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A revision of the genus *Austrolimnius* CARTER & ZECK, 1929 (Insecta: Coleoptera: Elmidae) from New Guinea and the Moluccas

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Abstract

Thirty-one species of the genus *Austrolimnius* CARTER & ZECK from New Guinea and the Moluccas are treated. Twenty-two new species (*A. apicarinatus* sp.n., *A. balkei* sp.n., *A. bispina* sp.n., *A. brevior* sp.n., *A. dentibialis* sp.n., *A. difficilis* sp.n., *A. dudgeoni* sp.n., *A. ekari* sp.n., *A. foveatus* sp.n., *A. gurakor* sp.n., *A. hercules* sp.n., *A. hilum* sp.n., *A. insinuatus* sp.n., *A. jaechi* sp.n., *A. lacrimabilis* sp.n., *A. ramuensis* sp.n., *A. seductor* sp.n., *A. similis* sp.n., *A. solitarius* sp.n., *A. speculifer* sp.n., *A. virilis* sp.n., and *A. weylandensis* sp.n.) are described. Detailed diagnoses for all species known from the area are given. Line drawings of male genitalia, female sternites VIII and important tibial male secondary sexual characters are provided. Species groups are established and their relationships are briefly discussed.

Key words: Coleoptera, Elmidae, *Austrolimnius*, New Guinea, Moluccas, new species, taxonomy.

Zusammenfassung

Einunddreißig Arten der Gattung *Austrolimnius* CARTER & ZECK aus Neuguinea und von den Molukken werden behandelt. Zweiundzwanzig Arten (*A. apicarinatus* sp.n., *A. balkei* sp.n., *A. bispina* sp.n., *A. brevior* sp.n., *A. dentibialis* sp.n., *A. difficilis* sp.n., *A. dudgeoni* sp.n., *A. ekari* sp.n., *A. foveatus* sp.n., *A. gurakor* sp.n., *A. hercules* sp.n., *A. hilum* sp.n., *A. insinuatus* sp.n., *A. jaechi* sp.n., *A. lacrimabilis* sp.n., *A. ramuensis* sp.n., *A. seductor* sp.n., *A. similis* sp.n., *A. solitarius* sp.n., *A. speculifer* sp.n., *A. virilis* sp.n., und *A. weylandensis* sp.n.) werden neu beschrieben. Detaillierte Beschreibungen von allen bekannten Arten der Region sowie Zeichnungen der männlichen Genitalien, der weiblichen Sternite VIII und wichtiger sekundärer männlicher Geschlechtsmerkmale der Tibien werden präsentiert. Die Verwandtschaftsverhältnisse, der im Text aufgestellten Artengruppen, werden kurz diskutiert.

Introduction

The genus *Austrolimnius* CARTER & ZECK, 1929, is so far known to occur in Southern and Central America (18 species), in Australia including Tasmania (52 species and 2 subspecies) and in New Guinea (8 species).

The American fauna was revised more than 50 years ago (HINTON 1941) and only several species have been added since then (DELÈVE 1968, 1970, HINTON 1971, 1972). The revision of Australian species is also more than 30 years old (HINTON 1965), and no additional species were described (several, most probably new species from Queensland are deposited in NMW). The New Guinea species were described rather recently (JÄCH 1982, 1985).

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In the past ten years, biological surveys carried out by David Dudgeon in Papua (DUDGEON 1990), by Manfred A. Jäch in the Central Moluccas and by Michael Balke in Irian Jaya yielded more than 3000 individuals of *Austrolimnius* (deposited in the NMW). In addition to these, I was able to examine a series of *Austrolimnius* from south-eastern Papua collected by W.G. Ullrich and M.E. Bacchus. The material turned out to contain (at least) 31 species, among them all 8 species known so far from New Guinea; 22 of the additional 23 species are described herein. One, most probably new species is represented only by females, and I therefore refrain from its description.

Methods

Specimens were examined in diffuse light at up to 80 times magnifications. Genitalia, abdominal segments, elytra and legs were dissected and treated in lactic acid before examination for several hours or days. Surface microstructure and sensory pores bearing no conspicuous setae were omitted in all drawings. Pronotal length was measured from anterior margin to the antero-lateral angles of scutellum. Elytral length was measured analogously.

The term "pronotal disc" is used in accordance with HINTON (1965) to denote the area of pronotum between the sublateral carinae. Similarly, the term "elytral disc" applies to the inner elytral intervals (1 - 6).

Acronyms and Symbols

BML	The Natural History Museum, London [formerly: British Museum (Natural History)]	L	total body length (= PL + EL)
CBB	Boukal collection, České Budějovice	PL	pronotal length
CSUS	California State University, Sacramento	EL	elytral length
ISNB	Institut Royal des Sciences naturelles, Bruxelles	PW	maximal pronotal width
MHNG	Musée d'Histoire naturelle, Genève	EW	maximal elytral width
NMW	Naturhistorisches Museum, Wien	MTL	mesotibial length
TMB	Természettudományi Múzeum, Budapest	//	separate (locality or determination) labels
WUN	Women's University, Nagoya		

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General characteristics of New Guinea and Moluccan *Austrolimnius*

All New Guinea and Moluccan species are characterised by the following features: 1) pronotum with median longitudinal sulcus distinct, extending to at least anterior 0.4; 2) pronotal anterior margin between sublateral carinae without marginal line; 3) pronotal disc with well separated punctation; punctation usually finer anteriorly, coarser and denser postero-laterally; 4) elytral apices more or less conjointly rounded, often rather truncate;

5) each elytron (Fig. 90) with 8 rows of strial punctures (lateral stria 8 is trabecular, well visible only if elytron is removed and treated in lactic acid), all striae more or less obsolete on declivity, punctures of stria 7 distinct only in about anterior 0.5; 6) elytral intervals 5 and 7 carinate; carinae usually more or less lowering on declivity; interval 8 and lateral margin crenulate, interval 8 in anterior 0.5 - 0.7 between crenulate carina and stria 7 with another row of small granules (possibly a relict of an interval originally inserted between intervals 7 and 8); 7) elytra in cross section more or less evenly arched up to crenulate (outer) carina on interval 8, then abruptly declivious and almost evenly arched from the carina to epipleural margin, with at most feeble angle between elytral and epipleural margin; 8) metasternal disc and ventrite 1 with complete, more or less prominent admedian carinae; 9) parameres nearly as long as or longer than median lobe; 10) plastron covering genae, elytra between the row of small granules on interval 8 and lateral margin, epipleura, hypomera, lateral parts of pro-, meso- and metasternum, parts of all femora and lateral parts of ventrites 1 - 5 (ventrite 5 is often almost entirely covered with plastron); 11) body surface with sparse, evenly distributed, setiferous punctures[1].

Global affinities of New Guinea and Moluccan *Austrolimnius*

At closer examination, the New Guinea and Moluccan species turn out to possess a remarkably large number of male secondary sexual characters. It was already mentioned by HINTON (1965) that they are highly specific and provide very reliable diagnostic features. Using them along with the structure of the male genitalia, all New Guinea and Moluccan species of *Austrolimnius* clearly differ from other Neotropical and Australian members of the genus, and it seems that the New Guinea and Moluccan species are not very closely related to any of the Australian or Neotropical ones. The relative uniformity in many external morphological characters, compared to other *Austrolimnius* from Australia and America, suggests that the New Guinea and Moluccan species possibly form a monophyletic unit.

According to the key to subgenera (HINTON 1968), all New Guinea and Moluccan species are relatively closely related to the subgenus *Limnelmis*; they are possibly also related (JÄCH 1982) to the subgenus *Neosolus*, from which they differ mainly by the non-confluently punctate pronotal disc. I did not make any attempt at assigning them to any subgenus as the generic and subgeneric status of *Austrolimnius* is not satisfactorily understood. HINTON (1939, 1940) obviously misinterpreted the carinae on the lateral margin of elytra in the redescription of the genus, having treated the stria 8 and the crenulate lateral margin of elytra as a part of epipleuron. Consequently, the subgeneric division based largely on the condition of the elytral margin (positions of carinae, extent of plastron) remains doubtful. Also, the pronotal punctation (a defining character for the subgenus *Neosolus*) can be very variable even among very closely related species (e.g. in the *A. exilis* group). On the other hand, some of the subgenera may be found to have fully generic status when examined in detail.

The presently known distribution of *Austrolimnius* (Neotropical and Australian Realms) suggests that it is of Gondwana origin. Therefore, it would be very natural if the genus were represented also in South India and Africa. Indeed, in 1993 I collected two females

[1] These characters (1 - 11) are not explicitly repeated in the descriptions. This particularly applies to the sparse setiferous punctation of the body surface.

apparently belonging to this genus in the Nilgiri Hills (South India, Tamil Nadu); I have seen one species from Kenya (NMW; leg. M.A. Jäch) most probably belonging to the African genus *Helminthocharis* GROUVELLE, 1906, and there is no doubt that *Helminthocharis* and *Austrolimnius* are at least closely related. The problem of the possible synonymy of these two genera or, on the other hand, the fully generic status of some *Austrolimnius* subgenera, may be solved only by a thorough world revision of these two (and several other allied) genera.

Distribution of New Guinea and Moluccan *Austrolimnius*

Despite a remarkable effort of several entomologists and collectors (see Introduction), many parts of New Guinea remain untouched in the terms of aquatic Coleoptera. Most of the Papuan material available for this revision was taken in the Toricelli Mountains (a northern subcoastal mountain range), in the northern slopes of the Bismarck Range (in the north-eastern part of the Central Highlands) and in the Adelbert and Finisterre Ranges in eastern Papua; the remaining specimens come from various places in the Morobe District in the south-eastern part of the country. The material from Irian Jaya was taken at various places in the northwestern part of the central mountain range Pegunungan Maoke (the Baliem Valley, the Weyland Mountains etc.); only a few specimens were collected in the Cyclops Mountains at the northern coast. I could not trace any material from the southern part of New Guinea (southern slopes of the Central Highlands/ Pegunungan Maoke ranges and the southern lowland), from the central part of the main mountain ranges, from the northern highlands in Irian Jaya (Pegunungan Van Rees) as well as from extreme southeast (the Owen Stanley Range) and extreme north-west (the Bird's Head Peninsula) of the island. The considerable disproportion between the number of specimens taken in Irian Jaya (ca. 400) and Papua (ca. 3000) also possibly explains the disproportion between the number of species known from the eastern and from the western part of the island. Eight species are so far known to occur exclusively in Irian Jaya (*A. balkei* sp.n., *A. brevior* sp.n., *A. difficilis* sp.n., *A. ekari* sp.n., *A. insinuatus* sp.n., *A. schoelleri* JÄCH, *A. speculifer* sp.n., and *A. weylandensis* sp.n.) and three species are distributed both in Irian Jaya and in Papua New Guinea (*A. bispina* sp.n., *A. dentibialis* sp.n., and *A. ullrichi* JÄCH), compared to 19 species so far known only from the territory of Papua New Guinea (*A. apicarinatus* sp.n., *A. araneus* JÄCH, *A. brunneus* JÄCH, *A. dudgeoni* sp.n., *A. exilis* JÄCH, *A. foveatus* sp.n., *A. gurakor* sp.n., *A. hercules* sp.n., *A. hilum* sp.n., *A. lacrimabilis* sp.n., *A. papuanus* JÄCH, *A. pictus* JÄCH, *A. ramuensis* sp.n., *A. schoelleroides* JÄCH, *A. seductor* sp.n., *A. similis* sp.n., *A. solitarius* sp.n., *A. virilis* sp.n., and *Austrolimnius* sp. 1).

In the Moluccas, *Austrolimnius* is known to occur only in Ceram and Ambon (represented by a single species, *A. jaechi* sp.n.). As far as I know, no Elmidae were so far reported from the remaining Moluccan islands, as well as from the islands Biak and Yapen (Irian Jaya), and from New Britain, the Bismarck Archipelago, and the D'Entrecasteaux Islands (Papua New Guinea).

Species groups and lineages of New Guinea and Moluccan *Austrolimnius*

Based on the form of the male genitalia and the male secondary sexual characters, there are several distinct species groups among New Guinea *Austrolimnius*: the *A. papuanus* group

(comprising *A. papuanus* and *A. ramuensis*), the *A. araneus* group (with *A. schoelleri*, *A. schoelleroides*, *A. araneus,* and *A. brunneus*), the *A. exilis* group (consisting of *A. exilis*, *A. similis*, *A. apicarinatus*, *A. pictus A. virilis*, *A. difficilis*, *A. brevior,* and *A. insinuatus*), the *A. lacrimabilis* group (with *A. lacrimabilis*, *A. hercules*, *A. hilum,* and *A. ekari*), the *A. ullrichi* group (containing *A. ullrichi* and *A. bispina*), and the monospecific *A. jaechi* group. With a possible exception of the *A. lacrimabilis* group, all of them are well defined and monophyletic. The remaining species cannot be assigned to any of the previous groups and their phylogenetical status is not clear; however, some general (? clinal) features in the formation of male secondary sexual characters can be used to establish several lineages to include the remaining species: the *exilis-ullrichi* lineage (comprising the *A. exilis*, *A. lacrimabilis, A. ullrichi,* and *A. jaechi* groups and *A. balkei*, *A. dentibialis*, *A. dudgeoni*, *A. foveatus*, *A. gurakor*, *A. seductor*, *A. solitarius*, *A. speculifer,* and *A. weylandensis*), the *A. araneus* lineage (= the *A. araneus* group) and the *A. papuanus* lineage (= the *A. papuanus* group). However, the lineages should be regarded merely as working units as the *A. exilis-ullrichi* lineage may turn out to be paraphyletic; virtually nothing is known about the clinal tendencies and convergence of the male genitalia and the secondary sexual characters in *Austrolimnius*, on which the division is largely based (see also the diagnosis of the latter lineage).

I have made no attempt at a full cladistic analysis of the New Guinea and Moluccan *Austrolimnius*.

Description of species

The *Austrolimnius papuanus* group

Members of the *A. papuanus* group are characterized by the following apomorphies: 1) males with meso- and metatibial scraping setae transformed; 2) male meso- and metatibia distally with a mesial dilatation. Aedeagus simple (base of median lobe not shifted apicad from parameral base, basal apophyses short, parameres mesally smooth, endophallus without distinct sclerotizations). Legs moderately long. Male secondary sexual characters confined to the meso- and metatibial transformation, to posteriorly gibbous meso- and metatrochanter (in large males of *A. papuanus*), to long setae on basal metatarsomeres and to a somewhat different condition of metasternum. The group contains two species (*A. papuanus* and *A. ramuensis*) and is so far known only from Papua.

Austrolimnius papuanus JÄCH, 1985

Austrolimnius papuanus JÄCH, 1985: p. 252, fig. 37.

Type material: The holotype ♂ (not examined) and 7 paratypes (not examined) are deposited in the MHNG. I have examined the following paratypes (NMW): 3 exs., "PNG/WHProv., IV. 79, Bayer/Rokina, Antenge Riv."; 5 exs., "PNG/Mor./Lae, 14.VI. 79, Umg. Gebensis, Gorogias Riv.".

Additional material (NMW, BML, CBB, CSUS, MHNG, WUN): 3 exs., "NEW GUINEA, Morobe Dist., Lae-Bulolo Rd., Gurakor Creek, 30.xii.1964, M.E. Bacchus, B.M. 1965-120, Stn. No. 133"; 1 ex., "NEW GUINEA, Morobe Dist., Herzog Mts. Vagau, c. 4000 ft, 4.-17.i.1965, M.E. Bacchus, B.M. 1965-120, Stn. No. 152"; 3 exs., "NEW GUINEA, Morobe Dist., c. 3m. Lae-Busu Rd., 21.i.1965, M.E. Bacchus, B.M. 1965-120, Stn. No. 155"; 1 ex., "PAPUA, Pt. Moresby, Brown R. Rd., 15.iii.1965, M.E. Bacchus, B.M. 1965-120, Stn. No.

199"; 1 ex., "PAPUA N. GUINEA, Mt. Hagen 21.IV.79, Rokina, Bayer Valley, W.G. Ullrich"; ca. 350 exs., "Papua Nlle Guinée, Morobe 5km above, env. de Gurakor, W.G. Ullrich, I. 81"; 161 exs., "PAPUA NG 6./7. 1988, Sepik-Ramu Basin, leg. Dudgeon // Kojé Creek, 160m a.s.l., 5°33'S 145°23'E"; 9 exs., same data except: "Maram Creek, 80m a.s.l., 4°33'S 144°59'E"; 4 exs., "Hapia River, 200m a.s.l., 5°47'S 145°37'E"; 33 exs., "Mom Creek, 170m a.s.l., 5°45'S 145°20'E", 1 ex.; "Stream G-99, 1540m a.s.l., 6°18'S 145°55'E"; 3 exs., "Mambrangka River, 1550m a.s.l., 6°19'S 145°52'E"; 80 exs., "Upper Ramu River, 1620m a.s.l., 6°19'S 145°49'E"; 54 exs., "Coffee Stream, 1600m a.s.l., 6°18'S 145°50'E"; 36 exs., "Ralph's Stream, 1600m a.s.l., 6°16'S 145°52'E"; 2 exs., "Stream G-104, 1560m a.s.l., 6°16'S 145°58'E"; 2 exs., "Inonake Stream, 1320m a.s.l., 5°40'S 144°42'E"; 17 exs., "# 1" (one of the streams draining the Central Highlands; see Appendix); 15 exs., "# 2" (one of the streams draining the Finisterre and Adelbert Ranges and the Toricelli Mountains; see Appendix); 1 ex., "# 3" (one of the streams draining the Finisterre and Adelbert Ranges and the Toricelli Mountains; see Appendix).

Body form and colour: Size very variable (L = 1.13 - 1.54 mm) due to the broad vertical distribution of the species. In the material collected by Dudgeon, the Finisterre and Adelbert Ranges populations from altitudes below 200 m a.s.l. (Kojé Creek, Maram Creek, Hapia River) are in average smaller than the remaining populations from altitudes above 1300 m a.s.l. I was not able to find any other significant characters to separate these two population groups. Body elongate, subparallel, moderately depressed. Colouration black; anterior margin of pronotum, legs, antennae and mouthparts pale brown to yellowish; femora often darkened. Elytral base without a pale colour marking, at most vaguely brown in teneral specimens.

Head: Clypeus sparsely to rather densely, frons usually densely punctate. Fronto-clypeal suture complete.

Thorax: Pronotum slightly wider than long (PL = 0.37 - 0.49 mm, PW = 0.42 - 0.54 mm, PW/PL = 1.03 - 1.15) with rather variable shape, widest at posterior 0.3 - 0.5; sides feebly convex, usually slightly emarginate at base. Discal surface with fine, moderately dense punctation that is usually effaced on most of the disc; interstices smooth and glabrous. Median longitudinal sulcus moderately narrow, reaching anterior 0.2 - 0.1.

Elytra slightly obovate to subparallel (EL = 0.76 - 1.05 mm, EW = 0.52 - 0.71 mm, EW/EL = 0.66 - 0.72), about twice as long as and distinctly broader than pronotum (PL/EL = 0.46 - 0.51, PW/EW = 0.71 - 0.80). Humeri rounded or feebly gibbous. Disc with very sparse, fine micropunctation; interstices almost smooth with few transverse wrinkles, glabrous. Striae not distinctly impressed; strial punctures sparse and moderately fine. Carinae on intervals 5 and 7 fine; intervals 1 - 4 and 6 flat.

Metasternal disc flat or slightly convex in anterior 0.5 (usually less convex in males); with median depression (often more distinct in males) and longitudinal suture between posterior 0.3 - 0.5; postero-laterally variably punctate, the punctation often more extensive and more confluent in males; interstices smooth and glabrous.

Legs: Moderately long (MTL = 0.30 - 0.42 mm, MTL/L = 0.22 - 0.26). Distal 0.5 - 0.6 of male meso- and metatibia with a mesial carina-like dilatation, which is apparently proportional to the body size, more prominent in large males; the tibia of some large males also distinctly flattened and curved in lateral aspect; meso- and metatibia of female sometimes also feebly dilated. Scraping setae, sensu SPANGLER & PERKINS (1989), on the dilated parts stout, more closely set in males (more slender and everywhere sparse in females). Meso- and metatrochanter posteriorly gibbous in large males. Setae on the ventral side of male metatarsomeres 1 - 4 (especially 1 and 2) longer in females.

Abdomen: Ventrite 1 between admedian carinae in anterior 0.5 confluently to rugosely punctate, ventrite 5 sometimes with fine discal punctation; interstices smooth and glabrous.

Apex of male sternite VIII rather acuminately rounded; with two small, succesive median (pre)apical foveae in about posterior 0.4 and with two groups of long adfoveal setae. Apex of male tergite VIII evenly rounded.

Apex of female sternite VIII (Fig. 61) acuminately rounded; with a large apical fovea and two groups of long adfoveal setae. Apex of female tergite VIII almost evenly rounded.

Male genitalia: See JÄCH (1985: fig. 37). Aedeagus ca. 460 µm long, simple, well sclerotized. Median lobe slender, subparallel, feebly insinuated in lateral view; apex moderately rounded. Parameres as long as median lobe, slender; apices slightly curved ventrad, with 10 - 15 preapical setae.

Differential diagnosis: Males of *A. papuanus* are easily recognized by the combination of the dilated meso- and metatibia and the unicoloured elytra. Females can be determined by the unicoloured, smooth, not elongate elytra with fine carinae, by the moderately long legs and by the shape of sternite VIII and tergite VIII.

Distribution and habitat: *A. papuanus* seems to be a rather common and widespread species in Papua. It was collected at various streams (see also Appendix) at elevations between 80 m and 1620 m a.s.l.

Austrolimnius ramuensis sp.n.

Holotype ♂ (NMW): "PAPUA NG 6./7. 1988, Sepik-Ramu Basin, leg. Dudgeon // Stream G-99, 1540m a.s.l., 6°18'S 145°55'E". **Paratypes** (NMW, CBB): 14 exs., same data as holotype; 3 exs., same data as holotype except: "Mambrangka River, 1550m a.s.l., 6°19'S 145°52'E"; 5 exs., "Upper Ramu River, 1620m a.s.l., 6°19'S 145°49'E"; 2 exs., "# 1" (one of the streams draining the Central Highlands; see Appendix).

Body form and colour: Small (L = 1.28 - 1.37 mm). Body elongate, subparallel, moderately depressed; in size (PL = 0.39 - 0.43 mm, PW = 0.45 - 0.48 mm, EL = 0.89 - 0.95 mm, EW = 0.60 - 0.66 mm), proportions (PW/PL = 1.09 - 1.15, EW/EL = 0.67 - 0.71, PL/EL = 0.43 - 0.47, PW/EW = 0.71 - 0.75) and most external morphological structures within the variability range of *A. papuanus*. Colouration dark brown to black; anterior margin of pronotum, tibiae, tarsi, antennae and mouthparts pale brown to yellowish; femora dark brown. Humeri broadly yellowish to reddish, in some specimens also the elytral declivity vaguely paler.

Legs: Moderately long (MTL = 0.31 - 0.34 mm, MTL/L = 0.24 - 0.26). Distal 0.5 - 0.6 of male meso- and metatibia with a mesial carina-like dilatation, which is usually less pronounced than in *A. papuanus*, approximately corresponding to small males of *A. papuanus*; feebly to slightly dilated in females. Scraping setae on the dilated parts stouter and more closely arranged in males than in females. Setae on the ventral side of metatarsomeres 1 - 4 (especially 1 and 2) longer in males than in females.

Abdomen: Apex of male sternite VIII rather acuminately rounded; with an elongate, narrow, median fovea in posterior 0.4 (sometimes indistinctly divided into two successive foveae, resembling *A. papuanus*) and with two groups of long adfoveal setae. Apex of male tergite VIII evenly rounded.

Apex of female sternite VIII (Fig. 62) acuminately rounded; with a large apical fovea and two groups of long adfoveal setae. Apex of tergite VIII almost evenly rounded. Both segments very similar to those of *A. papuanus*.

Male genitalia: Aedeagus (Fig. 30) very small (ca. 370 µm long), little sclerotized, simple; of the same type as in *A. papuanus*, differing mainly by its smaller size and fainter sclerotization.

Differential diagnosis: *Austrolimnius ramuensis* can be separated from *A. papuanus* by the elytral colouration, by the much smaller and less strongly sclerotized aedeagus as well as by the slightly different shape of the apical fovea of sternite VIII and the less dilated meso- and metatibia in males. Externally, *A. ramuensis* differs from all New Guinea species by the combination of its elytral colouration and very shiny appearance.

Distribution and habitat: So far known only from several streams of the Upper Ramu River drainage system at elevations around 1600 m a.s.l. (see also Appendix).

Etymology: Named after the Ramu River.

The *Austrolimnius araneus* group

The *A. araneus* group comprises species with the following apomorphies: 1) male protibia with scraping setae transformed (stouter, differently arranged compared to females), meso- and metatibial scraping setae more or less equal in both sexes; 2) legs (especially middle and hind pair) prolonged, middle and hind legs longer in males than in females (MTL/L between 0.34 and 0.43 in males and between 0.28 and 0.34 in females); 3) male protibia transformed, mesally flattened and arched, or with a carina-like dilatation (cleaning fringe often reduced or absent); 4) male metasternum with a conspicuous setiferous tubercle posterior to each mesocoxal opening; 5) aedeagus very elongate; 6) base of median lobe conspicuously shifted apicad from parameral base; 7) basal apophyses conspicuously long. Probably all four, very similar species belonging to this group live in mountain streams at elevations between ca. 1300 m and 2000 m a.s.l.; *A. schoelleri* is known from Irian Jaya and *A. schoelleroides*, *A. araneus*, and *A. brunneus* occur in Papua.

Austrolimnius schoelleri JÄCH, 1982

Austrolimnius schoelleri JÄCH, 1982: p. 89, figs. 1, 2.

Holotype ♂ (NMW): "New Guinea, Baliem NG 8, leg. A. Schöller // Wamena, Jiwika, 16.8.1981". **Paratypes** (all NMW): 14 exs., "New Guinea 16.8.1981, Baliem Tal NG 8, leg. A. Schöller"; 8 exs., same data except "NG 12"; 6 exs., same data except, "15.8.81" and "NG 6"; 2 exs., "22.8.81" and "NG 9"; 5 exs., "22.8.81" and "NG 11"; 1 ex., "22.8.81" and "NG 12"; 3 exs., "14.8.81" and no locality number. I have not seen the additional paratypes ("zahlreiche Ex. aus verschiedenen Bächen des Baliemtales" according to the original description) that are deposited in the MHNG, BML, ISNB, and TMB.

