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A NEW SPECIES OF *ESANTHELPHUSA* (CRUSTACEA: BRACHYURA: PARATHELPHUSIDAE) FROM LAOS, AND A REDESCRIPTION OF *POTAMON (PARATHELPHUSA) DUGASTI* RATHBUN, 1902

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***ABSTRACT.* –** A new species of freshwater parathelphusid crab belonging to the genus *Esanthelphusa* is described from Vientianne, Laos. It differs from the type species, *Esanthelphusa dugasti* (Rathbun, 1902), as well as other congeners mainly by carapace and male first gonopod characters. A redescription of *Potamon (Parathelphusa) dugasti* Rathbun, 1902, is also provided.

***KEY WORDS.* –** Crustacea, Parathelphusidae, *Esanthelphusa*, new species, freshwater crab, Laos.

INTRODUCTION

In early 2003, I received specimens of a freshwater parathelphusid crab representing a species of *Esanthelphusa* Naiyanetr, 1994, which were collected by Nils Carlsson and colleagues (Lund University, Sweden) from a swamp outside Vientianne, Laos. The species proved to be new to science, possessing a suite of carapace and male first gonopod characters that cannot be ascribed to any other currently recognised member of the group, and is named herein as *Esanthelphusa nimoafi*. The opportunity is taken here to also provide a redescription of the poorly known type species, *Potamon (Parathelphusa) dugasti* Rathbun, 1902, which appears to be the closest congener to *E. nimoafi*, new species.

In a checklist of Indochinese freshwater crabs, Yeo & Ng (1999) listed eight members of the genus *Esanthelphusa* Naiyater, 1994. They had included *E. prolatus* Rathbun, 1902, and *E. grayi* Alcock, 1909, based on original descriptions and illustrations. However, I have since re-examined the types of these species, and found that, based on external and male first pleopod morphology, they should both be re-assigned instead to *Somanniathelphusa* sensu Naiyanetr, 1994 (pers. observ.). This will be elaborated on in a separate work, as it is outside the scope of the present paper. The genus *Esanthelphusa*, therefore, now consists of just seven species: *E. dugasti* (Rathbun, 1902)[type species], *E. denchaii* (Naiyanetr, 1984), *E. nani* (Naiyanetr, 1984), *E. fangensis* (Naiyanetr, 1987), *E. chiangmai* (Ng & Naiyanetr, 1993), *E. phetchaburi* (Ng & Naiyanetr, 1993), and *E. nimoafi*, new species. Apart from *E. dugasti*, the rest of the species will be elaborated on together with other Indochinese parathelphusids in an upcoming monograph on the Indochinese freshwater crabs now under preparation. The full description of *E. dugasti* given in the present study will serve as the benchmark for the genus, and subsequent species will only require the diagnosis of key characters.

MATERIALS AND METHODS

The following abbreviations are used: G1 for male first pleopod, G2 for male second pleopod. Measurements (in millimetres) are of carapace width and length respectively. Terminology used essentially follows Ng (1988). Specimens examined are deposited in the Zoological Reference Collection (ZRC) of the Raffles Museum of Biodiversity Research, National University of Singapore, Muséum national d'Histoire naturelle, Paris, France (MNHN) and Chulalongkorn University Natural History Museum, Bangkok, Thailand (CUMZ).

TAXONOMY

PARATHELPHUSIDAE ALCOCK, 1910

***Esanthelphusa dugasti* (Rathbun, 1902)**
(Figs. 1, 2)

Potamon (Parathelphusa) dugasti Rathbun, 1902: 185; 1905: 242, Pl. 11 fig. 10, Fig. 58.
Somanniathelphusa sinensis dugasti – Bott, 1968: 409, Figs. 13, 14, 31 (part); 1970a: 339 (part); 1970b: 112, Pl. 21 fig. 45-47, Pl. 30 fig. 82 (part); Chuensri, 1973: 14, Fig. 2C (part); 1974a: 20, Fig. 2C (part); 1974b: 16 (part).

Somanniathelphusa dugasti – Naiyanetr, 1975: 23 (part); 1978b: 6 (part), Fig. 5, 1978c: 27 (part); 1980a: 50 (part); 1980b: 25 (part); 1988: 4 (part), Pl. 2 fig. 3; 1992: 48 (part); Ng, 1988: 105 (part); Naiyanetr & Takeda, 1989: 115 (part); Ng & Naiyanetr, 1993: 46.

Esanthelphusa dugasti – Naiyanetr, 1994: 698, Fig. 3; 1998: 106; Yeo & Ng, 1999: 642.

