On the taxonomy of the endemic Inle Lake crab, *Inlethelphusa acanthica* (Kemp, 1918) (Crustacea: Brachyura: Potamidae) of Myanmar

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**Abstract.** The potamid freshwater crab, *Inlethelphusa acanthica* (Kemp, 1918), is endemic to Inle Lake, in Shan state, Myanmar, and was hitherto known only from the types and several small specimens collected in the 1930s. The species, the type of *Inlethelphusa* Yeo & Ng, 2007, is redescribed from a good series of fresh specimens. The taxonomy of the species is discussed and variations in the armature of the carapace anterolateral margin, male pleon, chela, as well as the male first gonopod structure are documented. Significantly, the male first gonopod of smaller specimens has the terminal segment straight and more cylindrical, with the tip truncate or weakly bifurcated, in contrast to that of larger males, which is more elongate, with the distal part gently curved upwards and the tip sharp.

**Key words.** Decapoda, freshwater crab, redescription, variation, diagnostic characters, wetland conservation

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**INTRODUCTION**

There is a group of freshwater crabs of the family Potamidae Ortmann, 1896, in northeastern India, Bangladesh, and Myanmar, which are morphologically distinct in that the anterolateral margins of the carapace are lined with many sharp spines or two or more distinct sharp teeth. All the species were placed in *Lobothelphusa* Bouvier, 1917, by Bott (1970) in his synopsis of the Potamoida. Yeo & Ng (2007) revised the generic system for the Potamidae, showing that Bott’s (1970) concept of “*Lobothelphusa*” was polyphyletic, with members belonging to two subfamilies: Potaminae Ortmann, 1896, and Potamiscinae Bott, 1970. Yeo & Ng (2007) recognised three genera of the potamine “Lobothelphusa”, namely *Lobothelphusa* Bouvier, 1917 sensu stricto, *Paratelphusula* Alcock, 1909, and *Acanthopotamon* Kemp, 1918. The taxonomy of these genera will probably need to be re-examined as more members are studied in detail (see Brandis & Sharma, 2005; Klaus et al., 2017, 2019; Pati et al., 2019). One species which Bott (1970) placed in *Lobothelphusa*, *Potamon acanthicum* Kemp, 1918, was shown by Yeo & Ng (2007) to belong to the Potamiscinae, instead, and was referred by them to a new genus, *Inlethelphusa*. Bott (1970: 150) had assigned *I. acanthica* (Kemp, 1918) [wrongly spelt as “acanthia”] to *Lobothelphusa*, but as he thought it was only a variant of *L. woodmasoni* (Rathbun, 1905) (type locality: Bangladesh), he excluded it from his *Lobothelphusa* species key.

*Inlethelphusa acanthica* is endemic to Inle Lake and its adjacent area. Inle Lake (also written as Inlé or Inlay Lake) is an area of international and regional importance for the conservation of indigenous and threatened diversity, including a number of endemic fish genera and species (Kano et al., 2016). On top of this, the unique natural wetland, which encompasses a variety of ecologically important systems that experience a gradation of sustainable human use/development, is also a designated ASEAN Heritage Park (in 2003; ASEAN, 2003); Important Bird and Biodiversity Area (IBA) (in 2004; BirdLife International, 2020); UNESCO Biosphere Reserve (in 2015; UNESCO, 2015); and Ramsar site (i.e., wetland of international importance) (in 2018; RSIS, 2020). The taxonomy of *I. acanthica*, however, is poorly studied. Until recently, it was only known from the type specimens (two males and six females) (Kemp, 1918) and juvenile specimens collected in the 1930s. Yeo & Ng (2007) had established *Inlethelphusa* on the basis of this old material. In recent years, the authors have obtained fresh specimens from in and around Inle Lake. The opportunity is thus taken to redescribe the species from this good series of specimens as well as to document significant morphological changes associated with growth.

