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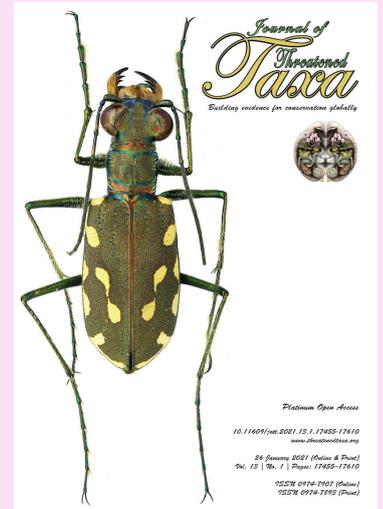
SHORT COMMUNICATION

ON A NEW SPECIES OF *MACROBRACHIUM* SPENCE BATE (DECAPODA: PALAEMONIDAE) FROM AYEYARWADY RIVER, MYANMAR

H.H.S. Myo, K.V. Jayachandran & K.L. Khin

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On a new species of *Macrobrachium* Spence Bate (Decapoda: Palaemonidae) from Ayeyarwady River, Myanmar

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Abstract: *Macrobrachium myanmarum* sp. nov. was found from near Min Kun (local name Min Gon) at Mandalay, Ayeyarwady (Irrawaddy) River (22.043N & 96.043E), Myanmar. It is a small-sized prawn showing close relation with *Arachnochium kulsienne* (Jayachandran et al. 2007) and *A. mirabile* (Kemp 1917). This species can at once be identified from both the species by the characters: medium-sized and highly-elevated and arched rostrum, extending as far as distal segment of antennular peduncle or behind, upper margin with 11–15 teeth of which three (rarely 4) teeth post-orbital; ventral margin without teeth (rarely one); second chelate legs unequal, right leg larger (sometimes left); major leg in which carpus with proximal part narrow and distal end broadened, subequal to merus, palm and fingers; propodus slightly more than the combined length of merus and carpus; fingers very slender, almost equal to palm, fixed finger a bit shorter than movable finger, cutting edges with 2–6 weak denticles at proximal cutting edges, distal denticle situated at about 1/3rd distance from base; ischium, merus, carpus, propodus, palm and dactylus in the ratio 9.62 : 19.25 : 24.06 : 47.06 : 23.53 : 23.53, respectively (related to the total length of pereopod); minor leg with minute tubercles in larger specimens; ischium, merus, carpus, propodus, palm and fingers in the ratio 13.1 : 23.68 : 22.37 : 40.8 : 15.8 : 25.0, respectively (related to total length of pereopod); palm slightly swollen and shorter than fingers, fingers slender and curved with a wide gap when closed. Maximum size recorded for the species is 56mm male and 44mm female.

Keywords: Identification, *Macrobrachium myanmarum* sp. nov., Min Kun, palaemonid prawn.

Taxonomic studies on palaemonid prawns of Myanmar were carried out by De Man (1888), Henderson (1893), Schenkel (1902), De Man (1905, 1906), Rathbun (1910), De Man (1911), Kemp (1917, 1918, 1925), Tiwari (1949), Holthuis (1950), Tiwari (1952, 1958), Holthuis (1980), Naiyanetr (1980), Jayachandran (2001), Cai & Ng (2002), Cai et al. (2004), Hla Phone & Suzuki (2004), Short (2004), Mie et al. (2009), Wowor & Ng (2010), Mar & Myint (2014), Khin et al. (2018), and Mar et al. (2018) have reported 40 species, namely, *Arachnochium mirabile* (Kemp), *Exopalaemon styliiferus* (Kemp), *Leptocarpus fluminicola* (Kemp), *Macrobrachium aemulum* (Nobili), *M. assamense* (Tiwari), *M. australiense* *M. birmanicum* (Schenkel), *M. cavernicola* (Kemp), *M. clymene* (De Man), *M. dayanum* (Henderson), *M. hendersoni* (De Man), *M. hildebrandti* (H.M.Edwards), *M. idella* (Hilgendorf), *M. johnsoni* Ravindranath, *M. joppae* Holthuis, *M. josephi* Jayachandran, *M. lamarrei* (H.M.Edwards), *M. lanatum* Cai & Ng, *M. lanceifrons* (Dana), *M. lanchesteri* (DeMan), *M. lar* (Fabricius), *M. latidactylus* (Thallawitz), *M. latimanus* (von Martens),

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Competing interests: The authors declare no competing interests.

