* Montandon, 1897: 440-442.

Material. – Malaysia. S. Sabah, Long Pasia area, Sg. Ritan, 4° 24'N 115° 42'E, 1160 m asl. Leg. J. Huisman & J. van Tol, 1 ♂ 1 ♀ (RMNH).

Distribution. – Brunei and Sabah.

Remarks. – *L. staudingeri* differs from related species in northern Borneo, *L. horvathi* Mont. and *L. maai* La Rivers (La Rivers 1970) by having the interoculus at halfway level slightly more than twice as wide as an eye.

### *Naucoris* Fabricius, 1775

There are six Malesian species, of which one occurs in Sulawesi. A revision of the genus is not available.

### *Naucoris scutellaris* Stål

*Naucoris scutellaris* Stål, 1859: 266. – Lundblad 1933a: 63-67, fig. 19 (redescription).

Material. – Sulawesi Tenggara: Kendari, N8904, 1 ♂; Mowewe, N8922A, 4 ♂ 2 ♀; 20 km S Pomalaa, N8928 (NC).

Remarks. – A widespread species, occurring from India through Sri Lanka and Thailand to Jawa and Sulawesi. The femur is strongly expanded at its inner apical two-thirds, giving the inner margin a deeply dented appearance. Other congeneric species have the inner margin of fore femur more or less straight.

### NEPIDAE

### Key to Indonesian and Eastern Malaysian genera

1. Flattened species, parasternites of abdomen visible, head distinctly narrower than the pronotum and partly enclosed by its anterolateral angles (Nepinae) ..... 2
  - Subcylindrical species, parasternites not visible, head free from pronotum and both of subequal width (Ranatrinae) ..... 3
2. Respiratory siphon longer than the inner margin of the hemielytra ..... *Laccotrephes* Stål
  - Respiratory siphon not more than half as long as the distance between apex of scutellum and the membrane along inner margin of hemielytra (only one very rare species, *T. breddini* Montandon, from Northern Borneo) ..... *Telmatotrepes* Stål



3. Eyes in lateral view globose, not reflexed downwards and not obscuring ventral margin of head ..... *Ranatra* Fabricius
- Eyes in lateral view reflexed downwards, obscuring ventral margin of head ..... *Cercotmetus* Amyot & Serville

### *Laccotrepbes* Stål, 1865

About eight species recorded from Malesia. A generic revision is not available and the status of many species is uncertain, which makes some records unreliable. Three species are known from Sulawesi and Pulau Buton.

#### Key to *Laccotrepbes* of Sulawesi and Buton

1. Body length over 35 mm, usually 40 mm or more ..... *L. robustus* Stål
- Body length less than 35 mm ..... 2
2. Respiratory siphon as long as or somewhat shorter than body ..... *L. occultus* Lundblad
- Respiratory siphon distinctly longer than body ..... *L. tristis* (Stål)

### *Laccotrepbes occultus* Lundblad

*Laccotrepbes occultus* Lundblad 1933a: 23-26, fig. 2, tab. 14 (1) [nom. nov. for *L. fuscus* auctores, nec L., redescription].

Material. - P. Buton: 16 km E of Baubau, N8944, 1 ♂ (NC). Maluku: Bacan, Wayauna, c. 50 m alt., logged forest, hand coll., 23-26 Jun 1985, leg. J. Huijbregts, 2 ♀ (RMNH).

Distribution. - Sumatera, Borneo, Buton, and Maluku (Moluccas).

### *Laccotrepbes robustus* Stål

*Laccotrepbes robustus* Stål, 1870: 706. - Lundblad, 1933a: 26-27, fig. 3 [redescription].

Material. - Jawa: Preanger, 1 ♂ 1 ♀; Paluabuan, 3.XI.1911, 1 ♂. Sumba: Kananggar, 700 m, V.1925, 1 ♂; Mao Marroe, 450 m, V.1925, leg. Dammerman, 1 ♀. Malaysia (Sabah): Danum valley, 4° 48'N 117° 48'E, 220 m streamlet, 23.III.1987, leg. J. Huisman, 1 ♀ (all RMNH).

Distribution. - Widespread species: Indochina and Taiwan, Philippines, Malacca, Sumatera, Jawa, Borneo, Sulawesi, Sumba and Bali.

### *Laccotrepbes tristis* (Stål)

*Nepa tristis* Stål, 1854: 11.

*Laccotrepbes tristis*; Hale, 1924: 504-507, pl. 34 (figs. 1-3), pl. 35 (figs. 2, 4, 6), pl. 36 (fig. 18); Lundblad 1933a: 25; Lansbury 1967: 644-646 [description of male genitalia].

Material. - Sulawesi Utara: Dumoga Bone N. P., Toraut, c. 200 m, multistr. evergreen forest, creek, 23.V.1985, leg. J. Huijbregts, 1 ♀ (RMNH).

Distribution. - Previously only known from Australia and New Guinea.

Remarks. - Identification of this specimen is doubtful. It differs from typical *L. occultus* by its slightly greater size (34 *vs.* 31-32 mm), its narrower appearance anteriorly (only visible under direct comparison), and its much longer respiratory siphon (40 *vs.* 30 mm).

### *Cercotmetus* Amyot & Serville

In the excellent revision of the genus by Lansbury (1973), six species are recorded from Malesia, including one from Sulawesi. Most species of this genus are seldomly collected and then usually only one specimen at a time. Consequently, distributional patterns of most species are poorly known.

#### Key to Malesian species of *Cercotmetus* (Adapted from Lansbury 1973)

1. Vertex raised between the eyes, but without a distinct tubercle ..... 2
- Vertex with a distinct, broadly and tooth-like tubercle ..... 4
2. Less than 43 mm long, middle femora clearly shorter than prothorax (widespread species: Sumatera, Jawa, Sarawak) ..... *C. brevipes* Montandon
- More than 47 mm long, middle femora longer than prothorax ..... 3
3. Eyes relatively small, width of vertex halfway the inner margin of eyes about twice the width of an eye at that level, vertex with a complete circlet of hairs (Sulawesi) ..... *C. robustus* Montandon
- Eyes larger, width of vertex halfway the inner margin of eyes subequal to the width of an eye, hairs on vertex few, not forming a complete circlet posteriorly (Irian Jaya) ..... *C. dissidens* Montandon
4. Distal third of tergite 6 raised and often very hairy, apex of paramere sinuate, female operculum not or hardly reaching beyond tergite 6 (widespread, Sumatera) ..... *C. compositus* Montandon
- Distal third of tergite 6 not distinctly raised and never hairy, apex of paramere evenly curved, female operculum reaching beyond tergite 6 for about one third of its length ..... 5
5. Along median line length of anterior lobe (anterior to transverse grooves) of pronotum less than three times the length of posterior lobe (widespread, Sumatra, Jawa, Borneo) ..... *C. asiaticus* Amyot & Serville



- Along median line length of anterior lobe more than three times the length of posterior lobe (Kalimantan, Sarawak) ..... *C. asiaticus* var. *longicollis* Montandon

### *Cercotmetus robustus* Montandon

*Cercotmetus robustus* Montandon, 1911: 92-93. - Lansbury 1973: 95-97, figs. 36-42 [redescription].

Material. - Sulawesi Tenggara: N8922A, 2 ♀ (NC).

Remarks. - Apparently a rare species, only known from the female holotype from Central Sulawesi ('Posso See' = Danau Poso) so far. Several small larvae, possibly of this species, were observed at locality N8931 (see appendix). Both larvae and adults are far better swimmers than *Ranatra*, they seem to use their fore legs for swimming.

### *Ranatra* Fabricius, 1790

About twelve species recorded from Malesia, of which three have been reported from Sulawesi (one with two subspecies). The Oriental species have been revised by Lansbury (1972). In the following key to the Sulawesi species, also two unrecorded but widespread species that might turn up in Sulawesi, were included.

#### Key to *Ranatra* of Sulawesi

(Adapted from Lansbury 1972).

