Mongolian Journal of Biological Sciences 2010 Vol. 8(1): 3-8

A Redescription of *Apatania mongolica* Martynov, 1914 (Trichoptera: Apataniidae), Based on Materials from Southern Mongolia

Suvdtsetseg Chuluunbat[1], Gantigmaa Chuluunbaatar[2] and John C. Morse[3]

[1]*Mongolian Aquatic Insect Survey, Hydrobiology Laboratory, Institute of Meteorology and Hydrology, Ulaanbaatar 210646, Mongolia, e-mail: suvdaa314@yahoo.com*
[2]*Institute of Biology, Mongolian Academy of Sciences, Ulaanbaatar 210351, Mongolia, e-mail: gantigaa_ch@yahoo.de*
[3]*Department of Entomology, Soils, and Plant Sciences, Clemson University, Long Hall, Box 340315, Clemson, South Carolina 29634-0315 USA, e-mail: jmorse@clemson.edu*

Abstract

The male of *Apatania mongolica* is redescribed, and the description of the previously undiagnosed female of this species is provided with illustrations. Based on the features of our material, the male of *A. mongolica* is easily distinguishable from those of other species of the genus by having a very broad median process of segment X curved ventrad and C-shaped. The female differs from those of other *Apatania* species by having the hind wing discoidal cell closed, the apex of segment IX rectangular in lateral view, and the supragenital plate well-developed and thick in lateral view.

Key words: *Apatania mongolica*, female description, diagnostic characters

Introduction

The male of a caddisfly species, *Apatania mongolica* was first described by Martynov (1914) based upon the collection made by M. Kozlov in 1908 from Alashan, Chyn-juan (presumably A-la Shan, Gansu Province and Inner Mongolia Autonomous Region, China). Subsequently, he transferred the species to the genus *Apatelia* Wallengren, 1886 (Martynov, 1917). Ulmer (1932) reported a male of *A. mongolica* at Yenching University in Beijing. Redrawing the illustrations of male genitalia of this species from Martynov's description, Schmid (1954) included it in his *A. mongolica* subgroup, *A. fimbriata* group, *A. fimbriata* supergroup. Later, Schmid (1955) analyzed the Apataniidae (as limnephilid subfamily Apataniinae) based on descriptions of several representative species and again placed *A. mongolica* into his *A. fimbriata* group, but the female of the species remained unknown. Presence of this species in Mongolia has not been confirmed since the report by Thienemann (1926).

During an insect survey, an unknown female was found in copula with a male of *A. mongolica*. This finding is providing us an opportunity to examine the mating pair of *A. mongolica* and present the first published description of the female and a redescription of the male.

Materials and Methods

A male and two females of *A. mongolica* were collected from the meadow surrounding Khairt spring, which is located about 20 km to the west of Khatsavch spring (E43.01046; N101.09266) in Gurvantes Soum in Umnugovi Aimag, Mongolia.

Methods used for preparation of genitalia are those outlined by Blahnik and Holzenthal (2004), and Blahnik *et al*. (2007). The abdomens were cut between segments III and IV, soaked in 12% potassium hydroxide (KOH), then heated on a hot plate for 15-20 minutes in order to digest ("clear") non-chitinous tissue. Cleared abdomens were passed through distilled water to remove the base, transferred to 70% ethyl alcohol for cleaning of the remaining debris with a fine-needle syringe, and permanently stored in glycerin. Wings of the specimens were mounted dry on microscope slides. Digital images of wings and genitalia were acquired with a Leica EZ4 D digital dissecting microscope camera. Length measurements were made using LAS EZ image capture software. These images were reduced to 18 X 23 cm and printed. All drawings were made by tracing the printed digital images, and then details of the genitalia were added by examining them in glycerin using the Leica EZ4 D dissecting microscope. Ruiter's (2000) terminology for

the wing venation of caddisflies is followed as shown in figures 1-4, and Nielsen's (1957, 1980) terminology for male and female genitalia is applied in this paper.

Descriptions of male and female

***Apatania mongolica* Martynov, 1914**
(Figs. 1-11)

Apatania mongolica Martynov, 1914: 44, figs. 33-36.

Apatelia mongolica (Martynov): Martynov, 1917: 61.

Apatania mongolica Martynov: Ulmer, 1932: 68.

Apatania mongolica Martynov: Schmid, 1954: 40, fig. 75.

