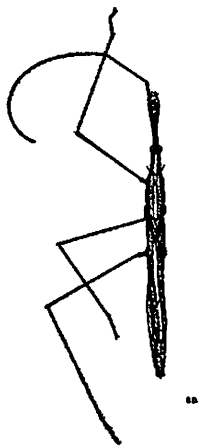
NUMBER 47, 67 pages 25 June 1997

BISHOP MUSEUM OCCASIONAL PAPERS

REVISION OF THE GENUS *HYDROMETRA* LATREILLE IN AUSTRALIA, MELANESIA, AND THE SOUTHWEST PACIFIC (HETEROPTERA: HYDROMETRIDAE)

JOHN T. POLHEMUS
AND
IVOR LANSBURY



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ISSN 0893-1348
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REVISION OF THE GENUS *HYDROMETRA* LATREILLE IN AUSTRALIA, MELANESIA AND THE SOUTHWEST PACIFIC (HETEROPTERA: HYDROMETRIDAE)

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ABSTRACT. A revision is presented of the water measurers in the genus *Hydrometra* occurring in Melanesia, including New Guinea and all nearby islands belonging to Irian Jaya (Indonesia) and Papua New Guinea, the Solomon Islands, Australia including Norfolk Island, New Caledonia, New Hebrides and New Zealand. A key to species is provided, followed by a taxonomic treatment and distribution of the species. The following new species are proposed: *H. claudie* J. Polhemus & Lansbury (P. & L.) from Australia (Queensland), *H. darwiniana* P. & L. from Australia (Northern Territory, Western Australia), *H. eioana* P. & L. from Papua New Guinea, *H. jourama* P. & L. from Australia (Queensland), *H. kiunga* P. & L. from Papua New Guinea and Irian Jaya, and *H. novaehollandiae* P. & L. from Australia (New South Wales). New synonymies: *H. strigosa* (Skuse) 1893 = *H. risbeci* Hungerford 1938; *H. feta* Hale 1925 = *H. illingworthi* Hungerford & Evans 1934; *H. horvathi* Hungerford & Evans 1934 = *H. becki* Drake 1951; *H. papuana* Kirkaldy 1901 = *H. hoplogastra* Hale 1925.

INTRODUCTION

The last revisions dealing with the *Hydrometra* of the Australasian Region were undertaken by Lundblad (1933) and Hungerford and Evans (1934). Since then a number of additional new species have been discovered and the distributions of others extended. The *H. longicapitis* group was recently revised by Andersen (1992) who added 1 new species from Thailand. All known species are redescribed here, with synonymy and distribution data given for all species occurring in Melanesia, including New Guinea and all nearby islands belonging to Irian Jaya (Indonesia) and Papua New Guinea, the Solomon Islands, Australia including Norfolk Island and Tasmania, New Caledonia, New Hebrides and New Zealand. A complementary revision was recently published by J. Polhemus and D. Polhemus (1995b) revising the *Hydrometra* fauna occurring in Indochina, the western Malay Archipelago, and the Philippines. The faunas of Melanesia and Southeast Asia are mainly separate, although the distributions of 4 species, *H. lineata* Eschscholtz, *H. mindoroensis* Polhemus, *H. orientalis* Lundblad and *H. papuana* Kirkaldy, overlap into both. A final contribution to this series will present a cladistic and zoogeographical analysis of both regional faunas.

METHODS

The geographical scope of this monograph includes 3 large, faunally similar regions: Melanesia; Australia; and New Caledonia, New Hebrides and New Zealand. Melanesia is defined as the island of New Guinea, its satellite islands lying on the Australian continental shelf, and the archipelagos to the east (mostly belonging to Papua New Guinea and the Solomon Islands), which comprise a faunally distinctive region. Australia includes Norfolk Island and Tasmania. New Caledonia, New Hebrides and New Zealand are included because they share species with Australia. The distributions of species are plotted on maps (Figs. 148–56); each marking (circle, square, or diamond) may represent more than 1 collection locality.

Much of the material upon which this revision is based was collected by J.T. and D.A. Polhemus during a series of expeditions to the Malay Archipelago supported by the National Geographic Society and the National Science Foundation. This material is held in the J.T. Polhemus collection, Englewood, Colorado, and the Bishop Museum, Honolulu, Hawaii, the latter also holding collections made by other workers. Significant additional material was available from collections made by Ivor Lansbury, and from the Natural History Museum, London, the Australian National Collection, Canberra, and the Australian Museum, Sydney. Acronyms for these and other collections consulted in the course of this research are given in the acknowledgments. The CL numbers following localities in the material examined sections refer to a coding system used to cross reference collecting sites and ecological data in journal books maintained with the Polhemus collection. All measurements are given in mm.

MORPHOLOGY

A review of the morphology of the Hydrometridae was given by J. Polhemus and D. Polhemus (1995b), thus only the essential elements are given here.

Head: A definitive study of the heteropteran head capsule was provided by Parsons (1962). Her study included a well supported definition of homologies and terms that are accepted here, and illustrated in Fig. 2. The long slender head is characteristic of the family and an apomorphy for the genera most closely related to *Hydrometra* (see Andersen 1982: 126–27). The anteclypeus (clypeus of authors) is quite variable in shape, from conical to transverse and truncate, but the shape is quite constant for a given species and often very useful in distinguishing species and species groups (Figs. 3, 6, 13, 30). The structure identified by Ekblom (1926; 120, Fig. 155, as lamina maxillaris) and Andersen (1982: 110, Fig. 174) as the maxillary plate is actually the mandibular plate (= lorum of Sprague 1956: 583, Fig. 7; see discussion, p.586). Anteroventral to the mandibular plate and separated from it by the genal suture is the maxillary plate which is variably sclerotized, quite variable in the degree of development (Figs. 2, 53, 73) and very useful in species differentiation. The maxillary plate is useful in separating species in some groups. Adjoining the maxillary plate anteroventrally is the gular lobe (= buccala of Sprague, ventral lobe of Andersen). The gular lobe is variable among the species of *Hydrometra*, sometimes useful in species separation, but apparently does not define groups. The labium, or beak, is very long and slender, usually reaching at least to the eyes, and its length is sometimes useful in separating species.

Thorax: The morphological terminology of the thorax is relatively stable and not controversial. A number of thoracic features are useful in classification. Among these are: punctation of the pronotal dorsum and pleura; complement of acetabular pits (which often vary by plus or minus 1 on each acetabulum); presence or absence of a longitudinal pruinose dorsal or lateral stripes; relative distances between acetabulae. The mesothoracic wings or hemelytra vary somewhat in length according to species, and the length of the micropterous wing pads are sometimes species diagnostic. Most species have a wing morph that is prevalent, and usually another that is at least occasional, but in most species only 2 morphs are found, 1 of them macropterous. The morphs recognized in this work are micropterous (tiny wing pads), brachypterous (slender straps reaching onto the base of the abdomen), and macropterous (broad, fully developed, reaching at least the middle of the abdomen, with metathoracic wings in addition to the hemelytra); all 3 morphs been found only in *H. halei*. The nature of the light colored longitudinal markings (stripe) on the hemelytra is constant within species and useful for separating closely related forms; in some species it is continuous (except for veins), whereas in others it has definite gaps, the number and width of which are also constant for a given species.

Pregenital Abdomen: The first abdominal segment is clearly present as tergite I in a few species of *Hydrometra*, particularly those possessing other plesiomorphic characters, but is usually fused with tergite II, and never visible ventrally. The fused tergites I and II, possessed by most species, were interpreted as tergite I by Hungerford and Evans (1934), thus they gave the last pregenital segment as VI instead of VII. Sometimes the first and second tergites are separated by a faint line, but in many species there is none. The division between tergites I and II is demarcated by 2 (1+1) lateral depressions whether or not any vestige of the transverse suture remains.

The mediotergites are narrow and the width to length ratio is useful in separating some closely allied species. The laterotergites (connexiva in our descriptions, paratergites of authors) are usually monotonous in structure, however the pruinose pattern is helpful at the species level. Each abdominal sternite bears a pair of widely separated, ventrally directed trichobothria or trichobothria-like setae, which are variable in development among the species studied and much longer and more prominent in males than in females.

The male sixth sternite of some species bears mammilose processes or tufts of setae near the posterior margin, but spinose processes are not yet known. The seventh sternite, on the other hand, exhibits a large variety of modifications including distinctive patterns of setiferation, spine-like setae arranged in transverse rows, clumps or tufts resembling stout spines, and large mammilose structures. These are very useful at the species level and occasionally at the species group level. Structures noted as spines in the key and text are actually small, tightly packed clusters of black setae, appearing as black spines, and referred to as such for the sake of brevity.

Genital segments: The male genital segments offer a wealth of characters at the species level, and occasionally in separating species groups. The eighth (first genital) sternite exhibits almost the variety of modifications given for sternite VII, which are very useful for species discrimination. The ninth segment (pygophore) may or may not be expanded posterodorsally into lateral flanges, a species specific character. The shape of the eighth female sternite is also a useful species character.

MEASUREMENTS

Measurements: Measurements defined below are intended to avoid the effects of pterygomorphism, and permit standardized measurements to be made whether or not all wing morphs are available. Where the measurements or terminology differ from that used by Hungerford and Evans (1934), the last revisors of *Hydrometra*, they are noted.

Head: The anteocular part is abbreviated as AO and the postocular part as PO, and both are measured from the closest eye margin, AO to the tip of the anteclypeus, PO to the anterior margin of the pronotum (Fig. 2).

Thorax: The pronotum is measured on the dorsal midline. The remainder of the thorax is measured from the posterior margin of the pronotum to the posterior margin of the metathoracic acetabula. The width of the insect is measured just behind the curvature of the anterior acetabula. Hungerford and Evans (1934) did not state their method of measurement, but apparently the metanotum length (remainder of the thorax above) was measured from the posterior margin of the pronotum to the anterior margin of the abdomen on the dorsal midline, meaning that the wing straps of brachypters must be moved aside, and in macropters the hemelytra must be removed to see this feature.

Abdomen: The abdomen is measured in lateral view, with length defined as the distance from the posterior margin of the metathoracic acetabula to the apex of segment VIII. The dorsal anterior margin of tergite I is actually anterior to this, but hidden in alate specimens, thus the measurement used will normalize the relative length for all morphs. Either method of measurement provides the same information content for species discrimination, which is its primary purpose.

SYSTEMATICS

KEY TO THE HYDROMETRA OF AUSTRALIA, MELANESIA, AND THE SOUTHWEST PACIFIC

Notes: This key is primarily applicable to males. Structures noted as spines in the key are actually small, tightly packed clusters of black setae, appearing as black spines, and referred to as such for the sake of brevity.

1. Clypeus angulate, conical, or narrow, narrowly to broadly rounded anteriorly (Figs. 6, 30, 89) 9
–. Clypeus broad, truncate, sometimes medially concave (Figs. 3, 13, 34) 2
2. Male sternite VII with a pair of prominent pad-like lateral projections covered with stiff black hairs (Figs. 5, 114). Female tergite VIII without a prominent distal process (Fig. 117) ..... ***papuana*** Kirkaldy
–. Male sternite VII without a pair of prominent pad-like lateral projections covered with stiff black hairs. Female tergite VIII with a prominent distal process 3
3. Male sternite VI with a prominent pair of blunt processes on either side of the ventral midline adjacent to the posterior margin 4
–. Male sternite VI without a prominent pair of blunt processes on either side of the ventral midline adjacent to the posterior margin. 5
4. Male sternite VIII with 2 (1+1) small short black spines (Fig. 44) ..... ***feta*** Hale
–. Male sternite VIII with 2 (1+1) elongate clusters of black setae on either side of the ventral midline (Fig. 19) ..... ***claudie*** n. sp.

5. Male sternite VIII essentially smooth, with 2 (1+1) small barely visible clusters of very short golden setae on either side of ventral midline (Fig. 63). . . . . ***jourama*** n. sp.
–. Male sternite VIII with either 2 (1+1) prominent stout spines or 2 prominent clusters of short stout brown or golden setae 6
6. Male sternite VIII with 2 (1+1) prominent stout spines 7
–. Male sternite VIII with 2 (1+1) clusters of short stout setae. 8
7. Head ventrally densely set with setae along entire length, short over most of head, much longer anteriorly. Lateral margins of male sternite VI densely clothed with semi-erect setae. Male sternites V, VI medially set with medium length semi-recumbent or adpressed golden setae. Male sternite VII hirsute anterolaterally; spines on sternite VIII small, slender, located approximately midway along segment (length measured along ventral midline) close to ventral midline (Fig. 51). . . . . ***halei*** Hungerford & Evans
–. Head ventrally fringed with short setae medially and a few long setae anteriorly. Lateral margins of male sternite VI not densely clothed with semi-erect setae. Male sternites V, VI with long soft golden setae, most erect but some adpressed; sternite VII not hirsute; spines on sternite VIII larger, on anterior 1/3–1/2 of segment far from ventral midline (Fig. 56) . . . . . ***horvathi*** Hungerford & Evans
8. Male sternite VIII with 2 tightly packed clusters each of about ten stout brown setae on either side of the ventral midline (Fig. 68). All abdominal sternites pilose, setae increasing in length and density to sternite VI. Female sternite VII distally truncate (Fig. 70) . . . . . ***kiunga*** n. sp.
–. Male sternite VIII with 2 crescent-shaped groups of short slender golden setae on either side of the ventral midline about midway along segment, easily visible only in oblique light (Fig. 36). Sternites V, VI uniformly sparsely pilose. Female sternite VII distally acuminate medially (Fig. 40) . . . . . ***eioana*** n. sp.
9. Male sternite VII with a broad transverse sulcus, deepest medially; anterior and posterior margins densely pilose, posterior margin declivant (Fig. 28); anterior 1/2 of sternite VI with scattered long setae, distal 1/2 moderately to densely pilose, less so medially (Figs. 21, 22) . . . . . ***darwiniana*** n. sp.
–. Male sternite VII without a broad transverse sulcus (*lineata* rarely with a transverse sulcus, not deepest medially; Fig. 77); anterior and posterior margins not densely pilose, posterior margin not declivant (Fig. 93); sternites VI, VII variably pilose 10
10. Terminal process of abdominal segment VIII prominently produced, large in both sexes (Figs. 90, 93); male sternite VII without prominent proximal hook-like processes (Fig. 94) 11
–. Terminal process of abdominal segment VIII not prominently produced, small in both sexes (Figs. 7, 8); male sternite VII with 2 (1+1) prominent proximal hook-like processes (Fig. 10) . . . . . ***aculeata*** Montrouzier
11. Male sternite VII usually with 2 prominent proximal peg fields (weak in some specimens of); not distinctly flattened medially. Macropterous female without white median stripe on hemelytra 12
– Male sternite VII smooth, hirsute, but without prominent proximal peg fields; distinctly flattened medially. Macropterous female with bright white median stripe on hemelytra 14
12. Clypeus may or may not project anteriorly, or be distinctly excavate beneath. Macropterous or micropterous; wing pads of latter either barely visible, or reaching almost halfway to abdomen. Male sternite VII proximally with 2 (1+1)

groups of stout setae; distally with 2 (1+1) peg fields on either side of ventral midline; not pilose ventrally; abdominal segment VIII (first genital) not pilose ventrally 13

–. Clypeus not projecting anteriorly, not distinctly excavate beneath. Micropterous, wing pads short to barely visible, not reaching 1/4 of distance to abdomen. Male sternite VII proximally with 2 (1+1) groups of very small peg fields, sometimes weakly developed, thus appearing as raised brown patches, not set on tumescences; distally without fields of pegs or stiff dark setae on either side of ventral midline; pilose ventrally; segment VIII proximally pilose ventrally, not tumid (Fig. 102) ..... ***novaehollandiae*** n. sp.

13. Clypeus projecting anteriorly, distinctly excavate beneath. Macropterous or micropterous; wing pads of latter reaching almost halfway to abdomen. Male sternite VII proximally with 2 (1+1) groups of stout setae superficially resembling spines, each set on a weak tumescence; distally with 2 (1+1) small fields of peg, or very short setae on either side of ventral midline (Figs. 104, 106). Male abdominal segment VIII (first genital) anteriorly tumid, ventral margin weakly convex in lateral view; not pilose basally ..... ***strigosa*** (Skuse)

–. Clypeus not projecting anteriorly, not distinctly excavate beneath (Fig. 80). Macropterous or micropterous; wing pads of latter barely visible. Male sternite VII proximally with 2 (1+1) elongate groups of stout setae each set on a raised, almost mammilose tumescence; distally with 2 (1+1) large elongate fields of dark posterolaterally directed setae on either side of ventral midline (Fig. 94). Male abdominal segment VIII (first genital) not anteriorly tumid, ventral margin almost straight in lateral view; pilose basally, particularly laterally, best seen in dorsal view ..... ***mindoroensis*** Polhemus

14. Maxillary plate extending anteriorly to apex of anteclypeus. Anteclypeus obtusely angled to broadly rounded anteriorly (Fig. 76). Male sternite VII essentially bare medially on caudal half, pilose laterally, usually with numerous closely set long brown setae forming 2 distinct divergent brushes, 1 on each side of midline, best seen in posterior view; abdominal segment VIII flared posteriorly in dorsal view; lateral wings of segment IX spinose (Figs. 77, 78). Median stripe on hemelytra bright white including in females, usually continuous except narrowly interrupted at cross veins (Fig. 1). Female connexiva convergent, acuminate distally (Fig. 79) ..... ***lineata*** Eschscholtz

–. Maxillary plate not extending anteriorly to apex of anteclypeus. Anteclypeus sharply triangular to obtusely angled anteriorly (Fig. 85). Male sternite VII pilose medially and laterally on caudal 1/2, but without 2 distinct divergent brushes; abdominal segment VIII with straight lateral margins in dorsal view, or nearly so; lateral wings of segment IX moderately developed, not spinose (Figs. 86, 87). Median stripe on hemelytra sordid to bright white, usually weak or effaced in females, with 2 to 4 wide gaps, at least 2 near cross veins (Fig. 74). Female connexiva parallel, truncate distally (Fig. 109) ..... ***orientalis*** Lundblad

Hydrometra aculeata Montrouzier Figs. 6–12, 118–19, 148

Hydrometra aculeata Montrouzier, P., 1864. *In* Perroud, B.-P., Mélanges Entomologiques, Part 4, F. Savy, Paris, pp 195–96. Lectotype, female, designated here, Kanala (= New Caledonia), Inst. R. Sci. Nat. Belgique, Brussels. (Description repeated in Perroud, B.-P. & P. Montrouzier, 1864, Ann. Soc. Linnéene Lyon (n. s.) 11: 240–241).

Description

MICROPTEROUS MALE. Length 7.98–9.04, width 0.38–0.58.

Color. Ground color brown; abdominal tergites brown, shining, faintly rastrate except VII clothed with fine pubescence, VIII mat and clothed with fine pubescence except shining posterior wedge. Head tinged with blackish dorsally, slightly lighter basally and anteriorly, lighter ventrally, yellowish beneath anterior margin, very lightly frosted ventrally and on narrow median longitudinal yellowish brown stripe dorsally behind eyes. Thorax dorsally with narrow median longitudinal frosted stripe, pronotum laterally with broad frosted longitudinal stripe, continuing along remainder of thorax and abdomen laterally (and on connexiva) onto segment VIII, visible in oblique light. Broad irregular longitudinal regions on upper part of thoracic pleura, venter of thorax and abdomen, all connexiva except narrow margins, light brown. Legs light brown to brown, darker distally, antennae brown to piceous; coxae, trochanters mostly light brown, similar to bases of femora.

Structure. Head relatively short (2.71), widest at antennal tubercles (0.36); set with many bristly setae beneath; gular lobe large, truncate; rostrum reaching well caudad of eyes, almost to pronotum (5/6); ratio anteocular/postocular portions: 1.67/0.82; interocular space/width of an eye: 0.10/0.13; anteclypeus almost parallel sided, broadly rounded anteriorly (Fig. 6). Antennal formula I:II:III:IV; 0.51: 0.92: 2.92: 1.59. Prothorax without pits on anterior lobe, posterior lobe with a few small shallow pits on midline. Pronotum length 1.23; remainder of thorax 0.92; abdomen length 3.12. Wing pads very small, not visible, hidden under pronotum. Thoracic, abdominal sternites pilose, about equally dense on all segments. Distance between anterior and middle coxae (measured between closest margins) 0.51; between middle and hind coxae 0.82. Acetabulae without pits; posterior acetabula with a weak depression dorsally. Entire venter set with minute black denticles.

Proportions of legs as follows: Femur, tibia, tarsal I, tarsal II, tarsal III of fore-leg, 2.82: 3.23: 0.07: 0.31: 0.20; of middle-leg, 3.17: 3.43: 0.10: 0.51: 0.26; of hind-leg, 4.04: 4.71: 0.10: 0.41: 0.26.

Male abdominal terminalia as shown in figs. 7, 9, 10, genitalia in figs. 118–19. Seventh sternite with 2 (1 + 1) protuberances on either side but removed from the ventral midline, each capped with a dark fringe of posteriorly directed tightly clustered setae.

MICROPTEROUS FEMALE. Length 8.85–10.39, width 0.58–0.67. Similar in most respects to male, but abdomen broader, deeper, curved, distal process of tergite VIII very short; connexival margins along tergites IV, V and base of VI set with a fringe of long, erect dark setae. Abdominal terminalia as shown in figs. 8, 11.

BRACHYPTEROUS, MACROPTEROUS FORMS. Unknown.

Diagnosis. Hydrometra aculeata is not closely related to any other species of the region except *H. gagnei* (J. & D. Polhemus, 1995a) from Tahiti. The erect fringe of setae on the female connexiva, lack of female terminal abdominal process, and lack of pits on the acetabula also suggest a group relationship with *H. papuana* Kirkaldy.

Distribution. New Caledonia (Fig. 148).

Material examained. (All micropterous). NEW CALEDONIA: 15 males, 8 females, Plaine des Lacs area, 6 Nov. 1958, C.R. Joyce; 1 female, Dumbea R., 28 Oct. 1958, C.R. Joyce; 2 females, Foret de Thi, 100–300 m, 25–29 Mar. 1961, J. Sedlacek; 1 female, La Coulee, 26 Jan. 1962, N.L.H. Kraus; 3 females, Forét de Thi, 29 Oct.–1 Nov. 1967, J. & M.S. Sedlacek; 2 females, Nossirah, 100 m, 20 Mar. 1961, L. Gressitt & T.C. Maa; 3 females, Yiambi, N.E., 1–50 m, 15 Oct. 1967, J. & M.S. Sedlacek; 1 female, Mt. Koghi, 500–750 m, 26–26 Oct. 1967, J. & M.S. Sedlacek; 4 males, 1 female, La Foa, 3 Feb. 1945, H.E. Milliron; 3 males, 3 females, Col d'Amieu, 750 m, 3 Mar. 1960, L. Gressitt;

1 female, 4 mi NNE Col de Keunthio (Col de Massirah Rte at Koua R.), 150–200 m, 22 Sept. 1979; 1 male, 2 females, Hienghene, 10–150 m, 14–17 Aug. 1979, G. Nishida; 1 male, St. Louis, 14 Oct. 1940, F.X. Williams (BPBM). 6 males, 3 females, Yaoué, 12 Dec. 1965, drying stream bed under boulders and edges of small pools; 1 male, Tinchialit, 650 m, 21 Oct. 1949, L.E. Cheesman (BMNH). 2 males, 2 females, Riviere Bleue, 170 m, CL 1862, 27 Sept. 1983; 1 male, 1 female, E. side Col d'Amieu, 300 m, CL 1848, 25 Sept. 1983; 10 males, 7 females, E. side Col d'Amieu, 320 m, CL 1847, 25 Sept. 1983; 6 males, 1 female, above Koindé, 600 m, CL 1851, 25 Sept. 1983; 6 males, 5 females, stream W of Koindé, 180 m, CL 1852, 25 Sept. 1983; 1 female, Upper Oinné Valley, CL 1856, 26 Sept. 1983; 6 males, 4 females, Oinné River, CL 1855, 26 Sept. 1983; 1 male, W. side Col d'Amieu, 320 m, CL 1846, 25 Sept. 1983; 12 males, 7 females, Mt. Mou, CL 1873, 27 Sept. 1983 (all coll. by J. & D. Polhemus; JTPC). 1 male, Koumac–Ouegoua, pond on rd., 18 Sept. 1965, F. Starmuhlner; 1 male, 2 females, Farino Village, La Farino R., 28 July 1965, F. Starmuhlner; 2 males, 2 females, stream on Mt. Pouédihi, 16 km W of Ouénarou Forest Sta., on Eaux de Foréts rd., 153 m, 8–10 Nov. 1972, W.L. & J.G. Peters; 1 male, 7 females, stream, headwaters of Fonwhary R., 1.3 km SE of Col d'Amieu, on Terr. Rte 5, 412 m, 14–15 Nov. 1972, W.L. & J.G. Peters (JTPC). 2 female syntypes (one headless). N. Calédonie, Kanala (P. Montrousier) (ISNB, examined on our behalf by N.M. Andersen); the almost complete specimen labelled "Hydrometra aculeata Montr., Typ." is here designated as lectotype, with the damaged specimen designated as a paralectotype.

Hydrometra claudie Polhemus & Lansbury, new species Figs. 13–19, 127–28, 149

Description

MACROPTEROUS MALE. Length 13.85, width 1.15.

Color. Ground color dark brown; abdominal tergite VI (the first visible) blackish brown, faintly shining, faintly transversely rastrate, minutely rugulose medially, VII–VIII mat and clothed with fine pubescence. Head marked with blackish dorsally, mostly black ventrally; lighter on sides, anteriorly and basally; very lightly frosted ventrally and on narrow median longitudinal stripe dorsally behind eyes. Thorax dorsally with prominent narrow median longitudinal frosted stripe flanked by broad black stripe on each side, laterally with broad frosted longitudinal stripe continuing along sides of abdomen onto segment VIII, visible in oblique light. Broad irregular longitudinal regions on either side of dorsal thoracic black stripes, narrow region of laterosternites, all connexiva except narrow margins, light brown to brown. Hemelytra brown, with 2 closed cells, veins dark; darker median longitudinal stripe set with 4 elongate irregular white spots beyond basal third, 2 in basal cell, 1 in distal cell and 1 near distal extreme; basal spot small and sometimes absent, distal spot small and almost ovate. Legs, antennae yellow brown to fuscous, tinged with piceous, darker distally; all femora distally, all tibia basally heavily tinged with piceous; coxae, trochanters mostly luteous, latter tinged with fuscous.

Structure. Head long (4.04), widest at antennal tubercles (0.56); clothed with very short decumbent setae; set beneath with bristly setae only anteriorly; gular lobe not pronounced, truncate; rostrum reaching well caudad of eyes, about 1/2 of distance from eyes to pronotum; ratio anteocular/postocular portions: 2.36/1.13; interocular space/width of an eye: 0.10/0.20; anteclypeus broad, expanded anteriorly, truncate, anterior margin almost straight, but medially faintly protruding and depressed (Fig.13). Antennal formula I:II:III:IV; 0.82: 1.43: 4.24: 2.25. Prothorax with a weak row of pits on anterior lobe weakly demarcating broad collar, posterior lobe set with numerous shallow pits. Pronotum length 2.36; remainder of thorax 1.95; abdomen length 5.43. Hemelytra reaching middle of tergite VI. Abdominal sternites with a few scattered long slender setae and scattered very fine appressed golden setae of moderate length; not pilose. Distance between anterior and middle coxae (measured between closest margins) 1.08; between middle and hind coxae 1.89. Anterior and middle acetabulae with 2 pits each on anterior and posterior parts; posterior acetabula without pits. Entire venter thickly set with minute black denticles.

Proportions of legs as follows: Femur, tibia, tarsal I, tarsal II, tarsal III of fore-leg, 4.14: 5.00:

0.10: 0.36: 0.26; of middle-leg, 5.00: 5.48: 0.10: 0.67: 0.31; of hind-leg, 5.96: 7.02: 0.10: 0.56: 0.31.