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M. malcolmsonii (H.M. Edwards), *M. minutum* (J. Roux), *M. naso* (Kemp), *M. neglectum* (De Man), *M. nipponense* (De Haan), *M. palaemonoides* Holthuis, *M. pethienense* Hla Phone & Suzuki, *M. peguense* (Tiwari), *M. platyrostris* (Tiwari), *M. rogersi* (Tiwari), *M. rosenbergii* (DeMan), *M. villosimanus* (Tiwari), *M. yui* Holthuis, *Nematopalaemon tenuipes* (Henderson), *Palaemon serrifer* (Stimpson), *P. sewelli* (Kemp), and *Palaemonetes sinensis* (Sollaud). The studies revealed that the fauna of the region is rich and more studies are necessary to arrive at the exact status of biodiversity. Recently, a new species has been collected from near Min Gon at Mandalay region of Ayeyarwady (Irrawaddy) River and is described herein.

MATERIALS AND METHODS

Seventeen specimens (eight males and nine females) were collected from Min Kun at Mandalay, Ayeyarwady River (22°2'.37"N & 96°2'.37"E), Myanmar, on 29 July 2018 and 10 June 2020 (Image 1). Holotype deposited at referral center of Central Marine Fisheries Research Institute (ICAR CMFRI), Kochi, Kerala, India (CMFRI DNR No. ED.2.2.1.6); 4 females deposited at Regional Centre of ICAR NBFGR, Kochi, Kerala, India.

The specimens were identified based on the relevant literature on Palaemonid prawns (De Man 1888;

Henderson 1893; Schenkel 1902; De Man 1905,1906; Rathbun 1910; De Man 1911; Kemp 1917, 1918, 1925; Tiwari 1949; Holthuis 1950, Tiwari 1952; 1958; Holthuis 1980; Naiyanetr 1980; Liu et al. 1990; Jayachandran 2001; Cai & Ng 2002; Cai et al. 2004; Short 2004; Hla Phone & Suzuki 2004; Komai & Fugita 2005; Jayachandran et al. 2007; Liu et al. 2007; Mie et al. 2009; Wowor & Ng 2010; Khin et al. 2018).

Infraorder: Caridea Dana, 1852

Superfamily: Palaemonoidea Rafinesque, 1815

Family: Palaemonidae Rafinesque, 1815

Subfamily: Palaemoninae Rafinesque, 1815

Genus: Macrobrachium Spence Bate, 1868

Macrobrachium myanmarum sp. nov.

(Figures 1–3; Image 3)

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Synonym: non *Macrobrachium kulsienne* Khin et al., 2018.

Materials examined

Holotype: Deposited at ICAR CMFRI referral museum, Kochi, Kerala, India with registration number - CMFRI DNR No. ED.2.2.1.6, male, Collected by Dr.H.H.S. Myo & Dr.K.L.Khin from Min Kun at Mandalay, Ayeyarwady River, Myanmar (22°2'.37"N & 96°2'.37"E) on 29.07.2018

Paratypes: 4 females, Collected from Min Kun by Dr. H.H.S.Myo & Dr. K.L.Khin on 29.07.2018 at Mandalay, Ayeyarwady River (22°2'.37"N & 96°2'.37"E), Myanmar has been utilized for molecular studies at Regional Centre of ICAR NBFGR, Kochi, Kerala, India. Remaining paratypes (males and females) collected from same locality on 29.07.2018 and 10.06.2020 in the personal collection of Dr. H.H.S. Myo at Department of Zoology.

Measurements (mm): Holotype (male): 56.0 TL, 24.0 CL; Paratypes: males 37.0 TL, 15.0 CL; 40.0 TL, 15.0 CL; 41.0 TL, 16.0 CL; 42.0 TL, 16.0 CL; 48.0 TL, 19.0 CL; 50.0 TL, 21.0 CL; 52.0 TL 21.5, CL; 56.0 TL, 24.0 CL; (females): 34.0 TL, 15.0 CL; 37.0 TL, 13.0 CL; 37.0 TL, 13.0 CL; 38.0 TL, 16.0 CL; 39.0 TL, 16.5 CL; 41.0 TL, 18.0 CL; 42.0 TL, 16.0 CL; 42 TL, 17.0 CL; 44.0 TL, 18.0 CL

Etymology: The species name is in honour of the country from where this new species has been collected and documented.

Diagnosis

Macrobrachium having the medium-sized, highly-elevated and arched rostrum, extending as far as distal segment of antennular peduncle or behind, upper margin



Image 1. Collection station - Min Kun from Ayeyarwady (Irrawaddy) River, Myanmar

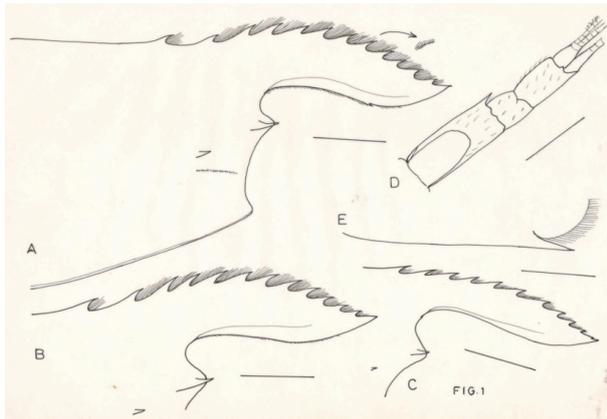


Figure 1. *Macrobrachium myanmarum* sp. nov.: A—anterior carapace of male | B—anterior carapace of female | C—anterior carapace of juvenile | D—antennular peduncle of male | E—outer disto-lateral region of antennal scale of male. scale 2mm