Additional material (NMW, CBB): 9 exs., "IRIAN JAYA, 26.9.1992, Baliem-Tal, Jiwika, 138°56' E 04°06'S, 1900m, leg. Balke (55)"; 2 exs., same data except "Baliem-Tal, Wamena, 1700m, loc. no. (56); 5 exs., "IRIAN JAYA, 1.10.1993, Eme Gebiet, Okloma, 1500m // ca. 139°55'E 04°14'S, leg. M.Balke (28)"; 4 exs., "IRIAN JAYA: 11.9.1993, Bime-Calab Gebiet, Bime, 1400m // ca. 140°12'E 04°20'S, leg. M.Balke (12)"; 12 exs., "IRIAN JAYA: Paniai Prov., road Nabire - Ilaga, km 180 - 190, Upper Kamo Valley // Bogemani-Moannemani, 5. - 6.9.1996, 1800 - 1900m, leg. M. Balke (96 # 17)".

Body form and colour: See JÄCH (1982: fig. 1). Large (L = 1.53 - 1.74 mm). Body subparallel, moderately depressed. Colouration dark brown to black; legs, antennae and mouthparts pale brown, anterior margin of pronotum brownish; femora darkened.

Head: Clypeus densely, sometimes rather rugosely punctate, frons with very coarse rugose punctation; interstices glabrous. Fronto-clypeal suture complete.

Thorax: Pronotum as wide as or slightly wider than long (PL = 0.50 - 0.59 mm, PW = 0.51 - 0.63 mm, PW/PL = 0.99 - 1.11); sides usually subparallel in posterior half, slightly convex in anterior half. Disc with fine and dense, usually largely effaced punctation. Median longitudinal sulcus moderately narrow, extending to anterior 0.1.

Elytra slightly obovate to subparallel (EL = 1.03 - 1.16 mm, EW = 0.74 - 0.83 mm, EW/EL = 0.66 - 0.73), about twice as long as and distinctly to very distinctly broader than pronotum (PL/EL = 0.46 - 0.52, PW/EW = 0.71 - 0.77). Humeri almost rounded. Discal surface with few micropunctures, interstices usually with a few wrinkles, smooth and glabrous. Striae not distinctly impressed, at most stria 1 slightly so at base; strial punctures moderately fine and deep, rather sparse. Carinae on intervals 5 and 7 moderately strong; intervals 1 - 4 and 6 flat.

Metasternal disc rather uneven in males and less uneven, more or less slightly convex in females; posterior angles more or less deeply impressed, setiferous punctures more or less granuliform; interstices with numerous rugose wrinkles to almost smooth, glabrous; laterally with a prominent tubercle behind each mesocoxal opening in males, the tubercle covered with granules bearing conspicuous long setae. Longitudinal suture distinct in about posterior 0.6 - 0.9.

Legs: Long and slender, middle and hind leg conspicuously prolonged in males (MTL = 0.61 - 0.69 mm in males, 0.45 - 0.54 mm in females; MTL/L = 0.39 - 0.42 in males, 0.28 - 0.31 in females). Male protibia mesally slightly emarginate in distal 0.5; cleaning fringe reduced, small; scraping setae stouter than in females.

Abdomen: Setiferous punctures sometimes partly granuliform. Ventrite 1 between admedian carinae in various extent rugosely punctate, female ventrite 5 discally with dense, partly rugose punctation; interstices smooth and glabrous.

Apex of male sternite VIII rather strongly acuminate, tuberculiform in lateral aspect; with a group of long apical setae. Apical fovea absent. Apex of tergite VI rather truncate.

Female sternite VIII (Fig. 64) and tergite VIII (Fig. 67) with apex more acuminate than most females of *A. araneus* and *A. schoelleroides*, its shape more or less constant in the available populations. Tergite VIII with a group of apical setae, apical fovea absent.

Male genitalia: See JÄCH (1982: fig. 2). Aedeagus ca. 750 µm long, well sclerotized. Median lobe moderately broad, strongly narrowed at about midlength, subparallel in apical 0.5, its base remarkably shifted apicad from parameral base; basal apophyses broad and extremely long, as long as median lobe. Endophallus basally with indistinct, dot-like sclerotizations. Parameres distinctly overreaching median lobe; apices feebly curved ventromediad, rather pointed, with very numerous (ca. 70) and very long preapical setae.

Differential diagnosis: *Austrolimnius schoelleri* larger than *A. araneus* and *A. brunneus* and probably has a different distribution than the remaining species of the *A. araneus*

group. Males are easily recognized by the relatively simple protibia and the shape of the aedeagus. Females of *A. schoelleri* are separated from other species outside the *A. araneus* group by combining the long legs and the non-foveate apex of tergite VIII. They usually have a distinctly more acuminate apex of sternite VIII and tergite VIII than females of *A. schoelleroides* and *A. araneus*; however, more populations have to be studied to find out the variability of each species. So far, I was not able to find any constant morphological character to separate the females of *A. schoelleri* from the latter two species (they were identified by associating them with males); *A. schoelleri* and *A. araneus* probably cannot be separated by the size of their antennomeres as stated in the original description (JÄCH 1985). *A. schoelleri* differs readily from *A. brunneus* by its larger size and by the comparatively narrower elytra.

Distribution and habitat: So far known only from the Baliem Valley and the Upper Kamo Valley regions in central Irian Jaya. It was collected in mountain streams at elevations between 1400 m and 1900 m a.s.l.

Austrolimnius schoelleroides JÄCH, 1985

Austrolimnius schoelleroides JÄCH, 1985: p. 251, fig. 36.

Type material: Holotype ♂ (MHNG) and paratype ♂ (NMW): "18. VI. 79 PNG/EHProv., Umg. Ofafina, Jababari Riv." examined.

Additional material (NMW, CBB, BML): 2 ♂♂, "NEW GUINEA: Morobe Dist., Herzog Mts., Vagau, C. 4,000 ft., 4 - 17.i.1965 // M.E. Bacchus., B.M. 1965-120 // Stn. No. 148"; 4 ♂♂, same data except "Stn. No. 152"; 2 ♂♂, "Stn. No. 152A"; 4 ♂♂, "NEW GUINEA: E. Highland Dist., Wanatabe Valley, Nr. Okapa, c. 5000 ft., 5.ii.1965 // M.E. Bacchus., B.M. 1965-120 // Stn. No. 176"; 1 ♂, same data except "Stn. No. 177"; 1 ♂, "Stn. No. 186".

I was not able to assign the following females with certainty either to *A. schoelleroides* or to *A. araneus* due to their morphological overlap (see also the differential diagnoses of both species): 9 ♀♀, "NEW GUINEA: E. Highland Dist., Wanatabe Valley, Nr. Okapa, c. 5000 ft., 5.ii.1965 // M.E. Bacchus., B.M. 1965-120 // Stn. No. 176"; 1 ♀, "NEW GUINEA: Morobe Dist., Herzog Mts., Vagau, C. 4,000 ft., 4 - 17.i.1965 // M.E. Bacchus., B.M. 1965-120 // Stn. No. 140"; 14 ♀♀, same data except "Stn. No. 148"; 8 ♀♀, "Stn. No. 152"; 3 ♀♀, same data except "3,700 ft., 8.i.1965" and "Stn. No. 145b".

Body form and colour: Large (L = 1.60 - 1.74 mm, PL = 0.53 - 0.61 mm, EL = 1.08 - 1.15 mm). In size, body shape (PW/PL = 0.98 - 1.12, EW/EL = 0.71 - 0.73, PL/EL = 0.46 - 0.56, PW/EW = 0.72 - 0.78); colour and most morphological structures very similar to *A. schoelleri* and *A. araneus*.

Thorax: Male metasternal lateral tubercles in average more prominent than in *A. schoelleri* and *A. araneus*.

Legs: Long and slender, middle and hind leg conspicuously prolonged in males (MTL = 0.56 - 0.61 mm and MTL/L = 0.34 - 0.36 in males; the values probably more or less identical with *A. araneus* in females). Male protibia mesally feebly dilated between distal 0.7 and 0.4, slightly emarginate in distal 0.3; scraping setae stouter than in females; cleaning fringe apparently not reduced in males.

Abdomen: Apex of male sternite VIII more strongly and more acuminately produced than in *A. schoelleri*. Apex of tergite VIII rather truncate, with a very faint, broad median emargination.

Apex of female sternite VIII (Fig. 65) and tergite VIII (Fig. 68) more evenly rounded than in *A. schoelleri* and possibly in average more evenly rounded than in *A. araneus*. The two illustrations show extremely rounded segments of a female most probably belonging to *A. schoelleroides*; the shape in the examined females of *A. araneus* and *A. araneus* / *A. schoelleroides* varies between this extreme and the shape of *A. schoelleri*; see also the diagnosis of *A. araneus*.

Male genitalia: See JÄCH (1985: fig. 36). Aedeagus ca. 780 µm long, well sclerotized. Median lobe moderately slender, subparallel in basal 0.6, then strongly narrowed; base shifted apicad from parameral base; basal apophyses broad and very long, ca. 0.7 as long as median lobe. Endophallus with scale-like sclerotizations. Parameres distinctly overreaching median lobe, almost straight; basally connected by a sclerotized band; apices rather pointed, with about 20 very long preapical setae.

Differential diagnosis: Males of *A. schoelleroides* differ from other species of the *A. araneus* group by the shape of the protibia and the aedeagus. Females (probably) possess a more rounded apex of abdominal sternite VIII and tergite VIII than *A. schoelleri*; so far, I was not able to separate them from females of *A. araneus* though they are probably slightly larger (deriving from the difference in the size of males). *Austrolimnius schoelleroides* differs readily from *A. brunneus* by its larger size and by the comparatively narrower elytra.

Distribution and habitat: So far known only from mountain streams of south-eastern Papua at elevations between 1200 m and 1500 m a.s.l.

Austrolimnius araneus JÄCH, 1985

Austrolimnius araneus JÄCH, 1985: p. 250, figs. 34, 35.

Type material: I have not examined the holotype ♂ and 10 paratypes that are deposited in the MHNG. I have seen the following paratypes (all deposited in NMW): 1 ex., "11.II.79 PNG/EHProv., Umg. Kainantu, Onerunka"; 2 exs., same data except: "16.II.79"; 3 exs., "18.VI.79"; 4 exs., "9.XII.79".

Additional material (NMW, CBB, CSUS, MHNG, WUN): 34 exs., "PAPUA NG 6./7. 1988, Sepik-Ramu Basin, leg. Dudgeon // Stream G-99, 1540m a.s.l., 6°18'S 145°55'E"; 78 exs., same data except: "Upper Ramu River, 1620m a.s.l., 6°19'S 145°49'E"; 12 exs., "Coffee Stream, 1600m a.s.l., 6°18'S 145°50'E"; 4 exs., "Ralph's Stream, 1600m a.s.l., 6°16'S 145°52'E"; 14 exs., "Stream G-104, 1560m a.s.l., 6°16'S 145°58'E"; 1 ♀, "Inonake Stream, 1320m a.s.l., 5°40'S 144°42'E"; 26 exs., "# 1" (one of the streams draining the Central Highlands; see Appendix); 8 ♂♂, "NEW GUINEA: E. Highland Dist., Wanatabe Valley, Nr. Okapa, c. 5000 ft., 5.ii.1965 // M.E. Bacchus., B.M. 1965-120 // Stn. No. 176"; 1 ♂, same data except: "Stn. No. 177"; 5 ♂♂, same data except: "10.-11.ii.1965" and "Stn. No. 186".

For the females I was unable to assign with certainty either to *A. araneus* or to *A. schoelleroides*, see the list of the latter; the uncertainty possibly applies also to the single female from Inonake Stream.

Body form and colour: See JÄCH (1985: fig. 34). Moderately large (L = 1.38 - 1.62 mm, PL = 0.46 - 55 mm, EL = 0.92 - 1.08 mm). In body shape (PW/PL = 1.00 - 1.16, EW/EL = 0.70 - 0.74, PL/EL = 0.46 - 0.53, PW/EW = 0.72 - 0.79), colour and most morphological structures very similar to *A. schoelleri* and *A. schoelleroides*.

Legs: Long and slender, middle and hind leg conspicuously prolonged in males (MTL = 0.58 - 0.66 mm in males and 0.45 - 0.53 mm in females; MTL/L = 0.38 - 0.42 in males and 0.31 - 0.34 in females). Male protibia (Fig. 53) mesally excised and arched; apex con-

spicuously produced mesad, tooth-like, armed with a large and stout seta; scraping setae very short, stouter, at the proximal end rather closely set, becoming more sparse towards apex (inversely arranged in comparison to females); cleaning fringe completely absent.

Abdomen: Male sternite VIII and tergite VIII as in *A. schoelleri*.

Apex of female sternite VIII and tergite VIII with a rather variable shape, usually distinctly more evenly rounded than in *A. schoelleri* and possibly in average slightly less evenly rounded than in *A. schoelleroides* (see also Figs. 64, 65, 67, and 68).

Male genitalia: See JÄCH (1985: fig. 35). Aedeagus ca. 640 µm long, well sclerotized. Median lobe moderately slender, tapering in basal 0.6, narrow and subparallel in apical 0.4, upturned dorsad in some specimens; base extremely shifted apicad from parameral base; basal apophyses broad and extremely long, distinctly longer than median lobe. Endophallus usually with faint and indistinct, dot-like sclerotizations in the apical part. Parameres distinctly overreaching median lobe; apices curved ventromediad, with extremely numerous (ca. 60 - 70) and very long preapical setae.

Differential diagnosis: Males of *A. araneus* differ from other species of the *A. araneus* group by the shape of the protibia (except *A. brunneus*) and of the aedeagus; females are somewhat smaller than *A. schoelleri* and probably have in average more rounded abdominal sternite VIII and tergite VIII; so far, I was not able to separate them from females of *A. schoelleroides* (though they are probably slightly different in size), and I determined them only by associating with males. *Austrolimnius araneus* is readily separated from *A. brunneus* by its comparatively narrower elytra.

Distribution and habitat: Known from various mountain streams of south-eastern Papua at elevations between 1300 m and 1600 m a.s.l. (see also Appendix).

Austrolimnius brunneus JÄCH, 1985

Austrolimnius brunneus JÄCH, 1985: p. 249, fig. 33.

Type material: I have not seen the holotype ♂ and the three paratypes that are deposited in the MHNG. I have examined the following paratypes (NMW): 1 ♀, "15. VII. 79 PNG/Mor./Lae, Umg. Oomsis, Buang Riv."; 1 ♂, 1 ♀, "14. VI. 79 PNG/Mor./Lae, Umg. Gebensis, Gorogias Riv."

Additional material (NMW, CBB, MHNG): 4 ♂♂, 12 ♀♀, "Papua Nlle Guinée, Morobe 5km above, env. de Gurakor, W.G. Ullrich, I. 81"; 1♀, "NEW GUINEA: Morobe Dist., Herzog Mts., Vagau, C. 4,000 ft., 4 - 17.i.1965 // M.E. Bacchus., B.M. 1965-120 // Stn. No. 148".

Body form and colour: See JÄCH (1985: fig. 33). Small to moderately large (L = 1.30 - 1.46 mm). Body subparallel, moderately depressed. Colouration dark brown to black; legs, antennae and mouthparts pale brown, anterior margin of pronotum brownish; femora sometimes somewhat darkened.

Head: As in other species of the group.

Thorax: Pronotum slightly wider than long (PL = 0.46 - 0.51 mm, PW = 0.50 - 0.58 mm, PW/PL = 1.05 - 1.13), widest at about posterior 0.4; sides slightly convex, often subparallel in posterior half. Disc with fine and dense, often very superficial punctation. Median longitudinal sulcus moderately narrow, extending to anterior 0.1.

Elytra slightly obovate to subparallel, distinctly shorter and comparatively broader than in other species of the group (EL = 0.84 - 0.95 mm, EW = 0.63 - 0.72 mm, EW/EL = 0.75 -

0.78), almost twice as long as and distinctly broader than pronotum (PL/EL = 0.52 - 0.57, PW/EW = 0.75 - 0.81). Humeri almost rounded. Surface structure as in other species of the group.

Metasternal disc as in other species of the group; male lateral tubercles slightly less prominent than in other species.

Legs: Long and slender, middle and hind leg conspicuously prolonged in males (MTL = 0.54 - 0.58 mm in males, 0.42 - 0.48 mm in females; MTL/L = 0.39 - 0.43 in males, 0.30 - 0.34 in females). Male protibia as in *A. araneus*.

Abdomen: Ventrite 1 between admedian carinae in various extent rugosely punctate, female ventrite 5 discally with dense, partly rugose punctation; interstices smooth and glabrous.

Male sternite VIII more or less as in *A. schoelleri* and *A. araneus*. Apex of male tergite VIII rounded, not distinctly truncate.

Apex of female sternite VIII (Fig. 63) slightly produced, acuminately rounded, with a group of long setae, apical fovea absent. Apex of female tergite VIII slightly produced, acuminately rounded.

Male genitalia: Aedeagus ca. 560 µm long, well sclerotized. In all essential characters agreeing with genitalia of *A. schoelleri* except the more pointed and more ventromediad curved parameral apices.

Differential diagnosis: Males of *A. brunneus* somewhat resemble *A. araneus* by the mesally excised and arched protibia with a prominent apical tooth. Both sexes can be distinguished from other members of the *A. araneus* group by the short and comparatively broad elytra as well as by the usually more distinct pronotal punctation.

Distribution and habitat: So far known only from the Morobe District in south-eastern Papua.

The *Austrolimnius exilis-ullrichi* lineage

The *A. exilis-ullrichi* lineage [= the *pictus* group sensu JÄCH 1985] comprises species with the following apomorphy: males with scraping setae on pro- and mesotibia transformed - stouter, less evenly and distally more closely set than in females. However, this definition should be regarded as provisional; the lineage is probably not monophyletic.

Usually, the male pro- and mesotibia are more or less distinctly dilated meso-cranially to meso-caudally before distal end; the tibial dilatations bearing more or less conspicuous, large and stout, usually clustered setae. Legs moderately long, somewhat prolonged only in several members of the lineage (*A. bispina*, *A. dentibialis*, *A. foveatus*, *A. ullrichi*) but never as long as in males of the *A. araneus* group; without differences in length between sexes (except *A. bispina* and *A. foveatus*). Structure of male genitalia very variable. Further male secondary sexual characters very diverse, the most common features being long and/or numerous setae on pro- and/or metatarsomeres, metatibial dilatation (without accompanying transformation of scraping setae except *A. speculifer*), differently arched metasternum (i.e. compared to females of the same species) and median tubercles on anterior margin of prosternum and in posterior half of metasternal disc.

The lineage includes *A. balkei*, *A. dentibialis*, *A. dudgeoni*, *A. foveatus*, *A. gurakor*, *A. seductor*, *A. solitarius*, *A. speculifer*, *A. weylandensis* and members of the *A. exilis*, *A. lacrimabilis*, *A. ullrichi* and *A. jaechi* groups. Three of the ungrouped species, *A. balkei*, *A. speculifer* and *A. weylandensis*, could be eventually grouped due to the nearly non-dilated pro- and mesotibia, but their additional apomorphic characters are clearly too variable to establish such a group. *Austrolimnius foveatus* probably stands between the *A. exilis-ullrichi* lineage and the *A. araneus* group. It resembles members of the latter group more than any other species of the *A. exilis-ullrichi* lineage by its general appearance, by the shape of male protibia as well as by somewhat prolonged legs; however, the clinal tendencies in *Austrolimnius* are not sufficiently understood. Generally, the phylogenetical status of the ungrouped species is not clear.

Austrolimnius balkei sp.n.

Holotype ♂ (NMW): "IRIAN JAYA, Zentralmassiv, 140°25'E 04°24'S // 12./18.8.1992, Borme 1000m, leg. Balke (7)". **Paratypes** (NMW, BML, CBB, CSUS, MHNG, WUN): 102 exs., same data as holotype.

Body form and colour: Moderately large (L = 1.36 - 1.54 mm). Body obovate to subparallel, rather convex. Colour in mature specimens black; legs, antennae and mouthparts pale brown, anterior margin of pronotum reddish; elytral base broadly reddish, posterior part of the disc sometimes brownish (? teneral specimens).

Head: Clypeus and frons with very dense, partly confluent punctation, interstices glabrous. Fronto-clypeal suture complete.

Thorax: Pronotum slightly wider than long (PL = 0.46 - 0.51 mm, PW = 0.50 - 0.57 mm, PW/PL = 1.06 - 1.17), widest at about posterior 0.3; sides feebly convex, straight to slightly emarginate at base. Pronotal disc with dense punctation; interstices almost smooth (sometimes with some intermixed flat-topped granules), glabrous. Median longitudinal sulcus moderately broad, extending to anterior 0.1.

Elytra feebly obovate (EL = 0.90 - 1.03 mm, EW = 0.66 - 0.74 mm, EW/EL = 0.69 - 0.75), rather convex in cross section (especially before declivity), evenly arched, about twice as long as and distinctly broader than pronotum (PL/EL = 0.47 - 0.51, PW/EW = 0.74 - 0.78). Humeri rounded. Disc with few micropunctures; interstices almost smooth with few wrinkles, glabrous. Striae often somewhat obtuse, at most stria 1 and 2 slightly impressed; strial punctures moderately large and deep, rather sparse. Carinae on intervals 5 and 7 moderately strong; intervals 1 - 4 and 6 flat to slightly convex, especially at base.

Metasternal disc almost flat to slightly convex; with rather coarse and dense, in posterior angles almost confluent punctation, median anterior area often impunctate; interstices smooth and glabrous. Longitudinal suture distinct in about posterior 0.7, rather deeply impressed, distinctly deeper in males than in females.

Legs: Moderately long (MTL = 0.32 - 0.35 mm, MTL/L = 0.22 - 0.24). Male pro- (Fig. 49) and mesotibia hardly noticeably dilated mesally, scraping setae stouter, less evenly and more closely arranged than in females, forming more or less distinct preapical cluster. Male metatarsomeres 1 - 2 (- 3) with numerous long setae: tarsomere 1 with ca. 10 setae that are distinctly longer than the segment, setae decreasing both in number and length on the following tarsomeres.

Abdomen: Ventrite 1 (sometimes except posterior margin) as densely and as coarsely punctate as the posterior part of metasternum, ventrites 2 - 4 with dense, superficial, often effaced punctation; interstices smooth and glabrous. Ventrite 5 with fine and dense punctation.

Apex of male sternite VIII acuminately rounded; with a small apical fovea and two groups of adfoveal setae. Apex of male tergite VIII evenly rounded.

Apex of female sternite VIII (Fig. 70) acuminately rounded; with a trace of an apical fovea and two groups of long adfoveal setae. Apex of female tergite VIII more or less acuminate.

Male genitalia: Aedeagus (Figs. 25, 26) ca. 450 µm long, well sclerotized. Median lobe moderately broad, evenly tapering; apex moderately pointed, curved ventrad; basal apophyses short. Endophallus distally with dot-like sclerotizations. Parameres as long as median lobe; in lateral view broad in basal 0.3, then strongly narrowed, slender and parallel-sided in apical 0.6; apices with about 10 long preapical setae.

Differential diagnosis: *A. balkei* is easily recognized by its convex, rather obovate body shape, by the reddish humeral marking and by the densely punctate pronotal disc.

Distribution and habitat: So far known only from the type locality in eastern Irian Jaya.

Etymology: Named after my friend Michael D. Balke (Berlin), an outstanding water beetle collector and excellent mountain trekker.

Austrolimnius dentibialis sp.n.

Holotype ♂ (NMW): "IRIAN JAYA: 29.9. 1993, Eme Gebiet, Emdoman, 800 - 1000m // ca. 139°55'E 04°14'S, leg. M.Balke (25)". **Paratypes** (NMW, CBB): 8 exs., same data as holotype; 1 ex., "IRIAN JAYA: 1.10. 1993, Eme Gebiet, Okloma, 1500m // ca. 139°55'E 04°14'S, leg. M.Balke (28)"; 3 exs., "IRIAN JAYA, Zentralmassiv, 140°26'E 04°24'S // Kali Takime, 1000m, 16.8.1992, leg. M.Balke (14)"; 7 exs., "PAPUA NG 6./7. 1988, Sepik-Ramu Basin, leg. Dudgeon // Inonake Stream, 1320m a.s.l., 5°40'S 144°42'E".

Additional material (NMW): 1 ♀, "IR 90#7: West New Guinea, Cyclops Mts, near Sentani, 600m, 8.-13.ix.1990, Balke"; 1 ♀, "W.-Neuguinea/Cyclops Mts., 4 km nördl. Sentani, 600m, 8.-13.1990 / IR 7, leg: Balke & Hendrich"; 1 ♀, "IRIAN JAYA,10.8. 1992, Umg. Sentani, ca. 200m, leg. Balke (6)".

Body form and colour: Small to moderately large (L = 1.34 - 1.44 mm). Body subparallel, moderately depressed. Colouration black; legs, antennae and mouthparts pale brown, anterior margin of pronotum reddish; femora darkened. Elytral base across humeri reddish.

Head: Clypeus sparsely to densely, frons usually rugosely and rather coarsely punctate; interstices glabrous. Fronto-clypeal suture complete.

Thorax: Pronotum slightly wider than long (PL = 0.43 - 0.49 mm, PW = 0.46 - 0.52 mm, PW/PL = 1.03 - 1.12), widest at about posterior 0.5; sides feebly convex, straight to slightly emarginate at base. Disc with dense, very superficial, often almost effaced punctation; interstices smooth and glabrous. Median longitudinal sulcus narrow, extending to anterior 0.1.

Elytra slightly obovate to subparallel (EL = 0.90 - 0.96 mm, EW = 0.63 - 0.70 mm, EW/EL = 0.68 - 0.74), about twice as long as and distinctly broader than pronotum

(PL/EL = 0.47 - 0.53, PW/EW = 0.71 - 0.79). Humeri almost rounded. Discal surface with sparse micropunctation; interstices with a few wrinkles, almost smooth, glabrous. Striae not distinctly impressed; strial punctures moderately fine and deep, rather sparse. Carinae on intervals 5 and 7 moderately fine; intervals 1 - 4 and 6 flat.

Anterior margin of prosternum with a very small median tubercle in males.

Metasternal disc slightly convex (females) or flat (males), surface smooth and glabrous, sometimes (usually males) postero-laterally with several punctures; postero-laterally with a group of setiferous granules next to each admedian carina in males. Longitudinal suture distinct in about posterior 0.5, more impressed in males.

Legs: Moderately long (MTL = 0.35 - 0.39 mm, MTL/L = 0.26 - 0.28). Male protibia (Fig. 50) dilated behind middle, scraping setae separated into two divergent parts at the end of the dilatation. Setae on the dilatation large and stout, compactly clustered; setae between the end of the dilatation and the distal end also partly stouter and more closely set. Mesotrochanter caudally with a small tubercle in males. Male mesotibia with a small, hump-like dilatation at distal 0.4, scraping setae transformed, the dilatation armed with ca. 5 stout, clustered setae. Male metatarsomeres 1 - 3 with somewhat prolonged setae.

Abdomen: Ventrite 1 in anterior 0.3 between admedian carinae finely and densely, partly rugosely punctate, ventrite 5 discally with fine and dense punctation; interstices smooth and glabrous.

Apex of male sternite VIII very slightly produced, acuminate; with a large, elongate apical fovea and two groups of long adfoveal setae. Apex of male tergite VIII evenly rounded.

