THE RAFFLES BULLETIN OF ZOOLOGY 2007 **55**(1): 77-87
Date of Publication: 28 Feb.2007

TWO NEW FRESHWATER PRAWNS OF THE GENUS *MACROBRACHIUM* BATE, 1868 (CRUSTACEA: DECAPODA: PALAEMONIDAE) FROM THE KELIAN RIVER, EAST KALIMANTAN, INDONESIA

Daisy Wowor
Division of Zoology, Research Center for Biology, Indonesian Institute of Sciences (LIPI), Jl. Raya Jakarta Bogor Km 46, Cibinong 16911, Indonesia
Email: daisy_wowor@yahoo.com (Corresponding author)

John W. Short
BioAccess Australia, P.O. Box 10281, Adelaide St, Brisbane, Queensland 4000, Australia

***ABSTRACT.* –** Two new species of restricted freshwater prawns of the genus *Macrobrachium* Bate, 1868, are described from East Kalimantan, Indonesia. *Macrobrachium urayang*, new species, from Kelian River of the Mahakam River, Kayan River and Sebuku River basins, can be differentiated from morphologically similar species by a combination of short rostrum, subequal length of carpus and merus, and presence of tufts of short velvety setae on inner margin of those segments of the major second pereiopod. *Macrobrachium kelianense*, new species, from the Kelian River, can be distinguished from other members of *M. pilimanus* species group by a combination of relatively long rostrum with more dorsal rostral teeth and trilobed epistome.

***KEY WORDS.* –** Freshwater prawn, Palaemonidae, *Macrobrachium*, East Kalimantan, Indonesia, new species, taxonomy.

INTRODUCTION

The freshwater prawns of the genus *Macrobrachium* Bate, 1868, of East Kaliamntan are poorly known, and only few reports have been published about them so far (de Man, 1898, 1908; Holthuis, 1950; Chace & Bruce, 1993). There are only four species that have been recorded, viz., *M. equidens* (Dana, 1852), *M. rosenbergii* (de Man, 1879), *M. pilimanus* (de Man, 1879) and *M. mirabile* (Kemp, 1917). Of the four species, only *M. pilimanus* is restricted to freshwater, whereas *M. rosenbergii* is distributed from brackish to freshwater, and *M. equidens* and *M. mirabile* are typical tidal water species.

Macrobrachium pilimanus species group is found throughout the Sunda shelf, from northern Vietnam and southern Yunnan in China to Java and Borneo (Holthuis, 1950, 1984; Dang & Nguyen, 1972; Dai, 1984; Chong & Khoo, 1987a, 1987b; Chong, 1989; Ng, 1995; Ou & Yeo, 1995; Cai & Dai, 1999; Cai et al., 2003). This species group is quite complex (Johnson, 1960; Holthuis, 1979; Ng, 1985; Yeo et al., 1999) and consisted of 14 species so far. The members of *M. pilimanus* species group in Borneo are not well studied.

The Kelian River is located in the interior of East Kalimantan Province (Indonesian Borneo). It lies near the equator in a pristine tropical rainforest and flows to the Mahakam River, the largest river in East Kalimantan, which empties into the Makassar Straits near the town of Samarinda. The Kelian River is about 250 km west of Samarinda.

Specimens are deposited in Division of Zoology, Research Centre for Biology, Indonesian Institute of Sciences [formerly Museum Zoologicum Bogoriense (MZB)], Cibinong, Indonesia; Queensland Museum (QM), Brisbane, Australia; Zoological Reference Collection (ZRC) of Raffles Museum of Biodiversity Research, Department of Biological Sciences, National University of Singapore, Singapore; Nationaal Natuurhistorisch Museum [formerly Rijksmuseum van Natuurlijke Historie (RMNH)], Leiden and Instituut voor Systematiek en Populatiebiologie [Zoölogisch Museum Amsterdam (ZMA)], Universiteit van Amsterdam, The Netherlands; National Museum of Natural History, Smithsonian Institution (USNM), Washington, D.C., U.S.A. The Indonesian word 'Sungai' is abbreviated as Sg. (river, stream or tributary). All material collected from the Kayan River basin was by D. Wowor and H. H. Tan, unless otherwise stated. The abbreviations used are: CL, carapace length, measured from the postorbital margin to the posterior median margin of the carapace; RL, rostrum length, measured from the tip of the rostrum to the postorbital margin; T, thoracic sternite. The shape of inferior orbit terminology follows Short & Marquet (1998). The diagnoses and descriptions are based on holotype with the variation seen in the paratypes included in parentheses, respectively. All synonymies provided are

restricted. Full synonymies can be found in Holthuis (1950), and Chace & Bruce (1993).

TAXONOMY

PALAEMONIDAE Rafinesque, 1815

Macrobrachium Bate, 1868

Macrobrachium urayang, new species
(Figs 1, 2)

Macrobrachium pilimanus – Holthuis, 1950: 214 (part).
Macrobrachium leptodactylus – Johnson, 1960: 265 (part), 1963: 13 (part); Chace & Bruce, 1993: 35 (part)(not *Palaemon pilimanus* de Man, 1879).

***Material examined.* –** Holotype: male (13.0 mm CL) (MZB Cru 1459), Sg. Enggeng I'ut, a tributary of Sg. Bahau, Kayan basin, East Kalimantan, 18 Nov.1999.

Paratypes: Mahakam basin: 3 males (11.5–14.8 mm CL), 1 female (8.9 mm CL) (QM W23118), Sg. Kelian, coll. R. & J. Powell, 27 May.1997; 1 male (13.5 mm CL) (MZB Cru 1476), Sg. Kelian, coll. R. & J. Powell, 27 May.1997; 3 juveniles (3.1–4.4 mm CL), 2 males (5.9–11.3 mm CL), 2 ovigerous females (7.4–8.9 mm CL) (ZRC 2000.2486), Sg. Kelian, coll. C. Yule, 5–7 Sep.1990; 1 female (6.5 mm CL) (ZRC 2000.2487), Sg. Kelian, coll. C. Yule, Sep.1990; 1 male (7.3 mm CL), 1 female (5.5 mm CL), 2 ovigerous females (6.6–7.3 mm CL) (ZRC 2000.2488), Sg. Kelian, coll. C. Yule, Mar.1991. *Kayan basin*: 23 males (6.2–13.7 mm CL), 4 females (5.1–10.4 mm CL), 6 ovigerous females (8.3–10.7 mm CL) (MZB Cru 1460), same data as holotype; 4 males (9.2–13.0 mm CL), 1 ovigerous female (9.6 mm CL) (QM W25715), same data as holotype; 4 males (8.8-11.5 mm CL), 1 ovigerous female (9.8 mm CL) (RMNH), same data as holotype; 9 males (9.5–12.4 mm CL), 1 ovigerous female (9.2 mm CL) (ZRC 2000.2479), same data as holotype; 2 males (10.8–13.0 mm CL), 3 females (9.8–12.7 mm CL) (MZB Cru 1461), Lalut Birai, tributary of Sg. Enggeng Bio draining into Sg. Bahau, 13-15 Nov.1999; 4 males (7.1–10.0 mm CL) (RMNH), Sg. Seba Ai, tributary of Sg. Kayan, 22 Nov.1999; 1 juvenile (3.9 mm CL), 12 males (5.4–12.0 mm CL), 8 females (5.3–7.7 mm CL), 7 ovigerous females (8.1–8.6 mm CL) (MZB Cru 1462), Sg. Bako, tributary of Sg. Kayan, 23 Nov.1999; 2 males (10.4–10.6 mm CL), 2 ovigerous females (8.1 mm CL) (QM W25716), Sg. Bako, tributary of Sg. Kayan, 23 Nov.1999; 1 male (5.9 mm CL), 2 ovigerous females (9.1–10.1 mm CL) (MZB Cru 1463), Sg. Panan, tributary of Sg. Iwan draining to Sg. Kayan, 25 Nov.1999; 6 males (8.7–13.4 mm CL), 4 females (6.9–8.0 mm CL), 18 ovigerous females (8.4–10.8 mm CL) (MZB Cru 1464), Sg. Nah, tributary of Sg. Kayan, 27 Nov.1999; 2 males (8.0–10.6 mm CL), 1 female (7.4 mm CL), 1 ovigerous female (12.7 mm CL) (USNM), Sg. Nah, tributary of Sg. Kayan, 27 Nov.1999; 4 males (8.4-12.5 mm CL), 6 ovigerous females (8.0–9.5 mm CL) (ZRC 2000.2480), Sg. Nah, tributary of Sg. Kayan, 27 Nov.1999.