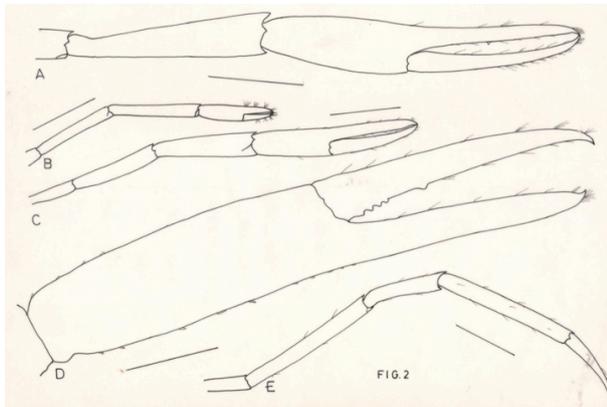


Figure 2. *Macrobrachium myanmarum* sp. nov.: A—2nd chelate leg of female | B—1st chelate leg of male | C—minor 2nd cheliped of male | D—Major 2nd cheliped of male | E—3rd non-chelate leg of male. Scale 2mm.

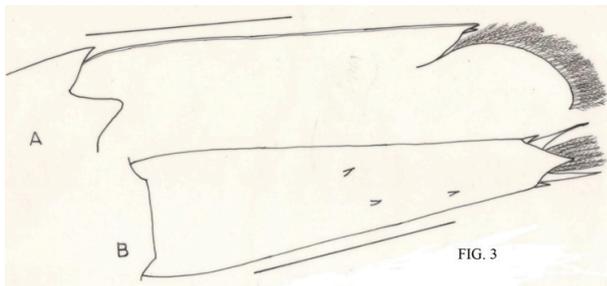


Figure 3. *Macrobrachium myanmarum* sp. nov. male: A—diaeresis | B—telson; scale 2mm

with 11–15 of which three (rarely 4) teeth post-orbital; ventral margin generally without teeth (rarely with one); second chelate legs unequal, right leg larger (sometimes left leg); major leg in which carpus with proximal part

narrow and distal end broadened, subequal to merus, palm and fingers; propodus slightly more than the combined length of merus and carpus; fingers very slender, almost equal to palm, fixed finger a bit shorter than movable finger, cutting edges with 2–6 weak denticles at proximal cutting edges, distal denticles at about 1/3rd distance from base; ischium, merus, carpus, propodus, palm and dactylus in the ratio: 9.62: 19.25: 24.06: 47.06: 23.53: 23.53 respectively (related to total length of pereopod); minor leg with tubercles in large specimens; ischium, merus, carpus, propodus, palm and fingers in the ratio 13.1: 23.68: 22.37: 40.8: 15.8: 25.0, respectively (related to total length of pereopod); palm swollen and slightly shorter than fingers

Description

Rostrum medium-sized, extending as far as distal segment of antennular peduncle or behind, highly elevated and arched and tip directed forwards (in younger specimens rostrum less elevated), upper margin with 11–15 teeth of which three teeth (rarely 4) behind the orbit, proximal most and second teeth more widely separated than the remaining series teeth of uniform distance between them, proximal six teeth anteriorly directed and remaining teeth directed upwards, thick and long bunches of setae present in between teeth; ventral margin curved upwards, one minute tooth in holotype at the level of 10th dorsal tooth (generally absent); setae longer and closely set in both upper and lower margins (Figs. 1 A,B Image 2,4)

Carapace generally smooth but with small tubercles on antero-lateral side, about 43.0 per cent of total length, orbit sunken, antennal spine sharp, not placed at edge; hepatic spine sharp; a distinct groove present below hepatic spine, pterygostomian region not sharp (Figs. 1A,B Image 2,4)

Eyes developed. Telson slender, distal end sharply pointed and extends as far as or beyond the level of the outer spine of uropodal exopod; upper margin with two pairs of feeble spines, proximal pair situated at about 53 per cent and not in a line and distal pair closer to proximal pair (76 per cent), distal end with two pairs of spines, outer pair smaller and inner pair slender, longer and sharp, eight long plumose setae present in between the inner pair of spines (Fig. 3B).

