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A New Species of *Quadrimaera* (Amphipoda: Maeridae) from Coral Reefs of Chon Buri Province, Thailand

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ABSTRACT.– *Quadrimaera sirindhornae* sp. nov. was described from specimens collected from algae in a coral reef in Chon Buri Province, Thailand. The new amphipod species can be distinguished from its closest relative by its accessory flagellum with seven articles, gnathopod 2 propodus 1.8x longer than wide, uropod 3 ratio of outer ramus and peduncle is 1.2. The illustration and comparison of diagnostic characteristics in male *Quadrimaera* reported in Southeast Asia were provided.

KEYWORDS: Amphipoda, new species, algal bed, Gulf of Thailand

INTRODUCTION

Samaesan Island is in the upper Gulf of Thailand, south of Sattahip District in Chon Buri Province. The surrounding marine environment comprises coral assemblages and algal beds. These habitats provide favorable conditions for amphipod communities (Noiraksar et al., 2017). Despite this, studies focusing on amphipod diversity in the region remain limited. Only Wongkamhaeng et al. (2009) and Wongkamhaeng et al. (2013) have documented seven amphipod species from the Southern Sea Islands and a single species from Samaesan Island.

The genus *Quadrimaera*, established in 2000 by Krapp-Schickel, previously included in the genus *Maera* and was mentioned as *Maera quadrimana*-complex. The diagnosis characteristics of this genus are mandibular palp article 1 ventro-distally not lengthened, never produced into acute ventral tooth; article 3 narrow, as long as or longer than article 2; gnathopod 2 dactylus with one single seta on outer margin, inner margin often with humps, teeth or excavations; palmar corner of gnathopod 2 propodus = or < 90"; dactyli of peraeopods with a second tip on outer margin, thus seemingly bifid. During that time, a total of 20 species were reported. Until now, 45 species in this genus have been reported worldwide from marine tropical and temperate areas (Horton et al., 2025). Herein, we describe a new species, *Quadrimaera sirindhornae*, and provide a key to adult males in Southeast Asia.

MATERIALS AND METHODS

The crustaceans were collected from washing algae at Nangrong Beach, Samaesarn Island, Chon Buri Province. Animals were collected by hand and placed in a bucket containing seawater. Ethanol solution was added to the bucket and left to stand for 30–45 minutes. The samples were rinsed and washed with seawater, then passed through a 300 μm sieve. In the field, samples were fixed with about 10% formalin in seawater. The specimens were initially examined under a stereo microscope. Appendages on the right side were selected for dissection, mounted on semi-permanent slides, and examined. Representative illustrations were prepared using a camera lucida attached to an Olympus BX43 light microscope. The drawings were digitized on Adobe Illustrator CS6 using the methods described in Coleman (2003). Distributions maps were plotted using SimpleMappr (Shorthouse, 2010)

The material described in this study is lodged at the THNHM, Thailand Natural History Museum, Bangkok, Thailand. The following abbreviations are used on the plates: **A**, antenna; **EP**, epimeron; **G**, gnathopod; **HD**, head; **LL**, lower lip; **LMD**, left mandible; **RMD**, righ mandible; **MX**, maxilla; **MP**, maxilliped; **P**, pereopod; **PL**, pleopod; **T**, telson; **U**, uropod; **UL**, upper lip.