1. Head with prominent tubercle between eyes, metasternum emarginate (fig. 9) ..... 2
- Head at most only slightly raised between eyes, metasternum not emarginate ..... 3
2. Length of respiratory siphon subequal to length of body (Sulawesi Tenggara) ..... *R. sulawesii* sp. n.
- Length of siphon one-third of body length (not recorded from Sulawesi, but a widespread species, Indochina, Sumatera, Jawa, Nusa Tenggara) ..... *R. parmata* Mayr
3. Width of fore femora measured from dorsal margin to apex of large tooth about the same as widest part of femora proximally ..... 4
- Width of fore femora measured from dorsal margin to apex of larger tooth clearly greater than widest part of fore femur proximally (endemic to Sulawesi) .... *R. malayana* Lundblad
4. Larger tooth of fore femora more or less equidistant between ends of femora (not recorded from Sulawesi, but a widespread species: India, Ceylon, Indochina, Sumatera, Jawa) ..... *R. varipes* Stål
- Larger tooth of fore femora clearly nearer to distal end of femora ..... 5

5. Third episternum with two clumps of small hairs (on each side) (endemic to Sulawesi Selatan) ..... *R. longipes celebensis* Lansbury
- Third episternum without clumps of small hairs (Indonesia, incl. Sulawesi Tenggara, E. Malaysia) ..... *R. longipes longipes*

### *Ranatra longipes longipes* Stål

*Ranatra longipes* Stål, 1861: 203.

*Ranatra longipes longipes*. - Lansbury 1972: 332-334, figs. 220-229 [redescription].

Material. - Sulawesi Tenggara: N8901, 3 ♂ 3 ♀; N8909, 3 ♂; N8910, 2 ♂; N8917, 2 ♂; N8919, 1 ♂ 3 ♀; N8930, 1 ♀.

Distribution. - Known from Sumatera, Borneo (Brunei, Sabah), Jawa, Bali and Sulawesi.

Remarks. - Our specimens were compared with a series from Bali, of which several were identified by Lansbury. The specimens mentioned above do not show any of the diagnostic characters characterizing subspecies *celebensis* (Lansbury 1972).

### *Ranatra malayana* Lundblad

*Ranatra birói* var. *malayana* Lundblad, 1933a: 40, fig. 9A.

*Ranatra malayana*. - Lansbury 1972: 319-321, figs. 142-152.

Material. - Sulawesi Tenggara: N8917, 1 ♂ 1 ♀ (NC).

Remarks. - Until now only known by three specimens from Sulawesi Selatan. Respiratory siphon, when folded back over dorsum, reaching halfway head in the male, and anterior margin of pronotum in female.

### *Ranatra sulawesii* sp. n. (figs. 8-11)

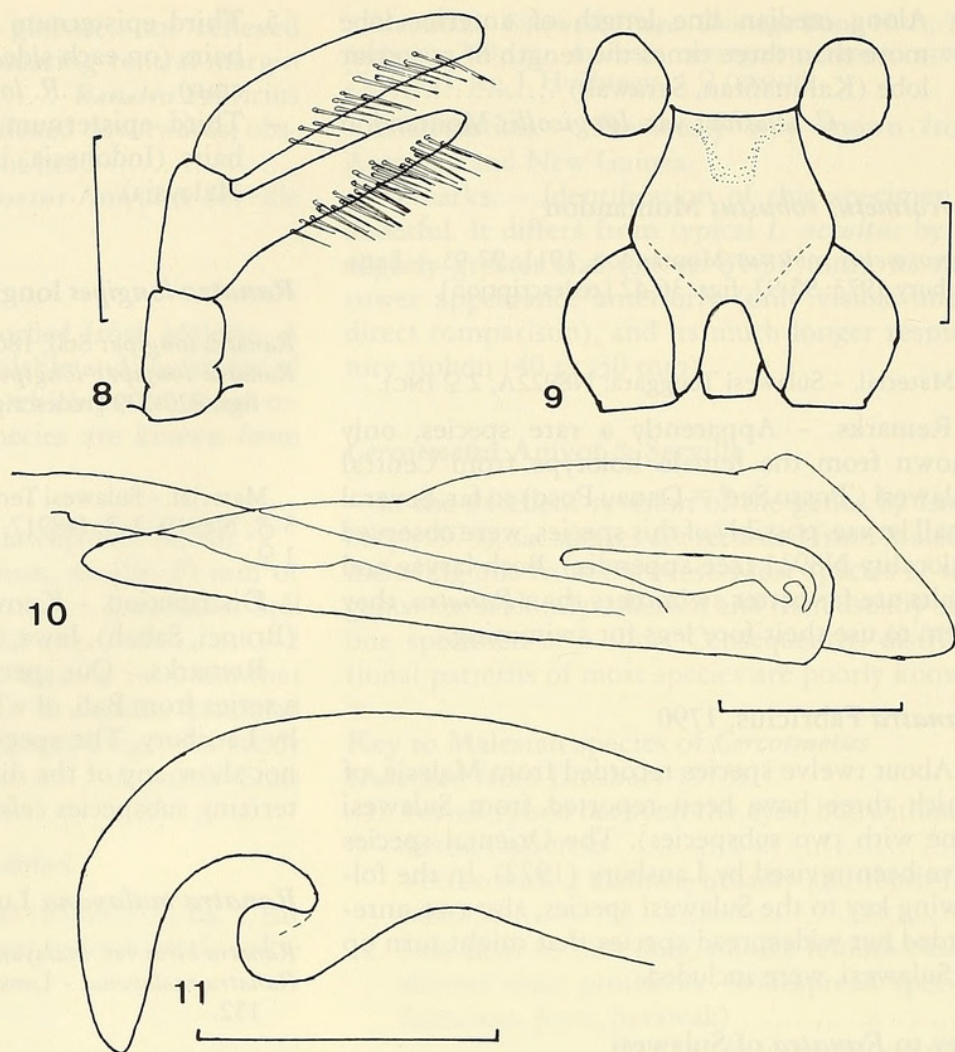
Type material. - Holotype ♂: Sulawesi Tenggara, K. Kendari, pond with *Nymphaea* at Wawonggole, 20.II.1989, N8902, leg. N. Nieser (RMNH). - 10 ♂ 7 ♀ (including one labelled allotype), same data as holotype, deposited as follows: 1 ♀ (RMNH); 3 ♂ 2 ♀ (NC); 1 ♂ 1 ♀ (MBJ); 1 ♂ (BPUH); 1 ♂ 1 ♀ (JTPC); 1 ♂ 1 ♀ (SEM); 1 ♂ (OXUM).

#### Description

Adult. - Measurements. Length ♂ 34-38.3 mm; ♀ 35-39.5 mm; length of siphon ♂ 39.0-41.7 mm, ♀ 35-45 mm; width of head ♂ 3.2-3.3 mm, ♀ 3.2-3.5 mm; humeral width of pronotum ♂ 3.5-3.9 mm; ♀ 3.6-4.2 mm. Colour. Dark brown, legs paler with indistinct annulation.



Figs. 8-11. *Ranatra sulawesii*. - 8, antenna; 9, metasternum, 10, genital capsule of male, lateral view; 11, apex of paramere. Scales: 0.5 mm (8), 1 mm (9-10), 0.25 mm (11).



Head with small, but distinct nodule on vertex; eyes slightly wider than width of interoculus; lora strongly developed, higher than clypeus, which has two small nodules apically; second segment of antennae with long, finger-like projection, subequal to length of segment 3 (fig. 8).

Thorax. Prothorax in lateral view about  $1.5 \times$  as long as fore coxa, about  $1.1 \times$  as long as fore femur; anterior lobe twice as long as posterior lobe in median line; anterior margin not conspicuously raised; humeral width / anterior width 1.4; pronotal grooves well developed; posterior lobe without tubercles, ventrally with a broad concavity anteriorly at insertion of coxae, caused by produced anteroventral angles, remainder of prothorax flat with a vague carina in anterior one-third. Scutellum about  $1.5 \times$  longer than wide, with a shallow broad transverse depression in apical third. Mesosternum with anterior margin raised, posterior margin of metasternum deeply incised (fig. 9); space between middle and hind coxae subequal.

Legs. Fore femur with one median tooth at apical 0.4 of femoral length, no secondary tooth distally. Length of middle and hind femur subequal. Middle

tibia shorter, hind tibia longer than femur; apical  $\frac{3}{4}$  of middle and hind tibia with hair fringe. Hind femur reaching about  $\frac{3}{4}$  along last abdominal sternite in both sexes.

Male genitalia. See figs. 10, 11.

Female. - Genital operculum not reaching the base of respiratory siphon.

### Comparative notes

Based on the tuberculate vertex and emarginate metasternum this species can be included in the *R. gracilis* group (Lansbury 1972). *R. sulawesii* can be distinguished by (a) siphon longer than the body length, (b) distance between the middle and the hind coxae subequal, and (c) finger-like projection of antennal segment 2 long. In the key by Lansbury (1972) it runs to *R. parmata* Mayr, from which it differs by its long siphon, and the shape of the paramere, which is apically more swollen in *R. parmata*.

### Etymology

*Sulawesii*, a noun in genitive case, refers to the type locality.