Apatania mongolica Martynov: Schmid, 1955: 83.

Both male and female: Head reddish brown, appendages of head fuscous. Head with 3 ocelli. Antennae uniformly brown, reaching forewings. Antennal scapes shorter than head length. Maxillary palps 3-segmented in male, 5-segmented in female. Labial palps 3-segmented in both sexes. Thorax brown. Prothorax much shorter than other thoracic segments, pronotum bearing 2 pairs of setal warts. Mesoscutum narrowing posteriorly and with pair of large oval setal warts anteriorly. Mesoscutellum triangular, with pair of large subtriangular setal warts placed on anterolateral edges of mesoscutellum. Anterior margin of metascutum broadly notched medially, metascutellum subtriangular, broadly pointed anteriorly and gradually widened posteriorly.

Legs generally brown, with proximal segments darker and distal segments lighter. Legs with tibial spurs 1, 2, 4 on each foreleg, midleg, and hind leg, respectively. Wings light brown. Each forewing with subcosta (*Sc*) abruptly angled anterad to notched costal margin (*C*), *Sc* and first radial vein (*R1*) connected with subcostal-radial crossvein (*sc-r*) at this angle, forming distinctive truncate basal border of pterostigma. Pterostigma with thick, deciduous androconial hairs. Discoidal cell (*dsc.cl*.) short and thyridial cell (*thd.cl*.) long. Cubital crossvein (*cu*) connecting first and second cubital veins (*Cu1* and *Cu2*) subapically at point where *Cu2* angles abruptly to hind margin. Anal veins (*A1*, *A2* and *A3*) short, looped and fused apically into single vein. Forks *I, II, III*, and *V* present (Figs. 1, 3). Hind wings each with 3 frenular setae (*fr.st*.) at base of frenulum. Hind wing discoidal cell open (male, Fig. 2) or closed and short (female, Fig. 4), thyridial cell (*thd.cl*.) long. Posterior median vein (*M3+4*) and anterior *Cu1* vein (*Cu1a*) fused for short distance, without *m-cu* crossvein. Forks *I, II, III*, and *V* present.

Male genitalia (Figs. 5-8): Segment IX (*IX*) short ventrally, longer laterally, short dorsally, forming narrow transverse dorsal band (*ac*) with dorsal process (*dpr*) rounded posteriorly; anterolateral margins convex subdorsally and concave subventrally, posterolateral margins straight subdorsally and convex subventrally with row of long setae near posterolateral margin. Inferior appendages (*inf.ap*) cylindrical, bearing numerous setae, each with basal segment tall and broad basally, narrowed ventromesally, thick in distal half; its harpago (*hrp*) more slender than its basal segment and shorter, comprised of upper and lower parts (*hrp.ul* and *hrp.ll*), with upper lobe slender and apically blunt, lower lobe subtriangular in lateral and ventral views, apically rounded and less than half as long as upper lobe. Superior appendages (*sp.ap*) of segment X small with few setae, cylindrical. External branches of segment X (*ext.br*) long, slender, 4 times longer than superior appendages. Median process of segment X (*me.pr*) shorter than external branches, its base broad, apex slender, strongly curved ventrad. Body of segment X (*bo.X*) triangular, semi-membranous, dorsoventrally depressed. Phallus with cup-like phallobase (*phb*), phallicata (*phl*) tubular and heavily sclerotized, with pair of long membranous endothecal processes (*end*) bearing numerous bristles (*phls*). Parameres (*prm*) slender, obliquely truncated apically.

Female genitalia (Figs. 9-11): Segment IX (*IXa, b, c, d*) separated laterally from segment X, IXa bare, IXb setose, IXc setose and fused ventrally beneath anus (*an*), lateral lobes (*IXd*) well-developed, each divided into 2 parts: setose, triangular, dorsolateral portion (*IXd.d*) and bare, elliptical, ventrolateral portion (*IXd.v*). External portion of segment X or supragenital plate (*Xe*) transverse, rather short, relatively broadly rounded in ventral view, thick and apically blunt in lateral view, and heavily sclerotized. External portion of sternum IX (*e.gon.IX*) forming triangular vulvar