Others: *Mahakam basin:* 8 juveniles, 12 males, 13 females, 7 ovigerous females (MZB Cru 1561), Sg. Lakan at Lakan Bilem village, coll .D. Wowor, 9–10 Jun.2006; 1 male (MZB Cru 1562), Sg. Mapan at Jantur Mapan, Bigung village, coll. D. Wowor, 10 Jun.2006. *Kayan basin*: 24 males, 4 females, 16 ovigerous females (MZB Cru 1465), Sg. Bahau at Long Pujungan, coll. S. Wirjoatmodjo, Aug.1999; 3 males, 1 female (MZB Cru 1466), Sg. Enggeng Bio draining to Sg. Bahau, 14 Nov.1999; 1 male, 1 female (ZRC 2000.2481), Sg. Enggeng Bio draining to Sg. Bahau, 15 Nov.1999; 4 juveniles, 14 males, 7 females, 15 ovigerous females (MZB Cru 1467), Sg. Batu Baya, tributary of Sg. Bahau, 16 Nov.1999; 1 male, 1 female (MZB Cru 1468), Lalut Sem, tributary of Sg. Bahau, 16 Nov.1999; 1 juvenile, 3 males, 2 females, 6 ovigerous females (MZB Cru 1469), Lalut Putu Loten, tributary of Sg. Bahau, 17 Nov.1999; 2 juveniles, 52 males, 11 females), 2 ovigerous females (MZB Cru 1470), Sg. Enggeng I'ut, a tributary of Sg. Bahau, 18 Nov.1999; 34 males, 1 female, 2 ovigerous females (ZRC 2000.2482), Sg. Enggeng I'ut, a tributary of Sg. Bahau, 18 Nov.1999; 3 males, 5 ovigerous females (MZB Cru 1471), Sg. Bua Alat, a tributary of Sg. Bahau, 18 Nov.1999; 4 males, 3 females, 5 ovigerous females (MZB Cru 1472), Sg. Pingai, tributary of Sg. Kayan, 20 Nov.1999; 7 juveniles, 8 males, 1 female, 2 ovigerous females (ZRC 2000.2483), Sg. Mutai, tributary of Sg. Kayan, 20 Nov.1999; 11 juveniles, 16 males, 13 females, 28 ovigerous females (MZB Cru 1473), Sg. Seba Ai, tributary of Sg. Kayan, 22 Nov.1999; 7 juveniles, 21 males, 20 females, 18 ovigerous females (ZRC 2000.2484), Sg. Seba Ai, tributary of Sg. Kayan, 22 Nov.1999; 21 males, 7 females, 9 ovigerous females (MZB Cru 1474), Sg. Nah, tributary of Sg. Kayan, 27 Nov.1999; 1 juvenile, 21 males, 8 females, 8 ovigerous females (ZRC 2000.2485), Sg. Nah, tributary of Sg. Kayan, 27 Nov.1999; 104 juveniles, 33 males, 11 females (MZB Cru 1475), S. Kayan, 29 Nov.1999. Sebuku basin: 4 males, 8 ovigerous females (ZRC 1995.470), Sg. Bantul at Bantul logging camp, draining to Sg. Tulit, coll. M. Kottelat, 10 Feb.1993; 1 male, 1 female, 1 ovigerous female (ZRC 1995.476), Sg. Tulit at Kalonsayan, coll. M. Kottelat, 12 Feb.1993; 2 males, 2 ovigerous females (ZRC 1995.518), Stream at Km 18-19 on road from Semunad to Bantul logging camp, a tributary of Sg. Tikung, coll. M. Kottelat, 18 Feb.1993.

***Diagnosis.* –** A subcylindrical body form species. Rostrum short, reaching mid-line or slightly extending beyond end of second segment of antennular peduncle; moderately slender; dorsal carina slightly convex. Rostral formula: 4–5) 9-13/ 1-2 teeth. Inferior orbital margin moderately produced, obtuse, postantennular carapace margin evenly rounded. Carapace spinose. Ocular beak moderately developed. Epistome bilobed. Second pereiopod robust, similar in shape, unequal in size. Long velvety setae present on both chelae. Fingers with less than 10 teeth. Carpus long conical, shorter than chela, about as long as palm and merus. All segments covered with spines. Inner margins of carpus and merus of major cheliped covered with short velvety setae. T4 unarmed, with moderate posterior submedian plate; T5 with transverse plate with median notch; T8 with contiguous posteromedially anterior lobes, without median process posteriorly. Preanal carina present. Telson stout, glabrous, with about 8–12 pairs of long plumose subventral setae. Uropods glabrous; exopod with mobile mesial spine longer than distolateral tooth. Developed eggs large, maximum size 1.7 by 1.2 mm, ovoid, few.

***Description of holotype.* –** *Rostrum*. Very short, 0.32 CL (0.36–0.41 in paratypes), reaching mid-line of or slightly extending beyond end of second segment of antennular peduncle; slender, maximum depth distinctly less than maximum dorsoventral diameter of cornea; lateral carina well developed, continuing almost to tip; dorsal carina slightly sinuous, bent downwards in front of orbit with tip directed anteriorly, teeth subequally spaced, 11 teeth (9–13, mode 11 or 12), 4 teeth (4 or 5, mode 4) completely postorbital,

