

NEW SPECIES OF THE WATER STRIDER GENERA *EOTRECHUS* KIRKALDY AND *RHYACOBATES* ESAKI (HETEROPTERA: GERRIDAE) FROM VIETNAM

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ABSTRACT. – Three new species, *Eotrechus vietnamensis*, *Rhyacobates anderseni*, and *Rhyacobates gongvo*, are described from Vietnam. Both genera, *Eotrechus* and *Rhyacobates*, are first records for Vietnam. *Rhyacobates abdominalis* is also first reported from Vietnam.

KEY WORDS. – Vietnam, Gerridae, *Eotrechus*, *Rhyacobates*, new species, first record.

INTRODUCTION

The literature on aquatic heteropteran fauna of Vietnam is rather scanty and scattered. The most comprehensive study on Gerridae is by Zettel & Chen (1996), who documented 40 species in 18 genera. In this study, we described one new species of *Eotrechus* and two new species of *Rhyacobates*. Both *Eotrechus* and *Rhyacobates* are recorded for the first time from Vietnam.

Species of the genus *Eotrechus* Kirkaldy, only found in mountainous areas, inhabit hygropetric habitats on rock or soil kept wet by water seepage and stream, or on waterfall splash zone (Andersen, 1982, 1998). Hitherto, there are eight described species (Andersen, 1982, 1998), two from southern China, two from northern Thailand, and four others found in India, Nepal and Myanmar. The new species *Eotrechus vietnamensis* described in this study extends the known distribution of the genus to Vietnam.

The genus *Rhyacobates* Esaki inhabits fast-flowing mountainous streams. In their revision of the genus *Rhyacobates*, Andersen & Chen (1995) recorded nine species from Asia (China, Korea, Taiwan, Myanmar, and Thailand), all with rather restricted distribution. Only one species, *R. malaisei* Andersen & Chen, is found in China, Myanmar and Thailand where these three countries meet. In this study, *R. abdominalis* Andersen & Chen, described from China is recorded for Vietnam for the first time.

MATERIALS AND METHODS

Specimens for this study were collected from Vietnam by the first author during the period from April to June 2003 and on 3 July 2004. Additional specimens of *Eotrechus vietnamensis* were provided by Dr. J. T. Polhemus (Colorado, U.S.A). They were collected by sweeping a hand net over the water surface (for *Rhyacobates* species) or around rock surfaces of forested streams (for *Eotrechus* species). All specimens were preserved in 75% alcohol except those were dissected or mounted dry. Measurements of new species refer to the holotype, the allotype, or the single winged specimen, if no variations were given. For *R. abdominalis*, mean measurements for appendages were given. The remaining measurements were given as ranges based on randomly selected specimens. All measurements were in millimetres. Length of the body was measured from the anterior margin of the head to the posterior tip of the last abdominal tergum. Width of the body was measured across meso-acetabula.

The specimens were deposited in the following collections: JTPC, Collection of J.T. Polhemus, Englewood, Colorado, U.S.A
NHMW, Natural History Museum Vienna, Austria
ZMHU, Zoological Museum, Hanoi University of Science, Vietnam
ZRC, Zoological Reference Collection, Raffles Museum of Biodiversity Research, National University of Singapore, Singapore

TAXONOMY

Eotrechus vietnamensis, new species

(Figs. 1-6, 26)

Material examined. – Holotype (apterous male) and allotype (apterous female), Vietnam, Vinh Phuc province, Tam Dao National Park, Suoi Thac Bac (near Doi Che), 21°27.005'N 105°38.771'E, 749 m, coll. A. D. Tran & Q. K. Hoang, 17 Jun.2003, TAD0351, (ZMHU).

Paratypes: Vietnam: apterous 4 males, 3 females, same locality data as holotype; apterous 4 males, 1 female, Vinh Phuc province, Tam Dao National Park, Suoi Mo, 21°27.103'N 105°38.872'E, 924m, coll. A. D. Tran & Q. K. Hoang, 16 Jun.2003, TAD0350; apterous 3 males, 2 females, Vinh Phuc province, Tam Dao National Park, 21°27.747'N 105°38.754'E, 1000m, coll. A. D. Tran & Q. K. Hoang, 18 Jun.2003, TAD0354; apterous 1 male, macropterous 3 females, Vinh Phuc province, Tam Dao National Park, 21°27.439'N 105°39.193'E, 1000m, coll. A. D. Tran & Q. K. Hoang, 18 Jun.2003, TAD0355; apterous 5 males, 5 females, Vinh Phuc province, Tam Dao National Park, Suoi Bua Lon, 600m, coll. A. D. Tran & Q. K. Hoang, 19 Jun.2003, TAD0356; apterous 5 males, 3 females, Dien Bien province, Muong Phang, upstream and water fall of Muong Phang stream, 21°27.000'N 103°10.548'E, 1070m, coll. A. D. Tran, 28 Jul.2004, DY0419 (NHMW, ZMHU, and ZRC); apterous 1 male, Ha Tay province, Ba Vi National Park, small stream, 575 m, coll. J. T. Polhemus, D. A. Polhemus & P. Nguyen, 4 Apr.2000, CL4391; apterous 1 male, 1 female, Ha Tay province, Ba Vi National Park, seeping rock face on upper road, 895 m, coll. J. T. Polhemus, D. A. Polhemus & P. Nguyen, 4 Apr.2000, CL4391; apterous 6 males, 5 females, Lao Cai province, roadside seeps, 11 km NE Sa Pa, 22°23.42'N 103°52.92'E, 1220 m, coll. J. T. Polhemus, D. A. Polhemus & P. Nguyen, 7 Apr.2000, CL4396; apterous 2 females, Lai Chau province, Nam Ceung stream, 15 km N Lai Chau, 22°08.67'N 103°11.55'E, 207 m, coll. J. T. Polhemus, D. A. Polhemus & P. Nguyen, 11 Apr.2000, CL4409; apterous 5 males, 5 females, Lai Chau province, cascading tributary to Nam Na River, 12 km N Lai Chau, 22°07.325'N 103°11.50'E, 290 m, coll. J. T. Polhemus, D. A. Polhemus & P. Nguyen, 11 Apr.2000, CL4410 (JTPC).