Sayamia dugasti – Ng & Kosuge, 1995: 61.

***Material examined.* –** Holotype, male (46.0 by 36.7 mm) (MNHN-B 5113), Lakhone, Laos, Siam, coll. Dugast, no date.

Others - 4 males (largest 49.9 by 39.6 mm) (ZRC), 2 males (larger 53.9 by 41.7 mm) (CUMZ), That Phanom District, Nakhon Phanom Province, northeastern Thailand, coll. P. Naiyanetr, 17 Apr.1984; 1 male (32.1 by 25.9 mm), 1 female (ZRC), 4 males, 4 females (CUMZ), Muang Nakhon Phanom District, Nakhon Phanom Province, northeastern Thailand, coll. Manu, 22 Sep.1974.

***Description.* –** Carapace slightly broader than long, relatively high; dorsal surface strongly inflated, glabrous; regions indistinct, cervical grooves poorly developed, H-shaped groove well developed (Figs. 1A, B). Epigastric cristae well developed, sharp, smooth, separated by distinct groove which opens up into inverted V-shape posteriorly, slightly anterior to postorbital cristae, separated from postorbital cristae by distinct groove; postorbital cristae well developed but short, not reaching beginning of cervical grooves, gently convex, sharp, smooth; regions behind epigastric and postorbital cristae smooth (Figs. 1A, B). Frontal margin sinuous, cristate, with distinct, complete frontal median triangle; frontal region hardly deflexed, smooth; antennular fossae subrectangular when viewed from front; supraorbital margin sinuous, cristate; infraorbital margin sinuous, cristate; orbital region relatively broad; eyes normal; sub-hepatic and sub-branchial regions