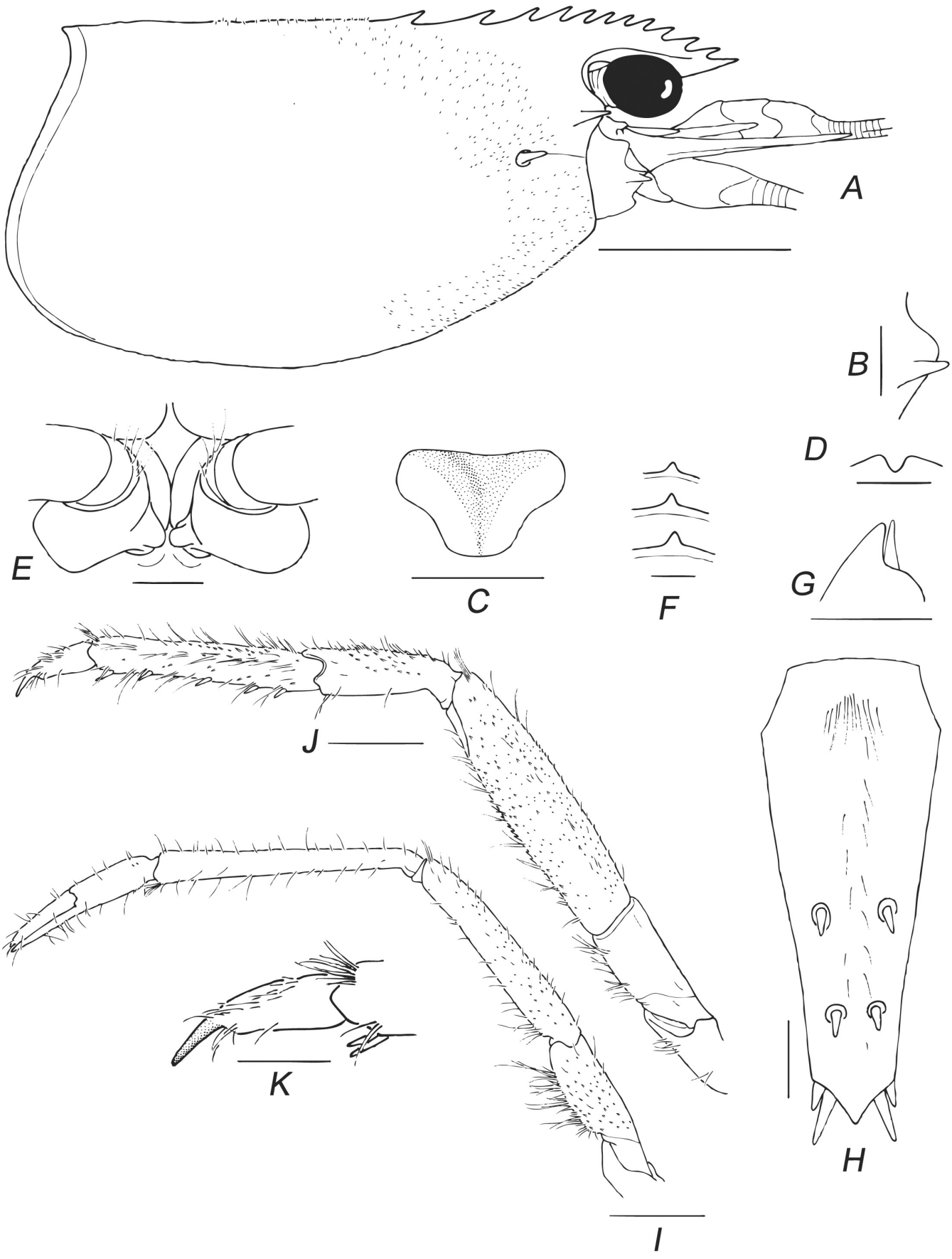

Fig. 1. *Macrobrachium urayang*, new species, holotype, male 13.00 mm CL, MZB Cru 1459: A, lateral view of carapace; B, postantennular carapace margin; C, epistome; D, T4; E, T8; F, first 3 abdominal sternites; G, mobile mesial spine of exopod of uropod; H, telson; I, first pereiopod; J, third pereiopod; K, dactylus of third pereiopod. Scale bars: A = 5 mm; I–J = 2 mm; B–H, K = 1 mm.

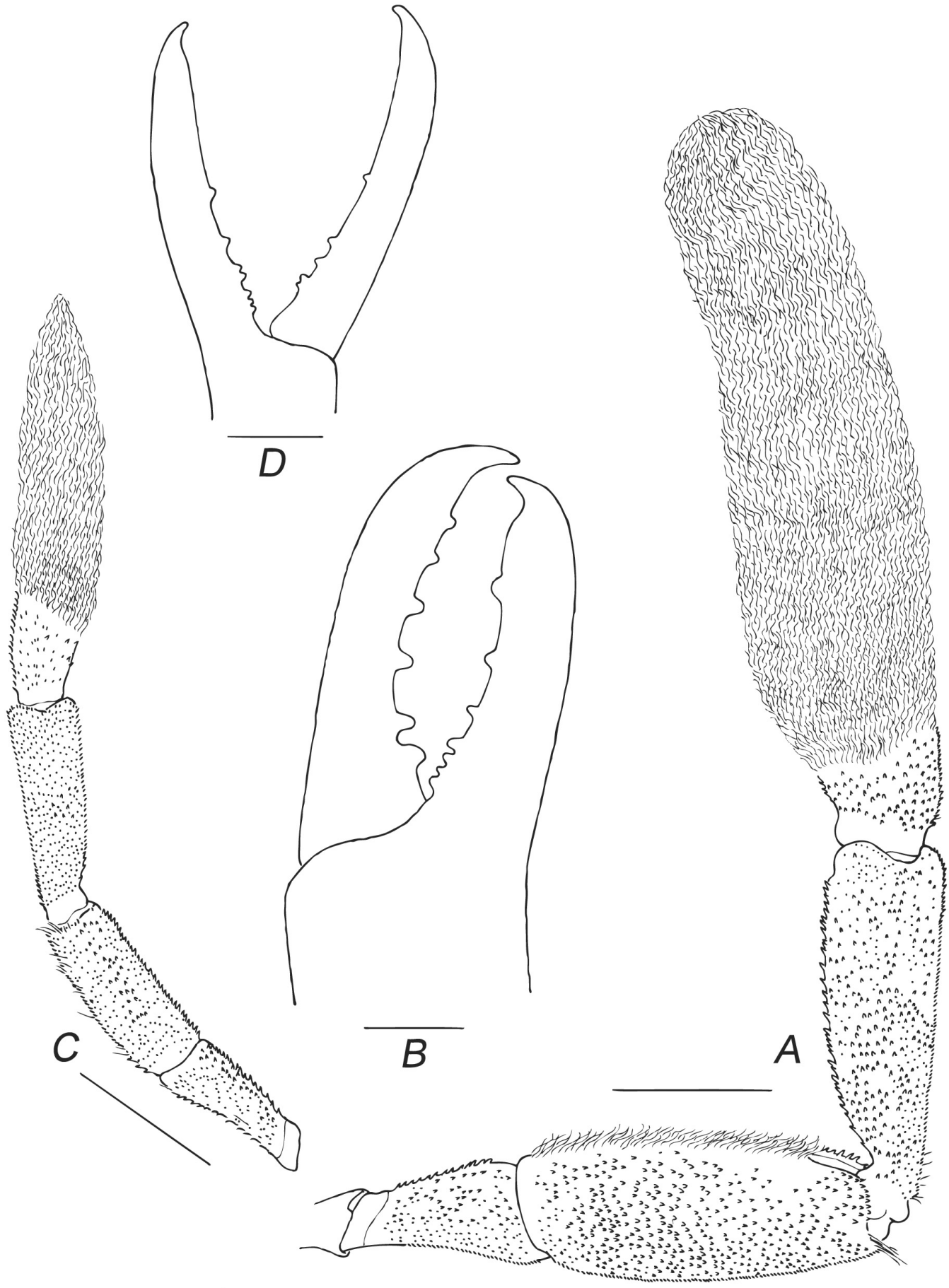

Fig. 2. *Macrobrachium urayang*, new species, holotype, male 13.00 mm CL, MZB Cru 1459: A, lateral view of major second pereiopod; B, same, cheliped, denuded, dorsal view; C, lateral view of minor second pereiopod; D, same, cheliped, denuded, dorsal view. Scale bars: A, C = 5 mm; B, D = 2 mm.

postorbital teeth on anterior 0.36 of carapace (0.28–0.39), teeth strong, relatively long, upwardly directed, more closely distributed above orbit; ventral carina with 1 tooth (1 or 2, mode 2), first tooth located at about distal half (Fig. 1A).

