A new species of freshwater crab of the genus *Qianguimon* Huang, 2018 (Decapoda: Brachyura: Potamidae) from Guangxi, Southern China

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Abstract

A new species of freshwater crab of the genus *Qianguimon* Huang, 2018, is described from Guangxi Zhuang Autonomous Region, southern China. *Qianguimon yuzhouense* n. sp. has the diagnostic features of *Qianguimon*, such as visible postorbital and epigastric cristae and male first gonopod generally slender with boot-shaped terminal segment. It can be distinguished from congeners by the following characters: male first gonopods bent inward at about 45° at base of terminal segment, carapace regions distinct and rugged and the female vulva opening inwards and downwards. In addition, molecular evidence derived from the 16S rRNA gene was used to study the phylogenetic position of *Qianguimon* and the relationships amongst its species. It supports the species described in this study as a new species of *Qianguimon*.

Introduction

China is the global center of freshwater crab diversity, it has the richest number of freshwater crab species in the world, with more than 300 species from 48 genera and 2 subfamilies with many more to be discovered (Dai, 1999; Yeo et al., 2007; Cumberlidge et al., 2011; Chu et al., 2018; Chu, Wang & Sun, 2018; Huang, Shih & Ahyong, 2018; Huang, Wong & Ahyong, 2018; Naruse, Wang, Huang & Zou, 2019; Wang, Zhou & Zou, 2019). The vast majority of these species are distributed in south China, and the lower the latitude, the higher the species richness (Dai, 1999).

Qianguimon is a genus established by Huang, 2018, with four species have been reported at present. The prominent feature of this genus is the boot-shaped terminal segment of the male first gonopod (Huang, 2018; Wang, Huang & Zou, 2019). It is distributed in southern Guizhou

Province and eastern Guangxi Zhuang Autonomous Region. Unlike crabs of other genera that hide under stones, these crabs are collected from shallow burrows. They have a broad altitude range, from close to sea level to over 1,000 m, and can be found at altitudes as high as 1,500 m (Huang, 2018).

Species exploration is ongoing. In a joint research survey with Chao Huang and Si-ying Mao, we discovered a new species of the genus *Qianguimon* from Yuzhou District, Yulin City, Guangxi Zhuang Autonomous Region, southern China during. It is herein described as a new species.

Material & Methods

Specimens were collected from Yuzhou district of Yulin City in Guangxi Zhuang Autonomous Region by Song-Bo Wang, preserved in 95% ethanol; and deposited at the Department of Parasitology of the Medical College of Nanchang University, Jiangxi, China (NCU MCP), Zoological Reference Collection of the Raffles Museum of Biodiversity Research, National University of Singapore, Singapore (ZRC), Sun Yat-sen Museum of Biology, Sun Yat-sen University, Guangzhou, China (SYSBM). Some of the comparative materials were also deposited at the Sun Yat-sen Museum of Biology, Sun Yat-sen University, Guangzhou, China (SYSBM). Carapace width and length were measured in millimeters. The abbreviations G1 and G2 refer to the male first and second gonopods, respectively. The terminology used herein primarily follows that of Dai (1999) and Davie et al. (2015).

Muscle tissue was excised from chelipeds, total genomic DNA was extracted from the tissue using the Omega Tissue Kit following the manufacturer's protocol. Then, the 16S rRNA gene was amplified using polymerase chain reaction (PCR) with the primers 1471 (5′-CCTGTTTANCAAAAACAT-3′) and 1472 (5′-AGATAGAAACCAACCTGG-3′) (Crandall and Fitzpatrick, 1996). The PCR conditions were as follows: denaturation for 50 s at 94 °C, annealing for 40 s at 52 °C and extension for 1 min at 72°C (33 cycles), followed by a final extension for 10 min at 72 °C. The PCR products were purified and sequenced using an AB I3730 automatic sequencer.

We performed molecular analysis with the mitochondrial 16S rRNA gene fragment. In total, 58 species of 45 genera were used to construct phylogenetic trees (Table 1). Sequences were aligned using MAFFT ver.7.215 (Katoh & Standley, 2013) based on the G-INS-I method, and the conserved regions were selected with Gblocks 0.91b (Castresana, 2000) using the default settings. The best-fitting model for Bayesian Inference (BI) analysis was determined by MrModeltest ver.2.2 (Nylander, 2005), selected by the Akaike information criterion (AIC). The obtained model was GTR+I+G. MrBayes ver.3.2.6 (Ronquist et al., 2012) was employed to perform the BI analysis, and four Monte Carlo Markov Chains of 2,000,000 generations were run with sampling every 1,000 generations. The first 500,000 generations were discarded as burn-in. The best evolutionary model for Maximum Likelihood (ML) analysis was HKY+I+G, determined by MEGA ver.X.0 (Kumar et al. 2018) based on the Bayesian information criterion

(BIC). The ML tree was built based on 1000 bootstrap replicates in MEGA ver.X.0 (Kumar et al. 2018).

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Results

Systematics

Family Potamidae Ortmann, 1896

***Qianguimon* Huang, 2018**

***Qianguimon yuzhouense* n. sp. (Figs. 1-4)**

urn:lsid:zoobank.org:act: A785F440-CFB0-42A8-9304-7433E6FE57A8

Material examined. Holotype: male (21.3 ×18.2 mm) (NCU MCP 415701), Winding road beside Hanshan Temple on Gui Mountain (22°41’5.18’’N 110°12’58.56’’E, 246 m asl.), Yuzhou District, Yulin City, Guangxi Zhuang Autonomous Region, China, coll. Song-Bo Wang, Jie-Xin Zou, Chao Huang, Si-Ying Mao, 18 Dec. 2018. Paratypes: 1 female (allotype) (14.5 × 12.3 mm) (NCU MCP 415703), 2 males (18.7 × 16.0 mm, 20.3 mm × 16.6mm) (NCU MCP 415702, ZRC 2019.1662) same data as holotype. Others: 5 males (16.0 × 13.8 mm, 15.7 × 13.4 mm, 22.6 × 18.9 mm, 19.5 × 16.9 mm, 14.1 × 11.5 mm; NCU MCP 415704, NCU MCP 415705, SYSBM 001977, SYSBM 001978, SYSBM 001979) and 2 females (14.6 × 12.1 mm, 15.8 × 13.2 mm) (NCU MCP 415706, SYSBM 001980), same data as holotype.