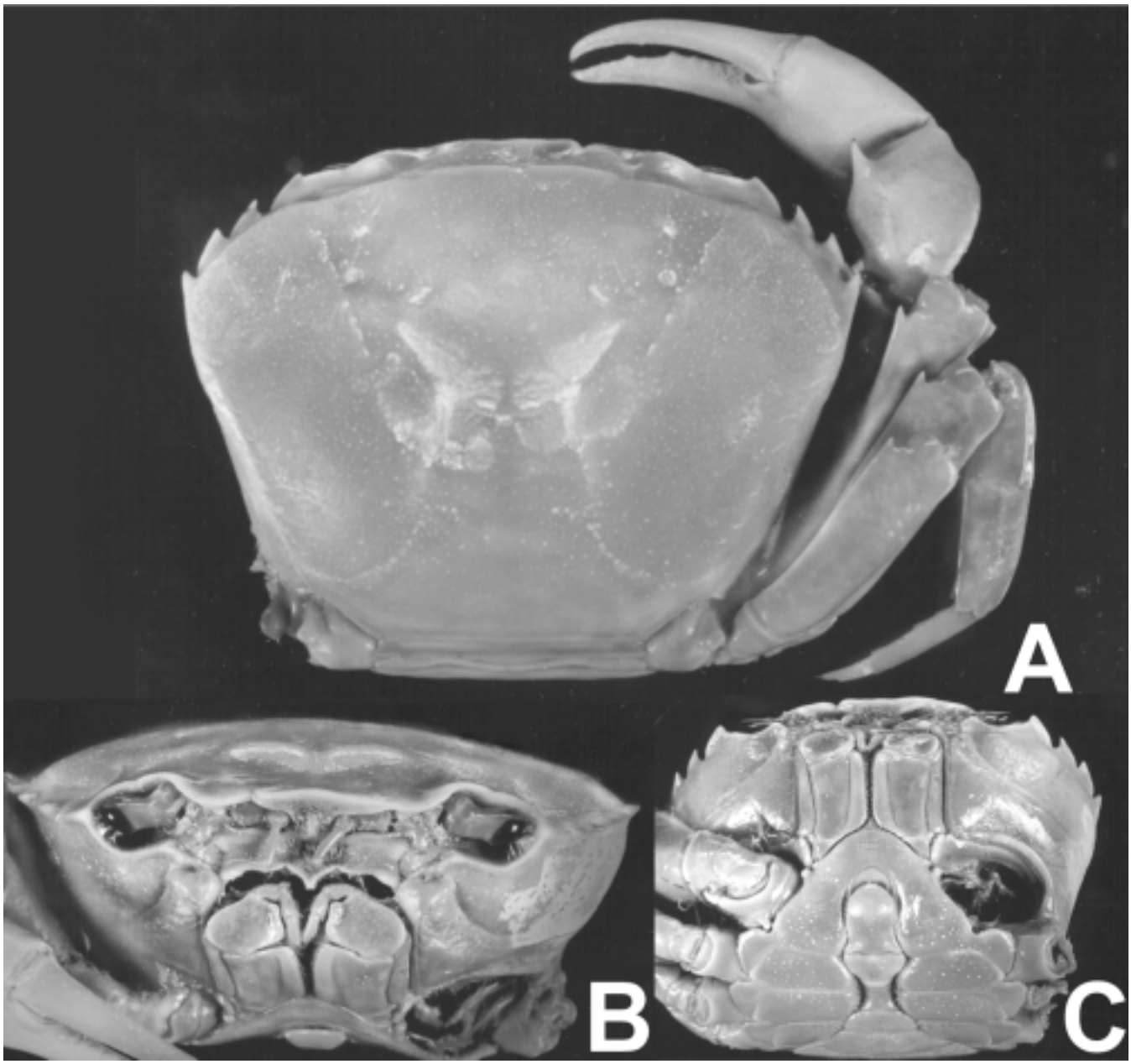

Fig. 1. *Esanthelphusa dugasti* (Rathbun, 1902), holotype male (46.0 by 36.7 mm) (MNHN-B 5113). A, dorsal view; B, frontal view; C. ventral view.

sparsely rugose (Fig. 1). External orbital angle well developed, acutely triangular, with outer margin longer than inner margin, convex, margins cristate, with deep, narrow, triangular cleft separating it from first epibranchial tooth; anterolateral margin gently convex, with three distinct epibranchial teeth, well developed, triangular, relatively narrow, flattened, confluent with posterolateral margin; posterolateral margin strongly converging posteriorly, entire, straight; branchial region smooth; metabranchial region with weak oblique striae (Fig. 1A). Epistome anterior margin with median triangle; posterior margin median tooth distinct, well developed, broadly triangular, with acute tip, outer parts not concave, sloping downwards, lateral parts gently convex; median endostomial ridge absent (Fig. 1B).

Third maxilliped glabrous; ischium broadly rectangular, with distinct longitudinal median sulcus; merus squarish, subequal to half of ischium length, with concave outer surface, with smooth margins; palp normal; exopod long, exceeding upper edge of ischium, straight, distally tapered, inner margin of distal part produced as a tooth, with well developed flagellum, longer than merus width (Fig. 2A).

Chelipeds unequal (see Rathbun, 1905: Pl. 11 fig. 10), outer surface of merus, carpus and palm smooth; fingers gaping, longer than palm, tips hooked and overlapping, carpus with robust, obliquely directed subdistal spine on inner margin; merus with subterminal spine (Fig. 1A).

