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ON A NEW SPECIES OF *PHRICOTELPHUSA* ALCOCK, 1909, FROM A LIMESTONE CAVE IN PERLIS, PENINSULAR MALAYSIA (CRUSTACEA: DECAPODA: BRACHYURA: GECARCINUCIDAE)

Peter K. L. Ng
Raffles Museum of Biodiversity Research, Faculty of Science, National University of Singapore
14 Science Drive 4, 117543 Singapore
Email: dbsngkl@nus.edu.sg

Patrick K. Y. Lee
Division of Ecology and Biodiversity, Institute of Biological Sciences, Faculty of Science
University of Malaya, 50603 Kuala Lumpur, Malaysia
Email: patrick@um.edu.my

ABSTRACT. — A new species of the freshwater crab genus *Phricotelphusa* Alcock, 1909 (Gecarcinucidae) is described from a limestone cave in Perlis, northern Peninsular Malaysia. The new species is characterised by its very long ambulatory legs, and differs from congeners in the structure of its carapace, male abdomen and gonopods. This brings to four the number of *Phricotelphusa* species now known from Malaysia.

KEY WORDS. — Crustacea, Brachyura, Gecarcinucidae, *Phricotelphusa*, new species, cave, Malaysia

INTRODUCTION

The Indo-Chinese gecarcinucid genus *Phricotelphusa* Alcock, 1909 (type species *Telphusa callianira* De Man, 1887), is represented by 11 species (Ng et al., 2008). Three species of *Phricotelphusa* are currently known from northern Peninsular Malaysia: *P. amnicola* Ng, 1994 (Kedah), *P. gracilipes* Ng & H. P. Ng, 1987 (Langkawi Island), and *P. hockpingi* Ng, 1986 (Perak; Ng, 2004; Ng & Yeo, 2007). Another six species are present in nearby southern Thailand: *P. aedes* (Kemp, 1923), *P. callianira* (De Man, 1887), *P. deharvengi* Ng, 1988, *P. limula* (Hilgendorf, 1882), *P. ranongi* Naiyanetr, 1982, and *P. sirindhorn* Naiyanetr, 1989 (see Ng & Naiyanetr, 1993; Lheknim & Leelawathanagoon, 2009). One southern Thai species *Phricotelphusa yongchindaratae* Naiyanetr, 1988, was transferred to a new genus, *Thaksinthelphusa*, by Ng & Naiyanetr (1993).

Recently, an unusual long-legged species of *Phricotelphusa* was collected from a limestone cave in Perlis. While superficially similar to *P. aedes*, it differed in the form of the carapace, ambulatory leg proportions as well as general structure of the male abdomen and gonopods. It is here referred to a new species. The present paper describes this new species and compares it with congeners.

Specimens examined are deposited in the Zoology Museum of the University of Malaya, Kuala Lumpur, Malaysia (ZMUM); Zoological Survey of India, Calcutta, India (ZSI); and Zoological Reference Collection of the Raffles Museum of Biodiversity Research, National University of Singapore (ZRC). The abbreviations G1 and G2 are for the male first and second gonopods, respectively. The terminology used follows that in Ng (1988) . Measurements provided (in millimetres) are of the carapace width and length, respectively.

TAXONOMY

Family Gecarcinucidae Rathbun, 1904

Phricotelphusa Alcock, 1909

Type species. — *Telphusa callianira* De Man, 1887, by original designation; gender feminine.

Phricotelphusa hymeiri sp. nov.
(Figs. 1–3)

Material examined. — Holotype male (20.5×16.5 mm) (ZMUM), inside Loposang Cave, Wang Mu Forest Reserve, Perlis, Peninsular Malaysia, coll. K. Hymeir, Mar.2008. Comparative material of *P. aedes* (Kemp, 1923): Holotype female (25.8×18.6 mm) (ZSI C 602/1) (photographs examined), Khao Ram, Nakhon Si Thammarat mountains, southern Thailand, coll. M. Smith, no date; 1 male (17.5×13.2 mm), 1 female (ZRC), Phrommalok waterfall,

Phrommakhiri District, Nakhon Si Thammarat Province, southern Thailand, coll. P. Naiyanetr, 8 Mar.1965.