Apex of female sternite VIII (Fig. 71) evenly rounded, sometimes slightly truncate; with a shallow, indistinct, broad preapical impression and a group of long setae on both sides of the impression. Apex of female tergite VIII evenly to acuminately rounded.

Male genitalia: Aedeagus (Fig. 36) ca. 560 µm long, well sclerotized. Median lobe broad; apex somewhat asymmetrical, moderately rounded, curved ventrad, slightly rotated; basal apophyses long. Endophallus without distinct sclerotizations. Parameres distinctly stronger sclerotized than median lobe; almost as long as the median lobe, slightly asymmetrical and rotated; ventro-basally broadly connected by a sclerotized band; with about 20 long preapical setae.

Differential diagnosis: Externally, *A. dentibialis* resembles *A. ullrichi* and *A. seductor* by its comparatively smooth pronotum and elytra, and by the dark colouration with red humeri. It is easily separated from *A. seductor* by its non-explanate elytral margins, by the less constricted elytral and pronotal base, and by the less thickened front legs in males. It differs from *A. ullrichi* in the simple protrochanter, in the absence of postero-lateral metasternal impressions and in the differently shaped male protibia. A useful character for the separation of females of *A. dentibialis* from *A. ullrichi* and *A. seductor* is the more evenly rounded, shallowly impressed sternite VIII.

Distribution and habitat: *A. dentibialis* seems to be rather widespread in central New Guinea. It was collected in northeastern Irian Jaya and northwestern Papua at elevations between 800 m and 1500 m a.s.l. (see also Appendix). The three specimens collected in the Cyclops Mountains (at altitudes below 600 m a.s.l.) are single females, and I therefore did not include them in the type series though they most probably belong to *A. dentibialis*.

Etymology: From the Latin *dens* and *tibialis*, referring to the strong, dent-like dilatation of the male protibia which is armed with a row of stout setae.

Austrolimnius dudgeoni sp.n.

Holotype ♂ (NMW): "PAPUA NG, 6./7. 1988, Sepik-Ramu Basin, leg. Dudgeon // Hohoma River, 160m a.s.l., 3°44'S 143°23'E". **Paratypes** (NMW, BML, CBB, CSUS, MHNG, WUN): 130 exs., same data as holotype; 6 exs., same data except: Kamasau River, 200m a.s.l., 3°47'S 143°50'E"; 37 exs., "Kumbagora Stream, 320m a.s.l., 3°42'S 143°41'E"; 45 exs., "Olpaip Creek, 200m a.s.l., 3°36'S 143°03'E"; 8 exs., "Maringjang Creek, 120m a.s.l., 3°42'S 143°14'E"; 1 ex., "Mindjim River, 80m a.s.l., 3°49'S 143°35'E".

Body form and colour: Small to very small (L = 1.13 - 1.30 mm). Body subparallel, moderately depressed. Colour in mature specimens black; anterior margin of pronotum, legs, antennae and mouthparts pale brown to yellowish; femora sometimes darkened.

Head: Clypeus and frons usually with moderately dense, sometimes partly effaced punctation. Fronto-clypeal suture complete.

Thorax: Pronotum slightly wider than long (PL = 0.37 - 0.43 mm, PW = 0.42 - 0.47 mm, PW/PL = 1.04 - 1.14), widest at posterior 0.3 - 0.4; sides feebly convex. Discal surface with fine, moderately dense punctation that is usually effaced on most of the disc; interstices smooth and glabrous. Median longitudinal sulcus moderately narrow, extending to anterior 0.1 - 0.3.

Elytra subparallel (EL = 0.75 - 0.87 mm, EW = 0.51 - 0.57 mm, EW/EL = 0.65 - 0.71), about twice as long as and distinctly broader than pronotum (PL/EL = 0.47 - 0.53, PW/EW = 0.76 - 0.86). Humeri rounded. Surface with very fine, sparse micropunctation; interstices almost smooth with few transverse wrinkles, glabrous. Striae not distinctly impressed; strial punctures moderately fine and deep, rather sparse. Carinae on intervals 5 and 7 moderately fine; intervals 1 - 4 and 6 flat.

Anterior margin of prosternum with a very small median tubercle in males.

Metasternal disc almost flat or slightly concave posteriorly (in average flatter in females); with more or less distinct postero-lateral impressions in both sexes (usually deeper in males); median longitudinal suture distinct in posterior 0.5; discal surface postero-laterally with rather coarse, partly confluent punctation.

Legs: Moderately long (MTL = 0.25 - 0.28 mm, MTL/L = 0.21 - 0.23). Male protibia (Fig. 47) transformed similarly as in members of the *A. exilis* group. Mesotrochanter caudally with a prominent tubercle in males; some females also with a distinct tubercle. Male mesotibia (Fig. 54) with a dilatation at distal 0.4, the dilatation armed with one conspicuously large and stout seta; scraping setae not uniform. Ventral side of metatarsomeres 1 - 4 with numerous long setae in males: segment 1 and 2 with about 20 - 30, segment 3 with 15 - 20 very long setae (ca. 2 times as long as the segment); segment 4 with about 10 long setae (longer than the segment).

Abdomen: Ventrite 1 in anterior 0.5 - 0.8 between admedian carinae with rather coarse, partly confluent punctation, ventrite 2 with at most few fine punctures at anterior margin, ventrite 5 discally with fine dense punctation; interstices smooth and glabrous.

Apex of male sternite VIII acuminate; with a small apical fovea and two groups of long adfoveal setae. Apex of male tergite VIII more or less evenly rounded.

Apex of female sternite VIII (Fig. 72) acuminately rounded to acuminate; with a very small, shallow apical fovea and two groups of long adfoveal setae. Apex of female tergite VIII acuminately rounded.

Male genitalia: Aedeagus (Fig. 23, 24) ca. 430 µm long, slender; median lobe and parameres conspicuously little sclerotized in comparison to basal piece. Base of median lobe rather distant from parameral base; basal apophyses moderately long. Median lobe slightly broadening from base to about middle, then tapering towards rounded apex. Endophallus without distinct sclerotizations. Parameres with 10 - 15 preapical setae; fused basally; conspicuously narrowed basally in lateral view.

Differential diagnosis: Males and some females of *A. dudgeoni* differ from all New Guinea species with uniformly dark, smooth and relatively shiny surface by the presence of a caudal tubercle on mesotrochanter. However, the tubercle is not traceable or scarcely visible in many females, which then strongly resemble small females of *A. papuanus*, and can be separated from them only by the comparatively flatter, narrower, more parallel-sided elytra, by the usually distinct postero-lateral metasternal impressions, and by the differently shaped tergite VIII and sternite VIII. The shape of the aedeagus suggests that *A. dudgeoni* stands in an isolated position among other members of the *A. exilis-ullrichi* lineage.

Distribution and habitat: *A. dudgeoni* was collected in various streams draining the Toricelli Mountains (northwestern Papua) at altitudes below 400 m a.s.l. (see also Appendix).

Etymology: Named after Dr. David Dudgeon (Hong Kong), whose rich and valuable material (now deposited in NMW) ignited this revision.

Austrolimnius foveatus sp.n.

Holotype ♂ (NMW): "PAPUA NG 6./7. 1988, Sepik-Ramu Basin, leg. Dudgeon // Kil Stream, 1800m a.s.l., 5°40'S 144°42'E". **Paratypes** (NMW, BML, CBB, MHNG): 1 ♂, 2 ♀♀, same data as holotype; 1 ♂, 1 ♀, "Papua Nlle Guinée, Morobe 5km above, env. de Gurakor, W.G. Ullrich, I. 81"; 9 ♂♂, 1 ♀, "NEW GUINEA: E.Highland Dist., Wanatabe Valley, Nr. Okapa, c. 5000 ft., 5.ii.1965 // M.E. Bacchus., B.M. 1965-120 // Stn. No. 176"; 3 ♂♂, 2 ♀♀, same data except: "Stn. No. 177"; 2 ♂♂, 1 ♀, "Stn. No. 177a"; 2 ♂♂, 3 ♀♀, "NEW GUINEA: E.Highland Dist., Waisa, Nr. Okapa, c. 5000 ft., 5.ii.1965 // M.E. Bacchus., B.M. 1965-120 // Stn. No. 192"; 1 ♂, same data except: "Stn. No. 192a".

Body form and colour: Moderately large (L = 1.44 - 1.58 mm). Body subparallel, moderately depressed. Colour in mature specimens dark brown to black; legs, antennae and mouthparts pale brown, anterior margin of pronotum brownish; femora sometimes darkened.

Head: Clypeus sparsely to moderately punctate, frons with rugose and rather coarse punctation; interstices glabrous. Fronto-clypeal suture complete.

Thorax: Pronotum slightly wider than long (PL = 0.47 - 0.55 mm, PW = 0.54 - 0.58 mm, PW/PL = 1.05 - 1.14), widest at about posterior 0.4; sides slightly convex, often subparallel in posterior half. Disc with fine and dense, often almost effaced punctation; interstices smooth and glabrous. Median longitudinal sulcus moderately narrow, extending to anterior 0.1.

Elytra subparallel (EL = 0.94 - 1.04 mm, EW = 0.69 - 0.73 mm, EW/EL = 0.68 - 0.75), about twice as long as and distinctly broader than pronotum (PL/EL = 0.48 - 0.54,

PW/EW = 0.75 - 0.83). Humeri almost rounded to feebly gibbous. Discal surface with few micropunctures; interstices with a few wrinkles, smooth and glabrous. Striae not distinctly impressed; strial punctures moderately large and deep. Carinae on intervals 5 and 7 moderately strong (somewhat stronger in paratypes from Wanatabe Valley); intervals 1 - 4 and 6 flat.

Anterior margin of prosternum with a median tubercle in males.

Metasternal disc slightly convex (slightly flatter in males), surface smooth and glabrous, postero-laterally with rugose punctation (more extensive and coarser in males); posterior angles usually with several conspicuous setae in males. Longitudinal suture distinct in about posterior 0.5, rather fine.

Legs: Rather long, middle and hind leg somewhat more prolonged in males (MTL = 0.47 - 0.51 mm in males, 0.43 - 0.46 mm in females; MTL/L = 0.31 - 0.35 in males, 0.29 - 0.31 in females). Male protibia (Fig. 52) transformed, mesally flattened and slightly insinuated in distal 0.5; apex feebly produced mesad, armed with a large, stout seta; scraping setae in distal 0.5 stouter than in females; cleaning fringe small, reduced. Male mesotibia with scraping setae not uniform, distally stouter and more closely arranged than in females. Male metatarsomere 1 with ca. 10 very long setae.

Abdomen: Ventrite 1 in anterior 0.5 between admedian carinae rugosely punctate; interstices smooth and glabrous.

Apex of male sternite VIII slightly produced, acuminately rounded; with a very large, elongate apical fovea and two groups of numerous, very long adfoveal setae. Apex of male tergite VIII evenly rounded.

Apex of female sternite VIII (Fig. 73) evenly rounded; with a very large apical fovea and two groups of long adfoveal setae. Apex of female tergite VIII rounded.

Male genitalia: Aedeagus (Fig. 37) ca. 630 µm long, well sclerotized. Median lobe moderately slender, evenly tapering; apex moderately rounded, curved ventrad; basal apophyses very long. Endophallus with scale-like sclerotizations. Parameres moderately broad; apices slightly curved ventromediad, with about 30 - 40 very long preapical setae.

Differential diagnosis: Both sexes of *A. foveatus* are distinguished from all similar New Guinea species by the conspicuous, large apical fovea and the long adfoveal setae of sternite VIII. Externally, *A. foveatus* resembles members of the *araneus* group from which it can be separated by its stouter and usually shorter legs.

Distribution and habitat: So far known from several mountain streams in south-eastern Papua (see also Appendix). It was collected at altitudes between 1600 m and 1800 m a.s.l.

Etymology: From the Latin *foveatus*, referring to the conspicuous fovea-like impression of sternite VIII in both sexes.

Austrolimnius gurakor sp.n.

Holotype ♂ (MHNG): "Papua Nlle Guinée, Morobe 5 km above, env. de Gurakor, W. G. Ullrich, I.81".

Body form and colour: Large (L = 1.75 mm). Body subparallel (Fig. 88), moderately depressed; elytral base rather arched in lateral aspect. Colouration dark brown, elytra

somewhat paler; anterior margin of pronotum, legs, antennae and mouthparts yellowish (not a fully mature specimen).

Head: Clypeus moderately punctate, frons with moderately dense, very coarse to rugose punctation; interstices smooth and glabrous; anterior and lateral margins somewhat depressed. Fronto-clypeal suture complete.

Thorax: Pronotum as wide as long (PL = 0.58 mm, PW = 0.58 mm, PW/PL = 1.00), widest at posterior 0.3; sides slightly convex, slightly emarginate at base. Pronotal disc with sparse superficial micropunctation; interstices smooth and glabrous. Median longitudinal sulcus narrow, extending to anterior 0.1 - 0.2.

Elytra subparallel (EL = 1.17 mm, EW = 0.78 mm, EW/EL = 0.67), twice as long as and distinctly broader than pronotum (PL/EL = 0.50, PW/EW = 0.74). Humeri slightly gibbous. Discal surface without micropunctation, with sparse setiferous punctures only; interstices smooth and glabrous. Striae not distinctly impressed; strial punctures fine. Carinae on intervals 5 and 7 moderately strong; intervals 1 - 4 and 6 flat.

Anterior margin of prosternum with a very small median tubercle.

Metasternal disc flat, postero-laterally with some punctures and wrinkles; interstices smooth and glabrous; with a group of setiferous granules next to each admedian carina in posterior 0.5. Median longitudinal suture distinct in posterior 0.5, with very small median tubercle at posterior 0.3.

Legs: Moderately long (MTL = 0.51 mm, MTL/L = 0.25). Protibia mesally dilated, the dilatation ends at distal 0.35; slightly mesally emarginate in distal 0.3; scraping setae transformed similarly as in other members of the lineage, the distal end of the dilatation armed both meso-cranially and meso-caudally with ca. 5 stout, compactly clustered setae. Mesotibia mesally dilated, the dilatation ends at distal 0.3, armed with ca. 5 stout setae; mesial margin slightly emarginate in distal 0.3. Metatibia slightly mesally dilated in distal half. Metatarsomeres 1 - 4 with long and numerous setae, decreasing both in number and in length from segment 1 to 4.

Abdomen: Ventrite 1 between admedian carinae in anterior 0.3 shallowly, rugosely punctate; interstices of segments 1 - 4 smooth and glabrous. Ventrite 5, sternite VIII and tergite VIII unfortunately destroyed during preparation. Female unknown.

Male genitalia: Aedeagus (Fig. 31) large, ca. 720 µm long, little sclerotized due to the immaturity of holotype. Median lobe rather broad, evenly tapering; basal apophyses moderately long, slender; endophallus partly extended, in apical part with an indistinct, amorphous mass (? sclerotization). Parameres slightly shorter than median lobe, slender, in lateral aspect evenly tapering; apices feebly curved ventromediad, with ca. 15 - 20 very long setae.

Differential diagnosis: Males of *A. gurakor* can be separated from other species of the lineage by its large size, by the comparatively smooth surface, by the unicoloured elytra, by the rather convex elytral base and by the shape of the pro- and mesotibia. Females of *A. gurakor* are still unknown.

Distribution and habitat: So far known only from the type locality in south-eastern Papua.

Etymology: Named after the type locality; noun used in aposition.

Austrolimnius seductor sp.n.

Holotype ♂ (NMW): "PAPUA NG, 6./7. 1988, Sepik-Ramu Basin, leg. Dudgeon // Kumbagora Stream, 320m a.s.l., 3°42'S 143°41'E". **Paratypes** (NMW, CBB): 51 ♀♀, same data as holotype; 1 ♀, same data except: "Saramandi Creek, 40m a.s.l., 4°01'S 144°02'E".

Body form and colour: Small to very small (L = 1.13 - 1.32 mm). Body subparallel, moderately depressed. Colouration dark brown to black; legs, antennae and mouthparts pale brown, anterior margin of pronotum reddish; femora usually darkened. Elytral base across humeri reddish.

Head: Clypeus and frons with sparse punctation, lateral parts of frons more densely and somewhat rugosely punctate; interstices glabrous. Fronto-clypeal suture usually complete, sometimes very fine to evanescent between antennal acetabula.

Thorax: Pronotum slightly wider than long (PL = 0.38 - 0.47 mm, PW = 0.43 - 0.49 mm, PW/PL = 1.04 - 1.11), widest at about posterior 0.4; sides feebly convex, not evenly arched, emarginate at base. Discal surface with dense, often more or less effaced punctation; interstices smooth and glabrous. Median longitudinal sulcus moderately broad, reaching anterior 0.1 - 0.2.

Elytra slightly obovate (EL = 0.74 - 0.85 mm, EW = 0.52 - 0.64 mm, EW/EL = 0.70 - 0.76), about twice as long as and distinctly broader than pronotum (PL/EL = 0.51 - 0.55, PW/EW = 0.76 - 0.82). Humeri rounded, remarkably flat. Lateral margins distinctly more explanate than in other species with red humeral marking. Disc with sparse micropunctation; interstices with few to numerous transverse wrinkles, usually almost smooth, glabrous. Striae somewhat obtuse, striae 1 and 2 feebly impressed; strial punctures moderately large and deep. Carinae on intervals 5 and 7 sharp and moderately fine; intervals 1 - 4 and 6 more or less flat.

Anterior margin of prosternum with a median tubercle in males.

Metasternal disc almost flat (females) or feebly concave (male); postero-laterally with rather fine punctation, the punctation being more extensive and somewhat rugose in the holotype male and a few females; interstices smooth and glabrous; median longitudinal suture distinct in posterior 0.7.

Legs: Moderately long (MTL = 0.25 - 0.30 mm, MTL/L = 0.22 - 0.24). Male protarsi somewhat dilated in lateral view, with several long setae inserted ventrally and dorsally on tarsomeres 2 - 4. Male protibia somewhat dilated mesally, with a group of ca. 4 stout, very closely arranged setae at distal 0.3. Male mesotibia not distinctly dilated; scraping setae transformed, with a group of ca. 3 stout, clustered setae at distal 0.15. Male metatarsomere 1 with ca. 20 - 30 very long setae inserted ventrally and dorsally; metatarsomeres 2 - 4 with almost equally long setae gradually declining in numbers. All femora and tibiae (especially the front pair) thickened in the male.

Abdomen: Ventrite 1 between admedian carinae more or less as coarsely and as densely punctate as metasternum, ventrites 2 - 5 discally almost impunctate; interstices smooth and glabrous.

Apex of male sternite VIII slightly produced, acuminately rounded; with a small apical fovea and two groups of adfoveal setae. Apex of male tergite VIII more or less evenly rounded.

Apex of female sternite VIII (Fig. 74) acuminately rounded to acuminate; with a group of long setae, apical fovea absent. Apex of female tergite VIII acuminately rounded.

Male genitalia: Aedeagus (Fig. 33) ca. 490 µm long, well sclerotized. Median lobe moderately slender; apex rounded and curved ventrad; basal apophyses moderately short. Endophallus extended in the only specimen available (in Fig. 33 shown in hypothetical repose), membraneous, without sclerotizations. Parameres almost as long as median lobe; with ca. 10 preapical setae and conspicuous lateral gibbosities at apical 0.2.

Differential diagnosis: Externally, *A. seductor* somewhat resembles *A. ullrichi* and *A. dentibialis* by its comparatively smooth appearance and by the dark elytra with red humeri. It differs from them, among other characters, by the rather explanate lateral margins of elytra as well as by its simple male pro- and mesotrochanter and by the strongly thickened male protibia and profemora. The preapical lateral gibbosities of the parameres are a unique character among all New Guinea *Austrolimnius*.

Distribution and habitat: So far known only from two lowland streams draining the Toricelli Mountains in nortwestern Papua (see also Appendix).

Etymology: From the Latin *seductor* - seducer, referring to the unusually disproportionate ratio between the sexes in the type series.

Austrolimnius solitarius sp.n.

Holotype ♂ (NMW): "PAPUA NG, 6./7. 1988, Sepik-Ramu Basin, leg. Dudgeon // Kumbagora Stream, 320m a.s.l., 3°42'S 143°41'E".

Body form and colour: Very small (L = 1.16 mm). Body subparallel, moderately depressed. Colouration dark brown to black; legs, antennae and mouthparts pale brown, anterior margin of pronotum reddish; femora slightly darkened. Elytral base across humeri reddish.

Head: Clypeus and frons densely punctate, interstices glabrous. Fronto-clypeal suture complete.

Thorax: Pronotum slightly wider than long (PL = 0.39 mm, PW = 0.44 mm, PW/PL = 1.13), widest at about posterior 0.4; sides slightly convex. Discal surface with dense punctation; interstices smooth and glabrous. Median longitudinal sulcus reaching anterior 0.1 - 0.2.

Elytra subparallel (EL = 0.77 mm, EW = 0.55 mm, EW/EL = 0.72), twice as long as and distinctly broader than pronotum (PL/EL = 0.51, PW/EW = 0.80). Humeri slightly gibbous. Discal surface with sparse micropunctation; interstices with few transverse wrinkles, almost smooth, glabrous. Stria 1 feebly impressed in anterior 0.5; strial punctures moderately fine and deep. Carinae on intervals 5 and 7 sharp and moderately fine; intervals 1 - 4 and 6 flat, inner ones slightly convex at base.

Anterior margin of prosternum with a median tubercle.

Metasternal disc slightly concave; surface rather coarsely, confluently punctate; with two flat tubercles behind mesocoxae, each tubercle bearing ca. 5 long setae. Longitudinal suture distinct in posterior 0.7, rather deep.

Legs: Moderately long (MTL = 0.25 mm, MTL/L = 0.22). Male protibia dilated behind middle; scraping setae transformed, separated into two divergent parts, setae at the end

of the dilatation large and stout, tightly clustered; setae between the dilatation and distal end also stouter and more closely set. Mesotrochanter caudally with a distinct tubercle. Mesotibia (of male) not distinctly dilated; scraping setae transformed, unevenly spaced, with one large and stout seta at apical 0.2. Male metatarsomeres 1 - 4 with numerous long setae: tarsomere 1 on the ventral and lateral sides with ca. 15 very long setae, decreasing both in length and number on following tarsomeres. Profemora distinctly, also meso- and metafemora (probably) slightly thickened.

Abdomen: Ventrite 1 between admedian carinae as densely and almost as coarsely punctate as metasternum, ventrites 2 - 5 discally with dense superficial punctation; interstices smooth and glabrous.

Apex of male sternite VIII slightly produced, acuminately rounded, with a small apical fovea and two groups of long adfoveal setae. Apex of tergite VIII evenly rounded.

Female unknown.

Male genitalia: Aedeagus (Fig. 28) ca. 470 µm long, well sclerotized, somewhat similar to that of *A. ullrichi*. Median lobe moderately slender; apex curved ventrad; basal apophyses moderately long. Endophallus with distinct scale-like sclerotizations. Parameres as long as median lobe; apices nearly straight, with about 15 - 20 long preapical setae.

Differential diagnosis: *A. solitarius* differs externally from all other New Guinea species except *A. lacrimabilis* by combining its densely, rather strongly punctate pronotal and metasternal disc and the dark colour with red elytral base. For its separation from *A. lacrimabilis*, see the differential diagnosis of the latter.

Distribution and habitat: Presently known only from the type locality, a stream draining Toricelli Mountains in northwestern Papua (see also Appendix).

Etymology: From the Latin *solitarius* - lonely, referring to the striking disproportion between the type series of *A. solitarius* (1 ♂) and *A. seductor* (1 ♂, 52 ♀♀). Both species resemble each other in size and colour and were collected in the same stream.

Austrolimnius speculifer sp.n.

Holotype ♂ (NMW): "IRIAN JAYA: Paniai Prov., road Nabire - Ilaga, km 53, 17.9.1996, 700m, leg. M. Balke (96 # 23)". **Paratypes** (NMW, CBB): 6 ♂♂, 1 ♀, same data as holotype.

Body form and colour: Very small (L = 1.09 - 1.19 mm). Body elongate, subparallel, moderately depressed. Colouration black; anterior margin of pronotum, legs, antennae and mouthparts pale brown; femora at most slightly darkened.

Head: Clypeus and median part of frons with fine, moderately dense punctation; lateral parts of frons usually more densely and more strongly punctate; interstices smooth and glabrous. Fronto-clypeal suture complete.

Thorax: Pronotum slightly wider than long (PL = 0.38 - 0.41 mm, PW = 0.41 - 0.44 mm, PW/PL = 1.05 - 1.15), widest at posterior 0.3 - 0.5; sides feebly convex, usually slightly emarginate at base. Discal surface with fine and superficial, dense punctation; interstices smooth and glabrous. Median longitudinal sulcus moderately narrow, reaching anterior 0.1 - 0.2.

Elytra slightly obovate to subparallel (EL = 0.71 - 0.79 mm, EW = 0.51 - 0.56 mm, EW/EL = 0.70 - 0.79), about twice as long as and slightly broader than pronotum (PL/EL = 0.51 - 0.56, PW/EW = 0.79 - 0.82). Humeri rounded. Disc with very sparse, fine micropunctation; interstices with at most a few transverse wrinkles, smooth and glabrous. Striae not distinctly impressed; strial punctures sparse and fine. Carinae on intervals 5 and 7 moderately strong; intervals 1 - 4 and 6 flat.

Metasternal disc flat, with faint postero-lateral impressions in both sexes; median longitudinal suture fine and shallow, distinct in posterior 0.5 in the female, obsolete or completely absent in males; with a very small median tubercle at posterior 0.3 in males; postero-laterally with several granuliform, setiferous punctures; surface smooth and glabrous.

Legs: Moderately long (MTL = 0.28 - 0.30 mm, MTL/L = 0.24 - 0.27). Male pro- and mesotibia with scraping setae stouter and more closely set than in females; the row ending close before apex on both tibia, forming a distal cluster on protibia (similar to *A. weylandensis*, cf. Fig. 48). Metatibia somewhat dilated in both sexes, scraping setae stouter, less evenly spaced in males (more slender, everywhere sparse in females).

Abdomen: Ventrites 1 - 4 discally with very sparse micropunctures, ventrite 1 in anterior 0.3 sometimes with shallow, confluent punctation; ventrite 5 in some paratypes with superficial dense punctation; interstices smooth and glabrous.

Male sternite VIII acuminately rounded, apex produced; with a large apical fovea and two groups of long adfoveal setae. Apex of male tergite VIII rounded.

Apex of female sternite VIII (Fig. 75) acuminate; with a shallow, moderately large apical fovea and two groups of long adfoveal setae. Female tergite VIII acuminately rounded, with a very faint, narrow apical emargination.

Male genitalia: Aedeagus (Fig. 29) ca. 430 µm long, well sclerotized. Median lobe slender, evenly tapering; apex moderately rounded. Endophallus in apical half with distinct, scale-like sclerotizations. Parameres shorter than median lobe, slender, in lateral view evenly tapering; apices slightly curved ventrad, pointed in lateral aspect, with ca. 15 preapical setae.