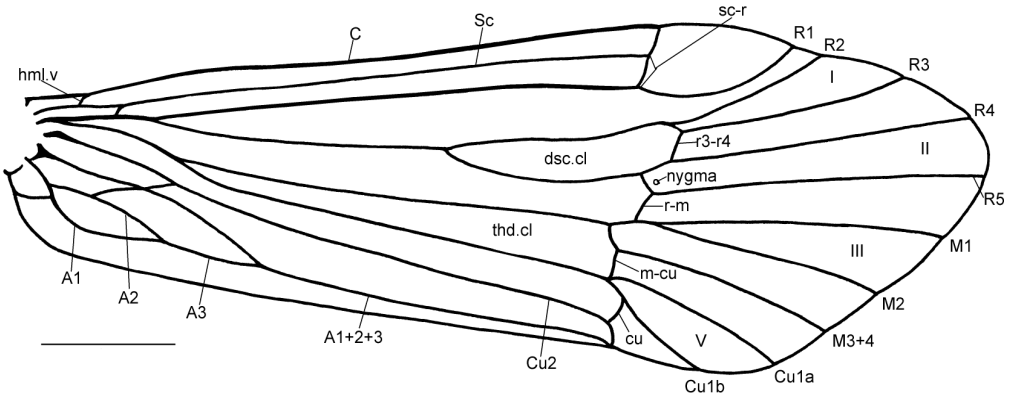


Figure 1. Male right forewing of *Apatania mongolica*, dorsal. Scale bar = 1 mm. A1, A2, A3, A1+A2+A3 = anal veins 1, 2, and 3, and these veins combined, respectively; C = costal vein; Cu1a, Cu1b, Cu2 = cubital veins 1 anterior, 1 posterior and 2, respectively; cu = cubital crossvein; cu-a = cubital-anal crossvein; dsc.cl = discoidal cell; hml.v = humeral cross vein; JB = jugal bar; M1, M2, M3+M4 = median veins 1, 2, and 3 and 4 combined, respectively; m-cu = medial-cubital crossvein; thd.cl = thyridial cell; r-m = radial-medial crossvein; R1, R2, R3, R4, R5 = radial veins 1, 2, 3, 4, and 5, respectively; r3-r4 = sectoral vein; Sc = subcostal vein; sc-r = subcostal-radial crossvein; I, II, III, V = forks 1, 2, 3, and 5, respectively.

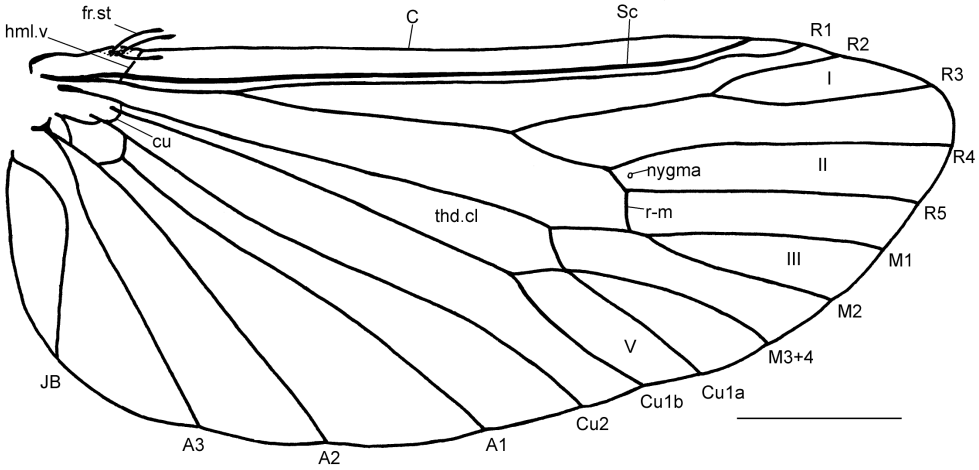


Figure 2. Male right hind wing of *Apatania mongolica*, dorsal. Scale bar = 1 mm. A1, A2, A3, A1+A2+A3 = anal veins 1, 2, and 3, and these veins combined, respectively; C = costal vein; Cu1a, Cu1b, Cu2 = cubital veins 1 anterior, 1 posterior, and 2, respectively; cu = cubital crossvein; fr.st = frenular setae; hml.v = humeral crossvein; JB = jugal bar; M1, M2, M3+M4 = median veins 1, 2, and 3 and 4 combined, respectively; thd.cl = thyridial cell; r-m = radial-medial crossvein; R1, R2, R3, R4, R5 = radial veins 1, 2, 3, 4, and 5, respectively; Sc = subcostal vein; I, II, III, V = forks 1, 2, 3, and 5, respectively.