**MATERIAL AND METHODS**

The material examined is deposited in the Zoological Survey of India (ZSI), Kolkata, India; Swedish Museum of Natural History (NRM), Stockholm, Sweden; and Zoological Reference Collection (ZRC) of the Lee Kong
Chian Natural History Museum, National University of Singapore (LKCNHM, NUS). The terminology used follows Ng (1988) with recent changes by Davie et al. (2015). The abbreviations G1 and G2 are used for the male first and second gonopods, respectively. Measurements provided, in millimetres, are of the maximum carapace width and length, respectively.

**TAXONOMY**

**Family Potamidae Ortmann, 1896**

Subfamily Potamiscinae Bott, 1970 sensu Yeo & Ng, 2004

*Inlethelphusa* Yeo & Ng, 2004

**Type species.** *Potamon (Potamon) acanthicum* Kemp, 1918, by monotypy.

**Diagnosis.** Carapace broader than long, relatively low; dorsal surface gently convex; epigastric cristae low, distinct, not sharp, anterior to postorbital cristae, distinctly separated from postorbital cristae by groove; postorbital cristae low, blunt, not confluent with epibranchial teeth; external orbital angle well developed, separate from rest of anterolateral margin by deep cleft; epibranchial tooth well developed, spiniform; anterolateral margins prominently serrated, with anterior serrations larger; antennular fossae subrectangular, broad; epistome posterior margin with low but distinct median tooth; endostomial ridge absent. Third maxilliped with long exopod, with long flagellum. Ambulatory legs short; merus without subdistal spine on dorsal margin. Suture between male thoracic sternites 2 and 3 distinct; thoracic sternite 8 completely separated by a longitudinal medial line; sternopleonal cavity almost reaching imaginary line joining anterior edges of cheliped bases; male pleon triangular. G1 subterminal segment with distal third bent outward, appears neck-like, being distinctly tapered or constricted; G1 terminal segment slender, elongate, tubular to tapering, tip truncate or sharp, upcurved, dorsal flap absent. G2 longer than G1, distal segment distinctly less than half length of basal segment.

*Inlethelphusa acanthica* (Kemp, 1918)  
(Figs. 1–8)

*Potamon (Potamon) acanthicum* Kemp, 1918: 85, fig. 2, pl. 24 figs. 3, 4.  
*Lobothelphusa acanthia* – Bott, 1970: 150; Yeo & Ng, 1999: 640.  
*Inlethelphusa acanthica* – Yeo & Ng, 2007: 283, fig. 6; Ng et al., 2008: 163.

**Material examined.** Lectotype (here designated): male (26.3 × 19.8 mm) (ZSI 9771-2/10a), Inle Lake. Parallectotypes: 1 male (30.2 × 22.3 mm), 5 females (largest 35.3 × 25.4 mm), 3 juveniles (ZSI 9771-2/10b), Inle Lake. Others: 2 males (larger 23.2 × 17.5 mm), 1 female (35.4 × 26.5 mm), 1 juvenile (ZSI 9773/10), He-Ho stream, near Inle Lake; 1 juvenile male (largest 12.5 × 9.8 mm) (NRM 13917), Inle Lake, 3,000 ft (914 m), Southern Shan States, coll. Malaise, 12 September 1934; 7 males (26.4 × 19.5 mm, 27.4 × 20.4 mm) (ZRC 2018.1370); C, male (30.3 × 22.8 mm) (ZRC 2018.0736); D, female (38.6 × 28.1 mm) (ZRC 2018.1370).
mm, 27.6 × 20.6 mm, 28.1 × 20.5 mm, 31.6 × 22.4 mm, 34.2 × 25.9 mm, 34.4 × 25.1 mm), 3 females (38.6 × 28.1 mm, 38.8 × 27.8 mm, 43.1 × 31.4 mm) (ZRC 2018.1370), from Inle Heritage Lake, ca. 20°26′53.0″N, 96°54′17.4″E, Nyaung Shwe Township, Taunggyi District, from local fishermen, coll. J. Lai, 13 December 2018; 1 male (30.3 × 22.8 mm), 1 young male (ZRC 2018.0736), Naung Shwe, near Inle lake (ca. 20°39′02.2″N, 96°55′23.1″E), Shan State, coll. Shwe Le Win, 2018; 4 males, 8 females (ZRC 2019.1794), Nampan village, near Inle heritage story houses, Inle Lake, Shan State, coll. J. Lai, local fishermen, 18 December 2019. All locations in Myanmar.

