PROCEEDINGS OF THE ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA 156: 59-69 JUNE 2007

The crane fly family Cylindrotomidae (Diptera): newly recorded for Mongolia

JON K. GELHAUS, SIGITAS PODENAS, YADAMSUREN OYUNCHULUUN AND VIRGINIJA PODENIENE

[JKG] Department of Entomology, Academy of Natural Sciences, Philadelphia, PA, USA 19103-1195, gelhaus@ansp.org

[SP] Institute of Ecology of Vilnius University, Akademijos 2, LT-08412, Vilnius-21, LITHUANIA. Research Associate, The Academy of Natural Sciences

[YO] Mongolian Aquatic Insect Survey c/o The Institute of Meteorology and Hydrology, Khudaldaany Gudamj-5, Ulaanbaatar 210646, MONGOLIA

[VP] Department of Zoology, Vilnius University, Ciurlionio 21/27, LT-2009 Vilnius, LITHUANIA. Research Associate, The Academy of Natural Sciences

ABSTRACT:—The crane fly family Cylindrotomidae is newly recorded for Mongolia. Four species, *Cylindrotoma distinctissima* (Meigen, 1818), *C. nigriventris* Loew, 1849, *Diogma glabrata* (Meigen, 1818), *Phalacrocera replicata* (Linnaeus, 1758) are first recorded in Mongolia from sampling during 2002-2006. An illustrated key to identify these species, and the regional *C. japonica* Alexander, is presented. The two subspecies of *Diogma glabrata* (Meigen, 1818), *D. g. megacauda* Alexander 1931 and the nominotypical subspecies, are not supported as distinct.

INTRODUCTION

The crane fly families Tipulidae, Cylindrotomidae and Limoniidae (here including Pediciinae, which is sometimes elevated to family rank; Stary, 1992) make up the superfamily Tipuloidea with over 15,000 described species (Oosterbroek, 2005). Cylindrotomidae is a small family of about 70 species, with a fairly extensive fossil record from the Cretaceous; recent species are concentrated in the Holarctic and Oriental regions, with scattered species isolated in southern South America, New Guinea and Australia (Soos and Oosterbroek, 1992). Unlike most other Tipuloidea, the larvae of cylindrotomids feed on living plants, including mosses and higher plants. A discussion of the life histories of western Palaearctic species can be found in Peus (1952). In the Palaearctic fauna, the family can be distinguished by recent keys in Oosterbroek (2006) and Sidorenko (1999).

Crane flies (superfamily Tipuloidea) in Mongolia are composed of a primarily Palaearctic fauna, with groups of species with Central Asian, endemic Mongolian and disjunct distributions (between Mongolia and western Palaearctic or Palaearctic Far East) (Gelhaus and Podenas, 2006). Earlier work by us focused on surveying in the Lake Hovsgol region, with scattered samples from elsewhere in northern Mongolia, and resulted in description of ten new species of crane flies (Podenas and Gelhaus, 2000, 2001; Gelhaus, Podenas and Brodo, 2000).

Current sampling for crane flies in Mongolia is part of activities of The Mongolian Aquatic Insect Survey (MAIS), a multinational collaborative project between Mongolian, U.S.A. and European scientists, funded primarily by a grant from the U.S.A. National Science Foundation (Biotic Surveys and Inventories Program). Starting in 2002, this project has focused on documenting the species diversity of aquatic insects in Mongolia. Sampling in this first phase of MAIS (2003-2006) involves the Selenge River Basin watershed, building on earlier collaborative work in the Lake Hovsgol watershed (Goulden, Sitnikova, Gelhaus and Boldgiv, 2006). Sampling in 2003 focused on the Hentiy Mountains and surrounding environs, that in 2004 on the Hangai Mountains drainages, and in 2005 the lower drainages of the Selenge, and upper drainages of the Eg and Delger Moron Rivers. Sampling in 2006 focused on the upper Delger Moron drainages of the Selenge River and the adjoining Darhad drainage basin, part of the upper drainages of the Yenisey River. Further information on the project can be found in Gelhaus et al. (2006). In this paper we discuss the first discovery of the family Cylindrotomidae in Mongolia, represented by four species.