Comparative material. *Qianguimon rongxianense* Wang, Huang & Zou, 2019: Holotype: 1 male (15.2 × 12.8 mm) (NCU MCP 118401), Sixian Village, Licun Town, Rong County, Yulin City, Guangxi Zhuang Autonomous Region, small stream, coll. Ye-Song Cheng, August 23, 2007; Paratype, 1 female (allotype) (20.4 × 16.0 mm) (NCU MCP 118403), same data as holotype. *Qianguimon aflagellum* Huang, 2018: 1 male (19.4 × 15.8 mm) (SYSBM 001403), Wuzhou, Mengshan, Guangxi Province, shallow creek, April 2014 coll. C. Huang; 1 female (22.7 × 18.0 mm) (SYSBM 001404), same data as above [photos examined]. *Qianguimon elongatum* Huang, 2018: Holotype, 1 male (22.0 × 16.8 mm) (SYSBM 001421), Leishan

County, Qiandongnan Miao and Dong Autonomous Prefecture, Guizhou Province, mud burrows at the side of hillstreams, July 2013, coll. C. Huang; Paratypes, 1 female (allotype), (29.0 × 21.5 mm) SYSBM 001423, same data as holotype [photos examined]. *Qianguimon splendidum* Huang, 2018: Holotype, 1 male (27.8 × 21.1 mm) (SYSBM 001597), Yanghe County, Liuzhou City, Guangxi Zhuang Autonomous Region, mud burrows at the side of hillstreams, September 2015, coll. C. Huang; Paratype, 1 female (allotype) (30.8 × 23.0 mm) (SYSBM 001598), same data as holotype [photos examined].

Diagnosis. Carapace broader than long, regions distinct, anterolateral regions rugose; cervical groove and H-shaped groove deep, distinct; epigastric cristae conspicuous, postorbital cristae sharp (Figs. 1A and 3A). External orbital angle narrowly triangular, separated from anterolateral margin by gap; epibranchial teeth distinct; anterolateral margin lined with conspicuous granules (Figs. 1A and 3A). Third maxilliped merus median depression indistinct, exopod with vestigial flagellum (Fig. 1C). Chelipeds slightly unequal; outer surfaces of chelae smooth; fingers with very small gap when closed (Fig. 2A). Male pleon narrowly triangular, lateral margins gently concave; telson triangular, somite 6 transversely trapeziform (Fig. 2B). Male sterno-pleonal cavity very deep, median longitudinal suture of sternites 7/8 deep and relatively long (Fig. 2C). G1 very slender, terminal segment boot-shaped, distinctly sinuous, tip of terminal segment exceeding sternites 4/5 suture (Figs. 2E and 4). Female vulva reaching sternites 5/6 suture, with opening directed inward at an angle of 45° (Fig. 3B).

Description. Carapace sub-quadrate, 1.1-1.2 times as broad as long (mean = 1.18); regions distinct, dorsal surface with pits and scattered setae; anterolateral region wrinkled (Figs. 1A and 3A). Branchial regions slightly swollen. Cervical groove very deep, distinct; H-shaped groove between gastric and cardiac regions deep and distinct (Figs. 1A and 3A). Epigastric cristae conspicuous, separated by narrow gap; postorbital cristae sharp, not fused with epigastric cristae, nearly reaching the anterolateral margin (Figs. 1A and 3A). Front distinctly deflexed, margin ridged in dorsal view, medially concave (Figs. 1A and 3A). External orbital angle narrowly triangular, very sharp, margins smooth and without any granules, separated from anterolateral margin by small distinct V-shaped gap; epibranchial teeth small, distinct, granular (Figs. 1A and 3A). Anterolateral margin distantly cristate, lined with approximately 16 granules, lateral part bent inward; posterolateral surface smooth, with inconspicuous oblique striae, converging towards posterior carapace margin (Figs. 1A and 3A). Orbits medium size; supraorbital, infraorbital margins cristate, smooth and without granules (Fig. 1B). Sub-orbital regions covered with scattered rounded granules; sub-hepatic regions and pterygostomial regions covered numerous large granules (Fig. 1B). Epistome posterior margin narrow; median lobe triangular, lateral margins oblique (Fig. 1B).

Third maxilliped merus about 1.3 times as broad as long, trapezoidal, median depression indistinct; ischium about 1.5 times as long as broad, rectangular, with distinct median sulcus;

exopod reaching approximately 1/5 of merus length, with vestigial flagellum; dactylus not reaching the upper edge of ischium (Fig. 1C).

Chelipeds slightly unequal (Fig. 2A). Merus cross-section trigonal, with inner-lower margin crenulated (Fig. 2A). Carpus surface weakly wrinkled, with prominent sharp spine at inner-distal margin (Fig. 1A). Outer surfaces of chelae pitted, palm of larger chela about 1.2 times as long as high (Fig. 2A). Movable finger approximately as long as the immovable finger; inner margin of fingers with numerous round and blunt teeth; fingers forming inconspicuous gap when closed (Fig. 2A).

Male thoracic sternum generally smooth, pitted (Fig. 2B). Sternites 1, 2 completely fused to form triangular structure; sternites 2, 3 separated by obvious suture; sternites 3, 4 fused (Fig. 2A). Male sterno-pleonal cavity very deep, nearly reaching imaginary line connecting mid-length of cheliped coxae (Fig. 2C). Median longitudinal suture of sternites 7, 8 deep and relatively long; male pleonal locking tubercle inconspicous, round, on posterior third of sternite 5 (Fig. 2C). Female vulva reaching sternites 5/6, reaching proximal three-quarters width of sternite 6; upper and lower margin flat without any swelling; opening directed inward at about an angle of 45° (Fig. 3B).

Male pleon narrowly triangular, lateral margins gently concave; telson triangular, lateral margins oblique, straight; somite 6 transversely trapeziform, about 2.1 times as broad as long (Fig. 2B); somites 3–5 trapezoidal, gradually decreasing in width, increasing in length, lateral margins oblique; somites 1 and 2 sub-rectangular, very wide, the former flatter, reaching to bases of coxae of fourth ambulatory legs (Fig. 2D).

Ambulatory legs slender; the second pair longest and last pair shortest (Fig. 1A). Merus longest, without subdistal spine or tooth; carpus stout, dorsal margin with cristae (Fig. 1A). The fourth leg propodus about 1.9 times as long as broad, slightly shorter than dactylus; dactylus sharp, with several spines and numerous setae on the surface (Fig. 2E).

G1 very slender, dorsal and ventral surface smooth, lateral margin without seta, terminal segment boot-shaped, distinctly sinuous, bend inward at a 45° angle medially, with blunt sub-distal projection (Figs. 4A-D and 5A); tip of terminal segment exceeding sternites 4/5 suture (Fig. 2D); subterminal segment about 2.0 times as long as terminal segment. G2 elongate, almost equal to G1 in length; basal segment about 2.2 times length of distal segment, basal segment sub-ovate (Fig. 4E). Groove for G2 located medially on the ventral side of G1 subterminal segment, thin setae on distal regions of G1 subterminal segment (Fig. 4A).