Male abdominal terminalia as shown in Figs. 14, 18–19, genitalia in Figs. 127–28. Sixth male sternite with 2 (1 + 1) large mammilose processes on either side of midline along posterior margin. Seventh male sternite with 2 (1 + 1) dark tightly packed elongate clusters of stout brown setae on either side of the ventral midline.

MACROPTEROUS FEMALE. Length 13.95, width 1.06. Similar in most respects to male. Abdominal terminalia as shown in figs. 15–17.

BRACHYPTEROUS FORM. Males, length 13.04–13.48, width 0.78–0.83. Females, length 13.1–13.54, width 0.78–0.83. Similar in most respects to macropterous form, but wings reaching middle of tergite III.

MICROPTEROUS FORM. Unknown.

Etymology. This species is named for the type locality; *claudie* is a noun in apposition.

Diagnosis. Hydrometra claudie is most closely related to *H. feta* Hale, and both species occur in north Queensland. The 2 species may be separated by the characters shown in the key and discussed under *H. feta.*

Distribution. Australia (north Queensland) (Fig. 149).

Material examined. Holotype, macropterous male: AUSTRALIA: **Queensland**: Iron Range, Claudie River, CL 1752, 24 Aug. 1983, J.T. & D.A. Polhemus (ANIC). Paratypes: AUSTRALIA: Queensland: 4 brachypterous males, 5 brachypterous females, 6 macropterous males, 2 macropterous females, same data as holotype (JTPC, BPBM, ANIC). 1 brachypterous female, Iron Range, pond nr. Chili Beach, CL 1753, 24 Aug. 1983, J.T. & D.A. Polhemus; 1 brachypterous male, 1 brachypterous female, 1 macropterous female, Gordon Cr., CL 1755, 24 Aug. 1983, J.T. & D.A. Polhemus (JTPC). 2 males, 8 females, Claudie R., nr. Mt Lamond, 26 May 1966, D.K. McAlpine (AMSA).

Hydrometra darwiniana Polhemus & Lansbury, **new species** Figs. 20–23, 123–24, 149

Description

MACROPTEROUS MALE. Length 10.54–11.60, width 0.55–0.67.

Color. Ground color light brown; abdominal tergites orange brown, faintly shining, faintly rastrate except VII–VIII mat and clothed with fine pubescence. Head tinged with blackish antero-dorsally, lighter ventrally, very lightly frosted ventrally and on narrow median longitudinal stripe dorsally behind eyes. Thorax dorsally with prominent narrow median longitudinal frosted stripe, pronotum laterally with narrow arched frosted longitudinal stripe; remainder of thorax and abdomen frosted laterally except narrow abdominal stripe along junction of medio- and latero-tergites, visible in oblique light. Head ventrally beneath base, eyes and anterior margin, broad irregular longitudinal regions on either side of dorsal thoracic midline of posterior lobe, venter of thorax and abdomen, all connexiva except narrow margins, light brown. Legs, antennae light brown to brown, darker distally; coxae, trochanters mostly light brown, similar to bases of femora.

Structure. Head long (3.23), widest at antennal tubercles (0.41); without bristly setae; gular lobe of moderate size; rostrum reaching well caudad of eyes, 1/2 way to pronotum; ratio anteocular/postocular portions: 2.15/0.77; interocular space/width of an eye: 0.10/0.15; anteclypeus narrow, conical, rounded anteriorly (Fig. 30). Antennal formula I:II:III:IV; 0.41: 0.92: 2.25: 1.18. Prothorax with row of encircling pits on anterior lobe setting off collar, posterior lobe with scattered deep pits including on midline, each pit appearing frosted in oblique light. Pronotum length 1.64; remainder of thorax 1.33; abdomen length 5.00. Hemelytra reaching to distal part of tergite V; basal white stripe mesad of R + M evanescent beyond basal fourth; median stripe bright white, commencing near base, extending almost to apex, interrupted only by cross veins. Abdominal sternites not pilose, set with scattered short recumbent pubescence, almost invisible except in oblique light. Distance between anterior and middle coxae (measured between closest margins) 0.77; between middle and hind coxae

1.28. Anterior acetabulae with 3 pits on anterior part, 2 on posterior part; middle acetabulae with 2 pits each on anterior and posterior parts; posterior acetabula with 1 pit on anterior part. Entire venter set with minute black denticles.

Proportions of legs as follows: Femur, tibia, tarsal I, tarsal II, tarsal III of fore-leg, 2.89: 3.08: 0.07: 0.26: 0.18; of middle-leg, 3.17: 3.56: 0.07: 0.36: 0.20; of hind-leg, 4.14: 5.00: 0.07: 0.31: 0.20.

Male abdominal terminalia as shown in figs. 20–22, 25–26, 28, 31–33, genitalia in figs. 123–24. Seventh male sternite with a broad deep transverse sulcus not reaching lateral margins, proximal and distal margins densely pilose; distal 1/2 of sixth sternite variably pilose, more so in specimens from Western Australia.

MACROPTEROUS FEMALE. Length 10.99–11.93, width 0.61. Similar in most respects to male, but slightly larger. Hemelytra reaching to distal part of tergite V; without evident white stripe. Abdominal terminalia as shown in figs. 23–24, 27, 29.

MICROPTEROUS FORMS. Male, length 9.38, width 0.55. Females, length 11.15–11.26, width 0.50–0.55. Similar in most respects to macropterous form; wing pads reaching almost to base of abdomen in male, onto base of abdomen in female.

BRACHYPTEROUS FORM. Unknown.

Etymology. This species honors Charles Darwin, as does the name of the major city closest to the type locality, Darwin, N.T.

Diagnosis. This species is most closely related to *H. novaehollandiae* and *strigosa*, both species occuring further south in Australia. The species may be separated by the characters shown in the key, especially the transverse sulcus on male sternite VII.

The male from Pemberton, W.A., is much smaller than any other specimens (length 10.54 mm, compared with a minimum of 10.82 mm for the smallest male from the Northern Territory) and the hemelytra reach only onto the base of tergite V, but matches the other males in all important respects. Pemberton is far removed from the remainder of the known range (Fig. 149).

Hungerford and Evans (1934: 76) said they saw a female of *H. strigosa* from Adelaide River (Northern Territory, near Darwin), in the collection of the Natural History Museum (BMNH). We have not seen this specimen, but it is probably *H. darwiniana.*

Distribution. Australia (Northern Territory, Western Australia) (Fig. 149).

Material examined. Holotype, macropterous male: AUSTRALIA, **Northern Territory**: 9 km N by E of Mudginberry HS, 12°31' S, 132°54' E, 26 May 1973, M. S, Upton & McInnes (ANIC). *Paratypes*: AUSTRALIA, **Northern Territory**: 1 micropterous male, 1 micropterous female, Darwin, swamp, CL 903, 10.XII.1977, J.T. Polhemus; 3 micropterous females, South Alligator River at Arnhem Highway, CL 919, 16.XII.1977, J.T. Polhemus; 1 micropterous female, N. of Adelaide River, CL 912, 12.XII.1977, J.T. Polhemus (JTPC). 1 female, Kakadu NP, Saucery Rock near Cannon Hill, 28 March 1980, M. Malipatil (MAGD). 1 macropterous male, 1 macropterous female, same data as holotype; 1 macropterous male, Magela Creek, 1 km NNW Mudginberry HS, 12°36' S, 132°52' E, 25 May 1973, M. S, Upton & McInnes; 1 macropterous male, Birraduk Cr., NE Oenpelli, 12°17' S, 133°13' E, at light, 4 June 1973, R. I Kitching; 1 macropterous male, Birraduk Cr., NE Oenpelli, 12°16' S, 133°13' E, at light, 4 June 1973, T. Weir & A. Allwood; 1 macropterous male, Jasper Gorge, 54 km NW of Victoria Downs, 16°02'S, 130°41'E, 30 April 1974, T. Weir & T. Angeles; 1 macropterous male, Cooper Cr., 15 km S by W of Nimbuwah Rock, 12°20'S 133°19'E, at light, 2 June 1973, T. Weir & N. Forrester; 1 macropterous female, Darwin River, 16 km SW by S of Noonamah, 12° 44' S 130° 58' E, 16 May 1974, T. Angeles & W. Mollah (ANIC, JTPC). **Western Australia**: 1 micropterous male, Pemberton, 100 m., 5.I.1961, J.L. Gressitt (BPBM). 1 female, Kimberley, Lennard R. crossing, Gibb R. Rd., 17° 23' S 124°44' E, at m.v. light, 7 Apr. 1988, T. Houston; 1 female, Ord R. (WAMP).

Additional material (doubtful determinations; not named paratypes): AUSTRALIA, **Northern Territory**: 1 female, Kakadu N. P., Magela Cr. nr. Magela Falls, 3 May 1990, P. Dostine (OSSJ). **Queensland**: 1 female, Iron Range, 7 Apr. 1964, I.F.B. Common & M.S. Upton (ANIC). 1 female, Kuranda, Mar. 1950, J.G. Brooks (AMSA).

Hydrometra eioana Polhemus & Lansbury, **new species** Figs. 34–40, 129–30, 150

Description

BRACHYPTEROUS MALE. Length 13.48–14.14, width 0.55–0.72.

Color. Ground color chocolate brown; abdominal tergites blackish brown, shining, faintly transversely rastrate except VII–VIII mat and clothed with fine pubescence. Head mostly blackish, lighter basally and anteriorly, lightly frosted ventrally and on narrow median longitudinal stripe dorsally behind eyes. Thorax dorsally with prominent narrow median longitudinal frosted stripe flanked by broad black stripes, laterally with broad frosted longitudinal stripe continuing along sides of abdomen onto segment VIII, visible in oblique light. Broad irregular longitudinal regions on either side of dorsal thoracic midline, broad region of laterosternites, all connexiva except narrow margins, light brown. Legs, antennae light brown to fuscous, lighter beneath, darker distally; hind tibia subbasally with poorly defined broad light annulus; coxae, trochanters mostly leucine to luteous, latter tinged with fuscous.

Structure. Head long (4.15), widest at antennal tubercles (0.46); sparsely clothed with very short decumbent setae; set beneath eyes and anteriorly with bristly setae, longer and more numerous anteriorly; gular lobe of moderate size; rostrum reaching well caudad of eyes; ratio anteocular/postocular portions: 2.71/1.13; interocular space/width of an eye: 0.10/0.15; anteclypeus broad, expanded anteriorly, truncate, anterior margin straight but depressed medially (Fig. 34). Antennal formula I:II:III:IV; 0.87: 1.59: 5.07: 2.41. Prothorax without evident pits on anterior lobe, posterior lobe sparsely set with moderately deep pits. Pronotum length 1.79; remainder of thorax 1.75; abdomen length 6.45. Wing pads reaching onto middle to distal part of tergite II. All abdominal sternites pilose, setae of moderate length, densest on sternite VI. Distance between anterior and middle coxae (measured between closest margins) 0.67; between middle and hind coxae 1.59. Anterior and middle acetabulae with 2 pits each on anterior and posterior parts; posterior acetabula without pits. Entire venter thickly set with minute black denticles, often difficult to see against dark background.

Proportions of legs as follows: Femur, tibia, tarsal I, tarsal II, tarsal III of fore-leg, 5.00: 5.39: 0.10: 0.41: 0.31; of middle-leg, 6.06: 6.25: 0.10: 0.77: 0.31; of hind-leg, 7.12: 7.98: 0.10: 0.67: 0.26. Male abdominal terminalia as shown in figs. 35–36, 38, genitalia in figs. 129–30. Seventh male sternite with 2 (1 + 1) broad shallow crescents of fine golden setae on either side of the ventral midline, plainly visible only in oblique light.

BRACHYPTEROUS FEMALE. Length 14.82 long, width 0.72–0.77. Similar in most respects to male. Sternite VII posteromedially with a distinct ventrally directed spur; abdominal terminalia as shown in figs. 37, 39–40. Wing straps dark brown, reaching past middle of tergite II.

MACROPTEROUS FEMALE. Length 14.59 long, width 0.72. Similar in most respects to bracypterous female. Hemelytra dark brown, with faint light stripe, reaching to base of tergite VI.

MICROPTEROUS FORM. Unknown.

Etymology. This species is named for the type locality, Eio Creek.

Diagnosis. Hydrometra eioana is most closely related to *H. kiunga* n. sp., and both species occur in the southern part of Papua New Guinea. The 2 species may be separated by the characters shown in the key.

Distribution. Papua New Guinea (Central Prov.) (Fig. 150).

Material examined. Holotype, brachypterous male: PAPUA NEW GUINEA, **Central Prov.**: Eio Creek, nr. Baruanumu, CL 1840, 22 Sept. 1983, J.T. & D.A. Polhemus (BPBM). *Paratypes*: PAPUA

NEW GUINEA, **Central Prov.**: 4 brachypterous males, 4 brachypterous females, 1 macropterous female, same data as holotype (JTPC, BPBM, ANIC); 2 brachypterous males, Musgrave (Aieme) R. at Awarere Plantation, E of Port Moresby, CL 1841, 22 Sept. 1983, J.T. & D.A. Polhemus (JTPC).

Hydrometra feta Hale

Figs. 41–46, 125–26, 150

Hydrometra feta Hale, H.M., 1925. Arkiv för Zoologi 17A, N. 20: 4. Holotype, macropterous female, Australia, Queensland, Bellenden Ker (NHRS).

Hydrometra illingworthi Hungerford, H.B. & N.E. Evans, 1934. Ann. Mus. Nat. Hung. 28: 59. Holotype, male, Australia, Queensland, Cairns (USNM). **New synonymy.**

Description

MACROPTEROUS MALE. Length 12.03–13.09, width 0.58–0.61.

Color. Ground color brown; abdominal tergites blackish brown, shining, faintly rastrate medially except VII–VIII mat and clothed with fine pubescence; VI set with a few short golden recumbent setae. Head tinged with blackish dorsally ahead of, between and behind eyes, and at anterior extreme; black ventrally, lighter anteriorly; very lightly frosted ventrally and on narrow median longitudinal stripe dorsally behind eyes. Thorax dorsally with prominent narrow median longitudinal frosted stripe set in a broader blackish brown stripe, laterally with broad frosted longitudinal stripe continuing along sides of abdomen onto segment VIII, visible in oblique light. Broad irregular longitudinal regions on either side of dorsal thoracic midline, thoracic pleura, all connexiva except narrow margins, light brown. Legs, antennae brown to piceous, darker distally; all femora subdistally with poorly defined broad light annulus; coxae, trochanters mostly luteous, tinged with fuscous.

Structure. Head long (3.89), widest at antennal tubercles (0.56); very sparsely set beneath with bristly setae, much longer and more numerous anteriorly; gular lobe of moderate size; rostrum reaching well caudad of eyes, almost 1/2 way to pronotum; ratio anteocular/postocular portions: 2.41/1.13; interocular space/width of an eye: 0.10/0.17; anteclypeus broad, expanded anteriorly, truncate, anterior margin straight but depressed medially (Fig. 41). Antennal formula I:II:III:IV; 0.82: 1.38: 5.89: 2.46. Prothorax with an inconspicuous row of encircling pits on anterior lobe demarcating broad collar, posterior lobe with numerous broad shallow pits. Pronotum length 2.20; remainder of thorax 1.84; abdomen length 6.06. Hemelytra with usual 2 closed cells, reaching base of tergite VI; with 4 white spots, basal elongate, narrow somewhat ragged, distal spot ragged ovate. Thoracic and abdominal sternites set with minute black denticles. All abdominal sternites pilose, setae increasing in length and density to sternite V and base of VI, weakly hirsute on VII. Distance between anterior and middle coxae (measured between closest margins) 0.92; between middle and hind coxae 1.79. Anterior acetabulae with 1 pit each on anterior and posterior parts, middle acetabulae with 2 pits on each part; posterior acetabula without pits.

Proportions of legs as follows: Femur, tibia, tarsal I, tarsal II, tarsal III of fore-leg, 3.99: 4.71: 0.10: 0.41: 0.26; of middle-leg, 4.81: 5.48: 0.10: 0.61: 0.36; of hind-leg, 6.04: 7.01: 0.10: 0.41: 0.31

Abdominal terminalia as shown in figs. 41, 44, genitalia in figs. 125–26. Sixth male sternite set with 2 (1 + 1) large mammilose processes on posterior margin, far removed from midline but not on sides. Eighth male sternite with 2 tightly packed clusters each of about ten stout brown setae appaearing as a short spine on either side of the ventral midline at about middle.

MACROPTEROUS FEMALE. Length 12.70–13.76, width 0.58–0.87. Similar to male but somewhat larger. Body slightly sinuate in lateral view, abdomen curved slightly upward distally. Hemelytra brown, without white markings, reaching middle of tergite VI. Abdominal terminalia as shown in Figs. 43, 45–46.

BRACHYPTEROUS, MICROPTEROUS FORMS. Unknown.

Diagnosis. Hydrometra feta is very close to *Hydrometra claudie* n. sp., the primary difference being the nature of the setae on the first male genital segment, and (see key, and Figs. 19 and 44).

Hydrometra feta, *H. halei*, *H. jourama* and *H. claudie* form a close knit group. The females all have abdominal ventrites III–VI weakly carinate on the midline. The head of *H. halei* is quite hirsute ventrally, much more so than the other species of the group, and in addition has a larger maxillary plate (mxp) than the others species. The head and abdomen of *H. jourama* are moderately hirsute ventrally, less so on basal abdominal sternites, but more so than *H. feta* or *H. claudie*. The ventral postocular portion (PO) of the head of *H. claudie* is essentially without setae, the ventral PO of *H. feta* with scattered short setae. The posterior margin of ventrite VI of *H. feta* is deeply notched, but not so in *H. claudie*. In females of *H. jourama*, sternite VII on the midline is distinctly triangular posteriorly, whereas in *H. halei* it is distinctly rounded and not triangular. These distinctions among females are important because the type of *H. feta* is a female, and all 4 of these species are geographically proximate. *H. jourama* and *H. halei* have been found in the same sample.

Both authors have studied the types of both *Hydrometra feta* (NHRS) and *Hydrometra illingworthi* (USNM) to establish the synonymy given above. The female type of *Hydrometra feta* (NHRS) is missing the antennae and all legs on the right side. A female specimen in the Bishop Museum labelled "Cairns, N. Qld. 17, J. F. Illingworth" and a handwritten label "98" appears to be the same species, as does the male type of *Hydrometra illingworthi* (USNM) which bears similar labels.

Distribution. Australia (north Queensland) (Fig. 150).

Material examined. AUSTRALIA: **Queensland**: 1 macropterous female, Bellenden Ker, Queensl., Mjöberg (Holotype, *Hydrometra feta*, NHRS). 1 macropterous male, 1 macropterous female, Cairns, N. Qld., J.F. Illingworth (male, holotype, *Hydrometra illingworthi*, USNM; female, BPBM). 1 male, Julatten, rain forest creek, densely shaded, very cool, fast flowing, 21 May 1979 (ILC). 3 males, Julatten, rain forest creek, densely shaded, very cool, fast flowing, 21 May 1979 (ILC). 1 male, Iron Range, 2–9 June 1971, E.F. Riek (ANIC). 3 macropterous males, 1 macropterous female, The Boulders, nr. Babinda, CL1722, 14 Aug. 1983, J.T. & D.A. Polhemus (JTPC).

Hydrometra halei Hungerford & Evans — Figs. 47–53, 137–38, 151

Hydrometra halei Hungerford, H.B. & N.E. Evans, 1934. Ann. Mus. Nat. Hung. 28: 61. Holotype, male, Australia, Queensland, Cairns (USNM).

Description

BRACHYPTEROUS MALE. Length 12.03–13.09, width 0.58–0.61.

Color. Ground color brown; abdominal tergites blackish brown, shining, faintly rastrate medially except VII–VIII mat and clothed with fine pubescence; VI sparsely set with short golden recumbent pubescence. Head tinged with blackish dorsally, lighter basally, anteriorly, laterally; black ventrally, lighter anteriorly; lightly frosted ventrally and on narrow median longitudinal stripe dorsally behind eyes. Thorax dorsally with prominent narrow median longitudinal frosted stripe set in a broader deep brown stripe, laterally with broad frosted longitudinal stripe continuing along sides of abdomen onto segment VIII, visible in oblique light. Broad irregular longitudinal regions on either side of dorsal thoracic midline, thoracic pleura, all connexiva except narrow margins, light brown. Legs, antennae brown to piceous, lighter distally; all femora subdistally with poorly defined broad light annulus; coxae, trochanters mostly luteous, tinged with fuscous.

Structure: Head long (3.74), widest at antennal tubercles (0.51); set beneath with bristly setae, somewhat denser basally, much longer and more numerous anteriorly; gular lobe of moderate size; rostrum reaching just caudad of eyes; ratio anteocular/postocular portions: 2.30/1.08; interocular

space/width of an eye: 0.13/0.20; anteclypeus broad, expanded anteriorly, truncate, anterior margin straight but depressed medially (Fig. 47). Antennal formula I:II:III:IV; 0.82: 1.43: 5.99: 2.25. Prothorax with an inconspicuous row of pits on anterior lobe demarcating broad collar, posterior lobe with scattered small pits. Pronotum length 1.79; remainder of thorax 1.69; abdomen length 5.22. Hemelytra brown, narrow, reaching middle of tergite III. All abdominal sternites pilose, setae increasing in length and density to sternite V and base of VI, weakly hirsute on VII. Distance between anterior and middle coxae (measured between closest margins) 0.72; between middle and hind coxae 1.69. Anterior acetabulae with 2 pits each on anterior and posterior parts, middle acetabulae with 1 pit on each part; posterior acetabula without pits.

Proportions of legs as follows: Femur, tibia, tarsal I, tarsal II, tarsal III of fore-leg, 4.15: 4.76: 0.10: 0.41: 0.26; of middle-leg, 4.92: 5.32: 0.10: 0.77: 0.31; of hind-leg, 5.94: 6.67: 0.10: 0.61: 0.31.

Abdominal terminalia as shown in figs. 48, 50–51, genitalia in figs. 137–38. Seventh male sternite with 2 tightly packed clusters each of about ten stout brown setae appaearing as a short spine on either side of the ventral midline.

BRACHYPTEROUS FEMALE. Length 12.70–13.76, width 0.58–0.87. Similar to male but somewhat larger. Body slightly sinuate in lateral view, abdomen curved slightly upward distally. Abdominal terminalia as shown in figs. 49, 52.

MACROPTEROUS FORMS. Males, length 12.31–13.28, width 0.67–0.77. Females length 13.66–13.95, width 0.87–0.96. Most characteristics as in brachypterous forms. Hemleytra with usual 2 closed cells, reaching base of tergite VI; with 4 white spots, basal and third elongate, narrow somewhat ragged, second ovate to elongate, distal spot ragged ovate.

MICROPTEROUS FORM. Male, length 13.43, width 0.77. Most characteristics as in brachypterous forms. Wing pads barely visible.

Diagnosis. Hydrometra halei is most closely related to *H. feta* Hale and related species; see diagnosis under *H. feta.*

Distribution. Australia (Northern Territory, Queensland, Western Australia) (Fig. 151).

Material examined. AUSTRALIA: **Northern Territory**: 1 male, 1 female, Birraduk Cr., 18 km NE Oenpelli, at light, 12°17' S 133°13' E, 4 June 1973, R. I Kitching; 4 males, E. Alligator R., 1 km N Cahills Crossing, at light, 12°25' S 132°58' E, 7 June 1973, R. I Kitching; 1 male, 9 km NE Mudginbarry HS, 12°31' S 132°54' E, 10 June 1973, R. I Kitching (ANIC). many males, females, Koongarra Cr., nr mining camp, 8 May 1979, I. Lansbury; 5 males, many females, Flying Fox Cr., I. Lansbury; 11 males, 3 females, Stapleton Cr., detritus and floating macrophytes, 15 May 1979, I. Lansbury; 11 males, 5 females, Coomalie Cr., 15 May 1979, I. Lansbury; 6 males, 2 females, Manton R., almost stagnant, 15 May 1979, I. Lansbury ; many males, many females, Arnhem Hwy., creek 13 km W Mary R., 7 May 1979, I. Lansbury; 1 female, Arnhem Hwy., Mary R., side pool joined to river, 17 May 1979, I. Lansbury; 2 males, 1 female, Arnhem Hwy., Wildman R., large isolated pool, no vegetation, 17 May 1979, I. Lansbury (ANIC, ILC). 2 males, 2 females, S. Alligator R., nr Koolpie Crossing, 13° 38' S 132°33' E, 6 Sept. 1989, P. Dostine; 1 male, Kakadu N. P., Barramundi Gorge, side pool, 10 Dec. 1989, P. Dostine (OSSJ). 1 female, Darwin R. Reservoir, 7 July 1980, M. Malipatil; 1 male, Katherine Gorge N. P., Butterfly Gorge, 5 Dec. 1980, M. Malipatil; 1 male, 1 female, Howard Spring, Darwin, 15 Oct. 1980, M. Malipatil (MAGD). 6 brachypterous males, 6 brachypterous females, 1 macropterous male, 1 macropterous female, Alligator Cr., nr. Daly River, CL 909, 11 Dec. 1977, J.T. Polhemus; 2 brachypterous males, ponds nr. Robin Falls, CL 911, 12 Dec. 1977, J.T. Polhemus; 1 brachypterous male, 3 brachypterous females, 13 macropterous males, 1 macropterous female, stream nr. Robin Falls, CL 910, 12 Dec. 1977, J.T. Polhemus; 1 brachypterous male, Coomalie Cr., nr. Darwin, CL 913, 11 Dec. 1977, J.T. Polhemus; 1 brachypterous male, 2 macropterous males, Koongarra, CL 916, 15 Dec. 1977, J.T. Polhemus; 2 macropterous males, Adelaide River, CL 912, 12 Dec. 1977, J. T. Polhemus; 4 brachypterous males, 2 brachypterous females, 3 macropterous males, 1 macropterous female, 5 mi. SW Katherine, 22 Oct. 1962, E. S. Ross & D. Q. Cavagnaro (JTPC). **Queensland**: 3 males, 6 km N Cardwell, Hwy No. 1, 25 Apr. 1985, F.

S. Truxal (LACM). 2 males, 2 females, 7 km N Hope Vale Mission, 15° 14' S 145°07' E, 4 Oct. 1980, T. Weir; 24 males, 25 females, Mt. Molloy, 13 June 1971, E. F. Riek (ANIC). 1 male, Julatten, N of Cairns, creek in deep gully, deep shade, 20 May 1979, I. Lansbury; 2 males, Julatten, rain forest creek , very cool, fast flowing, deep shade, 21 May 1979, I. Lansbury; 3 males, 4 females, Brisbane, Cedar Falls, 7 June 1979, I. Lansbury; (ANIC, ILC). 1 brachypterous female, 4 macropterous males, 18 macropterous females, McCleod River, nr. Mt. Carbine, CL 1736, 20 Aug. 1983; 2 macropterous males, 1 macropterous female, Jourama Falls N. P., CL 1716, 13 Aug. 1983; 2 macropterous males, 3 macropterous females, 6 km E Murray Falls, CL 1719, 13 Aug. 1983; 1 brachypterous female, 7 km N Mission Beach, CL 1721, 14 Aug. 1983; 1 macropterous male, Wenlock River, CL 1750, 23 Aug. 1983; 1 macropterous male, 1 macropterous female, Laradeenya Cr., nr. Cape York, CL 1766, 29 Aug. 1983; 2 brachypterous females, 1 macropterous male, 1 macropterous female, Wenlock River, nr. Moreton, CL 1756, 26 Aug. 1983; 1 brachypterous male, 1 macropterous male, 1 macropterous female, Coen River, at Coen, CL 1748, 22 Aug. 1983; 4 macropterous males, 1 macropterous female, Archer River, CL 1749, 22 Aug. 1983; 3 macropterous males, 2 macropterous females, Jardine River, CL 1761, 27 Aug. 1983; 5 macropterous males, 3 macropterous females, Big Cr., nr. Cape York, CL 1765, 29 Aug. 1983; 4 macropterous males, 3 macropterous females, upper Mulgrave River, CL 1726, 16 Aug. 1983; 4 macropterous males, 5 macropterous females, trib. to upper Mulgrave River, CL 1727, 16 Aug. 1983; 1 macropterous male, 2 macropterous females, Davies Cr. N. P., CL 1729, 16 Aug. 1983; 13 macropterous males, 5 macropterous females, Hutchinsons Cr., Cape Tribulation Rd., CL 1733, 17 Aug. 1983; 7 macropterous males, 4 macropterous females, Mossman River, CL 1735, 18 Aug. 1983; 6 macropterous males, 4 macropterous females, Annan River, CL 1737, 19 Aug. 1983; 1 micropterous male, 4 brachypterous males, 2 brachypterous females, 3 macropterous males, 4 macropterous females, Pinetree Cr., nr. Jowilbinna, CL 1742, 21 Aug. 1983; 2 brachypterous males, 1 macropterous male, Little Laura River, CL 1744, 21 Aug. 1983; 1 micropterous male, 1 brachypterous female, 3 macropterous males, 2 macropterous females, Hann River, CL 1745, 21 Aug. 1983; 1 brachypterous male, 8 macropterous males, 5 macropterous females, Stewart River, CL 1747, 22 Aug. 1983; 3 macropterous males, Coopers Creek, nr. Cape Tribulation, CL 1734, 17 Aug. 1983 (all coll. by J.T. & D.A. Polhemus; JTPC). **Western Australia**: 3 males, Carson Escarpment, 14° 49' S 126°49' E, 9–15 Aug. 1975, I. F. B. Common & M. S. Upton (ANIC).