MATERIALS AND METHODS

Adult specimens were collected by aerial sweeping, Malaise traps, and hand collections; light traps that were run did not attract cylindrotomid adults. Further details on collecting sites can be found in Gelhaus et al. (2005) and unpublished field notes of the senior author (JKG) available at The Academy of Natural Sciences of Philadelphia (ANSP). Adult specimens were preserved both dry and in ethanol. Specimens to be preserved dry were killed and placed in envelopes in the field and mounted on their side on a paper point with legs generally surrounding the insect pin following guidelines of Byers (1961: 677-678). Many adult specimens were preserved in 70% or 95% ethanol. Genitalia were prepared and studied by immersing overnight in cold sodium hydroxide solution to clear tissue, then

preserving in glycerin or ethanol, along with the rest of the specimen; selected specimens were slide mounted in Euparol. Identifications of adults were made in comparison to type and reliably determined specimens, and published keys, illustrations and descriptions. Images of morphological characters were taken using Leica MZ dissecting and Leica DMRB compound microscopes outfitted with an Automontage imaging system. Illustrations are drawn by S. Podenas.

By agreement between the Mongolian Academy of Sciences (MAS) and ANSP, any primary types and a portion of other specimens are deposited in the collection of the MAS, Ulaanbaatar (Dr. Bulgan Namkhaidorj, curator), with other specimens deposited in the collection of ANSP and other non-Mongolian collections. A reference collection is also available in the joint MAIS/Hydrobiological Section Laboratory, Institute of Meteorology and Hydrology (IMH), Ulaanbaatar, Mongolia.

In the locality data presented, the Mongolian term "aimag" refers to a major political geographical division of the country comparable to a state or province.

"Gol" is the Mongolian term for a body of water, usually a stream or river.

Key to Mongolian and regional species of Cylindrotomidae

1 Four branches of M reaching wing margin (M1 and M2 separate), m-cu located distal to base of discal cell (Figs. 1, 2). 10th tergite of ovipositor with very long bifid dorsal lobe, apex of which nearly reaches tip of cerci (Fig. 9) .... ***Cylindrotoma*** Macquart (2)

— Three branches of M reaching wing margin (M1 and M2 fused), m-cu located at extreme base of discal cell or slightly before it (Figs. 3, 4). 10th tergite of ovipositor without long dorsal lobe (Figs. 10, 11) **4**

2 Dorsum of mesothorax with three dark longitudinal stripes and yellow interspaces (sometimes central stripe divided in two by narrow longitudinal yellow line) **3**

— Dorsum of mesothorax completely black, subopaque, with deep impressed longitudinal grooves .... ****Cylindrotoma japonica*** Alexander [*Species not yet found in Mongolia]

3 Abdomen light, brownish yellow. Penis of male aedeagus with three branches at apex (Fig. 5) .... ***Cylindrotoma distinctissima*** (Meigen)

— Abdomen dark, blackish. Penis of male aedeagus with five branches at apex (Figs. 6, 7) ....***Cylindrotoma nigriventris*** Loew

4 Thorax with lustrous surface. Wing clear. Two branches of R merge into wing apex, M1+2 and M3 clearly separate at base (Fig. 3). Hypovalve of ovipositor simple, without additional spine-like lobe on dorsal margin (Fig. 11) .... ***Diogma glabrata*** (Meigen)

— Thorax with matte surface. Wing pigmented, brownish. Three branches of R merge into wing apex, M1+2 and M3 having a point contact at base or even short common stem (Fig. 4). Hypovalve of ovipositor with additional spine-like lobe on dorsal margin (Fig. 10) .... ***Phalacrocera replicata*** (Linnaeus)