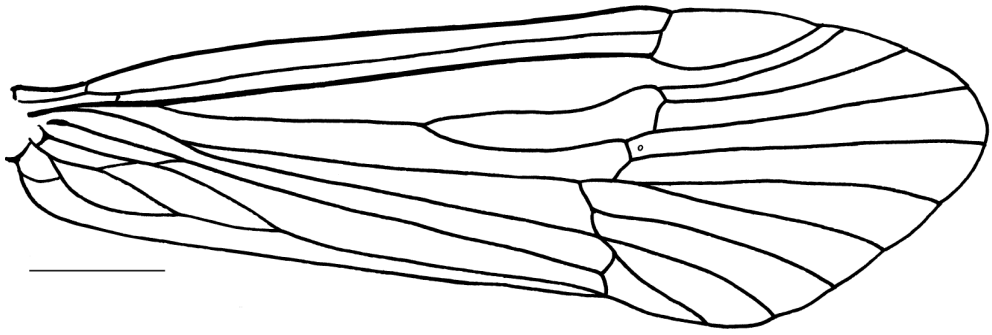


Figure 3. Female right forewing of *Apatania mongolica*, dorsal. Scale bar = 1 mm. Captions same as male right forewing.

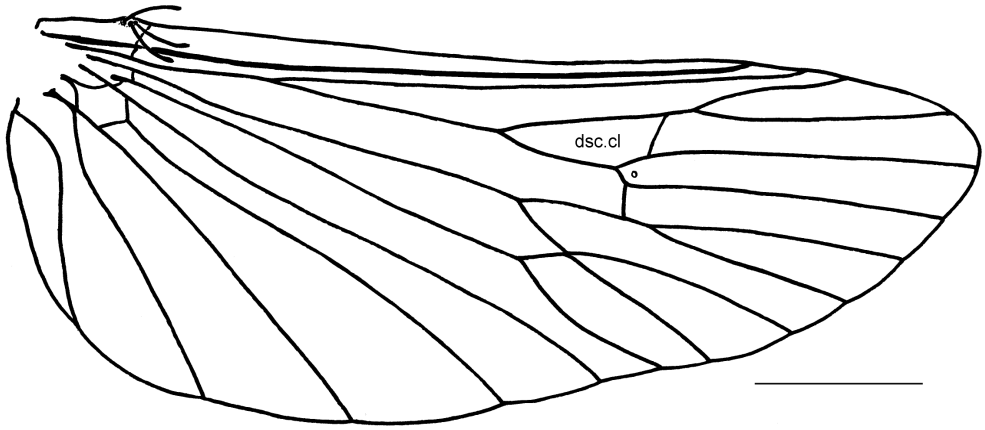


Figure 4. Female right hind wing of *Apatania mongolica*, dorsal. Scale bar = 1 mm. Captions same as male right hind wing, and discoidal cell (dsc.cl) closed.

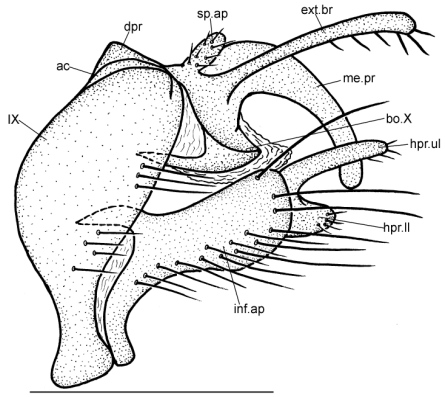
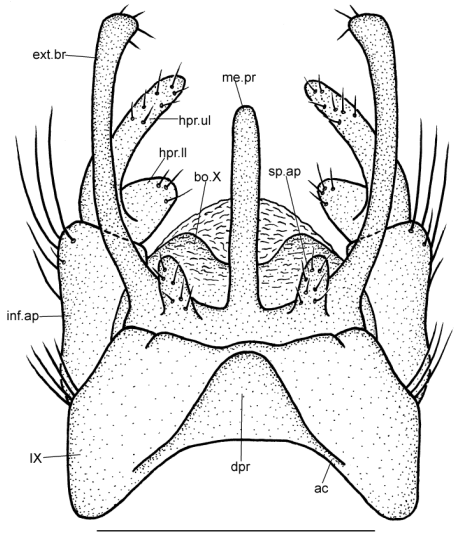


Figure 5. Male genitalia of *Apatania mongolica*, left lateral. Scale bar = 0.5 mm. ac = antecosta of segment IX; bo.X = body of segment X; dpr = dorsal process of segment IX; ext.br = external branch of segment X/lateral process of segment X; hpr.ll = lower lip of harpago; hpr.ul = upper lip of harpago; inf.ap = basal segment of inferior appendage/ coxopodite; me.pr = median process of segment X; sp.ap = superior appendage/preanal appendage; IX = abdominal segment IX.