**Remark**

The type locality is a small pond at the edge of marshy fields with some water lilies (*Nymphaea* sp.), and abundant marginal vegetation flattened and hanging into the water.

**NOTONECTIDAE****Key to Indonesian and Eastern Malaysian genera**

1. Hemilytral commissure anteriorly without a definite hair-lined pit (Notonectinae) ..... 2
- Hemilytral commissure anteriorly with a definite hair-lined pit (Anisopinae) ..... *Anisops* Spinola
2. Middle femur with an antepical pointed protuberance ..... *Enithares* Spinola
- Middle femur without such a protuberance 3
3. Eyes contiguous or forming an ocular commissure near posterior border of head ..... *Nychia* Stål
- Eyes widely spaced near posterior border of head ..... *Aphelonecta* Lansbury

***Anisops* Spinola, 1840**

Due to insufficient knowledge of the fauna, a key to the regional species of the genus *Anisops* Spinola cannot be presented. The reader is referred to Brooks' (1951) revision and various papers by Lansbury (1964, 1965, 1978). Several species, e.g. *A. breddini*, *A. nasuta* and *A. paracrinata*, can be found in village ponds and rice fields. Such species tend to be very widespread in Southeast Asia.

***Anisops batillifrons* Lundblad**

*Anisops batillifrons* Lundblad, 1933: 463-464, fig. 8. – Brooks 1951: 420-423, figs. 71, 101.

Material. – Malaysia, Sabah: 16 km NE Tenom: Agricultural Research Station, Sg. Segalan, 115°59'E 5°12'N, a. l., 23.XI.1987, 1 ♂ 1 ♀, leg. J. Huisman & R. de Jong (RMNH).

Distribution. – A widespread species: India through Indochina to Hainan, Taiwan, Iriomote and the Philippines; apparently mainly in subtropical regions.

***Anisops biroi* Brooks**

*Anisops biroi* Brooks, 1951: 454-456, fig. 49. – Lansbury 1978: 111, figs. 37-39.

Material. – Sulawesi Tengah: 50 km SE of Palu: Lore Lindu N.P., Sopa valley near Dongi Dongi, 6 Dec 1985 (sample B), leg. J. van Tol & J. Krikken 3 ♂ 2 ♀ (RMNH). Pulau Buton: N8939, 10 ♂ 4 ♀ (NC). Maluku: Bacan, Wayauna, alt. 50 m, sec. growth, eutrophic pool, 5-7 July 1985, HH382, leg. J. Huijbregts, 1 ♂ 5 ♀ (RMNH).

Remarks. – Identification of this species somewhat doubtful. The rather short rostral prong suggests the very similar *A. rigoensis*. None of the present specimens, however, has a carina on the posterior part of the vertex, which is reported to be characteristic for *A. rigoensis* (Lansbury 1978). Both species were only known from New Guinea up to now.

***Anisops breddini* Kirkaldy**

*Anisops breddini* Kirkaldy, 1901a: 5-6. – Brooks 1951: 439-441, figs. 78, 99; Leong 1962 [life cycle]; Lansbury 1965: 58.

Material. – Sulawesi Tenggara: N8901, 22 ♂ 27 ♀, 5 larvae; N8917, 1 ♂ 1 ♀; N8918, 1 ♂ 1 ♀; N8931, 1 ♂ 1 ♀. Pulau Buton, N8938, 5 ♂ 22 ♀.

Distribution. – Widespread species: India and Sri Lanka through Indochina to Jawa, Sulawesi and Buton.

***Anisops nasuta* Fieber**

*Anisops nasuta* Fieber, 1851: 484-485. – Lundblad 1933a: 168-171, fig. 58; Brooks 1951: 416-418, figs. 60, 98; Lansbury 1965: 61.

Material. – Sulawesi Tenggara: N8917, 4 ♂ 4 ♀ 31 larvae; N8931, 3 ♂ 5 ♀. Pulau Buton: N8938, 16 ♂ 21 ♀.

Distribution. – A very widespread species: E. India and Sri Lanka through China and Indonesia to Australia and Samoa.

***Anisops occipitalis* Breddin**

*Anisops occipitalis* Breddin, 1905: 152. – Brooks 1951: 344-346, fig. 22; Lansbury 1965: 61-67, figs. 3-4, 7-8.

Material. – Sulawesi Tenggara. N8908, 8 ♂ 15 ♀; N8917, 2 ♂; N8927, 4 ♂ 7 ♀; N8931, 1 ♂ 1 ♀. Pulau Buton. N8938, 1 ♂ 1 ♀.

Distribution. – Widespread through Indonesia to Northern Australia.

***Anisops paracrinata* Brooks**

*Anisops paracrinata* Brooks 1951: 329-331, fig. 12. – Lansbury 1965: 57-58.



Material. – Sulawesi Tengah. SW of Luwuk, Totop camp along Batui River, 19-21 Oct 1989, Sul. 18, J. P. Duffels, 1 ♂ (ZMA). Sulawesi Tenggara. Desa Kagunya, N8908, 1 ♂ 6 ♀; Jalan Asera, N8917, 26 ♂ 23 ♀; Jalan Asera, N8918, 5 ♂ 1 ♀; 20 km S Pomalaa, N8927, 4 ♂; 15 km S Pomalaa, N8931, 17 ♂ 17 ♀. Pulau Buton. Desa Gareg-Gareng, N8938, 36 ♂ ∞ ♀.

Distribution. – Sumatera, Jawa, Bali, Sumbawa, Sulawesi, Buton, E. Australia.

*Anisops stali* Kirkaldy

*Anisops stali* Kirkaldy, 1904: 113, 132. – Brooks 1951: 319-322, figs. 9, 107; Lansbury 1965: 58.

Material. – Sulawesi Tenggara. Desa Kagunya, N8908, 2 ♀; 15 km S Pomalaa, N8931, 2 ♀.

Remark. – Identification of these specimens uncertain since no males were available; they agree with specimens from Jawa.

Distribution. – Widespread; the Philippines, Jawa, Sulawesi, Nusa Tenggara, Australia, Okinawa.

*Anisops tabitiensis* Lundblad

*Anisops tabitiensis* Lundblad, 1934: 121-123, figs. 1-5. – Brooks 1951: 376-378, fig. 40; Lansbury 1964: 217-218, fig. 7.

Material. – Sulawesi Tenggara. 20 km E Kolaka, N8934, 4 ♂. Malaysia, Sabah. 20 km W of Sandakan, Sepilok-Laut. ML, 4 Nov. 1987, leg. J. Huisman & R. de Jong, 1 ♂ (RMNH).

Remark. – The specimens were compared with a male from New Guinea and they differ only in the facial carina being slightly less prominent in the Sulawesi and Sabah specimens.

Distribution. – Widespread: Andaman Islands, Borneo, Sulawesi, the Philippines, New Guinea, New Hebrides, Tahiti, Guadalcanal, Okinawa.

*Aphelonecta* Lansbury

This genus contains three species, one from Thailand and two from Borneo (Lansbury 1966).

*Aphelonecta alexis* Lansbury

*Aphelonecta alexis* Lansbury, 1965a: 328-330, figs. 2-18. – Lansbury 1966: 632.

Material. – Malaysia, Sabah. 60 km W of Lahad Datu, Danum Valley, 14 Mar 1987 (B), leg. J. Huisman, 1 ♂ (RMNH).

Distribution. – Sabah and Sarawak.

*Enithares* Spinola

A large, mostly Oriental genus. Thirty-three species are known from Malesia, of which seven occur in Sulawesi and one on Buton. There is an excellent revision of the Oriental species (Lansbury 1968).