**Description of adult male.** Carapace slightly broader than long; dorsal surface gently convex longitudinally and transversely, glabrous; regions indistinct, cervical grooves poorly developed, low, H-shaped groove well developed, distinct (Figs. 1A–C, 2A–E). Epigastric cristae well developed, not sharp, gently rugose to smooth, separated by distinct groove which opens up into inverted V-shape posteriorly, anterior to postorbital cristae, separated from
postorbital cristae by distinct narrow groove; postorbital cristae distinct but low, gently sloping posterolaterally, not sharp, weakly rugose, not confluent with epibranchial teeth; regions behind epigastric and postorbital cristae smooth (Figs. 1A–C, 2A–E). Frontal margin weakly bilobed with shallow median concavity, cristate; frontal region gently deflexed downwards, smooth; antennular fossae broadly subrectangular when viewed from front; supraorbital margin gently sinuous, cristate; infraorbital margin straight, cristate; orbital region relatively broad; eyes normal; sub-hepatic and sub-branchial regions rugose (Figs. 2A–E, 3A). External orbital angle well developed, triangular, outer margin longer than inner
margin, convex, margins cristate, with deep cleft separating it from epibranchial tooth; epibranchial tooth distinct, well developed, almost spiniform; anterolateral margin convex, not confluent with posterolateral margin, appears strongly and unevenly serrated, with anterior serrations forming 1–4 distinct anteriorly directed spines of variable sizes, larger spines may have accessory spinules basally; posterolateral margin distinctly converging posteriorly, convex to almost straight; posterior carapace margin gently to distinctly convex; branchial region sparsely granulose; metabranchial region with distinct oblique striae (Fig. 2A–E). Posterior margin of epistome with distinct medial tooth, lateral margins strongly sinuous; endostomial ridge absent (Fig. 3A).

Third maxilliped glabrous; ischium broadly rectangular, with distinct longitudinal median sulcus; merus squarish, subequal to half of ischium length, outer surface concave, with weakly granular margins, anterolateral margin rounded; palp normal; exopod long, slender, exceeding upper edge of ischium, straight, distally tapered, inner margin of distal part produced as a tooth, with long flagellum, longer than or subequal to merus width (Fig. 4K).
Chelipeds subequal, outer surfaces of merus, carpus and palm relatively smooth to weakly rugose with scattered low and flattened granules; inner margin of basis-ischium with short, sharp granules; ventral margins of merus with row of low, sharp granules, distal ones larger, dorsal margin uneven with blunt subterminal tooth; carpus with sharp spine on inner subdistal tooth; fingers subequal to longer than palm; tips hooked, overlapping when closed, basal part gap in large specimens, cutting margins with low teeth (Figs. 1A–C, 3C, D).

Ambulatory legs glabrous, relatively short, second leg longest; surfaces of propodus, carpus, and merus weakly rugose; dorsal margin of merus weakly serrate, with weak subdistal spine in first to third legs, that on fourth leg barely or not discernible; carpus short; propodus subovate; dactylus very slender, distinctly elongate in first to third legs, that of fourth leg distinctly shorter; fourth ambulatory leg dactylus about 1.2 times as long as propodus, about 8 times longer than proximal width (Fig. 1A–C).