Hydrometra horvathi Hungerford & Evans — Figs. 54–59, 131–32, 152

Hydrometra horvathi Hungerford, H.B. & N.E. Evans, 1934. Ann. Mus. Nat. Hung. 28: 62. Type, male, Stephansort, Astrolabe B. (= Bay), N. Guinea (= Papua New Guinea) (HNHM).

Hydrometra becki Drake, C.J., 1951. Bull. So. Calif. Acad. Sci. 50: 103. Type, male, Guadalcanal, Solomon Islands (USNM). **New Synonymy.**

Description

BRACHYPTEROUS MALE. Length 13.66–14.43, width 0.67.

Color. Ground color chocolate brown; abdominal tergites blackish brown, shining, faintly rastrate except VII–VIII mat and clothed with fine pubescence. Head tinged with blackish dorsally, black ventrally, lighter on sides, basally and anteriorly, lightly frosted especially on narrow median longitudinal stripe dorsally behind eyes. Thorax dorsally with prominent narrow median longitudinal frosted stripe set in a broader dark brown stripe, laterally with broad frosted longitudinal stripe continuing along sides of abdomen onto segment VIII, visible in oblique light. Broad irregular longitudinal regions on either side of median dorsal thoracic black stripe, narrow region of laterosternites, all connexiva except narrow margins, light brown. Legs, brown to fuscous, darker distally; antennae dark brown, lighter on distal segments; posterior femora subapically, tibia subbasally with poorly defined broad light annulus; coxae, trochanters mostly luteous.

Structure. Head long (4.45), widest at antennal tubercles (0.56); set beneath with bristly setae beneath eyes and anteriorly; gular lobe of moderate size, truncate ventrally; rostrum reaching well

caudad of eyes, 1/2 way to prothorax; ratio anteocular/postocular portions: 2.92/1.18; interocular space/width of an eye: 0.15/0.23; anteclypeus broad, expanded anteriorly, truncate, anterior margin almost straight but depressed medially (Fig. 54). Antennal formula I:II:III:IV; 0.82: 1.74: 5.53: 2.71. Prothorax with an encircling row of small pits on anterior lobe weakly demarcating collar, posterior lobe with numerous small deep pits. Pronotum length 1.89; remainder of thorax 1.89; abdomen length 5.89. Abbreviated wings reaching onto base of tergite III. Abdomen curved upward posteriorly, segment VII recurved ventrally, segment VIII horizontal. All abdominal sternites pilose, setae densest on sternite IV, much shorter and sparser on posterior 1/2 of V and all of VI, sternite VII esentially bare; tergite VII sparsely set with long slender golden setae. Distance between anterior and middle coxae (measured between closest margins) 0.72; between middle and hind coxae 1.64. Anterior and middle acetabulae with 2 pits each on anterior and posterior parts; posterior acetabula without pits.

Proportions of legs as follows: Femur, tibia, tarsal I, tarsal II, tarsal III of fore-leg, 4.92: 5.83: 0.10: 0.46: 0.31; of middle-leg, 5.79: 6.40: 0.10: 0.77: 0.31; of hind-leg, 7.07: 8.65: 0.10: 0.67: 0.41.

Abdominal terminalia as shown in figs. 55–56, 58, genitalia in figs. 131–32. Sixth sternite weakly tumescent on either side of midline along posterior margin. Seventh sternite weakly depressed medially. Eighth segment with 2 tightly packed clusters each of about ten stout brown setae on either side of but quite removed from the ventral midline, located about 1/3 to 1/2 of the ventral midline distance from anterior margin; laterally and dorsally with numerous dark slender setae.

BRACHYPTEROUS FEMALE. Length 13.56–14.91, width 0.67–0.77. Similar in most respects to male. Abdomen similarly curved upward, segments VII and VIII directed slightly upward. Abdominal terminalia as shown in figs. 57, 59.

MACROPTEROUS FORM. Males, length 13.85–14.43, width 0.96–1.06. Females, length 14.05–14.91, width 0.96–1.06. Similar in most respects to brachypterous form, but pronotum slightly wider. Hemelytra reaching to or onto base of tergite VI in male, slightly shorter in female; with 4 longitudinal white streaks almost evenly spaced from basal fourth, basal and third longest, distal shortest; basally with a short sordid white streak; all light marks effaced in females.

MICROPTEROUS FORM. Unknown.

Diagnosis. Hydrometra horvathi is most closely related to *H. kiunga* n. sp. from New Guinea, and to *H. halei* Hungerford & Evans and *H. feta* Hale from Australia. These species may be separated by the characters given in the key.

The type of *Hydrometra horvathi* is a male in good condition bearing several labels (see material examined) including a manuscript label "Hydrometra pachynotum n. sp." undoubtedly placed by Horvath with the intention of describing the new species. He died without accomplishing this, so Hungerford & Evans named the species *H. horvathi.* A red printed label reads "HOLOTYPE, *H. horvathi* Hungerford & Evans."

H. horvathi was described and illustrated as having the pair of dark spines on male abdominal ventrite VIII located a little less than half of the ventral midline distance from the anterior margin, as they are in the type. The placement of the spines is variable however; in 2 topotypic males from the Madang District of Papua New Guinea, they are near the middle in one, slightly nearer the base in the other. In a series from the Arfak Mountains of Irian Jaya, the placement is variable, the spines in some specimens slightly nearer the base, others almost at middle. Also, if segment VIII is slightly withdrawn from segment VII, then the spines appear to be about in the middle. This variability has caused confusion, and is most likely the reason that Drake described the synonymous *H. becki* for the most common form in which the spines appear to be slightly more basal.

Distribution. New Guinea (Irian Jaya, Papua New Guinea), New Hebrides, Solomon Islands (Fig. 152).

Material examined. INDONESIA: **Irian Jaya Prov.**: 1 male, NW New Guinea, Expl. Detach. Orondeek, 16 May 1960 (RMNH). 2 females, Biak Isl., Kampong Landbouw, 50–100 m, 27 May 1959, J.L. Gressitt; 1 female, Waris, S of Hollandia, 400–500 m, 8–15 Aug. 1959, T.C. Maa (BPBM). 1 macropterous male, Maffin Bay, 8 July 1944, E.S. Ross (JTPC). 3 brachypterous males, 1 brachypterous female, Mupi River, above Warkomi, Arfak Mtns., 38 km SW Manokwari, CL 2646, 18 Oct. 1991, J.T. & D.A. Polhemus; 15 brachypterous males, 6 brachypterous females, 2 nymphs, Aimasi Hulu, Stream, Arfak Mtns., 65 km SW Manokwari, 140 m, CL 2649, 19 Oct. 1991, J. T. & D. A. Polhemus (JTPC). NEW HEBRIDES: 2 males, 1 female, Malekula Ouna, Mar.- Apr. 1929, L. E. Cheesman (BMNH). 1 male, 1 female, Epate Isl. (NW), N Maat, limestone plateau, 100 m, 22 Aug. 1957, J.L. Gressitt (BPBM). PAPUA NEW GUINEA, **Central Prov.**: 1 male, SE Port Moresby district, 16 mi. from A/P on Brown R. Rd., stream, 20 Apr. 1972, J.A. Tenorio; 1 female, Brown R., 23 May 1956, E. J. Ford (BPBM). **East Sepik Prov.**: 1 female, Maprik area, 160 m, 26 Aug. 1957, F. Hardy (BPBM). 3 macropterous males, River Salamin, on puddle, 29 Nov. 1995, R. Prior (IL, JTPC). 5 brachypterous males, 4 brachypterous females, 1 macropterous male, Ramumba, NW of Wewak, CL 1801, 11 Sept. 1983; 1 brachypterous male, 5 macropterous males, 4 macropterous females, 2 nymphs, Mandi Creek, CL 1797, 10 Sept. 1983; 7 macropterous males, 5 macropterous females, 2 nymphs, Nagam River, CL 1799, 10 Sept. 1983; 7 macropterous males, 3 macropterous females, Pasam, CL 1798, 10 Sept. 1983; 2 macropterous males, 4 macropterous females, Yemogu Creek, CL 1805, 13 Sept. 1983; 2 macropterous males, trib. of Yemogu Creek, CL 1804, 13 Sept. 1983; 1 macropterous male, Brandi River, nr. Wewak, CL 1796, 10 Sept. 1983 (all coll. by J.T. & D.A. Polhemus; JTPC). **Madang Prov.**: N. Guinea, Biró 97. Stephansort, Astrolabe B. (holotype, *H. horvathi*, HNHM). 2 males, Kau R., Kau Wildlife Area, N. of Madang, 50 m, 26 Mar. 1995, D.A. Polhemus; 1 male, 1 female, trib. to Mangen R. at Reinduk, 11 km SW Bunabun, 150 m, 28 Mar. 1995, D.A. Polhemus; 1 female, Gum R., nr. Ohu, 11 km W of Madang, 80 m, water temp. 28° C., 27 Mar. 1995, D.A. Polhemus (all macropterous, BPBM, JTPC). **Morobe Prov.**: 1 male, 2 females, NE of Wau, 1000 m, 7 Jan. 1970, J. Sedlacek; 1 male, 1 female, 5 km N of Bulolo, 630 m, 6 Aug. 1964, J. Sedlacek; 1 male, NE of Bulolo, 731 m, at light, 17 Aug. 1956, E. J. Ford; 8 females, Lae, July 1944, F. E. Skinner; 1 female, NE Busu R., E of Lae, 13 Sept. 1955, J. L. Gressitt; 1 female, 14 km W of Lae, 28–30 Oct. 1965; 2 females, Bulolo R., Wau, 880–900 m, 31 Aug. 1965, J. Sedlacek (BPBM). SOLOMON ISLANDS, **Guadalcanal**: 1 male, 1 female, Guadalcanal, D.E. Beck (USNM).

Hydrometra jourama Polhemus & Lansbury, new species Figs. 60–65, 133–34, 153

Description

MACROPTEROUS MALE. Length 12.99, width 0.77.

Color. Ground color light orange brown; abdominal tergite VI (the first visible) brown to blackish brown, shining, faintly transversely rastrate medially, VII–VIII mat and clothed with fine pubescence. Head tinged with fuscous dorsally, mostly black ventrally; lighter on sides, antreriorly and basally; lightly frosted ventrally and on narrow median longitudinal stripe dorsally behind eyes. Thorax dorsally with prominent narrow median longitudinal frosted stripe, laterally with broad frosted longitudinal stripe continuing along sides of abdomen onto segment VIII, visible in oblique light. Broad irregular longitudinal regions on either side of dorsal thoracic midline black. Thorax laterally irregularly marked with fuscous. Hemelytra brown; darker median longitudinal stripe set with 4 elongate irregular white spots beuond basal third, 2 in basal cell, 1 in distal cell and 1 near distal extreme; with 2 closed cells, veins dark. Legs, antennae fuscous to piceous, darker distally; all femora orange brown, piceous distally; coxae, trochanters mostly luteous, latter tinged with fuscous.

Structure. Head long (3.66), widest at antennal tubercles (0.56); clothed with very short decumbent setae; set beneath with bristly setae, somewhat longer beneath eyes, much longer and more numerous anteriorly; gular lobe large, truncate; rostrum reaching well caudad of eyes; ratio anteocular/postocular portions: 2.36/1.13; interocular space/width of an eye: 0.15/0.20; anteclypeus broad,

expanded anteriorly, truncate, anterior margin slightly indented and depressed medially (Fig. 60). Antennal formula I:II:III:IV; 0.82: 1.23: 4.90: 2.25. Prothorax with a row of pits on anterior lobe weakly demarcating collar, posterior lobe set with small pits, more numerous on sides. Pronotum length 2.10; remainder of thorax 1.69; abdomen length 7.41. Hemelytra dark brown, with 4 widely spaced elongate short white streaks, reaching to distal part of tergite VI. All abdominal sternites pilose, setae increasing in length and density posteriorly, longest and densest on sternite VI and base of VII. Distance between anterior and middle coxae (measured between closest margins) 0.87; between middle and hind coxae 1.74. Anterior and middle acetabulae with 1 pit each on anterior and posterior parts; posterior acetabula without pits. Entire venter thickly set with minute black denticles.

Proportions of legs as follows: Femur, tibia, tarsal I, tarsal II, tarsal III of fore-leg, 4.10: 4.40: 0.10: 0.41: 0.26; of middle-leg, 4.71: 4.97: 0.10: 0.66: 0.31; of hind-leg, 5.79: 6.60: 0.10: 0.56: 0.31

Male abdominal terminalia as shown in figs. 60–63, genitalia as in figs. 133–34. Seventh male sternite with 2 (1 + 1) clusters of golden setae on either side of the ventral midline, almost invisible except in oblique light.

MACROPTEROUS FEMALE. Length 13.08–13.37, width 0.87–0.96. Similar in most respects to male. Hemelytra dark brown, without a light stripe, reaching to middle of tergite VI. Abdominal terminalia as shown in Figs. 64–65.

BRACHYPTEROUS FEMALE. Length 13.04, width 0.78. Similar in most respects to macropterous female. Wings reaching onto base of tergite III.

MICROPTEROUS FORMS. Unknown.

Etymology. This species is named for the type locality; jourama is a noun in apposition.

Diagnosis. Hydrometra jourama is most closely related to *H. halei* Hungerford & Evans, and both species occur in Queensland. *H. halei* is very common and widespread in northern Australia, but *H. jourama* is so far known only from the restricted type region. The 2 species may be separated by the characters shown in the key.

Distribution. Australia (north Queensland) (Fig. 153).

Material examined. Holotype, macropterous male: AUSTRALIA: **Queensland**: Jourama Falls Nat. Park, CL 1716, 13 Aug. 1983, J.T. & D.A. Polhemus (ANIC). Paratypes: AUSTRALIA: **Queensland**: 20 macropterous males, 35 macropterous females, same data as holotype (JTPC, BPBM, ANIC). 1 brachypterous female, pond on Murray Falls Rd., CL 1720, 13 Aug. 1983, J.T. & D.A. Polhemus; 1 macropterous female, 6 km E Murray Falls, CL 1719, 13 Aug. 1983, J.T. & D.A. Polhemus (JTPC).

Hydrometra kiunga Polhemus & Lansbury, new species Figs. 66–73, 135–36, 152

Description

BRACHYPTEROUS MALE. Length 14.05–14.72, width 0.58–0.67.

Color. Ground color chocolate brown; abdominal tergites blackish brown, shining, faintly transversely rastrate except VII–VIII mat and clothed with fine pubescence. Head tinged with blackish dorsally, black ventrally, lighter on sides and basally, lightly frosted ventrally and on narrow median longitudinal stripe dorsally behind eyes. Thorax dorsally with prominent narrow median longitudinal frosted stripe flanked by broad black stripes, laterally with broad frosted longitudinal stripe continuing along sides of abdomen onto segment VIII, visible in oblique light. Broad irregular longitudinal regions on either side of dorsal thoracic midline, broad region of laterosternites, all connexiva except narrow margins, light brown. Legs, antennae fuscous to piceous, lighter distally; posterior femora sub-distally, all tibia sub-basally with poorly defined broad light annulus; coxae, trochanters mostly luteous.

Structure. Head long (4.30), widest at antennal tubercles (0.51); sparsely clothed with very short decumbent setae; set beneath with bristly setae, longer and more numerous anteriorly; gular

lobe of moderate size; rostrum reaching just caudad of eyes; ratio anteocular/postocular portions: 2.82/1.18; interocular space/width of an eye: 0.10/0.20; anteclypeus broad, expanded anteriorly, truncate, anterior margin straight but depressed medially (Fig. 66). Antennal formula I:II:III:IV; 0.87: 1.64: 6.14: 2.87. Prothorax without evident pits on anterior lobe, posterior lobe with numerous large shallow pits. Pronotum length 1.84; remainder of thorax 1.54; abdomen length 6.50. Wings reaching to distal part of tergite III. All abdominal sternites pilose, setae increasing in length and density to sternite VI, less dense on VII. Distance between anterior and middle coxae (measured between closest margins) 0.67; between middle and hind coxae 1.59. Anterior and middle acetabulae with 2 pits each on anterior and posterior parts; posterior acetabula without pits. Entire venter thickly set with minute black denticles.

Proportions of legs as follows: Femur, tibia, tarsal I, tarsal II, tarsal III of fore-leg, 5.22: 5.99: 0.10: 0.41: 0.26; of middle-leg, 5.99: 6.81: 0.10: 0.82: 0.31; of hind-leg, 7.48: 8.55: 0.10: 0.61: 0.31. Male abdominal terminalia as shown in Figs. 67–68, 72, genitalia as in Figs. 135–36. Seventh male sternite with 2 (1 + 1) tightly packed clusters each of about ten stout brown setae on either side of the ventral midline.

BRACHYPTEROUS FEMALE. Length 15.01–15.68, width 0.67. Similar in most respects to male. Abdominal terminalia as shown in figs. 69–71.

MACROPTEROUS FORM. Male, length 13.15–13.48, width 0.72. Female, length 14.59–15.37, width 0.72–0.83. Similar in most respects to brachypterous form. Hemelytra dark brown, with 4 widely separated elongate white streaks, reaching to middle of tergite VI; light markings much weaker in females.

MICROPTEROUS FORM. Unknown.

Etymology. This species is named for the type locality; *kiunga* is a noun in apposition.

Diagnosis. Hydrometra kiunga is most closely related to *H. halei*, but the latter is a shorter species with a slightly smaller patch of setae on ventrite VIII, a larger maxillary plate, and smaller gular lobe; *halei* does not occur outside of Australia. *H. kiunga* is also related to *H. eioana*, and both species occur in the southern part of Papua New Guinea. These species may be separated by the characters given in the key.

Distribution. Indonesia (southern Irian Jaya), Papua New Guinea (southern) (Fig. 152).

Material examined. Holotype, brachypterous male: PAPUA NEW GUINEA: **Western Prov.**: Fly River above Kiunga, CL 1774, 3 Sept. 1983, J.T. & D.A. Polhemus (BPBM). *Paratypes*: PAPUA NEW GUINEA: **Gulf Prov.**: 33 males, 46 females, 3 nymphs, 2 km S. Kopi Oil Camp, roadside ponds in lowland forest, water temp. 24° C., 27 Feb. 1995, D.A. Polhemus (BPBM, JTPC, ANIC). **Southern Highlands Prov.**: 31 males, 9 females, 1 nymph, 3.5 km S. Moro Oil Camp, branch of upper Kara Creek (trib. of Digimu R.) on road to Ridge Camp, 900 m, water temp. 20° C., 13 Mar. 1995, D.A. Polhemus (BPBM, JTPC); 11 males, 8 females, Moro Oil Camp, imponded roadside stream in forest, 840 m, water temp. 25° C., 24 Mar. 1995, D.A. Polhemus (BPBM, JTPC); 3 males, 1 female, rocky stream entering Lake Kutubu nr. Inu, 800 m, water temp. of stream 24° C., of lake 30° C., 15 Mar. 1995, D.A. Polhemus (BPBM); 1 male, 3 females, rocky stream at Ludesa Mission, 700 m, water temp. of stream 23° C., 20 Mar. 1995, D.A. Polhemus (BPBM); 9 males, 9 females, Moro Oil Camp, Kerisa Creek, 840 m, water temp. 22° C., 21–24 Mar. 1995, D.A. Polhemus (BPBM). **Western Prov.**: 3 brachypterous males, 5 brachypterous females, 1 macropterous male, same data as holotype (JTPC, BPBM); 6 brachypterous males, 3 brachypterous females, 10 km N Kiunga on OK Tedi Rd., CL 1775, 4 Sept. 1983, J.T. & D.A. Polhemus (JTPC). INDONESIA: **Irian Jaya Prov.**: 7 brachypterous males, 4 brachypterous females, 2 nymphs, swamp forest pond S of Walio Oil Field, 5 km S Kasim, 5 m, CL 2620, 29 Sept. 1991; 4 brachypterous males, 3 brachypterous females, 2 macropterous females, Wajar River, Wagon Mts., Salawati Isl., 0–30 m, CL 2623, 30 Sept. 1991; 6 brachypterous males, 2 brachypterous females, 1 macropterous male, 3 macropterous females, small forest trib. to Klagalo River, 45 km SE of Sorong, 45 m, CL 2628, 1 Oct. 1991; 3 brachypterous males, 2 brachypterous females, pools in lowland forest stream, 28 km NE Kasim, 15

m, CL 2630, 2 Oct. 1991; 9 brachypterous males, 6 brachypterous females, 1 macropterous male, Batuputih River, nr. Krooy, 3 km NW Kaimana, 30 m, CL 2639, 12 Oct. 1991 (all coll. by J.T. & D.A. Polhemus; JTPC).

Hydrometra lineata Eschscholtz — Figs. 1, 75–79, 139–41, 153

Hydrometra lineata Eschscholtz, J.F., 1822. Entomographien, Berlin, Lfg. 1, p.110. (Type-locality, Philippines, Luzon, near Manila; repository unknown)

Hydrometra vittata Stål, C., 1870. Öfv. Kongl. Vet.-Akad. Forh. 27: 705. (Type-locality, Philippines; NHRS). Syn. by Lundblad, 1933: 429.

Description

MACROPTEROUS MALE. Length 11.68–13.12, width 0.61.

Color. Ground color brown; abdominal tergite VI orange brown, faintly shining, faintly rastrate medially; VII, VIII mostly mat and clothed with fine pubescence; VII with basal median area faintly shining, pruinose laterally; VIII pruinose. Head tinged with blackish dorsally between and ahead of eyes, ventrally except basally and anteriorly, very lightly pruinose ventrally and on median longitudinal light stripe dorsally behind eyes. Thorax dorsally with prominent median longitudinal pruinose stripe, wider on posterior lobe, pronotum laterally with narrow arched pruinose longitudinal stripe; most of remainder of thorax and abdomen at least lightly pruinose except broad abdominal stripe along junction of medio- and laterotergites, visible in oblique light. Head ventrally beneath base and anterior margin, broad irregular longitudinal regions on either side of dorsal thoracic midline of posterior lobe, venter of thorax and abdomen, yellowish brown. Connexiva brown, inner margin pruinose, lighter medially; pruinosity more pronounced at segmental sutures on laterosternites. Legs, antennae yellowish brown to brown, darker distally; coxae, trochanters mostly light yellowish brown, similar to bases of femora.

Structure. Head long (3.33), widest at antennal tubercles (0.39); almost devoid of setae, with a few scattered very short decumbent setae, anteroventrally with a few bristly setae; maxillary plate of moderate size, covering base of gular lobe, not extending to tip of anteclypeus anteriorly; gular lobe of moderate size, elongate; rostrum reaching well caudad of eyes, about 1/2 way to prosternum; ratio anteocular/postocular portions: 2.11/0.89; interocular space/width of an eye: 0.11/0.14; anteclypeus broadly rounded to obtusely angled anteriorly (Fig. 76). Antennal formula I:II:III:IV; 0.61: 1.33: 2.94: 1.50. Prothorax with row of deep encircling pits on anterior lobe setting off collar, plus 6–8 along lateral margin, posterior lobe with numerous pits including on midline, each pit appearing pruinose in oblique light. Pronotum length 1.78; remainder of thorax 1.50; abdomen length 4.66. Hemelytra reaching middle of tergite VI; basal white stripe mesad of R + M evanescent beyond basal fourth; median stripe bright white, commencing near base, extending almost to apex, interrupted only by cross veins. Abdominal sternites sparsely set with short slender setae, more numerous on V–VII. Posterior femur without long setae. Distance between anterior and middle coxae (measured between closest margins) 0.83; between middle and hind coxae 1.50. Anterior, middle acetabulae with 2 or 3 pits each on anterior and posterior parts; posterior acetabula with 1 pit dorsally on anterior part. Entire venter set with minute black denticles.

Proportions of legs as follows: Femur, tibia, tarsal I, tarsal II, tarsal III of fore-leg, 3.33: 3.55: 0.10: 0.33: 0.22; of middle-leg, 3.94: 3.94: 0.10: 0.61: 0.33; of hind-leg, 4.77: 5.38: 0.10: 0.50: 0.28.

Abdominal terminalia as shown in figs. 77–78, genitalia as in figs. 139–41. Male sternite VII slightly depressed and bare medially, setose laterally, with many long setae, most dense near posterior margin. Eighth sternite unmodified, weakly raised medially, caudal process of moderate length, directed slightly dorsad, slightly curved. Segment IX with well developed lateral wings.

MACROPTEROUS FEMALE. Length 11.34–14.88, width 0.67. Most structures and coloration as in male, except abdominal sternites not set with long setae. Hemelytra reaching middle to distal part of tergite V; bright white markings similar to male. Caudal process of tergite VIII prominent, slightly curved. Connexiva of tergite VII posteriorly directed inward, usually set with short dark setae (Fig. 79).

BRACHYPTEROUS FORM. Hemelytra reaching onto tergite II, each with a narrow white stripe on inner margin which together form a continuation of the light prontal pruinose stripe. Pronotum narrower posteriorly than in macropter, usually with fewer pits.

MICROPTEROUS FORM. Unknown.

Diagnosis. Hydrometra lineata is very similar to *Hydrometra orientalis*, and their distributions overlap, however the 2 species may be separated by the characters given in the key above, and by the posteriorly convergent connexiva in females of *lineata* (Fig. 79). In addition, *H. lineata* has a continuous pruinose stripe on the dorsum of the connexiva, which is lacking in *H. orientalis*.

Distribution. Borneo (Sabah), Ambon, Celebes, New Guinea (Irian Jaya), Philippines (Leyte, Luzon, Mindanao, Palawan) (Fig. 153).

Material examined. INDONESIA: **Irian Jaya Prov.**: 1 brachypterous male, swamp forest pond S of Walio Oil Field, 5 km S Kasim, 5 m, CL 2620, 29 Sept. 1991; 9 brachypterous males, 10 brachypterous females, 2 macropterous males, 2 macropterous females, pond 3 km E of Klagalo River, SE of Sorong, 80 m, CL 2625, 1 Oct. 1991; 3 brachypterous males, 2 macropterous females, Klagalo River at Klagagi Oil Field, SE of Sorong, 45 m, CL 2627, 1 Oct. 1991; 1 brachypterous male, Aimasi River, Arfak Mtns., 60 km SW Manokwari, 90 m, CL 2651, 19 Oct. 1991 (all coll. by J.T. & D.A. Polhemus; JTPC).

Hydrometra mindoroensis Polhemus — Figs. 80–83, 89–95, 144–45, 150

Hydrometra mindoroensis Polhemus, J.T., 1976. In Polhemus, J.T. & W.K. Reisen, Kalikasan, Philipp. J. Biol. 5: 283. Holotype, male, San Jose, Mindoro, Philippines (CAS).

Description

MICROPTEROUS MALE. Length 9.92–10.56 long, width 0.39 (versus 0.50 in the macropterous form).