General cephalon. Ocular cornea well developed, 0.16 CL (0.15–0.17). Inferior orbital margin moderately produced, obtuse, postantennular carapace margin evenly rounded (Fig. 1B). Antennal spine sharp, slender, continuing posteriorly as ridge, situated below lower orbital angle; hepatic spine smaller, situated behind and below antennal spine; branchiostegal suture running from hepatic spine to carapace margin. Carapace spinulate on dorsal and branchiostegal regions. Ocular beak moderately developed, without laterally expanded tip. Epistome completely bilobed, lobes with blunt rounded margin (Fig. 1C). Scaphocerite stout, 0.46 CL (0.45–0.47), length 2.50 times maximum breadth (2.33–2.73), lateral margin slightly concave, distolateral tooth failing to reach end of lamella. Third maxilliped with ultimate segment reaching beyond antennal peduncle; ultimate shorter than penultimate, 0.71 as long as penultimate (0.80–0.93); exopod shorter than ischiomerus

First pereiopods. Slender, exceeding scaphocerite by chela and distal three-fourths of carpus; fingers about as long as palm; carpus 1.77 chela length (1.46–1.64), 1.12 merus length (1.10–1.16); merus and ischium covered with spinules; scattered short stiff setae present on all segments, otherwise glabrous (Fig. 1I).

Second pereiopods. Similar in shape, unequal in size, robust; carpus of minor cheliped extend beyond end of scaphocerite. *Major cheliped*. Spinules abundant on all segments except fingers and distal half or two-thirds of palm; fingers, distal part of palm, inner margins of carpus and merus covered by tufts of long velvety setae, especially on fingers and palm; chela 1.70 CL (1.37–1.80), length 4.92 times width (4.26–5.55), outer and inner margins slightly convex and concave respectively, upper and lower margins rounded; palm subcylindrical, about as broad as maximum merus width, slightly compressed, width 1.34 times depth (1.31–1.36); fingers 0.68 times palm length (0.71–0.94), gaping; dactylus with 6–8 medium-sized teeth, first tooth at proximal 0.8, pollex with 4–6 medium-sized teeth of equal size and 3 smaller teeth towards articulation of fingers, first tooth at proximal 0.7, teeth subequally distributed and obscured by long velvety setae, both fingers with oblique carina distally; fingers uncinate at tip; carpus 0.80 palm length (0.80–0.98), conically long, length 2.78 times distal width (2.42–3.84), 0.48 times chela length (0.47–0.51), 0.97 times merus length (0.95–1.00); merus not inflated, 1.81 times ischium length (1.45–1.96); ischium tapereds (Figs. 2A, B). *Minor cheliped*. Generally resembling major cheliped; spinules abundant on all segments except fingers and distal three-fourths of palm covered thickly by tufts of long velvety setae, especially on fingers; cheliped 0.61 times major cheliped (0.55–0.65); fingers 1.36 times palm length (1.32–1.76), gaping; dactylus with 5–8 small teeth, pollex with 7 or 8 small teeth, teeth subequally distributed along proximal half of cutting edges, obscured by long velvety setae; carpus shorter than chela, conically long, 1.15 times palm length (1.23–1.31) and 1.05 merus length (0.98-1.02); merus subcylindrical and stout, 1.25 times ischium length (1.13–1.40); ischium shorter than merus, tapered (Figs. 2C, D).

Third pereiopods. Entire dactylus and distal half of propodus extend beyond scaphocerite; spinules present on all segments except ischium, few scattered short stiff setae present on all segments, otherwise glabrous (Fig. 1J); dactylus stout, curved, fringed with dorsolateral setae, ventral carina well developed (Fig. 1K); propodus length 6.00 times longer than width (6.43–7.14); 8 ventral spines distributed along length of propodus, 2 distal most spines paired; carpus 0.46 times propodus length (0.49–0.58); merus 1.23 times propodus length (1.22–1.27), 1.97 times ischium length (2.04–2.14).

Fourth pereiopods. Entire dactylus extend beyond scaphocerite; spinules present on all segments except ischium, few scattered short stiff setae present on all segments, otherwise glabrous; 8 ventral spines distributed along length of propodus, 2 distal most spines paired; merus 2.04 times ischium length (2.00–2.29).

Fifth pereiopods. Tip of dactylus reaching distal end of scaphocerite; spinules present on all segments except ischium, few scattered short stiff setae present on all segments, otherwise glabrous; 12 ventral spines distributed along length of propodus; merus 1.04 as long as propodus (0.93–1.00), 2.28 longer than ischium (1.93–2.29).

Thoracic sternum. T4 without median process; with moderate posterior submedian plate (Fig. 1D); T8 with contiguous posteromedially anterolateral lobes, without median process (Fig. 1E). *Abdomen*. Smooth, glabrous. *Male abdominal sternites*. First 3 abdominal sternites with medium-sized triangular median process of similar form and size (Fig. 1F). *Inter-uropodal sclerite*. Well developed, elevated as longitudinal preanal carina, carina medium-sized, about same size as posterolateral teeth of sixth abdominal somite. *Telson*. Moderate and stout, 3.50 times median width (3.06–3.44), lateral margins straight, convergent with 2 pairs of dorsal spines present, posterior subventral margin straight with blunt median point, median projection overreached by inner pair of posterior spines (Fig. 1H). *Uropods*. With acute distolateral tooth, mobile mesial spine slightly or distinctly longer than distolateral tooth (Fig. 1G), exopod 2.33 times longer than broad (2.11–2.21).

Etymology. – The specific name *urayang* is derived from Kayan dialect for prawn, language used by the indigenous Dayak Kayan of the interior East Kalimantan. The name is used as a noun in apposition.

Size. – Males reach larger sizes than females; the largest male recorded being 14.8 mm CL; the largest female 12.7 mm CL and ovigerous females are between 6.6 to 12.7 mm CL (n=49).

Remarks. – This new species has unequal robust second pereiopods, with both chelae being covered with long velvety setae; and the females have large and few eggs. These

characters apparently compelled Holthuis (1950) to put specimens of this species under *Macrobrachium pilimanus* (de Man, 1879). However, Johnson (1960, 1963) believed that the new species closely resembles *Macrobrachium leptodactylus* (de Man, 1892). The two species share several characters such as a spinulate carapace; a T4 with a moderately sized posterior submedian plate; a T8 which has contiguous posteromedially anterior lobes but without a median process; the first three abdominal sternites having a moderately sized median process; and the second pereiopod having a long conical carpus and non-inflated merus. Nevertheless, Johnson (1963: 14) doubted the identity of this Bornean species stating that: "… the Bornean specimens may not belong to this species". *Macrobrachium urayang* can be differentiated from *M. leptodactylus* in having longer and prominent rostral teeth (vs. short and not outstanding); a completely bilobed epistome (vs. partly bilobed); absence of preanal carina (vs. presence); fewer teeth on both chelae of second pereiopods (5–8 teeth vs. 11–16 teeth), shorter movable finger of the major second pereiopod chela (ratio of movable finger length to palm length 0.68–0.94 vs. 1.07–1.63), fingers widely gaping (vs. moderately gaping), a relatively longer carpus (ratio of carpus length to merus length 0.95–1.00 vs. 0.78–0.90), the inner margin of carpus and merus having long velvety setae (vs. without long velvety setae), the entire second chelipeds having more and larger spinules (vs. less and smaller); the third to fifth pereiopods being spinulate (vs. glabrous); and the mobile mesial spine of the uropod being longer than the distolateral tooth (vs. shorter).