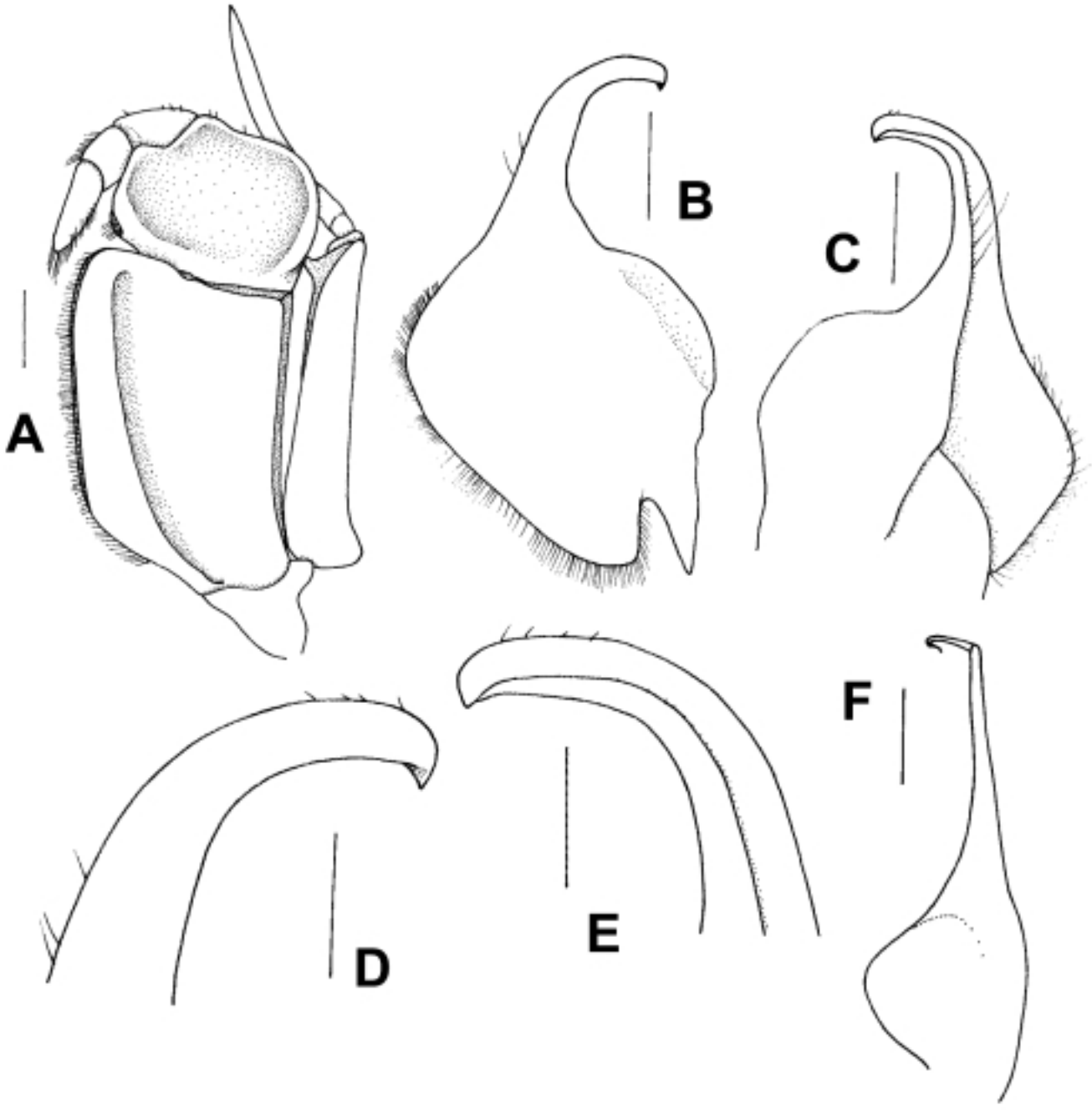

Fig. 2. *Esanthelphusa dugasti* (Rathbun, 1902), holotype male (46.0 by 36.7 mm) (MNHN-B 5113). A, left third maxilliped; B-E, right G1, B: dorsal view, C: ventral view, D: dorsal view of distal part, E: ventral view of distal part; F, right G2. Scales = 2.0 mm in A; 1.0 mm in B, C, F; 0.5 mm in D, E.

Ambulatory legs glabrous, relatively short, relatively slender; dactyli short, stout, merus subdistal spine present, upper margin smooth; fourth ambulatory leg dactylus about 1.3 times as long as propodus, about 5.2 times longer than proximal width; propodus, carpus and merus smooth (Fig. 1A).

Suture between anterior thoracic sternites 2 and 3 incomplete, gently sinuous; groove or suture between anterior thoracic sternites 3 and 4 not discernible; posterior thoracic sternite 5 medially interrupted; thoracic sternite 6 and 7 separated by longitudinal median line, with transverse ridge at suture separating the two sternites; abdominal cavity reaching imaginary line joining anterior edge of cheliped bases (Fig. 1C). Male abdomen T-shaped; telson tongue shaped, subequal to sixth segment, lateral margins concave, tip rounded, proximal margin sinuous; segment 6 distal margin distinctly longer than proximal margin, with distinctly concave lateral margins, proximal margin almost straight; segments 3 to 5 trapezoidal, with lateral margins of segment 5 and 3 slightly convex, lateral margins of segment 4 slightly concave (Fig. 1C).

G1 strongly bent outwards, stocky; terminal segment not separated from subterminal segment, distal part distinctly narrowed, appears shorter than proximal part, cylindrical, strongly curved outwards, almost perpendicularly, with bend or curve in median part, tip broadly tapered, hooked, directed downwards, groove for G2 ventral; proximal part expanded, with distinct, broad shelf on outer margin, with distinctly convex inner margin (Figs. 2B-E). G2 distal segment distinctly shorter than half of basal segment, slender, tapering; basal segment outer margin expanded (Fig. 2F).