Diagnosis. — Carapace subovate, broader than long; dorsal surfaces gently granulose to rugose; branchial regions inflated dorsally and laterally; frontal margin protruding anteriorly beyond level of external orbital tooth; anterolateral margin distinctly convex; epibranchial tooth spiniform, small but sharp, separated from external orbital angle by narrow notch; epistome relatively wide longitudinally; third maxilliped ischium with shallow oblique median sulcus; exopod reaches beyond distal edge of ischium; antennular fossa relatively broad, rectangular in shape; ambulatory legs very long; male abdomen broadly T-shaped, reaching imaginary longitudinal line joining median edge of bases of chelipeds; telson shorter than somite 6 with gently concave lateral margins; somites 5 and 6 relatively broad; G1 relatively straight, terminal segment cone-shaped, ca. 0.3 times subterminal segment; G2 distal segment ca. 0.3 times length of basal segment.

Description of holotype. — Carapace subovate, broader than long; regions distinct; dorsal surfaces gently granulose to rugose; antero- and posterolateral regions lined with short but strong oblique striae; cervical grooves broad; pterygostomial, suborbital and sub-branchial regions rugose to granulose. Branchial regions gently inflated dorsally and laterally. Frontal margin distinct, protruding anteriorly beyond level of external orbital tooth, gently sinuous, median part distinctly gently deflexed downwards, without any trace of median pseudo-frontal triangle. Anterolateral margin distinctly convex, not clearly demarcated from posterolateral margin; epibranchial tooth spiniform, small but distinct, sharp, separated from external orbital angle by narrow notch; external orbital angle broadly triangular, outer margin ca. 3 times length of inner margin; epigastric and postorbital cristae sharp, distinct, rugose, separated by shallow oblique groove; epigastric cristae relatively stronger, anterior of postorbital cristae, separated by median groove. Posterior margin of carapace gently concave. Epistome relatively wide longitudinally; posterior margin with distinct median triangular lobe, lateral margins gently sinuous. Eyes relatively large, completely filling orbits; cornea large, fully pigmented. Antennular fossa relatively broad, rectangular in shape. Third maxilliped quadrate; ischium with shallow oblique median sulcus; exopod reaches beyond distal edge of ischium, flagellum absent. No suture between thoracic sternal segments 2 and 3.

Left cheliped larger; outer surfaces of both chelipeds rugose, without sharp spines or spinules; inner margin of merus with distinct granules; carpus with sharp inner distal tooth and smaller sub-basal spine; outer surface of palm gently rugose to granulose, especially lower half; ventral margin of pollex with numerous small denticles, outer surface with 2 rows of

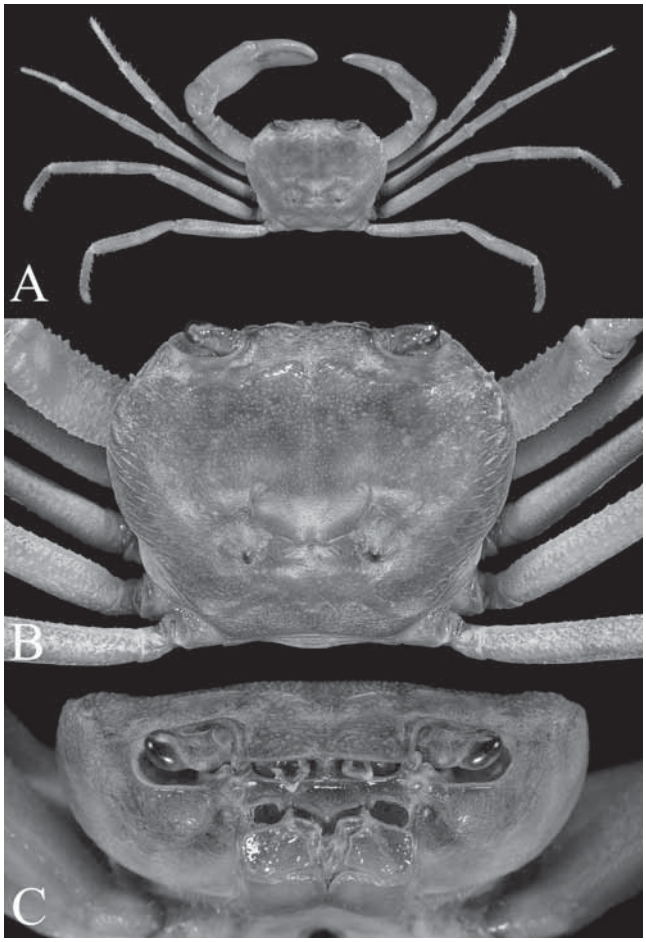

Fig. 1. *Phricotelphusa hymeiri* sp. nov., holotype male (20.5×16.5 mm) (ZMUM), Perlis, Malaysia. A, overall dorsal view; B, dorsal view of carapace; C, frontal view of carapace.