Thoracic sternites 1 and 2 completely fused forming triangular structure; suture between anterior thoracic sternites 2 and 3 distinct, complete, gently curved; sternites 3 and 4 fused, groove between sternites not discernible; posterior thoracic sternites 5 and 6 medially interrupted; thoracic sternite 7 completely separated by longitudinal median line; thoracic sternite 8 completely separated by longitudinal median line, without transverse ridge; sternite 8 not visible when pleon closed; sternopleonal cavity almost reaching imaginary line joining anterior edges of coxae of chelipeds (Fig. 4A–C, J). Press-button pleonal locking mechanism with rounded submedial tubercle on sternite 5 (Fig. 4J). Male pleon triangular; telson triangular, approximately as wide as long, slightly longer or subequal to somite 6, lateral margins gently convex to almost straight, tip rounded; somite 6 trapezoidal, median length about half of proximal width, lateral margins gently convex to almost straight; somites 3–5 trapezoidal, somite 3 widest; somite 2 subrectangular, reaching bases of coxae of last ambulatory legs; somite 1 longitudinally narrow, as wide as somite 2 (Fig. 3A–I).

G1 sinuous, slender; proximal two-thirds of subterminal segment stout, subtruncate, distal third bent outwards, tapering sharply along distal third to form slender neck-like structure, without shelf-like structure on outer margin, clearly separated from terminal segment by swelling and suture; terminal segment more than half length of subterminal segment, slender, straight to gently sinuous, tip subtruncate or gently bifurcate in smaller specimens, tapering to sharp tip, gently curving upwards in larger specimens, groove for G2 appearing marginal, without longitudinal torque, without obvious swelling on inner margin (if visible, very low), dorsal flap absent (Figs. 5, 6A–D). G2 longer than G1; distal segment flagelliform, shorter than half length of basal segment, slender, tapering, without distal projection; basal segment with outer margin gently convex (Fig. 6E).

Variation. The carapace shape of smaller specimens (ca. 30 mm and less carapace width) tends to be hexagonal (Fig. 2E). As the specimens get larger (both sexes), the carapace gets proportionately broader and more transversely ovate (Fig. 2A–D, F). The carapace also becomes proportionately higher with the dorsal surface more convex in adult males and females (Fig. 3A, B); in smaller specimens, the carapace appears less inflated and the dorsal surface is somewhat flatter. The spines on the anterolateral margin, however, do not vary substantially with carapace size (Fig. 2). The sternopleonal cavity in adult males reaches an imaginary line connecting beyond the median point, almost to the anterior edges, of the coxae of the chelipeds (Fig. 4A–C). In smaller males, however, the sternopleonal cavity only reaches an imaginary line joining the midpoint of the bases of the chelipeds (Fig. 4D). The male pleon does not change much in shape in adults (Fig. 4A–C, E–H), although in smaller males, it is relatively shorter overall (Fig. 4D, I). The fingers of the cheliped are always longer than the palm; in smaller males, the fingers in both chelae are almost straight and do not gape basally (Fig. 3C). In larger males and females, the fingers of the larger chela become more curved, forming a distinct basal gape when the fingers are closed (Fig. 3D, E). The most substantial change takes place in the G1. Males which are less than 30 mm in carapace width have the G1 terminal segment straight, more cylinrical with the tip truncate or weakly bifurcated (Fig. 5A–D). Larger males have the G1 terminal segment relatively more elongate, tapering and the distal part is gently curved upwards with the tip sharp (Figs. 5E–H, 6A–D).

Female. The adult female pleon is large, ovate, and completely covers the thoracic sternum (Fig. 7A). The vulvae are large, positioned at the anterior margin of sternite 6 and push into the margin of sternite 5; the openings are directly laterally inwards and the sternal cover is large, covering most of the surface (Fig. 7B). Smaller females among the material examined were all mature specimens as well, and morphologically similar to the individual featured in Fig. 7, with no discernible differences or distinct subadult features.