Key to the males of *Enithares* of Sulawesi and Buton

- 1. Embolium in ventral view (ventral ridge of hemielytron) greatly expanded anteriorly (fig. 21); pronotal humeral angles produced into broad knobs. Length about 9 mm (Sulawesi) ..... *E. producta* Lsb.
- Embolium in ventral view not greatly expanded anteriorly; pronotal humeral angles not produced ..... 2
- 2. Length up to 9 mm ..... 3
- Length 9.5 mm or more ..... 4
- 3. Head width twice the median length or less, anterior lobe of genital capsule bilobed due to a deep and broad median incision (widespread species) ..... *E. bakeri* Brks.
- Head width just over twice its median length, anterior lobe of genital capsule not bilobed (P. Biak, possibly Sulawesi Tenggara) ..... *E. vulgaris* Lsb.
- 4. Length 12.5 mm, median length of head one-fourth of its length shorter than median length of pronotum, anterior margin of middle tibia straight to very slightly concave, posterior lobe of genital capsule broadly rodlike (Sulawesi Selatan) ..... *E. horvathi* Kirk.
- Length not over 12 mm; if apex of posterior lobe of genital capsule rodlike, then length not over 11 mm, anterior margin of middle tibia more or less convex ..... 5
- 5. Apex of posterior lobe of genital capsule rodlike (figs. 13, 16) ..... 6
- Apex of posterior lobe of genital capsule rounded (figs. 12, 15) ..... 7
- 6. Middle tibia not distinctly broadened (fig. 18), rod-like apices of posterior lobes of genital capsule rather short with small solid pegs on inner sides (fig. 13) (Sulawesi Tenggara) ..... *E. lansburyi* sp. n.
- Middle tibia distinctly broadened (fig. 20), rod-like apices of posterior lobes of genital capsule more elongate without pegs on inner sides (fig. 16) (P. Buton) ..... *E. skutalis* sp. n.
- 7. Apical half of middle femora with very long hairs, covering ventral margin in inner view; genital capsule with a bilobed posterior lobe bearing an apicaudal tuft of setae (fig. 12) (Sulawesi Tengah) ..... *E. caesaries* sp. n.
- Middle femora without strikingly long hairs,



posterior lobe of genital capsule not bilobed,  
without tuft of setae (fig. 15) .....  
..... *E. phenakismos* sp. n.

### *Enithares bakeri* Brooks

*Enithares bakeri* Brooks, 1948: 40, pl. 1, fig. 3. – Lansbury 1968: 384-385, figs. 91-95; Nieser & Chen, in press.

Material. – Sulawesi Tenggara. Desa Kagunyala, N8908, 1 ♂ 1 ♀; Aopa marsh, N8913, 1 ♀; Jalan Asera, N8917, 1 ♂; 15 km S Pomalaa, N8931, 4 ♀. Pulau Buton. Desa Gareg-Gareg, N8938, 1 ♂ 1 ♀. Maluku. Bacan, Wayaua, eutrophic pool, HH382, 6-7 July 1985, leg. J. Huijbregts, 2 ♂ 3 ♀ (RMNH).

Distribution. – One of the few widespread species of *Enithares* in the area, occurring in the Philippines, Sabah, Sulawesi, Maluku, Flores.

Remarks. – The length of the females from Sulawesi and Buton centers around 7.5 mm, which is slightly less, and of the specimens from the Maluku around 8.3, which is slightly more than indicated by Lansbury (1968). This suggests that the variability in size is greater than known up to now, and that there is significant variability between populations.

*Enithares bakeri* is smaller than most of its congeners, and lives e.g. in village ponds together with the more common species of *Anisops*.

### *Enithares hippokleides* Kirkaldy

*Enithares hippokleides* Kirkaldy, 1898: 73. – Lansbury 1968: 400-402, figs. 165-172 [redescription, synonymy].

Material. – Jawa, S. Muller [19th century], 1 ♂ 2 ♀; G. Malang, Aug. 1935, 4 ♂ 2 ♀ (all det. *E. frubstorferi* by Brooks) (RMNH).

Distribution. – Only known from Jawa.

### *Enithares intricata* Breddin

*Enithares intricata* Breddin, 1905: 154. – Lundblad 1933a: 174-177, fig. 64, pl. 5, 21; Lansbury 1968: 404-405, figs. 185-190 [redescription, synonymy].

Material. – N. Sumatra: Toba plateau, Tigadolok, 2°50'N 99°03'E, c. 150 m, 20 Jun 1972, leg. J. Krikken (21), 1 ♀ (RMNH).

Distribution. – Sumatera and Jawa.

### *Enithares producta* Lansbury

*Enithares producta* Lansbury, 1968: 368-369, figs. 15-21.

Material. – Sulawesi Utara: Dumoga Bone N. P., several localities, incl. Tumpah river, Toraut river, Waterfall Creek, small creek near basecamp, leg. J. P. Duffels, J. Huijbregts, J. van Tol, total 13 ♂ 14 ♀ (ZMA, RMNH). Sulawesi Tengah. 60 km SE Palu: Lore Lindu NP, Danau Taming and brooklets, 1600 m, 7 Dec 1985, leg. J. van Tol, 1 ♀ (RMNH).

Distribution. – Sulawesi.

### *Enithares ripleyana* Lansbury

*Enithares ripleyana* Lansbury, 1968: 402-403, figs. 173-178.

Material. – Maluku. Bacan. Wayaua, logged forest, 5-16 July 1985, leg. J. Huijbregts, 1 ♂ (NC).

Distribution. – Bacan, which is the present spelling of Batjan, the type locality of this species.

Remarks. – This specimen agrees with the description of *E. ripleyana*, except for its smaller size (7.3 mm), and the apical part of the posterior lobe of the genital capsule, which is inclined caudad. The dense tuft of setae on the genital capsule look solid when glued dry on a card.

### *Enithares vulgaris* Lansbury

*Enithares vulgaris* Lansbury, 1968: 403-404.

Material. – Sulawesi Tenggara. 20 km E Kolaka, N8934, 1 ♀.

Distribution. – So far only known from the type series from P. Biak, situated east from the NW part of Irian Jaya.

Remarks. – The size of the Sulawesi specimen is 9.1 mm, which indicates to *E. vulgaris* rather than to *E. intricata* Breddin. Males are needed for definitive identification.

### *Enithares caesaries* sp. n.

(Figs. 12, 17)

Type material. – Holotype ♂: Sulawesi Tengah. Luwuk area, Sungai Tikalalang, 20 Oct 1989, 89JvT26, leg. J. van Tol (RMNH).

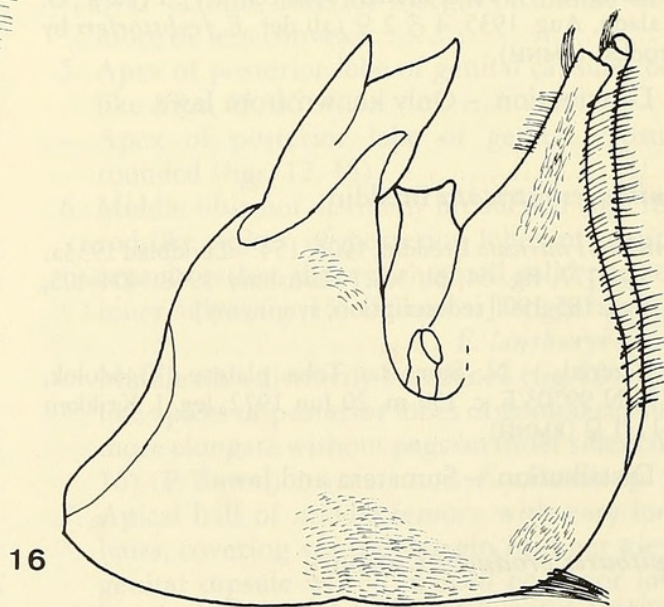
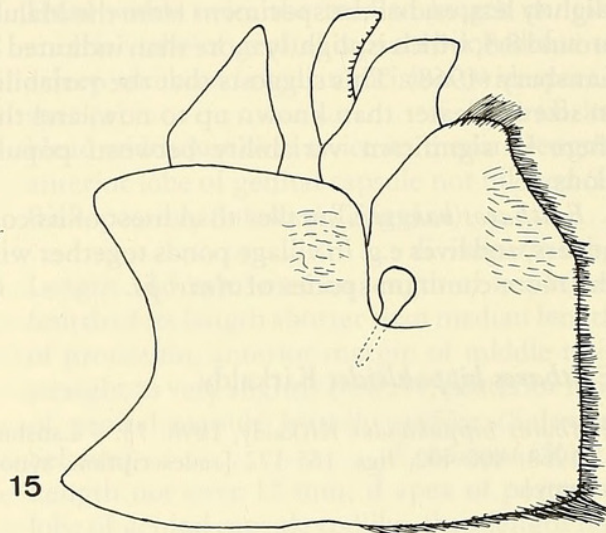
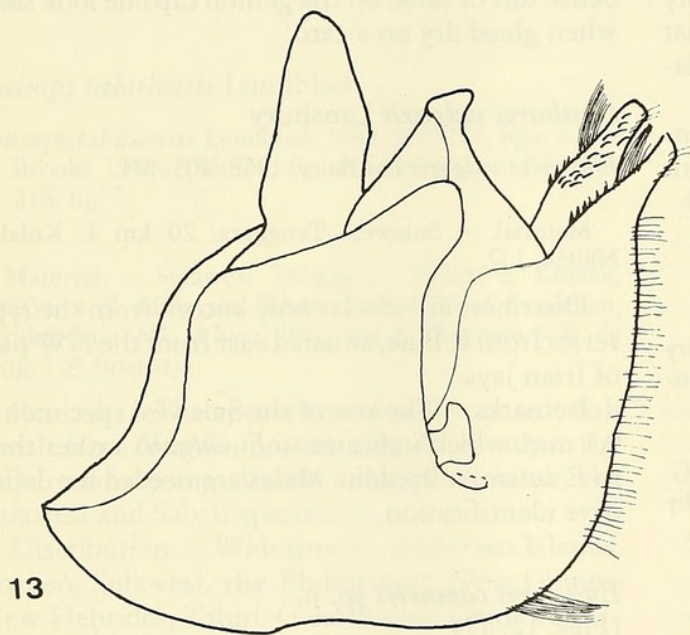
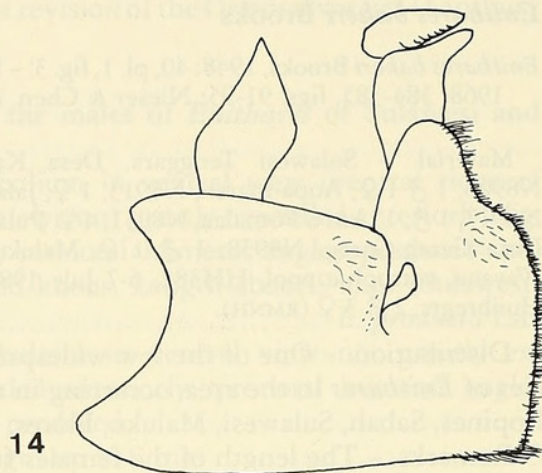
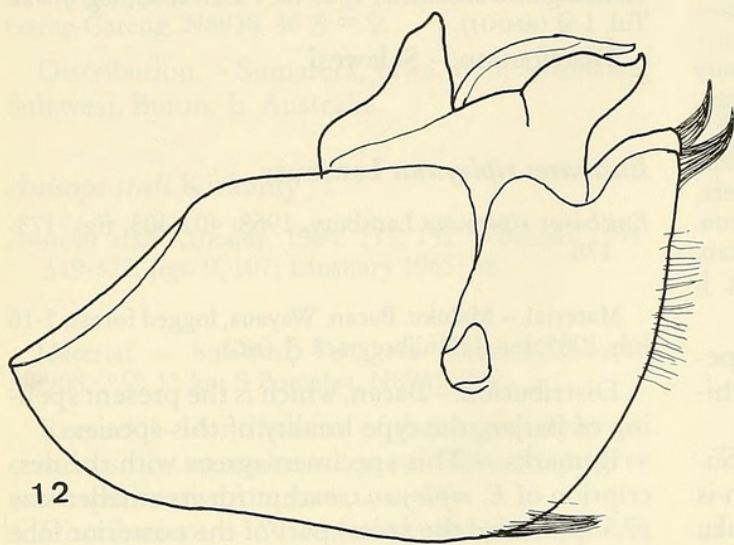
### Description