***Remarks.* –** Rathbun (1902) described *Esanthelphusa dugasti* [as *Potamon (Parathelphusa) dugasti*] based on an unspecified number of specimens from "Lakhone, Laos, Siam", but gave the measurements of a male specimen as 46.5 by 36.8 mm. Rathbun (1905) subsequently listed a single male specimen from that locality, together with numerous specimens from other parts of Laos, as well as "Cochinchine", in her material for *E. dugasti*; however, only the male specimen from "Lakhone, Laos, Siam" was designated as a type. The measurement of this single type specimen, which is therefore the holotype of *E. dugasti*, matches that originally given by Rathbun (1902). "Lakhone, Laos, Siam" refers to the present day Nakhon Phanom Province of northeastern Thailand, and *E. dugasti* appears to be restricted to that area. Specimens collected from there closely match the holotype of *E. dugasti* and are clearly referable to the species (Yeo & Nguyen, 1999; P. Naiyanetr, pers. comm.; present study). Specimens from other areas previously referred to *E. dugasti* by Rathbun (1905), Bott (1968, 1970b), Dang (1975, 1980), and Naiyanetr (1975, 1978a, b, c, 1980a, 1988), actually represent different species, such as *E. phetchaburi* (Ng & Naiyanetr, 1993), *E. chiangmai* (Ng & Naiyanetr, 1993), *Somanniathelphusa pax* Ng & Kosuge, 1995, and possibly some undescribed species including *E. nimoafi*, new species (see later; unpublished data; see also Ng & Naiyanetr, 1993; Yeo & Nguyen, 1999). The other new species will be described in a separate study, but it is important to note here that they clearly belong to *Esanthelphusa* and will not affect the current generic system.

Esanthelphusa dugasti most closely resembles *E. nimoafi*, *E. phetchaburi* and *E. chiangmai* in terms of the G1 structure, but can be externally distinguished from the latter two species by its more strongly developed, distinct postorbital cristae (versus postorbital cristae very low and weak, sometimes indistinct); longer anterolateral margins (versus shorter), with well developed and acute epibranchial teeth (versus epibranchial teeth relatively lower and broader); and much more strongly constricted sixth male abdominal segment, with very slender proximal part and strongly concave lateral margins (versus sixth male abdominal segment less strongly constricted, with relatively broader proximal part and less strongly concave lateral margins) (Fig. 1; Ng & Naiyanetr, 1993: Figs. 31, 32). The G1 of *E. dugasti* differs from that of *E. phetchaburi* and *E. chiangmai* by the tip being broader and less strongly hooked (versus G1 tip sharper and more strongly hooked), and bent portion of the distal part being proportionately longer (versus proportionately shorter) (Figs. 2B-E; Ng & Naiyanetr, 1993: Figs. 66B, C, E-G, 67B-F). The differences between *E. dugasti* and *E. nimoafi* are covered in the ***Remarks*** for the latter (see later).

Distribution. – Nakhon Phanom Province, northeastern Thailand.

Esanthelphusa nimoafi, new species

(Figs. 3-5)

Esanthelphusa sp. – Carlsson, 2004: 15.
Esanthelphasa nimoafi – Carlsson, 2004: 17, 63, 64, Fig. 4 (nomen nudum).

***Material examined.* –** Holotype - male, 34.6 by 27.2 mm (ZRC 2003.0268), That Luang wetlands, outskirts of Vientianne, Laos, coll. A. Kestrup & M. Martensson, 1-15 Nov.2002.

Paratypes – 2 males (32.5 by 23.9 mm, 30.1 by 23.9 mm), 1 female (36.0 by 27.9 mm) (ZRC 2003.0269), same data as holotype; 2 males (32.5 by 24.5 mm, 26.6 by 20.9 mm), 2 females (34.4 by 25.9 mm, 33.8 by 26.2 mm) (ZRC 2003.0270), That Luang swamp, outside Vientianne, Laos, coll. N. Carlsson, 17 Jan.2003.

***Diagnosis.* –** Carapace broader than long, high; dorsal surface longitudinally convex; cervical grooves shallow; epigastric cristae slightly anterior to postorbital cristae; postorbital cristae short, not reaching beginning of cervical grooves; antennular fossae subrectangular; external orbital angle acutely triangular, outer margin longer than inner margin, separated from first epibranchial tooth by narrow triangular cleft; anterolateral margin with three well developed, acute epibranchial teeth. Chelipeds unequal, outer surfaces smooth. Ambulatory meri subdistal spine present. Abdominal cavity reaching imaginary line joining anterior edge of cheliped bases. Male telson tongue shaped, with lateral margins gently concave; sixth male abdominal segment constricted, with gently concave lateral margins. G1 distal part relatively long,

subequal in length to proximal part, slender, strongly curved and bent outwards, tip acute, strongly hooked, directed downwards to obliquely inward; proximal part expanded. G2 distal segment distinctly shorter than half of basal segment.