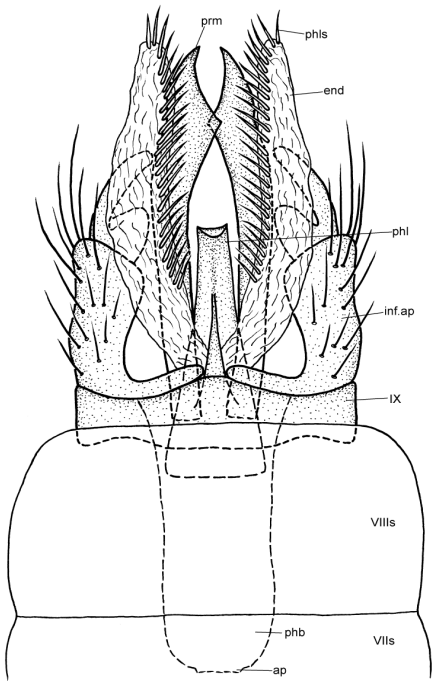


Figure 7. Male genitalia of *Apatania mongolica*, ventral. Scale bar = 0.5 mm. ap = phallic apodeme; inf. ap = basal segment of inferior appendage/coxopodite; end = endophallus; phb = phallobase; phl = phallicata; phls = setae of phallicata; prm = parameres; VIIs = abdominal sternite VII; VIIIs = abdominal sternite VIII; IX = abdominal segment IX.

← Figure 6. Male genitalia of *Apatania mongolica*, dorsal. Scale bar = 0.5 mm. ac = antecosta of segment IX; bo.X = body of segment X; dpr = dorsal process of segment IX; ext.br = external branch of segment X/lateral process of segment X; hpr.ll = lower lip of harpago; hpr.ul = upper lip of harpago; inf.ap = basal segment of inferior appendage/coxopodite; me.pr = median process of segment X; sp.ap = superior appendage/preanal appendage; IX = abdominal segment IX.

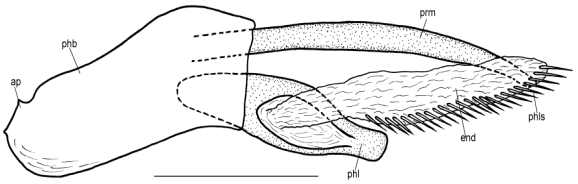


Figure 8. Phallic apparatus of *Apatania mongolica*, left lateral. Scale bar = 0.5 mm. ap = phallic apodeme; end = endophallus; phb = phallobase; phl = phallicata; phls = setae of endophallus; prm = parameres.

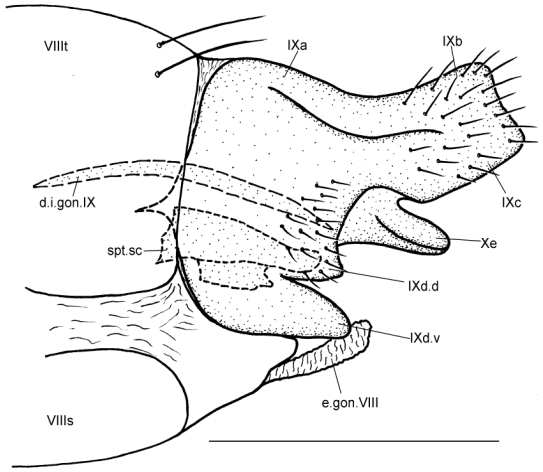


Figure 9. Female genitalia of *Apatania mongolica*, left lateral. Scale bar = 0.5 mm. d.i.gon.IX = dorsal internal part of gonopod IX; e.gon.VIII = external part of gonopod VIII/vulvar lobe; VIIIs = abdominal sternite VIII; VIIIt = abdominal tergite VIII; IXa-d = portions of segment IX; Xe = external part of segment X/supragenital plate; spt.sc = spermathecal sclerite.