Color. Ground color brown, dorsally mostly brown to orange brown; abdominal tergites orange brown, shining except VII, VIII mat, clothed with fine pubescence, all but median part pruinose. Head tinged with black dorsally, laterally, entirely lightly pruinose, more noticeable on median longitudinal stripe dorsally behind eyes. Pronotum dorsally with median longitudinal pruinose stripe, on posterior lobe broader, bordered with brown on each side; laterally with an arched pruinose longitudinal stripe, weakly continuing linearly along remainder of thorax and abdomen onto segment VIII, visible in oblique light; entire venter more lightly pruinose, separated from pruinose stripe described above by dark stripe which, in completely different oblique light (by 90°), is also pruinose. Connexiva except narrow margins, brown, basal third of each segment and adjacent spot on each laterosternite heavily pruinose. Legs, antennae light brown to brown, darker distally; coxae, trochanters mostly light brown, similar to bases of femora.

Structure. Head long (2.89), widest at antennal tubercles (0.36); set with very short inconspicuous recumbent setae, longest beneath anterior extreme; maxillary plate not prominent; gular lobe large, truncate ventrally, covering base of rostrum; rostrum reaching well caudad of eyes, about 3/4 toward prosternum; ratio anteocular/postocular portions: 1.83/0.83; interocular space/width of an eye: 0.08/0.15; anteclypeus small, tapering anteriorly, lateral margins straight, rounded to conical anteriorly (Figs. 81, 89). Antennal formula I:II:III:IV; 0.39: 0.92: 2.83: 1.50. Prothorax with a row of encircling small pits on anterior lobe setting off collar, posterior lobe with scattered shallow pits, with row of shallow pits on midline. Pronotum length 1.28; remainder of thorax 1.17; abdomen length 3.77. Wing pads very small, barely visible. Abdominal sternites set with scattered short semi-erect setae, plus a few long erect setae increasing in length posteriorly, longest, most numerous on tergite VI. Distance between anterior and middle coxae (measured between closest margins) 0.50; between

middle and hind coxae 1.05. Anterior, middle acetabulae with 1 or 2 pits each on anterior and posterior parts; posterior acetabula with 1 pit on anterior part dorsally. Entire venter, head except base, anterior lobe of pronotum set with minute black denticles.

Proportions of legs as follows: Femur, tibia, tarsal I, tarsal II, tarsal III of fore-leg, 2.83: 3.22: 0.10: 0.25: 0.22; of middle-leg, 3.16: 3.55: 0.10: 0.33: 0.22; of hind-leg, 3.77: 4.72: 0.10: 0.28: 0.122.

Male abdominal terminalia as shown in figs. 82–83, 91–94, genitalia as in figs. 144–45. Male sternite VII with 2 (1+1) small black widely separated posteriorly directed processes along anterior margin, each set on a weak tumescence, each composed of tightly clustered dark stiff setae, similar to strigosa; also set with 2 (1+1) patches of short dark stiff setae near posterior margin, less widely spaced than the previous structures. Eighth male sternite broadly laterally compressed basally, forming a weak excavation on each side, ventral margin slightly curved.

MICROPTEROUS FEMALE. Length 10.40–12.48 long, width 0.44 (versus 0.61 in the macropterous form). Similar in most respects to male, but slightly larger and broader across abdomen; color lighter, more uniform light to orange brown dorsally. Abdomen curved upward caudally; set with stiff upright setae along connexival margin of tergite VI (and sometimes part of V), basal part of VII; ventrally set with short erect setae, longer caudally, densest on sternites V–VII; ventrite VIII laterally with numerous dark curved setae forming a brush plainly visible from above; distal process of tergite VIII prominent, straight. Abdominal terminalia as shown in figs. 90, 95.

MACROPTEROUS FORM. Most characteristics as in micropterous form. Hemelytra brown, reaching base of tergite VII in males, middle of tergite VI in females; male with long basal light streak mesad of M + Cu, plus long medial sordid white stripe (sometimes partly effaced) reaching from near base almost to apex, interrupted only by dark cross veins; light markings effaced in female.

BRACHYPTEROUS FORM. Not known.

Diagnosis. This species is widespread in the Philippine Islands and Celebes, with a few records from northern Borneo. It is very closely related to *H. lombok* from the western Malay Archipelago, but not to any other Melanesian species, although it is in the same species group as the widespread *H. strigosa.* See key.

Distribution. Borneo, Celebes, Philippines (Leyte, Luzon, Mindanao, Mindoro, Palawan), New Guinea (Papua New Guinea, Irian Jaya) (Fig. 150).

Material examined. (all micropterous): PAPUA NEW GUINEA: **East Sepik Prov.**; 5 males, 1 female, Nagam River, CL 1799, 10 Sept. 1983, J.T. & D.A. Polhemus (JTPC). INDONESIA: **Irian Jaya Prov.**: 1 male, 3 females, small forest trib. to Klagalo River, 20 km SE of Sorong, 45 m, CL 2628, 1 Oct. 1991; 2 males, 2 females, Klagalo River at Klagagi Oil Field, SE of Sorong, 45 m, CL 2627, 1 Oct. 1991; 10 males, 11 females, Wajar River, Wagon Mts., Salawati Isl., 0–30 m, CL 2623, 30 Sept. 1991 (all coll. by J.T. & D.A. Polhemus; JTPC).

Hydrometra novaehollandiae Polhemus & Lansbury, **new species** Figs. 100–03, 146, 149

Description.

MICROPTEROUS MALE. Length 9.72–10.49, width 0.38–0.48.

Color: Ground color brown, dorsally mostly orange brown; abdominal tergites orange brown, shining, faintly rastrate medially except VII laterally, VIII all but medially frosted and clothed with fine pubescence. Head tinged with blackish antero-dorsally, mostly darker ventrally, very lightly frosted ventrally and on narrow median longitudinal stripe dorsally behind eyes. Thorax dorsally with weakly developed narrow median longitudinal frosted stripe, pronotum laterally with an arched frosted longitudinal stripe, continuing linearly along remainder of thorax and abdomen onto segment VIII, visible in oblique light. Head ventrally beneath base, eyes and anterior margin, venter of thorax and abdomen, all connexiva except narrow margins, light brown. Legs, antennae light brown to brown, darker distally; coxae, trochanters mostly light brown, similar to bases of femora.

Structure: Head long (2.87), widest at antennal tubercles (0.41); set with very short inconspicuous recumbent setae; ventrally with short bristly setae on basal 1/2 and anteriorly, latter longest; gular

lobe of moderate size, not covering base of rostrum; rostrum reaching well caudad of eyes, about 3/4 toward pronotum; ratio anteocular/postocular portions: 1.79/0.87; interocular space/width of an eye: 0.10/0.15; anteclypeus small, tapering anteriorly, broadly rounded anteriorly (Fig. 97). Antennal formula I:II:III:IV; 0.46: 0.97: 2.71: 1.59. Prothorax with an inconsipuous row of weakly formed encircling pits on anterior lobe setting off collar, posterior lobe with scattered shallow pits, plus a row of deep pits on midline, each of the latter appearing frosted in oblique light. Pronotum length 1.54; remainder of thorax 1.38; abdomen length 4.51. Wing pads short to barely visible, not reaching more than 1/4 of distance to abdomen. Abdominal sternites pilose, set with scattered long erect pubescence, increasing in length and density posteriorly, longest, densest on tergites VI, basal 2/3 of VII, base of VIII. Distance between anterior and middle coxae (measured between closest margins) 0.67; between middle and hind coxae 1.23. Anterior and middle acetabulae with 2 pits each on anterior and posterior parts; posterior acetabula with 1 pit on anterior part dorsally. Entire venter set with minute black denticles.

Proportions of legs as follows: Femur, tibia, tarsal I, tarsal II, tarsal III of fore-leg, 2.69: 3.27: 0.10: 0.26: 0.20; of middle-leg, 3.27: 3.56: 0.10: 0.36: 0.26; of hind-leg, 4.04: 4.11: 0.10: 0.36: 0.26.

Male abdominal terminalia as shown in figs. 98, 100, 102, genitalia as in fig. 147. Sternite VII with 2 (1 + 1) small black widely separated posteriorly directed processes along anterior margin, each composed of tightly clustered dark stiff setae plus a fringes of longer golden setae; these processes vary from well developed to essentially absent, but always visible. Eighth sternite broadly laterally compressed on middle.

MICROPTEROUS FEMALE. Length 10.97–11.16, width 0.48–0.58. Similar in most respects to male. Abdominal terminalia as shown in Figs. 101, 103.

BRACHYPTEROUS, MACROPTEROUS FORM. Unknown.

Diagnosis. Hydrometra novaehollandiae is closely related to *H. mindoroensis*, *H. darwiniana* and *H. strigosa*; the latter is sympatric with *novaehollandiae* in New South Wales. The males of *H. novaehollandiae* and *H. strigosa* are easily separated by differences in the modifications of abdominal segments VII and VIII (see key and Figs. 102, 104). Females, however, are more difficult to separate, and the 2 species occur together in Royal National Park, New South Wales. In *novaehollandiae* the anteclypeus (AC) is blunt anteriorly and scarcely exceeds the anterior edge of the maxillary plate (MXP), whereas in *strigosa* the AC is more acutely rounded anteriorly and exceeds the anterior edge of the MXP. In addition, in *novaehollandiae* females the middle coxal cavities are closer together than the posterior ones when compared to *strigosa*; in *novaehollandiae* females the ratio of the distance between the middle coxal cavities divided by the distance between the posterior coxal cavities is 0.43, whereas in *strigosa* the ratio is 0.58 to 0.71 where the 2 species are found together. In females of *strigosa* from Ellery Gorge, near Alice Springs, the lowest ratio is 0.53. Female connexival margins of segments VI and VII of *novaehollandiae* have a fringe of long slender upright setae, only on segment VII of *strigosa*. The extent of ventral frosting is also different in the 2 species; in oblique lateral view, the frosting of the abdominal venter of *strigosa* is almost complete, with only a narrow dark band evident below the broad laterosternal bright stripe adjacent to the connexival margin, whereas in *novaehollandiae* the ventral frosting is much weaker, the broad laterosternal stripe appearing as a broad dark stripe in the same aspect. Lastly the degree of micropterous wing development is different in the 2 species, and diagnostic; in *H. novaehollandiae* only the micropterous form is known, with wing pads barely visible to very short, not reaching one-fourth of the distance from their origin to the base of the abdomen; in *H. strigosa* both the macropterous and micropterous forms are known, the latter with wing pads reaching almost halfway to abdomen.

Distribution. Australia (southeastern) (Fig. 149).

Material examined. Holotype, micropterous male: AUSTRALIA: **New South Wales:** Royal Nat. Park, Upper Causeway, CL 1405, 20 Dec. 1977, J.T. & M.S. Polhemus (ANIC). *Paratypes:* (all micropterous). AUSTRALIA: **New South Wales:** 9 males, 5 females, same data as holotype; 1 male, Kurrajong, CL 1403, 19 Dec. 1977, J.T. & M.S. Polhemus; 4 males, 1 female, Royal Nat. Park, Upper Bola Cr., cold clear stream, 7 Nov. 1970, H.C. Chapman; 1 male, Point Clave, nr. Gosford, 16 Feb. 1958, M.J. Nitikin (JTPC).

Hydrometra orientalis Lundblad — Figs. 74, 84–88, 107–12, 142–43, 148

Hydrometra orientalis Lundblad, O., 1933. Arch. Hydrobiol., Suppl. Bd. 12, Trop. Binnengewass. 4: 430. Holotype, male, Sumatra (NHRS).

Hydrometra insularis Hungerford, H.B. & N.E. Evans, 1934. Ann. Mus.Nat. Hungar. 28: 76. Holotype, male, Sumatra (Vienna Musuem). Syn. by Polhemus, J.T. & W.K. Reisen,, 1976, Kalikasan, Philipp. J. Biol. 5: 284. Preoccupied by *Hydrometra insularis* Motschulsky, 1886.

Hydrometra sumatrana Ruhoff, F.A., 1964. Proc. Entomol. Soc. Wash. 66: 32. Syn. by Polhemus, J.T. & W.K. Reisen, 1976, Kalikasan, Philipp. J. Biol. 5: 284. Unnecessary new name for *H. insularis* Hungerford & Evans, 1934.

Description

MACROPTEROUS MALE. Length 9.81–11.74, width 0.29–0.38.

Color. Ground color light brown tinged with dark brown; abdominal tergite VI orange brown, faintly shining, faintly rastrate; VII–VIII mostly mat and clothed with fine pubescence; VII with small basal median area faintly shining, faintly pruinose laterally; VIII pruinose laterally. Head tinged with brown dorsally between eyes, ventrally except basally, beneath eyes and anteriorly, very lightly pruinose ventrally and on median longitudinal light stripe dorsally behind eyes. Thorax dorsally with prominent median longitudinal pruinose stripe, wider on posterior lobe, pronotum laterally with narrow arched pruinose longitudinal stripe; most of remainder of thorax and abdomen at least lightly pruinose except broad abdominal stripe along junction of medio- and laterotergites, visible in oblique light. Head ventrally beneath base and anterior margin, broad irregular longitudinal regions on either side of dorsal thoracic midline of posterior lobe, venter of thorax and abdomen, yellowish brown. Connexiva brown, weakly pruinose; pruinosity more pronounced at segmental sutures on laterosternites. Legs, antennae yellowish brown to brown, darker distally; coxae, trochanters mostly light yellowish brown, similar to bases of femora.

Structure. Head long (3.17), widest at antennal tubercles (0.38); almost devoid of setae, with a few scattered very short decumbent setae, anteroventrally with a few bristly setae; maxillary plate of moderate size, covering base of gular lobe, not extending to tip of anteclypeus anteriorly; gular lobe of moderate size, elongate; rostrum reaching well caudad of eyes, about 1/2 way to prosternum; ratio anteocular/postocular portions: 1.95/0.87; interocular space/width of an eye: 0.10/0.15; anteclypeus broadly to sharply angled anteriorly (Fig. 85, 107). Antennal formula I:II:III:IV; 0.41: 1.02: 2.36: 1.13. Prothorax with row of deep encircling pits on anterior lobe setting off collar, plus 6–8 along lateral margin, posterior lobe with numerous pits including on midline, each pit appearing pruinose in oblique light. Pronotum length 1.59; remainder of thorax 1.43; abdomen length 3.94. Hemelytra reaching base of tergite VI; basal white stripe mesad of R + M continuing to beyond middle, weak beyond; median stripe sordid white, commencing near base, extending almost to apex, broadly interrupted at least 3 times at cross veins, usually more. Abdominal sternites sparsely set with very short slender setae, numerous long erect setae on at least distal 1/2 of VI (sometimes all, and posterior part of V), all of VII. Posterior femur without long setae. Distance between anterior and middle coxae (measured between closest margins) 0.77; between middle and hind coxae 1.33. Anterior, middle acetabulae with 2 or 3 pits each on anterior and posterior parts; posterior acetabula with 1 pit dorsally on anterior part. Entire venter set with minute black denticles.

Proportions of legs as follows: Femur, tibia, tarsal I, tarsal II, tarsal III of fore-leg, 3.02: 3.28:

0.10: 0.26: 0.20; of middle-leg, 3.38: 3.74: 0.10: 0.36: 0.26; of hind-leg, 3.94: 5.02: 0.10: 0.31: 0.26.

Abdominal terminalia as shown in figs. 86–87, 108, 110–11, genitalia as in figs. 142–43. Sternite VII flattened or slightly depressed medially, covered with long slender erect setae. Eighth sternite unmodified, broadly carinate medially, caudal process of moderate length, straight. Segment IX with weakly developed lateral wings

MACROPTEROUS FEMALE. Length 11.68–13.44, width 0.58. Most structures and coloration as in male. Hemelytra reaching distal part of tergite V or base of tergite VI; broken median light stripe similar to male, but much weaker or effaced. Caudal process of tergite VIII prominent, directed very slightly dorsad, straight. Abdominal terminalia as shown in figs. 88, 109, 112.

BRACHYPTEROUS FORM. Females, width 10.58–12.12, width 0.38. Most structures and coloration as in macropter. Hemelytra narrow strips reaching onto base of abdomen; with narrow white stripe on each, adjacent to each other, thus forming a medial white stripe. Basal abdominal tergites light orange brown.

MICROPTEROUS FORM. Unknown.

Diagnosis. Hydrometra orientalis is closely related to *H. lineata* , a species that is also widespread. These 2 species are sympatric in the Philippines, but not in the region dealt with here. They are difficult to separate at first glance, but have a number of separating characters as shown in the key. The specimens from Australia and Papua New Guinea have the abdominal venter more hirsute than those from further north, i. e. strongly hirsute on the posterior half of sternite V, and all of VI, VII versus more weakly hirsute on the posterior half of sternite VI, and all of VII. In addition the anteclypeus is usually less sharply conical, the male terminal process is shorter, and the maxillary plate is usually more produced anteriorly than those from further north and west. These differences originally suggested that we were dealing with 2 species, however an analysis of numerous specimens leads to the conclusion that we are most likely dealing with a clinal character shift. We will need to see much more material from various regions before the matter can be resolved. This species and *H. lineata* may be separated by the characters given in the key; see also discussion under the latter.

Distribution. Philippines (Luzon, Lubang, Mindanao), Celebes, Java, Sumatra, Sumba, Papua New Guinea, Malay Peninsula, Thailand, Burma, Vietnam, Australia (Fig. 148).

Material examined. (all macropterous): AUSTRALIA, **Northern Territory**: 2 males, 2 females, Arnhem Hwy., Wildman R., W. Branch, 17 May 1979, I. Lansbury (ILC); 1 female, Darwin River, 16 km SW by S of Noonamah, 12°44' S 130° 58' E, 16 May 1974, T. Angeles & W. Mollah (ANIC). 2 males, Gimbat St., mvlt, 13° 29' S 132° 28' E, 7–8 Oct. 1986, P. Horner (MAGD). 1 female, Howard Springs, at light, 2 May 1982, J. Doyen (CAS). 1 male, 7 km SW Katherine, 22 Oct. 1962, E. S. Ross & D.Q. Cavagnaro (JTPC). **Queensland**: 1 male, 2 females, Mt. Webb N. P., nr. Cooktown, stop 27, 27–30 Apr. 1981, D.F.C. Rentz (ANIC). 2 males, 2 females, Coen River at Coen, CL 1748, 22 Aug. 1983, J.T. & D.A. Polhemus; 2 females, Stewart River S of Coen, CL 1747, 22 Aug. 1983, J. T. & D. A. Polhemus; 1 female, Archer River along Peninsula Dev. Rd., CL 1749, 22 Aug. 1983, J. T. & D. A. Polhemus (JTPC). PAPUA NEW GUINEA: **East Sepik Prov.**: 2 males, 1 female, Nagam River, CL 1799, 10 Sept. 1983; 1 female, Brandi River, nr. Wewak, CL 1796, 10 Sept. 1983; 3 males, 3 females, Urr-u Creek, 6 km E Wandeman, CL 1808, 13 Sept. 1983; 6 males, 3 females, Yemogu Creek, 2 km W. Tring, CL 1805, 13 Sept. 1983 (all coll. by J.T. & D.A. Polhemus; JTPC).

Additional material examined (questionable determinations): AUSTRALIA, **Northern Territory**: 1 female, Cooper Cr., 11 km SW Nimbuwah Rock, at light, 12°17' S 133°20' E, 3 June 1973, R.I Kitching; 1 female, 1 km N Cahills Crossing, East Alligator R., at light, 12°25' S 132°58' E, 7 June 1973, R.I Kitching; 1 female, 16 km NE Mt. Cahill, at light, 12°50' S 132°51' E, 7 June 1973, R.I Kitching; 1 female, Kakadu N. P., Jim-Jim Gorge, 21 Feb. 1989, P. Dostine (OSSJ).

Hydrometra papuana Kirkaldy Figs. 2–5, 113–17, 146, 154, 155

Hydrometra papuana Kirkaldy, G. W., 1901. Ann. Mus. Civ. Storia Nat. Genova (Ser. 2) 20: 807 (Type-locality, Fly River, New Guinea; type lost, supposed to be in Mus. Civ. Storia Nat., Genova; neotype, macropterous male, designated here, from Fly River area, Papua New Guinea, BPBM)

Hydrometra hoplogastra Hale, H. M., 1925. Arkiv för Zoologi 17A, N. 20: 2. (Type-locality, Australia, Queensland, Laura; NHRS). New synonymy.

Description

MICROPTEROUS MALE. Length 11.93–13.18, width 0.38–0.48.

Color. Ground color light orange brown; abdominal tergites orange brown, shining, faintly rastrate medially except most of VII, VIII mat and clothed with fine pubescence; basal triangle on VII shining. Head weakly tinged with fuscous dorsally between eyes and anteriorly, lighter and lightly frosted ventrally. Pronotum dorsally without median longitudinal black or frosted stripes; laterally with broad frosted longitudinal stripe continuing along sides of abdomen onto segment VIII, visible in oblique light. Narrow connexival margins, dark brown. Legs, antennae orange brown to brown, darker distally. Coxae, trochanters mostly luteous, latter tinged with brown.

Structure. Head very long (4.10), widest at antennal tubercles (0.37); set beneath with a few bristly setae anteriorly; gular lobe of large size; rostrum reaching just caudad of eyes; ratio anteocular/postocular portions: 2.76/0.92; interocular space/width of an eye: 0.10/0.15; anteclypeus broad, almost parallel sided, anterolateral angles rounded, anterior margin almost straight but broadly depressed medially (Fig. 113). Antennal formula I:II:III:IV; 0.77: 1.89: 5.63: 1.79. Prothorax with an encircling row of scattered weak pits on anterior lobe demarcating broad collar, posterior lobe with a few weak pits medially. Pronotum length 1.89; remainder of thorax 2.05; abdomen length 5.07. Wing pads very short, usually not visible, hidden under pronotum. Abdominal sternites with a few scattered long slender setae. Distance between anterior and middle coxae (measured between closest margins) 1.02; between middle and hind coxae 1.84. Acetabulae without pits.

Proportions of legs as follows: Femur, tibia, tarsal I, tarsal II, tarsal III of fore-leg, 4.86: 5.38: 0.10: 0.31: 0.20; of middle-leg, 5.48: 6.35: 0.10: 0.51: 0.31; of hind-leg, 6.20: 7.68: 0.10: 0.51: 0.31.

Abdominal terminalia as shown in figs. 114, 116, genitalia as in fig. 146. Male sternite VII with 2 (1+1) black widely separated setose pads, each posteriorly raised, each composed of tightly clustered dark stiff setae, occupying about 1/2 the length of the segment. Eighth male sternite weakly depressed on sides, forming a weak median carina in the form of 2 Vs with their points touching; distal process of tergite VIII short, straight.

MICROPTEROUS FEMALE. Length 14.05–18.09 long, width 0.58–0.67. Similar in many respects to male, except coloration somewhat darker, especially the abdomen medially. Abdomen slightly curved upward distally; sternite VII caudally produced, caudal extreme exceeding segment VIII; connexival segments V–VII set with a row of erect slender setae on posterior 1/2 to 2/3; terminal process of tergite VIII absent. Abdominal terminalia as shown in Figs. 115, 117.

MACROPTEROUS FORM. Males, length 12.03–13.08, width 0.58. Females, length 13.76–15.68, width 0.67–0.77. Most characteristics as in micropterous form, except pronotum larger, longer. Hemelytra brown, reaching onto base of tergite V in males, middle of tergite V in females; male with short basal light streak mesad of M + Cu, plus long medial white stripe reaching from near base almost to apex, interrupted only by dark cross veins; light markings effaced in female.

BRACHYPTEROUS FORM. Unknown.

Diagnosis. Hydrometra papuana is not close to any other species of *Hydrometra* in the region treated here, but instead seems most closely related to species occurring in Madagascar, especially *H. cavernicola* J. Polhemus & D. Polhemus, 1987; there is a relationship, but less close, with South American species, notably *H. metator* White. Characters similar in *H. papuana* and *H. cavernicola* are the very long, slender body and head, lack of pits on the acetabula, extreme microptery, pad-like processes in the same position on a

very short male sternite VII, female tergite VII extended posteriorly, and trapezoidal female tergite VIII without a well developed process; this character set is probably a mixture of plesiomorphies and apomorphies, a matter to be analyzed in a forthcoming phylogenetic analysis. The anteclypeus is blunt anteriorly, but much narrower than in any other species with a blunt anteclypeus. The raised pad-like processes on the seventh male abdominal sternite are unique. The lack of a well developed female distal process on tergite VIII is shared only by *H. aculeata* from New Caledonia and *H. gagnei* from Tahiti (both much shorter and smaller species), *H. cavernicola*, and several South American species.

Kirkaldy apparently described a dark colored macropterous specimen; most of the specimens we have seen are micropterous or macropterous, and our specimens usually have a lighter coloration. Specimens from the western Malay Archipelago are generally somewhat larger in size and darker than those from New Guinea, thus the descriptions of the 2 populations differ slightly (see J. & D. Polhemus, 1995b).

Specimens termed "apterous" by most workers are in fact micropterous with hidden wing pads or buds (see discussion in J. Polhemus & D. Polhemus, 1987); we have 1 female with tiny exposed wing pads, but in all others they are hidden.

The distribution shown on the map is only for the area considered in this paper; the distribution of this species the western Malay Archipelago was provided by J. & D. Polhemus (1995b).

Type-material. The "type" of *Hydrometra papuana* was said by Hungerford and Evans (1934) to have been destroyed, but they did not elaborate. Kirkaldy did not designate holotypes, at least we have never seen one. One of us (JTP) has searched most of the major museums of the world without finding a type of this species, and additionally corresponded with Dr. Valter Raineri of the Museo Civico di Storia Naturale "Giacamo Doria" in Genova, Italy (MCSN) where the type or types should be housed. There should be at least 2 specimens, both males, that would qualify as lectotypes, as Kirkaldy listed "New Guinea: Fly River, (L.M. D'Albertis, 1876–77); Rigo, (Loria, July, 1899)." In the type collection of the Snow Entomological Museum, University of Kansas, there is a pin with an empty card that apparently once supported 1 of these specimens, bearing the labels: Nuova Guinea, Fly River, L.M. D'Albertis 1876–1876 (top label, printed); *Hydrometra papuana* Kirkaldy Type (2nd label, handwritten); Limnobates stagnorum (3rd, handwritten); Museo Civ. Genova (4th, printed on yellow paper); 363 (5th, printed on blue paper); The G.W. Kirkaldy Collection now Univ. of Kans. Coll. (6th, printed on green paper). Much of the Kirkaldy Collection was acquired by J.R. de la Torre-Bueno after Kirkaldy's untimely death, and subsequently Torre-Bueno's collection was purchased from his widow by H.B. Hungerford at the University of Kansas. During the time Torre Bueno's collection was stored in the basement of his private home in Tucson, Arizona, a flood caused considerable damage and possibly floated the specimen off the card. In any case, it appears that no type material presently exists.

Hungerford and Evans (1934) deferred a decision concerning the relationship of *papuana* and *hoplogastra*, stating that "the question cannot be settled without the examination of more material." With much more material available from both New Guinea and Australia, the matter still cannot be resolved without reference to a type.

Kirkaldy's description is hopelessly inadequate, and unfortunately in most respects could apply to either *papuana* or the new species described herein, *H. kiunga*, both found in the same area. Both of these have the fore femur reaching beyond the apex of the head,

anterior part of the head more than twice as long as posterior part, and the last abdominal sternite widening posteriorly. The color is variable in both of these but selected specimens of either could match the description. Only the "elytra with a longitudinal, interrupted whitish stripe" and "underside blackish" give us a clue, as we have 1 specimen from near Kiunga in the Fly River area that matches these descriptors. This macropterous male also conforms to the presently accepted concept of the species, thus in order to avoid future upheavals in the nomenclature it is here designated as neotype, bearing the following labels: 1) "PAPUA NEW GUINEA, Western Prov., 7 km N Kiunga on OK Tedi road, CL 1775, 4 Sept. 1983, J.T. & D.A. Polhemus." 2) a pink label with "Neotype, *Hydrometra papuana* Kirkaldy, J.T. Polhemus." This specimen will be placed in the Bishop Museum (BPBM).