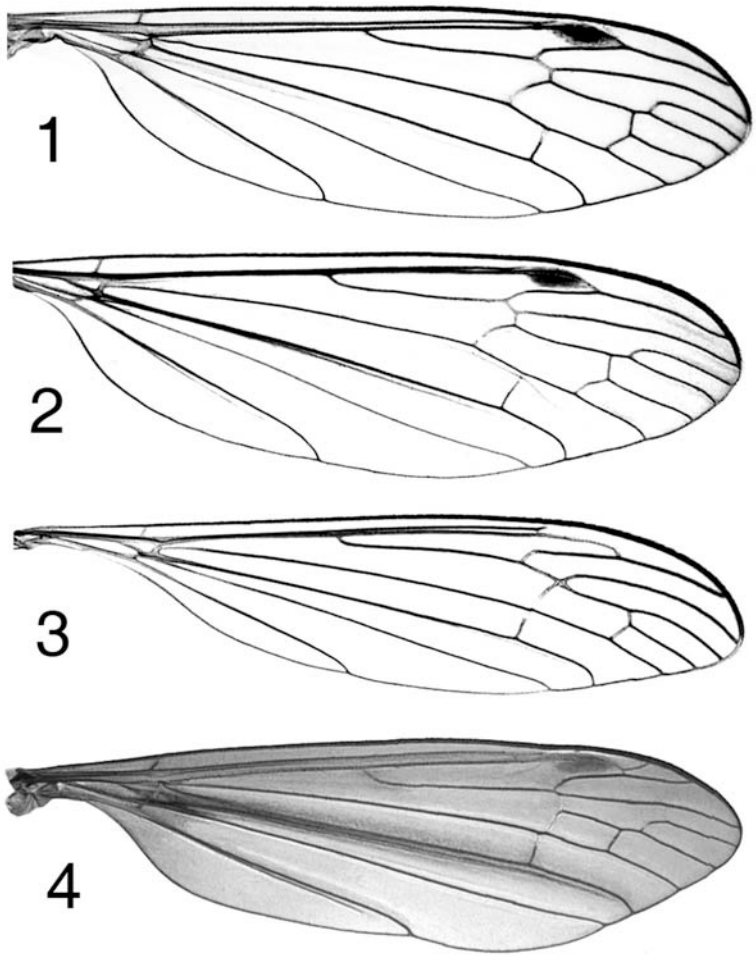
Cylindrotoma distinctissima distinctissima (Meigen 1818) Figs. 1, 5

Material Examined.—76 males and 57 females from Mongolia:

ARKHANGAY AIMAG, Tsenkher Soum, **Tsetseleg Gol** ~17 km SW of Tavanbulag, 47°26999 N, 101°80227 E, elevation 1684 m, 10-12.VII.2004, collector S. Podenas(SP), Selenge River Project Number (=SRP) SRP#04071002, 3 males, 2 females; same but collector J. K. Gelhaus (JG) field notes number JKG#958, 3 males, 2 females; same but collector Yadamsuren Oyunchuluun (YO), 1 male, 3 females. Chuluut Soum, **Chuluutin Gol** ~45 km SW of Chuluut/Jargalant, 47°21768 N, 99°92824 E, elevation 2471 m, 16.VII.2004, collector YO, SRP#04071602, 1 male, 1 female.

BULGAN AIMAG, Selenge Soum, **West Branch of Khartsain Gol**, 33.8 km WNW of Hyalgant, 49°65090 N, 103°88078 E, elevation 1480 m, 9.VII.2005, collector SP, SRP#05070802; 8 males, 3 females. Teshig Soum, **West Branch Tariakhtain Gol**, 49°70189 N, 103°80034 E, elevation 1432 m, 9.VII.2005, collector SP, SRP#05070901; 1 male. Teshig Soum, **Main Branch of Tariakhtain Gol**, 49°77796 N, 103°60863 E, elevation 1203 m, 9-10.VII.2005, collector SP, SRP#05070902; 4 males, 4 females; same but collector JG, JKG#1002, 1 female.

HOVSGOL AIMAG, **east side of Hovsgol Lake**, **Borsog valley**, Malaise trap in forest, elevation 1680 m, 18-21.VII.2002, collected Khishigbold; 1 female; same except riparian zone of Borsog Gol valley, Malaise trap, 18-25.VII.2002, collector YO, 1 male; same but forest edge in Borsog valley, Malaise trap, 18-25.VII.2002, collector YO; 3 males, 3 females. Same but **Noyon river**, 51°21008 N, 100°77897 E, VII.2004, collected B. Bazartseren, 1 female. Erdenebulgan Soum, **Emt Gol**, 33.2 km NW of Tarialyn, 49°87742 N, 101°82073 E, elevation 1496 m, 14.VII.2005, collector SP, SRP#05071302, 1 male. Chandmani-Ondor Soum, **unnamed tributary of Hohoo Gol**, 50°66022 N, 100°73886 E, elevation 1566 m, 18.VII.2005, collector SP, SRP#05071802, 4 males, 2 females; same but collector JG, 1 female. Buren Soum, **Delger Moron Gol**, 12.0 km km.