The description is based on the holotype only. Generally a rather large boat-shaped species, greatest width at level of apex of scutellum.

Measurements. – Length 10.3 mm, maximal width 4.03 mm, width of head 3.22 mm, humeral width of pronotum 3.81 mm, anterior width of vertex 1.10 mm, synthlipsis 0.70 mm.

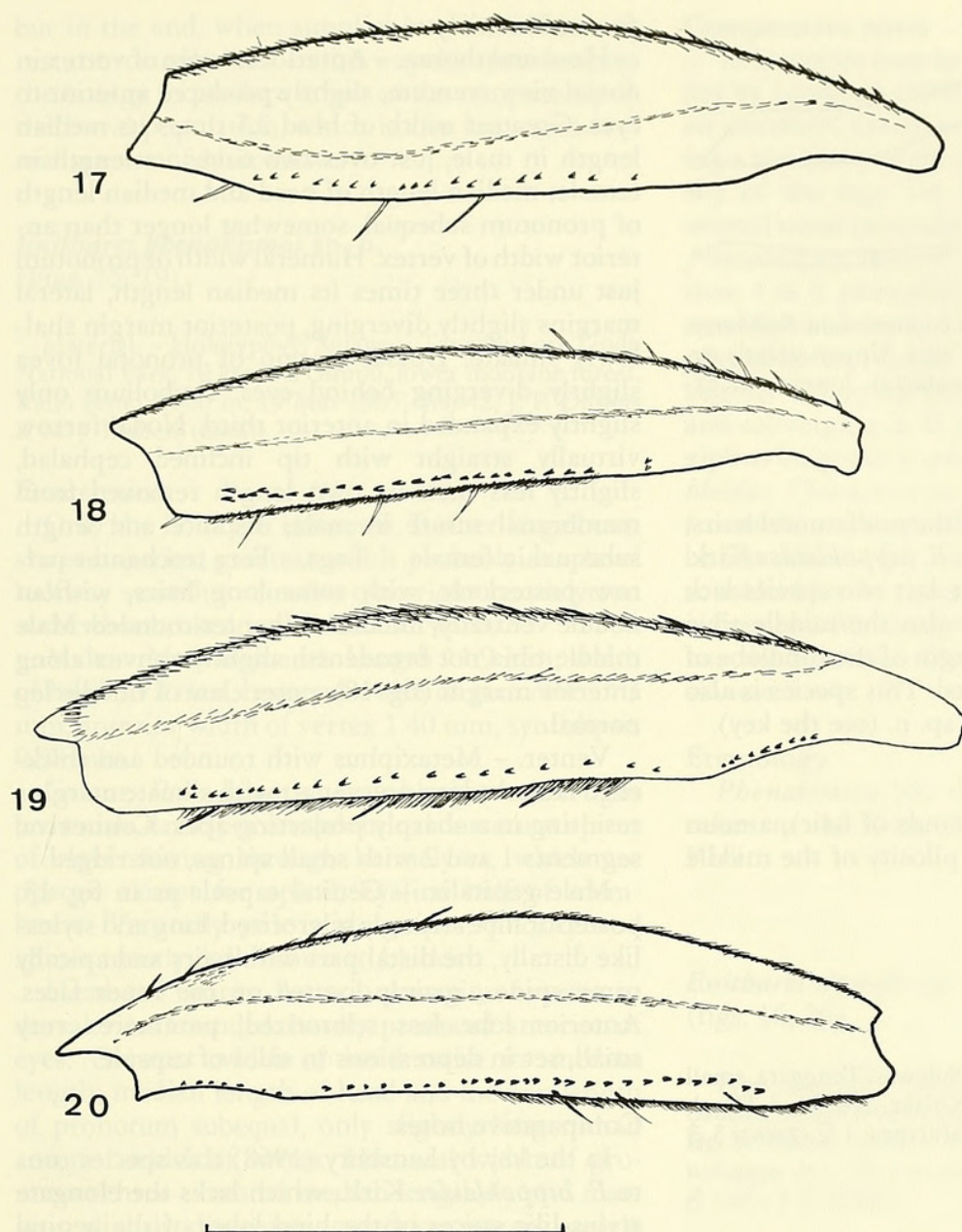
Colour. – Pale luteous, eyes dark brown, apical





Figs. 12-16. Genital capsule in male *Enithares*. – 12, *E. caesaries*, holotype; 13, *E. lansburyi*, paratype; 14, *E. hippokleides*; 15, *E. phenakismos*, holotype; 16, *E. skutalis*, paratype. Scale bar 1 mm.





Figs. 17-20. Middle tibia of male *Enithares*. 17, *E. caesaries*, holotype; 18, *E. lansburyi*, paratype; 19, *E. phenakismos*, holotype; 20, *E. skutalis*, paratype. Scale bar 1 mm.

half of membrane smoky brown to blackish. Ventral side pale with rostrum, stripe along inner (costal) margin of embolium, pilosity, spines, patches and stripes dark brown to blackish.

Head and thorax. – Anterior margin of vertex in dorsal view truncate, hardly produced anterior to eyes. Greatest width of head  $2.3 \times$  its median length; median length of head and median length of pronotum subequal, somewhat longer than anterior width of vertex. Humeral width of pronotum  $3 \times$  its median length, lateral margin slightly diverging, posterior margin somewhat sinuate. Dorsal margin of pronotal fovea slightly diverging behind eyes. Embolium only slightly expanded in anterior third. Nodal furrow about its own length from membranous suture.

Legs. – Fore trochanter narrow posteriorly, with some long hairs, without nodule on ventral side,

meso-trochanter rounded. Mid-femoral hairs in apical half very long, covering ventral margin in inner view; mid tibia not broadened, slightly convex along anterior margin (fig. 17), outer claw of midleg normal.