RESULTS

Taxonomy

Order Amphipoda Latreille, 1816
Family Maeridae Krapp-Schickel, 2008

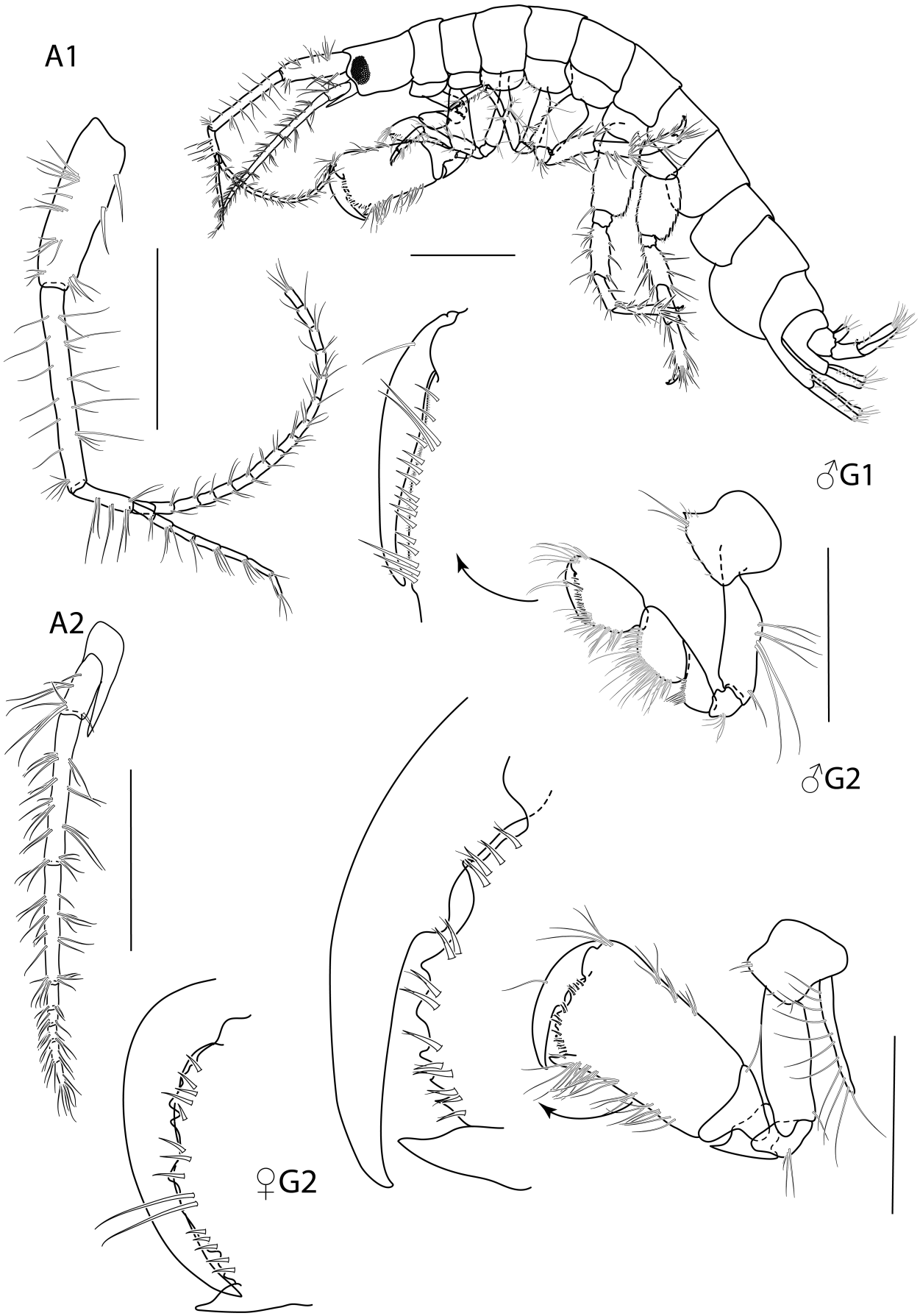

FIGURE 1. *Quadrimaera sirindhornae* sp. nov., holotype, male, (THNHM-lv-21132), 8.0 mm, female 5.4 mm. Nangrong Beach, Samaesarn Island, Chon Buri Province. Scales represent 0.5 mm.