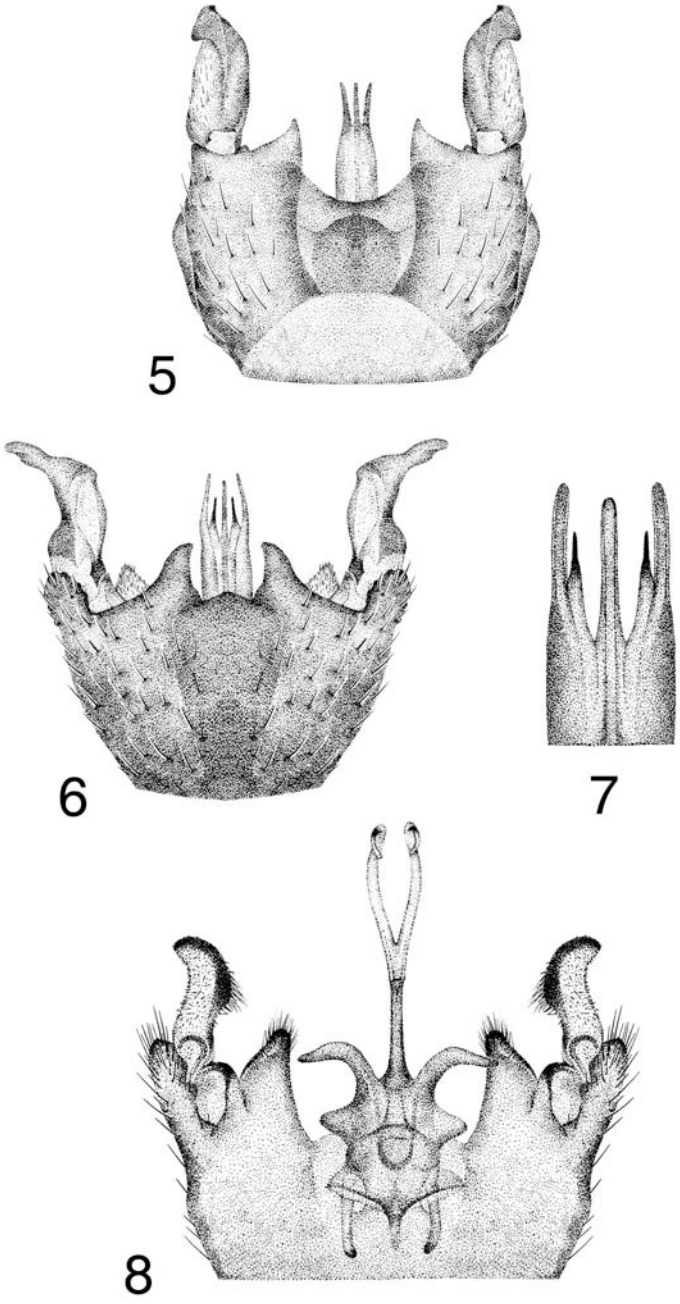


Figs 1–4: Wings of Mongolian Cylindrotomidae: 1, *Cylindrotoma distinctissima*. 2, *Cylindrotoma nigriventris*. 3, *Diogma glabrata*. 4, *Phalacrocera replicata*.

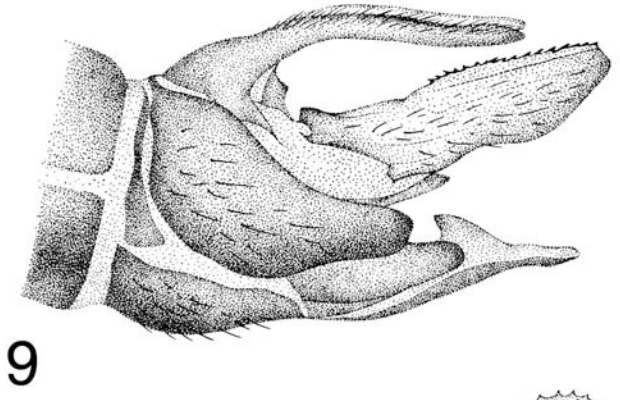
W of Moron, 49°62821 N, 99°99731 E, elevation 1277 m, 20-21.VII.2005, collector YO, SRP#05072001, 1 female.

OVORHANGAY AIMAG, Bat-Olziy Soum, **Ulaan Gol** ~93 km W of Khujirt, 46°73093 N, 101°88583 E, elevation 1894 m, 7.VII.2004, collector SP, SRP#04070702, 3 males; same but collector YO, 13 males, 4 females. Bat-Olziy Soum, **tributary of Ulaan Gol** ~92 km W of Khujirt, 46°72826 N, 101°89317 E, elevation 1941 m, 08.VII.2004, collector YO, SRP#04070801, 3 males, 4 females;