Although the specimens from the upper Kayan River which were collected by Dr. A. W. Nieuwenhuis in 1900, deposited in RMNH, Leiden, The Netherlands, are not examined in this study, the first author had collected a good series of this species from the upper Kayan River, which fit very well with Johnson's drawing and short description of this Bornean species. Therefore, there is no doubt that the species collected by Dr. A. W. Nieuwenhuis is the same species as those collected.

Macrobrachium urayang also morphologically resembles *M. malayanum* (Roux, 1934). Both species have a spinulate carapace; a completely bilobed epistome; first three abdominal sternites each with a moderately sized median process; no preanal carina; a mobile mesial spine of the uropod which is longer than the distolateral tooth; major second pereiopod with fingers shorter than the palm, fingers widely gaping with 5–8 teeth, and the carpus about as long as the merus. However, *Macrobrachium urayang* can be distinguished from *M. malayanum* by several characters, i.e. shorter rostrum (ratio of rostrum length to carapace length 0.32–0.41 vs. 0.59–0.73), tip reaching to or slightly extending beyond the second segment of the antennular peduncle (vs. extending the end of the third segment of the antennular peduncle or slightly extending beyond the distal end of the scaphocerite), less ventral teeth (1–2 vs. 3–5); a T8 with contiguous posteromedially anterior lobes (vs. moderately separated); a major second pereiopod chela covered with long velvety setae (vs. short velvety setae), the inner margins of carpus and merus having long velvety setae (vs. without velvety setae), the minor second pereiopod chela being densely covered with long velvety setae (vs. scattered long stiff setae), both second chelipeds being covered with spinules (vs. spines); and the third to fifth pereiopods being robust (vs. slender) and spinulate (vs. glabrous).

***Distribution.* –** Presently only known from the upper to the middle part of the Mahakam, Kayan and Sebuku River basins which drain to the Makassar Straits at the eastern coast of Kalimantan, Indonesian Borneo.

***Comparative material examined.* –** *Macrobrachium pilimanus*: lectotype, male 14.95 mm CL (RMNH D 1477) Moearalaboeh [Muaralabuh], W. Sumatra, Indonesia, coll. Midden Sumatra Expedition, 1877; paralectotypes, 4 males (RMNH D 1477), same data as lectotype; 1 male (RMNH D 1095), Alahanpandjang [Alahanpanjang], W. Sumatra, Indonesia, coll. Midden Sumatra Expedition, 1877; *ca.* 50 specimens (RMNH D 2490), river near Alahanpandjang [Alahanpanjang], W. Sumatra, Indonesia, coll. Midden Sumatra Expedition, 1877; 2 males (MNHN Na. 13595 - ex. Museè de Leyde, 1899), river at Alahanpandjang [Alahanpanjang], W. Sumatra, Indonesia, coll. Midden Sumatra Expedition, 1877. *M. leptodactylus*: lectotype, male 16.0 mm CL (RMNH D 1801), Buitenzorg [Bogor], W. Java, coll. M. Weber, Mar.–Sep.1888; paralectotypes, male (RMNH D 38072), Buitenzorg [Bogor], W. Java, coll. M. Weber, Mar.–Sep.1888; 5 males (ZMA De 102564), Buitenzorg [Bogor], W. Java, coll. M. Weber, Mar.–Sep.1888.

Macrobrachium kelianense, new species

(Figs 3, 4)

Macrobrachium pilimanus – Holthuis, 1950: 214 (part); Johnson, 1960: 263 (part); 1963: 10 (part); Chace & Bruce, 1993: 35 (part) (not *Palaemon pilimanus* de Man, 1879).

***Material examined.* –** Holotype: male (11.2 mm CL) (MZB Cru 1477), Sg. Kelian confluence with Sg. Ketang, Mahakam River basin, E. Kalimantan, coll. R. & J. Powell, 2 Nov.1995.

Paratypes: 6 males (9.5–11.6 mm CL), 3 females (7.9–9.4 mm CL), 8 ovigerous females (9.5–10.6 mm CL) (QM W21515), same data as holotype; 1 ovigerous female (10.3 mm CL) (MZB Cru 1478), same data as holotype; 1 male (8.2 mm CL) (ZRC 2000.2489), Sg. Kelian, Mahakam River basin, E. Kalimantan, coll. C. Yule, Sep. 1990; 1 female (9.4 mm CL) (ZRC 2000.2490), Sg. Kelian, Mahakam River basin, E. Kalimantan, coll. C. Yule, Sep. 1991.

Others: Mahakam basin: 7 juveniles, 40 males, 51 females, 8 ovigerous females (MZB Cru 1563), Sg. Lakan at Lakan Bilem village, coll. D. Wowor, 9–10 Jun.2006; 1 male (MZB Cru 1564), Sg. Mapan at Jantur Mapan, Bigung village, coll. D. Wowor, 10 Jun.2006.

***Diagnosis.* –** A subcylindrical body form species. Rostrum short, reaching slightly behind or end of third segment of antennular peduncle; slender; dorsal carina slightly convex. Rostral formula: 3–5) 12–17/ 2–3 teeth. Inferior orbital margin