Remarks. The new species is similar to other species *Qianguimon*, in its carapace broader than long, postorbital and epigastric cristae visible; exopod of third maxilliped with short or no flagellum, male pleon triangular; G1 generally slender, terminal segment boot-shaped with sub-distal projection; vulvae medium-sized and reaching proximal three-quarters width of sternite 6. But *Q. yuzhouense* n. sp. can be differentiated from congeners by its regions distinct and dorsal surface rugged, narrowly triangular and sharp external orbital angle, blunt and broadly triangular epibranchial tooth, G1 very slender and bent inward at about 45° at base of terminal segment, tip

exceeding sternites 4/5 suture in situ, female vulva opening inward at a 45° angle. Other differences are listed in Table 1 and Figure 5.

Etymology. The new species is named after the type locality, Yuzhou District, Yulin City, Guangxi Zhuang Autonomous Region, China.

Living color. Most of the carapace is dark brown, the chelipeds are brown mixed with orange and the ambulatory legs are brown. The overall color is consistent with the surrounding environment. (Figs. 6A-B)

Ecology. This species was found in a stream next to the winding road going down the mountain. The stream has no obvious flowing water and has lush weeds growing in it. We found burrows by removing the weeds, the burrows are sandy and without much soil. Digging the burrow to about 10 cm deep by hand, we found the crabs hiding in it. (Figs. 6C-D)

Phylogenetic analyses

In this study, we obtained the 16S rRNA molecular data of three specimens collected from Yuzhou District, Yulin City, Guangxi Zhuang Autonomous Region, China. The alignment sequences were downloaded from GenBank and include 58 species from 45 genera of the subfamily Potamidae Ortmann, 1896 from Asia. The access numbers can be found in Table 2. We used the BI and ML methods to construct the phylogenetic tree. The topological structure of the trees showed a high degree of consistency (Fig. 7). The three mitochondrial 16S rRNA gene fragments of the new species are very close genetically, which indicates that they are sequences from the same species and are consistent with the results of the morphological study. The genetic distance amongst *Qianguimon yuzhouense* and other comparative species is beyond the interspecific distance, which indicates that it is a new species from the molecular data. However, the new species are clustered together with *Q. rongxianense*, *Q. aflagellum*, *Q. elongatum* and *Q. splendidum*, and form an independent branch in the clade “China-East Asia Islands” (Shih, Darren & Ng, 2009), indicating that the five species are congeners of the genus *Qianguimon*.

Discussion

In this study, we collected mitochondrial 16S rRNA gene molecular data for all species of the genus *Qianguimon* Huang, 2018, and based on this, established BI and ML phylogenetic trees. In our analysis, we found that the research hypothesis, that the species reported in this paper collected from Guangxi is a new species of *Qianguimon*, can be verified from the molecular data, morphology and biogeography.

In taxonomic studies, identifying species by morphological differences is too subjective. Some scholars use mitochondrial or nuclear gene fragment sequences to produce phylogenetic trees so that the species classification has an analytical basis at the molecular level which makes it more rigorous (Shih, Darren & Ng, 2009). When it is difficult to distinguish related species using

traditional morphological methods, molecular data can become an effective tool for identification (Shih, Huang & Ng, 2016; Ji et al., 2016). With the development of bioinformatics technology, from single mitochondrial gene sequencing analysis to complete mitochondrial gene sequencing analysis, the accumulation of molecular data has enabled the research of freshwater crabs to be more rigorous (Jia et al., 2018; Zhang et al., 2020).

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Figure 1

Qianguimon yuzhouense n. sp. Holotype male (21.3 × 18.2 mm) (NCU MCP 415701).

(A) overall habitus; (B) frontal view of the cephalothorax; (C) left third maxilliped. Scales = 5 mm. Photo credit: Song-Bo Wang.

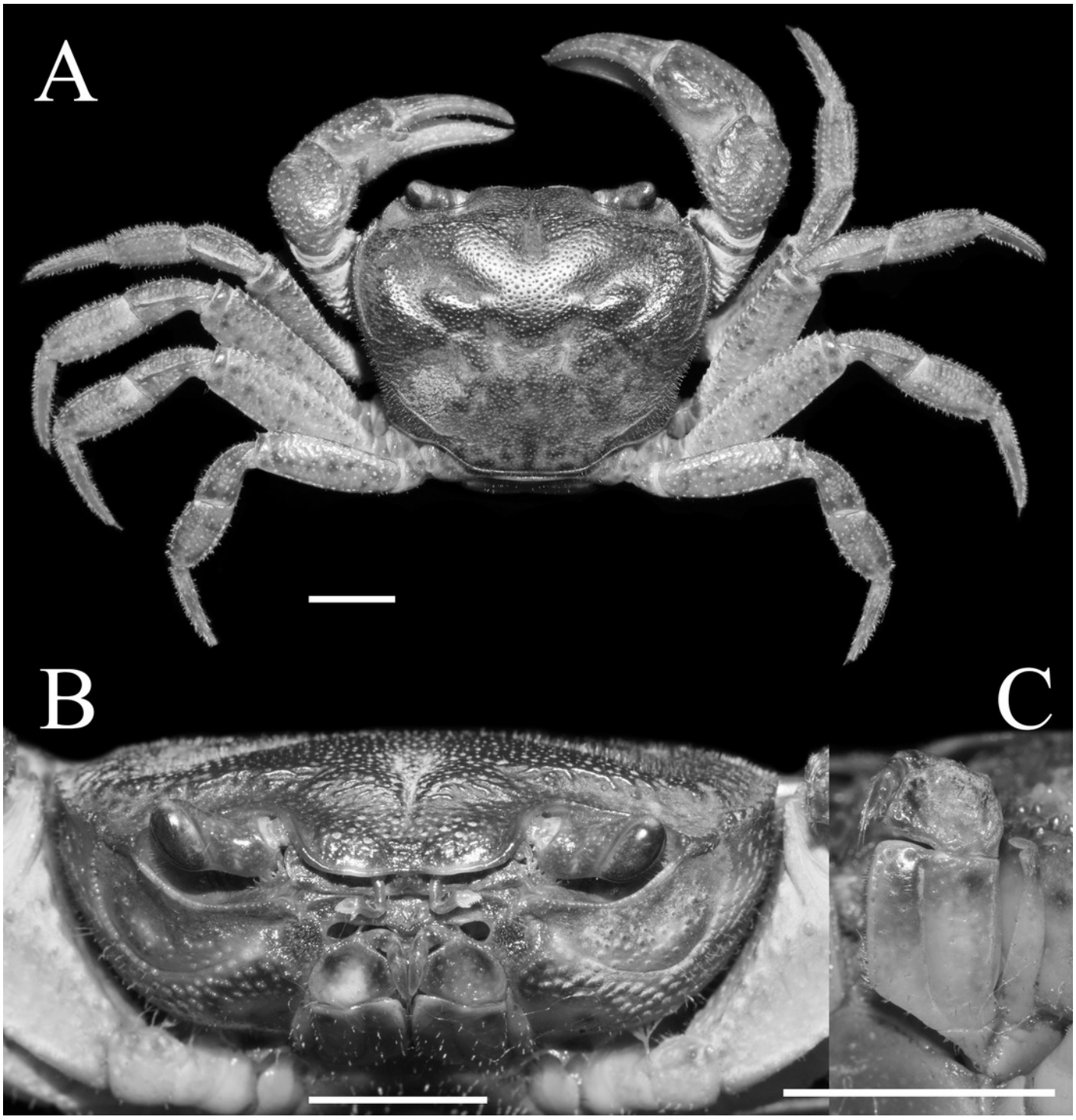
A
B
C

Figure 2

Qianguimon yuzhouense n. sp. Holotype male (21.3 × 18.2 mm) (NCU MCP 415701).