Variation. – Slight variation was observed in the G1 structure of *E. nimoafi* specimens, in that the tip of some male paratype specimens were more acute in appearance and more strongly hooked than in the holotype (Figs. 5C-F, I-K). In addition, the basal part outer margin of the expanded proximal part of the G1 was sometimes collapsed to different degrees in various specimens. This is an artefact resulting from preservation, shrinkage and handling that is often seen in *Esanthelphusa* species (pers. observ.).

Etymology. – The species is named after the collectors, Nils Carlsson, Asa Kestrup and Monica Martensson, with the specific epithet being an arbitrary combination of their initials.

Ecological notes – *Esanthelphusa nimoafi* is common in both rice fields and wetlands around Vientianne, Laos. They appear to be territorial and quarrelsome, with larger individuals often attacking smaller conspecifics. They normally burrow into the mud, down to a depth of at least 50 cm (Nils Carlsson, pers. comm.).

In a recent study by Carlsson (2004), *E. nimoafi* was found to be an important predator of the invasive gastropod species, the Golden apple snail (*Pomacea canaliculata*), which is a major pest on rice and other aquatic plants in Southeast Asian wetlands.

Remarks. – Carlsson (2004) first used the name *Esanthelphusa nimoafi* in a published thesis (with an ISBN number) and although he citied that it was by "Yeo, in press", the fact is the latter paper was not yet published. The name as cited by Carlsson, however, is not valid under the current ICZN (1999) rules as it was not accompanied by any description, diagnosis or morphological comparisons. The present paper, which provides the necessary diagnosis and morphological comparisons, thus represents the first valid publication of the name.

The strongly convex carapace dorsal surface, weak cervical grooves, postorbital cristae ending well before the beginning of cervical grooves, and relatively short and hooked G1 distal part clearly place the present species in the genus *Esanthelphusa* Naiyanetr, 1994.

Esanthelphusa nimoafi, new species, is most likely to be confused with *E. dugasti* (Rathbun, 1902) in its well developed and acute epibranchial teeth and overall form of the G1. However, upon comparing directly with the holotype as well as non-types of *E. dugasti*, it was found that *E. nimoafi* can easily be distinguished from *E. dugasti* by the following diagnostic G1 characters: distal part proportionately longer, subequal in length to basal part, and slenderer (versus G1 distal part proportionately shorter, shorter than basal part, and stouter); and tip of G1 acute and more strongly hooked, directed downwards to obliquely inward (versus tip of G1 broadly tapered and less strongly hooked, directed obliquely outward) (Figs. 2B-E, 5C-F, I-K). These differences apply to much larger as well as similar-sized *E. dugasti* specimens (present study).

Esanthelphusa nimoafi further differs from *E. dugasti* by the lateral margins of the sixth abdominal segment being gently and less strongly concave, with distal margin about 1.8 to 1.9 times as broad as narrowest part (versus sixth abdominal segment lateral margins abruptly and more strongly concave, with distal margin broadest about 1.9 to 2.1 times as broad as narrowest part) (Figs. 1C, 5G). This character, however, is less reliable when the comparing *E. nimoafi* against small, similar-sized *E. dugasti* specimens. *Esanthelphusa nimoafi* does appear to be a generally smaller species than *E. dugasti*, as all individuals encountered were no larger than those in the present type series (carapace width up to 36 mm) (Nils Carlsson, pers. comm.). *Esanthelphusa dugasti*, on the other hand, attains sizes of up to carapace width 50 mm or more (present study).

The only other *Esanthelphusa* species with superficially similar G1 shapes to *E. nimoafi* are *E. phetchaburi* (Ng & Naiyanetr, 1993) and *E. chiangmai* (Ng & Naiyanetr, 1993). *Esanthelphusa nimoafi*, however, possesses well developed and acute epibranchial teeth (versus epibranchial teeth very low, weak and broad in *E. phetchaburi* and *E. chiangmai*) (Figs. 3, 5A; cf. Ng & Naiyanetr, 1993: Figs. 31, 32). The G1 of *E. nimoafi* also differs from both *E. phetchaburi* and *E. chiangmai* in the outwardly bent portion of the distal part