SELENGE AIMAG, Bugant/Yaroo Soum, **Khongiin Gol** at Yeroo Gol confluence, 49°08636 N, 107°30750 E, elevation 943 m, 18-19.VII.2003, collected SP, SRP#03071803; 3 males, 1 female; same but collector JG, JKG#921; 1 male, 3 females. Bugant/Yaroo Soum, **unnamed tributary of Ichilegiin Gol**, 8.5 km downstream of Yeroogiin Khaluun Rashaan, 49°06472 N, 107°47257 E, elevation 990 m, 19.VII.2003, collected SP, SRP#03071902; 1 male; same but collector YO, 2 females. Mandal Soum, **Aguit Gol**, 48°97025 N, 107°14252 E, elevation 1059 m, 18.VII.2003, collected SP, SRP#03071801; 8 males, 6 females; same but collector JG, JKG# 919, 6 males; same but collector B. Namkhaidorj; 1 female. Mandal Soum, **Bar Chuluu** at upstream bridge, c. 6 km above downstream bridge, 48°99356 N, 106°95023 E, elevation 1053 m, 20.VII.2003, collected SP, SRP#03072001; 1 female. Mandal Soum, **Boyant Go**l (trib. of Tunkhel Gol), 13.8 km



Figs 5–8. Structures of male genitalia of Mongolian Cylindrotomidae: 5, male genitalia of *Cylindrotoma distinctissima*, ventral view. 6, male genitalia of *Cylindrotoma nigriventris*, dorsal view. 7, tip of penis of *Cylindrotoma nigriventris*. 8, ventral portion of male genitalia of *Diogma glabrata*, dorsal view, ninth tergite removed.



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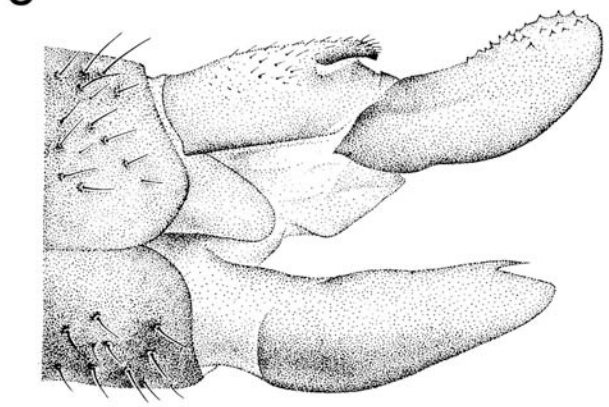

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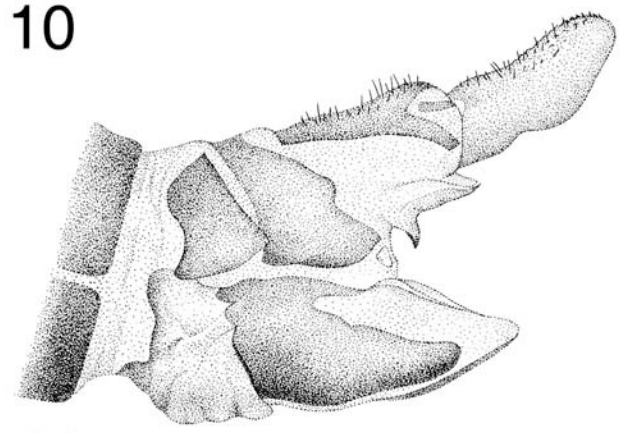

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Figs 9–11. Lateral views of ovipositors of Mongolian Cylindrotomidae: 9, *Cylindrotoma nigriventris*. 10, *Phalacrocera replicata*. 11, *Diogma glabrata*.

above town of Tunkhel, 2.0 km upstream of Shonkhor Camp, 48°67237 N, 106°87851 E, elevation 1078 m, shrubs along the river, 16-17.VII.2003, collected SP, SRP#03071602; 2 males, 2 females. Khuder Soum, **Zerlegiin Gol** c. 12 km E of Khuder, 49°73130 N, 107°63484 E, elevation 763 m, 24.VII.2003, collected SP, SRP#03072401; 6 females; same but collector YO; 1 male.

TOV AIMAG, Batsumber Soum, **Unnamed tributary of Segnogor Gol**, 14.3 km upstream of Segnogor Amralt, 48°43755 N, 107°03066 E, elevation 1255 m, among shrubs, 15.VII.2003, collector SP, SRP#03071501-A; 1 male; Batsumber Soum, **Segnogor Gol**, 15.VII.2003, collector JG, JKG#913, SRP#03071501-B, 1 male. Erdene Soum, Gorkhi Terelj National Park, **Terelj Gol** braid downstream of Terelj, 10.6 km N of Mungut Rock Road, 47°97944 N, 107°47761 E, elevation 1487 m, 05.VII.2003, collector YO, SRP#03070502; 1 female,

Distribution in Mongolia.—Arkhangay, Bulgan, Hovsgol, Ovorhangay, Selenge and Tov Aimags. The elevations of the above collections range from 763-1894 m.