Differential diagnosis: *A. speculifer* is separated from other New Guinea species with uniformly dark elytra and relatively smooth surface by combining its small size, the flat and smooth metasternal disc, the comparatively strong elytral carinae as well as the median metasternal tubercle and tibial transformation in males.

Distribution and habitat: So far known only from the type locality in western Irian Jaya (the Weyland Mountains).

Etymology: From the Latin *speculum*, a mirror, and *-fer*, carrying, referring to the remarkably flat and glabrous metasternal disc.

Austrolimnius weylandensis sp.n.

Holotype ♂ (NMW): "IRIAN JAYA: Paniai Prov., road Nabire - Ilaga, km 180 - 190, Upper Kamo Valley // Bogemani-Moannemani, 5. - 6.9.1996, 1800 - 1900m, leg. M. Balke (96 # 17)". **Paratypes** (NMW, CBB): 4 ♂♂, 2 ♀♀, same data as holotype.

Body form and colour: Moderately large (L = 1.44 - 1.56 mm). Body subparallel, moderately depressed. Colouration black; legs, antennae and mouthparts pale brown, anterior margin of pronotum reddish; femora darkened. Elytral base across humeri vaguely brownish in some paratypes.

Head: Clypeus and frons with fine and dense punctation; interstices glabrous. Frontoclypeal suture complete.

Thorax: Pronotum as wide as long (PL = 0.49 - 0.54 mm, PW = 0.50 - 0.54 mm, PW/PL = 1.00 - 1.05), widest at about posterior 0.4; sides feebly convex, slightly emarginate at base. Disc with fine and dense punctation; interstices smooth and glabrous. Median longitudinal sulcus moderately narrow, extending to anterior 0.1.

Elytra slightly obovate to subparallel (EL = 0.93 - 1.02 mm, EW = 0.64 - 0.69 mm, EW/EL = 0.66 - 0.70), about twice as long as and distinctly broader than pronotum (PL/EL = 0.49 - 0.53, PW/EW = 0.72 - 0.80). Humeri slightly gibbous to almost rounded. Discal surface with sparse micropunctation; interstices with few wrinkles, almost smooth, glabrous. Striae often somehat obtuse, not distinctly impressed; strial punctures rather fine and shallow, rather sparse. Carinae on intervals 5 and 7 moderately fine; intervals 1 - 4 and 6 flat.

Anterior margin of prosternum with a very small median tubercle in males.

Metasternal disc slightly convex (females) or flat (males), with very superficial, largely effaced punctation, interstices smooth and glabrous; setiferous punctures postero-laterally granuliform, bearing rather long setae in males. Longitudinal suture distinct in about posterior 0.5, rather obsolete, with a median tubercle at about posterior 0.5 in males.

Legs: Moderately long (MTL = 0.34 - 0.36 mm, MTL/L = 0.23 - 0.25). Protibia thickened, stout; males with scraping setae stout and closely arranged, clustered before the distal end in males (Fig. 48). Male mesotibia with scraping setae stouter, more closely arranged than in females. Male metatarsomere 1 with ca. 20 long setae, also tarsomeres 2 and 3 with several rather long setae. All femora distinctly thickened in two male paratypes.

Abdomen: Ventrite 1 in anterior 0.4 between admedian carinae finely and densely, partly rugosely punctate; ventrite 5 discally with fine and dense, also the remainder of ventrite 1 and ventrites 2 - 4 sometimes with fine, very superficial punctation; interstices smooth and glabrous.

Apex of male sternite VIII acuminate, feebly produced; with a moderately large apical fovea and two groups of long adfoveal setae. Apex of male tergite VIII rounded, with a faint apical emargination.

Apex of female sternite VIII (Fig. 76) acuminate; with a group of long apical setae, apical fovea absent. Apex of female tergite VIII rounded, with a very faint apical emargination.

Male genitalia: Aedeagus (Fig. 27) ca. 470 µm long, well sclerotized. Median lobe moderately narrow, slightly broadening towards apex; apex produced, rather pointed; basal apophyses long. Endophallus without distinct sclerotizations. Parameres as long as median lobe; apices moderately rounded, with about 20 long preapical setae.

Differential diagnosis: *A. weylandensis* differs from other New Guinea species with dark colouration and relatively smooth surface by its stout, thickened protibia; males are

easily recognized also by combining the tubercles on prosternum and metasternal disc and the little expressed tibial secondary sexual characters.

Distribution and habitat: So far known only from the type locality in western Irian Jaya.

Etymology: Named after the Weyland mountains, where the type locality lies.

The *Austrolimnius exilis* group

The *A. exilis* group contains several species rather different in overall appearance but clearly morphologically united by the following apomorphies: 1) basal 0.7 of parameres mesally with a fine transversal microstructure ("dactyloscopic lines") visible from about 200 times magnification; 2) (sclerotized part of) parameres with a dorsal insinuation in dorso-lateral view; 3) male pro- and mesotibia (typically) transformed (cf. Figs. 40 and 55). Aedeagus with base of median lobe not shifted apicad from parameral base; basal apophyses moderately short; endophallus without distinct sclerotizations (the *A. exilis* subgroup, see below) or with indistinct, dot-like sclerotizations (the *A. difficilis* subgroup), only rarely spinose (some specimens of *A. difficilis*). Male pro- and mesotibia mesally to meso-cranially dilated before apex. Scraping setae on male protibia discontinuous, separated into two divergent parts at the end of the dilatation; setae on the dilatation remarkably enlarged, stout, clustered (the row is continuous and composed of more or less evenly spaced, gradually enlarging, slender setae in females; see Fig. 45). Scraping setae on male mesotibia transformed similarly as on protibia, the row being shortly interrupted behind the dilatation; setae on the dilatation stout, clustered.

The position and shape of the pro- and mesotibial dilatations as well as the number of stout setae on both dilatations is more or less constant in all species of the group. Further male secondary sexual characters are rather diverse (see the characterisation of the *A. exilis-ullrichi* lineage). The group comprises eight species that seem to live predominantly at low altitudes below 400 m a.s.l. The group may eventually split into two subgroups based mainly on the condition of parameres: the *A. exilis* sensu stricto subgroup (with *A. exilis*, *A. similis*, *A. apicarinatus*, *A. pictus* and *A. virilis*; all from Papua) and the *A. difficilis* subgroup (with *A. difficilis*, *A. brevior* and *A. insinuatus*; all from Irian Jaya), the latter differing by a less distinct mesal microstructure (often distinct only in a narrow strip at about midlength), by a more basally placed insinuation of the dorsal margin and by a more developed unsclerotized mesal part (cf. Figs. 3 and 14). Additional species are necessary to confirm the status of the *A. exilis* group.

Austrolimnius exilis JÄCH, 1985

Austrolimnius exilis JÄCH, 1985: p. 247, figs. 29, 32a, b.

Type material: Holotype ♂ (MHNG): "14. VI. 79 PNG/Mor./Lae, Umg. Oomsis, Buang Riv.", examined.

Additional material (NMW, BML, CBB, CSUS, MHNG, WUN): 120 exs., "PAPUA NG, 6./7. 1988, Sepik-Ramu Basin, leg. Dudgeon // Kamasau River, 200m a.s.l., 3°47'S 143°50'E"; ca. 180 exs., same data except: "Saramandi Creek, 40m a.s.l., 4°01'S 144°02'E"; 103 exs., "Kumbagora Stream, 320m a.s.l., 3°42'S 143°41'E"; 14 exs., "Olpaip Creek, 200m a.s.l., 3°36'S 143°03'E"; 76 exs., "Maringjang Creek, 120m a.s.l., 3°42'S 143°14'E"; 6 exs., "Hohoma River, 160m a.s.l., 3°44'S 143°23'E"; 49 exs., "Mindjim River, 80m a.s.l., 3°49'S 143°35'E"; 83 exs., "Kojé Creek, 160m a.s.l., 5°33'S 145°23'E"; 107 exs., "Maram Creek, 80m a.s.l., 4°33'S 144°59'E"; 1 ex., "Ofri Creek, 130m a.s.l., 5°43'S 145°22'E"; 22 exs., "# 2" (one of the streams

draining Finisterre and Adelbert Ranges and Toricelli Mountains; see Appendix); 1 ex., "NEW GUINEA, Morobe Dist., c. 3m. Lae-Busu Rd. 21.i.1965 // M.E. Bacchus, B.M. 1965-120 // Stn. No. 155" (this specimen also bears the following identification labels: "Austrolimnius crino Hinton, Paratype // MANUSCRIPT NAME" and "Austrolimnius sp.3, det. M.Jäch 84" to which I added my identification label).

Body form and colour: Small to very small (L = 1.13 - 1.30 mm). Body subparallel, moderately depressed. The type specimen, see JÄCH (1985, Fig. 29), is quite slender (PW/PL = 1.05, EW/EL = 0.69) in comparison to the additional material collected by Dudgeon. Colouration brownish black to black; legs, antennae and mouthparts pale brown to yellowish, anterior margin of pronotum reddish; femora usually darkened.

Head: Clypeus and frons with very dense, rather coarse punctation. Fronto-clypeal suture complete.

Thorax: Pronotum slightly wider than long (PL = 0.37 - 0.45 mm, PW = 0.44 - 0.50 mm, PW/PL = 1.05 - 1.19), with a rather variable shape, widest at about posterior 0.4; sides feebly convex, sometimes slightly emarginate at base. Discal surface with moderately fine, dense punctation; interstices smooth and glabrous. Median longitudinal sulcus moderately broad, extending to at least anterior 0.2.

Elytra slightly obovate to subparallel (EL = 0.75 - 0.86 mm, EW = 0.52 - 0.63 mm, EW/EL = 0.69 - 0.77), about twice as long as and distinctly broader than pronotum (PL/EL = 0.46 - 0.54, PW/EW = 0.73 - 0.83). Humeri almost always rounded. Disc with moderately sparse, fine micropunctation; interstices rather smooth with numerous transverse wrinkles, glabrous. Striae somewhat obtuse, stria 1 and 2 usually feebly impressed; strial punctures moderately large and deep. Carinae on intervals 5 and 7 moderately strong; intervals 1 - 4 and 6 flat to slightly convex, especially the inner ones at base.

Anterior margin of prosternum with a small median tubercle in males.

Metasternal disc almost flat (females) or concave (males, Fig. 91), coarsely confluently punctate. Median longitudinal suture usually distinct in posterior 0.5 - 0.7; with a median tubercle at about posterior 0.3, the tubercle being prominent in males and small in females (corresponding approximately to males of *A. pictus*); the tubercle often taking form of a low longitudinal carina in posterior 0.5 in females.

Legs: Moderately long (MTL = 0.26 - 0.31 mm, MTL/L = 0.23 - 0.25). Male protarsi with long setae inserted ventrally and dorsally; their number more or less the same as in females on tarsomeres 1 and 2, gradually increasing from tarsomere 3 to 5. Male pro- and mesotibia transformed (Fig. 40 and 55); the mesotibial dilatation ends at distal 0.15, i.e. closer to the distal end than in any other species of the group; the dilatation armed with ca. 6 - 7 stout, clustered setae. Male metatibia distinctly dilated in distal 0.6 (slightly dilated in females). Male metatarsomere 1 distinctly dilated in dorsoventral aspect, also tarsomeres 2 and 3 feebly dilated in some males; setae on the ventral and lateral sides of metatarsomeres 1 - 4 longer and more numerous than in females: segment 1 with very numerous (up to 30 - 40), very long setae (ca. 2 times as long as the segment), decreasing both in numbers and length on following segments. All femora distinctly thickened in males.

Abdomen: Ventrite 1 between admedian carinae as coarsely and as densely punctate as metasternum, ventrites 2 - 5 discally with an equally dense, gradually refining punctation.

Apex of male sternite VIII slightly produced, acuminately rounded; with a small apical fovea and two groups of adfoveal setae. Apex of male tergite VIII evenly rounded.

Apex of female sternite VIII (Fig. 79) feebly produced, acuminately rounded; with a small, elongate apical fovea and two groups of adfoveal setae. Apex of female tergite VIII acuminately rounded.

Male genitalia: See JÄCH (1985: fig. 32a, b) and Fig. 3. Apical 0.3 of parameres in dorso-lateral view with a dorsal insinuation which is more prominent than in other species of the *A. exilis* group. Ventral margin of parameres insinuated in apical 0.3 in lateral aspect (straighter in other species of the group).

Differential diagnosis: Externally, *A. exilis* somewhat resembles *A. similis* and *A. apicarinatus* by the uniformly dark, rather rugose elytra and by the everywhere distinctly, densely punctate pronotal and metasternal disc. It differs from the latter two species by the somewhat shallower punctation, by the black colour (*A. similis*: dark brown or greyish), by the simple mesotrochanter (*A. similis*: posteriorly gibbous), by the elytral carinae lowering on declivity (*A. apicarinatus*: abruptly ended) as well as by the dilated and conspicuously setose basal metatarsomeres in males. Females of *A. exilis* (all tibia simple) can be easily recognized by the presence of the metasternal median tubercle or carina.

Distribution and habitat: *Austrolimnius exilis* seems to be rather widespread and common in Papua. It was collected in various streams of the Sepik - Ramu drainage system (northern Papua; see also Appendix) at low altitudes. Two specimens (among them the holotype) were taken near Lae on the eastern Papuan coast.

Austrolimnius similis sp.n.

Holotype ♂ (NMW): "PAPUA NG, 6./7. 1988, Sepik-Ramu Basin, leg. Dudgeon // Kamasau River, 200m a.s.l., 3°47'S 143°50'E". **Paratypes** (NMW, BML, CBB, WUN): 67 exs., same data as holotype; 10 exs., same data except: "Saramandi Creek, 40m a.s.l., 4°01'S 144°02'E"; 13 exs., "Kumbagora Stream, 320m a.s.l., 3°42'S 143°41'E"; 1 ex., "Maram Creek, 80m a.s.l., 4°33'S 144°59'E".

Body form and colour: Small to very small (L = 1.15 - 1.28 mm). Body subparallel, moderately depressed. Colouration brown to grey; legs, antennae and mouthparts pale brown, anterior margin of pronotum reddish; femora sometimes darkened. Elytra usually paler than pronotum.

Head: Clypeus and frons densely punctate, frons sometimes with a few flat-topped granules. Fronto-clypeal suture complete.

Thorax: Pronotum wider than long (PL = 0.36 - 0.43 mm, PW = 0.45 - 0.52 mm, PW/PL = 1.13 - 1.23), widest at about posterior 0.4; sides feebly convex, sometimes slightly emarginate at base. Discal surface with dense punctation; interstices smooth, sometimes with several intermixed flat-topped granules, glabrous. Median longitudinal sulcus moderately broad, reaching anterior 0.1 - 0.2.

Elytra slightly obovate to subparallel (EL = 0.75 - 0.85 mm, EW = 0.56 - 0.63 mm, EW/EL = 0.70 - 0.75), about twice as long as and distinctly broader than pronotum (PL/EL = 0.46 - 0.52, PW/EW = 0.79 - 0.83). Humeri rounded. Disc with rather dense micropunctation; interstices with numerous transverse wrinkles, glabrous. Striae 1 and 2 feebly impressed; strial punctures moderately large and deep. Carinae on intervals 5 and 7 moderately strong; intervals 1 - 4 flat to feebly convex, especially at base.

Anterior margin of prosternum with a very small median tubercle in males.

Metasternal disc almost flat (females) or feebly concave (males), coarsely and almost confluently punctate; median longitudinal suture distinct in posterior 0.5 - 0.7, with a small median tubercle at about posterior 0.3 in males.

Legs: Moderately long (MTL = 0.24 - 0.28 mm, MTL/L = 0.21 - 0.23). Male protarsi (especially tarsomeres 2 - 4) with several long setae inserted ventrally and dorsally. Male protibial dilatation (Fig. 41) slightly less prominent than in *A. exilis*. Mesotrochanter caudally gibbous in both sexes. Male mesotibial dilatation (Fig. 56) ends at distal 0.25, the dilatation armed with ca. 2 - 3 stout setae. Male metatibia slightly dilated in distal 0.5. Male metatarsomere 1 on ventral and lateral sides with 5 - 10 very long setae, setae on tarsomeres 2 - 4 also prolonged.

Abdomen: Ventrite 1 between admedian carinae as coarsely and as densely punctate as metasternum, ventrites 2 - 5 discally with equally dense, gradually refining punctation.

Apex of male sternite VIII acuminately rounded; with a moderately small apical fovea and two groups of adfoveal setae. Apex of male tergite VIII more or less evenly rounded.

Apex of female sternite VIII (Fig. 80) evenly to acuminately rounded; with a moderately large apical fovea and two groups of long adfoveal setae. Apex of female tergite VIII evenly rounded.

Male genitalia: Aedeagus (Figs. 6, 7) ca. 400 µm long, moderately slender, well sclerotized, similar to the aedeagus of *A. pictus*. For their comparison, see the diagnosis of the latter.

Differential diagnosis: In the overall appearance, *A. similis* somewhat resembles *A. exilis* and *A. apicarinatus*. It can be distinguished from the latter two species by its caudally gibbous mesotrochanter (both sexes), by the more slender and more parallel-sided elytra as well as by its paler colouration. *Austrolimnius similis* differs from *A. apicarinatus* also by its usually smaller size and the posteriorly less prominent inner elytral carinae. For further distinction of *A. similis* from *A. exilis*, see the differential diagnosis of the latter. Some (? teneral) specimens of *similis* with a pale elytral base or disc could be mistaken for *A. lacrimabilis*; they are easily separated, among other characters, by the caudally gibbous mesotrochanter.

Distribution and habitat: So far known from several streams of the Sepik - Ramu drainage system in northern Papua; it was collected at altitudes between 40 m and 320 m a.s.l. (see also Appendix).

Etymology: From the Latin *similis* - similar, referring to its external resemblance of *A. exilis* and *A. apicarinatus* and to its male genitalia that are similar to those of *A. pictus*.

Austrolimnius apicarinatus sp.n.

Holotype ♂ (NMW): "PAPUA NG, 6./7. 1988, Sepik-Ramu Basin, leg. Dudgeon // Saramandi Creek, 40m a.s.l., 4°01'S 144°02'E". **Paratypes** (NMW, BML, CBB, CSUS, MHNG, WUN): 242 exs., same data as holotype; 12 exs., same data except: "Kamasau River, 200m a.s.l., 3°47'S 143°50'E"; 10 exs., "Kumbagora Stream, 320m a.s.l., 3°42'S 143°41'E"; 1 ex., "Olpaip Creek, 200m a.s.l., 3°36'S 143°03'E"; 2 exs., "Maram Creek, 80m a.s.l., 4°33'S 144°59'E".

Body form and colour: Small (L = 1.21 - 1.40 mm). Body subparallel, moderately depressed. Colouration black to dark brown; legs, antennae and mouthparts pale brown, anterior margin of pronotum reddish; femora usually darkened.

Head: Clypeus and frons densely punctate. Fronto-clypeal suture complete.

Thorax: Pronotum distinctly wider than long (PL = 0.39 - 0.48 mm, PW = 0.49 - 0.56 mm, PW/PL = 1.15 - 1.26), widest at about posterior 0.4, its sides feebly convex. Disc with very dense, partly almost confluent punctation, distance between punctures smaller than their diameter; interstices with some intermixed flat-topped granules, glabrous. Median longitudinal sulcus broad, extending to anterior 0.1 - 0.2.

Elytra slightly obovate to subparallel (EL = 0.80 - 0.93 mm, EW = 0.62 - 0.70 mm, EW/EL = 0.75 - 0.80), about twice as long as and distinctly broader than pronotum (PL/EL = 0.47 - 0.54, PW/EW = 0.75 - 0.80). Humeri rounded. Discal surface with dense strong micropunctation; interstices with numerous transverse wrinkles, glabrous. Elytral striae 1 and 2 feebly impressed; strial punctures moderately large and deep. Carina on interval 5 prominent, almost abruptly ended before apex, carina on interval 7 moderately strong, lowering on declivity. Intervals 1 - 4 and 6 flat to feebly convex, especially at base.

Metasternal disc almost flat (usually in females) or slightly concave (usually in males), coarsely and almost confluently punctate; median longitudinal suture usually distinct between posterior 0.5 to 0.7, with a very small median tubercle between posterior 0.3 - 0.4 in males.

Legs: Moderately long (MTL = 0.28 - 0.32 mm, MTL/L = 0.23 - 0.25). Male protarsi with dorsal setae prolonged. Male pro- and mesotibia transformed (Figs. 42 and 57); mesotibial dilatation ends at distal 0.35, the dilatation armed with ca. 5 - 6 stout setae. Male metatibia slightly dilated in distal 0.5. Metatarsomere 1 on ventral and lateral sides with 10 - 15 long setae (longer than the segment), segments 2 - 4 with 5 (- 10) moderately long setae (as long as the segment).

Abdomen: Ventrite 1 between admedian carinae as coarsely and as densely punctate as metasternum, ventrites 2 - 5 discally with an equally dense, gradually refining punctation.

Apex of male sternite VIII acuminately rounded; with a moderately small apical fovea and two groups of adfoveal setae. Apex of male tergite VIII almost evenly rounded.

Apex of female sternite VIII (Fig. 81) acuminately rounded; with a small apical fovea and two small groups of adfoveal setae. Apex of female tergite VIII acuminately rounded.

Male genitalia: Aedeagus (Fig. 1, 2) ca. 380 µm long, moderately slender, well sclerotized, differing from the genitalia of *A. pictus* and *A. similis* mainly by the only shallowly emarginate dorsal margin of parameres (dorso-lateral view).

Differential diagnosis: The only other two New Guinea species with uniformly dark, rather rugose elytra and comparatively strong pronotal punctation are *A. similis* and *A. exilis*; for their separation from *A. apicarinatus*, see their respective differential diagnoses. In general, *A. apicarinatus* differs readily from the two species by its robust appearance and by the prominent inner elytral carinae.

Distribution and habitat: So far known from several streams of the Sepik - Ramu drainage system in northern Papua; it was collected at altitudes between 40 m and 200 m a.s.l. (see also Appendix).

Etymology: From the Latin *apex* and *carinatus*, referring to the prominent, almost abruptly ended elytral carinae on interval 5.

Austrolimnius pictus JÄCH, 1985

Austrolimnius pictus JÄCH, 1985: p. 247, figs. 28, 31a, b.

Type material: The holotype ♂ and 4 paratypes are deposited in the MHNG (not examined). I have seen the following paratypes (NMW): 1 ex., "14. VI. 79 PNG/Mor./Lae, Umg. Oomsis, Buang Riv."; 1 ex., same data except from 15.VII.79; 3 exs., "14. VI. 79 PNG/Mor./Lae, Umg. Gebensis, Gorogias Riv."

Additional material (NMW, BML, CBB, CSUS, MHNG, WUN): 19 exs., "PAPUA NG, 6./7. 1988, Sepik-Ramu Basin, leg. Dudgeon // Kamasau River, 200m a.s.l., 3°47'S 143°50'E"; 2 exs., same data except: "Saramandi Creek, 40m a.s.l., 4°01'S 144°02'E"; 29 exs., "Kumbagora Stream, 320m a.s.l., 3°42'S 143°41'E"; 3 exs., "Olpaip Creek, 200m a.s.l., 3°36'S 143°03'E"; 2 exs., "Maringjang Creek, 120m a.s.l., 3°42'S 143°14'E"; about 650 exs. (partly unmounted), "Hohoma River, 160m a.s.l., 3°44'S 143°23'E"; 56 exs., "Mindjim River, 80m a.s.l., 3°49'S 143°35'E"; 9 exs., "Kojé Creek, 160m a.s.l., 5°33'S 145°23'E"; 2 exs., "Ofri Creek, 130m a.s.l., 5°43'S 145°22'E"; 80 exs., "# 3" (one of the streams draining Finisterre and Adelbert Ranges and Toricelli Mountains; see Appendix); 1 ex., "# 2" (one of the streams draining Finisterre and Adelbert Ranges and Toricelli Mountains; see Appendix).

Body form and colour: See JÄCH (1985: fig. 28). Small to very small (L = 1.15 - 1.33 mm). The type specimens I have seen differ slightly from the remaining material in their size (L = 1.31 - 1.33 mm; specimens collected by Dudgeon do not exceed 1.29 mm) as well as by the slightly narrower pronotum (PW/PL = 1.08 - 1.10; in Dudgeon's specimens 1.11 - 1.19). This is most probably due to the fact that the type specimens come from higher altitudes than the material collected by Dudgeon (though the altitude of the type locality is unknown). Body subparallel, moderately depressed. Colouration brown (in teneral specimens) to black; legs, antennae and mouthparts pale brown to yellowish, anterior margin of pronotum paler than the disc, i.e. yellowish to reddish; femora often darkened. Each elytron with a large yellowish humeral spot and a smaller, reddish to yellowish preapical spot; humeral spots almost always fused together; sometimes (probably in immature specimens only) also humeral and preapical spots on each elytron are fused so that most of the elytral disc is pale.

Head: Clypeus sparsely punctate, frons with moderately dense, usually at least partly effaced punctation; interstices smooth and glabrous. Fronto-clypeal suture complete.

Thorax: Pronotum slightly wider than long (PL = 0.37 - 0.44 mm, PW = 0.43 - 0.49 mm, PW/PL = 1.08 - 1.19), widest at basal 0.3 - 0.4; sides feebly convex, usually slightly emarginate at base. Disc with fine, moderately dense, usually largely effaced punctation; interstices smooth and glabrous. Median longitudinal sulcus moderately narrow, reaching at least anterior 0.1 - 0.2.

Elytra slightly obovate to subparallel (EL = 0.77 - 0.91 mm, EW = 0.57 - 0.64 mm, EW/EL = 0.70 - 0.77), about twice as long as and very distinctly broader than pronotum (PL/EL = 0.45 - 0.50, PW/EW = 0.71 - 0.77). Humeri usually rounded, sometimes feebly gibbous. Surface with very fine, sparse micropunctation; interstices almost smooth with some transverse wrinkles, glabrous. Elytral striae not distinctly impressed; strial punctures moderately fine and deep. Carinae on intervals 5 and 7 moderately fine; intervals 1 - 4 and 6 flat.

Anterior margin of prosternum with a small median tubercle in males.

Metasternal disc more or less flat or slightly convex (in average flatter in males); median longitudinal suture distinct in posterior 0.5 - 0.7, with a small median tubercle at about posterior 0.3 in males. Discal surface with fine (usually females) to rather coarse (usually

males) punctation, the punctation being coarser and more confluent postero-laterally and often effaced or lacking anterio-medially.

Legs: Moderately long (MTL = 0.27 - 0.31 mm, MTL/L = 0.23 - 0.25), more slender than in other species of the *exilis* group. Male protarsomeres 1 - 4 with dorsally and ventrally inserted, long setae. Male protibia (Fig. 43) transformed similarly as in other species of the group. Male mesotibia (Fig. 58) hardly noticeably dilated at distal 0.35; scraping setae not uniform, the dilatation armed with ca. 4 larger, stouter, clustered setae. Male metatarsomere 1 slightly dilated in dorsoventral aspect. Setae on the ventral and lateral sides of metatarsomeres 1 - 4 long and numerous in males: segment 1 with about 20 - 25 very long setae, setae on the following segments decreasing both in number and length.