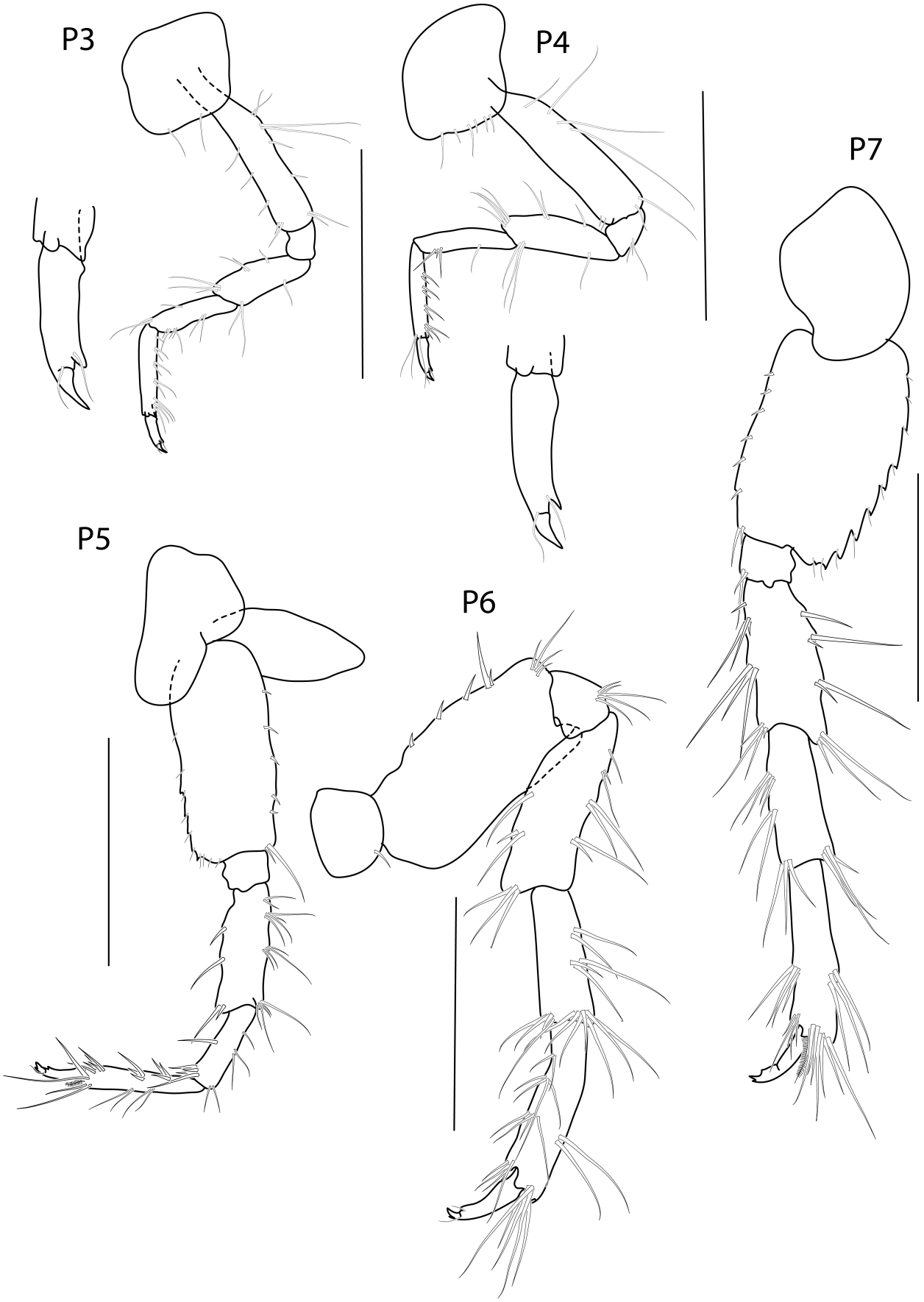

FIGURE 2. *Quadrimaera sirindhornae* sp. nov., holotype, male, (THNHM-lv-21132), 8.0 mm. Nangrong Beach, Samaesarn Island, Chon Buri Province. Scales represent 0.5 mm.