Description. – Apterous male, length 5.5-5.9 (holotype 5.9), width 1.85-2.07 (holotype 1.97) (n=20); apterous female length 6.3-7.0 (allotype 6.9), width 2.22-2.39 (allotype 2.32) (n=14); macropterous female length 7.2-7.8, width 2.20-2.44 (n=3).

Colour. Apterous form, body mainly brown on dorsal side and pale yellow on ventral side (females with two brown markings on mesosterno-pleura and median brown patches on metasterno-pleura); dorsal surface covered with silvery or greenish pubescence. Head with one median yellow stripe; antennae yellow to brown. Pronotum with five longitudinal yellow stripes on dorsal and lateral sides. Mesonotum mainly yellow with six longitudinal markings: two slender dark brown lateral stripes, two slender dark brown sub-lateral stripes and two light brown markings in the centre. Metanotum and abdominal tergum mainly dark brown. Pro-, meso- and meta-sternopleura with dense silvery and reflective pubescence. Legs: all coxae, trochanters and femora yellow (slightly darker in females), all tibiae and tarsi brown. In macropterous form, anterior part of pronotum with five yellow stripes as in apterous form, posterior part totally brown, wings brown.

Structural characteristics

Apterous male (holotype): Head width across eyes 1.29; interocular width 0.60; eye kidney-shaped on dorsal view, length of eye 0.63. Antennae about 1.2x body length (6.99: 5.90), lengths of segments 1-4: 1.94: 1.55: 1.46: 2.04; first segment with 2-3 black spine-like hairs in apical part. Pronotum, broader than long, slightly shorter than head length (0.84: 1.16). Lengths of mesosternum and metasternum: 1.97 and 0.37. Posterior margin of metasternum with a median fringe of short black hairs (Fig. 3). Lengths of leg segments (femur: tibia: tarsal segment 1: tarsal segment 2) as follows: fore leg: 2.43: 1.89: 0.22: 0.32; middle leg: 6.90: 5.10: 0.61: 0.49; hind leg: 7.20: 5.00: 0.73: 0.49. Fore femur (Fig. 2) simple, length about 6.57x maximum width (2.43: 0.37), ventral surface with 2 black stout hairs (2-6 hairs in other paratypes); fore tibia almost straight, with some long black spine-like hairs on apical margin. Middle and hind femur slender and slightly longer than the body, with scattered small brown spines. Claws stout, length 0.20. Abdomen relatively short, pregenital length 1.22, with patch of long yellow hairs on median sterna 1-5. Sternum 7 about 2.25x length of two preceding sterna combined (0.61: 0.27), posterior margin with very deep rectangular median notch (about half the length of sternum 7) (Fig. 3). Genital segments large, length 0.54, pygophore broadly suboval, with a pair of disto-lateral processes, each directed obliquely upwards, plate like, and with slightly pointed apex in lateral view (Figs. 3-4). Parameres small and blunt.