Overall Distribution.—From western Europe, to Russian Far East (including Sakhalin) (Oosterbroek, 2005), also central Mongolia (this paper).

Habitat.—This species is the most commonly encountered cylindrotomid in Mongolia. Adults in Mongolia were found in wooded areas of larch (*Larix*), birch (*Betula*) and willow (*Salix*), in ungrazed or lightly grazed woodland understory vegetation, usually a mix of grasses and other plants including *Geranium, Astilbe, Allium*, and others (J. Gelhaus, field notes), The species was particularly abundant at localities such as at the Aguit Gol, Kongiin Gol and Tsetserleg Gol sites. Although the species was often collected in riparian areas, it was also found in forest on mountain slopes and ridges, such as at the Borsog Gol site.

Adults were collected from July 7-24, or nearly throughout the entire Selenge Project sampling period.

Larvae of this species have not been collected from Mongolia, but they are well known from Europe. They are terrestrial, developing in damp areas of shrubs and forests, usually living and feeding on higher plants and mosses, similar to habits of many lepidopteran larvae. The larvae are known to feed on a wide variety of monocot and dicot plants in the forest understory, such as *Stellaria*, *Anemone*, *Ranunculus*, *Caltha*, *Valeriana*, *Sanicula*, *Viola*, *Allium*, *Lapsana*, *Galinsoga*, as noted by Alexander (1920), Peus (1952) and Brinkmann (1991) for the nominotypical subspecies and Poinar and Gelhaus (2004) for the Nearctic subspecies, *C. d. americana* Osten Sacken, 1865.

Cylindrotoma japonica Alexander, 1919

Material Examined.— Holotype and type series (dry specimens); 1 male (labeled as Metatype by Alexander) Japan, Narikadake, Japanese Alps, 26.VII.1929, collected J. Machida (slide mounted).

This species was described by Alexander (1919) from Japan, but is also known from Sakhalin and Kuril islands, and has recently been found on the mainland in Primorskiy district of the Russian Far East (Pilipenko and Sidirenko, 2004). *C. japonica* has not yet been found in Mongolia, but could likely occur in the central and eastern part of the country. Overall habitus of the adult of *C. japonica* looks similar to *C. nigriventris,* but both species appear to be readily separated by the pattern of the mesothoracic dorsum (as noted in the key). *C. japonica* has a totally black dorsum without any stripes and with only deep impressed longitudinal grooves. *C. nigriventris* has three longitudinal black stripes on the thoracic dorsum (sometimes middle stripe is longitudinally separated by narrow yellow line into two) with the yellow interspaces with deep impressed longitudinal grooves. Male genitalia, especially the penis, of *C. japonica* resembles that of *C. distinctissima*.

Larvae of this species are unknown.

Cylindrotoma nigriventris Loew, 1849
Figs. 2, 6, 7, 9

Material Examined.—21 male, 11 females, 2 larvae and 2 male pupae from Mongolia:

BULGAN AIMAG, Selenge Soum, **West Branch of Khartsain Gol**, 33.8 km WNW of Hyalgant, 49°6509 N, 103°88078 E, elevation 1480 m, 9.VII.2005, collected SP, SRP#05070802; 1 male, 3 females. Teshig Soum, **West Branch Tariakhtain Gol**, 49°70189 N, 103°80034 E, elevation 1432 m, 9.VII.2005, collected SP, SRP#05070901; 1 female.

HOVSGOL AIMAG, **Borsog Gol**, Hovsgol GEF Project Camp, 50°96289 N, 100°72353 E, 1680 m, 17.VII.2002, collectors JG, JKG#878 & YO, 1 female. Hanh Soum**, Turag forest edge**, 51°17285N 100°48491E, Malaise trap, 14-21.VII.2003, collector YO, 1 male; Khankh Soum, **Noyon River**, 51°12361 N, 100°46477 E, elevation 1667 m, 28.VI.2005, collector SP, 14 males, 1 female; as preceding but 51°12600N 100°46768E, middle of July 2005, collector YO. 5 males, 2 females; as preceding but 2 larvae, 2 male pupae, V. Podeniene. Renchinlhumbe Soum, **Jaray Gol**, 33 km N Renchinlhumbe, N51°39865, E99°75060, elevation 1580 m, VII-2-3-2006, collector SP, SRP#06070203, 8 males, 3 females.