Antennular peduncle three segmented, extends as far as 1/3rd of merus of major second cheliped and beyond merus of minor second legs, middle segment shortest, antero-lateral spine of basal segment reaches beyond middle but not to tip of 2nd segment of antennular peduncle (Fig. 1 D); disto-lateral spine of antennal scale

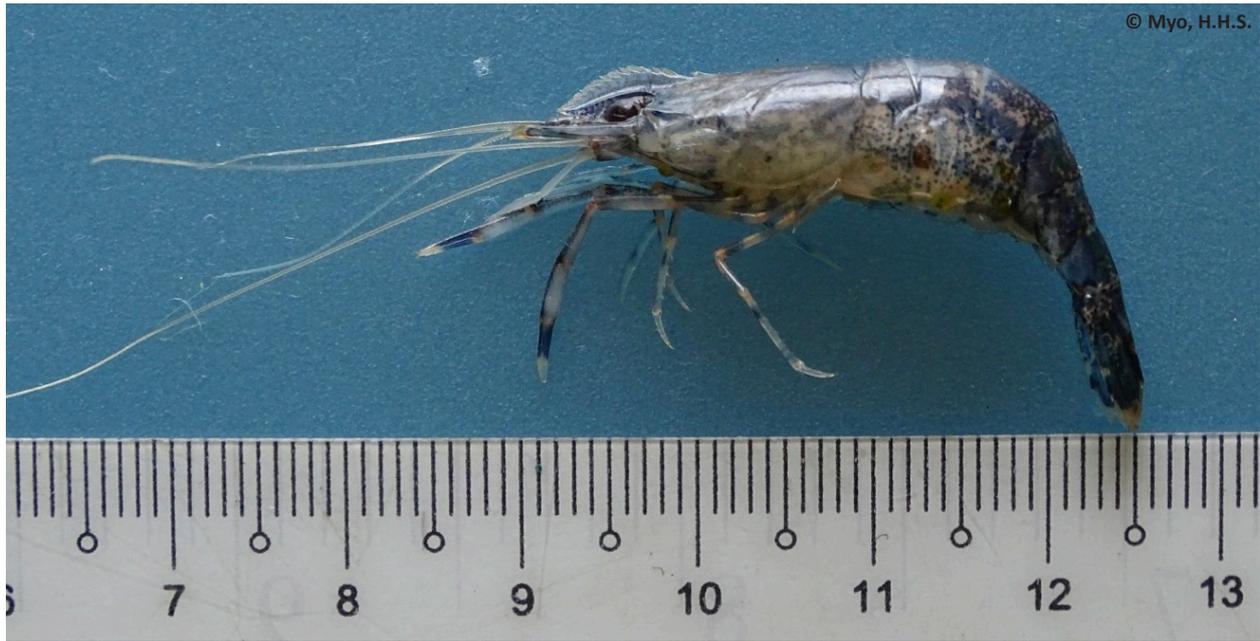


Image 2. *Macrobrachium myanmarum* sp. nov. (female) from Ayeyarwady (Irrawaddy) River, Myanmar.



Image 3. *Macrobrachium myanmarum* sp. nov. (male holotype) from Ayeyarwady (Irrawaddy) River, Myanmar showing nature of second pereiopods.

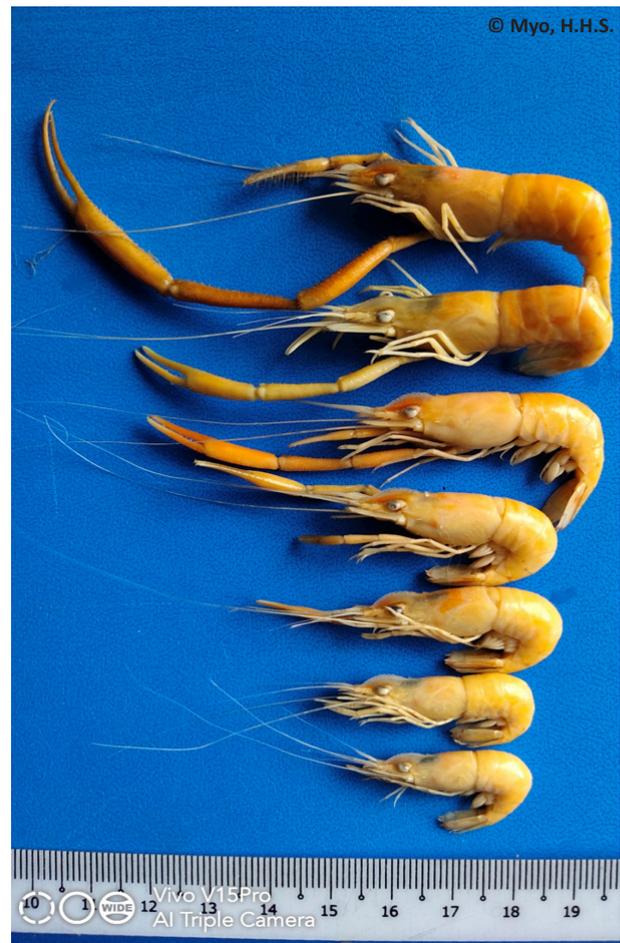


Image 4. Growth variations in *Macrobrachium myanmarum* sp. nov. from Mandalay, Myanmar; the smaller two specimens are females.

sharply pointed, subdistal in position and extends just in front of distal end of merus of 2nd cheliped (Fig. 1E).