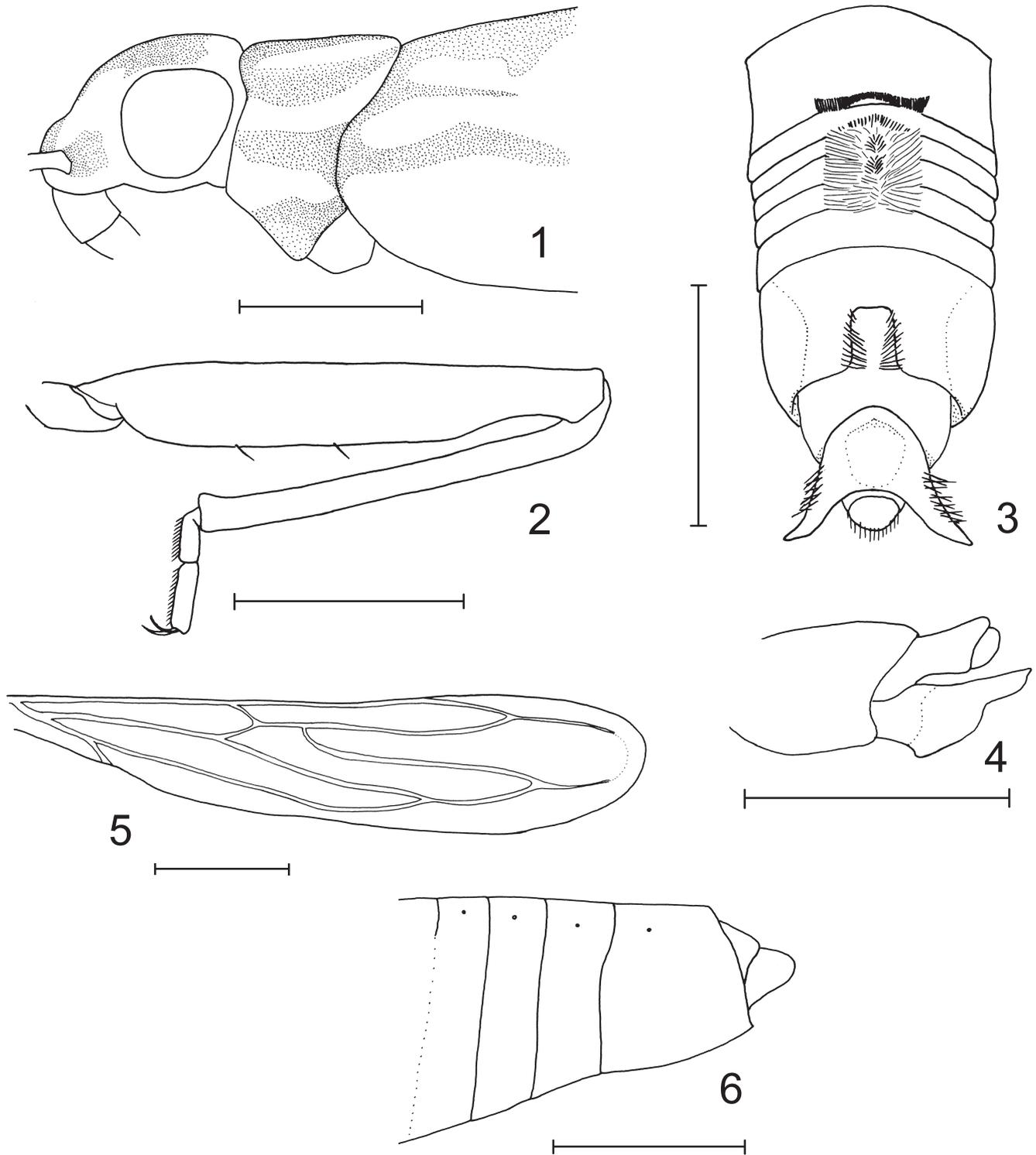
Apterous female (allotype): slightly bigger than the male. Head width across eyes 1.37; interocular width 0.65; eye kidney-shaped, length of eye 0.61. Antennae about 0.9x of body length (6.20: 6.90), lengths of segments 1-4: 1.79: 1.41: 1.16: 1.84; first segment with 2-3 black spines sub-apically. Pronotum slightly shorter than head length (0.83: 1.16). Lengths of mesosternum and metasternum: 2.24 and 0.51. Lengths of leg segments (femur: tibia: tarsal segment 1: tarsal segment 2): fore leg: 2.38: 1.79: 0.24: 0.39; middle leg: 6.80: 4.80: 0.76: 0.61; hind leg: 6.90: 4.90: 0.83: 0.54. Fore femur simple, length about 7.0x maximum width (2.38: 0.34), ventral surface with five black stout hairs; fore tibia almost straight with some long black spines on apical margin. Middle and hind femur slender and subequal to body length, scattered with small brown spines. Claws stout, length 0.20. Pregenital abdominal venter 0.32x body length (2.24: 6.90). Venter of sterna 1-6 without patch of long hairs. Sternum 7 about 1.18x length of two preceding sterna together (0.60: 0.51), posterior margin straight. Genital segments not concealed, proctiger round and slightly deflected (Fig. 6).

Macropterous female: similar to apterous female but slightly bigger in size. Fore wings distinctly surpassing abdominal apex. Wing veins as shown in Fig. 5.

Macropterous male unknown.

Etymology. – This species is named after its country of origin.

Distribution & habitat. – Northern Vietnam (Vinh Phuc, Ba Vi, Lai Chau, Dien Bien, and Lao Cai provinces). *Eotrechus*



Figs. 1-6. *Eotrechus vietnamensis*, new species. 1-4, male holotype: 1, lateral view of head and prothorax. 2, right fore leg. 3, abdomen, ventral view. 4, genital segments, lateral view. 5, fore wing of male. 6, female allotype, lateral view of abdomen. Scales bars 1-6: 1 mm.

vietnamensis was collected on wet surfaces of rocks, cliffs covered with mosses at waterfalls or along forest streams at different elevations (from 200-1200 m) of mountainous areas in northern Vietnam. Adults and nymphs were seen resting on almost vertical rock surfaces. When disturbed, they jumped away or hid in shaded spaces beneath the rocks. They were found in the same habitat as *Onychotrechus* species.

Remarks. – In the key given by Andersen (1982), the male of *E. vietnamensis* could be keyed to *E. brevipes* by having plate-shaped processes in the pygophore, and the relatively short middle and hind femura which are only slightly longer than body. However, males of this species can be distinguished from *E. brevipes* by the following characters: lateral processes of pygophore flattened, expanded distally and without finger-like process; median emargination of sternum 7 much deeper than in all known *Eotrechus* species; fore trochanter without patch of spinules, fore femur of males more slender, fore tibia without apical process. The female of *E. vietnamensis*, could not be keyed to any described species because the genital segments are not concealed and the proctiger is not elongated but deflected. In lateral view, sternum 7 of the female is rather similar to that of *E. sinensis* but it has fewer stout hairs on fore femur and a lesser ratio of sternum 7: sternum 5+6.