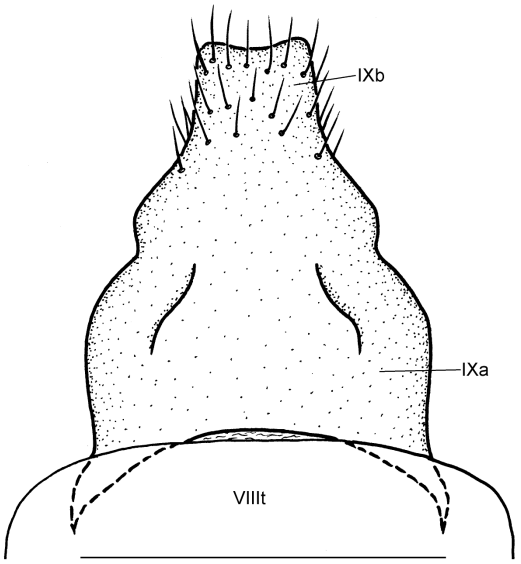


Figure 10. Female genitalia of *Apatania mongolica*, dorsal. Scale bar = 0.5 mm. VIIIt = abdominal tergite VIII; IXa-b = portions of segment IX.

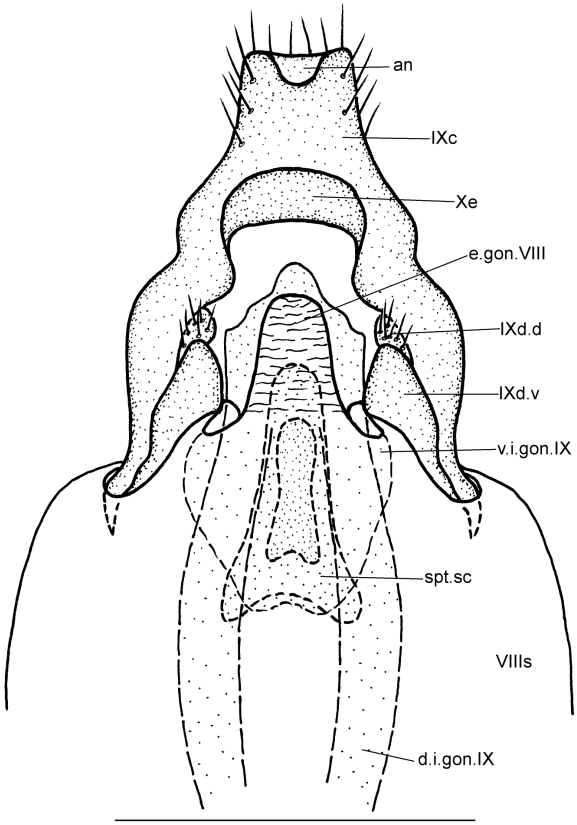


Figure 11. Female genitalia of *Apatania mongolica*, ventral. Scale bar = 0.5 mm. an = anus/anal opening; d.i.gon.IX = dorsal internal part of gonopods IX; e.gon. VIII = external part of gonopod VIII/vulvar lobe; e.gon.IX = external part of gonopod IX/vulvar scale; VIIIs = abdominal sternite VIII; IXb-d = portions of segment IX; Xe = external part of segment X/ supragenital plate; spt.sc = spermathecal sclerites; v.i.gon.IX = ventral internal part of gonopods IX.

scale (in the sense of Unzicker, 1968), internally divided into broad ventral plate (*v.i.gon.IX*) and pair of dorsal bands (*d.i.gon.IX*). Sternum VIII (*e.gon.VIII*) semimembranous apically with transverse striations, forming long, slender and thumb-like vulvar lobe. Anal opening (*an*) visible ventrally.

Diagnosis: The male of *A. mongolica* is easily distinguishable from those of other species of the genus by having a very broad median process of segment X curved ventrad, C-shaped. The female differs from those of other *Apatania* species by having the hind wing discoidal cell closed, the apex of segment IX rectangular in lateral view, and the supragenital plate well-developed and thick in lateral view.

Distribution: Alashan, Chyn-juan, China, and Umnugovi Aimag, Mongolia.