First chelate legs slender, extends up to tip of antennal scale; ischium slightly broader; merus slender; carpus 1.60 times longer than propodus; palm cylindrical, 1.3 times longer than fingers; fingers slender, equal sized with tufts of setae on outer margin (Fig. 2B).

Second chelate legs with tubercles in bigger specimens, unequal, right leg larger (sometimes left); major leg 1.7 times the size of total length and 2.4 times the size of minor leg; ischium flat; merus cylindrical; carpus with proximal part narrow and distal end broadened, subequal to merus, palm and fingers;



Table 1. Morphometric measurements (mm and ratio) of specimens of *Macrobrachium myanmarum* sp. nov. from Ayeyarwady (Irrawaddy) River, Myanmar.

| Sex | TL | CL | CTL | LR | LT | Major second chelate leg | | | | | | Third non-chelate legs | | | | |
|---|------|------|------|-----|------|--------------------------|-------|-------|-------|-------|-------|------------------------|------|------|------|------|
| | | | | | | I | M | C | P | Pa | D | I | M | C | P | D |
| <i>Macrobrachium myanmarum</i> sp. nov. | | | | | | | | | | | | | | | | |
| M* | 56.0 | 24.0 | 17.0 | 7.0 | 7.0 | 9.0 | 18.0 | 22.5 | 44.0 | 22.0 | 22.0 | 3.0 | 7.5 | 3.0 | 8.5 | 2.5 |
| Ratio → | | | | | | 9.62 | 19.25 | 24.06 | 47.06 | 23.53 | 23.53 | 13.9 | 34.9 | 13.9 | 37.2 | 11.6 |
| | | | | | | Minor second chelate leg | | | | | | | | | | |
| | | | | | | 5.0 | 9.0 | 8.5 | 15.5 | 6.0 | 9.5 | | | | | |
| Ratio → | | | | | | 13.1 | 23.68 | 22.37 | 40.80 | 15.8 | 25.0 | | | | | |
| F | 41.0 | 18.0 | 12.0 | 7.0 | 06.5 | 4.0 | 5.5 | 4.25 | 7.0 | 3.5 | 3.5 | 3.0 | 5.5 | 3.0 | 6.0 | 3.0 |
| F | 39.0 | 16.5 | 12.0 | 6.0 | 07.0 | 3.5 | 5.0 | 4.0 | 7.0 | 3.0 | 3.75 | 2.25 | 5.5 | 2.25 | 5.0 | 3.0 |
| F | 38.0 | 16.0 | 11.0 | 6.0 | 06.5 | 3.25 | 6.0 | 5.0 | 8.5 | 4.0 | 4.5 | 2.5 | 4.5 | 2.5 | 5.0 | 3.0 |
| F | 34.0 | 15.0 | 09.0 | 5.0 | 06.0 | 3.0 | 5.0 | 4.5 | 7.0 | 3.5 | 3.5 | 2.0 | 4.0 | 2.0 | 4.25 | 2.5 |
| Ratio → | | | | | | 16.8 | 26.0 | 21.6 | 35.7 | 17.9 | 18.4 | 13.8 | 27.5 | 13.8 | 28.6 | 16.3 |

(M*—male (Holotype) | F—female | TL—total length | CL—carapace length | CTL—post-orbital carapace length | LR—length of rostrum | LT—length of telson | I—ischium | M—merus | C—carpus | P—propodus | Pa—palm | D—dactylus)

propodus with maximum width at distal palm and slightly more than the combined length of merus and carpus; fingers very slender almost equal to palm, fixed finger a bit shorter than movable finger, movable finger curved, cutting edges with 2–6 weak denticles at proximal cutting edges, distal denticle at about 1/3rd distance from base; ischium, merus, carpus, propodus, palm and dactylus in the ratio 9.62: 19.25: 24.06: 47.06: 23.53: 23.53, respectively (related to total length of pereopod) (Fig. 2D, Image 3). Minor leg with tubercles in larger specimens; ischium, merus, carpus, propodus, palm and fingers in the ratio 13.1: 23.68: 22.37: 40.8: 15.8: 25.0, respectively (related to total length of pereopod); palm swollen and slightly shorter than fingers; fingers slender with a wide gap when closed (Fig. 2C, Image 3).

Three pairs of non-chelate legs nearly equal sized, slender, smooth, not reaching beyond antennular scale when extended, propodus subequal to merus, carpus subequal to dactylus; dactylus slender sharply pointed, curved distally; ischium, merus, carpus, propodus and dactylus of third pair in the ratio 13.9: 34.9: 13.9: 37.2: 11.6, respectively (Fig. 2E).