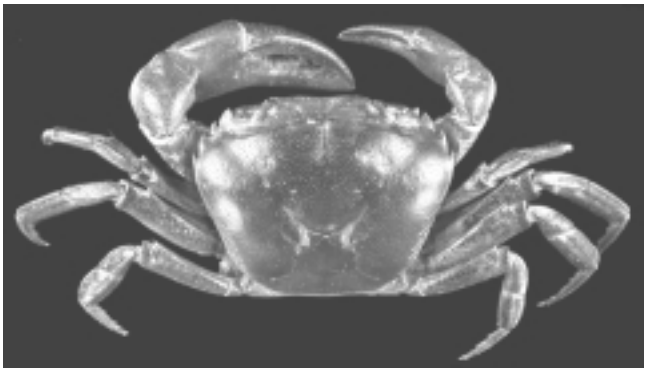

Fig. 3. *Esanthelphusa nimoafi*, new species, holotype male (34.6 by 27.2 mm) (ZRC 2003.0268). Dorsal view.

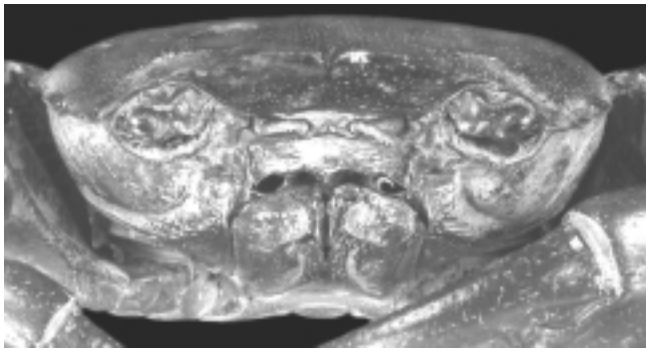

Fig. 4. *Esanthelphusa nimoafi*, new species, holotype male (34.6 by 27.2 mm) (ZRC 2003.0268). Frontal view.