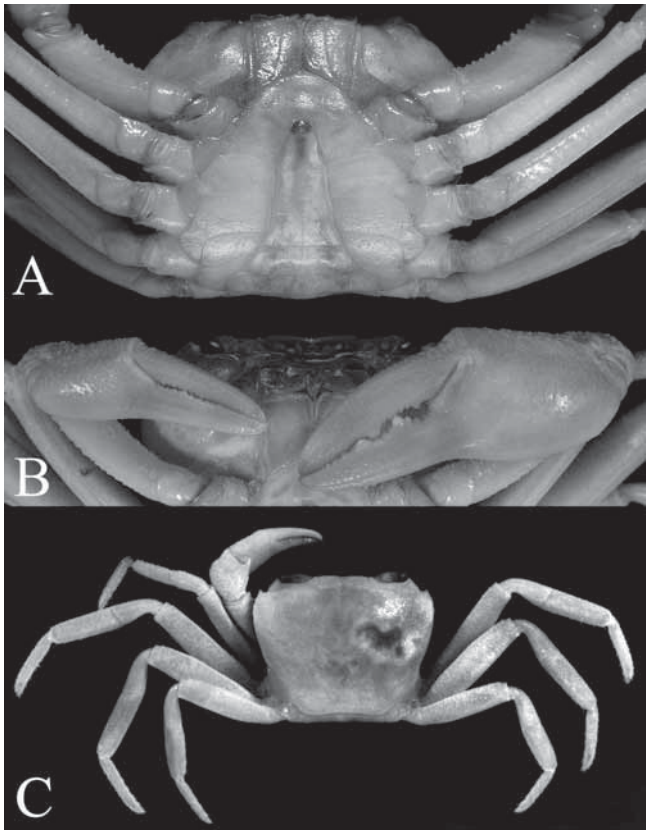

Fig. 2. A, B, *Phricotelphusa hymeiri* sp. nov., holotype male (20.5×16.5 mm) (ZMUM), Perlis, Malaysia; C, *Phricotelphusa aedes* (Kemp, 1923), male (17.5×13.2 mm) (ZRC), southern Thailand. A, ventral view of carapace showing anterior thoracic sternum and abdomen; B, outer view of chelae; C, overall dorsal view.

low tubercles and 2 shallow longitudinal grooves; cutting edges of both fingers with blunt teeth and denticles.

Ambulatory legs very long, slender; second pair longest; merus unarmed, dorsal margin gently serrated but not spiniform; outer surfaces in first to third pairs rugose; propodus with row of small movable ventral spines; dactylus gently curved, with 2 rows of strong spines on dorsal and ventral margins.

Male abdomen broadly T-shaped, reaching imaginary transverse line joining median edge of bases of chelipeds; telson shorter than somite 6 with gently concave lateral margins, tip rounded; somites 5 and 6 relatively broad.

G1 relatively straight, terminal segment cone-shaped, ca. 0.3 times subterminal segment; distal part covered with numerous very small scale-like spines and setae on outer margin, tip rounded. G2 distal segment ca. 0.3 times length of basal segment.

Colour. — According to the collector, the live specimen is dark orange, with the chelipeds and legs darker coloured. The ventral surfaces are a pale yellow. The corneas are black.

Habitat. — Loposang Cave and others like it in the Wang Mu area are natural limestone structures that have been exploited by man. The sediment in these caves is rich in tin ore and as such, they have been mined since the early part of the 20th