(A) outer view of chelipeds; (B) ventral view of anterior thoracic sternum, telson, and male pleonal somites 4–6; (C) ventral view of sterno-pleonal cavity with G1 *in situ*; (D) male pleonal somites 1–4; (E)the fourth ambulatory leg. Scales = 5 mm. Photo credit: Song-Bo Wang.

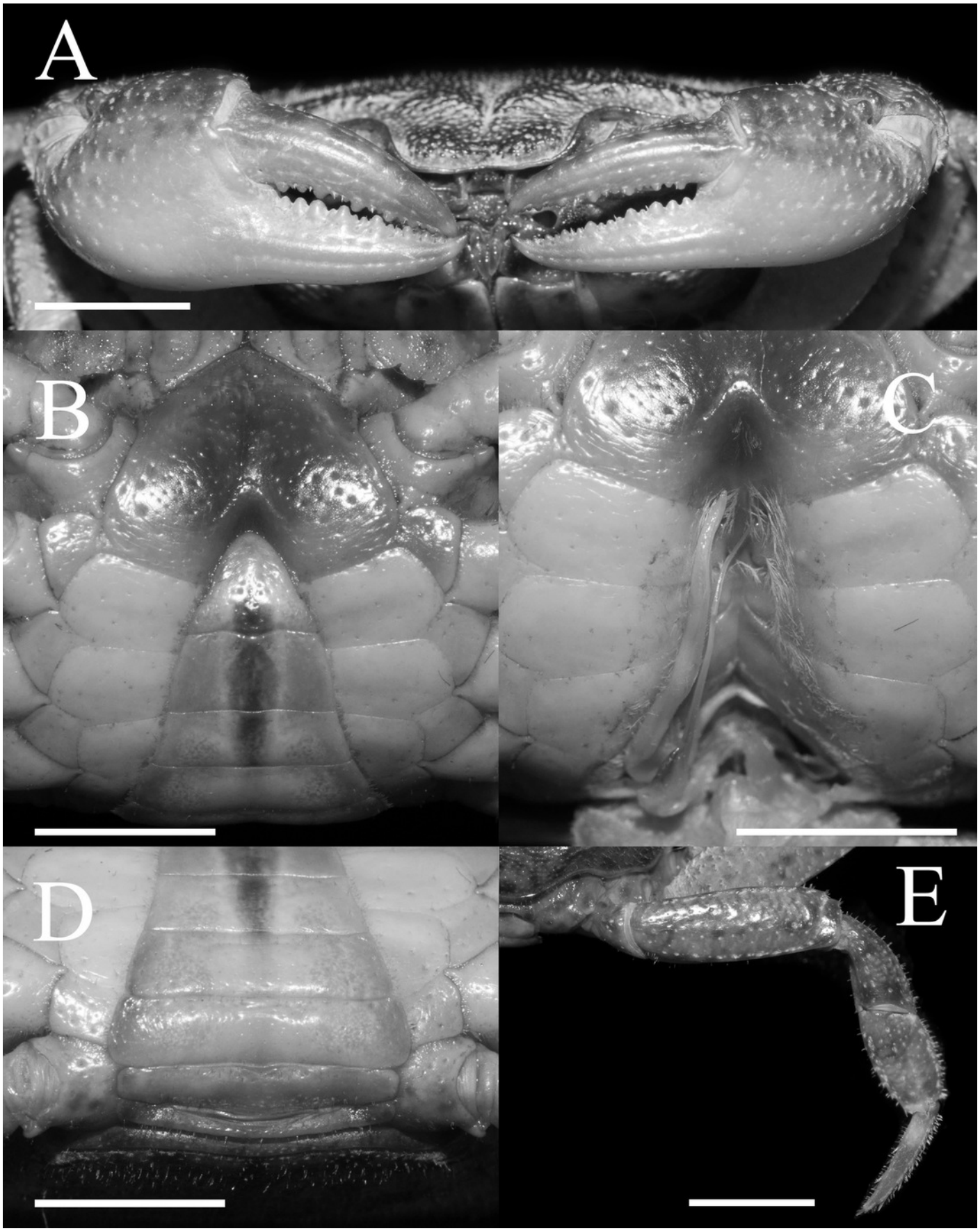
A
B
C
D
E

Figure 3

Qianguimon yuzhouense n. sp. Paratype female (14.5 × 12.3 mm) (NCU MCP 415703).

(A) overall habitus; (B) female vulvae. Scales = 5 mm. Photo credit: Song-Bo Wang.