SELENGE AIMAG, Mandal Soum, **Aguit Gol**, 48°97025 N, 107°14252 E, elevation 1059 m, 18.VII.2003,

collector YO, SRP#03071801; 1 female. Khuder Soum, **Zerlegiin Gol** c. 12 km E of Khuder, 49°73130 N, 107°63484 E, elevation 763 m, *Salix* groves on riverside, 24.VII.2003, collector JG, JKG#931, SRP#03072401, scattered woodland surrounded by hummocky, grassy meadows, moderate size stream, 1 female,

TOV AIMAG, Erdene Soum, Gorkhi Terelj National Park, **Galtain Spring** 4.5 km upstream of road crossing, 48°18393 N, 107°96222 E, elevation 1649 m, 09.VII.2003, collector YO, SRP#03070901, 1 female; **Ulaanbaatar environs**, valley of Uliastain gol, N48°10505, E107°07754, elevation 1589 m, 18-VII-2006, collector SP, 2 males, 2 females.

Distribution in Mongolia.—Bulgan, Hovsgol, Selenge Aimags. The species occurred at elevations ranging from 763-1680 m.

Overall Distribution.—From Finland to western Siberia (Oosterbroek, 2005), also northcentral Mongolia (this paper).

Habitat.—This species is much less encountered than *C. distinctissima* in Mongolia. Adults of the two species co-occurred in a number of the above localities and in the same microhabitats, ungrazed and lightly grazed understory vegetation in broadleaf and coniferous forest (J. Gelhaus, field notes). Adults were collected from June 28-July 24, or throughout the entire Selenge Project sampling period.

Larvae of this species were previously unknown, but were reared for the first time during this Mongolia study, at Noyon Gol, Hovsgol Aimag, cited above. Larvae were found in forest, on ground, under leaf litter of *Salix sp*. and *Populus sp*. it is unclear what plants they fed on (Podeniene, field notes).

Discussion.—Adult general appearance and coloration of *C. nigriventris* resembles that of *C. japonica*, but both species can be easily separated according to the structure of the male genitalia, especially the shape of the penis, which has five apical branches in *C. nigriventris* and three in *C. japonica*.

Diogma glabrata (Meigen, 1818)
Figs. 3, 8, 11 – 20

Material Examined.— 3 males and 1 female from Mongolia:

SELENGE AIMAG, Bugant/Yaroo Soum, **Khongiin Gol** at Yeroo Gol confluence, 49°08636 N, 107°30750 E, elevation 943 m, birch forest and swampy ponds, 18-19.VII.2003, collector SP, SRP#03071803, 2 males.

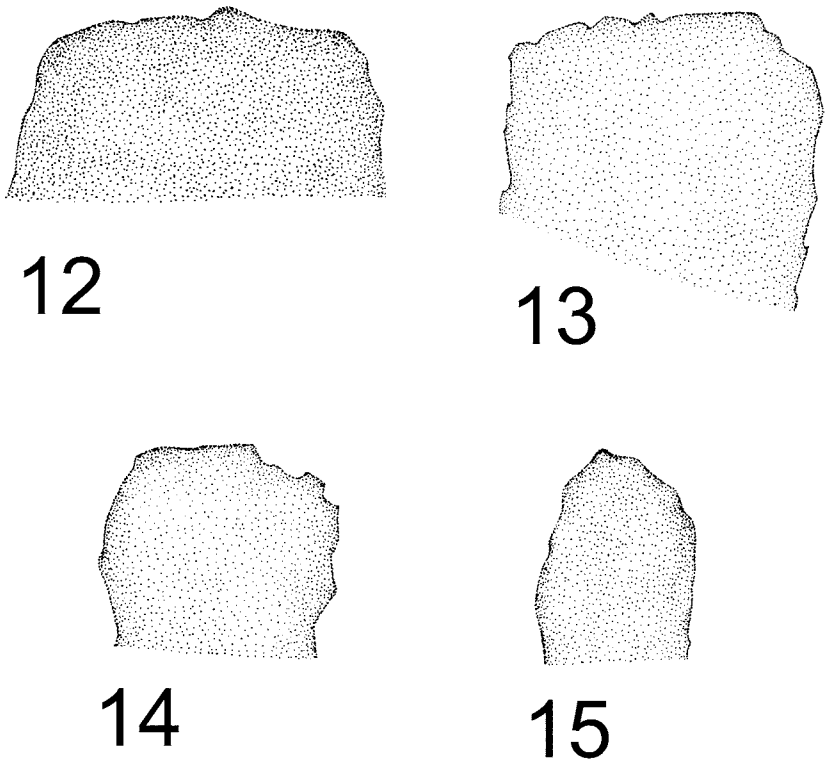
BULGAN AIMAG, Selenge Soum, **West Branch of Khartsain Gol**, 33.8 km WNW of Hyalgant, 49°6509 N, 103°88078 E, elevation 1480 m, small rivulet covered with dense and high *Salix* groves, 9.VII.2005, collector SP, SRP#05070802; 1 male, 1 female,