One of us (IL) has studied the type of *Hydrometra hoplogastra*, and confirmed that it agrees with the current concept of *H. papuana*.

Distribution. Borneo (East Kalimantan), Malay Peninsula (Pahang), New Guinea, Australia (Figs. 154, 155).

Material examined. AUSTRALIA, **Northern Territory**: 1 male, 1 female, 9 km NE Mudginbarry HS, 12°31' S 132°54' E, 10 June 1973, R.I Kitching; 1 female, 1 km N Cahills Crossing, East Alligator R., 12°25' S 132°58' E, 7 June 1973, R.I Kitching; 1 female, 6 km SSW Oenpelli, 12°22' S 133°01' E, 8 June 1973, R. I Kitching (ANIC). 1 female, Howard Spring, 3 May 1979, I. Lansbury; 2 females, Fogg Dam, 4 May 1979, I. Lansbury; 1 female, Koongarra, small pool, 9 May 1979, I. Lansbury; 1 male, 2 females, Stapleton Cr., detritus and floating macrophytes, 15 May 1979, I. Lansbury; 1 female, Mary R., pools, shallow, grassy, 17 May 1979, I. Lansbury (ILC). many males, females, Koongarra Cr., nr mining camp, 8 May 1979, I. Lansbury; 5 males, many females, Flying Fox Cr., I. Lansbury (ANIC, ILC). 1 male, Limestone Gorge, 16° 02' S 130°23' E, 23–26 June 1986, Operation Raleigh, M. Malipatil; 1 male, 1 female, 5 km SW Armstrong River on Buchanan Hwy., 13 Nov. 1984, M. Malipatil; 1 female, Crocodile Cr., nr Dorisvale, 14° 29' S 131°22' E, 17–18 Nov. 1984, M. Malipatil; 1 female, Lake Argyle, m. v. light, 16° 07' S 129°01' E, 15 Nov. 1984, M. Malipatil; 1 female, Jct. Arnhem Hwy. & Oenpelli Rd., m. v. light, 27 June 1980, M. Malipatil (MAGD). 1 female, Kakadu N. P., outflow from Buffalo Billabong, 27 Apr. 1990, P. Dostine; 1 male, Kakadu N.P., Graveside Gorge, 4 Aug. 1990, P. Dostine (OSSJ). 1 micropterous male, Mulupinbanjo Cr., nr. Jabiru, CL 917, 15 Dec. 1977, J.T. Polhemus; 1 micropterous male, 1 micropterous female, ponds nr. Robin Falls, CL 911, 12 Dec. 1977, J.T. Polhemus; 1 micropterous male, 1 micropterous female, Koongarra, CL 916, 15 Dec. 1977, J.T. Polhemus; 1 micropterous male, 4 micropterous females, 1 macropterous female, swamp, Darwin, CL 903, 10 Dec. 1977, J.T. Polhemus; 1 micropterous male, 1 micropterous female, 5 mi. SW Katherine, 22 Oct. 1962, E.S. Ross & D.Q. Cavagnaro (JTPC). **Queensland**: 1 female, Mt. Molloy, 13 June 1971, E.F. Reik; 1 female, Katherine Gorge, 26 Oct. 1972, E.F. Reik (ANIC). 2 females, immatures, Water Lily Lagoon, McDougalls Rd., Julattten, 20 May 1979, I. Lansbury; 2 males, 1 female, Tinaroo Falls Dam, inlet just above Look Out Point, 22 May 1979, I. Lansbury (ILC). 2 micropterous males, 1 macropterous female, Archer River, CL 1749, 22 Aug. 1983; 3 micropterous males, 8 micropterous females, Jardine River, CL 1761, 27 Aug. 1983; 1 macropterous female, Pinetree Cr., nr. Jowilbinna, CL 1742, 21 Aug. 1983; 8 macropterous males, 24 macropterous females, Laura River, CL 1741, 20 Aug. 1983; 1 micropterous female, 9 macropterous males, 20 macropterous females, Hann River, CL 1745, 21 Aug. 1983; 1 macropterous male, Stewart River, CL 1747, 22 Aug. 1983 (all coll. by J.T. & D.A. Polhemus; JTPC). **Western Australia**: 3 males, Millstream, top end of Crossing Pool, 20 July 1958, R.P. McMillan (WAMP). INDONESIA: **Irian Jaya Prov.**: 3 males, 6 females, Lake Senatani Iffar, Aug. 1936, L.E. Cheesman (BMNH). 10 micropterous males, 15 micropterous females, 1 nymph, swamp forest pond S of Walio Oil Field, 5 km S Kasim, 5 m, CL 2620, 29 Sept. 1991; 1 micropterous female, 1 macropterous female, pond 3 km E of Klagalo River, SE of Sorong, 80 m, CL 2625, 1 Oct. 1991; 9 micropterous

males, 9 micropterous females, Klagana, pond, CL 2629, 1 Oct. 1991; 4 micropterous males, 10 micropterous females, Aimasi River, Arfak Mtns., 60 km SW Manokwari, 90 m, CL 2651, 19 Oct. 1991; 16 micropterous males, 8 micropterous females, 1 nymph, Prafi River, at Warmari, Arfak Mtns., 48 km SW Manokwari, 215 m, CL 2652, 19 Oct. 1991 (all coll. by J.T. & D.A. Polhemus; JTPC). PAPUA NEW GUINEA, **Central Prov.**: 1 male, SE Port Moresby district, 16 mi. from A/P on Brown R. Rd., stream, J. A. Tenorio (BPBM). **East Sepik Prov.** 1 macropterous female, Urr-u Cr., 6 km E Wandemin, CL 1808, 13 Sept. 1983, J.T. & D.A. Polhemus; 1 micropterous male, Ramumba, Nw of Wewak, CL 1801, 11 Sept. 1983, J.T. & D.A. Polhemus (JTPC). **Bouganville**: 2 females, Kieta, small sunken pool 5 m across, open ground, coastal flat, 30 May 1956, E. S. Brown (BMNH). **Madang Prov.**: 1 macropterous female, N. Guinea, Biró '97, Lemien, Berlinhafen (JTPC). **Western Prov.**: 3 micropterous males, 3 micropterous females, 2 nymphs, Balimo, CL 1772, 2 Sept. 1983; 2 macropterous females, Fly River nr. Kiunga, CL 1774, 3 Sept. 1983; 2 micropterous females, 2 macropterous males, 3 macropterous females, 7 km N Kiunga on OK Tedi road, CL 1775, 4 Sept. 1983 (all coll. by J.T. & D.A. Polhemus; JTPC). SOLOMON ISLANDS, **Guadalcanal**: 3 males, 6 females, Honiara Distr., Aruligo, weedy pool exposed at beach-head opposite ship wreck, 9 Sept. 1956, E. S. Brown; 1 female, Guadalcanal, Kokumbona R., 13 May 1956, E.S. Brown (BMNH). 1 macropterous male, Guadalcanal & Florida Isls., Jan.–Mar. 1945, J. R. Stuntz; 2 macropterous males, 2 macropterous females, Guadalcanal, Jan. 1945, P.H. Eichmeier (JTPC).

Hydrometra strigosa (Skuse) Figs. 96, 99, 104–06, 120–22, 155, 156

Limnobates strigosa Skuse, F.A.A., 1893. Rec. Austr. Mus. 2: 43. Lectotype, designated here, macropterous male, slide mounted, Australia, Botany Swamps, New South Wales (AMSA).

Hydrometra risbeci Hungerford, H.B., 1938. Pan Pac. Entomol. 14: 81 Type, male, New Caledonia (SEMC). **New Synonymy.**

Description

MICROPTEROUS MALE. Length 7.79–9.91, width 0.29–0.38.

Color. Ground color light brown, dorsally yellowish to yellow brown; abdominal tergites orange brown, faintly shining, faintly rastrate except VII laterally, VIII all but median part frosted and clothed with fine pubescence. Head quite uniform in coloration dorsally, mostly darker laterally, entirely lightly frosted, more noticeable on narrow median longitudinal stripe dorsally behind eyes. Pronotum with median longitudinal frosted stripe, laterally with narrow arched frosted longitudinal stripe, continuing linearly along remainder of thorax and abdomen onto segment VIII, visible in oblique light; entire venter more lightly frosted, separated from stripe described above by a dark band which, in a completely different oblique light (by 90°) is also frosted. Connexiva except narrow margins, brown, heavily frosted. Legs, antennae light brown to brown, darker distally; coxae, trochanters mostly light brown, similar to bases of femora.

Structure. Head long (2.41), widest at antennal tubercles (0.36); set with very short inconspicuous recumbent setae, ventrally with short bristly setae on basal 1/2 and anteriorly, latter longest; gular lobe large, truncate ventrally, covering base of rostrum; rostrum reaching well caudad of eyes, about 3/4 toward pronotum; ratio anteocular/postocular portions: 1.43/0.77; interocular space/width of an eye: 0.10/0.13; anteclypeus small, tapering anteriorly, margins curved, acutely rounded anteriorly (Fig. 96). Antennal formula I:II:III:IV; 0.41: 0.77: 2.00: 1.18. Prothorax with row of encircling small pits on anterior lobe setting off collar, posterior lobe with scattered shallow, plus a row of deep pits on midline. Pronotum length 1.33; remainder of thorax 1.18; abdomen length 3.79. Wing pads reaching almost 1/2 way to abdomen. Abdominal sternites set with scattered short semi-erect setae, plus a few long erect setae increasing in length posteriorly, most numerous on sternite VI. Distance between anterior and middle coxae (measured between closest margins) 0.66; between middle and hind coxae 1.08. Anterior, middle acetabulae with 2 pits each on anterior and posterior parts; posterior acetabula with 1 pit on anterior part dorsally. Entire venter set with minute black denticles.

Proportions of legs as follows: Femur, tibia, tarsal I, tarsal II, tarsal III of fore-leg, 2.30: 2.30: 0.07: 0.26: 0.15; of middle-leg, 2.66: 2.76: 0.10: 0.36: 0.20; of hind-leg, 3.17: 3.74: 0.10: 0.36: 0.20.

Male abdominal terminalia as shown in figs. 104, 106, genitalia as in figs. 120–22. Seventh sternite with 2 (1 +1) small black widely separated posteriorly directed processes along anterior margin, each set on a weak tumescence, each composed of tightly clustered dark stiff setae, similar to H. novaehollandiae, but lacking the fringe of longer golden setae (always well developed in novaehollandiae), plus 2 (1 +1) less widely spaced patches of short dark stiff setae near posterior margin. Eighth sternite broadly laterally compressed except distally, weakly tumid ventrally.

MICROPTEROUS FEMALE. Length 7.79–9.91, width 0.29–0.38. Similar in most respects to male. Abdominal terminalia as shown in figs. 99, 105.

MACROPTEROUS FORM. Most characteristics as in micropterous form, except hemelytra reaching onto base of tergite VII in male, onto tergite VI in female (variable); males with long basal light streak mesad of M + Cu, plus long medial white stripe reaching from near base almost to apex, interrupted only by dark cross veins; light markings effaced in females.

BRACHYPTEROUS FORM. Unknown.

Diagnosis. This species is most closely related to *H. darwiniana* and *H. novaehollandiae*, species occurring also in Australia, the latter sympatrically. The males of these species may be separated quite easily by the abdominal terminalia, however the females present more difficulties. Female tergite VII of *strigosa* is somewhat depressed transversely near the base, not so in *novaehollandiae*. The extent of ventral frosting is also different in females of the 2 species; in oblique lateral view, the frosting of the abdominal venter of *strigosa* is almost complete, with only a narrow dark band evident below the broad laterosternal bright stripe adjacent to the connexival margin, whereas in *novaehollandiae* the ventral frosting is much weaker, the broad laterosternal stripe appearing as a broad dark stripe in the same aspect. For further discussion, see key and diagnosis under *H. novaehollandiae*.

The description of *H. strigosa* (Skuse, 1893) is hopelessly inadequate and could refer to almost any small *Hydrometra* from any continent, and the habitus figure is scarcely more helpful. Therefore it is fortunate that the type is extant (see below) and in good condition.

When Hungerford (1938) described *H. risbeci* from Australia, New Caledonia and Tahiti, he took no notice of *H. strigosa*, and quite obviously knew nothing of the species. Had he borrowed the type of *H. strigosa* from the Australian Museum, he would have instantly seen that his proposed *H. risbeci* was the same species, as the modifications of the male sternites VII and VIII are diagnostic. *H. risbeci* was first reported from 2 localities in New Zealand by Woodward (1952).

Type notes. JTP has studied the type of *strigosa*. It is a slide mounted macropterous male, in excellent condition, bearing 2 labels; the first is "Rec. Aust. Mus. Vol. II. No. 4. Pl. XI. f 2. Austr. Mus."; the second "Limnobates strigosa, Sk., TYPE, F. A. A. Skuse, Botany Swamps, N. S. W." This specimen is here designated as lectotype. In addition, there are 2 conspecific females on cards studied by IL, apparently from the same place, with similar labels by Skuse, that are designated as paralectotypes.

There is a male paratype of *risbeci* in the J.T. Polhemus Collection, from Brisbane, Queensland that is the same species, therefore synonymous.

Distribution. Australia (widespread, including Norfolk Island, Tasmania); New Caledonia; New Hebrides; New Zealand; Tahiti (Figs. 155, 156).

Material examined. AUSTRALIA: **New South Wales:** 1 macropterous male, Botany Swamps

(lectotype, *Limnobates strigosa* Skuse, K68633, AMSA); 2 females, Botany Swamps (paralectotypes, *Limnobates strigosa* Skuse, AMSA); 4 males, 1 female, Goono State Forest, 5 mi. S Mendooran, 23 Mar. 1971, D.K. McAlpine, mv lamp; 1 male, National Park, 30 Jan. 1966, D.K. McAlpine; 1 male, 1 female, Point Clave nr Gosford, 16 Feb. 1958, M.J. Nitikin; 3 females, Bourke & Wilcania, Darling River floods, May–June 1890, Helms (AMSA). 3 males, 3 females, Kara Creek, Mt. Kosciusco N.P., nr Jindabyne, 940 m, 16 Mar. 1979, I. Lansbury (ANIC, ILC). 2 females, Tuglo Wildlife Refuge, 30 km N Singleton, farm dams, 10–11 Mar. 1979, I. Lansbury (ILC). 1 micropterous male, 1 micropterous female, 1 macropterous male, 1 macropterous female, Upper Causeway, Royal N. P., CL 1405, 20 Dec. 1977, J.T. & M.S. Polhemus; 1 micropterous male, 1 micropterous female, 1 macropterous male, 1 macropterous female, Era, Royal N. P., CL 1406, 20 Dec. 1977, J.T. & M.S. Polhemus; 1 macropterous female, Point Clave, nr. Gosford, 16 Feb. 1958, M.J. Nitikin; 2 macropterous females, Canley Vale, 8 Jan. 1958, M.J. Nitikin (JTPC). **Norfolk Island**: 3 micropterous males, 1 micropterous female, swamp, west side, CL 1428, 29 Dec. 1977; 2 micropterous males, 4 micropterous females, 1 nymph, Cascade, S.P., CL 1422, 27 Dec. 1977; 10 micropterous males, 4 micropterous females, Gaol, S.P., CL 1423, 28 Dec. 1977 (all coll. by J.T. & M.S. Polhemus; JTPC). **Northern Territory**: 1 micropterous male, 2 micropterous females, Ellery Gorge, nr. Alice Springs, CL 1417, 23 Dec. 1977, J.T. & M.S. Polhemus (JTPC). **Queensland**: 1 macropterous male, Brisbane, 3.III.(1932?), Australian Harvard Exp., Darlington (paratype, *H. risbeci* Hungerford, exch. from MCZC; JTPC). 1 male, Cairns, Jan. 1951, J. G. Brooks; 1 male, Clermont, Oct. 1929, R.K. Spence; 1 female, Townsville, 10 Oct. 1903, F. P. Dodd (AMSA). 1 female, rain forest creek at Julatten, 21 May 1979, I. Lansbury; 2 males, Carr Creek, ca 18 km from Mareeba, 22 May 1979, I. Lansbury; 1 female, Mitchell River, fast flowing, bright sunlight, 22 May 1979, I. Lansbury; 1 female, near Stanthorpe, Sundown N. P., disused farm dam, 6 Apr. 1985, I. Lansbury (ILC). many males, females, Tinaroo Falls Dam, inlet just below Lookout Point, 22 May 1979, I. Lansbury; 1 male, 2 females, Townsville Inst. Mar. Sci., rocky creek with Pandanus, 30 May 1979, I. Lansbury; 2 males, 2 females, Brisbane, Moggill Farm, small roadside pools, polluted, 6 June 1979, I. Lansbury; many males, females, Brisbane, Cedar Creek at Samford, 7 June 1979, I. Lansbury; 5 males, 2 females, Brisbane, Cedar Falls, 7 June 1979, I. Lansbury; 1 male, 3 females, 1 nymph, creek west of Stanthorpe, 6 Apr. 1985, I. Lansbury; 6 males, 2 females, near Stanthorpe, Sundown N. P., Ooline Creek, 6 Apr. 1985, I. Lansbury (ANIC, ILC). 1 male, Palmer River, 14 June 1971, E. F. Reik (ANIC). 4 specimens, Townsville, Oct 1903, F. P. Dodd (BMNH). several specimens, Townsville (RMNH). 1 micropterous female, Dalby, n. Geary, Dec. 1933 (JTPC). 6 macropterous males, 4 macropterous females, McCleod River, nr. Mt. Carbon, CL 1736, 20 Aug. 1983; 1 macropterous male, 3 macropterous females, Jourama Falls N.P., CL 1716, 13 Aug. 1983; 15 macropterous males, 5 macropterous females, 6 km E Murray Falls, CL 1719, 13 Aug. 1983; 2 macropterous males, Davies Cr. N.P., CL 1729, 16 Aug. 1983; 1 macropterous female, Hutchinson Cr., Cape Tribulation Rd., CL 1733, 17 Aug. 1983; 1 micropterous male, 1 micropterous female, 1 macropterous female, beach pond, Cooper Cr., nr. Cape Tribulation, CL 1734, 17 Aug. 1983; 2 macropterous females, Stewart River, S. of Coen, CL 1747, 22 Aug. 1983; 2 micropterous males, 1 macropterous female, Annan River, CL 1737, 19 Aug. 1983 (all coll. by J.T. & D.A. Polhemus; JTPC). **South Australia**: 3 males, 6 females, Kangaroo Island, South West River (Grassdale), between western highway and Karatta, 9 Apr. 1979, I. Lansbury; 1 male, 2 females, Kangaroo Island, River just beyond Karatta on road to Kingscote, 9 Apr. 1979, I. Lansbury (ANIC, ILC). 1 female, Mosquito Creek, Straun nr Naracoorte, 23 Apr. 1979, I. Lansbury (ILC). 1 micropterous male, Murray Bridge (JTPC). **Tasmania**: males, females, Beacons Field lagoon, 60m, 41°12' S, 146°48' E, 25.XI.1993 (ILC). **Victoria**: 1 male, 1 female, Anderson Railway Station Pool, nr Phillip Isl., 30 Mar. 1985, I. Lansbury (ILC). 2 males, 1 female, 8 km SW Moyston, 16 Nov. 1961, E. F. Reik (ANIC). 1 female, Macalister-Thomson River junction, 28 Apr. 1977, M. Malipatil (MAGD). **Western Australia**: 3 males, 1 female, Swan River, L J. Newman (BMNH). 1 micropterous male, St. Johns Brook, Vassee Hwy., CL 887, 5 Dec. 1977, J.T. Polhemus; 1 micropterous male, 2 micropterous females, Stirling Ranges N. P., Hdqtrs., CL 898, 8 Dec. 1977, J.T. Polhemus; 1 micropterous male, Capell river, Capell, CL 884, 5 Dec. 1977, J. T. Polhemus; 4 micropterous females, 2 nymphs, Barlee Brook, CL 890, 8 Dec.

1977, J.T. Polhemus (JTPC). NEW CALEDONIA: 1 male, 1 female, Isle de Pins, Bay de la Corbeille, 14 July 1958, B. Malkin; 1 male, 1 female, Isle de Pins, Kuot, fast stream, 14 July 1958, B. Malkin; 3 females, Dumba River, 28 Oct. 1958, C. R. Joyce; 1 female, Foret di Thi, 29 Oct .–1 Nov. 1967, J. & M. Sedlacek; 1 female, Nakale River, 10 Oct. 1940, F.X. Williams; 1 female, Noumea, July 1940, F.X. Williams (BPBM). 2 males, 2 females, Puebo Coast, 1500 ft., Oct 1949, L. E. Cheesman; 1 male, 1 female, R. Tandi, 500 ft., 31 Aug. 1949, L.E. Cheesman; 1 male, near Tamale River, 5 July 1952, M. Laird; 1 female, near Voh Gatope, 5 July 1952, M. Laird; 1 male, Oubatche, 11 Apr. 1911 (paratype, *H. risbeci* Hungerford) (BMNH). 3 micropterous females, 1 macropterous female, Upper Koalagogamba Valley, 800 m, CL 1854, 26 Sept. 1983, J.T. & D.A. Polhemus (JTPC). NEW HEBRIDES: 1 male, 3 females, Santo Isl., Big Bay, Jordan River, 10 m, 15 Sept. 1979, W.C. Gagne (BPBM). 2 males, 1 female, NE Malekula, June 1929, L.E. Cheesman; 1 male, 1 female, Malekula, July 1929, L.E. Cheesman (BMNH). NEW ZEALAND: 1 female, no data (BMNH). 2 micropterous males, 2 micropterous females, North Island, Rotorua Co., nr. outlet, Waimangu Strm., 10 May 1971, K. A. J. Wise (AMNZ, JTPC). TAHITI: 1 micropterous male, Vairao, Vairao Plateau, on stagnant pool, 30 Mar. 1934, E.C. Zimmerman (JTPC).

ACKNOWLEDGMENTS

We are pleased to acknowledge the invaluable assistance of the following persons who helped us with permits, guidance, transportation and logistics, and without whose help and patience our field surveys in Indonesia could not have been accomplished: Drs. Rosichon Ubaidillah, Dr. Soetikno Wiroatmodjo, Dr. Mohammed Amir, and other personnel from the Indonesian Institute of Sciences (LIPI), Bogor; Mrs. Moertini, Mr. Sanchoyo, the other staff members of the LIPI office in Jakarta; Mr. Benny Lesomar, Natrabu Corp., Biak; Mr. Lewis Zeigler, Mr. Jan Beiers, Mr. T. Loebis, Mr. Franz Petrusz and many others from the Petromer Trend Oil Company, Jakarta and Sorong; Mr. Neal Blackburn, Mobil Oil Indonesia Inc., Jakarta; Mr. James Carpenter, Mobil Oil Indonesia Inc., Fakfak; Mr. Petrus Manggai, Fakfak; Mr. Jacob Bakabessy and Mr. Bernardus Sambery, PHPA, Manokwari.

Special thanks are also due to the following persons who aided us with field surveys in Papua New Guinea: David and Dorothy Softe, Balimo; Vance and Patty Woodward, Kiunga; David Coates and Moses Arumba, Wewak; Stan and Kris Niemi, Mt. Hagen; and especially John Ismay, Hope Entomological Museum, Oxford University (formerly of the Bureau of Primary Industry, Konedobu).

We also thank the following for assistance in New Caledonia; Dr. P. Raven and Dr. G. McPherson, Missouri Botanical Gardens, St. Louis and Noumea; Dr. J. Gutierrez, ORSTOM, Noumea.

Finally, we are grateful to the following for assistance with collections in Australia; Martin S. Polhemus, Spokane, WA.; T. Angeles, CSIRO, Darwin; M. Trezise, Cairns.

The following curators kindly provided loans or exchanges of specimens held under their care (collection abbreviations are those used in the text): Dr. Robert Brooks, Snow Entomological Museum, Lawrence (SEMC); Dr. P.J. Arnaud, California Academy of Sciences, San Francisco (CAS); Dr. Richard Froeschner and Dr. Karl Krombein, National Museum of Natural History, Smithsonian Institution, Washington, D. C. (USNM); Dr. N.M. Andersen, Universitets Zoologisk Museum Copenhagen (ZMUC); Dr. G. Cassis, Australian Museum, Sydney (AMSA); Dr. H.E. Evans, (formerly at) Museum of Comparative Zoology, Harvard University, Cambridge (MCZC); T. Weir, Australian National

Insect Collection, Canberra (ANIC); D.A. Polhemus, Bishop Museum, Honolulu (BPBM); W. Dolling, The Natural History Museum, London (BMNH); M.B. Malipatil, Northern Territory Museum of Arts and Sciences, Darwin (MAGD); T.F. Houston, Western Australian Museum, Perth (WAMP); K.A.J. Wise, Auckland Insitute and Museum, Auckland (AMNZF); F.S. Truxal, Los Angeles County Museum of Natural History, Los Angeles (LACM).; P. Dostine, Office of the Supervising Scientist, Jabiru (OSSJ); P. Lindskog, Swedish Museum of Natural History, Stockholm (NHRS); J. van Tol, National Museum of Natural History Leiden (RMNH); T. Vasarhelyi, Hungarian Natural History Museum (HNHM); Dr. Leon Baert, Institut Royal des Sciences Naturelles de Belgique, Brussels (INSB); Dr. Valter Raineri, Museo Civico di Storia Naturale "Giacamo Doria", Genova (MCSN). Holotypes of all new species described herein are deposited in the Bishop Museum, Honolulu (BPBM), the Australian National Insect Collection, Canberra (ANIC), or the U. S. National Museum of Natural History (USNM); paratypes are held in the J. T. Polhemus collection, Englewood, Colorado (JTPC) and Ivor Lansbury collection, Oxford (ILC), and where numbers permit will be distributed to the institutions noted above.

The research of JTP was sponsored by a series of grants from the National Geographic Society, Washington, D. C. (2698-83, 3053-85, 3398-86, 4537-91), and by grant BSR-9020442 from the National Science Foundation, Washington, DC. This is a research contribution from Colorado State University, where JTP is adjunct faculty, and the Colorado Entomological Museum is an affiliate. The research of IL was supported by the Australian Biological Resource Study (ABRS), Canberra and a Leverhulme Research Fellowship, London. We thank these organizations for their continued support of research into the systematics and zoogeography of aquatic Heteroptera.