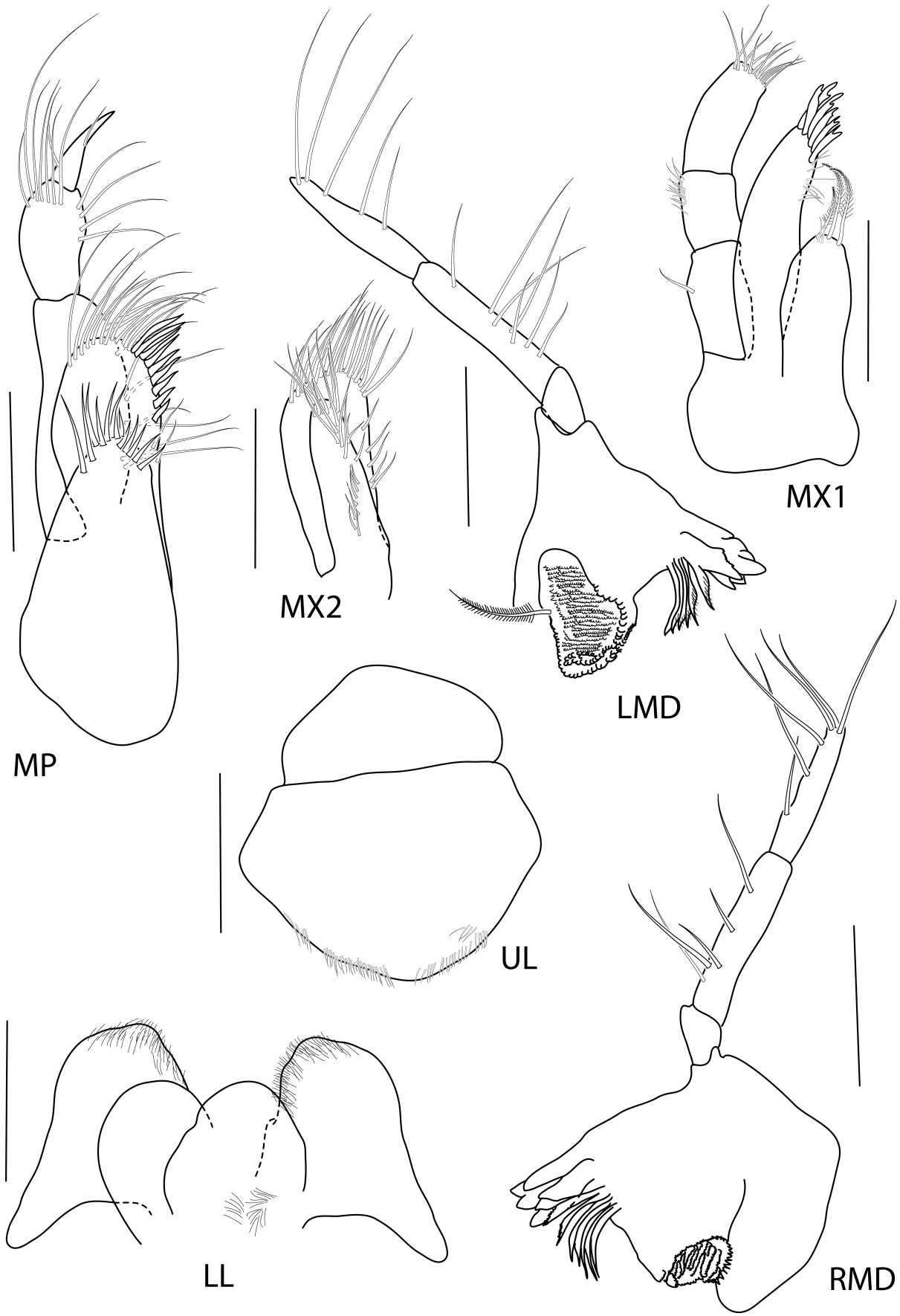

FIGURE 3. *Quadrimaera sirindhornae* sp. nov., holotype, male, (THNHM-lv-21132), 8.0 mm. Nangrong Beach, Samaesarn Island, Chon Buri Province. Scales represent 0.1 mm.

Genus *Quadrimaera* Krapp-Schickel & Ruffo, 2000

Diagnosis.– Mandibular palp article 1 ventro-distally not lengthened, never produced into acute ventral tooth; article 3 narrow, usually equally long or longer than article 3 (only in a few species shorter). Gnathopod 2 dactylus with one single seta on outer margin, inner margin often with humps, teeth or excavations; palmar corner of Gnathopod 2 propodus = or < 90"; dactyli of pereopods with a second tip on outer margin, thus seemingly bifid.

Quadrimaera sirindhornae sp. nov.

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(Figs 1–4)

Materials.– Holotype, male, body length 8.0 mm (THNHM-lv-21132); paratypes, 2 males and 2 females (THNHM-lv-21133).

Type locality.– Nangrong Beach, Samaesarn Island, Chon Buri Province (12°36'54.6"N 100°55'17.5"E), washing algae, Wongkamhaeng leg., 26 October 2023

Etymology.– The specific epithet is assigned in honor of Her Royal Highness Princess Maha Chakri Sirindhorn of Thailand, acknowledging her pivotal role in initiating the Plant Genetic Conservation Project, a national initiative dedicated to preserving biodiversity in terrestrial and marine environments.

Diagnosis.– Accessory flagellum with seven articles; gnathopod 2 propodus 1.8x longer than wide palm with a c-shape sinus. Male gnathopod 2 dactylus with medial tooth. Epimera 3 posterior margin with a small acute tooth. Uropod 3 ratio of outer ramus and peduncle is 1.2. Telson with 5 terminal robust setae on telsonic lobe

Description.– Based on male holotype, 8.0 mm.

Head (Figs 1, 2). Anteroventral corner not produced, eyes subrounded, about 0.25 times as long as head. Antenna 1 slender, poorly setose; peduncular articles 1–3 with length ratio of 2.6: 3: 1, article 1 with 2 robust setae posteriorly; accessory flagellum long, with 8 articles, tip lost; primary flagellum with >16 articles, tip lost.