Colour. Kemp (1918: 88–89) described the fresh colour as follows: “The dorsal surface is black or very dark green, except that the deep groove running across behind the orbits is pale greenish yellow with a blackish margin in front. The upper half of the chelae, including the whole of the movable finger, is densely marbled with pale olive and greenish black; the lower half, including the immovable finger, is pale yellowish. This particoloured character extends to the whole appendage. The articular membrane at the base of the claw is scarlet. The walking legs are dull olivaceous speckled with black. The ventral surface is yellowish and the mouth-parts are stained with dull olive. Individuals from the Inlé Lake are usually more brightly coloured than those from streams in the same district.” The recent specimens from Inle Lake (ZRC 2018.1370) agree with the above colour description, and the pattern is obvious even in freshly preserved specimens (Figs. 1A, B, D, 2A–C, F, G). The present specimens from Inle Lake (ZRC 2019.1794) also generally agree, except that in many of them, the background colour of the carapace is orangish-yellow to brownish-orange, the median anterior parts being dark purplish-brown or greenish-brown, with the
frontal and lateral parts light brown, highlighting the two-colour tone (Fig. 8). The chelipeds are yellowish-brown to brown with numerous dark spots and specks, and in large specimens, the upper half of the chela is a more uniform dark brown with the lower half orange. The legs are yellowish-brown with scattered specks of dark brown.

**Remarks.** To stabilise the taxonomy of the genus and species, we hereby select the specimen figured in Yeo & Ng (2007: 283, fig. 6) (a male, 26.3 × 19.8 mm, ZSI 9771-2/10a) as the lectotype of *Potamon (Potamon) acanthicum* Kemp, 1918.

As discussed earlier, the allometric changes in the G1 structure as individuals get larger are relatively substantial in *I. acanthica*. Smaller and presumably subadult specimens
have a relatively shorter and distinctly more tubular and straight G1 terminal segment with a truncate tip (Fig. 5A–D) compared to larger males only a few millimetres broader in carapace width, which have the G1 terminal segment longer, more elongate, and curved upwards to a sharp tip (Figs. 5E–H, 6A–D). The differences are such that the large and small specimens could potentially be misinterpreted as separate taxa, if the ontogenetic patterns were not better understood. Ng & Win Mar (2018) had discussed a similar problem with *Indochinnamon khinpyae* Ng & Win Mar, 2018, from northern Myanmar in which the overall G1 changes quite substantially as specimens become larger. In that species, the changes in carapace sculpture are also more significant than those observed for *I. acanthica* here (Ng & Win Mar, 2018).

**Ecological notes.** Kemp (1918: 89) notes that this “is apparently the only crab that makes its way into the central region of the Inle Lake, on the bottom of which it is occasionally found. It is more abundant among the roots of the floating islands at the edge of the lake, and also frequents small hill-streams.” The series of recent specimens
(ZRC 2018.1370) were from the centre of the lake and were collected in the nets of fishermen. Two other specimens (ZRC 2018.0736) were from small streams flowing into Inle Lake. Nothing else is known about its ecology. This potamid species occupies a lacustrine niche in northern Indochina that, in other parts of Southeast Asia, is normally filled by crabs of the family Gecarcinucidae Rathbun, 1904. The chelae of *I. acanthica* are gaped in large males and females (Fig. 3D, E), similar to those of the analogous lentic gecarcinucids found in swamps and lakes in Thailand and Cambodia, and are not specifically adapted for feeding on molluscs (see Ng & Naiyanetr, 1993; Ng, 1995). In ancient lakes in Sulawesi, molluscivorous species have large molariform teeth at the base of the gaping fingers (see Chia & Ng,
2006; Schubart & Ng, 2008), while there is no evidence of incipient development or evolution of any such molariform teeth in *I. acanthica*.

**Conservation.** A large number of freshwater crab species under IUCN Red List guidelines are assessed as “Data Deficient” (Cumberlidge et al., 2009), with the area currently defined as “Indo-Burma” being particularly poorly studied (Cumberlidge et al., 2012). The status of *I. acanthica* is similarly assessed as Data Deficient (Esser & Cumberlidge, 2008). The present data suggests the species is more widespread than previously believed and is still relatively abundant in the lake (J. Lai, pers. comm.). As such, the species may well have a status of Least Concern, and should be reassessed in light of the present data.

**Distribution.** Inle Lake and adjacent streams, southern Shan State, Myanmar.

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**LITERATURE CITED**


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