CHECKLIST OF *HYDROMETRA* OF AUSTRALIA, MELANESIA, AND THE SOUTHWEST PACIFIC

SPECIES	DISTRIBUTION
aculeata Montrouzier	New Caledonia
claudie Polhemus & Lansbury n. sp.	Australia (Queensland)
darwiniana Polhemus & Lansbury n. sp.	Australia
eioana Polhemus & Lansbury n. sp.	New Guinea (Papua New Guinea)
feta Hale	Australia (Queensland)
halei Hungerford & Evans	Australia
horvathi Hungerford & Evans	New Hebrides, New Guinea (Irian Jaya, Papua New Guinea), Solomon Islands
jourama Polhemus & Lansbury n. sp.	Australia (Queensland)
kiunga Polhemus & Lansbury n. sp.	New Guinea (Irian Jaya, Papua New Guinea)
lineata Eschscholtz*	Ambon, Celebes, New Guinea (Irian Jaya, Papua New Guinea), Borneo (Sabah), Philippines (Bohol, Leyte, Luzon, Mindanao, Negros, Palawan), China
mindoroensis Polhemus*	Celebes, New Guinea (Irian Jaya, Papua New Guinea), Philippines (Leyte, Luzon, Mindanao, Mindoro, Palawan), Borneo (Sabah)
novaehollandiae Polhemus & Lansbury n. sp.	Australia (New South Wales)
orientalis Lundblad*	SE Asia to Australia and New Guinea
papuana Kirkaldy*	Borneo, Malay Peninsula, Australia (northern), New Guinea (Irian Jaya, Papua New Guinea)
strigosa (Skuse)	Australia, Norfolk Isl., New Hebrides, New Caledonia, New Zealand, Tahiti

* = species common to both the Malay Archipelago and Melanesia

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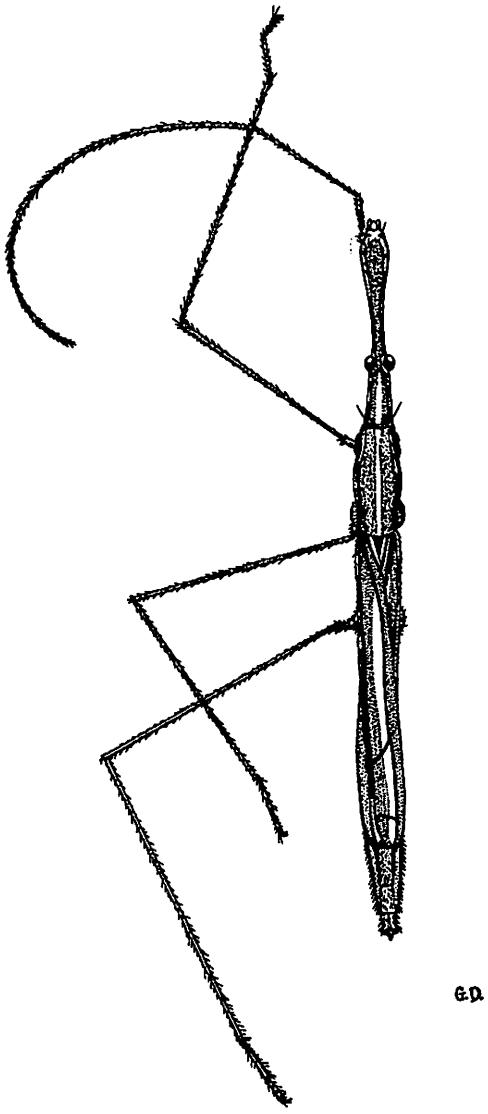
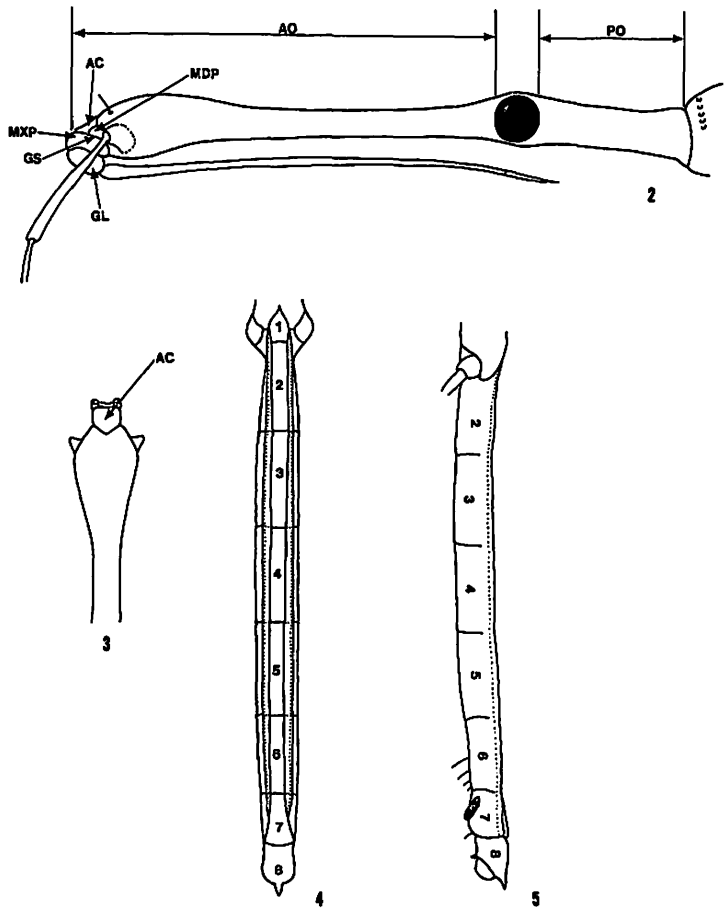
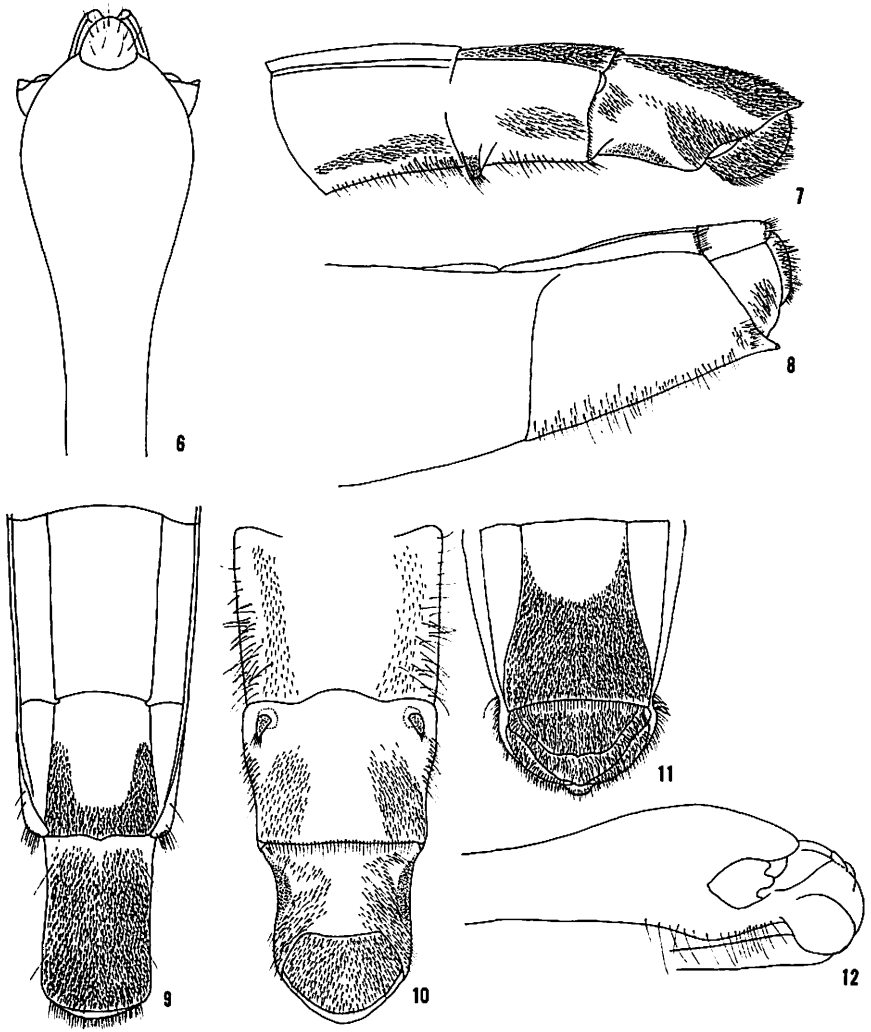


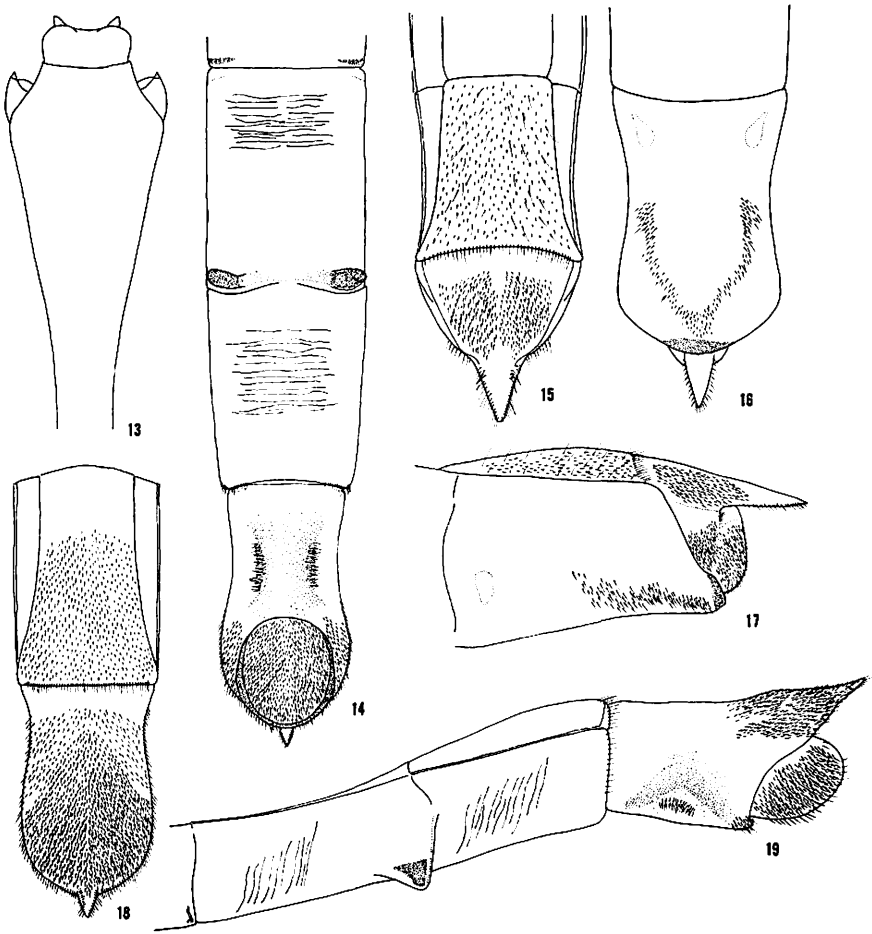
Fig. 1. *Hydrometra lineata* Eschscholtz, male, dorsal habitus.



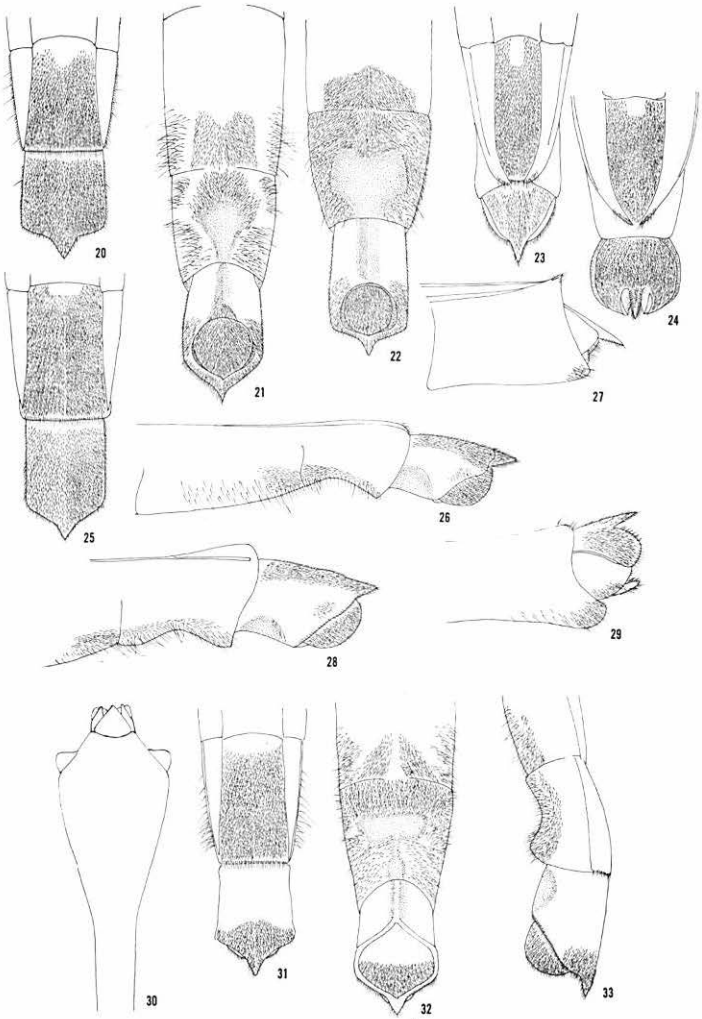
Figs. 2–5. *Hydrometra papuana* Kirkaldy, showing locations of structures discussed in text. 2. Head, lateral view. Abbreviations: AO = anteocular distance, PO = postocular distance, AC = anteclypeus, MXP = maxillary plate, GS = genal suture, GL = gular lobe, MDP = mandibular plate. 3. Head apex, dorsal view. AC = anteclypeus. 4. Male abdomen, dorsal view. Abdominal tergites I–VIII numbered. 5. Male abdomen, lateral view. Abdominal segments II–VIII numbered.



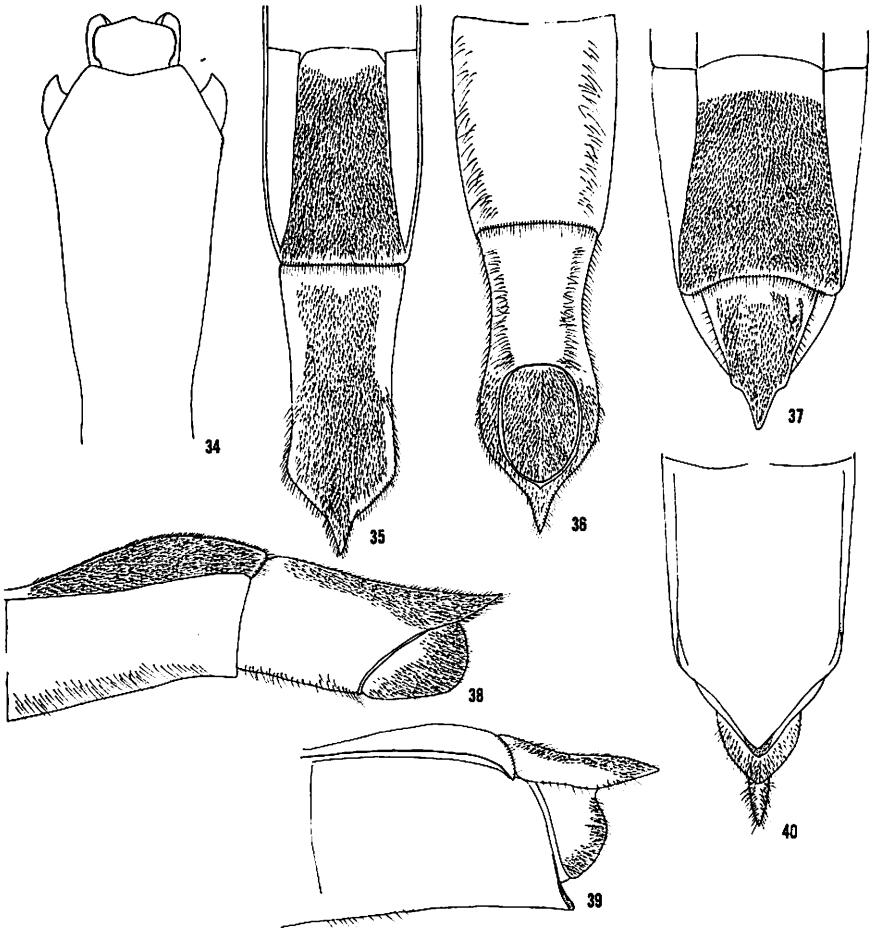
Figs. 6–12. *Hydrometra aculeata* Montrouzier. **6.** Apex of head, dorsal view. **7.** Male terminal abdomen, lateral view. **8.** Female terminal abdomen, lateral view. **9.** Male terminal abdomen, dorsal view. **10.** Male terminal abdomen, ventral view. **11.** Female terminal abdomen, dorsal view. **12.** Apex of head, lateral view.



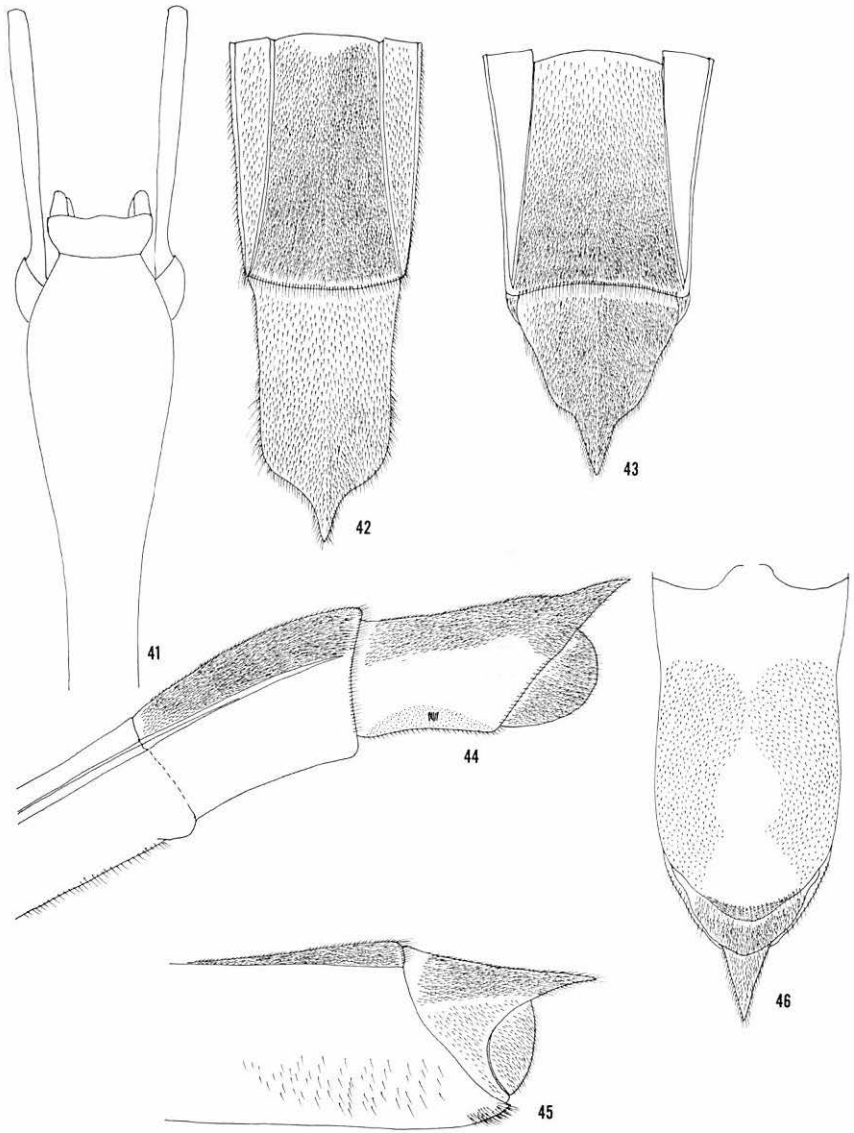
Figs. 13–19. *Hydrometra claudie* n.sp. **13.** Apex of head, dorsal view. **14.** Male terminal abdomen, ventral view. **15.** Female terminal abdomen, dorsal view. **16.** Female terminal abdomen, ventral view. **17.** Female terminal abdomen, lateral view. **18.** Male terminal abdomen, dorsal view. **19.** Male terminal abdomen, lateral view.



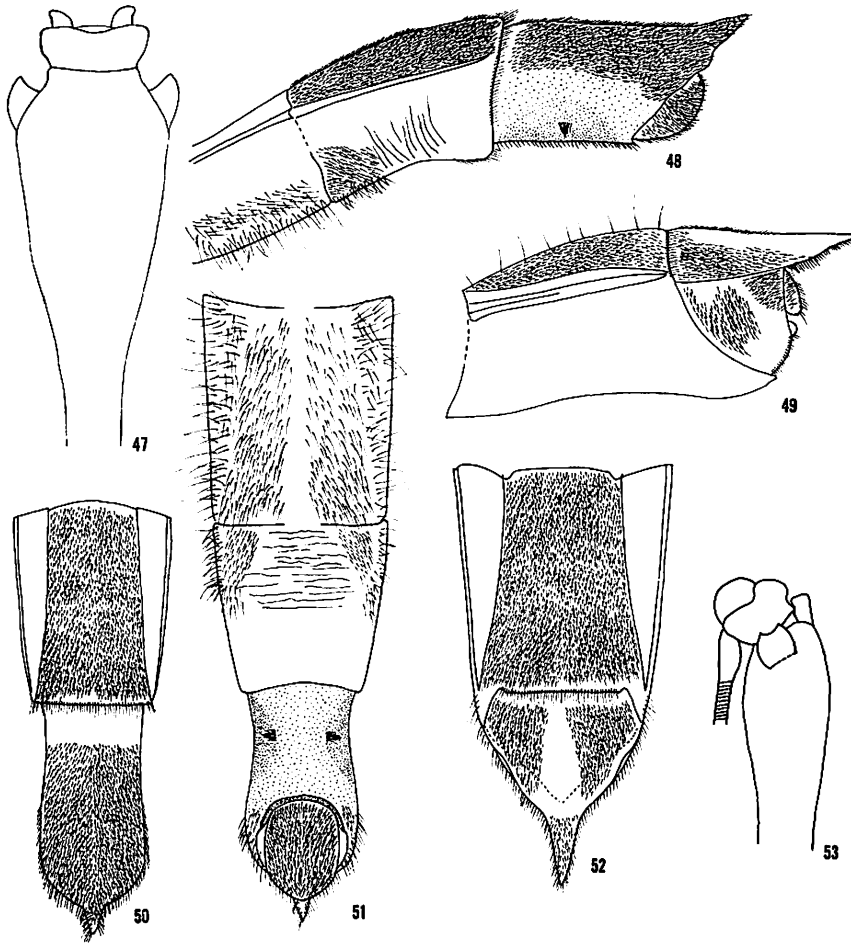
Figs. 20–33. *Hydrometra darwiniana* n.sp. **20**. Male terminal abdomen, dorsal view (Pemberton, W.A.). **21**. Male terminal abdomen, ventral view (Pemberton, W.A.). **22**. Male terminal abdomen, ventral view (Darwin, N.T.). **23**. Female terminal abdomen, dorsal view (Darwin, N.T.). **24**. Female terminal abdomen, dorsal view (Kimberley, W.A.). **25**. Male terminal abdomen, dorsal view (Darwin, N.T.). **26**. Male terminal abdomen, lateral view (Pemberton, W.A.). **27**. Female terminal abdomen, lateral view (Darwin, N.T.). **28**. Male terminal abdomen, lateral view (Darwin, N.T.). **29**. Female terminal abdomen, lateral view (Kimberley, W.A.). **30**. Apex of head, dorsal view. **31**. Male terminal abdomen, dorsal view. **32**. Male terminal abdomen, ventral view. **33**. Male terminal abdomen, lateral view.



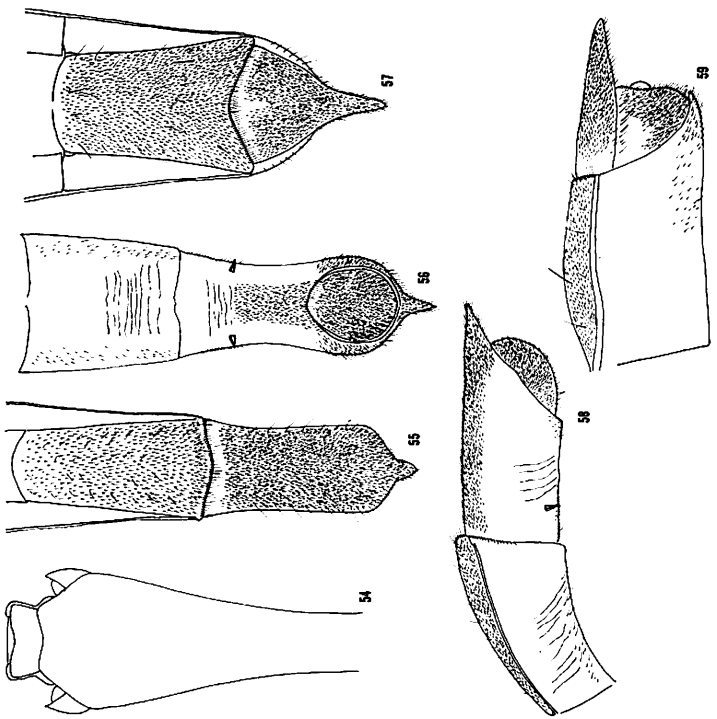
Figs. 34–40. *Hydrometra eioana* n.sp. **34.** Apex of head, dorsal view. **35.** Male terminal abdomen, dorsal view. **36.** Male terminal abdomen, ventral view. **37.** Female terminal abdomen, dorsal view. **38.** Male terminal abdomen, lateral view. **39.** Female terminal abdomen, lateral view. **40.** Female terminal abdomen, ventral view.



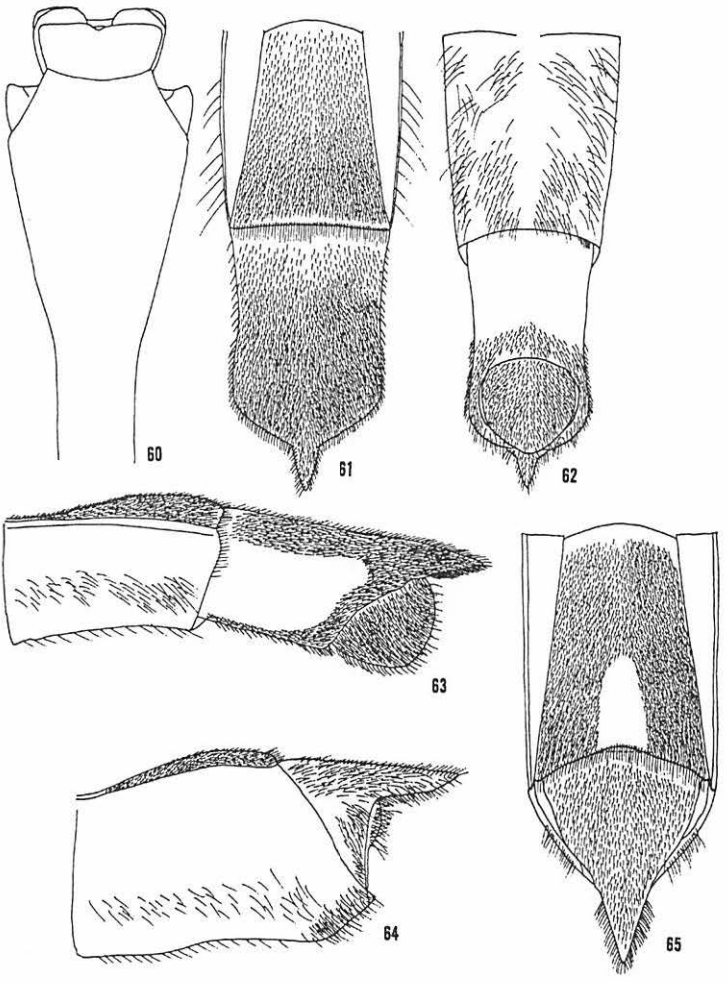
Figs. 41–46. *Hydrometra feta* Kirkaldy. **41.** Apex of head, dorsal view. **42.** Male terminal abdomen, dorsal view. **43.** Female terminal abdomen, dorsal view. **44.** Male terminal abdomen, lateral view. **45.** Female terminal abdomen, lateral view. **46.** Female terminal abdomen, ventral view.



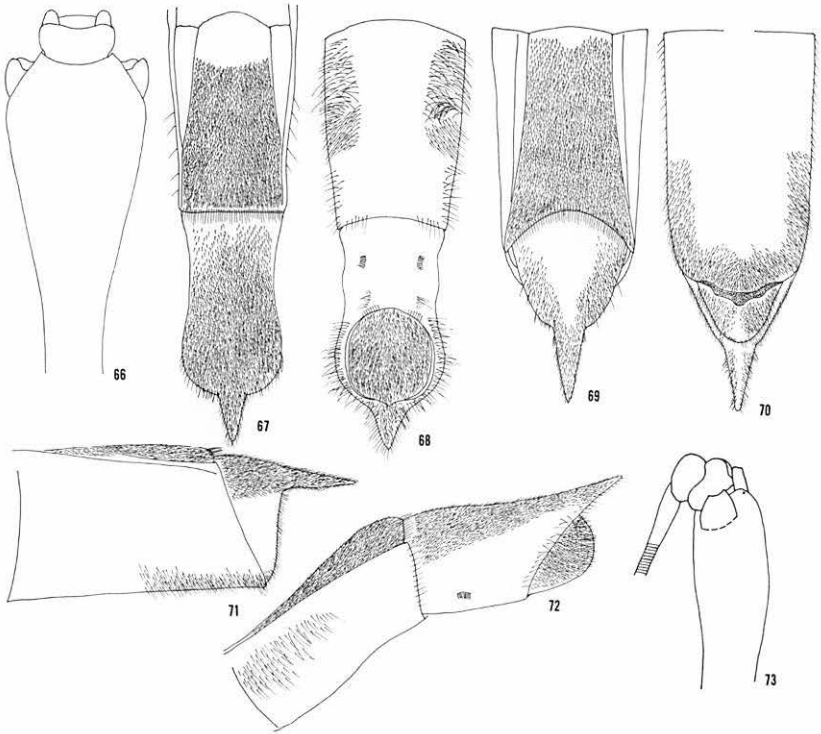
Figs. 47–53. *Hydrometra halei* Hungerford and Evans. 47. Apex of head, dorsal view. 48. Male terminal abdomen, lateral view. 49. Female terminal abdomen, lateral view. 50. Male terminal abdomen, dorsal view. 51. Male terminal abdomen, ventral view. 52. Female terminal abdomen, dorsal view. 53. Apex of head, lateral view.