***Antenna* 2** about 31% length of body, setose; peduncular articles 3–5 with length ratio of 1: 2: 2; flagellum with 6 articles, terminal article minute. Upper lip, ventral margin rounded, with short setae. Mandible, incisor bearing 5 cusps and 6 accessory setae, left lacinia mobilis 3-dentate, right lacinia mobilis 3-dentate; palp article 1 with distal tooth, articles 1–3 length ratio (excluding distal tooth of article 1) 1: 2.6: 2.5 in left and 1: 2.9: 2.5 in right, articles 2–3 setose. Lower lip with inner lobes, distal margins weakly setose, distal parts of outer lobes each with bundle of setae and dense fine setae. Maxilla 1, inner plate bullet-shaped, apically with three long plumose setae, medial margin bare; distal margin of outer plate with 6 robust setae; palp article 2 with many apical setae. Maxilla 2, outer plate larger than inner plate; medial margin of inner plate with several distal setae and several feeble setae. Maxilliped, distomedial corner of inner plate with 3 distal and 2 ventral robust setae; outer plate with 9 long-to-short robust setae on distomedial margin; palp with 4 articles, article 4 with large apical robust seta.

Pereon (Figs 1, 3). Gnathopod 1, coxa anteroventral corner pointed; basis with six long setae on posterior margin and medial surface; carpus with shallow excavation on anterior margin; propodus slightly longer than carpus, about 1.25x length of carpus, palm defined by palm defined by three short robust setae. Gnathopod 2, coxa subquadrate; basis narrow, anterodistal corners on lateral and medial sur-faces lobate, anterior margin naked, posterior margin bearing short distal setae; ischium, anterodistal corners on lateral and medial surfaces lobate; merus with acute posterodistal spine; propodus subrectangular, slightly widened distally, length about 1.6 times width; palm slightly oblique, rounded, defined by small tooth, margin toothed with wided rounded excavation in middle, and posterior with five teeth, anterior lobe with four robust setae, posterior lobe bearing 8 robust setae; dactylus, inner margin slightly curved, with a triangular tooth.

***Pereopods* 3–4** subequal in shape, pereopod 3 about 1.1 times length of pereopod 4; coxa subquadrater; basis with marginal setae. Pereopod 5 about 1.2 times length of pereopod 4; coxa with posterior lobe without robust seta; basis oblong, length about 2.2 times width, posterodistal lobe rounded, anterior margin with five short robust setae; merus swollen in middle. Pereopod 6 about 135% length of pereopod 5; coxa with a ventral robust setae on anterior lobes; basis subovate, length about 2 times width, posterodistal lobe rounded, anterior margin with five short robust setae, posterior margin with s. Pereopod 7 about 0.9 times length of pereopod 6; coxa suboval; basis subovate, length about 1.5 times width, posterodistal lobe angular, anterior margin with six short robust setae, posterior margin minutely serrate.

Pleon (Fig. 4). Epimera 1 slightly projected posteroventrally; epimera 2–3 each with oblique lateral ridge, ventral margins of epimera 1–3 with 2, 3, 5 robust setae, respectively. Pleopods 1–3, inner rami each with 10 articles and outer rami with 9, 8, 8 articles