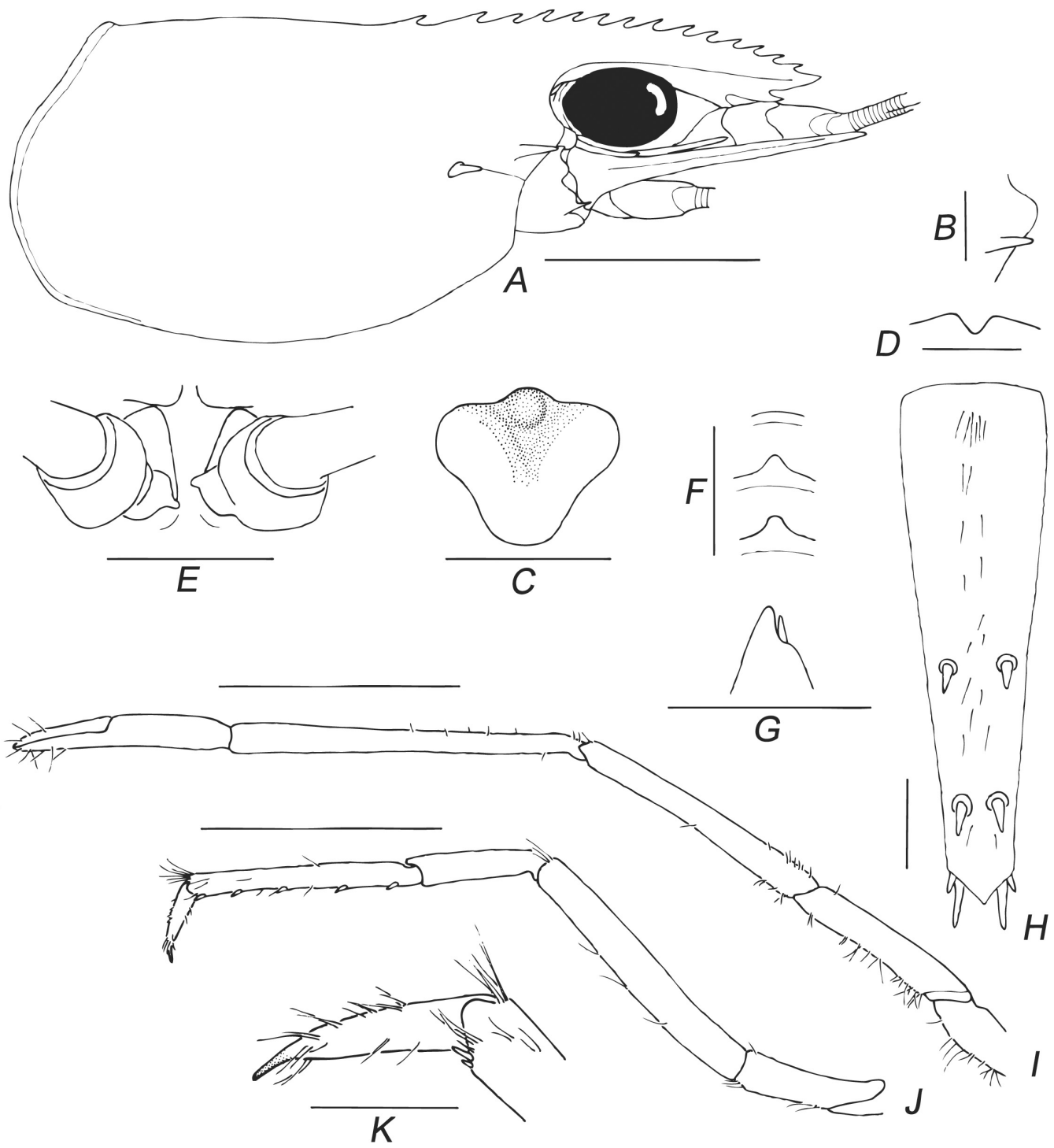

Fig. 3. *Macrobrachium kelianense*, new species, holotype, male 11.20 mm CL, MZB Cru 1477: A, lateral view of carapace; B, postantennular carapace margin; C, epistome; D, T4; E, T8; F, first 3 abdominal sternites; G, mobile mesial spine of exopod of uropod; H, telson; I, first pereiopod; J, third pereiopod; K, dactylus of third pereiopod. Scale bars: A, I–J = 5 mm; E = 2 mm; B–D, F–H, K = 1 mm.

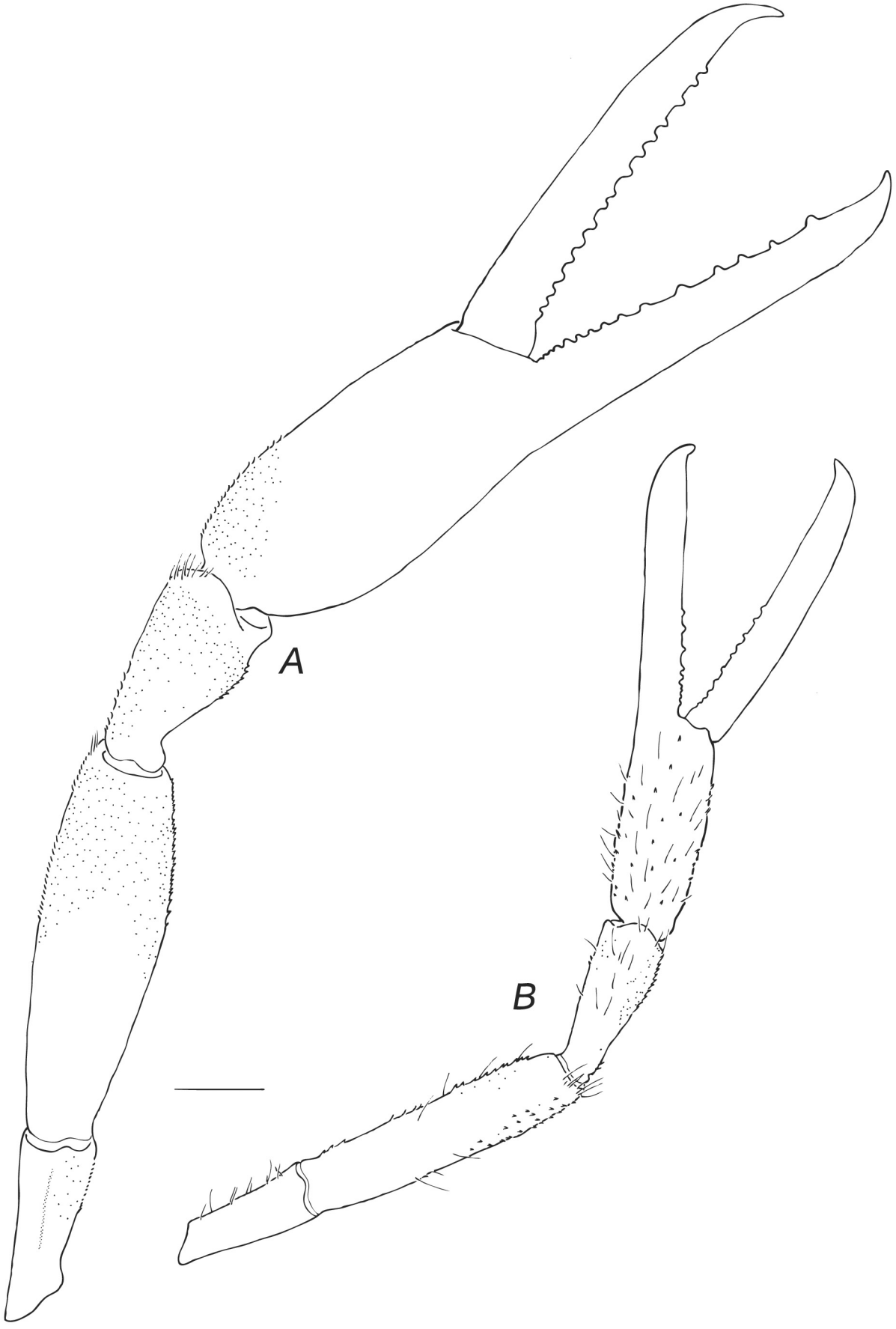

Fig. 4. *Macrobrachium kelianense*, new species, holotype, male 11.20 mm CL, MZB Cru 1477: A, dorsal view of major second pereiopod; B, dorsal view of minor second pereiopod. Setae omitted. Scale bar: A–B = 2 mm.

moderately produced, obtuse, postantennular carapace margin evenly rounded. Carapace glabrous. Ocular beak moderately developed. Epistome completely trilobed. Second pereiopod robust, similar in shape, unequal in size. Long velvety setae present on both chelae. Fingers with more than 10 teeth. Carpus conical, shorter than chela, palm and merus. All segments covered with spinules. T4 unarmed, with moderate posterior submedian plate; T5 with transverse plate with median notch; T8 with moderately separated anterior lobes, without median process posteriorly. Preanal carina present. Telson relatively slender, glabrous, with about 6–9 pairs of long plumose subventral setae. Uropod glabrous; exopod with mobile mesial spine shorter than distolateral tooth. Developed eggs large, maximum size 1.7 by 1.2 mm, ovoid, few.

Description in holotype. – *Rostrum*. Short, 0.54 CL (0.53–0.64 in paratypes), slightly behind or reaching end of third segment of antennular peduncle; slender, maximum depth distinctly less than maximum dorsoventral diameter of cornea; lateral carina well developed, continuing almost to tip; dorsal carina slightly convex, bent downwards in front of orbit with tip directed anteriorly, teeth subequally distributed, armed with 14 teeth (12–17, mode 14), 4 teeth (3–5, mode 4) completely postorbital, postorbital teeth on anterior 0.34 of carapace (0.28–0.35); ventral carina with 2 teeth (2 or 3, mode 2), first tooth located at about distal one-third (Fig. 3A).