Male specimens from Dien Bien province and Lai Chau province differed from those collected in locality of holotype in the following characters: fringe of short black hairs on posterior margin of metasternum less dense, hair patch on sterna 1-5 less dense, median notch of sternum 7 gradually widened towards posterior margin, disto-lateral processes of pygophore slightly thicker and less pointed, posterior margin of pygophore slightly produced on median. However, the presence of a hair fringe on metasternum, hair patches on sterna 1-5, and a very deep median notch of sternum 7 are unique among *Eotrechus* species. Therefore, we treated these differences as intraspecific variations.

As the manuscript was being prepared, Dr. J. T. Polhemus (Colorado, U.S.A) informed us that he had collected specimens which he believed could be the same species as *E. vietnamensis*. He kindly sent us part of his material (lot number CL4391, CL 4396, and CL4410) to confirm its identity. His specimens are conspecific with *E. vietnamensis* as he had suspected, and as such, we have included all his material as paratypes.

Rhyacobates anderseni, new species

(Figs. 7-16, 27)

Material examined. – Holotype (apterous female) and allotype (apterous male), Vietnam, Ha Tinh province, Vu Quang National Park, Khe Lim, 18°16.416'N 105°26.467'E, 291 m, coll. A. D. Tran, 24 Apr.2003, TAD0304 (ZMHU).

Paratypes: Vietnam: apterous 3 males, 6 females, same locality data as holotype; apterous 1 male, 1 female, macropterous 2 males, Ha Tinh province, Vu Quang National Park, Song Con, Sao La station, 18°15.386'N 105°27.442'E, 293 m, coll. A. D. Tran, 25 Apr.2003, TAD0307a (NHMW, ZMHU, and ZRC).

Additional material. – 1 apterous female, China, Yunnan, Xishuangbanna, Hill stream, 90km from Jinghong to Simao, 1070 m, coll. H. H. Tan, 20 May.2000, THH0068 (ZRC).

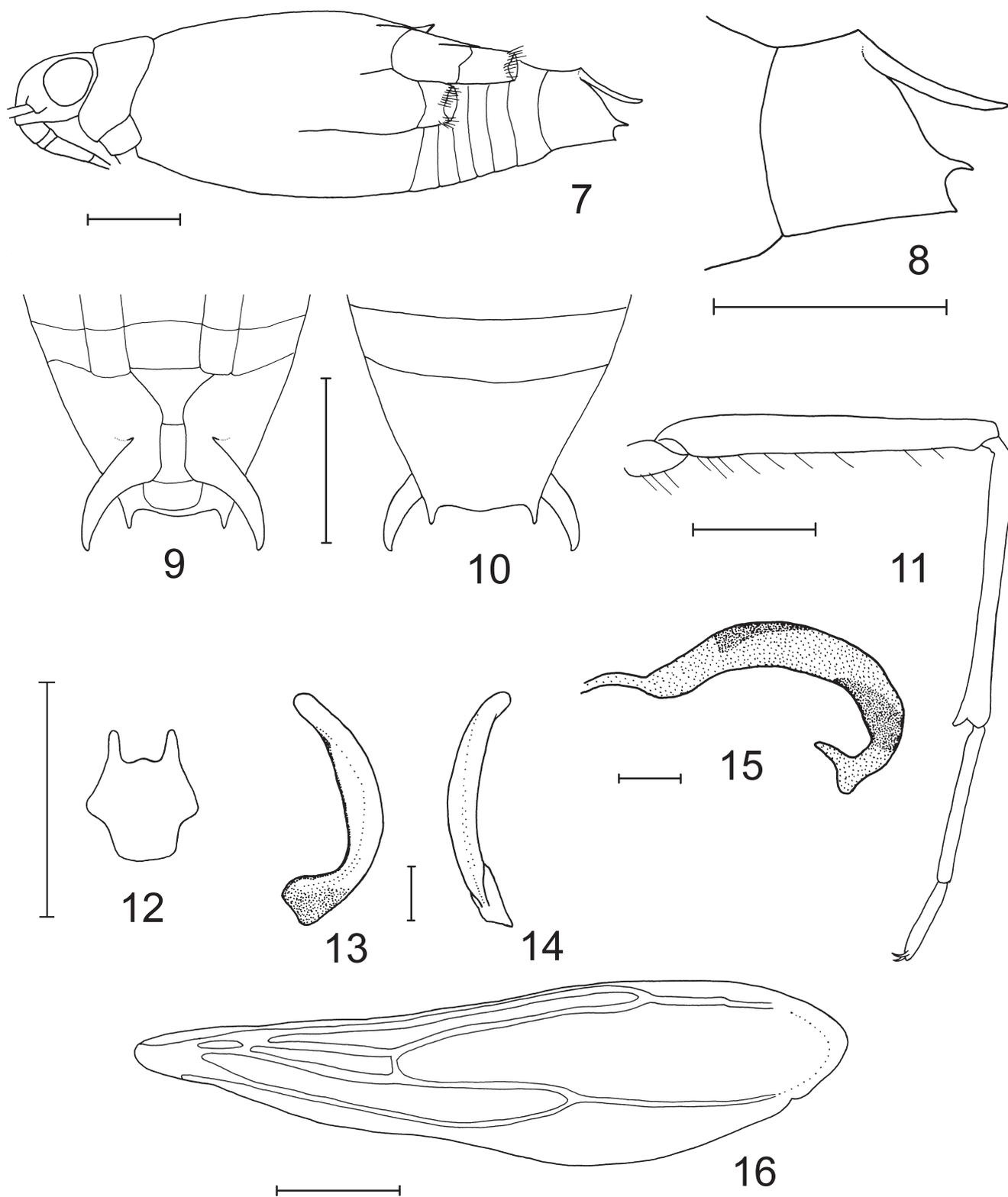
Description. – Apterous male: length 6.0-6.1 (allotype 6.0), width 1.83-1.85 (allotype 1.83) (n=5); apterous female: length 6.8-7.0 (holotype 6.8), width 2.52-2.57 (holotype 2.52) (n=8); macropterous male: length 6.1-6.2, width 1.85-1.88 (n=2).