Figs. 54–59. *Hydrometra horvathi* Hungerford and Evans. 54. Apex of head, dorsal view. 55. Male terminal abdomen, dorsal view. 56. Male terminal abdomen, ventral view. 57. Female terminal abdomen, dorsal view. 58. Male terminal abdomen, lateral view. 59. Female terminal abdomen, lateral view.



Figs. 60–65. *Hydrometra jourama* n.sp. **60.** Apex of head, dorsal view. **61.** Male terminal abdomen, dorsal view. **62.** Male terminal abdomen, ventral view. **63.** Male terminal abdomen, lateral view. **64.** Female terminal abdomen, lateral view. **65.** Female terminal abdomen, dorsal view.



Figs. 66–73. *Hydrometra kiunga* n.sp. **66**. Apex of head, dorsal view. **67**. Male terminal abdomen, dorsal view. **68**. Male terminal abdomen, ventral view. **69**. Female terminal abdomen, dorsal view. **70**. Female terminal abdomen, ventral view. **71**. Female terminal abdomen, lateral view. **72**. Male terminal abdomen, lateral view. **73**. Apex of head, lateral view.

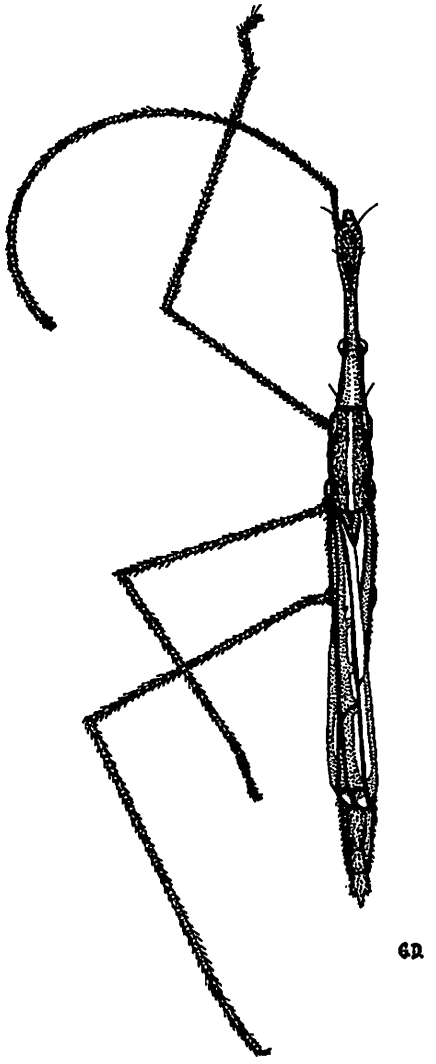
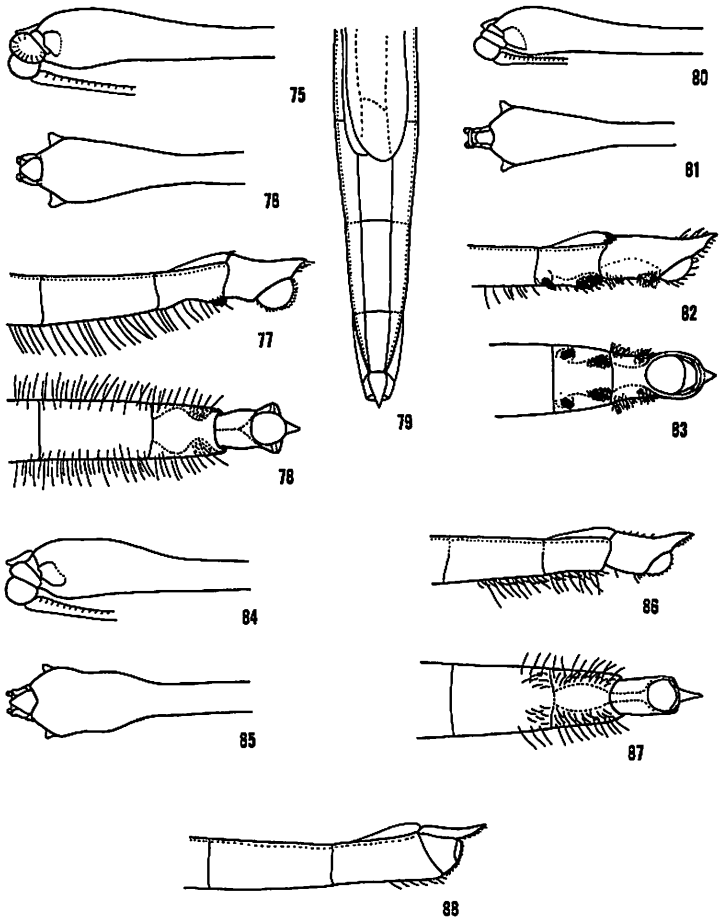
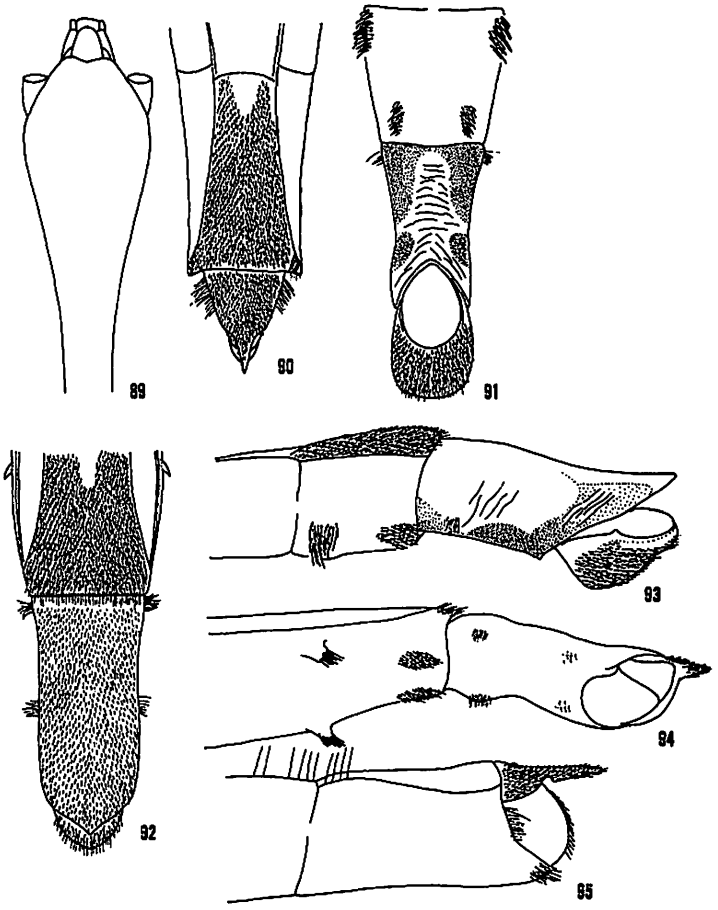


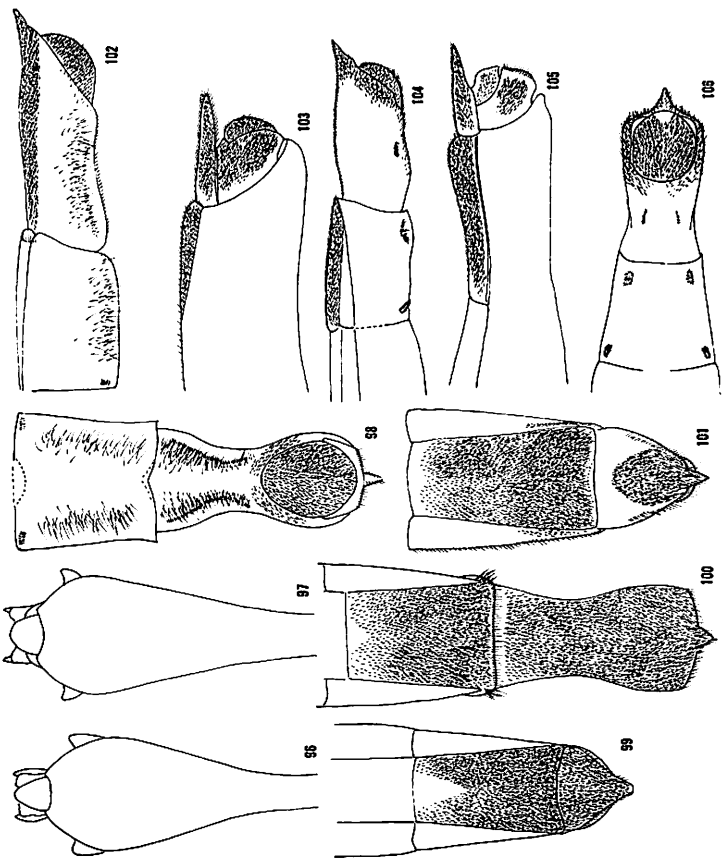
Fig. 74. *Hydrometra orientalis* Lundblad, male, dorsal habitus.



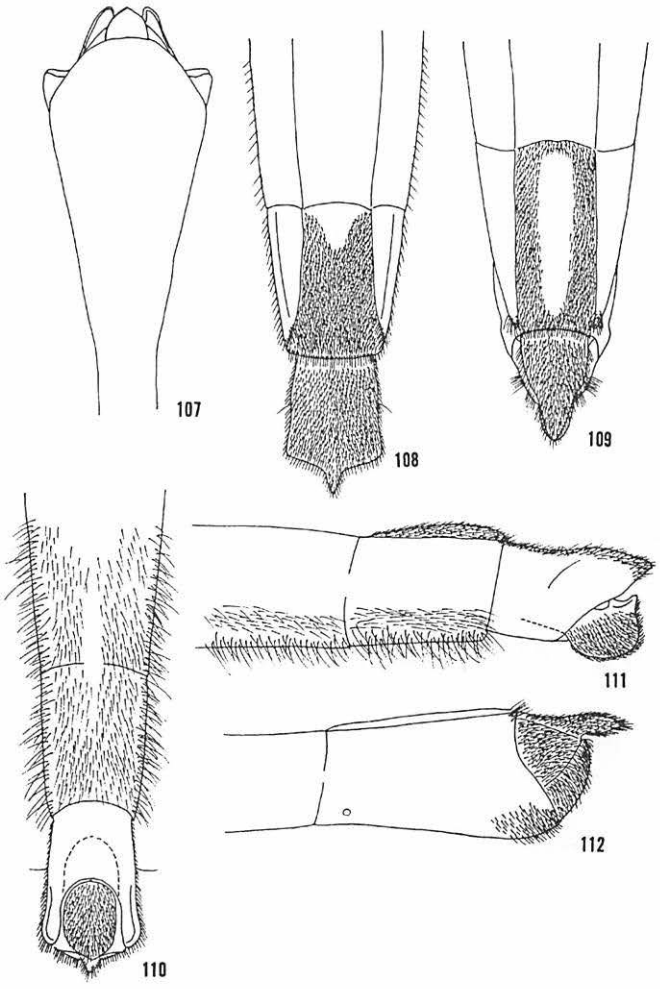
Figs. 75–79. *Hydrometra lineata* Eschscholtz. **75.** Apex of head, lateral view. **76.** Apex of head, dorsal view. **77.** Male terminal abdomen, lateral view. **78.** Male terminal abdomen, ventral view. **79.** Female abdomen, dorsal view. Note convergent connexiva posteriorly. **Figs. 80–83.** *Hydrometra mindoroensis* Polhemus. **80.** Apex of head, lateral view. **81.** Apex of head, dorsal view. **82.** Male terminal abdomen, lateral view. **83.** Male terminal abdomen, ventral view. **Figs. 84–88.** *Hydrometra orientalis* Lundblad. **84.** Apex of head, lateral view. **85.** Apex of head, dorsal view. **86.** Male terminal abdomen, lateral view. **87.** Male terminal abdomen, ventral view. **88.** Female terminal abdomen, lateral view.



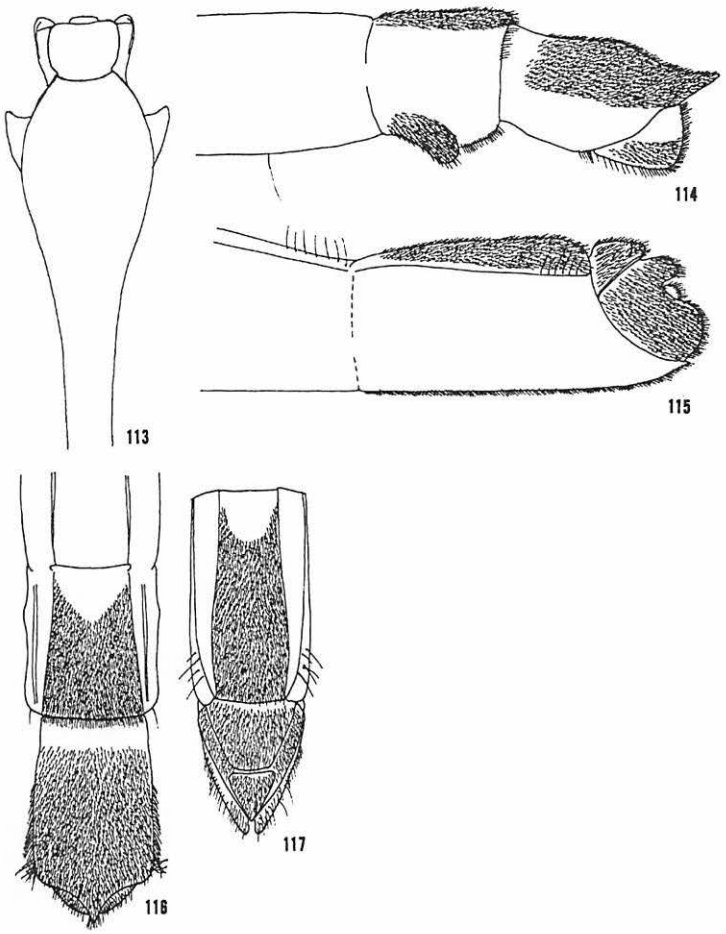
Figs. 89–95. *Hydrometra mindoroensis* Polhemus. 89. Apex of head, dorsal view. 90. Female terminal abdomen, dorsal view. 91. Male terminal abdomen, ventral view. 92. Male terminal abdomen, dorsal view. 93. Male terminal abdomen, lateral view. 94. Male terminal abdomen, ventro-lateral view. 95. Female terminal abdomen, lateral view.



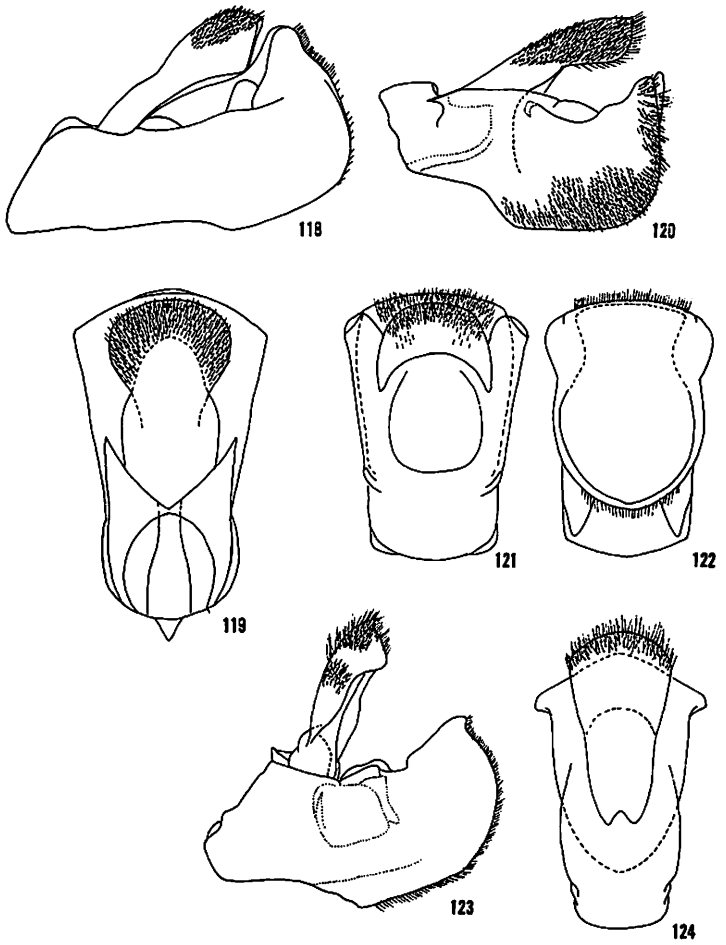
Figs. 96, 99, 104–106. *Hydrometra strigosa* (Skuse). **96.** Apex of head, dorsal view. **99.** Female terminal abdomen, dorsal view. **104.** Male terminal abdomen, lateral view. **105.** Female terminal abdomen, lateral view. **106.** Male terminal abdomen, ventral view. **Figs. 97–98, 100–103.** *Hydrometra novaehollandiae* n.sp. **97.** Apex of head, dorsal view. **98.** Male terminal abdomen, ventral view. **100.** Male terminal abdomen, dorsal view. **101.** Female terminal abdomen, dorsal view. **102.** Male terminal abdomen, lateral view. **103.** Female terminal abdomen, lateral view.



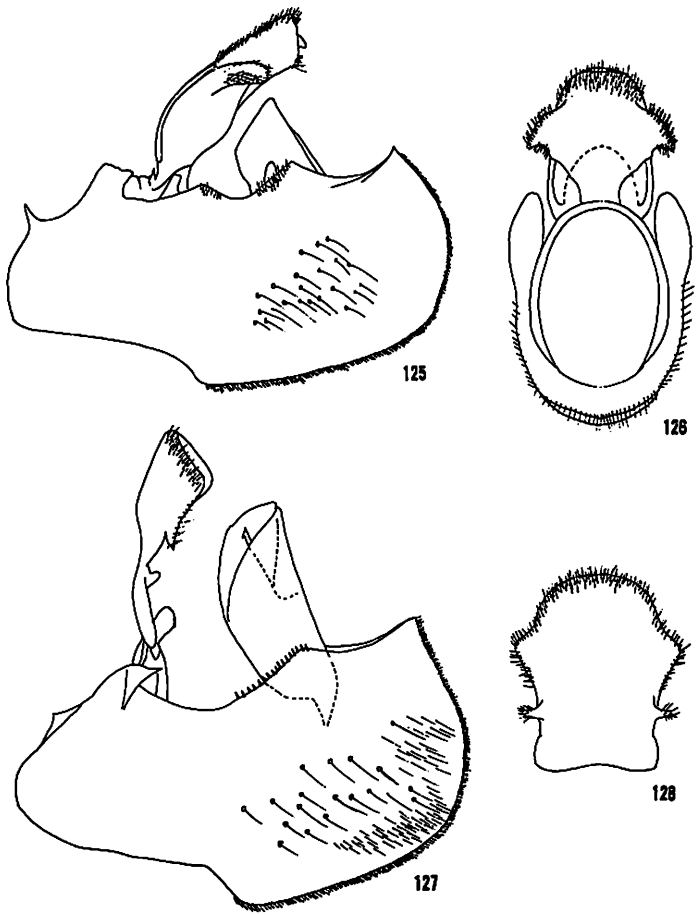
Figs. **107–112**. *Hydrometra orientalis* Lundblad (Australia). **107**. Apex of head, dorsal view. **108**. Male terminal abdomen, dorsal view. **109**. Female terminal abdomen, dorsal view. **110**. Male terminal abdomen, ventral view. **111**. Male terminal abdomen, lateral view. **112**. Female terminal abdomen, lateral view.



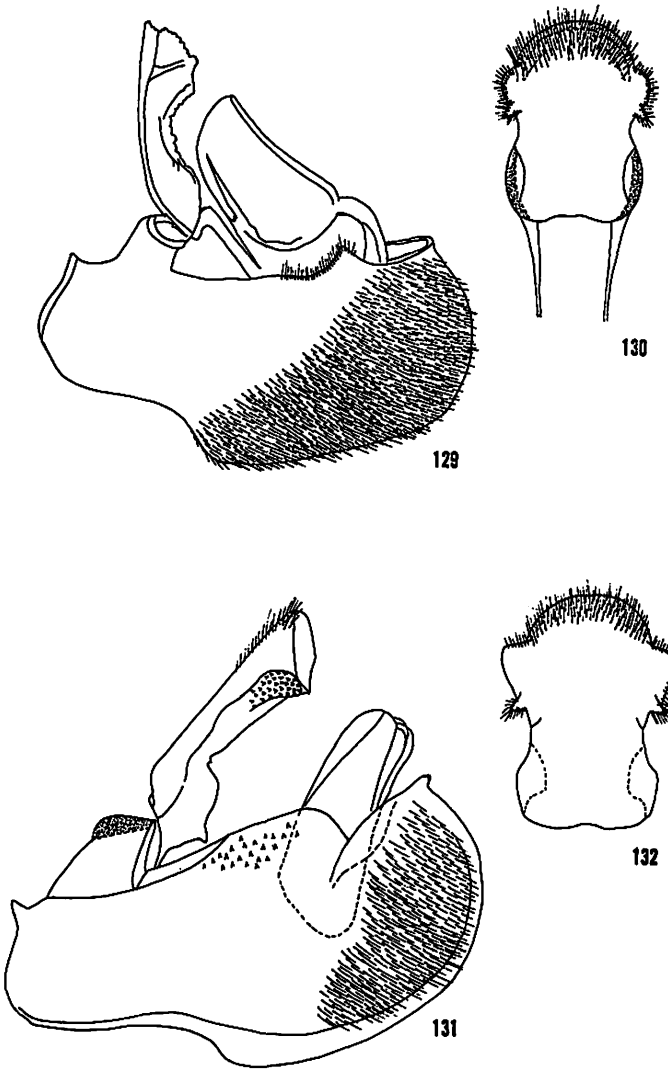
Figs. **113–117**. *Hydrometra papuana* Kirkaldy. **113**. Apex of head, dorsal view. **114**. Male terminal abdomen, lateral view. **115**. Female terminal abdomen, lateral view. **116**. Male terminal abdomen, dorsal view. **117**. Female terminal abdomen, dorsal view.



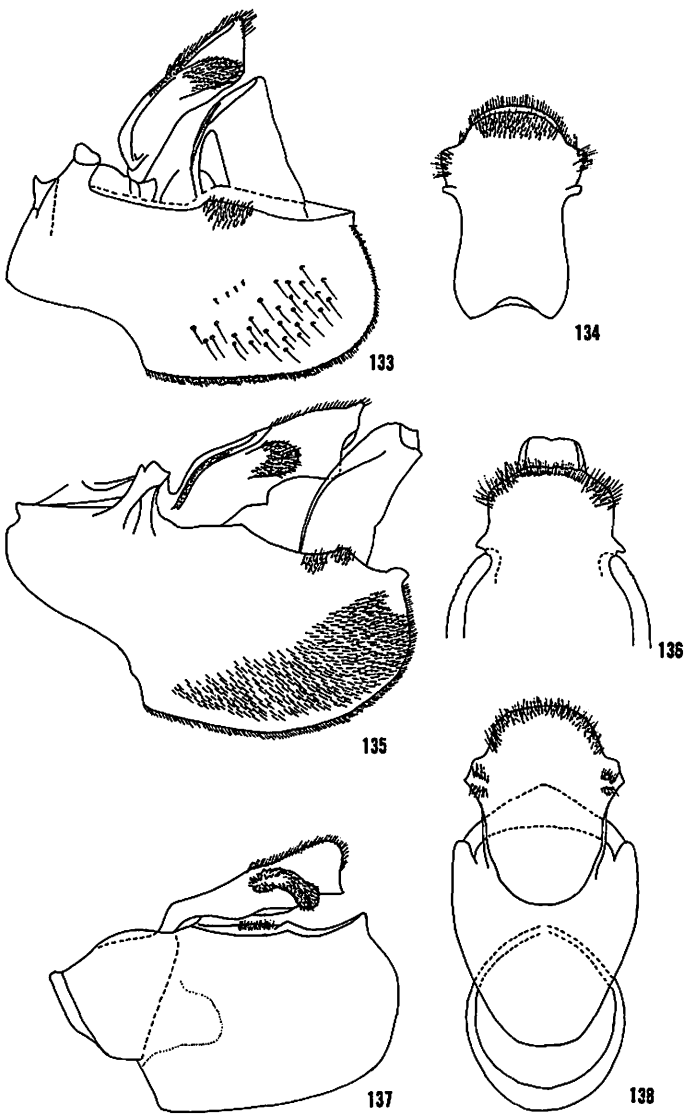
Figs. 118–19. *Hydrometra aculeata* Montrouzier, male genitalia. **118.** Pygophore and proctiger, lateral view. **119.** Phallus, dorsal view. **Figs. 120–122.** *Hydrometra strigosa* (Skuse), male genitalia. **120.** Pygophore and proctiger, lateral view. **121.** Phallus, dorsal view. **122.** Phallus, ventral view. **Figs. 123–124.** *Hydrometra darwiniana* n.sp., male genitalia. **123.** Pygophore and proctiger, lateral view. **124.** Phallus, dorsal view.



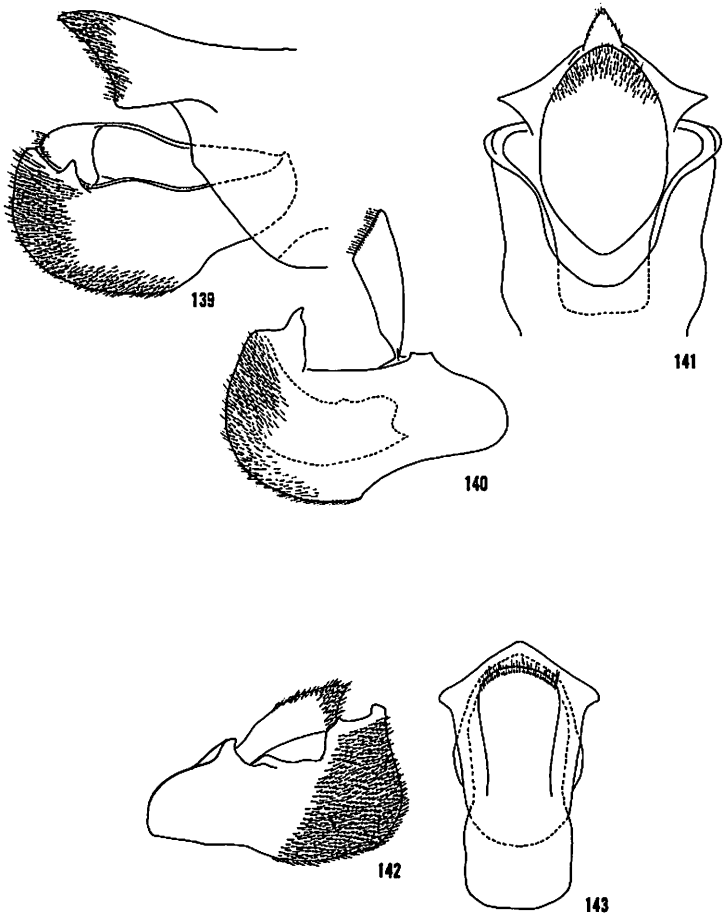
Figs. 125–126. *Hydrometra feta* Kirkaldy, male genitalia. 125. Pygophore and proctiger, lateral view. 126. Pygophore and proctiger, dorsal view. Figs. 127–128. *Hydrometra claudie* n.sp., male genitalia. 127. Pygophore and proctiger, lateral view. 128. Proctiger, dorsal view.