General cephalon. Ocular cornea well-developed, 0.22 CL (0.21–0.25). Inferior orbital margin moderately produced, obtuse, postantennular carapace margin evenly rounded (Fig. 3B). Antennal spine sharp, slender, continuing posteriorly as ridge, situated below lower orbital angle; hepatic spine smaller, situated behind and below antennal spine; branchiostegal suture running from hepatic spine to carapace margin. Carapace glabrous. Ocular beak moderately developed, without laterally expanded tip. Epistome completely trilobed, lobes with blunt rounded margin (Fig. 3C). Scaphocerite stout, 0.66 CL (0.58–0.71), length 2.96 times maximum breadth (2.70–3.08), lateral margin straight, distolateral tooth failing to reach end of lamella. Third maxilliped exceeding antennal peduncle by ultimate and distal one-third of penultimate; ultimate shorter than penultimate, 0.80 as long as penultimate (0.68–0.87); exopod shorter than ischiomerus.

First pereiopods. Slender, exceeding scaphocerite by chela and distal four-fifths of carpus; fingers about as long as palm; carpus 1.59 chela length (1.46–1.91), 1.19 merus length (1.12–1.42); few scattered short stiff setae present on all segments, otherwise glabrous (Fig. 3I).

Second pereiopods. Similar in shape, unequal in size, robust; carpus of minor cheliped extend beyond distal end of scaphocerite. *Major cheliped.* Spinules present only on proximal palm, carpus, distal merus and small part of inner margin of merus; fingers and distal part of palm lightly covered by tufts of long velvety seta; chela 1.58 CL (1.17–1.51), length 4.77 times width (4.31–5.94), outer and inner margins slightly convex and concave respectively, upper and lower margins rounded; palm subcylindrical, clearly greater than maximum merus width, slightly compressed, width 1.25 times depth (1.19–1.21); fingers 1.39 times palm length (0.81–1.33), more or less touching along their length; dactylus with 16 medium-sized teeth and pollex with 11 medium-sized and 4 small teeth towards articulation of fingers, teeth subequally distributed along cutting edges; fingers uncinate at tip; carpus 0.58 palm length (0.44–0.77), conical, length 1.59 times distal width (1.70–2.46), 0.24 times chela length (0.24–0.30), 0.48 merus length (0.47–0.55), without tuft of velvety setae nor long stiff setae on distal margin; merus moderately inflated, length 3.10 times depth (2.89–4.61), 2.0 times ischium length (1.86–2.23); ischium tapered (Fig. 4A). *Minor cheliped.* Generally resembling major cheliped; few spinules present on palm, carpus and merus; palm covered lightly by scattered long stiff setae; fingers covered by tufts of long velvety setae; cheliped 0.71 times major cheliped (0.75–0.76); fingers 1.57 times palm length (1.24–1.59), more or less touching along their length; dactylus with 8 small teeth, pollex with 9small teeth, teeth subequally distributed at about proximal half; carpus shorter than chela, conical, 0.72 times palm length (0.70–0.79) and 0. 48 merus length (0.54–0.57), without tufts of long velvety setae on inner distal margin; merus subcylindrical and stout, 1.65 times ischium length (1.39–1.82); ischium shorter than merus, tapered (Fig. 4B).

Third pereiopods. Tip of dactylus reaching distal end of scaphocerite; few scattered short stiff setae present on all segments, otherwise glabrous (Fig. 3J); dactylus stout, curved, ventral carina obsolete (Fig. 3K); propodus length 9.20 times longer than width (9.25–13.33); 7 ventral spines distributed along length of propodus, 2 distal most spines paired; carpus 0.54 times propodus length (0.50–0.57); merus 1.26 times propodus length (1.14–1.30), 2.07 times ischium length (1.93–2.15).

Fourth pereiopods. Tip of dactylus reaching distal end of scaphocerite; few scattered short stiff setae present on all segments, otherwise glabrous; 7 ventral spines distributed along length of propodus, 2 distal most spines paired; merus 2.23 times ischium length (1.86–2.40).

Fifth pereiopods. Tip of dactylus reaching distal one-eighth of scaphocerite; few scattered short stiff setae present on all segments, otherwise glabrous; 5 ventral spines distributed along length of propodus; merus 1.12 as long as propodus (0.98–1.12), 2.15 longer than ischium (1.96–2.30).

Thoracic sternum. T4 without median process; posterior submedian plate moderate with bluntly rounded tip, notch shallow and wide (Fig. 3D); T8 with anterior lobes moderately separated, without median process (Fig. 3E). *Abdomen*. Smooth, glabrous. *Male abdominal sternites*. First 2 abdominal sternites each with a small triangular median process of similar form and size, third abdominal sternite without a median process (Fig. 3F). *Inter-uropodal sclerite*. Well developed, elevated as longitudinal preanal carina, carina small-sized, smaller than posterolateral teeth of sixth abdominal somite. *Telson*. Relatively slender, glabrous, 4.23

times median width (3.61–4.73), lateral margin straight, convergent, 2 pairs of dorsal spines present, posterior subventral margin straight with rounded median point, median projection overreached by inner pair of posterior spines (Fig. 3H). *Uropods*. With acute distolateral tooth, mobile mesial spine distinctly smaller than distolateral tooth (Fig. 3G), exopod 2.95 times longer than broad (2.29–2.62), glabrous.

Etymology. **–** This species is named after its type locality, Kelian River.

Size. **–** Males reach larger sizes than females; the largest male recorded being 11.6 mm CL; the largest female 10.6 mm CL and ovigerous females are between 9.5 to 10.6 mm CL (n=9).

Remarks. **–** *Macrobrachium kelianense,* new species, closely resembles *M. pygmaeum* (Roux, 1928) and *M. eriocheirum* Dai, 1984, two members of *M. pilimanus* species group. The three species mentioned above have short rostrum which is not extending beyond the end of the third segment of the antennular peduncle, the chelae of the second pereiopods being slender with more than 10 teeth on each finger, the carpus being long conical, and the merus being slightly inflated. However, *M. kelianense* can be distinguished from *M. pygmaeum* in having a longer rostrum (ratio of rostrum length to carapace length 0.53–0.55 vs. 0.41–0.44); slightly more widely distributed postorbital teeth (ratio of epigastric length to carapace length 0.28–0.35 vs. 0.20–0.25); trilobed epistome (vs. partly bilobed); moderately separated T8 anterior lobes (vs. narrowly separated); more slender third periopods (ratio of propodus length to propodus width 9.20–13.33 vs. 8.75–9.00); the first two abdominal sternites each with a small median process (vs. medium-sized); and a small preanal carina (vs. medium-sized).

Macrobrachium kelianense can also be separated from *M. eriocheirum* Dai, 1984, by its longer rostrum (ratio of rostrum length to carapace length 0.53–0.55 vs. 0.41–0.49); trilobed epistome (vs. unilobed); moderately separated T8 anterior lobes (vs. narrowly separated); major second periopod with moderately inflated merus (vs. slightly inflated); more slender third periopods (ratio of propodus length to propodus width 9.20–13.33 vs. 8.13); the first two abdominal sternites each with a small median process (vs. medium-sized), the third abdominal sternite being without a median process (vs. small); and a small preanal carina (vs. medium-sized).

Distribution. **–** Mahakam River basin, E. Kalimantan Province, Borneo.

Comparative material examined. **–** *Macrobrachium pygmaeum:* 17 juveniles, 12 males, 4 females (ZMA De 240495), Kastoba crater lake, P. Bawean, E. Java, coll. J. H. Coert, 25–27 Nov.1937; 12 males (MZB Cru 278), P. Bawean, E. Java, coll. Asman, 17 Jun.1954. *M. eriocheirum:* holotype, male 17.75 mm CL (IZAS), Jingsan, Yunnan, China, coll. C. Wang, 11 Apr.1957; paratypes,1 male, 1 female (IZAS 00409), same locality as holotype, no date.