Colour. Body almost black dorsally, covered with silvery pubescence. Head and pronotum black with semi-circular yellow markings. Antennae mainly dark brown to black, first antennal segment with yellow basal half, last segment with whitish area in distal two fifths. Male with longitudinal thin yellow stripe on posterior half of mesonotum. Yellow stripe on mesonotum of female broader than that of male. Venter bright yellow except anterior part of mesosterno-pleura black. All coxae, trochanters and femora yellow. Fore femur of both sexes with two brown longitudinal stripes on dorsal and external side, more slender and lighter brown in the female. Middle and hind femora yellow at base but brown or black at distal end. All tibiae and tarsi dark brown to black.

Structural characteristics

Apterous female (holotype): Head width across eyes 1.22, eye length 0.54, interocular width 0.48. Lengths of antennal segments 1-4: 2.86: 0.68: 1.02: 0.73. Pronotum broader than long, length and width: 0.63 and 1.36. Mesonotum length 2.02. Posterior margin of metanotum with a median pointed process (Fig. 7). Lengths of leg segments (femur: tibia: tarsal segment 1: tarsal segment 2): fore leg: 2.86: 2.37: 1.33: 0.71; middle leg: 8.50: 5.20: 2.24: 0.32; hind leg: 8.60: 3.10: 0.15: 0.20. All coxae with rings of dark bristle-like hairs at apical margin. Fore trochanter with long hairs ventrally, hind trochanter with dense long hairs dorsally. Fore femur with nine long dark bristle-like hairs posteriorly and scattered with soft long yellow hairs on venter (Fig. 11). Middle tibia lined with brownish hair-fringe ventrally. Hind femur with long yellow hairs on basal part. Abdomen relatively short, pregenital abdomen length 1.27. Length of sterna 5 and 6: 0.30 and 0.40. Abdominal segment 7 long, length 0.80, raised slightly upwards dorsally, bearing a pair of long projections pointing outwards and downwards (Figs. 8-10); posterior margin more or less straight with two short lateral processes (Figs. 9 & 10). Abdominal segment 7 almost enclosing the genital segments.

Apterous male (allotype): Head width across eyes 1.16, interocular width 0.43, eye length 0.46. Lengths of antennal segments: 2.67: 0.68: 1.05: 0.71. Pronotum broader than long, length and width: 0.59 and 1.22. Mesonotum length 1.76. Posterior margin of metanotum without a median process. Lengths of leg segments (femur: tibia: tarsal segment 1: tarsal segment 2): fore leg: 2.73: 2.18: 0.83: 0.51; middle leg: 8.10: 4.50: 2.02: 0.34; hind leg: 8.00: 2.52: 0.12: 0.17. Structure of legs similar to female except middle femur with small spinules but not in a row, spinules more scattered on distal part. Abdomen short, pregenital abdomen length 1.37, about 0.23x of body length. Sternum 7 length 0.43, posterior margin straight with long hairs. Genital segments slightly curve



Figs. 7-16. *Rhyacobates anderseni*, new species. 7-11, female holotype: 7, lateral view. 8-10, subgenital segments: 8, lateral view. 9, dorsal view. 10, ventral view. 11, right fore leg. 12-16, male: 12, proctiger. 13-14, left paramere, two different views. 15, vesical sclerites. 16, right fore wing. Scales bars 7-12, 16: 1 mm, 13-15: 0.1 mm.

downwards. On lateral view, abdominal segment 8 with concave venter, dorsal margin straight. Venter of abdominal segment 8 length 0.35. Pygophore large, ovate; proctiger with round angular projections on each side (Fig. 12). Parameres falciform, slightly broad, long, not conspicuously setose (Figs. 13-14). Vesical sclerites as illustrated in Fig. 15.

Macropterous male: Head width across eyes 1.15, eye length 0.46, interocular width of head 0.48. Head with long bristle-like hair around eyes. Lengths of antennal segments 1-4: 2.70: 0.67: 1.00: 0.71. Posterior margin of metanotum with a median pointed process. Lengths of leg segments (femur: tibia: tarsal segment 1: tarsal segment 2): fore leg: 2.73: 2.21: 0.78: 0.51; middle leg: 8.20: 4.61: 2.05: 0.32; hind leg: 8.30: 2.47: 0.13: 0.16. Fore wings surpassing abdominal apex, wing vein shown in Fig. 16. Other characteristics similar to apterous male.

Macropterous female unknown.

Etymology. – This species is dedicated to the late Prof. N. M. Andersen (Copenhagen) for his great contributions to the research on semi-aquatic Heteroptera.

Distribution & habitat. – Northern Vietnam and Yunnan, China. The type material was collected from moderate flowing streams of a forest at an elevation of 300 m. The specimen from Yunnan was collected from a stream above 1000m in elevation.