Abdomen: Ventrites 1 - 5 discally with very sparse micropunctation, anterior half of ventrite 1 between admedian carinae with dense, more (usually males) or less (usually females) coarse punctation, also ventrite 5 sometimes with fine punctation.

Apex of male sternite VIII slightly produced, acuminately rounded; with a small apical fovea and two groups of adfoveal setae. Apex of male tergite VIII evenly rounded.

Female sternite VIII (Fig. 82) shorter than in other species of the *A. exilis* group; apex acuminate, with a group of long setae, apical fovea absent. Apex of female tergite VIII evenly rounded.

Male genitalia: See JÄCH (1985: fig. 31a, b) and Fig. 8. Aedeagus ca. 400 µm long, moderately slender, well sclerotized, similar to the genitalia of *A. similis*. Parameres with the insinuation of the dorsal margin approximately as deep as in *A. similis* (less prominent than in *A. virilis* and *A. exilis* and more prominent than in *A. apicarinatus*). In comparison to *A. similis*, parameres of *A. pictus* are slightly more slender in dorso-lateral view, the dorsal insinuation is placed more apically, and the apex of the median lobe is broader and less curved in lateral / dorso-lateral view.

Differential diagnosis: *A. pictus* can be easily recognized among all New Guinea species by the combination of its elytral colour pattern and its smooth and shiny general appearance.

Distribution and habitat: *A. pictus* seems to be rather widespread and common in various streams of the Sepik - Ramu drainage system at low altitudes (see also Appendix). Specimens of the type series were collected near Lae on the eastern coast of Papua.

Austrolimnius virilis sp.n.

Holotype ♂ (NMW): "PAPUA NG, 6./7. 1988, Sepik-Ramu Basin, leg. Dudgeon // Ofri Creek, 130m a.s.l., 5°43'S 145°22'E". **Paratypes** (NMW, CBB): 43 exs., same data as holotype.

Body form and colour: Small (L = 1.21 - 1.42 mm). Body elongate, subparallel, moderately depressed. Colouration dark brown to black; anterior margin of pronotum reddish, legs, antennae and mouthparts pale brown; femora often somewhat darkened. Base of elytra usually paler than the remainder; sometimes also the declivity vaguely paler.

Head: Clypeus and frons with sparse, fine punctures, interstices smooth and glabrous. Fronto-clypeal suture not traceable or scarcely visible between antennal acetabula.

Thorax: Pronotum approximately as broad as long (PL = 0.40 - 0.48 mm, PW = 0.43 - 0.49 mm, PW/PL = 0.98 - 1.11), widest at posterior 0.3 - 0.4; sides slightly convex.

Discal surface with very fine, moderately dense punctation that is usually effaced on most of the disc; interstices smooth and glabrous. Median longitudinal sulcus fine and shallow, reaching about anterior 0.3 - 0.4.

Elytra elongate, subparallel (EL = 0.80 - 0.94 mm, EW = 0.51 - 0.58 mm, EW/EL = 0.60 - 0.65), about twice as long as and slightly broader than pronotum (PL/EL = 0.47 - 0.54, PW/EW = 0.78 - 0.87). Humeri rounded or slightly gibbous. Discal surface with very fine, sparse micropunctation; interstices almost smooth with few transverse wrinkles, glabrous. Striae not distinctly impressed; strial punctures fine and shallow, rather sparse. Carinae on interval 5 and 7 fine; intervals 1 - 4 and 6 flat.

Anterior margin of prosternum with a small median tubercle in males.

Metasternal disc more or less flat; median longitudinal suture distinct in posterior 0.3 - 0.5 in females, replaced by a prominent median tubercle in males; surface sparsely punctate, the puctuation denser and coarser postero-laterally, interstices smooth and glabrous; usually with a group of rather conspicuous setae next to admedian carinae at posterior 0.5 in males.

Legs: Moderately long (MTL = 0.27 - 0.31 mm, MTL/L = 0.21 - 0.23). All femora and tibiae very distinctly thickened in males. Tarsi of both sexes somewhat longer than in other species of the *A. exilis* group. Male protarsi rather compact, dilated in lateral aspect; tarsomeres 2 - 4 with numerous long, dorsally inserted setae. Male protibia (Fig. 92) extremely dilated mesally, the end of the dilatation is at distal 0.15; scraping setae not uniform, the end of the dilatation is armed with two rows of stout, clustered setae (meso-caudally with ca. 4 and meso-cranially with a long row). Mesotrochanter caudally gibbous in both sexes. Male mesotibia (Fig. 93) mesally dilated, the dilatation ends at distal 0.25, armed with about 6 stout setae. Male metatibia distinctly dilated, cleaning hairs rather prolonged (not as long as in *A. jaechi*). Male metatarsomeres (Fig. 94) remarkably dilated in dorso-lateral view, segment 1 very wide, following segments progressively narrowing, segment 5 only slightly broader than in females. Male metatarsomeres 1 - 4 with extremely long and numerous, ventrally and laterally inserted golden setae, decreasing both in length and number in segments 1 - 4; segment 5 with several long setae. The extent of the development of the male secondary sexual characters (especially on the metatarsi) is apparently proportionate to the individual size so that smaller males are less "virile" than the larger ones.

Abdomen: Ventrites 1 - 5 discally with a few micropunctures, interstices smooth and glabrous. Ventrite 1 between admedian carinae except posterior margin with fine and dense, partly confluent punctation.

Apex of male sternite VIII slightly produced, acuminately rounded; with a moderately small apical fovea and two groups of adfoveal setae. Apex of male tergite VIII evenly rounded.

Apex of female sternite VIII (Fig. 83) acuminate; with a group of long setae, apical fovea absent. Apex of female tergite VIII evenly rounded.

Male genitalia: Aedeagus (Fig. 32) ca. 510 µm long, slender. Phallobasis very long, at least as long as parameres. Apex of median lobe strongly curved ventrad; basal apophyses moderately long. The dorsal margin of parameres in dorso-lateral view only shallowly insinuated, approximately as in *A. apicarinatus*.

Differential diagnosis: Males of *A. virilis* can be easily recognized by their slender body shape, by the smooth integument as well as by the unusual number and intensity of their male secondary sexual characters, especially on the metatarsi. Females differ readily from all New Guinea species by combining the comparatively broad pronotum, the elongate elytra, the dark colour and the shiny appearance (see also differential diagnosis of *A. jaechi*).

Distribution and habitat: So far known only from the type locality in north-eastern Papua, a lowland stream in the Ramu floodplain (see also Appendix).

Etymology: From the Latin *virilis* - virile, referring to the conspicuously developed secondary sexual characters in males.

Austrolimnius difficilis sp.n.

Holotype ♂ (NMW): "IRIAN JAYA: Paniai Prov., road Nabire - Ilaga, km 62, 28.8.1996, 300m, leg. M. Balke (96 # 5)". **Paratypes** (NMW, CBB): 17 ♂♂, same data as holotype; 8 ♂♂, same data except: "km 80, 1.9.1996, 200m, (96 # 10)"; 2 ♂♂, same data except: "km 38, 18.9.1996, 200m, (96 # 25)".

Additional material (NMW): 11 ♂♂, 28 ♀♀, same data as holotype; 6 ♂♂, 14 ♀♀, same data except: "km 80, 1.9.1996, 200m, (96 # 10)"; 1 ♂, "km 117, Unipo, 2.9.1996, 150m, (96 # 12)"; 1 ♂, 2 ♀♀, "km 140, 4.9.1996, 450m, (96 # 13)"; 6 ♀♀, "km 160, 4.9.1996, 600m, (96 # 14)"; 10 ♀♀, "km 165, 4.9.1996, 650m, (96 # 15)"; 2 ♂♂, 5 ♀♀, "km 38, 18.9.1996, 200m, (96 # 25)".

The additional material includes males with deviating genitalia and external charaters (see below) as well as several undissected males.

Due to the overlap in the general morphology and the conjoint distribution of males, I was unable to distinguish the females of *A. difficilis*, *A. brevior* and *A. insinuatus*. Thus, all females of this species complex are listed here under *A. difficilis*; however, the females from locality no. 15 (and from no. 14) probably belong either to *A. brevior* or to *A. insinuatus*.

Body form and colour: Small to moderately large (L = 1.19 - 1.45 mm; due to the remarkable morphological varibility of *A. difficilis*, *A. brevior* and *A. insinuatus*, all the morphometrical data are given collectively in the description of *A. difficilis*). Body elongate, subparallel, moderately depressed. Colouration black; anterior margin of pronotum, legs, antennae and mouthparts pale brown to yellowish; femora usually darkened.

Head: Clypeus sparsely to rather densely, frons usually densely punctate. Fronto-clypeal suture complete.

Thorax: Pronotum as wide as or slightly wider than long (PL = 0.40 - 0.49 mm, PW = 0.42 - 0.51 mm, PW/PL = 0.97 - 1.14) with rather variable shape, widest at posterior 0.3 - 0.5; sides subparallel in posterior half to feebly convex, straight to feebly emarginate at base. Discal surface with fine and moderately dense, often partly effaced punctation; interstices smooth and glabrous. Median longitudinal sulcus more or less moderately narrow, reaching anterior 0.2 - 0.1.

Elytra slightly obovate to subparallel (EL = 0.79 - 0.96 mm, EW = 0.51 - 0.68 mm, EW/EL = 0.64 - 0.72), about twice as long as and slightly to distinctly broader than pronotum (PL/EL = 0.49 - 0.55, PW/EW = 0.74 - 0.87). Humeri rounded or feebly gibbous. Disc usually almost smooth, with few transverse wrinkles and sparse micropunctures; interstices glabrous. Striae often somewhat obtuse, not distinctly impressed; strial punc-

tures sparse and moderately fine. Carinae on intervals 5 and 7 usually fine, rarely distinctly stronger; intervals 1 - 4 and 6 flat.

Anterior margin of prosternum with a small median tubercle in males.

Metasternal disc more or less flat, usually with a faint posterior median impression in males, flat to slightly convex in females; with median longitudinal suture in posterior 0.6 - 0.4; with a small (very small in a few examined specimens) median tubercle at posterior 0.4 in males; with a dense, rather shallow, posteriorly partly rugose punctation in males, the punctation reduced to posterolateral angles in most females; interstices smooth and glabrous.

Legs: Moderately long (MTL = 0.27 - 0.36 mm, MTL/L = 0.20 - 0.25). Male protarsomeres 1 and 2 with several long, dorsally inserted setae. Male pro- and mesotibia transformed (Fig. 44 and 59); the mesotibial dilatation ends at distal 0.4 - 0.3; the dilatation armed with 3 - 4 stout, clustered setae. Mesotrochanter caudally gibbous in males (very indistinctly in females). Male metatibia often with distinct mesal dilatation (scraping setae distinctly transformed in one specimen, not included in the type series, see under "Variability"). Male metatarsomere 1 with numerous (ca. 20), very long setae, decreasing both in numbers and length on segments 2 - 4. Protibia and all femora more or less distinctly thickened in most males.

Abdomen: Ventrite 1 in anterior 0.6 between admedian carinae as coarsely and as densely punctate as metasternum; ventrite 5 discally usually with fine and dense punctation.

Apex of male sternite VIII acuminately rounded to acuminate; with a large apical fovea and two groups of adfoveal setae. Apex of male tergite VIII rounded.

I was able to distinguish at least three female morphotypes based on the shape of sternite VIII. Type A (Fig. 85): apex of female sternite VIII more or less acuminate; with a group of adfoveal setae (sometimes indistinctly divided into two separate groups), apical fovea absent; type B (Fig. 86): apex of sternite VIII rounded, distinctly emarginate, with a (trace of) shallow, apical fovea and two groups of long adfoveal setae; type C (Fig. 87): apex acuminately rounded, with a moderately large, narrow apical fovea and two groups of long adfoveal setae. In the examined females, the type C is represented by a single female from loc. no. "96 # 5"; the types A and B are somewhat variable and not distinctly separated. More material has to be seen to figure out whether these types represent different species. Apex of female tergite VIII acuminately rounded to acuminate in all three morphotypes.

Male genitalia: Aedeagus (Fig. 17, 18) ca. 400 µm long, moderately slender, well sclerotized, rather robust (parameres longer than 300 µm); proportions variable (parameres ca. 1.7 to 2.2 times as long as phallobasis). Median lobe in the type specimens moderately slender; apex rather stout, moderately rounded; basal apophyses moderately long. Endophallus (type specimens) at most with indistinct, dot-like sclerotizations in the distal part. Parameres moderately broad in dorsolateral aspect; with mesal unsclerotized part strongly developed, mesal microsculpture distinct usually only in a small area at about midlength; dorsal insinuation rather prominent, placed at about midlength.

Variability: *Austrolimnius difficilis* is a remarkably variable species, both in external and aedeagal characters, but there seems to be no straightforward correlation in the

various deviating characters. Therefore, I tentatively assign the deviating specimens to *A. difficilis*. It is, however, quite possible that *A. difficilis* in fact represents a cluster of closely related taxa.

The single male from locality no. "96 # 12" agrees with the type series in the aedeagal characters but differs from them by the more convex elytra with strongly carinate intervals 5 and 7 and by the distinctly stouter metatibial scraping setae.

Some specimens, occuring together with the typical specimens, differ either in the distinctly spinose endophallus (Fig. 20), or in the broader, sometimes also more insinuated median lobe or in the laterally narrower, more distally insinuated parameres (Fig. 19). More material has to be studied to evaluate the taxonomic value of these differences.

Differential diagnosis: Inside the *A. exilis* group, *A. difficilis* is easily separated from other species (except *A. brevior* and *A. insinuatus*) by combining its comparatively smooth appearance and its dark, moderately short elytra; for its separation from the latter two species, see their respective differential diagnoses. Many females agree well in size and most morphological characters with females of *A. papuanus*, differing from the latter mainly by the posteriorly not impressed metasternum and the differently shaped tergite VIII and sternite VIII; so far, I was not able to separate the females of *A. difficilis*, *A. brevior* and *A. insinuatus*.

Distribution and habitat: So far known from several streams in the Weyland Mountains in western Irian Jaya.

Etymology: From the Latin *difficilis*, difficult, referring to the uncertain taxonomic status of the material tentatively assigned to the species.

Austrolimnius brevior sp.n.

Holotype ♂ (NMW): "IRIAN JAYA: Paniai Prov., road Nabire - Ilaga, km 80, 1.9.1996, 200m, leg. M. Balke (96 # 10)". **Paratypes** (NMW, CBB): 6 ♂♂, same data as holotype; 2 ♂♂, same data except: "km 62, 28.8.1996, 300m, (96 # 5)"; 4 ♂♂, "km 140, 4.9.1996, 450m, (96 # 13)"; 2 ♂♂, "km 165, 4.9.1996, 650m,, (96 # 15)"; 1 ♂, "km 53, 17.9.1996, 700m, (96 # 23)".

Additional material (NMW): 1 ♂, "IRIAN JAYA: Paniai Prov., road Nabire - Ilaga, km 62, 28.8.1996, leg. M. Balke (96 # 5)".

See additional material of *A. difficilis* for females.

Body form and colour: In size, colour, body form and most morphological characters within the variability range of *A. difficilis*; females so far not separable from the preceding and the following species (see the diagnosis of *A. difficilis*).

Thorax: Elytra usually with humeri feebly rounded; sides usually more distinctly subparallel than in most *A. difficilis*.

Metasternal median tubercle very small to nearly indistinct in examined specimens; metasternal punctation usually largely effaced anterio-medially.

Abdomen: Male sternite VIII with apical fovea slightly more parallel-sided than in *A. difficilis*.

Male genitalia: Aedeagus (Figs. 11, 12) ca. 340 - 370 µm long, moderately slender, well sclerotized, distinctly less robust (parameres ca. 240 - 260 µm long) than in *A. difficilis*.

Phallobasis rather long (parameres ca. 1.5 - 1.75 times as long as phallobasis, only exceptionally more than 1.8 times as long). Median lobe rather slender; apex acuminately rounded; basal apophyses moderately long. Endophallus distally at most with indistinct sclerotizations. Parameres moderately broad in dorsolateral aspect; with mesal unsclerotized part strongly developed, mesal microsculpture distinct usually only in a small area at about midlength; dorsal insinuation rather prominent, placed at about midlength.

Variability: Genitalia of one male (locality no. "96 # 5") agree with *A. brevior* in the size of parameres and phallobasis as well as in the moderately broad parameres; they differ from the typical *A. brevior* genitalia in a distinctly stouter apex of the median lobe and in a generally more robust appearance (resembling *A. difficilis*) and in a more evenly, more distally insinuated dorsal margin of the parameres (resembling *A. insinuatus*). I tentatively assign this specimen to *A. brevior*; more material has to be studied to decide whether this specimen belongs to any of the three described species or represents a new one.

Differential diagnosis: Externally, males of *A. brevior* strongly resemble *A. difficilis* and *A. insinuatus*, differing from the former species only in the usually less punctate metasternal disc with a less prominent metasternal tubercle. Genitalically, *A. brevior* differs from *A. difficilis* in the less robust aedeagus with shorter parameres as well as by the distinctly more acuminate apex of the median lobe; it is separated from *A. insinuatus* by the shorter and broader and more distinctly, usually more basally insinuated parameres as well as by the comparatively longer phallobasis.

Distribution and habitat: So far known from several streams in the Weyland Mountains in western Irian Jaya.

Etymology: From the Latin *brevior*, shorter, referring to the comparatively broad and short parameres compared to *A. insinuatus*.

Austrolimnius insinuatus sp.n.

Holotype ♂ (NMW): "IRIAN JAYA: Paniai Prov., road Nabire - Ilaga, km 165, 4.9.1996, 650m, leg. M. Balke (96 # 15)". **Paratypes** (NMW, CBB): 4 ♂♂, same data as holotype; 1 ♂, same data except "km 140, 4.9.1996, 450m, (96 # 13); 1 ♂, "km 38, 18.9.1996, 200m, (96 # 25)".

Additional material: See *A. difficilis* for females.

Body form and colour: In size, colour, body form and most external morphological characters probably identical with *A. brevior*.

Abdomen: Male sternite VIII with apical fovea distinctly more parallel-sided than in *A. difficilis* and in *A. brevior*.

Male genitalia: Aedeagus (Fig. 13, 14) ca. 340 - 370 µm long, slender, well sclerotized, distinctly less robust (parameres ca. 250 - 280 µm long) than in *A. difficilis*. Phallobasis rather short (parameres ca. 1.8 - 2.0 times as long as phallobasis, only exceptionally less than 1.8 times as long). Median lobe slender; apex acuminately rounded; basal apophyses moderately long. Endophallus distally at most with indistinct sclerotizations. Parameres narrow in dorsolateral aspect; with mesal unsclerotized part strongly developed, mesal microsculpture distinct usually only in a small area at about midlength; dorsal margin rather evenly insinuated, the insinuation placed usually in apical half.

Differential diagnosis: Externally, males of *A. insinuatus* strongly resemble *A. difficilis* and *A. brevior*. They differ from *A. difficilis* only in the usually less punctate metasternal disc with a less prominent metasternal tubercle. Genitalically, *A. insinuatus* differs from the latter two species by the more slender parameres with a less insinuated dorsal margin. Moreover, it differs from *A. difficilis* in the less robust aedeagus and the acuminate apex of the median lobe; it is separated from *A. brevior* also by the comparatively longer parameres and shorter phallobasis.

Distribution and habitat: So far known from several streams in the Weyland Mountains in western Irian Jaya.

Etymology: Referring to the moderately insinuated dorsal margin of the parameres.

The *Austrolimnius lacrimabilis* group

The *A. lacrimabilis* group includes species with a simple aedeagus: 1) parameres without an insinuated dorsal margin and 2) without a mesial microsculpture. The group agrees in other aedeagal characters (general shape, endophallus without sclerotizations), as well as in the shape of male pro- and mesotibial transformation with members of the *A. exilis* group (see also apomorphy 3 in the definition of the latter group). The *A. lacrimabilis* group comprises four species (*A. lacrimabilis*, *A. hilum*, *A. ekari*, and *A. hercules*) that were collected in lowland streams in western Irian Jaya and in the Sepik-Ramu drainage system in northern Papua.

Austrolimnius lacrimabilis sp.n.

Holotype ♂ (NMW): "PAPUA NG, 6./7. 1988, Sepik-Ramu Basin, leg. Dudgeon // Kamasau River, 200m a.s.l., 3°47'S 143°50'E". **Paratypes** (NMW, BML, CBB): 55 exs., same data as holotype; same data as holotype except: 2 exs., "Kumbagora Stream, 320m a.s.l., 3°42'S 143°41'E"; 1 ex., "Maringjang Creek, 120m a.s.l., 3°42'S 143°14'E".

Body form and colour: Small to very small (L = 1.15 - 1.36 mm). Body subparallel, moderately depressed. Colouration dark brown to black, legs, antennae and mouthparts pale brown, anterior margin of pronotum reddish; femora usually darkened. Elytral base reddish, also the rest of elytral disc between inner carinae sometimes vaguely brownish.

Head: Clypeus with sparse punctation, frons with moderately dense, usually partly effaced punctation; interstices smooth or with a few intermixed flat-topped granules, glabrous. Fronto-clypeal suture complete.

Thorax: Pronotum wider than long (PL = 0.37 - 0.46 mm, PW = 0.45 - 0.51 mm, PW/PL = 1.12 - 1.22), widest at about posterior 0.3; sides feebly convex, straight or rarely slightly emarginate at base. Disc densely, rather strongly punctate (the punctation is approximately as dense as in *A. similis* but somewhat stronger); interstices with numerous intermixed flat-topped granules, glabrous. Median longitudinal sulcus moderately broad, extending to anterior 0.1 - 0.2.

Elytra slightly obovate to subparallel (EL = 0.76 - 0.90 mm, EW = 0.56 - 0.67 mm, EW/EL = 0.72 - 0.75), about twice as long as and distinctly broader than pronotum (PL/EL = 0.47 - 0.52, PW/EW = 0.76 - 0.80). Humeri usually rounded but sometimes

(winged specimens ?) feebly gibbous. Surface with fine, sparse to moderately dense micropunctation; interstices usually with few transverse wrinkles, rather smooth, glabrous. Striae somewhat obtuse, stria 1 and 2 (especially in anterior part) feebly to moderately impressed; strial punctures moderately large and deep. Carinae on intervals 5 and 7 moderately strong; intervals 1 - 4 and 6 flat to feebly convex.

Metasternal disc almost flat (usually in females) or feebly concave (usually in males); discal surface coarsely, especially in posterior 0.5 almost confluently punctate; median longitudinal suture distinct in about posterior 0.5, usually more deeply impressed in males.

Legs: Moderately long (MTL = 0.26 - 0.31 mm, MTL/L = 0.22 - 0.25). Male pro- and mesotibia (Figs. 46 and 60) transformed similarly as in members of the *A. exilis* group; the mesotibial dilatation ends at distal 0.35, armed with about 5 stout setae. Metatarsomeres not distinctly dilated in dorsoventral aspect; the ventral side of tarsomeres 1 - 4 with 10 - 15 moderately long setae (as long as the segment).

Abdomen: Ventrite 1 between admedian carinae as densely and almost as coarsely punctate as metasternum, anterior margin of ventrite 2 discally with fine punctation, ventrites 3 - 5 discally with a few micropunctures; interstices smooth and glabrous.

Apex of male sternite VIII produced, acuminately rounded; with a moderately small apical fovea and two groups of long adfoveal setae. Apex of male tergite VIII evenly rounded.

Apex of female sternite VIII (Fig. 84) slightly produced, acuminately rounded; with a small, shallow apical fovea and two groups of long adfoveal setae. Apex of female tergite VIII evenly rounded.

Male genitalia: Aedeagus (Figs. 21, 22) ca. 400 µm long, moderately slender, well sclerotized. Above the characters defining the *A. lacrimabilis* group, it differs from members of the *A. exilis* group also by the much stouter apex of the median lobe and by the slightly longer basal apophyses.

Differential diagnosis: *Austrolimnius lacrimabilis* differs from all other New Guinea species except *A. solitarius* by combining its dark colouration with the red elytral base, the densely, rather strongly punctate pronotal disc and the moderately depressed, laterally not explanate elytra. Males can be distinguished from *A. solitarius*, among other characters, by the differently shaped metasternum and by the simple mesotrochanter; females of *A. solitarius* are still unknown.

Distribution and habitat: So far known from several streams draining the Toricelli Mountains in northern Papua; it was collected at altitudes between 120 m and 320 m a.s.l. (see also Appendix).

Etymology: From the Latin *lacrimabilis* - "shedding tears", referring to the shiny flat-topped granules on the pronotal disc.

Austrolimnius hilum sp.n.

Holotype ♂ (NMW): "PAPUA NG, 6./7. 1988, Sepik-Ramu Basin, leg. Dudgeon // Hohoma River, 160m a.s.l., 3°44'S 143°23'E".

Body form and colour: Very small (L = 1.11 mm). Body subparallel (Fig. 89), moderately depressed. Head dark brown; pronotum and elytra reddish brown; legs, antennae, mouthparts and anterior margin of pronotum pale brown.

Head: Clypeus finely and densely, frons densely, between antennal acetabula almost confluently punctate. Fronto-clypeal suture complete.

Thorax: Pronotum slightly wider than long (PL = 0.39 mm, PW = 0.44 mm, PW/PL = 1.13), widest at posterior 0.4; sides feebly convex. Discal surface with fine and dense, partly effaced punctation; interstices smooth and glabrous. Median longitudinal sulcus broad, reaching anterior 0.1.

Elytra slightly obovate (EL = 0.72 mm, EW = 0.57 mm, EW/EL = 0.79), almost twice as long as and distinctly broader than pronotum (PL/EL = 0.54, PW/EW = 0.77). Humeri rounded. Discal surface with sparse micropunctures and a few transverse wrinkles; interstices smooth and glabrous. Stria 1 and 2 feebly impressed at base; strial punctures moderately large and deep, rather sparse. Carinae on intervals 5 and 7 moderately strong, intervals 1 - 4 and 6 almost flat to slightly convex, especially at base.

Metasternal disc flat, with rather coarse, confluent punctation; median longitudinal suture distinct in about posterior 0.6.

Legs: Moderately long (MTL = 0.26 mm, MTL/L = 0.23). Pro- and mesotibia (of male) transformed similarly as in members of the *A. exilis* group but the dilatations are much less prominent on both tibiae; mesotibia hardly noticeably dilated at distal 0.4, scraping setae not uniform, the dilatation armed with ca. 4 stout setae. Metatarsomeres apparently without long or numerous setae.

Abdomen: Ventrites 1-5 discally with dense, progressively refining punctation, ventrite 1 as densely and almost as coarsely punctate as metasternum.

Ventrite 5 and terminal abdominal segments of the holotype male unfortunately destroyed during preparation; female unknown.