Fifth pleura of the abdomen unilobed at posterolateral region as in the genus. Pleopods comparatively shorter than in other species of the genus; second pleopod with basis and rami almost same sized; appendix masculina long, folded structure with very stiff setae along its border and extends up to 2/3 distance of endopod. Uropodal exopod bears an accessory spine almost the length of major one and free borders with

long setae (Fig. 3A).

Females: Carapace smooth, about 43 per cent to total length (average) (Fig. 1 B). Second pereopods slender, smooth, equal sized with ischium, merus, carpus, propodus, palm and dactylus in the average ratio 16.8: 26.0: 21.6: 35.7: 17.9: 18.4, respectively; palm subequal to fingers and without even traces of denticles on cutting edges (Fig. 2A). The non-chelate legs slender, segments in the average ratio 13.8: 27.5: 13.8: 28.6: 16.3, respectively. Fecundity 120 eggs (42 mm in total length).

Variation in growth: Young specimens: rostrum not much elevated as in adult, second chelipeds slender, without tubercles below the size of total length up to 48mm (Fig. 1 C). Male (big sized 56.0mm sized – recently collected): second pereopods unequal, major leg 2.4 times longer than minor leg; ischium, merus, carpus, palm and dactylus in the ratio 9.62: 19.25: 24.07: 23.52: 23.52, respectively; palm broader, fingers subequal and very slender, movable finger longer and slightly curved and with six small denticles of which distal one roughly 1/3rd distance from the base; minor leg with ischium, merus, carpus, palm and fingers in the ratio 14.10: 23.08 ; 21.79: 15.38: 25.64, respectively; palm swollen; fingers slender and curved with a wide gap when closed; palm and fingers possess stiff long setae (Image 3). Variations in the growth is shown in image 4.

Table 1 provides detailed morphometric measurements of the specimens.

Colouration: Body generally bluish coloured with red

Table 2. A comparison of characters of *Macrobrachium myanmarum* sp. nov. with related species.

| Characters | <i>A. kulsienne</i> | <i>A. mirabile</i> | <i>M. myanmarum</i> |
|--|--|---|--|
| Nature of rostrum | Long, reaches as far as the tip of antennal scale | Short, not reaching the tip of antennular peduncle | Medium sized reaching as far as distal segment of antennular peduncle or behind |
| Elevation of the upper margin of rostrum | Upper margin elevated, tip directed forwards | Upper margin highly elevated, tip directed forwards, | Upper margin highly elevated, tip directed forwards (small specimens not much elevated) |
| Nature of carapace | Smooth | Smooth | Generally smooth, antero-ventral region with tubercles |
| Rostral formula | 9–12 / 1 (2–3 post-orbital teeth) | 13–16/1 (3–5 post-orbital) | 11–15 / 0–1 (3–4 post-orbital) |
| Dorsal spines of telson | Placed at about 60 and 70 per cent, respectively | Placed at about 60 and 80 per cent, respectively | Placed at about 53 and 76 per cent, respectively |
| Ratio of segments of antennular peduncle | 3.0: 0.9: 1.75 | 3.3: 1.3: 2.3 | 3.3: 1: 1.4 |
| Nature of palm and fingers of first chelate legs | Palm and fingers equal sized | Palm shorter than fingers | Palm slightly longer than fingers |
| Nature and ratio of second chelate legs - ischium, merus, carpus, propodus, palm and fingers | Equal sized 21.43: 25.00: 21.43: 32.14: 14.28: 17.86 Fingers slender and equal sized | Equal sized and slender 21.15: 24.62: 20.38: 33.85: 14.62: 19.23 Fingers slender, equal in length | unequal in length (with spinules adult male). Large male in which major leg 2.4 times that of minor leg Major leg – 9.62: 19.25: 24.06: 47.06: 23.53: 23.53 Fingers slender, fixed finger a bit shorter than movable finger Minor leg – 13.1: 23.68: 22.37: 40.8: 15.8: 25.0 Fingers slender, curved with a wide gap when closed |
| Denticles on second chelate legs | Without denticles | Without denticles | 2 to 6 small denticles on the proximal part of fingers of major leg; distal one at 1/3 rd distance from base |
| Details on appendix masculina | Normal sized and with 6 lateral and 2 distal stiff setae | Normal sized | Long, extends up to 2/3 length of endopod and with numerous stiff setae |
| Eggs | Very few large 15-20 eggs | small sized over 1000 eggs | Over 120 eggs |
| Colouration | Whole body with spots | Creamy white | Whole body is Dark-bluish in colour, a dark band on the lateral side of the body |

streak on lateral side of rostrum

Distribution: Ayeyarwady River at Mandalay, Myanmar.