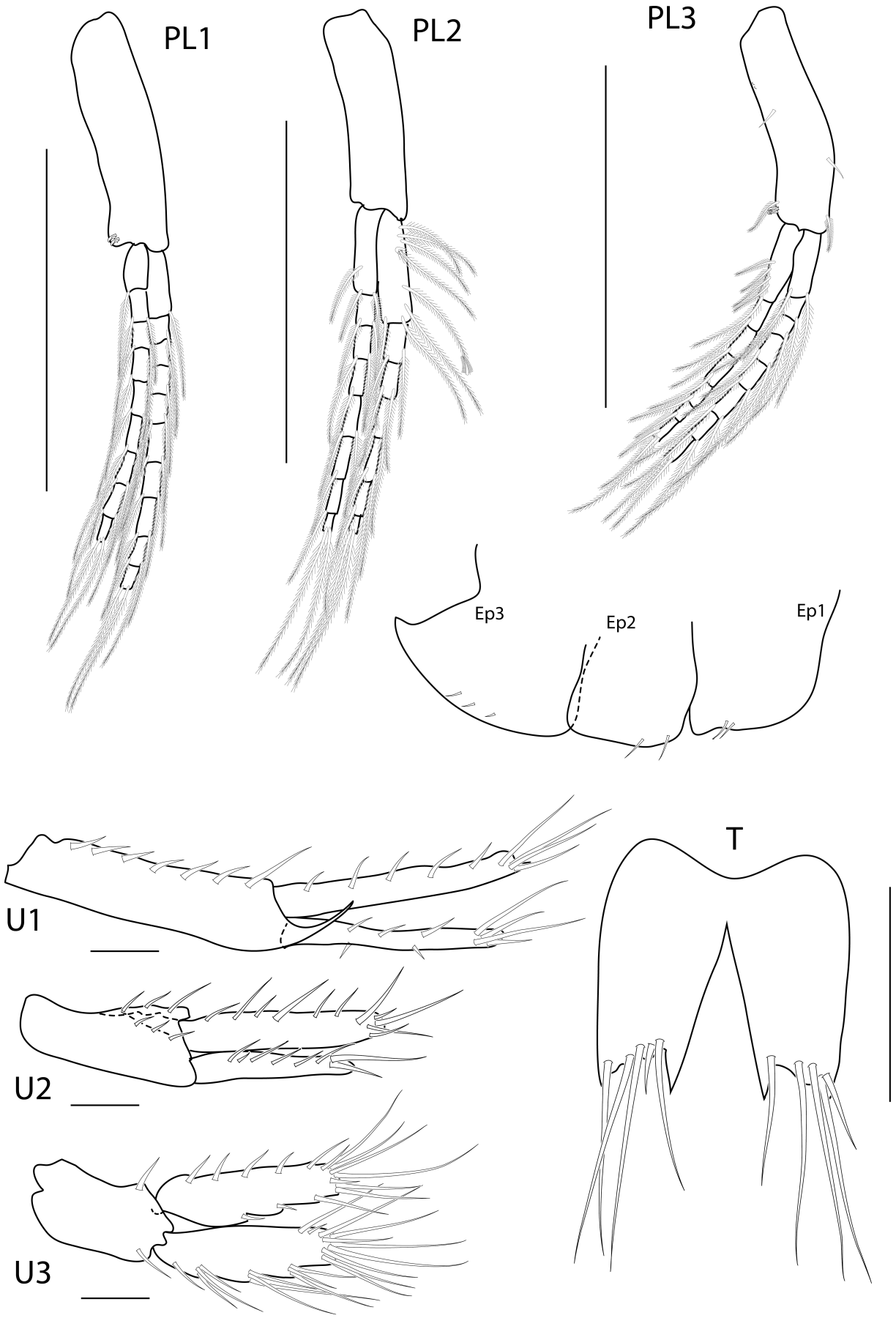

FIGURE 4. *Quadrimaera sirindhornae* sp. nov., holotype, male, (THNHM-lv-21132), 8.0 mm. Nangrong Beach, Samaesarn Island, Chon Buri Province. Scales represent 0.1 mm.