Male genitalia: Aedeagus (Figs. 4, 5) ca. 340 µm long, slender, slightly less sclerotized than in *A. lacrimabilis* or *A. hercules*. Essentially of the same form as in the latter two species (parameres mesally smooth, the dorsal margin almost straight in dorso-lateral view), differing mainly by its very small size and by the shorter basal apophyses; from *A. lacrimabilis* discernible also by the more pointed apex of the median lobe. For the differences between *A. hilum* and *A. ekari*, see the diagnosis of the latter.

Differential diagnosis: The combination of fine pronotal punctation, deep elytral strial punctures and densely, coarsely punctate metasternum in *A. hilum* is unique among all New Guinea *Austrolimnius* and could possibly serve in identifying the females. Above these characters, *A. hilum* differs from all other New Guinea species except *A. ekari* by its small size, by its little expressed male secondary sexual characters and by the very small, simple aedeagus. It can be separated from *A. ekari* also by its paler colouration and by the more rounded sides of pronotum and elytra.

Distribution and habitat: So far known only from the type locality, a stream draining the Toricelli Mountains in northern Papua (see also Appendix).

Etymology: From the Latin *hilum* - a trifle, referring to its small size; noun used in apposition.

Austrolimnius ekari sp.n.

Holotype ♂ (NMW): "IRIAN JAYA: Paniai Prov., road Nabire - Ilaga, km 80, 1.9.1996, 200m, leg. M. Balke (96 # 10)".

Body form and colour: Small (L = 1.24 mm). Body subparallel, moderately depressed. Head black; pronotum and elytra dark brown to black; legs, antennae, mouthparts and anterior margin of pronotum yellowish.

Head: Clypeus and anterior part of frons sparsely punctate, frons posteriorly with a dense, rather rugose punctation. Fronto-clypeal suture complete.

Thorax: Pronotum slightly wider than long (PL = 0.43 mm, PW = 0.46 mm, PW/PL = 1.08), widest at posterior 0.4; sides slightly convex, nearly subparallel in posterior half. Discal surface with fine and dense punctation; interstices smooth and glabrous. Median longitudinal sulcus narrow, reaching anterior 0.2.

Elytra nearly subparallel (EL = 0.81 mm, EW = 0.58 mm, EW/EL = 0.71), almost twice as long as and distinctly broader than pronotum (PL/EL = 0.53, PW/EW = 0.80). Humeri feebly gibbous. Discal surface with sparse micropunctures and few transverse wrinkles; interstices smooth and glabrous. Striae somewhat obtuse, not impressed; strial punctures fine and shallow, rather sparse. Carinae on intervals 5 and 7 moderately fine, intervals 1 - 4 and 6 flat.

Metasternal disc nearly flat, with dense and shallow, partly effaced punctation; postero-laterally somewhat impressed, with several long setae; median longitudinal suture distinct in about posterior 0.6, very fine.

Legs: Rather short (MTL = 0.24 mm, MTL/L = 0.20). Pro- and mesotibia (of male) transformed similarly as in *A. hilum*; protibia slightly dilated at distal 0.4, the dilatation meso-cranially and meso-caudally armed with a row of clustered, stout setae; mesotibia hardly noticeably dilated at distal 0.4, scraping setae not uniform, the dilatation armed with ca. 3 stout setae. Metatarsomere 1 with several long setae.

Abdomen: Ventrites 1 between admedian carinae densely, shallowly punctate, ventrites 2 - 4 discally with sparse micropunctation, ventrite 5 finely densely punctate.

Apex of male sternite VIII acuminate; with a small apical fovea and two groups of long adfoveal setae. Apex of male tergite VIII rounded. Female unknown.

Male genitalia: Aedeagus (Figs. 15, 16) ca. 320 µm long, slender, less sclerotized than in *A. lacrimabilis* or *A. hercules*; in size and form similar (parameres mesally smooth, the dorsal margin almost straight in dorso-lateral view) to *A. hilum*, differing mainly by the more pointed and more ventrad curved apex of the median lobe and by the slightly sinuous, apically slightly divergent parameres.

Differential diagnosis: *Austrolimnius ekari* differs from all other New Guinea species except *A. hilum* by its small size, by its little expressed male secondary sexual characters and by the very small, simple aedeagus. For its separation from *A. hilum*, see the diferential diagnosis of the latter.

Distribution and habitat: So far known only from the type locality in western Irian Jaya.

Etymology: Named after the Ekari tribe inhabiting the Weyland Mountains area where this and several other new species were collected by M. Balke; noun used in aposition.

Austrolimnius hercules sp.n.

Holotype ♂ (NMW): "PAPUA NG, 6./7. 1988, Sepik-Ramu Basin, leg. Dudgeon # 3" (one of the streams draining Finisterre and Adelbert Ranges and Toricelli Mountains, see Appendix).

Body form and colour: Small (L = 1.32 mm). Body subparallel, moderately depressed. Head and elytra black, pronotum dark brown; legs, antennae, mouthparts and anterior margin of pronotum pale brown; elytra with a vaguely brownish subbasal strip.

Head: Clypeus with dense punctation, frons very densely, almost confluently punctate. Fronto-clypeal suture complete.

Thorax: Pronotum slightly wider than long (PL = 0.47 mm, PW = 0.51 mm, PW/PL = 1.09), widest at basal 0.3; sides feebly convex, slightly emarginate at base. Discal surface densely punctate (approximately as in *A. exilis*); interstices smooth and glabrous. Median longitudinal sulcus broad, extendending to anterior 0.1 - 0.2.

Elytra slightly obovate to subparallel (EL = 0.85 mm, EW = 0.63 mm, EW/EL = 0.74), widest behind middle, almost twice as long as and slightly broader than pronotum (PL/EL = 0.55, PW/EW = 0.81). Humeri rounded. Discal surface with rather strong micropunctation; interstices with some transverse wrinkles, glabrous. Striae 1 and 2 distinctly impressed in anterior 0.5 - 0.7, other striae at most slightly impressed; strial punctures moderately large and deep. Carinae on intervals 5 and 7 moderately strong. Intervals 1 - 4 and 6 flat to feebly convex, especially the inner ones at base.

Anterior margin of prosternum with a small median tubercle.

Metasternal disc slightly concave, rather coarsely, almost confluently punctate; median longitudinal suture distinct in posterior 0.5, with a small median tubercle at posterior 0.3.

Legs: Moderately long (MTL = 0.29 mm, MTL/L = 0.22). All femora thickened, to an extreme extent in profemora; protibia also thickened. Protarsi somewhat dilated in lateral aspect. Pro- and mesotibia transformed similarly as in the *A. exilis* group, the mesotibial dilatation ends at distal 0.3, armed with about 4 - 5 stout setae. Setae on metatarsomeres 1 - 4 long and rather numerous.

Abdomen: Ventrite 1 between admedian carinae except for posterior margin as strongly and as densely punctate as metasternum, ventrites 2 - 4 discally with equally dense but progressively refining punctation in anterior 0.5 - 0.7.

Apex of male sternite VIII acuminately rounded; with a small apical fovea and two groups of adfoveal setae (most of them broken off in the holotype). Apex of male tergite VIII evenly rounded.

Female unknown.

Male genitalia: Aedeagus (Figs. 9, 10) ca. 470 µm long, slender. From the genitalia of *A. hilum* or *A. lacrimabilis* differing mainly by its large size; basal apophyses longer than in *A. hilum* and slightly shorter than in *A. lacrimabilis*; apex of median lobe approximately as in *A. hilum*.

Differential diagnosis: Males of *A. hercules* differ readily from all other New Guinea species with the exception of *A. virilis* and *A. seductor* by conspicuously thickened pro-

femora and protibia. It can be easily separated from *A. virilis* by a number of characters, e.g. by its coloration, by the obovate, broader body shape as well as by the densely punctate pronotal and metasternal disc. *Austrolimnius seductor* is smoother in general appearance and has distinctly red humeri and more explanate elytral margins.

Distribution and habitat: Precise locality unknown. It should be one of the streams draining the Finisterre and Adelbert Ranges and the Toricelli Mountains in northern Papua (see Appendix).

Etymology: After the mythical athlete Hercules, referring to its remarkably thickened profemora and protibia; noun used in aposition.

The *Austrolimnius ullrichi* group

This group is characterised by the following two apomorphies: 1) protrochanter cranio-distally spinose in males and distinctly tuberculate in females (it is more or less angulate or sometimes slightly tuberculate in most other New Guinea species but the angle is far not as much pronounced in other species); 2) aedeagus slightly assymetric, with apex of median lobe rotated; endophallus with distinct scale-like sclerotizations. Male pro- and mesotibia transformed; protibia meso-caudally dilated behind middle, scraping setae not uniform, the end of the dilatation is armed with two rows of stout, clustered setae: meso-cranially with a long row, meso-caudally with ca. 4 - 5 setae, the terminal meso-caudal seta being conspicuously large; also the setae between end of the dilatation and distal end stouter and more closely set. Male mesotibia mesally with feeble, hump-like dilatation in distal half, scraping setae transformed, not uniform. The group includes two species (*A. ullrichi* and *A. bispina*), both are widely distributed in New Guinea.

Austrolimnius ullrichi JÄCH, 1985

Austrolimnius ullrichi JÄCH, 1985: p. 246, figs. 27, 30.

Type material: The holotype ♂ (examined) and one paratype ♀ (not examined) are deposited in the MHNG. One paratype ♀ is housed in the NMW (examined). Both examined specimens bear the following locality data: "PNG/Mor./Lae, 14.VI. 79, Umg. Gebensis, Gorogias Riv."

Additional material (NMW, CBB, BML): 1 ♂, 1 ♀, "PAPUA NG 6./7. 1988, Sepik-Ramu Basin, leg. Dudgeon // Kojé Creek, 160m a.s.l., 5°33'S 145°23'E"; 2 ♂♂, 1 ♀, same data except: "Mom Creek, 170m a.s.l., 05°45'S 145°20'E"; 1 ♂, 4 ♀♀, "# 3" (one of the streams draining Finisterre and Adelbert Ranges and Toricelli Mountains; see Appendix); 4 ♂♂, 7 ♀♀, "IRIAN JAYA: 29.9. 1993, Eme Gebiet, Emdoman, 800 - 1000m // ca. 139°55'E 04°14'S, leg. M.Balke (25)"; 1 ♀, "IRIAN JAYA: 4.9. 1992, Diuremna - Naica, 139°49'E 04°24'S, 1500m, leg. Balke (36)"; 3 ♀♀, "IRIAN JAYA: Paniai Prov., road Nabire - Ilaga, km 62, 28.8.1996, 300m, leg. M. Balke (96 # 5)"; 1 ♂, "IRIAN JAYA: Paniai Prov., road Nabire - Ilaga, km 80, 1.9.1996, 200m, leg. M. Balke (96 # 10)"; 1 ♀, "IRIAN JAYA: Paniai Prov., road Nabire - Ilaga, km 140, 4.9.1996, 450m, leg. M. Balke (96 # 13)"; 1 ♂, 2 ♀♀, "IRIAN JAYA: Paniai Prov., road Nabire - Ilaga, km 160, 4.9.1996, 600m, leg. M. Balke (96 # 14)"; 1 ♀, "IRIAN JAYA: Paniai Prov., road Nabire - Ilaga, km 165, 4.9.1996, 650m, leg. M. Balke (96 # 15)"; 1 ♀, "PAPUA, Musgrave River, Sogeri Plateau, Nr. Pt. Moresby, 16.iii.1965 // M.E. Bacchus, B.M. 1965-120 // Stn. No. 200"; 1 ♀, "NEW GUINEA: E.Highland Dist., Wanatabe Valley, Nr. Okapa, c. 5000 ft., 5.ii.1965 // M.E. Bacchus., B.M. 1965-120 // Stn. No. 176".

Body form and colour: See JÄCH (1985: fig. 27). Small to moderately large (L = 1.29 - 1.48 mm). Body subparallel, moderately depressed, rather variable in body shape and

surface. Colour in mature specimens dark brown to black; legs, antennae and mouthparts pale brown, anterior margin of pronotum reddish; femora usually darkened. Elytral base across humeri reddish, in teneral specimens (from Mom Creek) brightly yellow.

Head: Clypeus sparsely to densely, sometimes partly rugosely punctate, interstices glabrous. Frons usually rugosely and rather coarsely punctate, punctation of anterior margin sometimes sparse, interstices usually glabrous. Fronto-clypeal suture complete.

Thorax: Pronotum slightly wider than long (PL = 0.45 - 0.51 mm, PW = 0.49 - 0.59 mm, PW/PL = 1.05 - 1.16), widest at about posterior 0.5; sides feebly convex, straight to slightly emarginate at base. Discal surface with dense, often largely effaced punctation; interstices smooth and glabrous. Median longitudinal sulcus more or less narrow, reaching anterior 0.2 - 0.1.

Elytra slightly obovate to subparallel (EL = 0.84 - 0.96 mm, EW = 0.62 - 0.71 mm, EW/EL = 0.69 - 0.75), almost twice as long as and distinctly to slightly broader than pronotum (PL/EL = 0.49 - 0.56, PW/EW = 0.77 - 0.86). Humeri rounded or slightly gibbous. Disc with sparse micropunctation; interstices usually with few transverse wrinkles, almost smooth and glabrous, sometimes partly with indistinct reticulation. At most stria 1 and 2 at base slightly impressed; strial punctures moderately fine and deep. Carinae on intervals 5 and 7 moderately fine; intervals 1 - 4 and 6 flat, inner ones sometimes slightly convex at base.

Anterior margin of prosternum with a very small, indistinct median tubercle in males.

Metasternal disc slightly convex (females) to slightly concave (males), with postero-lateral impressions; with a round elevation at posterior 0.5 next to each admedian carina in males, each elevation with a group of ca. 5 prolonged setae; postero-laterally with several large, shallow punctures (females, males from Mom Creek) to more or less extensive, dense, moderately fine to rather rugose punctation (remaining males). Interstices smooth, glabrous. Longitudinal suture distinct in about posterior 0.5, more impressed in males.

Legs: Moderately long (MTL = 0.39 - 0.45 mm, MTL/L = 0.25 - 0.29). Protrochanter cranio-distally with a small tubercle in females and a prominent, long, spine-like tubercle in males. Male protibial dilatation ends at distal 0.1, the dilatation placed rather meso-caudally. Male mesotibia with a hump-like dilatation between distal 0.5 and 0.25, the dilatation armed with ca. 10 stout, clustered setae. Male metatarsomere 1 slightly dilated in dorsoventral aspect, tarsomeres 1 - 3 with numerous long setae: segment 1 on ventral and lateral sides with ca. 10 - 15 very long setae, decreasing both in length and number on the following segments. All femora distinctly thickened in males.

Abdomen: Ventrite 1 in anterior 0.5 - 0.8 between admedian carinae as densely and almost as coarsely punctate as metasternum, ventrites 2 - 5 discally with at most sparse superficial punctures, interstices smooth and glabrous.

Apex of male sternite VIII feebly produced, acuminately rounded; with a large apical fovea and two groups of long adfoveal setae. Apex of male tergite VIII evenly rounded.

Apex of female sternite VIII (Fig. 77) rounded; with a group of long preapical setae, apical fovea absent. Apex of female tergite VIII evenly to acuminately rounded.

Male genitalia: See JÄCH (1985: fig. 30) and Fig. 34. Aedeagus ca. 540 - 560 µm long, well sclerotized. Median lobe moderately broad, evenly tapering; apex moderately rounded, curved ventrad, asymmetrically rotated; basal apophyses moderately long. Endophallus with distinct scale-like sclerotizations. Parameres almost as long as the median lobe; ventro-basally connected by a sclerotized band; apices slightly turned mediad, with about 20 - 30 very long preapical setae.

Differential diagnosis: Males of *A. ullrichi* can be easily separated from all New Guinea species by combining the reddish humeral marking and the cranio-distally tuberculate protrochanter. Combining its comparatively smooth surface and the broadly red humeri, *A. ullrichi* somewhat resembles *A. seductor* and *A. dentibialis*. For their separation, see also the diferential diagnosis of the latter two species.

Distribution and habitat: *A. ullrichi* is a very widespread species with a wide vertical distribution; it is already known from various localities both in Irian Jaya and Papua (see also Appendix), and was collected at altitudes ranging from 160 m to 1500 m a.s.l.

Austrolimnius bispina sp.n.

Holotype ♂ (NMW): "IRIAN JAYA: Borme, Tarmlu, 1500m, 6.9. 1993 // ca. 140°25'E 04°24'S, leg. M.Balke (5)". **Paratypes** (NMW, BML, CBB, MHNG): 1 ♂, same data as holotype; 10 ♂♂, 18 ♀♀, "Papua Nlle Guinée, Morobe 5km above, env. de Gurakor, W.G. Ullrich, I. 81"; 3 ♂♂, 1 ♀, "NEW GUINEA: Morobe Dist., Herzog Mts., Vagau, C. 4,000 ft., 4 - 17.i.1965 // M.E. Bacchus., B.M. 1965-120 // Stn. No. 140"; 1 ♀, same data except "Stn. No. 152", 1 ♂; same data except "9.i.1965" and "Stn. No. 147B"; 1 ♂, "NEW GUINEA: E. Highlands Dist., Wanatabe Valley, nr. Okapa, c. 5000 ft, 5.ii.1965 // M.E. Bacchus., B.M. 1965-120" (this and another specimen from "Stn. No. 140" bear Hinton's determination labels "Austrolimnius saon Hinton, Paratype // MANUSCRIPT NAME", the latter bearing also another label "Austrolimnius sp.2, det. M. Jäch 84").

Body form and colour: Moderately large (L = 1.39 - 1.53 mm). Body subparallel, moderately depressed. Colouration black; legs, antennae and mouthparts pale brown, anterior margin of pronotum brownish; femora darkened.

Head: Clypeus sparsely to densely, sometimes rugosely punctate, frons with rugose and rather coarse punctation; interstices glabrous. Fronto-clypeal suture complete.

Thorax: Pronotum slightly wider than long (PL = 0.46 - 0.53 mm, PW = 0.47 - 0.57 mm, PW/PL = 1.02 - 1.12), widest at about posterior 0.4; sides feebly convex, straight to slightly emarginate at base. Disc smooth and glabrous, sometimes partly with dense, very superficial and indistinct punctation. Median longitudinal sulcus more or less narrow, extending to anterior 0.1.

Elytra slightly obovate to subparallel (EL = 0.92 - 1.00 mm, EW = 0.66 - 0.71 mm, EW/EL = 0.68 - 0.73), about twice as long as and distinctly broader than pronotum (PL/EL = 0.49 - 0.53, PW/EW = 0.73 - 0.81). Humeri almost rounded. Discal surface with few micropunctures; interstices with a few wrinkles, almost smooth, glabrous. At most stria 1 slightly impressed, strial punctures moderately fine and deep, rather sparse. Carinae on intervals 5 and 7 moderately strong, intervals 1 - 4 and 6 flat.

Metasternal disc slightly convex (females) or flat (males), surface smooth and glabrous, at most with a few punctures; with a group of setiferous granules next to each admedian carina at about posterior 0.5, the granules more closely set in males; with a lateral

posterior impression behind the group of granules in males. Longitudinal suture distinct in about posterior 0.6 in females; obsolete, armed with a small median tubercle at posterior 0.3 in males.

Legs: Moderately long, middle and hind legs somewhat prolonged in males (MTL = 0.43 - 0.47 mm in males, 0.38 - 0.43 in females; MTL/L = 0.30 - 0.32 in males, 0.27 - 0.29 in females). Distal margin of protrochanter anteriorly with a small tubercle in females and a prominent, long, spine-like tubercle in males. Male protibia (Fig. 51) transformed similarly as in *A. ullrichi*, the dilatation more prominent, placed more mesally, the terminal seta even more prominent than in *A. ullrichi*. The mesotibial hump-like dilatation in males usually indistinct, placed at distal 0.4, armed with ca. 5 stout, clustered setae. Male metatarsomeres 1 - 3 with numerous long setae; segment 1 with ca. 15 very long setae (almost 2 times as long as the segment), decreasing both in number and length on the following segments.

Abdomen: Ventrite 1 in anterior 0.5 between admedian carinae usually with some rugose punctures or (in females) granules; interstices smooth and glabrous.

Apex of male sternite VIII produced, acuminate; with a large, deep apical fovea and two groups of long adfoveal setae, very deeply excised in lateral aspect; laterally seen, the apical part resembles a rod-like, caudad projecting apodeme inserted on the inner side of the ventrite. Apex of male tergite VIII almost truncate; with a faint median emargination.

Apex of female sternite VIII (Fig. 66) rounded; with a group of long setae, apical fovea absent. Apex of female tergite VIII (Fig. 69) produced and deeply excised, bifurcate.

Male genitalia: Aedeagus (Fig. 35) ca. 620 µm long, well sclerotized. Median lobe moderately slender, almost evenly tapering; apex moderately rounded, curved ventrad, slightly asymmetrical and rotated; basal apophyses very long, rather broad. Endophallus with scale-like sclerotizations. Parameres broad and slightly shorter than the median lobe, strongly narrowed in apical 0.3 in lateral view, dorsally emarginate in basal 0.4; apices slightly rotated, with about 40 very long preapical setae.

Differential diagnosis: Males of *A. bispina* are easily recognized among all New Guinea species by combining their dark colour and the prominently mesally indented protibia. Females are easily recognized by the bifurcate apex of tergite VIII.

Distribution and habitat: Similarly as *A. ullrichi* and *A. dentibialis*, *A. bispina* seems to be a rather widespread species; it is already known both from Irian Jaya and Papua.

Etymology: From the Latin substantive *bispina*, referring to the conspicuously bifurcate tergite VIII in females as well as to the spine-like protuberance on the protrochanter and to the prominent protibial dilatation in males.

The *Austrolimnius jaechi* group

The group is defined by the following (and very unusual) autapomorphies: 1) posterior margin of metasternum next to metacoxal openings with two tubercles (more developed, spine-like in males), 2) antennal segments stout, 3) distal antennomeres of male conspicuously dilated, with clusters of long setae, 4) male protarsi club-shaped, 5) male metatibia with conspicuously prolonged cleaning hairs. The group contains the only species found so far in the Moluccas.

Austrolimnius jaechi sp.n.

Holotype ♂ (NMW): "INDONESIA 1989, leg. Jäch 16 // CERAM, 16. - 18.2., Umg. Manusela, 700 - 900m". **Paratypes** (NMW, CBB): 8 exs., same data as holotype; 5 exs, "INDONESIA 1989, leg. Jäch 15 // CERAM, 16.2., Hatuolo - Manusela, 600 - 700m"; 3 exs., "INDONESIA 1989, leg. Jäch 13 // CERAM, 14.2., Kaloha - Hatuolo, 300 - 600m"; 6 exs., "INDONESIA 1989, leg. Jäch 1 // AMBON, 2.2., Soya"; 3 exs., "INDONESIA 1989, leg. Jäch 7 // AMBON, 4.2., Waai"; 2 exs., "INDONESIA 1989, leg. Jäch 8 // AMBON, Waai, Gg. Salahutu, 6.2.: 300 - 600m"; 8 exs., same data except loc. no. "(9)".

Body form and colour: Small to moderately large (L = 1.28 - 1.58 mm). Body elongate, subparallel, moderately depressed. Colouration pale to dark brown, head usually darker (not fully mature specimens ?); legs, antennae and mouthparts pale brown to yellowish.

Head: Clypeus and frons with very dense, partly confluent punctation. Fronto-clypeal suture complete. Antennae thickened in both sexes. Female antennomeres 1 - 8 feebly thickened; antennomeres 9 - 10 forming a very indistinct club, slightly broader than the preceding segments. Male antennomeres (Fig. 39) very strongly thickened, antennomeres 3 - 8 gradually broadening; antennomere 10 extremely and antennomere 9 very broad, both segments round and explanate, dorsally distinctly convex and ventrally slightly concave, ventral surface with clusters of very long setae; antennomere 11 approximately as broad as antennomere 3.

Thorax: Pronotum as broad as long (PL = 0.44 - 0.55 mm, PW = 0.46 - 0.56 mm, PW/PL = 0.99 - 1.07), widest at about posterior 0.4; sides slightly convex or straight in posterior half, sometimes slightly emarginate at base. Discal surface with rather fine, dense, usually partly effaced punctation; interstices smooth and glabrous. Median longitudinal sulcus moderately narrow, extending to anterior 0.2 - 0.1.

Elytra elongate, subparallel (EL = 0.83 - 1.06 mm, EW = 0.53 - 0.67 mm, EW/EL = 0.61 - 0.66), about twice as long as and slightly broader than pronotum (PL/EL = 0.49 - 0.55, PW/EW = 0.78 - 0.88). Humeri rounded or slightly gibbous. Disc with sparse micro-punctation; interstices usually with only few transverse wrinkles, almost smooth, glabrous. Striae often somewhat obtuse, stria 1 and 2 usually slightly impressed in anterior part; strial punctures moderately large and deep. Carinae on interval 5 and 7 moderately strong; intervals 1 - 4 and 6 flat to feebly convex, especially the inner ones at base.

Metasternal disc narrow, feebly convex, postero-laterally with dense punctation, posterior angles more coarsely, almost rugosely punctate; interstices smooth and glabrous. Admedian carinae very prominent. Median longitudinal suture distinct in posterior 0.6, slightly finer but more impressed before posterior margin in males. Posterior margin next to each metacoxal opening with a small tubercle in females and a conspicuous, spine-like, medio-anteriad oriented tubercle in males.

Legs: Moderately long (MTL = 0.28 - 0.31 mm, MTL/L = 0.20 - 0.23). All femora and tibiae very distinctly thickened in males. Male protibia very indistinctly dilated, with scraping setae transformed; the dilatation ending at distal 0.1, with a group of ca. 10 stout, tightly clustered setae. Male protarsi (Fig 95) club-shaped; tarsomeres 1 - 4 very thick and compact, tarsomere 5 very conspicuously dilated, concavely excavate mesally, the excavation bordered ventrally and dorsally by a sinuous carina; all tarsomeres with long, rather numerous setae. Male mesotibia (Fig. 96) not distinctly dilated, meso-distally with ca. 7 stout and large, sparsely arranged scraping setae. Male metatibia distally with

a mesial carina-like dilatation; the tuft of cleaning hairs very prominent, the hairs conspicuously prolonged, up to 0.7 times as long as metatibia. Male metatarsi distinctly thickened; tarsomeres 1 - 4 with ca. 10 - 20 extremely long setae (up to 3 - 4 times as long as the segment), tarsomere 5 with about 5 - 10 long setae.

Abdomen: Ventrite 1 between admedian carinae approximately as densely and as coarsely punctate as the posterior angles of metasternum, posterior margin often smooth; ventrites 2 - 5 discally at most with superficial, almost effaced punctation; interstices smooth and glabrous.

Apex of male sternite VIII acuminate; with a small apical fovea and two groups of long adfoveal setae. Apex of male tergite VIII truncate.

Apex of female sternite VIII (Fig. 78) acuminate; with a group of long setae, apical fovea absent. Apex of female tergite VIII rather evenly rounded.