Ventral side. – Lateral edges of metaxiphus only slightly rounded and thickened, apical part with sinuate margins resulting in a sharply projecting apex. Connexiva of segments 1-3 with small black spines, not ridged.

Male genitalia. – Genital capsule as in fig. 12; posterior lobe strongly sclerotized, its dorsal margin incised, the distal top with a distinct tuft of hairs; anterior lobe less sclerotized, parameres very small, set in depressions in sides of capsule.

#### Comparative notes

In the key by Lansbury (1968) this species runs



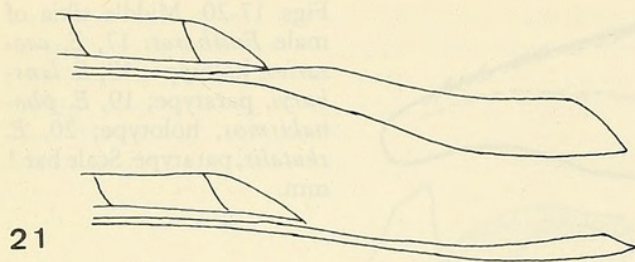


Fig. 21. Base of hemielytra and connexiva in *Enithares*, semidiagrammatical, in ventral view. Upper: greatly expanded anteriorly (as in *E. producta*), lower: not expanded.

to *E. alexis* Lansb. in view of the midfemoral hairs, or, ignoring this character, to *E. hippokleides* Kirk. or *E. timorensis* Brooks. The last two species lack the midfemoral hairs, have also the middle tibia less hairy and the dorsal margin of the hindlobe of the genital capsule not incised. This species is also quite similar to *E. lansburyi* sp. n. (see the key).

### Etymology

*Caesaries* (Latin: thick strands of hair), a noun in apposition, refers to the pilosity of the middle femur.

### *Enithares lansburyi* sp. n. (figs 13, 18)

Type material. – Holotype ♂: Sulawesi Tenggara, small mountain stream 20 km E of Kolaka, N8934, 3 March 1989, leg. N. Nieser (ZMA). – Paratypes: 1 ♀ (ZMA); 3 ♂ 3 ♀ (allotype) (NC, 1 ♂ MBBJ).

### Description

Shape. – Rather large boat-shaped species, greatest width over pronotal humeral angles.

Measurements. – Length ♂ 9.4–10.1 mm, ♀ 9.2–10.0 mm; maximal width 3.7–3.9 mm; width of head 3.0–3.1 mm; humeral width of pronotum 3.7–3.9 mm; anterior width of vertex 1.0–1.1 mm; synthipsis 0.61–0.69 mm.

Colour. – Pale form: Pale luteous, eyes dark brown, apical half of membrane and a large x-shaped spot at apex of scutellum smoky brown to blackish. Ventral side pale with proximal part of embolium, pilosity, spines, patches and stripes blackish. Dark form: anterior fourth of pronotum smoky brown, scutellum shiny black with, in fresh specimens, light greenish somewhat fluorescent stripes along lateral margins, in dried specimens these stripes become pale luteous. Hemielytra hyaline with apex of clavus, inner angle and outer band of corium and basal part of membrane black. Dorsum of abdomen black, showing through hyaline

parts of hemielytra.

Head and thorax. – Anterior margin of vertex in dorsal view truncate, slightly produced anterior to eyes. Greatest width of head 2.5 times its median length in male, just over two times its length in female; median length of head and median length of pronotum subequal, somewhat longer than anterior width of vertex. Humeral width of pronotum just under three times its median length, lateral margins slightly diverging, posterior margin shallowly sinuate. Dorsal margin of pronotal fovea slightly diverging behind eyes. Embolium only slightly expanded in anterior third. Nodal furrow virtually straight with tip inclined cephalad, slightly less than its own length removed from membranous suture in male, distance and length subequal in female. Legs. – Fore trochanter narrow posteriorly, with some long hairs, without nodule ventrally, middle trochanter rounded. Male middle tibia not broadened, slightly convex along anterior margin (fig. 18), outer claw of middle leg normal.

Venter. – Metaxiphus with rounded and thickened lateral edges, apical part with sinuate margins resulting in a sharply projecting apex. Connexiva, segments 1 and 2 with small spines, not ridged.

Male genitalia. – Genital capsule as in fig. 13, posterior lobe strongly sclerotized, long and stylus-like distally, the distal part with hairs and apically some spines, mainly located on the inner faces. Anterior lobe less sclerotized, parameres very small, set in depressions in sides of capsule.

### Comparative notes

In the key by Lansbury (1968) this species runs to *E. hippokleides* Kirk., which lacks the elongate stylus-like apices of the hind lobes of the genital capsule. *E. lansburyi* is very similar to *E. skutalis*, but differs in the apex of the metaxiphus, which is more pronounced, and in the characters mentioned in the key.

### Etymology

Named in honour of Dr. I. Lansbury for his excellent work on this genus and other Oriental Notonectidae.

### Biological notes

*E. lansburyi* and *E. skutalis* were found in similar habitats, virtually stagnant, shaded pools associated with small streams in woodland. In each pool one or two specimens can be found, while larvae, especially the smaller ones, may be found in larger numbers and are of the same or of consecutive instars. We hypothesize, that gravid *Enithares* females seek out suitable ponds to deposit a number of eggs. The larvae start to use other kind of food,



but in the end, when supplies become exhausted, resort to cannibalism. In this way the species stores the energy to produce a few adults temporarily in the larval population, which is also known in several species of *Notonecta*.

*Enithares phenakismos* sp. n.  
(Figs. 15, 19)

Material. – Holotype ♂: Sulawesi Tengah: Lore Lindu National Park, 10 km NE Gimpu, lower montane forest, Rano Rano, 1600 m, 15 Mar 1985, Sta. 42, J. P. Duffels & M. J. Duffels (ZMA).

**Description**

Only the holotype is known. Rather large boat-shaped species, greatest width probably at a level halfway scutellum (in the type right hemielytron somewhat broken and folded outward).

Male. – Measurements. Length 11.9 mm, width of head 3.72 mm, humeral width of pronotum 4.3 mm, anterior width of vertex 1.40 mm, synthlipsis 0.98 mm.

Colour. Pale luteous, eyes black, vertex light brownish, dark spot on abdominal dorsum at apices of clavi shining through hemielytra, which are opaque except for apical, hyaline half of membrane. Ventrally pale with stripes, pilosity and spines mostly dark brown to blackish.

Head and thorax. Anterior margin of vertex in dorsal view rounded, hardly produced anterior of eyes. Greatest width of head twice its median length; median length of head and median length of pronotum subequal, only slightly longer than anterior width of vertex. Humeral width of pronotum three times its median length, lateral margins slightly diverging, posterior margin nearly straight in median part, gently curved anteriorly in lateral parts. Dorsal margin of pronotal fovea converging behind eyes. Embolium only slightly expanded in anterior third. Nodal furrow about its own length removed from membranal suture.

Legs. Fore trochanter posteriorly narrow, with some long hairs, without nodule ventrally, mesotrochanter rounded. Mid-femoral hairs normal, with a row of short black hairs near suture with trochanter, but lacking the small patch of short black bristles at its apex, which are visible in most specimens of *E. hippokleides*, middle tibia not broadened, slightly convex along anterior margin (fig. 19), outer claw of middle leg normal.

Venter. Sides of metaxiphus somewhat rounded and thicken, apex long and sharply projecting. Connexiva of segments 1-3 with small black spines, not ridged.

Genital capsule as in fig. 15, posterior lobe with sinuate posterior margin.

**Comparative notes**

This species runs to *E. hippokleides* Kirk. in the key by Lansbury (1968). At first sight it looks like an oversized specimen of *E. hippokleides*, including a similarity of the genital capsule and the pilosity of the legs. On closer inspection there are several small structural differences, viz. head width / synthlipsis about 6 in *E. hippokleides* and less than 4 in *E. phenakismos*, anterior width vertex / synthlipsis about 2 in *E. hippokleides* and 1.5 in *E. phenakismos*, dorsal margin of pronotal fovea slightly diverging posteriorly in *E. hippokleides* and converging in *E. phenakismos*, apex of metaxiphus longer in *E. phenakismos* than in *E. hippokleides*. Characters to distinguish *E. phenakismos* from other new species described in this paper can be found in the key. *E. timorensis* Brooks, which is considered to be closely related to *E. hippokleides*, is even smaller (length of male up to 9.5 mm) and has the posterior lobe of the genital capsule not sinuate.

**Etymology**

*Phenakismos* (Gr. deceit), a noun in apposition, refers to the close similarity to *E. hippokleides* Kirk.