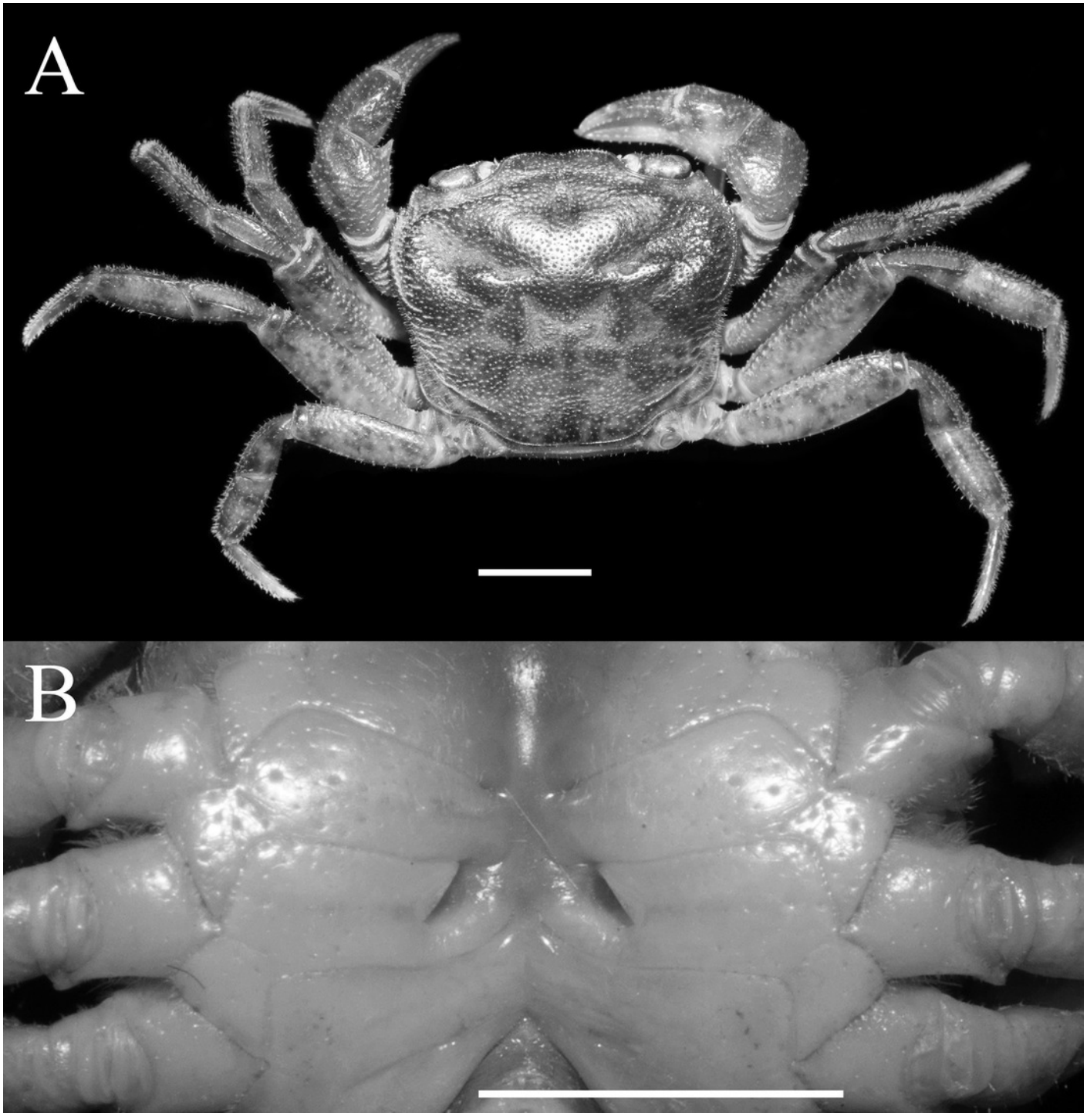

Figure 4

Gonopods of holotype.

(A) ventral view of the left G1; (B) ventral view of the terminal segment of left G1; (C) dorsal view of the left G1; (D) dorsal view of the terminal segment of left G1; (E) ventral view of the left G2. Scales = 1 mm. Photo credit: Song-Bo Wang.

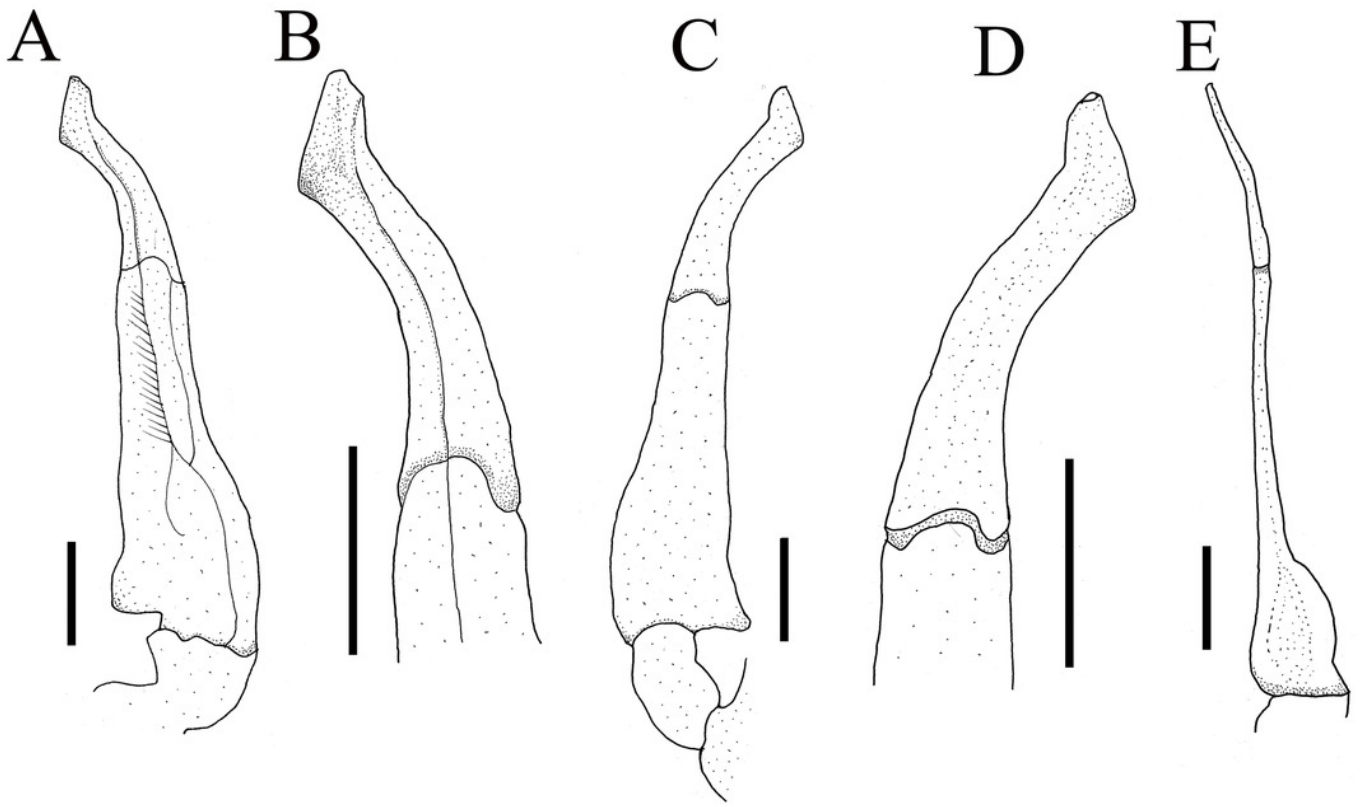

Figure 5

The left G1s of the five species of *Qianguimon*.

(A) *Q. yuzhouense* n. sp., NCU MCP 415701; (B) *Q. rongxianense* Wang, Huang & Zou, 2019, NCU MCP 118401; (C) *Q. aflagellum*, Huang, 2018, SYSBM 0014033; (D) *Q. elongatum*, Huang, 2018, SYSBM 001421 dorsal view of the terminal segment of right G1; (E) *Q.splendidum*, Huang, 2018, SYSBM 001597. Photo credit: Chao Huang.