Male genitalia: Aedeagus (Fig. 38) ca. 560 µm long, well sclerotized. Median lobe slender, subparallel in basal 0.6, then tapering towards strongly ventrad curved apex; basal apophyses long and broad. Endophallus apically with indistinct sclerotizations. Parameres almost straight; apices curved ventrad, with very numerous (ca. 50) long preapical setae.

Differential diagnosis: Phylogenetically, *A. jaechi* is undoubtedly a most isolated species. Externally, it differs readily from all New Guinea species except *A. virilis* by its comparatively broad pronotum and elongate elytra. However, *A. virilis* is easily distinguished, among other characters, by its more shiny appearance, by the more shallowly punctate pronotal disc, by the finer elytral strial punctures, by the slender antennae, by the absence of metasternal admedian tubercles, by the usually dark brown to black colour, as well as by the differently shaped legs in males.

Distribution and habitat: So far known only from Ceram and Ambon (Central Moluccas). It was collected at elevations between 300 m and 900 m a.s.l.

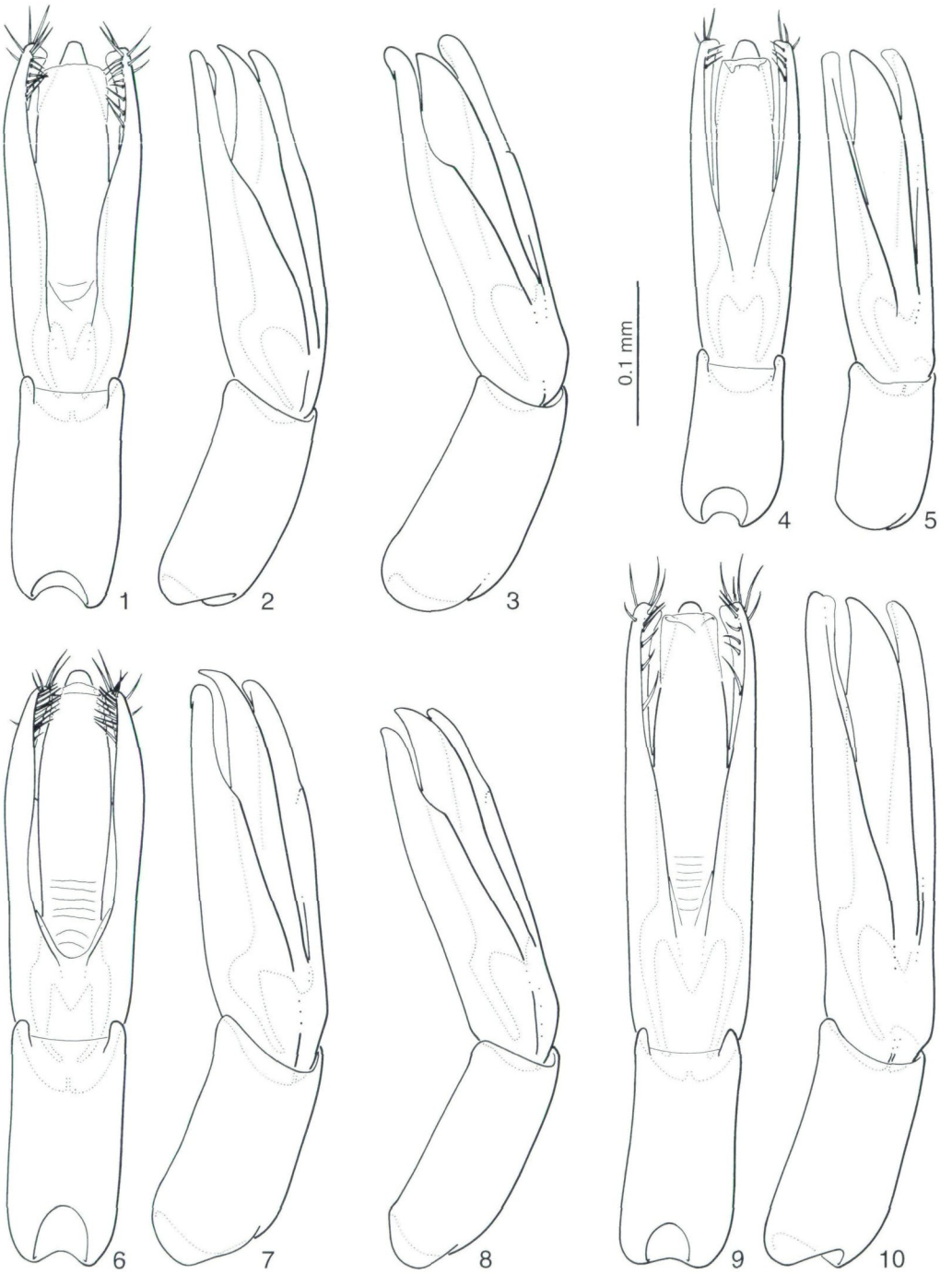
Etymology: Named after Dr. Manfred A. Jäch (Vienna), a leading water beetle specialist and inspired collector, without whose support this revision could not have been carried out.

Species incertae sedis

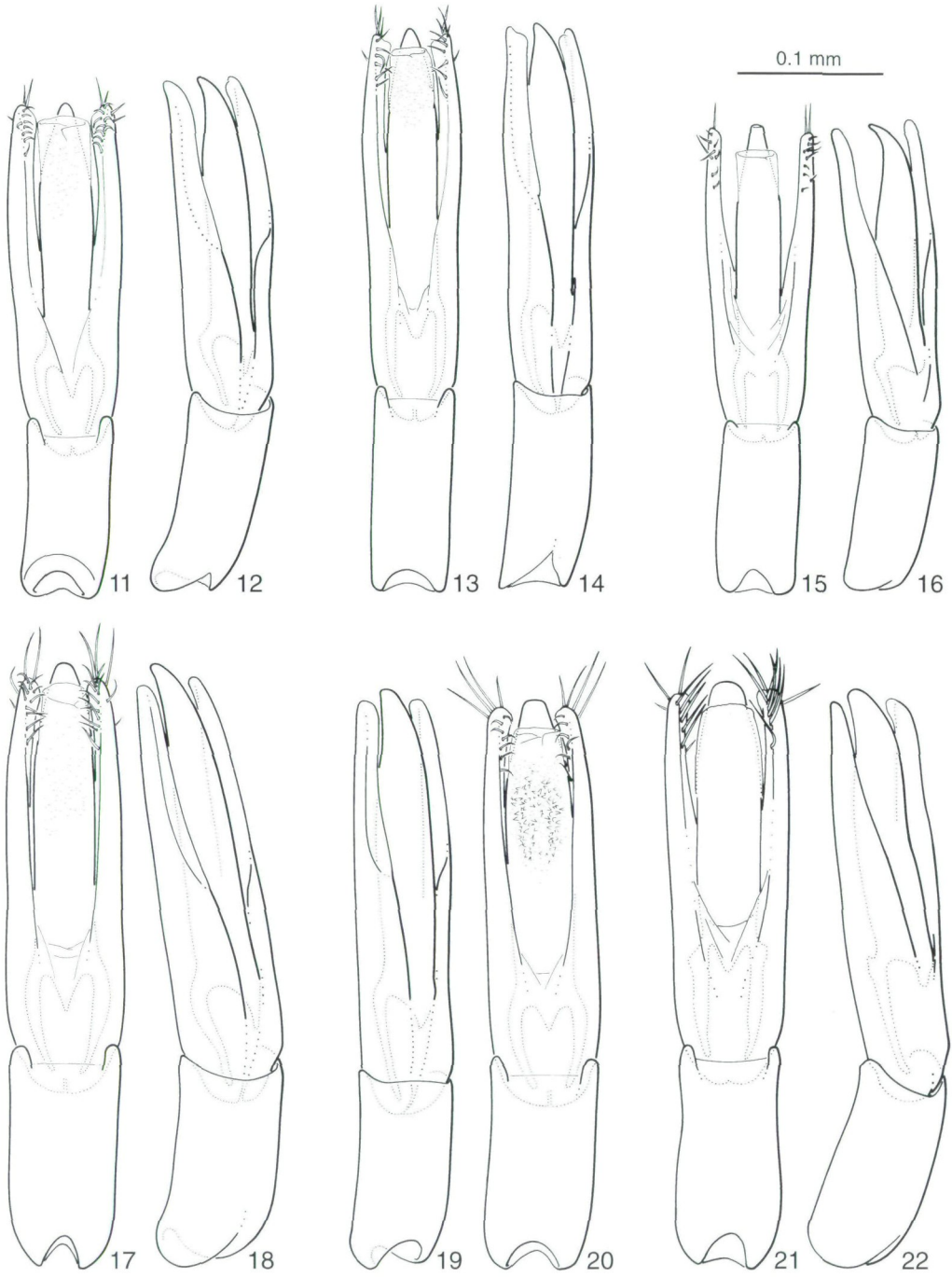
Austrolimnius sp. 1

Material examined (NMW, BML): 3 ♀♀, "NEW GUINEA: E. Highlands Dist., Waisa, nr. Okapa, c. 5,000 ft., 15.ii.1965 // M.E. Bacchus., B.M. 1965-120 // Stn. No. 192a".

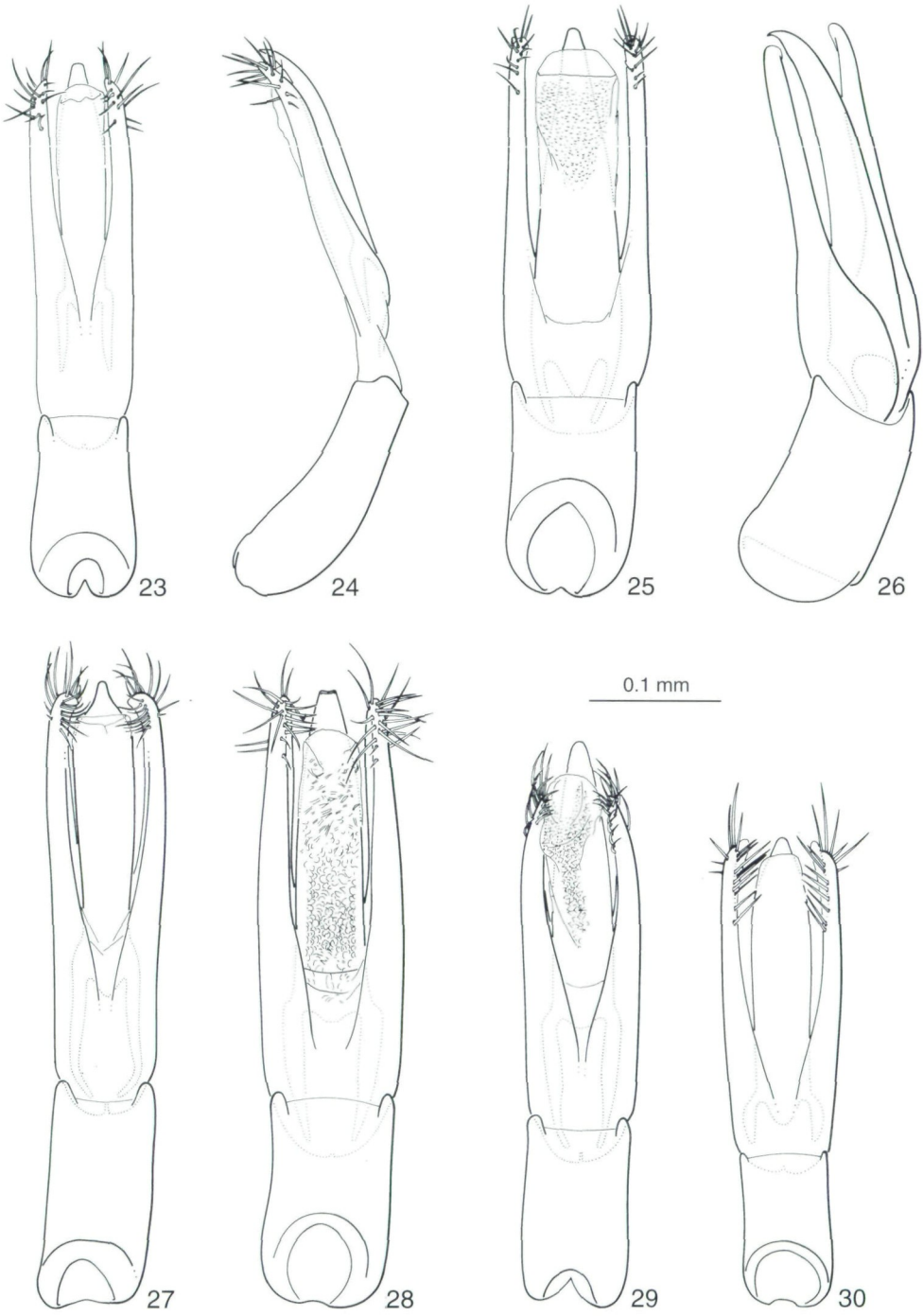
These females (from south-eastern Papua) are characterised by a conspicuously constricted elytral base. Body large (L = 1.75 mm; only the specimen deposited in the NMW measured), colouration dark brown, antennae, legs and mouthparts pale brown (elytra also pale in one, probably teneral specimen); clypeus with dense, frons with rugose coarse punctation; pronotal, elytral and abdominal disc at most with superficial, more or less effaced punctation, smooth and glabrous; pronotum as broad as long (PL = 0.62 mm, PW = 0.61 mm, PW/PL = 0.98), sides moderately convex; elytra rather elongate (EL = 1.13 mm, EW = 0.74 mm, EW/EL = 0.74), less than twice as long as and



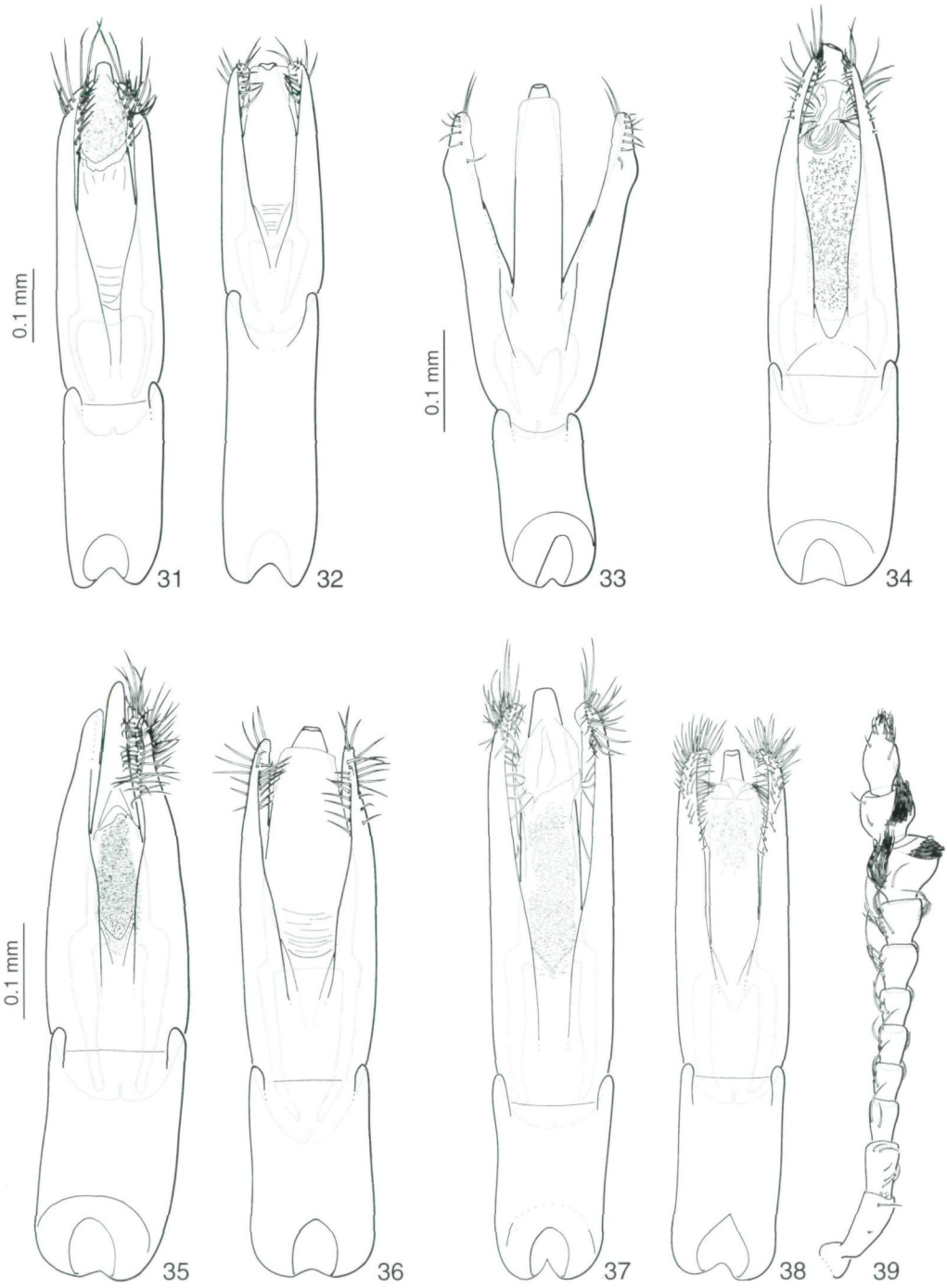
Figs. 1 - 10: Aedeagi in (1, 4, 6, 9) ventral and (2, 3, 5, 7, 8, 10) dorso-lateral aspect of (1, 2) *Austrolimnius apicarinatus*, (3) *A. exilis*, (4, 5) *A. hilum*, (6, 7) *A. similis*, (8) *A. pictus*, (9, 10) *A. hercules*. Ventral sac and setae omitted in all figures showing dorso-lateral aspect.



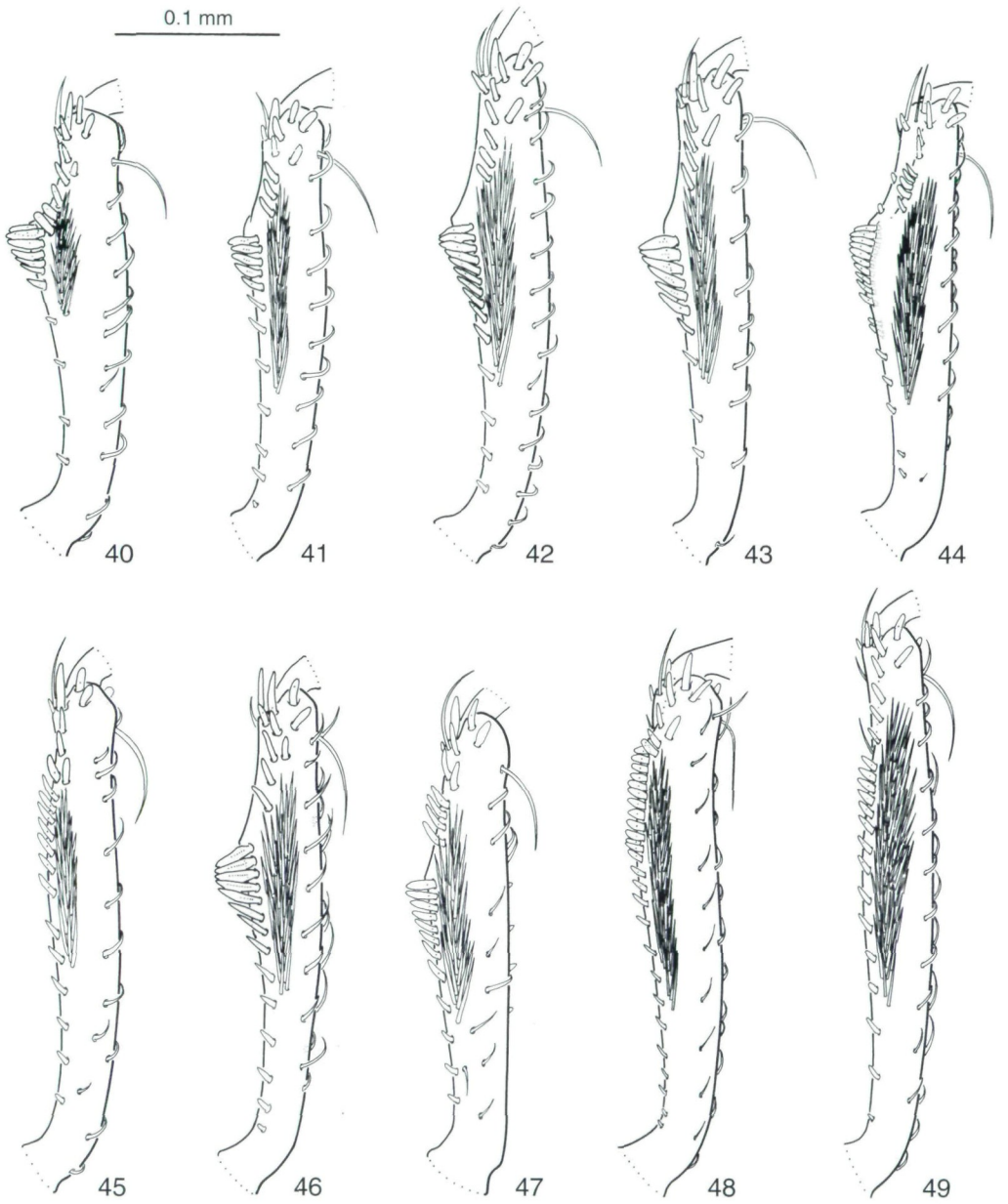
Figs. 11 - 22: Aedeagi in (11, 13, 15, 17, 20, 21) ventral and (12, 14, 16, 18, 19, 22) dorso-lateral aspect of (11, 12) *Austrolimnius brevior*, (13, 14) *A. insinuatus*, (15, 16) *A. ekari*, (17, 18) *A. difficilis*, (19, 20) *A. difficilis*, specimens not included in the type series, (21, 22) *A. lacrimabilis*. Ventral sac and setae omitted in all figures showing dorso-lateral aspect.



Figs. 23 - 30: Aedeagi in (23, 25, 27, 28 - 30) ventral, (24) lateral, and (26) dorso-lateral aspect of (23, 24) *Austrolimnius dudgeoni*, (25) *A. balkei*, (26) same, ventral sac and setae omitted, (27) *A. weylandensis*, (28) *A. solitarius*, (29) *A. speculifer*, (30) *A. ramuensis*.

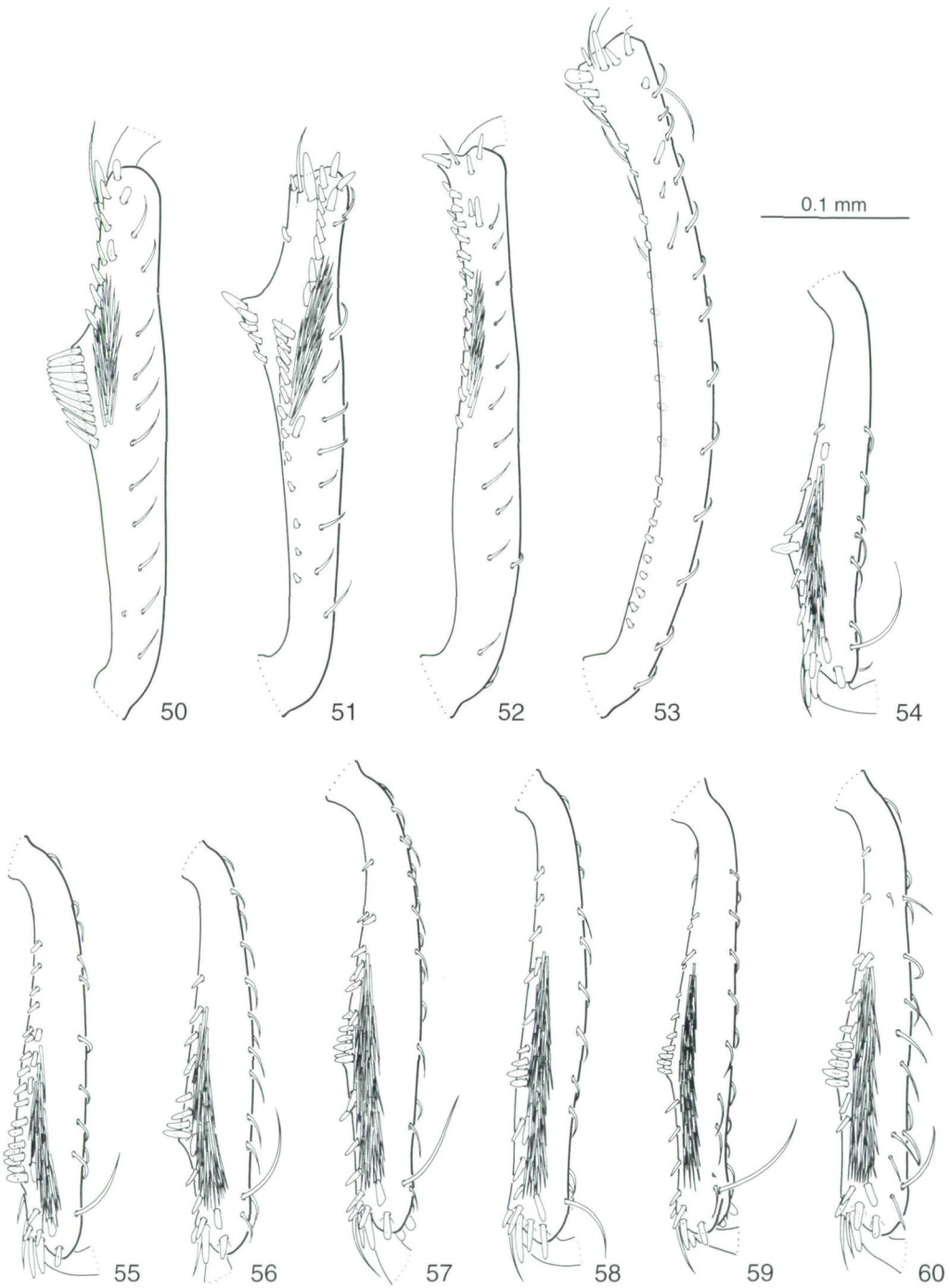


Figs. 31 - 39: (31 - 38) Aedeagi, ventral aspect of (31) *Austrolimnius gurakor*, (32) *A. virilis*, (33) *A. seductor*, (34) *A. ullrichi*, (35) *A. bispina*, setae on left paramere omitted, (36) *A. dentibialis*, (37) *A. foveatus*, (38) *A. jaechi*; (39) *Austrolimnius jaechi*, male antenna, ventral aspect.