*Enithares skutalis* sp. n.  
(figs. 16, 20)

Type material. – Holotype ♂: Pulau Buton, 16 km E Baubau, small stream in wet forest, 10.III.1989, N8944, leg. N. Nieser (ZMA). – Paratypes: 1 ♂ with same data as holotype (NC); Buton, small mountain stream, N8941, 2 ♂ (NC), 1 ♂ (MBJ).

**Description**

Male. – Shape. Rather large, boat-shaped species, greatest width across hemielytra just behind pronotal humeral angles.

Measurements. Length 10.4-10.8 mm, maximal width 4.10-4.15 mm, width of head 3.25 mm, humeral width of pronotum 4.00-4.05 mm, anterior width of vertex 1.15-1.20 mm, synthlipsis 0.65-0.68 mm.

Colour. Pale luteous, eyes dark brown, apical half of membrane smoky brown, spot just caudally of scutellum light smoky brown. Ventral side pale with pilosity, spines, patches and stripes blackish.

Head and thorax. Anterior margin of head in dorsal view nearly straight. Greatest width of head  $2.5 \times$  its median length; median length of head, median length of pronotum and anterior width of vertex subequal. Humeral width of pronotum more than  $3 \times$  its median length. Pronotum with lateral margins diverging, posterior margin straight; dor-



sal margin of pronotal fovea directed virtually straight caudad behind eyes. Embolium only slightly expanded in anterior third. Nodal furrow virtually straight with tip inclined cephalad, slightly less than its own length removed from membranous suture.

Legs. Fore trochanter narrow posteriorly, covered with thick long hairs, without nodule ventrally, mesotrochanter rounded. Male middle tibia slightly broadened, convex along anterior margin (fig. 20), outer claw of middle leg normal.

Venter. Metaxiphus with distinct rounded and thickened lateral edges, apical part triangular with virtually straight lateral margins. Connexiva of segments 1 and 2 with small black spines, not ridged.

Genital capsule as in fig. 16, posterior lobe strongly sclerotized, long, hairy and distally stylus-like. Anterior lobe less sclerotized, parameres very small, set in depressions in sides of capsule.

### Comparative notes

This species runs to *E. hebridensis* Lansb. or *E. hippokleides* Kirk. in the key by Lansbury (1968), which, however, both lack the elongate stylus-like apex of the hind lobe of the genital capsule, and differ in the shape of the male middle tibia. The genital capsule of *E. skutalis* has a structure similar to *E. horvathi* and *E. lansburyi*, but in detail these are quite different. Besides, *E. horvathi* is two mm longer and has the anterior margin of the male middle tibia slightly concave (convex in *E. skutalis*).

### Etymology

*Skutalis* (Gr. baton), a noun in apposition, refers to the rodlike shape of the apex of the posterior lobe of the genital capsule.

### *Nychia* Stål

Genus with only a few, mostly poorly known species. Apparently only one species in Malesia (Lansbury 1985).

### *Nychia sappho* Kirkaldy

*Nychia marshalli* var. *sappho* Kirkaldy, 1901a: 809-810.  
*Nychia malayana* Lundblad, 1933a: 148-155, figs. 49-51.  
*Nychia sappho*; Lansbury 1985: 4-8, figs. 7-21.

Material. – Sulawesi Tenggara: Wawanggole, N8901, 2 ♂ 4 ♀; Sungai Sampara, N8909, 3 ♂ 3 ♀; 2 km E Sungai Sampara, N8910, 1 ♀; Aopa marsh, N8913, 7 ♂ 3 ♀; Jalan Asera, N8916, 1 ♀. Pulau Buton: Road to Lawele, N8939, 5 ♂ 5 ♀, all brachypterous.

Distribution. – Malaysia, Indonesia, New Guinea and Northern Australia.

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## APPENDIX 1

Localities sampled by N. Nieser, Indonesia, Sulawesi Tenggara, 1989.

## N8901-N8920: Kabupaten Kendari

## N8901-N8902: Kecamatan Wawotobi

N8901. Wawongole, Sungai Anggoro, 20 Feb. 1989. Quietly flowing stream in open woodland, width 4-5 m, depth up to 1 m, dark brown water; vegetation hanging from the banks in the water.

N8902. Wawongole. 20 Feb. 1989. Pond with abundant *Nymphaea* in marshy fields; shore vegetation hanging into the water.

## N8903-N8912: Kecamatan Kendari

N8903. Eastern road to Lalimboe, 3 km outside Kendari, 21 Feb. 1989. Small stream, width 2-3 m, current 15m/m, slower in ponded sites, bottom sandy, some detergents, but clear.

N8903A. Same site, puddle at edge.

N8904. Eastern road to Lalimboe, 4 km outside Kendari, 21 Feb. 1989. Turbid, near stagnant stream, width 1.5 m, depth up to 1 m.

N8905. Desa Kagunyala, 21 Feb. 1989. Trench.

N8906. Desa Kagunyala, 21 Feb. 1989. Pond covered with *Azolla* and *Lemna*. 100 × 10 m, depth 0.05 m, bottom clay and mud.

N8907. Desa Kagunyala, 21 Feb. 1989. Pond with some *Lemna*, 15 × 5 m, depth 0.05 m, bottom clay and mud.

N8908. Road outside Desa Kagunyala, 21 Feb. 1989. Pond, 100 × 50 m, turbid, beige, grass-like vegetation along one bank. Many *Cybister* and *Dytiscus*.

N8909. Sungai Sampara, second bridge along road Kendari-Wawotobi, 22 Feb. 1989. River, sampled along bank at bridge, water turbid, beige, sand bottom.

N8910. About 2 km E of N8909, 22 Feb. 1989. Puddle in dry stream bed in savannah-like area at foot of hill with monsoon forest.

N8911. Small stream about 8 km E of N8909, 22 Feb. 1989. Width 3 m, depth 0.6 m, water turbid, beige, bottom sand and loam. Current up to 5 m/min.

N8912. Puddle high on banks of N8911, 22 Feb. 1989. Dimensions 10 × 3 m, depth 0.4 m.

## N8913-N8915: Kecamatan Lembuya

N8913. Aopa marsh, 23 Feb. 1989. Bay in marsh at office building, grass-like vegetation on banks, *Ceratophyllum* in water, water light brown but clear.

N8914. Road Lembuya-Palangga, desa Lamooso, 23 Feb. 1989. Sungai Simbangi. Open loamy and sand bottom. Slow current.

N8915. Road Lembuya-Palangga, 23 Feb. 1989. Swampy banks of stream in savannah.

## N8916-N8920. Kecamatan Asera.

N8916. Jalan Asera, first stream from bridge over S. Sampara, 24 Feb. 1989. Riffles with current 15-20 m/min. *Rhagovelia*.

N8917. Pool in meadow near N8916, 24 Feb. 1989. Dimensions 4 × 2.5 m, depth up to 0.3 m, water turbid, beige, grass-like vegetation and *Polygonum*.

N8918. Flooded banks of second stream, 24 Feb. 1989. Meadows mainly with Cyperaceae, water turbid, beige.

N8919. Same road, but here named Jalan Paku Jaya, fifth stream at slightly higher elevation, 24 Feb. 1989. At bridge, slow current, bottom sand and clay.

N8920. Same road, fourth stream, coming from wood-

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land, 24 Feb. 1989. *Ptilomera* in shade of trees, *Limnogonus* in exposed puddle aside of current.

#### N8921-N8934: Kabupaten Kolaka

##### N8921. Kecamatan Kolaka

N8921. Sungai Kolaka, 27 Feb. 1989. Upstream of Kolaka, river, bottom sand and pebbles, current variable. *Ochterus* and *Hydrometra* on mudflat.

N8921A. Same site, places with current.

N8921B. Same site, ponded sites.

##### N8922-N8924: Kecamatan Mowewe.

N8922. Sungai Mowewe, 28 Feb. 1989. Lowland stream, 2.5-10 m wide, in woodland with fields and settlements closeby. Water clear, colourless. Bottom sample at shallow, partly shaded places with moderate current, bottom coarse sand and small pebbles.

N8922A. Same site, pothole with undercut bank, tree roots, floating plant debris, depth over 1 m.

N8923. Small stream in fields and gardens near N8922, 28 Feb. 1989. Width 0.5-1 m, depth 0.1-0.3 m, bottom mostly pebbles, rather fast current.

N8924. Puddles on path at N8922-N8923, 28 Feb. 1989.

##### N8925-N8931: Kecamatan Kolaka.

N8925. Tamborasi, 1 Mar. 1989. Subterraneous stream flowing into small creek.