Remarks

The new species is closely related to *Arachnochium kulsienne* (Jayachandran, Lal Mohan & Raji, 2007) and *A. mirabile* (Kemp, 1917). *M. myanmarum* sp. nov. is characterized by the presence of a medium sized highly elevated rostrum which extends as far as the distal segment of antennular peduncle or behind. The dorsal margin is curved with 11–15 of which 3 (rarely 4) post-orbital in position. Branchiostegal groove extending slightly behind hepatic spine. The second pereopods are unequal. The major legs 1.7 times longer than the total length and 2.4 times the total length of minor leg. The fingers of major leg are slender and almost equal to palm and bear two to six minute denticles at proximal cutting edges of which the distal denticles situated at about

1/3rd distance from base whereas in the minor leg the palm is swollen and subequal to fingers and carpus. In large males the fixed finger is a bit smaller than movable finger and movable finger curved. It possesses large number of eggs. In *A. kulsienne* rostrum is long which extends as far as the tip of antennal scale and the upper margin highly elevated with 9–12 teeth of which two or three are post-orbital in position. The second cheliped in which palm is shorter than fingers and carpus. It possesses a few large eggs (up to 20). *A. mirabile* is characterized by a highly elevated short rostrum with a formula of 13–16 of which 4–6 teeth post-orbital in position and 1–2 ventral teeth. Dorsal teeth not uniformly spaced. Branchiostegal suture not extending behind hepatic spines. Second pereopods subequal in length and similar in form with palm subcylindrical, fingers slender and much longer than palm and without denticles on the cutting edges, chela 1 ¼ times as long as carpus, palm swollen, smooth and less than ¼ as



long as carpus. The present new species can at once be identified on the basis of its highly elevated curved rostrum with specific rostral formula and also nature, proportion of segments, ratio between carpus, palm and fingers of major leg and denticles on cutting edges. Fifth pleura of abdomen is unilobed as in the genus. A comparison of characters of related species is given in Table 2. Morphological variations during growth are shown in image 4.

The very slender fingers of the major second chelate leg of the present species shows some resemblance with that of *M. lar* (Fabricius, 1798). The rostral formula and general shape of the rostrum of the two species differ considerably. In *M. lar* chela is 3.5 times as long as carpus and palm of uniform thickness and longer than to twice as long as carpus. Carpus is shorter than merus. In the present new species chela is about 2.0 times as long as carpus and palm shorter than carpus and distal region with maximum thickness. Carpus longer than merus (Chace & Bruce 1993).

Wowor & Ng (2010) have created a new genus, namely, *Arachnochium*, to accommodate *M. mirabile* and *M. kulsense*. This new genus is characterized by the presence of elongated fourth and fifth pereopods, large blunt tip triangular median process on T4, without transverse plate in T5, without wide median process in T8, bilobed nature of postero-lateral region of fifth abdominal pleura and longer inner spine on exopod of uropod. The present new species does not possess any of the above characters and hence it is appropriate to retain it in the genus *Macrobachium* Bate, 1868

Khin et al. (2018) have reported *M. kulsense* Jayachandran, Lal Mohan & Raji (= *A. kulsense*) from Myanmar and is a misidentification.

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Communications

Diversity and distribution of snakes in Trashigang Territorial Forest Division, eastern Bhutan

– Bal Krishna Koirala, Karma Jamtsho, Phuntsho Wangdi, Dawa Tshering, Rinchen Wangdi, Lam Norbu, Sonam Phuntsho, Sonam Lhendup & Tshering Nidup, Pp. 17455–17469

Freshwater fishes of Cauvery Wildlife Sanctuary, Western Ghats of Karnataka, India

– Naren Sreenivasan, Neethi Mahesh & Rajeev Raghavan, Pp. 17470–17476

Fish communities and associated habitat variables in the upper Subansiri River of Arunachal Pradesh, eastern Himalaya, India

– Sutanu Satpathy, Kuppusamy Sivakumar & Jeyaraj Antony Johnson, Pp. 17477–17486

Diversity and distribution of odonates in Rani Reserve Forest, Assam, India

– Dipti Thakuria & Jatin Kalita, Pp. 17487–17503

An assessment of the population status of the threatened medicinal plant *Illicium griffithii* Hook.f. & Thomson in West Kameng District of Arunachal Pradesh, India

– Tashi Dorjee Bapu & Gibji Nimasow, Pp. 17504–17512

Short Communications

The discovery of a melanistic Leopard *Panthera pardus delacouri* (Linnaeus, 1758) (Mammalia: Carnivora: Felidae) at Bukit Kudung in Jeli, Kelantan, Peninsular Malaysia: conservation and ecotourism

– Kamarul Hambali, Nor Fakhira Muhamad Fazli, Aainaa Amir, Norashikin Fauzi, Nor Hizami Hassin, Muhamad Azahar Abas, Muhammad Firdaus Abdul Karim & Ai Yin Sow, Pp. 17513–17516

On the epidemiology of helminth parasites in Hangul Deer *Cervus hanglu hanglu* (Mammalia: Artiodactyla: Cervidae) of Dachigam National Park, India