Acknowledgements

The present study was supported by grants from the Environmental Policy Department of South Gobi Sands LLC (Mongolia, Ulaanbaatar), a subsidiary of South Gobi Energy Resources Ltd. We thank Mr. Khurelbaatar Bilguun and Ms. Sarantuya Dashdavaa (Environmental Officers of South Gobi Sands LLC) for extensive help with the field survey. We are grateful for helpful reviews of the manuscript by Drs. R.G. Bellinger and G.R. Carner of Clemson University, anonymous reviewers, and the editor. This work was supported by the US National Science Foundation (DEB-0743732). This is Technical Contribution Number 5752 of the Clemson University Experiment Station.

References

Blahnik, R. J. & Holzenthal, R.W. 2004. Collection and curation of Trichoptera, with an emphasis on pinned material. *Nectopsyche, Neotropical Trichoptera Newsletter*, 1: 8-20.

Blahnik, R. J., Holzenthal, R. W. & Prather, A. L. 2007. The lactic acid method for clearing Trichoptera genitalia. *In* Bueno-Soria J., Barba-Álvarez R. & Armitage B. (Eds.): *Proceedings of the 12th International Symposium on Trichoptera*, *México 18 to 22 June*, *2006*. The Caddis Press, Columbus, Ohio, pp. 9-14.

Martynov, A.V. 1914. Die Trichopteren Sibiriens und der angrenzenden Gebiete. III. Teil. Subf. Apataniinae (Fam. Limnophilidae). *Annuaire du Musée Zoologique de I'Académie des Sciences de I'URSS*., 19(1): 1-87.

Martynov, A. V. 1917. Sur une nouvelle espèce de la tribu des Apataniini et quelques autres forms provenant du pays de Minoussinsk. *Annuaire du Musée Zoologique de l'Académie des Sciences de Saint Pétersbourg*, 22: 43-63.

Nielsen, A. 1957. A comparative study of the genital segments and their appendages in male Trichoptera. *Biologiske Skrifter, det Kongelige Danske Videnskabernes Selskab, København*, 8(5): 159 pp.

Nielsen, A. 1980. A comparative study of the genital segments and the genital chamber in female Trichoptera. *Biologiske Skrifter, det Kongelige Danske Videnskabernes Selskab Køben*havn, 23(1): 200 pp.

Ruiter, E. D. 2000. Generic key to the adult ocellate Limnephiloidea of the Western Hemisphere (Insecta: Trichoptera). *Ohio Biological Survey Miscellaneous Contribution*, 5: iv+22 pp.

Schmid, F. 1954. Contribution a l'etude de la sous-famille des Apataniinae (Trichoptera, Limnophilidae), II. *Tidschrift voor Entomologie*, 97(1-2): 1-74.

Schmid, F. 1955. Contribution à l'etude des Limnophilidae (Trichoptera). *Mitteilungen der Schweizerischen Entomologischen Gesellschaft*, 28: 73-88.

Thienemann, A. 1926. Hydrobiologische Untersuchungen an den Kalten Quellen und der Halbinsel Jasmund. *Archiv für Hydrobiologie*, 17: 221-336.

Ulmer, G. 1932. Aquatic insects of China, Article III. Neue chinesische Trichopteren, nebst übersicht über die bisher aus China, bekannten arten. *Peking Natural History Bulletin*, 7: 39-70.

Unzicker, J. D. 1968. The comparative morphology and evolution of the internal female reproductive system of Trichoptera. *Illinois Biological Monographs*, 40: 72 pp.

Wallengren, H. D. J. 1886. Skandinaviens arter af trichopter-familjen Apataniidae. *Entomologisk Tidskrift*, 7: 73-80.

Хураангуй

Хоовгоны *Apatania mongolica* зүйлийн эр бодгальд нэмэлт бичиглэл хийж, мөн эм бодгалийг шинээр илрүүлэн бичиглэл хийсний зэрэгцээ тус зүйлийн бусад зүйлээс ялгарах шинж тэмдгүүдийг зургаар харуулав. *A. mongolica* зүйлийн эр бодгаль X сегментийн дунд хэсэгт C хэлбэрийн маш өргөн ургацагтай, харин эм бодгалийн хойд далавчны дискойдал хэлбэрийн нүд нь хаалттай, IX сегментийн үзүүр хажуу талаасаа дөрвөлжин хэлбэртэй харагддаг бөгөөд мөн супрагенитал хавтас нь сайн хөгжиж зузаарсан зэрэг байдал нь бусад зүйлээс ялгарах шинж болно.

Received: 18 December 2009
Accepted: 19 May 2010