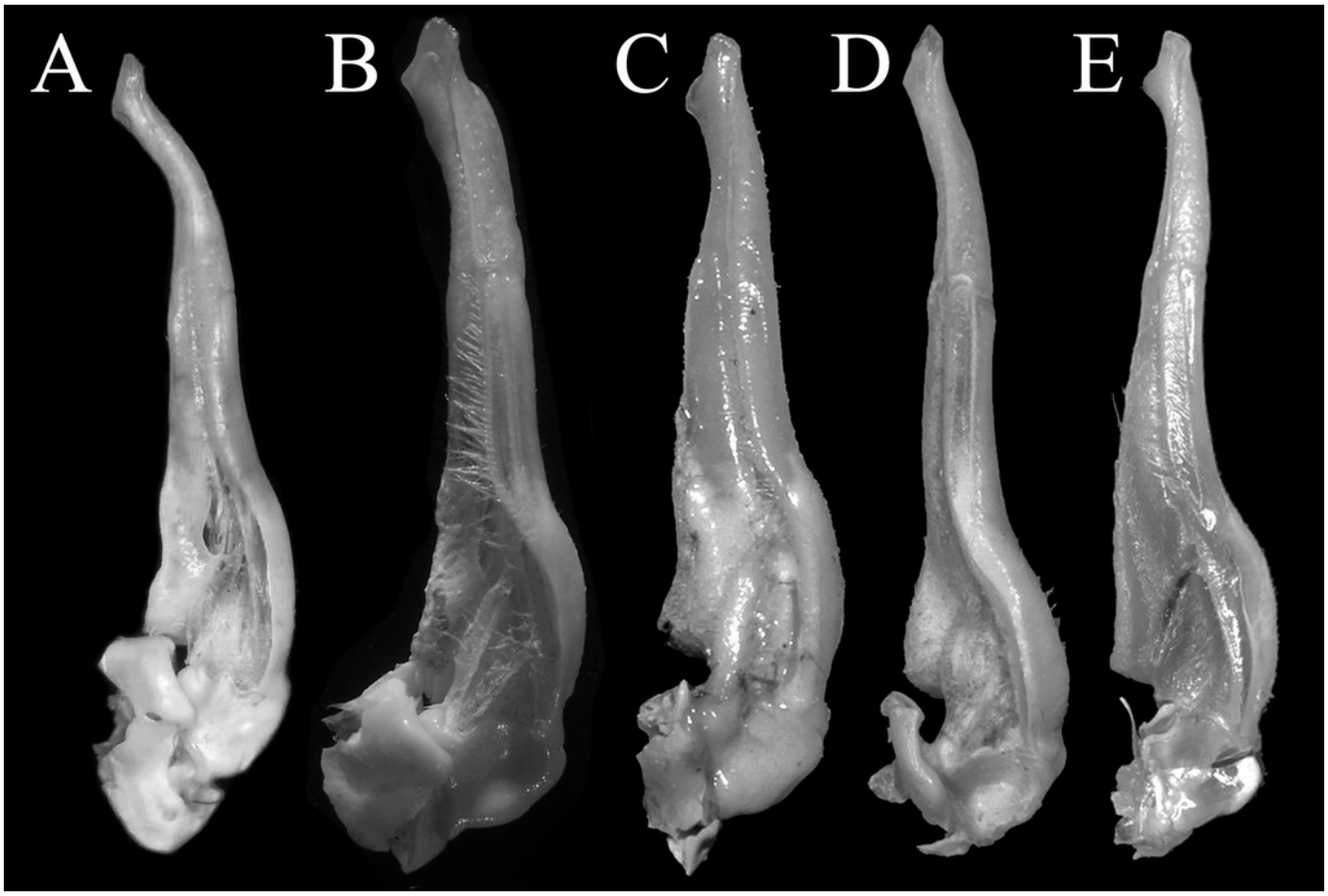

Figure 6

Habitat Environment.

(A and B) color in life; (C) a burrow inhabited by the new species (indicated by circle); (D) collecting specimens by hand. Photo credit: Chao Huang.

Figure 7

Phylogenetic tree.

Based on the 16S rRNA genes of the *Qianguimon yuzhouense* n. sp. and other species for comparison. Topology and branch lengths were obtained from the BI analysis. Support values represented at the nodes are from BI and ML analyses. Only values > 50% are shown. Photo credit: Song-Bo Wang.