ACKNOWLEDGEMENTS

We would like to thank C. Yule and R. & J. Powell for providing specimens from Kelian River and M. Kottelat for making specimens from Sebuku River basin available for this study. The first author also thanks Tan Heok Hui (NUS) for assistance during fieldwork in Kayan Mentarang National Park, E. Kalimantan. The research in the Kayan Mentarang National Park was supported by WWF Indonesia Program - Kayan Mentarang National Park Project for the first author.

LITERATURE CITED

Bate, C. S., 1868. On a new genus, with four new species, of freshwater prawns. *Proceedings of the Zoological Society of London*, **1868**: 363-368, Pls. 30, 31.

Cai, Y. & A. Y. Dai, 1999. Freshwater shrimps (Crustacea: Decapoda: Caridea) from the Xishuangbanna region of Yunnan Province, southern China. *Hydrobiologia*, **400**: 211-241.

Cai, Y., P. Naiyanetr & P. K. L. Ng, 2003. The freshwater prawns of the genus *Macrobrachium* Bate, 1868, of Thailand (Crustacea: Decapoda: Palaemonidae). *Journal of Natural History*, **38**: 581-649. (This article was published electronically in 2003, but the hard copy available only in 2004).

Chace, F. A. & A. J. Bruce, 1993. The caridean shrimps (Crustacea: Decapoda) of the *Albatross* Philippine Expedition, 1907–1910, Part 6: Superfamily Palaemonoidea. *Smithsonian Contribution to Zoology*, **543**: vii + 152 pp., Figs. 1-23.

Chong, S. S. C., 1989. A new species of freshwater prawn, *Macrobrachium gua* sp. nov. (Decapoda, Caridea, Palaemonidae) from Sabah, East Malaysia, Borneo. *Crustaceana*, **56**(1): 31-38.

Chong, S. S. C. & H. W. Khoo, 1987a. A new species of freshwater prawn, *Macrobrachium johnsoni* spec. nov. (Decapoda: Caridea: Palaemonidae) from Peninsular Malaysia, and a description of its first zoea. *Zoologische Mededelingen*, Leiden, **61**(25): 359-370.

Chong, S. S. C. & H. W. Khoo, 1987b. *Macrobrachium ahkowi* nom. nov., replacement name for *Macrobrachium johnsoni* Chong & Khoo, 1987, preoccupied by *Macrobrachium johnsoni* Ravindranath, 1979 (Decapoda: Caridea: Palaemonidae). *Zoologische Mededelingen*, Leiden, **61**(37): 561-562.

Dai, A. Y., 1984. A preliminary study on the freshwater prawn genus *Macrobrachium* of China (Decapoda: Caridea). *Acta Zootaxonomica Sinica*, **9**(3): 244-252 (in Chinese with English summary).

Dana, J. D., 1852. Conspectus crustaceorum quae in orbis terrarum circumnavigatione, Carolo Wilkes e classe republicae foederatae duce, lexit et descripsit. *Proceedings of the Acadaemy of Natural Sciences of Philadelphia*, **1852**: 10-28.

Dang, N. T., & H. Y. Nguyen, 1972. Dan lieu ve tom nuoc ngot going *Macrobrachium* Bate (Palaemonidae) o cac thuy vuc vung nui mien bac Viet Nam (Faunistic study of freshwater prawn genus *Macrobrachium* Bate from mountainous region of North Vietnam). *Tap san Sinh Vat-Dia Hoc*, **10**(104): 1-6. (In Vietnamese with French summary).

Holthuis, L. B., 1950. The Decapoda of the Siboga Expedition,

Part X: The Palaemonidae collected by the Siboga and Snellius Expeditions, with remarks on other species, Part I: Subfamily Palaemoninae. In *Siboga-Expeditie*, **39a^{9}**: 1-268, 52 figs.

Holthuis, L. B., 1979. Cavernicolous and terrestrial decapod crustacea from northern Sarawak, Borneo. *Zoologische Verhandelingen*, Leiden, **171**: 1-47.

Holthuis, L. B., 1984. Freshwater prawns (Crustacea Decapoda: Natantia) from subterranean waters of the Gunung Sewu area, Central Java, Indonesia. *Zoologische Mededelingen*, Leiden, **58**(9): 141-148.

Johnson, D. S., 1960. Sub-specific and infra-specific variation in some freshwater prawns of the Indo-Pacific region. In: R. D. Purchon (ed.), *Proceedings of the Centenary and Bicentenary Congress of Biology*, Singapore, December 2–9, 1958. University of Malaya Press, Singapore. Pp. 259-267.

Johnson, D. S., 1963. Distributional and other notes on some freshwater prawns (Atyidae and Palaemonidae) mainly from the Indo-West Pacific region. *Bulletin of the National Museum*, Singapore, **32**: 5-30.

Kemp, S., 1917. Notes on crustacea decapoda in the Indian museum, IX: *Leander styliferus*, Milne-Edwards, and related forms. *Records of the Indian Museum*, **13**(4): 203-231, Pls. 8-10, Figs. 1-7.

Man, J. G. de, 1879. On some species of the genus *Palaemon* Fabr. with descriptions of two new forms. *Notes from the Royal Zoological Museum of the Netherlands at Leyden*, **1**(41): 165-184.

Man, J. G. de, 1892. Decapoden des Indischen Archipels. In: M. Weber, *Zoologische Ergerbnisse einer Reise in Niederländisch Ost-Indien*, **2**: 265-527, Pls. 15-29.

Man, J. G. de, 1898. Macroura. Part I. The Crustaceans. In: Zoological Results of the Dutch Scientific Expedition to Central Borneo. *Notes from the Leyden Museum*, **20**: 137-161, Pls. 6-8.

Man, J. G. de, 1908. Decapod Crustacea, with an account of a small collection from brackish water near Calcutta and in the Decca district, Eastern Bengal. In: The fauna of brackish ponds at Port Canning, lower Bengal, Part X. *Records of the Indian Museum*, **2**: 211-231, 2 pls.

Ng, P. K. L., 1985. Freshwater decapod crustaceans from Pulau Tioman, West Malaysia. *Zoologische Mededelingen,* Leiden, **59**(14): 149-162.

Ng, P. K. L., 1995. Freshwater decapod crustaceans (Potamidae, Palaemonidae) of Temengor Forest Reserve, Hulu Perak, Malaysia. *Malayan Nature Journal 1995*, **48**: 249-257.

Ou, A. C. T. & D. C. J. Yeo, 1995. A new species of freshwater prawn, *Macrobrachium platycheles* (Decapoda: Caridea: Palaemonidae) from Singapore and Peninsular Malaysia. *Raffles Bulletin of Zoology*, **43**(2): 299-308.

Roux, J., 1928. Notes carcinologiques de l'archipel Indo-Australien. *Treubia*, **10**: 197-224.

Roux, J., 1934. New freshwater decapod crustaceans from the Malay Peninsula. *Bulletin of the Raffles Museum*, **9**: 28-33, Pl. 4.

Short, J. W. & G. Marquet, 1998. New records of freshwater Palaemonidae (Crustacea, Decapoda) from New Caledonia. *Zoosystema,* **20**(2): 401-410.

Yeo, D. C. J., Y. Cai & P. K. L. Ng, 1999. The freshwater and terrestrial decapod Crustacea of Pulau Tioman, Peninsular Malaysia. *Raffles Bulletin of Zoology*, Supplement **6**: 197-244.