Remarks. – Andersen & Chen (1995) listed the generic characteristics of the genus *Rhyacobates* as: (a) mesonotum black with pale median stripe; (b) first antennal segment longer than other three segment together, last antennal segment with whitish area in distal two fifths; (c) middle and hind tarsi without claws; (d) male parameres moderate in size, falciform and not conspicuously setose; (e) middle femur without distinct row of black spines; (f) eighth abdominal segment of male reduced ventrally, shorter than seventh segment; (g) posterior segments of female abdomen usually curved dorsad (apterous form); (h) seventh abdominal segment of female tube-like, long and completely enclosing the genital segments. *Rhyacobates anderseni* possesses all the above characters except that the female abdomen is relatively short, not curved dorsad, and abdominal segments 1-6 combined are only slightly longer than abdominal segment 7. This new species is also distinctly different from other known *Rhyacobates* species by having a very conspicuous median process on the posterior margin of metanotum in the female. This process is also found in *Andersenius* and *Pleciobates*. However, elongated hind coxae which are diagnostic for the genus *Andersenius* were not present in this new species. It is also distinct from *Pleciobates* by the colouration of mesonotum, general structure of male paramere and endosoma (for *Pleciobates* spp., see Zettel & Chen, 1996), and the absence of a row of black spines on the male middle femur. The dorsal projections of seventh abdominal segment in the new species are rather similar to those of *R. malaisei* but differ in the curvature of the internal margin.

We examined a single female from Yunnan, China which is almost identical to the Vietnamese specimens except for slight colour differences: head mainly yellow, larger yellow marking on pronotum, first and second antennal segments yellow, third and fourth antennal segments light brown.

Rhyacobates gongvo, new species

(Figs. 17-25, 28)

Material examined. – Holotype (apterous female) and allotype (apterous male), Vietnam, Lao Cai province, Sa Pa, Hoang Lien National Park, Sin Chai, 22°20.421'N 103°48.844'E, 1366 m, coll. A. D. Tran, 1 Jun.2003, TAD0337 (ZMHU).

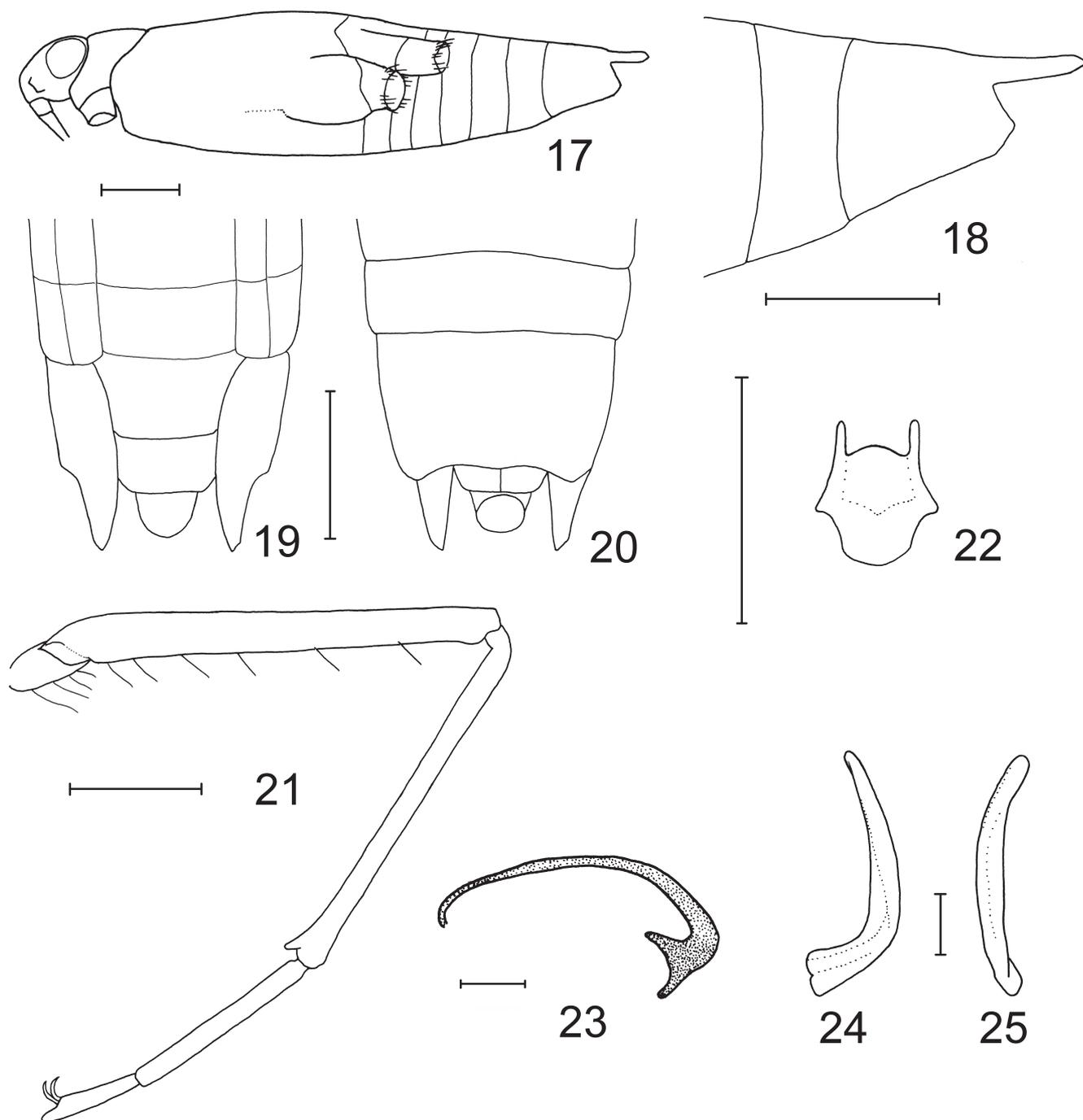
Paratypes: Vietnam: de-alated macropterous 2 males, 3 females, same locality data as holotype (ZRC); apterous 3 males, 6 females, same locality as holotype, coll. A. D. Tran, 3 Jul.2004, TAD0415 (NHMW, ZRC).