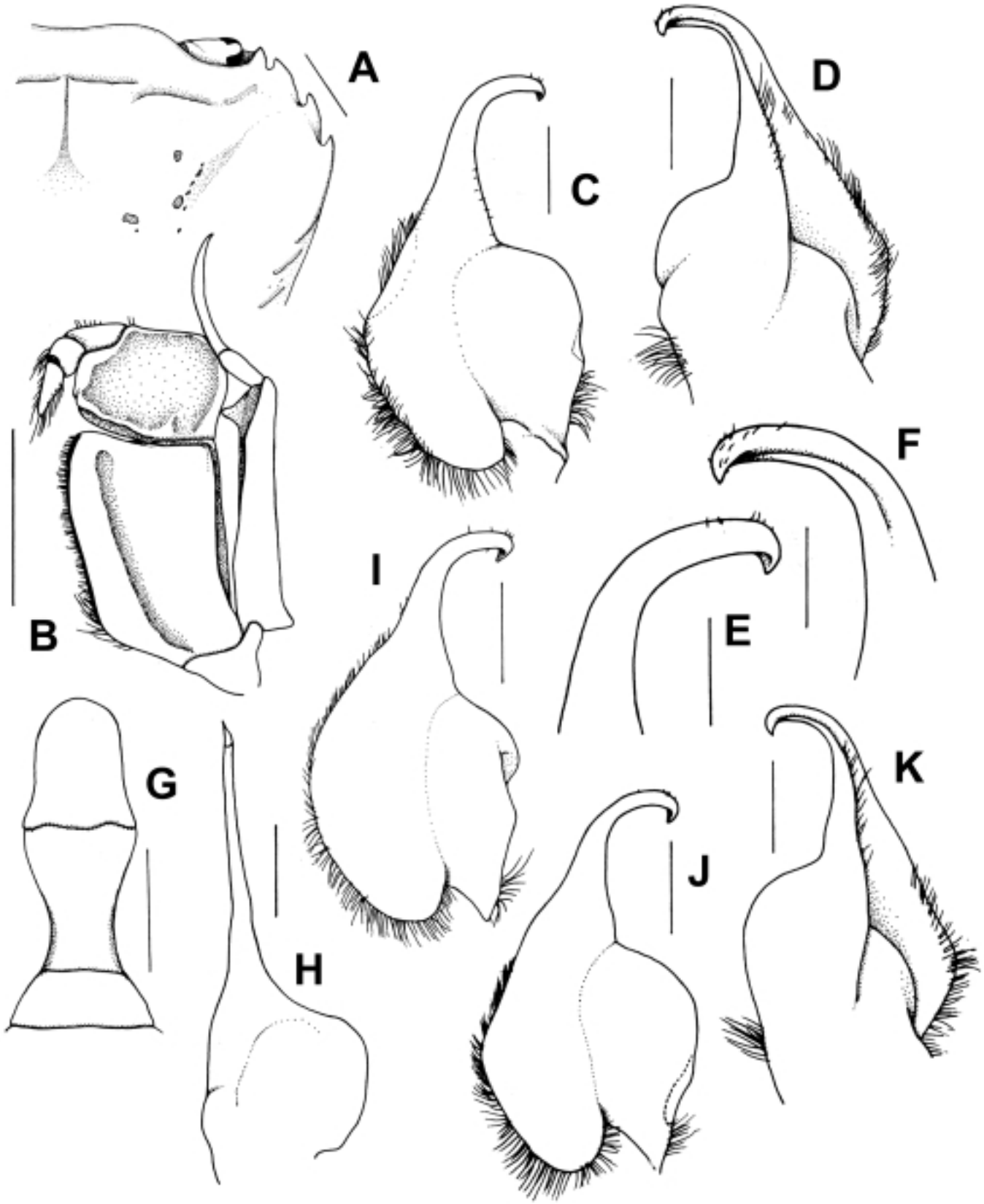

Fig. 5. *Esanthelphusa nimoafi*, new species. A-H, holotype male (34.6 by 27.2 mm) (ZRC 2003.0268); I, paratype male (30.1 by 23.9 mm) (ZRC 2003.0269); J, K, paratype male (32.5 by 23.9 mm) (ZRC 32.5 by 23.9 mm). A, anterior carapace; B, left third maxilliped; C-F, I-K, right G1, C, I, J: dorsal view, D, K: ventral view, E: dorsal view of distal part, F, ventral view of distal part; G, abdominal segments 5-7; H, right G2. Scales = 5.0 mm in A, B, G; 1.0 mm in C, D, H-K; 0.5 mm in E, F.

being proportionately longer (versus proportionately shorter) (Figs. 5C-F, I-K; cf. Ng & Naiyanetr, 1993: Figs. 66, 67).

***Distribution.* –** The present specimens of *Esanthelphusa nimoafi* were collected from Thet Luang swamp, outside Vientianne, Laos.

***Comparative Material. – Esanthelphusa phetchaburi* (Ng & Naiyanetr, 1993)** – Holotype - male (33.5 by 26.1 mm) (ZRC 1991.1886), 2-3 km from Phetchaburi town (99°56'N 13°06'E), Muang Phetchaburi District, Phetchaburi Province, Thailand, coll. P. K. L. Ng, Dec.1984. Paratype - 1 female (18.4 by 14.6 mm) (ZRC 1991.1887), same data as holotype. Others - 2 males 1 female (ZRC), Khok Samrong District, Lop Buri Province, southern Thailand, coll. Vinai, 21 Oct.1979; 1 male 2 females (male 44.0 by 33.0 mm) (CUMZ), same data as above; 4 males, 1 female (ZRC), Muang Prachuap Khiri Khan District, Prachuap Khiri Khan Province, Thailand, coll. Varoonphorn, 8 Oct.1979. ***Esanthelphusa chiangmai* (Ng & Naiyanetr, 1993) –** Holotype - male (44.0 by 33.3 mm) (RMNH D 42347), Buagcrok village, near Sonkampaeng, Muang Chiang Mai District, Chiang Mai Province, northern Thailand, coll. P. K. L. Ng, 29 Dec.1991. Paratypes - 2 males, 5 females (ZRC), 1 male (43.8 by 33.1 mm), 1 female (32.7 by 25.2 mm) (RMNH D 42028), Buagcrok village, near Sonkampaeng, Muang Chiangmai District, Chiangmai Province, Thailand, coll. P.K.L. Ng, 28-29 Dec.1991; 8 males, 28 females (ZRC), Sanpathong District, Chiangmai Province, Thailand, coll. P.K.L. Ng, 28-29 Dec.1991; 10 males, 3 females (ZRC), Handong District, Chiangmai Province, Thailand, coll. P.K.L. Ng, 28-29 Dec.1991; 12 males, 5 females (ZRC), Handong District; 12 males, 8 females (ZRC), Mae Sa Village, Muang Chiangmai District, Chiangmai Province, Thailand, coll. P.K.L. Ng, 28-29 Dec.1991. Others - 3 males (ZRC), Muang Lamphun District, Lamphun Province, Thailand, coll. P. Naiyanetr, 20 Aug.1974; 2 males, 1 females (ZRC), Muang Uttaradit District, Uttaradit Province, Thailand, coll. P. Naiyanetr, 13 Aug.1974.

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