N8926. Between Tamborasi and Wolo, 1 Mar. 1989. Mountain stream through cocoa plantation. *Ptilomera* and *Rhagovelia* on more quiet sites behind boulders. *Limnogonus* on puddle on banks.

N8927. About 20 km S of Pomalaa, 2 Mar. 1989. Pool at edge of marsh, 2 × 2 m, depth up to 0.7 m, bottom loam, water turbid, beige. *Juncus*, *Chara*, herbaceous plants.

N8928. Small stream in same marsh as N8927, 2 Mar. 1989. Water clear, light brown, flowing through dense marsh vegetation, sample at culvert under road, width 1 m, current c. 10 m/min, depth up to 0.7 m, bottom sand with pebbles.

N8929. Pond at edge of marshy forest. 2 Mar. 1989. *Nymphaea*, *Juncus*.

N8930. Small stream in marsh, 2 Mar. 1989. Open part with flooded banks. Grass-like vegetation along banks with considerable amount of epiphytic algae. Most species from flooded banks, but *Rhagovelia* from the stream.

N8931. C. 15 km S of Pomalaa, 2 Mar. 1989. Sand pits at edge of marsh. Water clear to somewhat turbid, light brown, depth up to 0.5 m.

##### N8932-N8933: Kecamatan Mowewe.

N8932. Road to Mowewe, 3 Mar. 1989. Narrow stream at edge of marsh, water dark brown, bottom with much muddy detritus and plant debris, some *Azolla*.

N8933. Wide stream near N8932, 3 Mar. 1989. Sample from shallow bay without current, soft loamy bottom, much debris from palm tree leaves.

##### N8934. Kecamatan Kolaka.

N8934. Road to Kendari, 20 km E of Kolaka, 3 Mar. 1989. Small mountain stream in woodland, 1-1.5 m wide, depth very variable, potholes up to 1 m, current very variable, small waterfalls and ponded sites.

N8936. Desa Gareng-gareng, 8 Mar. 1989. Pool with many small fish.

N8937. Desa Gareng-gareng, 8 Mar. 1989. Pool with very few fish.

N8938. Desa Gareng-gareng, 8 Mar. 1989. Dirty pond without fish.

N8939. Road to Lawele, 9 Mar. 1989. Mangrove swamp E of road, bottom with thin layer of mud and mangrove roots, marshy vegetation.

N8940. Lower course of small stream, 9 Mar. 1989. Bottom bare grey sand and mud, some plant debris, sluggish.

N8941. Small mountain stream close to the sea, 9 Mar. 1989. Bottom rocky without sand or pebbles, vary from small waterfalls to nearly stagnant pools, no water vegetation, but banks with dense cover of mosses.

N8942. Road to Parjowiro, about 15 km E of Baubau. 10 Mar. 1989. Small cascade-stream, water turbid, and somewhat milky colour.

N8943. Pool at edge of N8942, 10 Mar. 1989.

N8944. Road to Parjowiro, about 16 km E of Baubau, 10 Mar. 1989. Small stream, anastomosing, ponded sites, marshy forest, many buttressed trees, hilly country.

#### N8945-N8949. Kabupaten Kendari.

##### N8945-N8949. Kecamatan Kendari.

N8945. Teluk Kendari, 13 Mar. 1989. Small stream flowing through coconut plantation into bay, bottom sand and clay.

N8946. Teluk Kendari, 13 Mar. 1989. Well near coconut plantation.

N8947. Teluk Kendari, Pulau Bungku Toko, 13 Mar. 1989. Puddles in mangrove.

N8948. Teluk Kendari, close to sea. 13 Mar. 1989. Pool with seawater behind sand wall overgrown with *Ipomoea*.

N8949. Teluk Kendari. 13 Mar. 1989. Well protected by masonry, near N8948.

## APPENDIX 2

Localities on Sulawesi and Borneo from recent collections made by J. P. Duffels, J. Huisman, R. de Jong and J. van Tol.

## Borneo

14 Mar 1987 – Sabah. 60 km W of Lahad Datu. Danum Valley near Danum Valley Field Centre, brooklet at West 3. Sample B. Alt. 220 m asl. 4°58'N 117°48'E. (J. Huisman).

23 Mar 1987 – Sabah. 60 km W of Lahad Datu. Danum Valley near Danum Valley Field Centre, streamlet near West 11 / North 5. Sample A. Alt. 220 m asl. 4°48'N 117°48'E. (J. Huisman).

3 Apr 1987 – S Sabah. 105 km S of Beaufort: Long Pasia area. Sungai Maga near confluence Sg. Pasia. Alt. 1210 m asl. Larger fast running stream in untouched lower montane evergreen rain forest. Large boulders, rapids. 4°26'N 115°40'E. (J. van Tol).

8-9 Apr 1987 – S Sabah. 105 km S of Beaufort: Long Pasia area. Sungai Ritan. Alt. 1160 m asl. Undisturbed evergreen tropical rain forest. 4°24'N 115°42'E. (J. van Tol & J. Huisman).

#### N8935-N8944. Kabupaten Buton

N8935. First stream crossing road from Baubau to the north, 8 Mar. 1989. Downstream of man-made waterfall, width 5 m, depth and current velocity variable, water colourless, somewhat turbid.



- 4 Nov 1987 – Sabah. 20 km W of Sandakan. Sepilok Laut near resthouse. ML light. 5°49'N 118°06'E. (J. Huisman & R. de Jong).
- 23 Nov 1987 – Sabah. 16 km NE Tenom: Agricultural Research Station. Sungai Segalan. At light. 5°12'N 115°59'E. (J. Huisman & R. de Jong).

## Sulawesi

- 23 Feb 1985 – Sulawesi Utara. Dumoga-Bone NP. Project Wallace. Edward's Camp. Tumpah river. 900 m asl [recte 600 m]. (J. P. Duffels).
- 15 Mar 1985 – Sulawesi Tengah. Lore Lindu National Park. 10 km NE of Gimpu. Lower montane forest. Rano Rano. Alt. 1600 m asl. Duffels Sta. 42 (J. P. & M. J. Duffels).
- 23 Apr 1985 – Sulawesi Utara. Dumoga-Bone NP. Project Wallace. Waterfall Creek, tributary of Tumpah river. Sample B. c. 225 m asl. UTM WL9768 [recte XL0064]. 0°35'N 123°54'E. (J. van Tol).
- 23 May 1985 – Sulawesi Utara. Dumoga-Bone NP. Project Wallace. Tumpah river near confluence Toraut. Sample A. c. 210 m asl. UTM XL0063. 0°34'N 123°54'E (J. van Tol).
- 3 Jun 1985 – Sulawesi Utara. Dumoga-Bone NP. Project Wallace. Tumpah river near Edward's subcamp. Sample A. Alt. c. 600 m asl. UTM WL9365. 0°35'N 123°51'E. (J. van Tol).
- 4 Jun 1985 – Sulawesi Utara. Dumoga-Bone NP. Project Wallace. Brooklet c. 2 km west of Edward's subcamp. Sample A. c. 700 m asl. UTM WL9269. (J. van Tol).
- 6 Dec 1985 – Sulawesi Tengah. 50 km SE of Palu: Lore Lindu National Park. Sopo valley near Dongi Dongi. Sample B. Alt. 950 m asl. Rainwater puddle without vegetation, near logging road. UTM SJ86. 1°13'S 120°11'E (J. van Tol & J. Krikken).
- 7 Dec 1985 – Sulawesi Tengah. 60 km SE of Palu: Lore Lindu National Park. Danau Tambing and brooklets. Sample A. Alt. 1600 m asl. *Pandanus*. 1°20'S 120°15'E. (J. van Tol).
- 8 Dec 1985 – Sulawesi Tengah. 50 km SE of Palu: Lore Lindu National Park. Sopo river near Dongi Dongi. Sample A. Alt. 950 m asl. UTM= SJ86. 1°13'S 120°11'E (J. van Tol).
- 19-21 Oct 1989. – Sulawesi Tengah. SW of Luwuk: Totop camp along Batui river. Alt. 120 m asl. 1°09'S 122°31'30"E. Lowland rainforest. Sample Sul. 18 (J. P. Duffels).
- 20 Oct 1989. – Sulawesi Tengah. Luwuk area. Sungai Tikalalang. Sample 89JvT026. (J. van Tol).





Nieser, Nico and Chen, Pingping. 1991. "Naucoridae, Nepidae and Notonectidae, mainly from Sulawesi and Pulau Buton (Indonesia). Notes on Malesian aquatic and semiaquatic bugs (Heteroptera), I." *Tijdschrift voor entomologie* 134, 47–67.

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