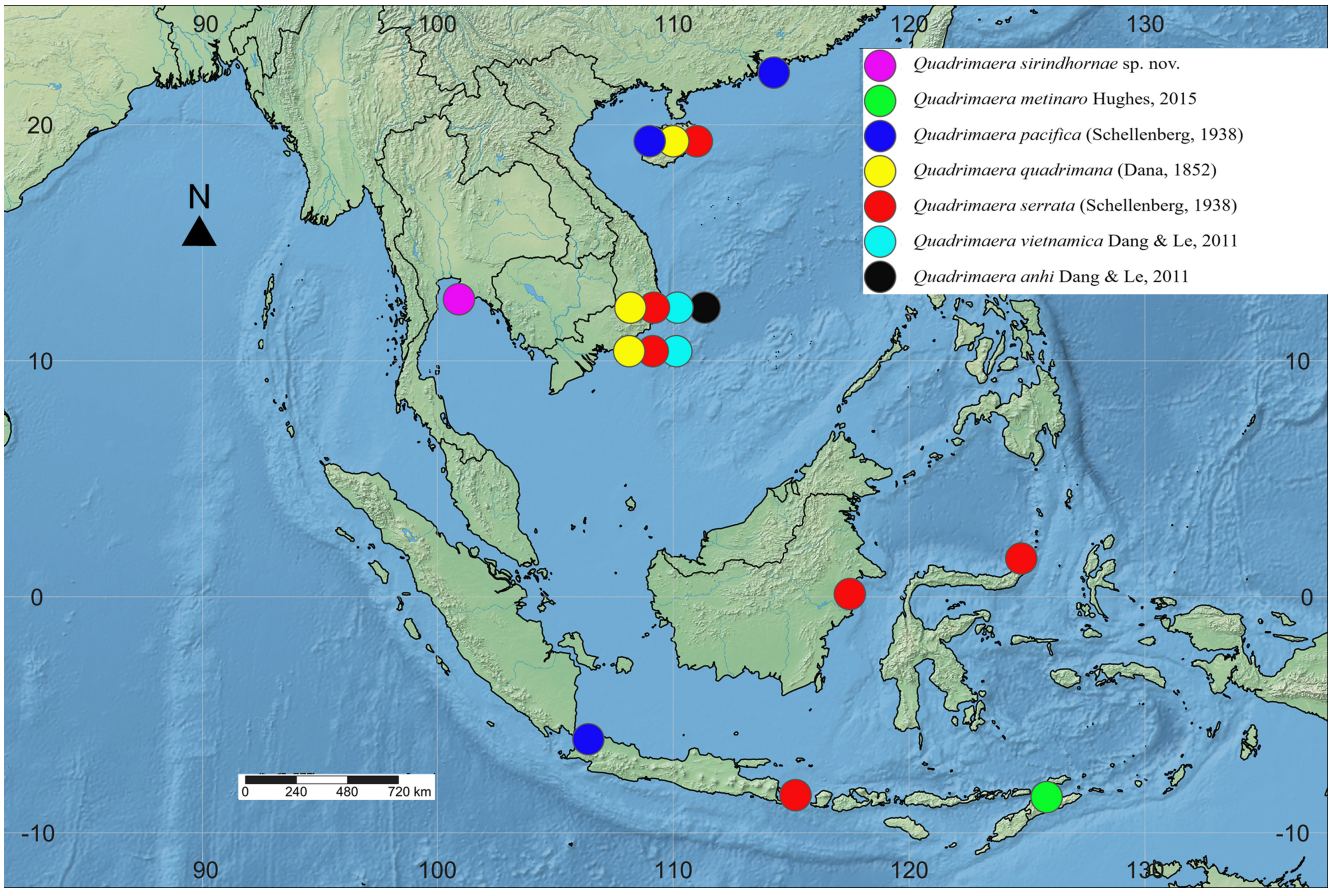

FIGURE 5. Distribution map of *Quadrimaera* species in Southeast Asia.

respectively; pleopod 3 shortest, peduncle bearing two robust setae distally. Uropod 1, peduncle with seven dorsolateral robust setae; outer ramus about 85% length of inner ramus, about 80% length of peduncle, with two lateral, four medial and five terminal robust setae; inner ramus with five medial and 5 terminal robust setae. Uropod 2 about 0.7 times length of uropod 1; peduncle bearing three dorsolateral and three dorsomedial robust setae; outer ramus about 85% length of inner ramus, about 95% length of peduncle, with six medial and two terminal robust setae; inner ramus with seven medial and three terminal robust setae. Uropod 3 about 0.9 times length of uropod 2; distolateral and distomedial corners of peduncle with a robust setae on each side; outer ramus about 1.1 times length of inner ramus, about 1.3 times length of peduncle; outer ramus with single and 3 groups of robust setae, distal margin with minute second article and 10 setae; inner ramus with three robust setae, distal margin with eight setae. Telson longer than wide; distal margins of lobes each with three long robust setae, longest robust seta about 0.8 times length of telson.

Female.– 5.4 mm. (sexually dimorphic characters).

***Gnathopod* 2** (Fig. 1) propodus palm with subacute distal shelf, convex sinus and short serrate tooth, distal shelf elevation lower than proximal tooth, palm defined by corner with well-developed tooth extending beyond palm margin.

Remarks.– A total of six species of the genus *Quadrimaera* have been recorded from Southeast Asia, including *Q. anhi* Dang & Le, 2011, *Q. metinaro* Hughes, 2015, *Q. pacifica* (Schellenberg, 1938), *Q. quadrimana* (Dana, 1852), *Q. serrata* (Schellenberg, 1938), and *Q. vietnamica* Dang & Le, 2011. However, none of them were from Thailand (Azman et al., 2022) (Fig. 5). A summary of the distinguishing characters among species discussed in this study is provided in Table 1. This species shares synapomorphic characteristics in having one or two sinuses on the males' gnathopod palm. All species have an epimeral 3 posterior margin with a small acute tooth, except *Q. anhi* and *Q. serrata*, which have a serrate posterior margin. The new species is closely related to *Q. vietnamica* from Vũng Tàu, Vietnam by having male gnathopod 2 palm with a c-shape sinus; epimera 3 with a small acute tooth; uropod 3 outer ramus and peduncle ratio with 1. 20. However, *Q. sirindhornae* sp. nov. can be separated from *Q. vietnamica* by male gnathopod 2 propodus 1.8x longer than width (vs. 1.2x longer than width); palm transverse (vs. oblique); accessory flagellum 7 articles (vs.