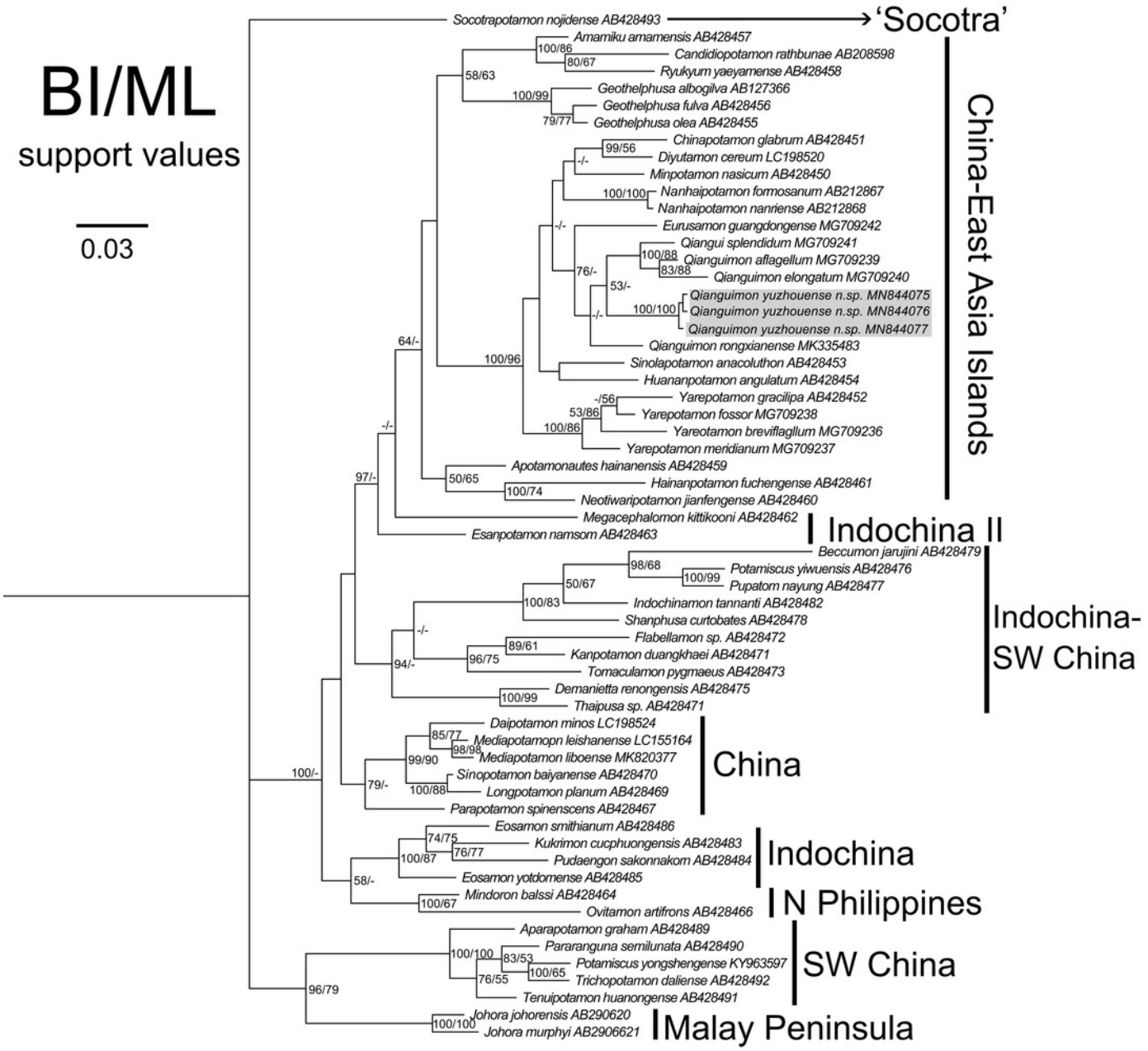
BI/ML
support values
0.03
Socotrapotamon nojidense AB428493
'Socotra'
Amamiku amamensis AB428457
Candidiopotamon rathbunae AB208598
Ryukyum yaeyamense AB428458
Geothelphusa albogilva AB127366
Geothelphusa fulva AB428456
Geothelphusa olea AB428455
Chinapotamon glabrum AB428451
Diyutamon cereum LC198520
Minpotamon nasicum AB428450
Nanhaipotamon formosanum AB212867
Nanhaipotamon nanriense AB212868
Eurusamon guangdongense MG709242
Qiangui splendidum MG709241
Qianguimon aflagellum MG709239
Qianguimon elongatum MG709240
Qianguimon yuzhouense n.sp. MN844075
Qianguimon yuzhouense n.sp. MN844076
Qianguimon yuzhouense n.sp. MN844077
Qianguimon rongxianense MK335483
Sinolapotamon anacoluthon AB428453
Huananpotamon angulatum AB428454
Yarepotamon gracilipa AB428452
Yarepotamon fossor MG709238
Yareotamon breviflagllum MG709236
Yarepotamon meridianum MG709237
Apotamonautes hainanensis AB428459
Hainanpotamon fuchengense AB428461
Neotiwaripotamon jianfengense AB428460
China-East Asia Islands
Megacephalomon kittikooni AB428462
Esanpotamon namsom AB428463
Indochina II
Beccumon jarujini AB428479
Potamiscus yiwuensis AB428476
Pupatom nayung AB428477
Indochinamon tannanti AB428482
Shanphusa curtobates AB428478
Flabellamon sp. AB428472
Kanpotamon duangkhaei AB428471
Tomaculamon pygmaeus AB428473
Demanietta renongensis AB428475
Thaipusa sp. AB428471
Indochina-SW China
Daipotamon minos LC198524
Mediapotamopn leishanense LC155164
Mediapotamon liboense MK820377
Sinopotamon baiyanense AB428470
Longpotamon planum AB428469
Parapotamon spinenscens AB428467
China
Eosamon smithianum AB428486
Kukrimon cucphuongensis AB428483
Pudaengon sakonnakom AB428484
Indochina
Eosamon yotdomense AB428485
Mindoron balssi AB428464
Ovitamon artifrons AB428466
N Philippines
Aparapotamon graham AB428489
Pararanguna semilunata AB428490
Potamiscus yongshengense KY963597
Trichopotamon daliense AB428492
Tenuipotamon huanongense AB428491
SW China
Johora johorensis AB290620
Johora murphyi AB2906621
Malay Peninsula

Table 1(on next page)

Morphological differences among the five species of *Qianguimon* Huang,2018.

Species/ Character	*Qianguimon yuzhouense* n.sp.	*Qianguimon rongxianense*	*Qianguimon aflagellum*	*Qianguimon elongatum*	*Qianguimon splendidum*
Carapace	Regions distinct, surface rugged	Regions indistinct, surface generally smooth	Regions indistinct, surface generally smooth	Regions indistinct, surface generally smooth	Regions indistinct, surface very smooth
Flagellum of exopod of third maxilliped	Very short to absent	Short length	Very short to absent	Absent	Absent
G1 *in situ*	Exceeding sternites 4/5 suture	Not reaching sternites 4/5 suture	Reaching to sternites 4/5 suture	Well exceeding sternites 4/5 suture	Exceeding sternites 4/5 suture
G1 and the shape of sub-distal projection	Very slender, bend inward about 45°, blunt	Generally slender, bend inward about 20°, large triangular	Generally slender, upward straightly, large triangular	Very slender, bend inward about 20°, blunt	Very slender, upward straightly, large triangular
Opening of female vulvae	Inward and deflect about 45°	Inward and deflect about 20°	Inward without deflect	Inward without deflect	Inward and deflect about 20°

1

Table 2(on next page)

GenBank accession numbers of the species used in the phylogenetic analysis.

The 16S rRNA genes of 58 species belonging to 45 genera of the subfamily Potamidae from Asia.