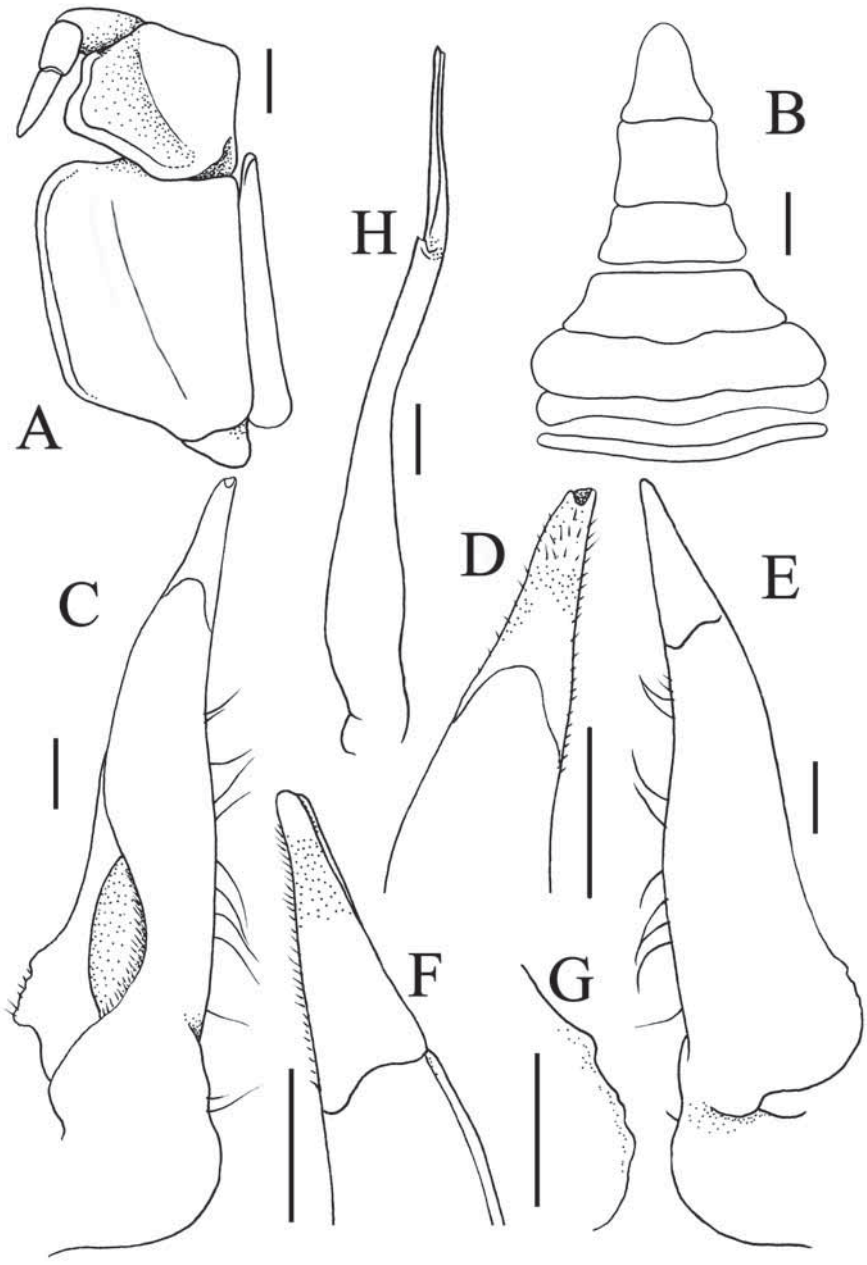

Fig. 3. *Phricotelphusa hymeiri* sp. nov., holotype male (20.5×16.5 mm) (ZMUM), Perlis, Malaysia. A, left third maxilliped; B, abdomen; C, left G1 (ventral view); D, distal part of left G1 (ventral view); E, left G1 (dorsal view); F, distal part of left G1 (dorsal view); G, proximal lower margin of subterminal segment of left G1 (dorsal view); H, left G2. Scales bars = 1.0 mm for A; 2.0 mm for B; 0.5 mm for C–H.

century. However, tin mining ceased in the 1980s, and the ecosystem in the cave has since been allowed to recover.

Loposang Cave is an active speleothem and is essentially a small, narrow to medium-sized passage (Fig. 4). Small streams flow on a rocky calcited bed through most sections of Loposang Cave. The upper section of the cave is comprised of vertical steep passages that form cascades and small waterfalls. The lower section is composed of predominantly horizontal passages with a calcited stream bed covered with small loose rocks. Due to the many streams, there is not much detritus in the cave, which is relatively warm and humid. Access into the cave is not easy due to the steep sections, and specialised caving skills and equipment are required to enter the system.

The crab was first seen in 1997 during the Perlis limestone caves survey conducted by the World Wide Fund for Nature (WWF)-Malaysia (Fig. 4; Hymeir, 1998). It was observed (but not collected) at the upper section with steep to vertical passages, less than 50 m from the entrance. The second sighting in 2008 (present specimen collected) was on the lower horizontal section of the cave, enroute to the adjacent Baba Cave section (Fig. 4). The specimen was collected relatively deep inside the cave, approximately 150–160 m (vertical distance) and 300–400 m (horizontal distance) from the entrance. In both cases, the crabs were observed out in the open but near holes or rocks. When approached, they scuttled away for shelter.

***Etymology*.** — The species is named after the collector, Mr. K. Hymeir, the past President of the Malaysian Karst Society, who is actively involved in raising awareness and promoting conservation of limestone caves and karst outcrops in the country.