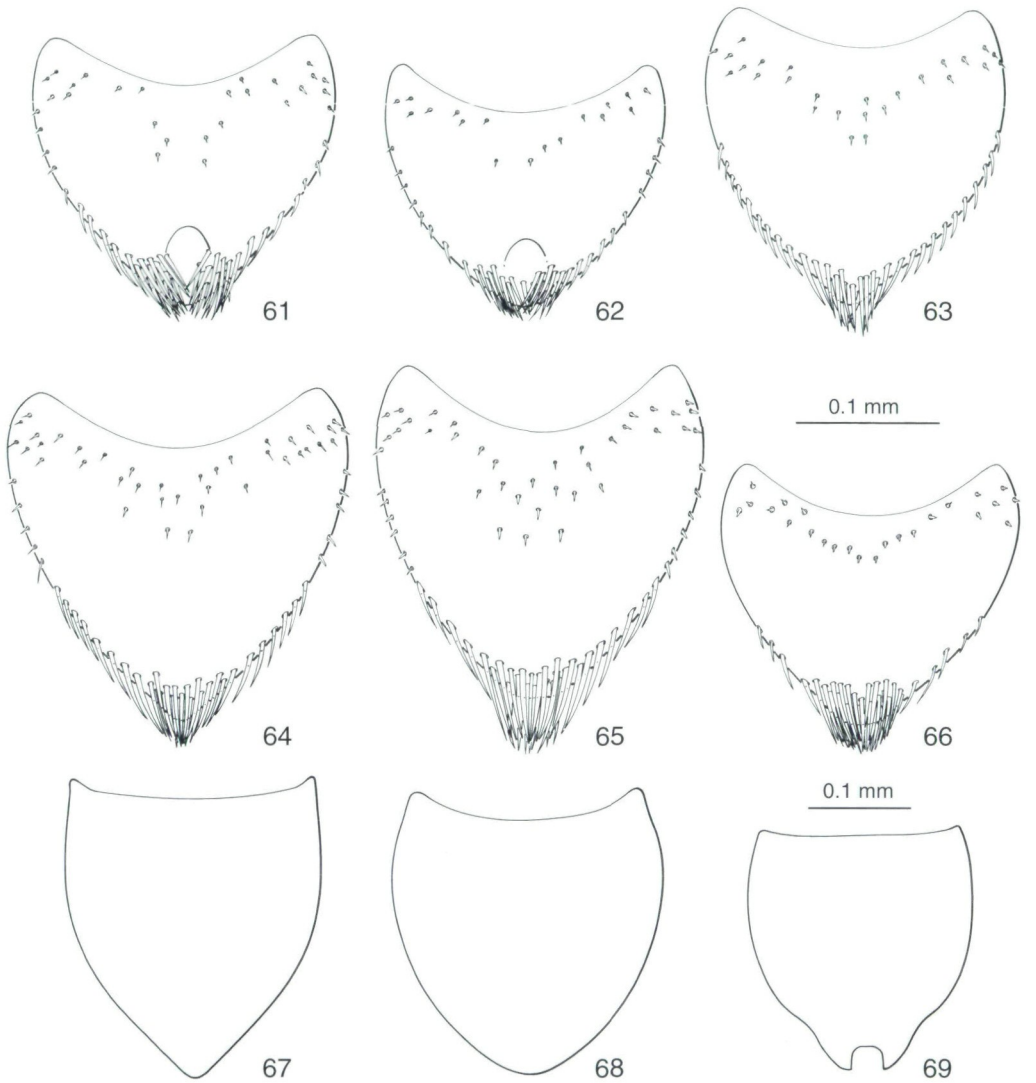


Figs. 40 - 49: Protibia, cranial aspect: (40) *Austrolimnius exilis*, male, (41) *A. similis*, male, (42) *A. apicarinatus*, male, (43) *A. pictus*, male, (44) *A. difficilis*, male, (45) *A. exilis*, female, (46) *A. lacrimabilis*, male, (47) *A. dudgeoni*, male, (48) *A. weylandensis*, male, (49) *A. balkei*, male.

slightly broader than pronotum (PL/EL = 0.56, PW/EW = 0.83), slightly obovate, humeri completely rounded and constricted, thus pronotal base broader than elytral base; metasternal disc nearly flat, postero-laterally with rugose transverse wrinkles and some



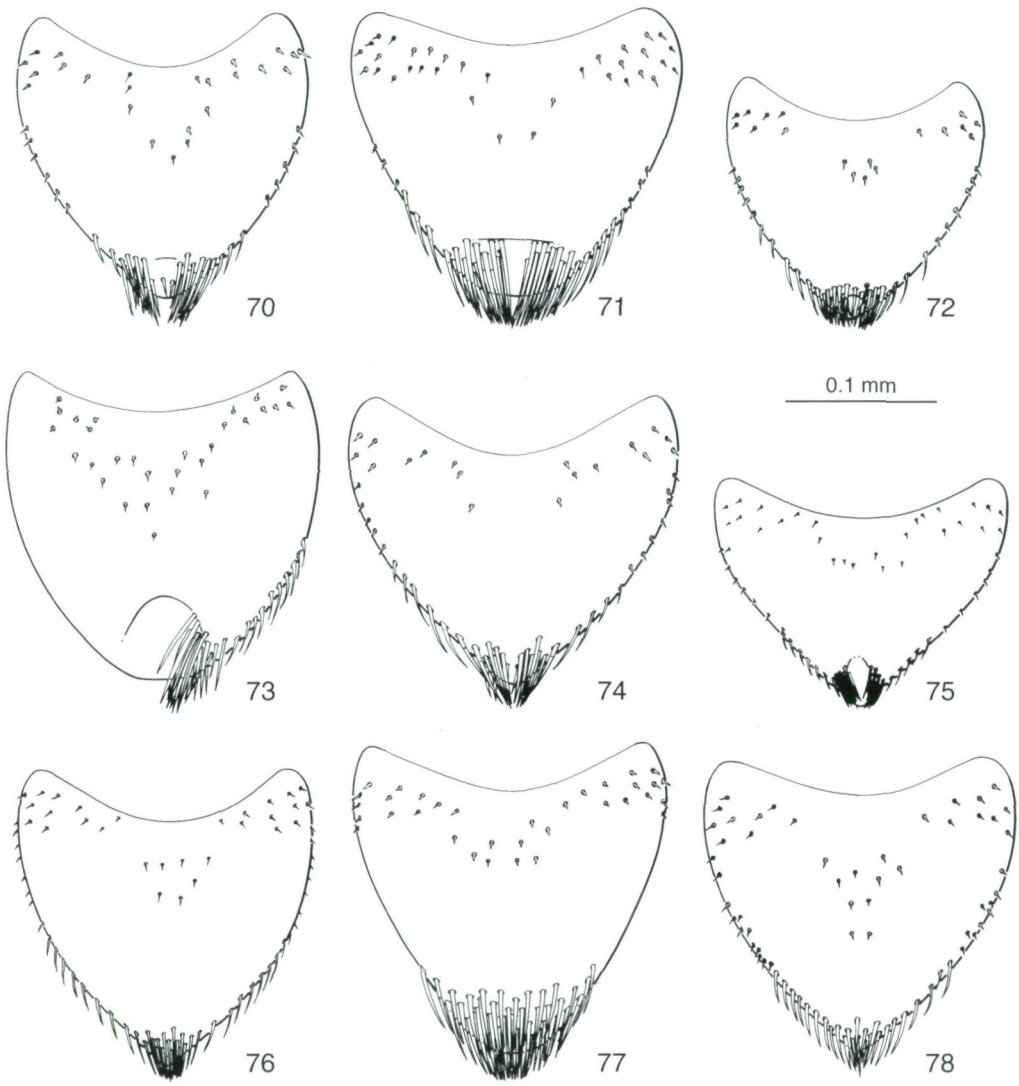
Figs. 50 - 60: Male protibia, cranial aspect: (50 - 53), male mesotibia, caudal aspect (54 - 60); (50) *Austrolimnius dentibialis*, (51) *A. bispina*, (52) *A. foveatus*, (53) *A. araneus*, (54) *A. dudgeoni*, (55) *A. exilis*, (56) *A. similis*, (57) *A. apicarinatus*, (58) *A. pictus*, (59) *A. difficilis*, (60) *A. lacrimabilis*.



Figs. 61 - 69: Female sternite VIII (61 - 66) and tergite VIII (67 - 69): (61) *Austrolimnius papuanus*, (62) *A. ramuensis*, (63) *A. brunneus*, (64) *A. schoelleri*, (65) *A.* ? *schoelleroides*, (66) *A. bispina*, (67) *A. schoelleri*, (68) *A.* ? *schoelleroides*, (69) *A. bispina*. Long scale = Figs. 61 - 66, short scale = Figs. 67 - 69. Setae omitted in Figs. 67 - 69.

punctures, interstices smooth and glabrous; legs moderately short (MTL = 0.36 mm, MTL/L = 0.20); sternite VIII with apex more or less truncate and slightly emarginate medially; apex of tergite VIII more or less rounded, with a large apical fovea and two groups of long adfoveal setae.

I refrain from the formal description of this species until males become available.



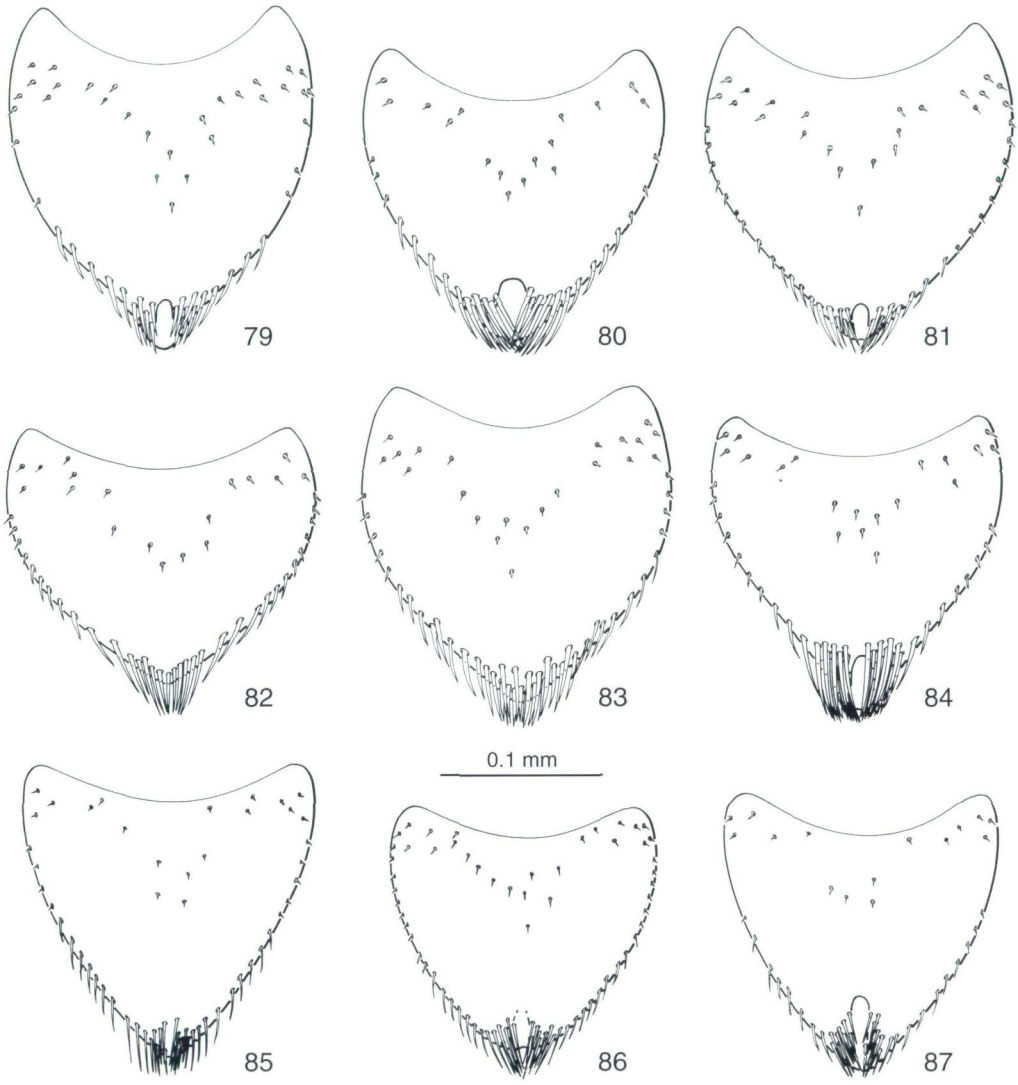
Figs. 70 - 78: Female sternite VIII: (70) *Austrolimnius balkei*, (71) *A. dentibialis*, (72) *A. dudgeoni*, (73) *A. foveatus*, setae on the left side omitted, (74) *A. seductor*, (75) *A. speculifer*, (76) *A. weylandensis*, (77) *A. ullrichi*, (78) *A. jaechi*.

Appendix: List of streams examined by David Dudgeon in Papua

This list was adapted from a draft sent by D. Dudgeon; only those streams are listed in which *Austrolimnius* was collected.

A. Streams draining the Toricelli Mountains

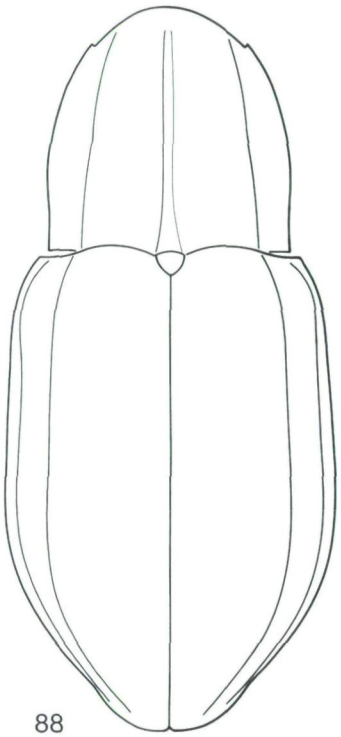
Kamasau River (3°47'S 143°50'E, 200 m a.s.l., gradient [= vertical change per distance] 0.042). Draining disturbed primary forest; channel 20 - 40 m wide, 10 - 50 cm



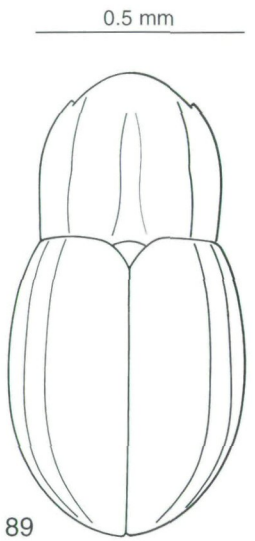
Figs. 79 - 87: Female sternite VIII: (79) *Austrolimnius exilis*, (80) *A. similis*, (81) *A. apicarinatus*, (82) *A. pictus*, (83) *A. virilis*, (84) *A. lacrimabilis*, (85) *A.* ? *difficilis*, type A, (86) *A.* ? *difficilis*, type B, (87) *A.* ? *difficilis*, type C.

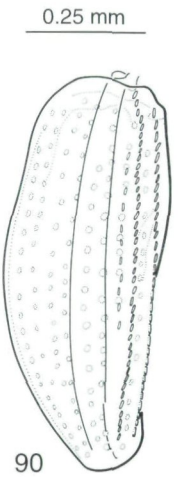
deep; only bankside partly shaded; in riffles moderately flowing (ca. 50 cm/sec). *Austrolimnius* species collected in the stream (ordered from the most to the least abundant): *A. exilis*, *A. similis*, *A. lacrimabilis*, *A. pictus*, *A. apicarinatus*, *A. dudgeoni*.

Saramandi Creek (4°01'S 144°02'E, 40 m a.s.l., gradient 0.011). Draining rubber and casava plantations; 1 - 1.5 m wide and 20 - 40 cm deep; slowly flowing (current speed ca. 20 cm/sec); partly shaded; substrate with scattered pebbles embedded in a sand matrix, with compact leaf-packs. *Austrolimnius apicarinatus*, *A. exilis*, *A. similis*, *A. pictus*, *A. seductor*.



Figs. 88 - 90: (88) *Austrolimnius gurakor*, habitus, (89) *A. hilum*, habitus, (90) *A. pictus*, right elytron, dorso-lateral aspect. Row of small granules between intervals 7 and 8, and crenulation of interval 8 and of lateral pronotal margin not shown in Figs. 88 and 89. Short scale = Figs. 88, 89, long scale = Fig. 90.





88 89 90

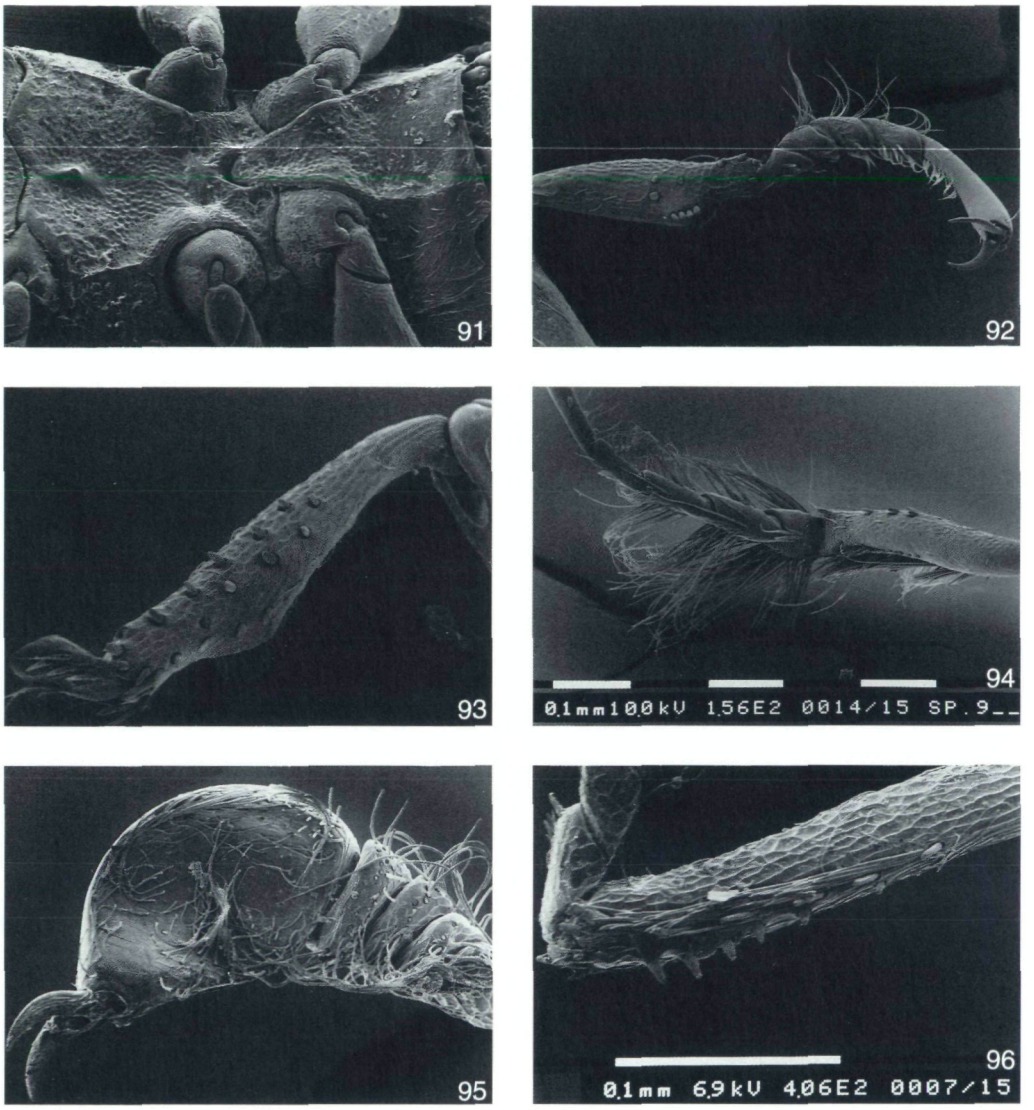
Kumbagora Stream (3°42'S 143°41'E, 320 m a.s.l., gradient 0.073). Draining a forest with shifting cultivation; 1.5 - 3 m wide and 10 - 40 cm deep; slowly flowing; heavily shaded; substrate with fossil corals embedded in a sand matrix, with rich decaying plant deposits. *Austrolimnius exilis*, *A. seductor*, *A. dudgeoni*, *A. pictus*, *A. similis*, *A. apicarinatus*, *A. lacrimabilis*, *A. solitarius* (the richest stream in terms of species).

Olpaip Creek (3°36'S 143°03'E, 200 m a.s.l., gradient 0.031). Draining a sago plantation; shallow, 2 - 2.5 m wide, 10 - 20 cm deep; slowly flowing; heavily shaded; substrate with coarse gravel, with sand patches and leaf packs. *Austrolimnius dudgeoni*, *A. exilis*, *A. pictus*, *A. apicarinatus*.

Maringjang Creek (3°42'S 143°14'E, 120 m a.s.l., gradient 0.014). Draining gardens, fringed by secondary riparian forest; shallow, 1 - 1.5 m wide, occupying only a part of the channel, less than 20 cm deep; slowly flowing (ca. 20 - 30 cm/sec in riffles); heavily shaded; substrate with coarse gravel embedded in sand matrix, with leaf packs. *Austrolimnius exilis*, *A. dudgeoni*, *A. pictus*, *A. lacrimabilis*.

Hohoma River (3°44'S 143°23'E, 160 m a.s.l., gradient 0.010). Draining gardens and secondary forest; 6 - 11 m wide and less than 40 cm deep (5 - 10 cm in runs); slowly flowing; almost unshaded; substrate with cobbles and coarse gravel. *Austrolimnius pictus*, *A. dudgeoni*, *A. exilis*, *A. hilum*.

Mindjim River (3°49'S 143°35'E, 80 m a.s.l., gradient 0.003). Draining secondary forest; 10 - 12 m wide and 25 - 40 cm deep; slowly flowing; little shaded; substrate with cobbles and coarse gravel embedded in sand matrix. *Austrolimnius A. pictus*, *A. exilis*, *A. dudgeoni*.



Figs. 91 - 96: (91) *Austrolimnius exilis*, male thorax, ventro-lateral aspect, (92) *A. virilis*, male protibia and protarsus, caudal aspect, (93) *A. virilis*, male mesotibia, cranial aspect, (94) *A. virilis*, male metatarsus and metatibia, dorsal aspect, (95) *A. jaechi*, male protarsus, mesal aspect, (96) *A. jaechi*, male mesotibia, caudal aspect.

B. Streams draining the Finisterre and Adelbert Ranges

Kojé Creek (5°33'S 145°23'E, 160 m a.s.l., gradient 0.012). Draining secondary forest and gardens; 1 - 2 m wide (channel ca. 5 m wide) and 10 - 25 cm deep; slowly to moderately flowing; unshaded; substrate with cobbles, gravel and fine sand, with small leaf packs. *Austrolimnius papuanus*, *A. exilis*, *A. pictus*, *A. ullrichi*. See DUDGEON (1990) for more information.

Maram Creek near Goam River (4°33'S 144°59'E, 80 m a.s.l., gradient 0.029). Draining rainforest; ca. 7 m wide, consisting of numerous pools separated by small runs and riffles, less than 5 cm deep in runs; in riffles moderately flowing; nearly fully shaded; substrate with cobbles of sedimentary rock and leaf packs. *Austrolimnius exilis*, *A. papuanus*, *A. apicarinatus*, *A. similis*. See DUDGEON (1990) for more information.

Hapia River (5°47'S 145°37'E, 200 m a.s.l., gradient 0.008). Draining savanna grassland with isolated trees; 8 - 20 m wide (channel 100 m wide), less than 10 cm deep in runs; in riffles moderately flowing; unshaded; substrate with cobbles embedded in compacted sand and leaf packs in runs. *Austrolimnius papuanus*.

C. Ramu River floodplain sites

Ofri Creek (5°43'S 145°22'E, 130 m a.s.l., gradient 0.008). Situated at the edge of the seasonally inundated region of the Ramu floodplain; 6 - 9 m wide and 20 - 60 cm deep; current speed uniform (30 cm/sec); rather shaded; substrate without gravel or rocks; with shifting sand, leaf packs and trailing vegetation. *Austrolimnius virilis*, *A. pictus*, *A. exilis*.

D. Streams draining the Central Highlands (northern slopes of the Bismarck Range)

Mom Creek (5°45'S 145°20'E, 170 m a.s.l., gradient 0.015). Situated just above the Ramu floodplain, draining secondary forest; shallow, ca. 3 m wide (channel 8 - 12 m wide), 10 - 20 cm deep; moderately flowing; little shaded; substrate with cobbles in coarse sand. *Austrolimnius ullrichi*, *A. papuanus*.

Stream G-99 (6°18'S 145°55'E, 1540 m a.s.l., gradient 0.038). Draining grassland; shallow, ca. 1 m wide, ca. 10 cm deep; water flow along boulders torrential (more than 50 cm/sec); unshaded. *Austrolimnius papuanus*, *A. araneus*, *A. ramuensis*.

Mambrangka River (6°19'S 145°52'E, 1550 m a.s.l., gradient 0.010). Draining grassland; ca 16 m wide and up to 60 cm deep; flow torrential; unshaded; with rocky bed. *Austrolimnius papuanus*, *A. araneus*.

Upper Ramu River (6°19'S 145°49'E, 1620 m a.s.l., gradient 0.008). Draining grassland and coffee gardens; up to 25 m wide, ca 30 cm deep in riffles; flow torrential (more than 1 m/sec) in riffles; unshaded; substrate with cobbles. *Austrolimnius papuanus*, *A. araneus*, *A. ramuensis*.

Coffee Stream (6°18'S 145°50'E, 1600 m a.s.l., gradient 0.019). Draining open woodland; less than 1 m wide and less than 20 cm deep; moderately flowing; half shaded; substrate with rocks and compacted sand with interpenetrating roots. *Austrolimnius papuanus*, *A. araneus*.

Ralph's Stream (6°16'S 145°22'E, 1600 m a.s.l., gradient 0.017). Draining grassland, with deeply incised, 8 m high banks; up to 3 m wide and less than 40 cm deep; in riffles moderately flowing; unshaded; with rocky-gravelly bed. *Austrolimnius papuanus*, *A. araneus*.

Stream G-104 (6°16'S 145°58'E, 1560 m a.s.l., gradient 0.186). Draining grassland; shallow, ca. 30 cm wide (channel 2 m wide), less than 10 cm deep; unshaded; substrate with gravel and coarse sand between large boulders. *Austrolimnius araneus*, *A. papuanus*, *A. dentibialis*.

Inonake Stream (5°40'S 144°42'E, 1320 m a.s.l., gradient 0.250). Draining forest and gardens; channel ca. 6 m wide, less than 35 cm deep; flow torrential; almost half shaded; substrate with cobbles, gravel and coarse sand in runs between large boulders. *Austrolimnius dentibialis*, *A. araneus*, *A. papuanus*.

Kil Stream (5°40'S 144°42'E, 1800 m a.s.l., gradient 0.270). Draining montane forest; ca. 6 m wide and less than 40 cm deep; flow moderate to torrential; deeply shaded; with rocky bed and gravel deposits in shallow runs. *Austrolimnius araneus*, *A. foveatus*.

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