Species	Museum number	Locality	GenBank number
Amamiku amamense (Minei, 1973)	NCHUZOOL 13125	Amami, the Ryukyus	AB428457
Aparapotamon grahami (Rathbun, 1929)	ZRC 0334(II)	Yunnan, China	AB428489
Apotamonautes hainanensis (Parisi, 1916)	ZRC	Hainan, China	AB428459
Beccumon jarujini (Ng & Naiyanetr, 1993)	ZRC 1991.1865	Chiangma, Thailand	AB428479
Candidiopotamon rathbunae (De Man, 1914)	NCHUZOOL	Nantou, Taiwan	AB208598
Chinapotamon glabrum (Dai, Song, Li & Liang, 1980)	CAS CB	Guangxi, China	AB428451
Cryptopotamon anacoluthon (Kemp, 1918)	NCHUZOOL 13122	Hong Kong	AB428453
Daipotamon minos Ng & Trontelj, 1996	ZRC	Guizhou, China	LC198524
Demanietta renongensis (Rathbun, 1905)	ZRC 1998.146	Ranong, Thailand	AB428475
Diyutamon cereum Huang, Shih & Ng, 2017	SYSBM	Guizhou, China	LC198520
Eosamon boonyaratae (Naiyanetr, 1987)	ZRC 1991.1861	Trat, Thailand	AB428487
Eosamon smithianum (Kemp, 1923)	ZRC	Chantaburi, Thailand	AB428486
Eosamon yotdomense (Naiyanetr, 1984)	ZRC 1991.1851	Ubon Ratchathani, Thailand	AB428485
Esanpotamon namsom Naiyanetr & Ng, 1997	ZRC 1997.776	Udon Thani, Thailand	AB428463
Eurusamon guangdongense dai& Tüerkay, 1997	SYSBM 01408	Guangdong, China	MG709242
Flabellamon sp.	ZRC	Mae Sot, Thailand	AB428472
Geothelphusa albogilva Shy, Ng & Yu, 1994	NCHUZOOL	Pingtung, Taiwan	AB127366
Geothelphusa marginata fulva Naruse, Shokita & Shy, 2004	NCHUZOOL 13124	Iriomote, the Ryukyus	AB428456
Geothelphusa olea Shy, Ng & Yu, 1994	NCHUZOOL 13123	Taichung, Taiwan	AB428455
Hainanpotamon fuchengense Dai, 1995	NCHUZOOL 13128	Hainan, China	AB428461
Huananpotamon angulatum (Dai & Lin, 1979)	ZRC	Fujian, China	AB428454
Indochinamon ou (Yeo & Ng, 1998)	ZRC	Phongsali, Laos	AB428481

Indochinamon tannanti (Rathbun, 1904)	ZRC 1998.264	Yunnan, China	AB428482
Johora johorensis (Roux, 1936)	ZRC 1990.576	Johor, Malaysia	AB290620
Johora murphyi Ng, 1986	ZRC 2001.2267	Johor, Malaysia	AB290621
Kanpotamon duangkhaei Ng & Naiyanetr, 1993	ZRC	Kanchanaburi, Thailand	AB428471
Kukrimon cucphuongense (Dang, 1975)	ZRC NHH9729 160997	Ninh Binh, Vietnam	AB428483
Longpotamon baiyanense Ng & Dai, 1997	ZRC	Hunan, China	AB428470
Longpotamon planum Dai, 1992	ZRC 1998.1178	Anhui, China	AB428469
Mediapotamon leishanense Dai, 1995	SYSBM001094	Guizhou, China	LC155164
Mediapotamon liboense Wang & Zhou, 2019	NCU MCP 343004	Guizhou, China	MK820377
Megacephalomon kittikooni (Yeo & Naiyanetr, 1999)	ZRC 1998.22	Xieng Khuang, Laos	AB428462
Mindoron balssi (Bott, 1968)	ZRC	Mindoro, Philippines	AB428464
Minpotamon nasicum (Dai & Chen, 1979)	NCHUZOOL 13121	Fujian, China	AB428450
Nanhaipotamon formosensis (Parisi, 1916)	NCHUZOOL 13144	Tainan, Taiwan	AB212867
Nanhaipotamon nanriense Dai, 1997	CAS CB05103	Fujian, China	AB212868
Neotiwaripotamon jianfengense Dai &*Naiyanetr*	NCHUZOOL 13127	Hainan, China	AB428460
Ovitamon artifrons (Bürger, 1894)	ZRC	Luzon, the Philippines	AB428466
Parapotamon spinescens (Calman, 1905)	NCU MCP	Yunnan, China	AB428467
Pararanguna semilunatum Dai & Chen, 1985	ZRC	Yunnan, China	AB428490
Potamiscus yiwuensis Dai & Cai, 1998	ZRC	Yunnan, China	AB428476
Potamiscus yongshengense Dai & Chen, 1985	NNU150951	Yunnan, China	KY963597
Pudaengon sakonnakorn Ng & Naiyanetr, 1995	ZRC	Thailand	AB428484
Pupamon nayung (Naiyanetr, 1993)	ZRC 1995.558	Udon Thani, Thailand	AB428477
Qianguimon splendidum Huang, 2018	SYSBM 001598	Guangxi, China	MG709241
Qianguimon aflagellum (Dai, Song, Li & Liang, 1980)	SYSBM 001404	Guangxi, China	MG709239
Qianguimon elongatum Huang, 2018	SYSBM 001424	Guizhou, China	MG709239
Qianguimon rongxianense Wang, 2019	NCU MCP 118401	Guangxi, China	MK335483

Ryukyum yaeyamense (Minei, 1973)	NCHUZOOL 13126	Iriomote, Ryukyus	AB428458
Shanphusa curtobates (Kemp, 1918)	NRM 13920	Shan State, Myanmar	AB428478
Socotrapotamon nojidensis Apel & Brandis, 2000	ZRC 2000.2232	Socotra, Yemen	AB428493
Tenuipotamon huaningense Dai & Bo, 1994	CAS CB05175	Yunnan, China	AB428491
Thaiphusa sp.	ZRC 1997.656	Thailand	AB428474
Tomaculamon pygmaeus Yeo & Ng, 1997	ZRC 1997.326-330 (paratype)	Phitsanulok, Thailand	AB428473
Trichopotamon daliense Dai & Chen, 1985	NCHUZOOL 13130	Yunnan, China	AB428492
Yarepotamon gracilipa (Dai, Song, Li & Liang, 1980)	ZRC	Guangxi, China	AB428452
Yarepotamon fossor Huang,2018	SYSBM 001417	Guangxi, China	MG709238
Yarepotamon breviflagllum Dai& Tüerkay,1997	SYSBM 001442	Guangdong, China	MG709236
Yarepotamon meridianum Huang, 2018	SYSBM 001581	Guangdong, China	MG709237
Qianguimon yuzhouense n. sp.	NCU MCP 415701	Guangxi, China	MN844075
Qianguimon yuzhouense n. sp.	NCU MCP 415704	Guangxi, China	MN844076
Qianguimon yuzhouense n. sp.	NCU MCP 415705	Guangxi, China	MN844077

CAS CB, Chinese Academy of Sciences, Beijing, China; NCHUZOOL, Zoological Collections of the Department of Life Science, National Chung Hsing University, Taichung, Taiwan; NCU MCP, Department of Parasitology of the Medical College of Nanchang University, Jiangxi, China; NNU, College of Life Sciences, Nanjing Normal University, Nanjing, China; NRM, Swedish Museum of Natural History, Stockholm, Sweden; SYSBM, Sun Yat-sen Museum of Biology, Sun Yat-Sen University, Guangzhou, China; ZRC, Zoological Reference Collection of the Raffles Museum of Biodiversity Research, National University of Singapore, Singapore.