Description. – Apterous male: length 6.3-6.5 (allotype 6.5), width 2.2 (n=2). Apterous female: length 8.3, width 2.52. De-alated macropterous male: length 6.4, width 1.97 (n=2). De-alated macropterous female: length 7.5, width 2.44 (n=3).

Colour. Body mainly black, covered with silvery pubescence. Head yellow with black markings dorsally. Antennae mainly black, fourth antennal segment with whitish area in distal two fifths. Pronotum with large sub-triangular yellow spot in apterous female and smaller and ovate in apterous male (Fig. 28). Pronotum in macropterous form with ovate (in males) or diamond-shaped (in females) yellow marking in anterior part and yellow posterior margin. Mesonotum in apterous form black with longitudinal yellow stripe posteriorly, stripe length about three fourths of mesonotum length. Metanotum and dorsal abdomen black. Venter of female light yellow except anterior 2/3 of mesosternum. Venter of male mainly black or dark brown, except acetabula and genital segments. All coxae and trochanters yellow. Fore femur yellow with one brown dorsal stripe. Middle and hind femora yellow at base, brown or black at distal part. All tibiae and tarsi dark brown or black.

Structural characteristics

Apterous female (holotype): Head width across eyes 1.37, interocular 0.52, eye length 0.56. Lengths of antennal segments 1-4: 3.54: 0.80: 1.10: 0.80. Pronotum broader than long, length 0.68, width 1.46. Mesonotum length 2.19. Metanotum without spine on median. Lengths of leg segments (femur: tibia: tarsal segment 1: tarsal segment 2): fore leg: 3.50: 2.91: 1.63: 0.81; middle leg: 10.10: 5.60: 2.52: 0.37; hind leg: 10.20: 3.10: 0.16: 0.20. All coxae with a ring of long dark hairs at apical margin. Fore trochanter with some long yellow hairs ventrally (Fig. 21). Middle and hind trochanters without hairs. Fore femur slender, with a row of 6-8 long dark bristle-like hairs and some scattered long soft yellow hairs on venter. Middle femur without small spinules. Abdomen elongate and straight, posterior part of sternum 7 slightly depressed ventrally (Fig. 17). Abdomen relatively long, pregenital segments length 3.15. Length of sterna 5 and



Figs. 17-25. *Rhyacobates gongvo*, new species. 17-21, female holotype: 17, lateral view. 18-20, subgenital segments: 18, lateral view. 19, dorsal view. 20, ventral view. 21, right fore leg. 22-25, male: 22, proctiger. 23, vesical sclerites. 24-25, left paramere, two different views. Scales bars 17-22: 1 mm, 23-25: 0.1 mm.

6: 0.45 and 0.57. Sternum 7 length 0.95, not totally enclosing genital segments, posterior ventral margin straight without process. Dorsal processes of sternum 7 long, straight and flatten (Figs. 18-20).

Apterous male (allotype): Head width across eyes 1.29, interocular width 0.51, eye length 0.49. Lengths of antennal segments 1-4: 3.25: 0.78: 1.22: 0.78. Pronotum short, length: width 0.66: 1.39. Mesonotum length 1.93. Metanotum without median spine or process on posterior margin. Lengths of leg segments (femur: tibia: tarsal segment 1: tarsal segment 2): fore leg: 3.40: 2.91: 1.10: 0.61; middle leg: 9.80: 5.10: 2.24: 0.34; hind leg: 10.00: 2.39: 0.15: 0.17. Other characters similar to apterous female except venter of fore femur with a row of 4 long, dark, bristle-like hairs at basal half. Middle femur with small spinules not placed in a row. Abdomen short and slightly curved downwards posteriorly. Pregenital abdomen length 1.68, about 0.27x body length. Sternum 7 length 0.51. Venter of abdominal segment 8 length 0.40. Genital segments length 0.88. Proctiger with small angular projections on each side (Fig. 22). Parameres relative long and slender (Figs. 24-25). Vesical sclerites as illustrated in Fig. 23.

De-alated macropterous female: similar to apterous female except slightly smaller in size. Head width across eyes 1.32, eye length 0.49, interocular width 0.48. Pronotum length: width 2.63: 2.00. Lengths of antennal segments 1-4: 3.25: 0.73: 1.11: 0.78. Lengths of leg segments (femur: tibia: tarsal segment 1: tarsal segment 2): fore leg: 3.40: 2.86: 1.54: 0.79;

middle leg: 9.80: 5.60: 2.44: 0.38; hind leg: 10.00: 2.91: 0.16: 0.20.

De-alated macropterous male: similar to apterous male. Head width across eyes 1.25, interocular width 0.48, eye length 0.48. Pronotum with longitudinal ridge along mid-line, pronotum length: width 2.44: 1.78. Lengths of antennal segments 1-4: 3.30: 0.78: 1.19: 0.78. Lengths of leg segments (femur: tibia: tarsal segment 1: tarsal segment 2): fore leg: 3.35: 2.96: 1.11: 0.63; middle leg: 10.00: 5.40: 2.37: 0.36; hind leg: 10.40: 2.52: 0.15: 0.17.