TABLE 1. Comparison of diagnostic characteristics in male *Quadrimaera* reported in Southeast Asia.

Species	Accessory flagellum	Gnathopod 2 propodus (length/width)	Gnathopod2 palm	Gnathopod2 palm	Male gnathopod 2 dactylus	Epimera 3 posterior margin	Uropod 3 outer ramus/peduncle	Robust setae on telsonic lobe
Quadrimaera sirindhornae sp. nov.	7	1.8	with a c-shape sinus	transverse	dactylus with medial tooth	with a small acute tooth	1.2	5
Quadrimaera anhi Dang & Le, 2011	6	1.6	with a U-shape sinus	transverse	dactylus with medial tooth	serrate	1.6	4
Quadrimaera metinaro Hughes, 2015	7	1.1	with a c-shape sinus	transverse	dactylus with medially expanded	with a small acute tooth	1.4	4
Quadrimaera pacifica (Schellenberg, 1938)	6	1.3	with a c-shape sinus	transverse	dactylus with medially expanded	with a small acute tooth	1.5	6–7
Quadrimaera quadrimana (Dana, 1852)	8	1.4	with a w-shape sinus	transverse	dactylus without medially expanded	with a small acute tooth	1.5	6
Quadrimaera serrata (Schellenberg, 1938)	9	1.5	with a c-shape sinus	transverse	dactylus with medially expanded	serrate	1.4	3
Quadrimaera vietnamica Dang & Le, 2011	10	1.2	with a c-shape sinus	oblique	dactylus with medially expanded	with a small acute tooth	1.2	4

10 articles); and telsonic lobe with 5 terminal robust setae (vs. 4 robust setae).

The new species is also similar to *Q. metinaro* Hughes, 2015 from Timor-Leste, by having an accessory flagellum with seven articles; male gnathopod 2 palm transverse with a c-shaped sinus; and epimera 3 with a small acute tooth. However, *Q. sirindhornae* sp. nov. can be separated from *Q. metinaro* by male gnathopod 2 propodus 1.8x longer than width (vs. 1.1x longer than width); and telsonic lobe with 5 terminal robust setae (vs. 4 robust setae).

Key to adult male *Quadrimaera* in Southeast Asia

1. Male gnathopod 2 dactylus smooth, without tooth or medially expanded. ……..…… ……..……. *Quadrimaera quadrimana* (Dana,1852)

- Male gnathopod 2 dactylus with medial tooth or medially expanded. …….……..……. 2

2. Male gnathopod 2 dactylus with medial tooth. ..… 3

- Male gnathopod 2 dactylus medially expanded. 4

3. Accessory flagellum 7 articles; gnathopod 2 propodus 1.8x width, palm with a C-shape sinus; epimera 3: posterior margin with a small acute tooth; uropod 3: outer ramus 1.2x peduncle; telsonic lobe with 5 robust setae …. *Quadrimaera sirindhornae* sp. nov.

- Accessory flagellum 6 articles; gnathopod 2 propodus 1.2x width, palm with a U-shape sinus; epimera 3: posterior margin serrate; uropod 3: outer ramus 1.2x peduncle; telsonic lobe with 4 robust setae ….. ……..……. *Quadrimaera anhi* Dang & Le, 2011

4. Epimera 3: posterior margin serrate. ……..…….. …….. *Quadrimaera serrata* (Schellenberg, 1938)

- Epimera 3: posterior margin with a small acute tooth. ……..……. 5

5. Gnathopod 2 palm oblique. ……...…… ….…… *Quadrimaera vietnamica* Dang & Le, 2011

- Gnathopod 2 palm transverse. ……..… 6

6. Accessory flagellum 7 articles; gnathopod 2 propodus 1.1x longer than width; uropod 3 outer ramus 1.4x longer than peduncle; telsonic lobe with 4 robust setae … *Quadrimaera metinaro* Hughes, 2015

- Accessory flagellum 6 articles; gnathopod 2 propodus 1.3x longer than width; uropod 3 outer ramus 1.5x longer than peduncle; telsonic lobe with 6 or 7 robust setae. ……..…. ……..... *Quadrimaera pacifica* (Schellenberg, 1938)

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