Remarks. — In general appearance, *P. hymeiri* sp. nov. closely resembles *P. aedes* (Kemp, 1923) (type locality Nakhon Si Tammarat, southern Thailand), especially with regard to its long ambulatory legs. *Parathelphusa* (*Phricotelphusa*) *aedes* Kemp, 1923, was synonymised under *P. limula* by Bott (1970) but Ng (1988a) commented that it is a distinct

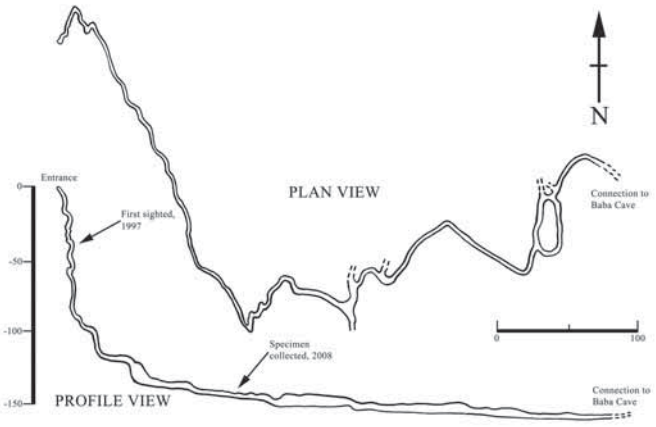

Fig. 4. Map of Loposang Cave, Wang Mu Forest Reserve, Perlis, Peninsular Malaysia, showing the plan and profile views of cave passage. Scales bars are in metres.

species (see also Naiyanetr, 1988b, 1992, 1998; Ng, 1988b; Ng & Naiyanetr, 1993; Yeo & Ng, 1999; Ng et al., 2008).

Phricotelphusa aedes differs from *P. hymeiri* in having the carapace more transversely subrectangular, being proportionately broader (Fig. 2C; Kemp, 1923: pl. 4, Fig. 12) (vs. carapace subovate and proportionately less broad in *P. hymeiri*, Fig. 1A, B); the granules on the dorsal surface of the carapace are low and relatively obscure (vs. prominent in *P. hymeiri*, Fig. 1A, B); the front is shorter and does not protrude anteriorly as far as *P. hymeiri* (Fig. 2C; Kemp, 1923: pl. 4, Fig. 12 vs. Fig. 1A, B); the postorbital and postfrontal regions are relatively narrower (Fig. 2C) (vs. relatively broader in *P. hymeiri*, Fig. 1); the outer margin of the external orbital tooth is subtruncate and separated from the epibranchial tooth by broad, prominent triangular cleft (Fig. 2C; Kemp, 1923: pl. 4, Fig. 12) (vs. margin almost straight, separated from epribranchial tooth by small notch in *P. hymeiri*, Fig. 1A, B); the epibranchial tooth is prominent and sharp (Fig. 2C; Kemp, 1923: pl. 4, Fig. 12) (vs. short and spiniform in *P. hymeiri*, Fig. 1A, B); the carapace branchial regions are gently convex to almost flat (Fig. 2C) (vs. distinctly convex and appears inflated in *P. hymeiri*, both from the dorsal as well as frontal views, Fig. 1A, B); the antennular fossa are relatively narrower (versus broader, more rectangular in *P. hymeiri*, Fig. 1B); the epistome is relatively narrow (vs. wider longitudinally in *P. hymeiri*, Fig. 1B); the exopod of the third maxilliped does not reach the distal margin of the ischium (vs. reaches beyond ischium margin in *P. hymeiri*, Fig. 3A); the ambulatory meri are relatively shorter (Fig. 2C; Kemp, 1923: pl. 4, Fig. 12) (vs. relatively longer in *P. hymeiri*, Fig. 1A); the male abdominal somites 5 and 6 are relatively narrower and more slender (vs. proportionately longer in *P. hymeiri*, Fig. 2A); the male telson is relatively shorter with the lateral margins more deeply concave (vs. relatively longer with gently convex lateral margins, longer in *P. hymeiri*, Figs. 2A, 3B); and the G1 has the distal margin of the subterminal segment part slightly more angular (vs. more rounded in *P. hymeiri*, Fig. 3C–F).

Phricotelphusa hymeiri does not display any of the features normally associated with a true troglobite (sensu Holthuis, 1986; Guinot, 1988), and its presence in the Perlis cave, must be regarded as incidental or facultative, even though it was collected deep inside the cave. There are some species (e.g., the Sarawakian gecarcinucid *Stygothelphusa bidiensis* (Lanchester, 1900)) which are known to be closely associated with caves but have apparently not developed any cave-adapted features like loss of pigmentation and reduced eyes (see Ng, 1989; Ng & Yusof, 1990; Ng & Sket, 1996).

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