– Naziya Khurshid, Hidayatulla Tak, Ruqeyya Nazir, Kulsum Ahmad Bhat & Muniza Manzoor, Pp. 17517–17520

Histopathological findings of infections caused by canine distemper virus, *Trypanosoma cruzi*, and other parasites in two free-ranging White-nosed Coatis *Nasua narica* (Carnivora: Procyonidae) from Costa Rica

– Jorge Rojas-Jiménez, Juan A. Morales-Acuña, Milena Argüello-Sáenz, Sílvia E. Acevedo-González, Michael J. Yabsley & Andrea Urbina-Villalobos, Pp. 17521–17528

On a new species of *Macrobrachium* Spence Bate (Decapoda: Palaemonidae) from Ayeyarwady River, Myanmar

– H.H.S. Myo, K.V. Jayachandran & K.L. Khin, Pp. 17529–17536

Review of the tiger beetle genus *Calomera* Motschulsky, 1862 (Coleoptera: Cicindelidae) of the Philippines

– Milton Norman Medina, Alexander Anichtchenko & Jürgen Wiesner, Pp. 17537–17542

Rediscovery of Martin's Duskhawker *Anaciaeschna martini* (Selys, 1897) (Odonata: Aeshnidae) from Western Ghats, peninsular India, with notes on its current distribution and oviposition behavior

– Kalesh Sadasivan, Manoj Sethumadavan, S. Jeevith & Baiju Kochunarayanan, Pp. 17543–17547

A note on the current distribution of reedtail damselfly *Protosticta rufostigma* Kimmins, 1958 (Odonata: Zygoptera: Platystictidae) from Western Ghats, and its addition to the odonate checklist of Kerala

– Kalesh Sadasivan & Muhamed Jafer Palot, Pp. 17548–17553

Assessment of threat status of the holly fern *Cyrtomium micropterum* (Kunze) Ching (Polypodiopsida: Dryopteridaceae) in India using IUCN Regional guidelines

– C. Bagathsingh & A. Benniamin, Pp. 17554–17560

Notes

First report of the Asiatic Brush-tailed Porcupine *Atherurus macrourus* (Linnaeus, 1758) (Mammalia: Rodentia: Hystricidae) from West Bengal, India

– Suraj Kumar Dash, Abhisek Chettri, Dipanjan Naha & Sambandam Sathyakumar, Pp. 17561–17563

Record of the world's biggest pangolin? New observations of bodyweight and total body length of the Indian Pangolin *Manis crassicaudata* Gray, 1827 (Mammalia: Pholidota: Manidae) from Mannar District, Sri Lanka

– Priyan Perera, Hirusha Randimal Algewatta & Buddhika Vidanage, Pp. 17564–17568

First record of *Touit melanonotus* (Wied, 1820) (Aves: Psittaciformes: Psittacidae) in Cantareira State Park, Brazil: new colonization or simply unnoticed?

– Marcos Antônio Melo & David de Almeida Braga, Pp. 17569–17573

Is *Bombus pomorum* (Panzer, 1805) (Hymenoptera: Apidae) a new bumblebee for Siberia or an indigenous species?

– Alexandr Byvaltsev, Svyatoslav Knyazev & Anatoly Afinogenov, Pp. 17574–17579

Some new records of scarab beetles of the genus *Onthophagus* Latreille, 1802 (Coleoptera: Scarabaeidae) from northern Western Ghats, Maharashtra, with a checklist

– Aparna Sureshchandra Kalawate, Banani Mukhopadhyay, Sonal Vithal Pawar & Vighnesh Durgaram Shinde, Pp. 17580–17586

Ecological importance of two large heritage trees in Moyar River valley, southern India

– Vedagiri Thirumurugan, Nehru Prabakaran, Vishnu Sreedharan Nair & Chinnasamy Ramesh, Pp. 17587–17591

Bulbophyllum spathulatum (Orchidaceae), a new record for Bhutan

– Pema Zangpo, Phub Gyeltshen & Pankaj Kumar, Pp. 17592–17596

On the occurrence and distribution of the narrowly endemic Andaman Lantern Flower *Ceropegia andamanica* (Apocynaceae: Ceropegieae)

– M. Uma Maheshwari & K. Karthigeyan, Pp. 17597–17600

The oat-like grass *Trisetopsis aspera* (Munro ex Thwaites) Röser & A.Wölk (Poaceae): a new record for the flora of central Western Ghats of Karnataka, India

– H.U. Abhijit, Y.L. Krishnamurthy & K. Gopalakrishna Bhat, Pp. 17601–17603

Star Grass Lily *Iphigenia stellata* Blatter (Colchicaceae) – a new addition to the flora of Gujarat, India

– Mitesh B. Patel, Pp. 17604–17606

A new record of pyrenocarpous lichen to the Indian biota

– N. Rajaprabu, P. Ponmurugan & Gaurav K. Mishra, Pp. 17607–17610

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