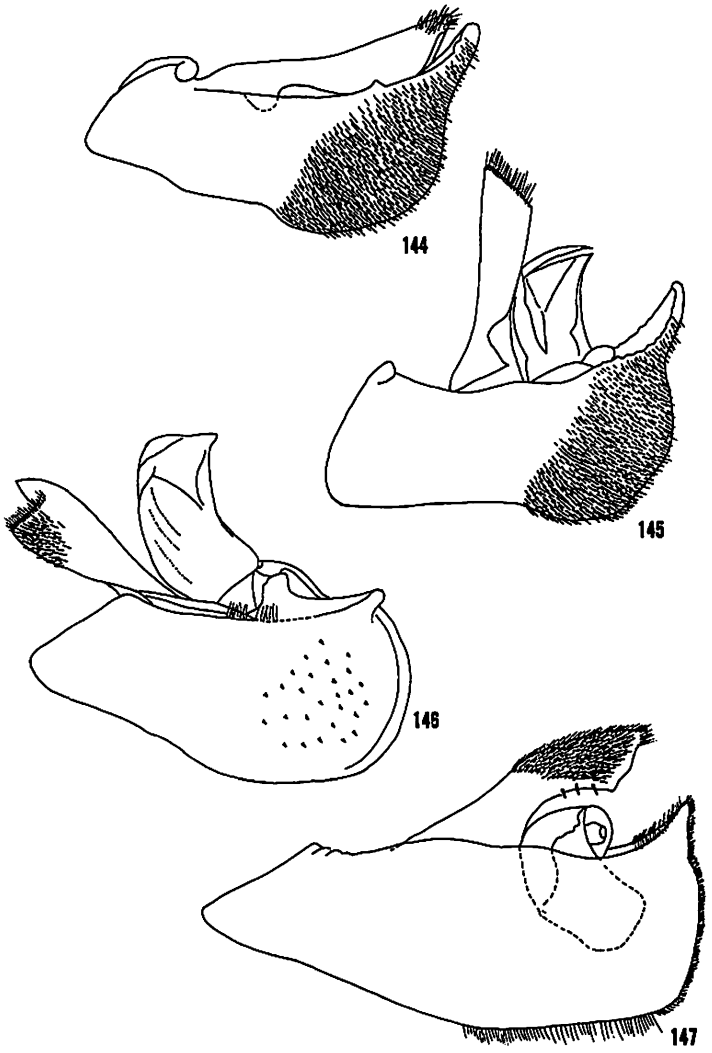
Figs. 129–130. *Hydrometra eioana* n.sp., male genitalia. **129.** Pygophore and proctiger, lateral view. **130.** Proctiger, dorsal view. **Figs. 131–132.** *Hydrometra horvathi* Hungerford and Evans, male genitalia. **131.** Pygophore and proctiger, lateral view. **132.** Proctiger, dorsal view.



Figs. 133–134. *Hydrometra jourama* n.sp., male genitalia. **133.** Pygophore and proctiger, lateral view. **134.** Proctiger, dorsal view. **Figs. 135–136.** *Hydrometra kiunga* n.sp., male genitalia. **135.** Pygophore and proctiger, lateral view. **136.** Proctiger, dorsal view. **Figs. 137–138.** *Hydrometra halei* Hungerford and Evans, male genitalia. **137.** Pygophore and proctiger, lateral view. **138.** Proctiger, dorsal view.



Figs. 139–141. *Hydrometra lineata* Eschscholtz, male genitalia. **139.** Abdominal terminalia, pygophore and proctiger, lateral view. **140.** Pygophore and proctiger, lateral view. **141.** Abdominal terminalia, pygophore and proctiger, ventral view. Figs. **142–143.** *Hydrometra orientalis* Lundblad, male genitalia. **142.** Pygophore and proctiger, lateral view. **143.** Proctiger, dorsal view.



Figs. 144–147. *Hydrometra species*, male genitalia, pygophore and proctiger, lateral view. 144–145. *Hydrometra mindoroensis* Polhemus. 146. *Hydrometra papuana* Kirkaldy. 147. *Hydrometra novaehollandiae* n. sp.

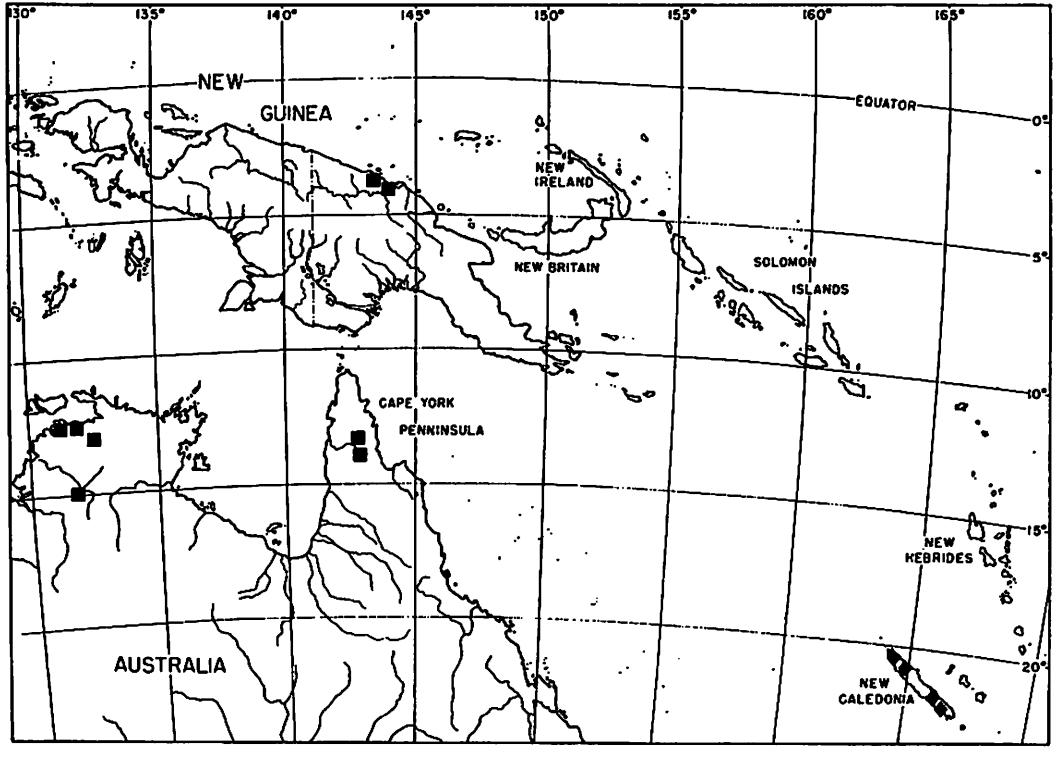


Fig. 148. Distribution of *Hydrometra* species in NE Australia and Melanesia. Diamonds = *H. aculeata* Montrouzier. Squares = *H. orientalis* Lundblad.

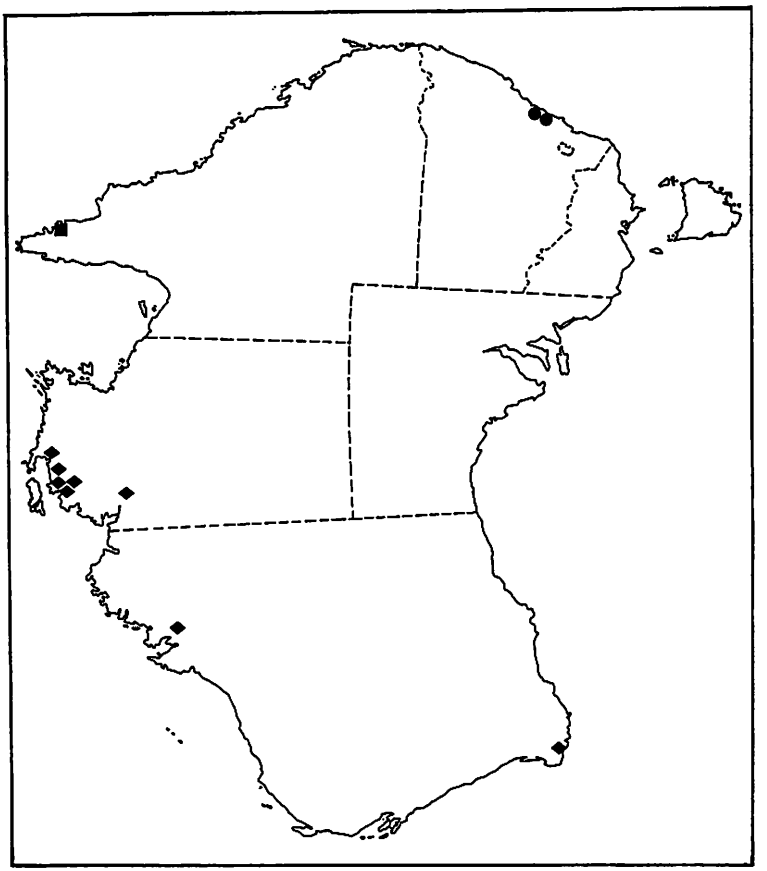


Fig. 149. Distribution of *Hydrometra* species in Australia. Diamonds = *H. darwiniana* n.sp. Square = *H. claudie* n.sp. Circles = *H. novaehollandiae* n.sp.

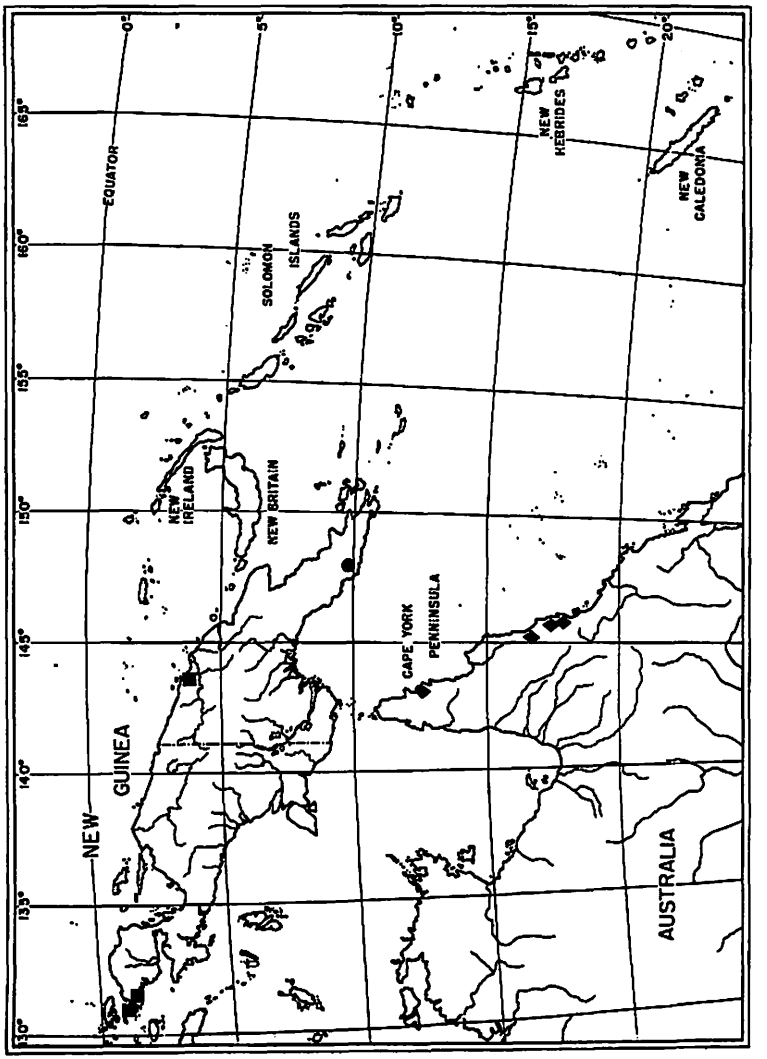


Fig. 150. Distribution of *Hydrometra* species in NE Australia and Melanesia. Circle = *H. eioana* n.sp. Squares = *H. mindoroensis* Polhemus. Diamonds = *H. feta* Hale.

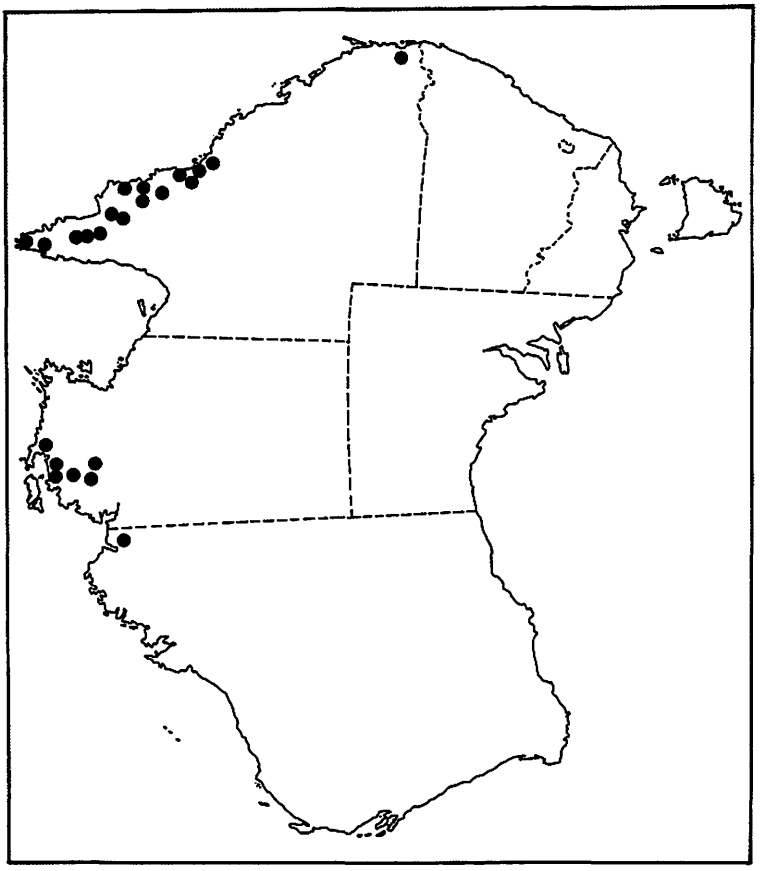


Fig. 151. Distribution of *H. halei* Hungerford and Evans in Australia.

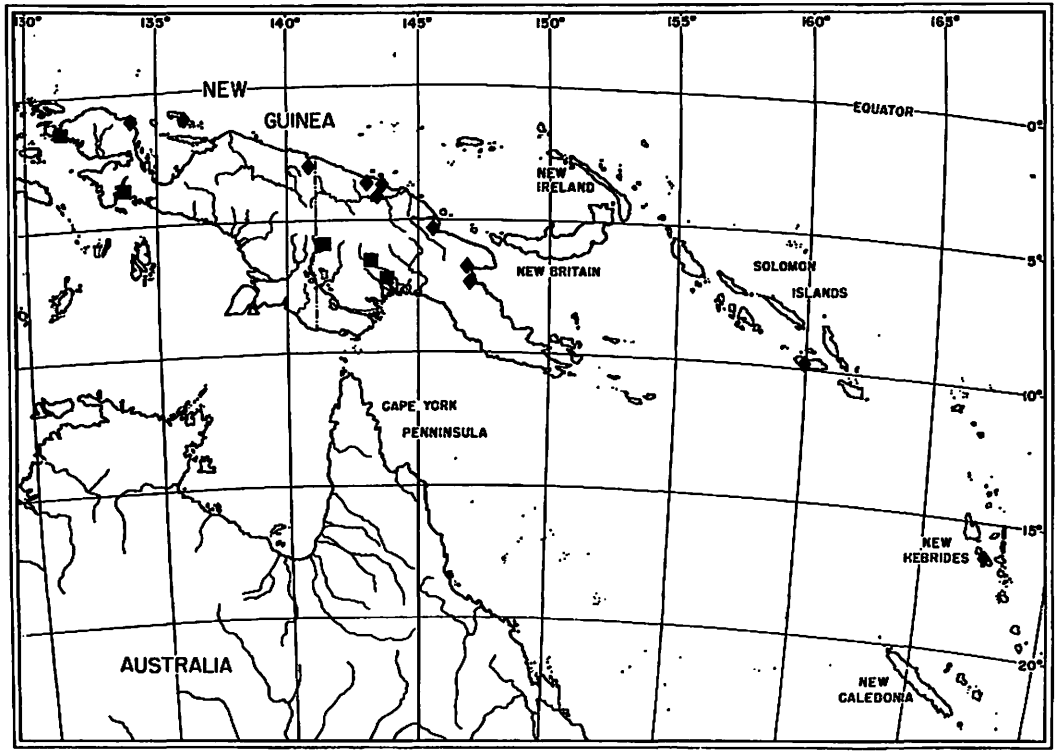


Fig. 152. Distribution of *Hydrometra* species in NE Australia and Melanesia. Diamonds = *Hydrometra horvathi* Hungerford and Evans. Squares = *H. kiunga* n.sp.

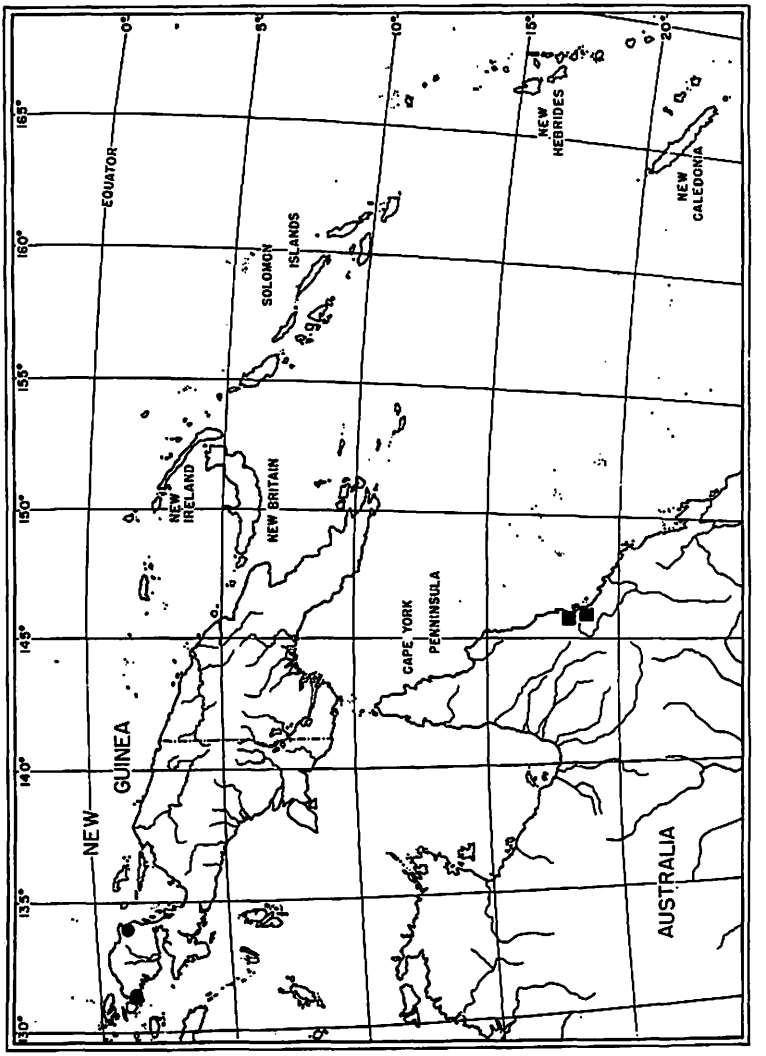


Fig. 153. Distribution of *Hydrometra* species in NE Australia and Melanesia. Circles = *Hydrometra lineata* Eschscholtz. Squares = *H. jourama* n.sp.

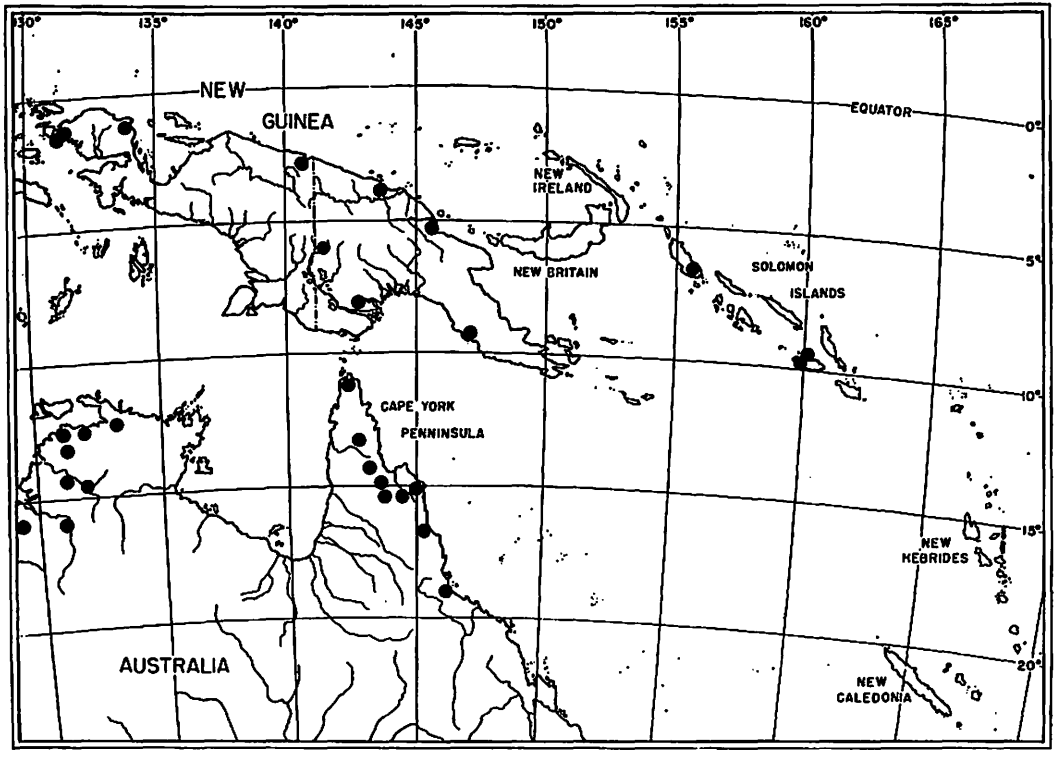


Fig. 154. Distribution of *H. papuana* Kirkaldy in NE Australia and Melanesia (part; see Fig. 155).

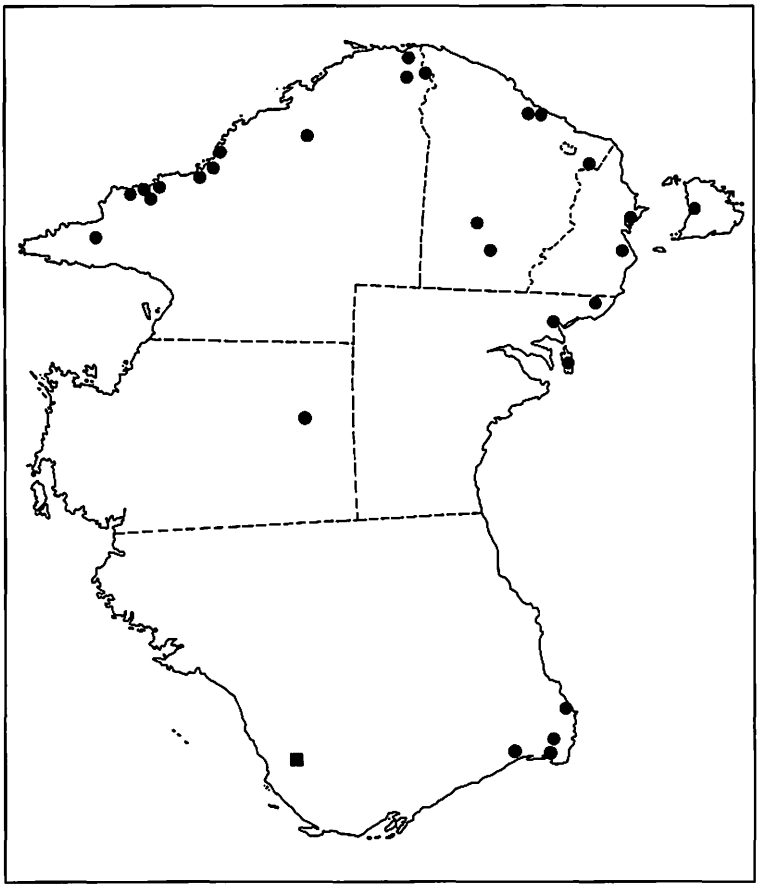


Fig. 155. Distribution of *Hydrometra* species in Australia. Circles = *H. strigosa* Skuse (part; see Fig. 156). Square = *H. papuana* Kirkaldy (part; see Fig. 154).

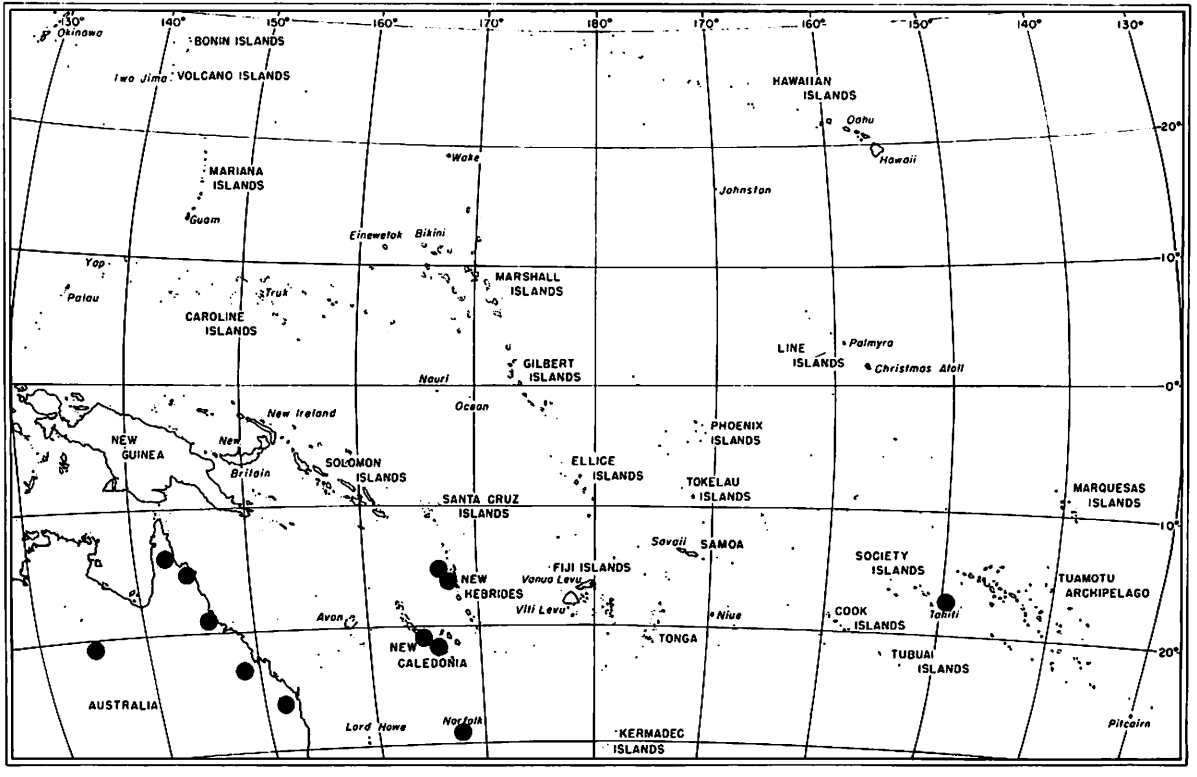


Fig. 156. Distribution of *H. strigosa* (Skuse) in Australia, Melanesia and Polynesia (part; circles in Australia represent areas; see Fig. 155).