Etymology. – The word “gong vo” in Vietnamese means water skaters, it is used here specifically as a noun in apposition.

Distribution & habitat. – Northern Vietnam, only known from the type locality. Specimens were collected from a fast flowing rocky mountainous stream in open area. They were seen skating swiftly on the water surface and well camouflaged in the torrential environment by their silvery pubescence. They were also found resting on shaded sides of exposed surfaces of rocks in the stream. Both *Rhyacobates gongvo* and *R. abdominalis* were found in the same habitat.

Remarks. – *Rhyacobates gongvo* matches diagnostic characters of the genus *Rhyacobates* except for characters (j) and (k) (see remarks for *R. anderseni* above): posterior segments of female straight, not curved dorsad; seventh segment of female abdomen not completely enclosing the



Fig. 26. Habitus of *Eotrechus vietnamensis*, holotype.



Fig. 27. Habitus of *Rhyacobates anderseni*, holotype.

genital segments. This species is relatively similar to *R. malaisei* in the following characters: abdomen of female elongate, almost straight in lateral view, tube-like seventh sternum shorter than two preceding sterna combined, seventh abdominal segment with long projections; male elongate with relatively short abdomen, eighth abdominal segment ventrolaterally depressed; similar lengths of antennal segments. However, it could be separated from *R. malaisei* by the following characters: proctiger of male without hook-shaped projection on each side; paramere long and slender; projections on abdominal segment 8 of female straight, not curved.

Rhyacobates abdominalis Andersen & Chen, 1995

Rhyacobates abdominalis Andersen & Chen, 1995: 58-59, Figs. 12-15.

Material examined. – Vietnam: apterous 4 males, 5 females, de-alated macropterous 1 female, Lao Cai province, Sa Pa, Hoang Lien National Park, Sin Chai, 1300m, coll. A.D. Tran, 1 Jun.2003, TAD0337 (ZMHU, ZRC); apterous 6 males, 5 females, de-alated macropterous 2 males, 1 female, same locality, coll. A.D. Tran, 3 Jul.2004, TAD0415 (ZMHU, ZRC).



Fig. 28. Habitus of *Rhyacobates gongvo*, holotype.

Paratypes examined: apterous 1 male, 1 female, labelled "China: Guangdong Prov., Ruyang Nat. Res., Lao Peng Keng stream, 1100m, 14 Aug.1990, coll. P.P. Chen, C9012" (NHMW).

Descriptive notes. – The specimens of *R. abdominalis* from Vietnam were not significantly different from specimens described by Andersen & Chen (1995) from China, except they are slightly bigger and the median process of sternum 7 in the female is less pointed. The following measurements are of Vietnamese specimens:

Apterous male: length 6.8-7.0, width 2.10-2.20 (n=4). Head width across eyes 1.30, interocular width 0.63, eye length 0.51. Lengths of antennal segments 1-4: 3.63: 0.99: 1.13: 0.92. Lengths of leg segments (femur: tibia: tarsal segment 1: tarsal segment 2): fore leg: 3.98: 3.15: 1.11: 0.69; middle leg: 10.80: 5.65: 2.47: 0.48; hind leg: 11.00: 3.88: 0.13: 0.21.

Apterous female: length 9.9-10.0, width 3.50 (n=5). Head width across eyes 1.55-1.58, interocular width 0.79, eye length 0.63. Lengths of antennal segments 1-4: 4.59: 1.21: 1.31: 1.04. Lengths of leg segments (femur: tibia: tarsal segment 1: tarsal segment 2): fore leg: 4.86: 4.25: 2.45: 1.07; middle leg: 12.00: 7.10: 3.69: 0.58; hind leg: 13.00: 5.75: 0.17: 0.25. Length of sterna 5 and 6: 0.59 and 0.71. Sternum 7 length 1.51.

De-alated macropterous male: length 6.4-6.6, width 2.06-2.11 (n=2). Head width across eyes 1.29-1.32, interocular width 0.52, eye length 0.54. Lengths of antennal segments 1-4: 3.53: 1.01: 1.16: 0.97. Lengths of leg segments (femur: tibia: tarsal segment 1: tarsal segment 2): fore leg: 3.72: 3.19: 0.98: 0.67; middle leg: 10.30: 5.60: 2.40: 0.44; hind leg: 12.40: 3.82: 0.11: 0.25. Pronotum covers almost of mesonotum, mainly black with a median yellow mark anteriorly and pale-yellowish posterior margin.

De-alated macropterous female: length 9.4-9.6, width 3.14-3.30 (n=2). Head width across eyes 1.49-1.55, interocular width 0.63-0.79, eye length 0.62-0.63. Lengths of antennal segments 1-4: 4.46: 1.21: 1.31: 1.02. Lengths of leg segments (femur: tibia: tarsal segment 1: tarsal segment 2): fore leg: 4.70: 4.03: 2.33: 1.02; middle leg: 12.70: 7.00: 3.54: 0.56; hind leg: 12.30: 5.75: 0.16: 0.27. Pronotum similar to macropterous male.

Distribution. – China and Vietnam.

Remarks. – This is the first record of this species for Vietnam. It was found in the same habitat as *Rhyacobates gongvo*.

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