Alexander described the species as *Phalacrocera megacauda* Alexander (1931:349-350). Description was based on external features, such as body coloration, wing venation and comparative size of male genitalia. No "inner" structures of the male genitalia were mentioned or figured, and specimens he studied (now at the Smithsonian) have intact genitalia, without his typical slide mount preparation. Later, comparing *Diogma brevifurca* Alexander with other regional species, he moved the *P. megacauda* to *Diogma*, treating it as *Diogma glabrata megacauda* (Alexander) (Alexander, 1949: 196) and wrote that this subspecies is also known from Korea. Takahashi (1960), in a revision of Japanese Cylindrotomidae looked at the "inner" structures of male genitalia which had not been discussed in Alexander (1931). We assume Takahashi was trying to find additional morphological differences between *D. glabrata glabrata* and *D. glabrata megacauda*, as he found that the body and wing coloration of both "subspecies" were identical. He outlined differences between the two subspecies in two structures of the ninth tergite.

We compared these features of the ninth tergite among specimens from Mongolia and Lithuania identified by Podenas and Gelhaus, and with specimens from the Smithsonian Institution determined by C. P. Alexander. The posteroventral lamina of the ninth tergite of the male genitalia in the Mongolian specimens (Figs. 16 – 18) are as illustrated by Takahashi (1960: Fig. 2) for *D. g. megacauda* from Japanese specimens. This indicates that the Mongolian specimens are attributed to the subspecies *D. glabrata megacauda* Alexander, 1931. But we note that specimens from Lithuania (Figs. 19, 20) also show these same features, and yet they have been considered to belong to the nominotypical subspecies which occurs throughout Europe. Also, when rotating the male genitalia under the microscope of both Mongolian and Lithuanian specimens, it is possible to get similar views of the two character states used to distinguish between these two subspecies (Figs. 16 – 18), as is depicted by Takahashi for *D. glabrata glabrata* (Meigen) (1960: Fig. 3) and *D. g. megacauda* (cited above).

The other feature used by Takahashi for separation of the two subspecies is what he called the "projections of the 9th tergite" along the posterior margin of the tergite. He noted that "the upper margin of the projection of the 9th tergite more feebly serrate in the subspecies" (i. e. *megacauda*) than the nominate subspecies. From Figs. 12 – 15 we can see, that differences between the left and right projection of the *same* specimen from Lithuania (Figs. 14, 15) can exceed the differences Takahashi outlined for separating the two subspecies.

Therefore, features used by Alexander (1931) and especially by Takahashi (1960) for distinguishing the subspecies are very variable, and the degree of variation we ob-



Figs 12–15. *Diogma glabrata*. Projections of 9th tergite of male genitalia (medio-dorso-posterial view): 12, specimen from Mongolia. 13, specimen from Kaltanenai (Lithuania). 14, specimen from Kaisiadorys (Lithuania), left projection. 15, same specimen, right projection. All figures are of same magnification.

serve exceeds the distinctions outlined by the latter author. From Takahashi's figures it is clear, from the details of his specimens which he used to separate subspecies, that they are identical with those of European specimens. Based on this, we cannot support the validity of these two subspecies.

Distribution in Mongolia.—Bulgan and Selenge Aimags. The species occurred at elevations ranging from 943-1480 m.

Overall Distribution.—From Western Europe (including Great Britain), western Russia, Kurile Islands, Korea and Japan (Oosterbroek, 2005), also northcentral Mongolia (this paper).

Habitat.—This species is only known from two localities in Mongolia, and co-occurs at Khongiin Gol with two species of *Cylindrotoma*. The Khongiin Gol location included in the floodplain grassy pools in a birch (*Betula*) forest. The Khartsain Gol location is a small creek flowing through tall grass and logged *Betula*/*Larix* riparian forest, with numerous damp grassy depressions.

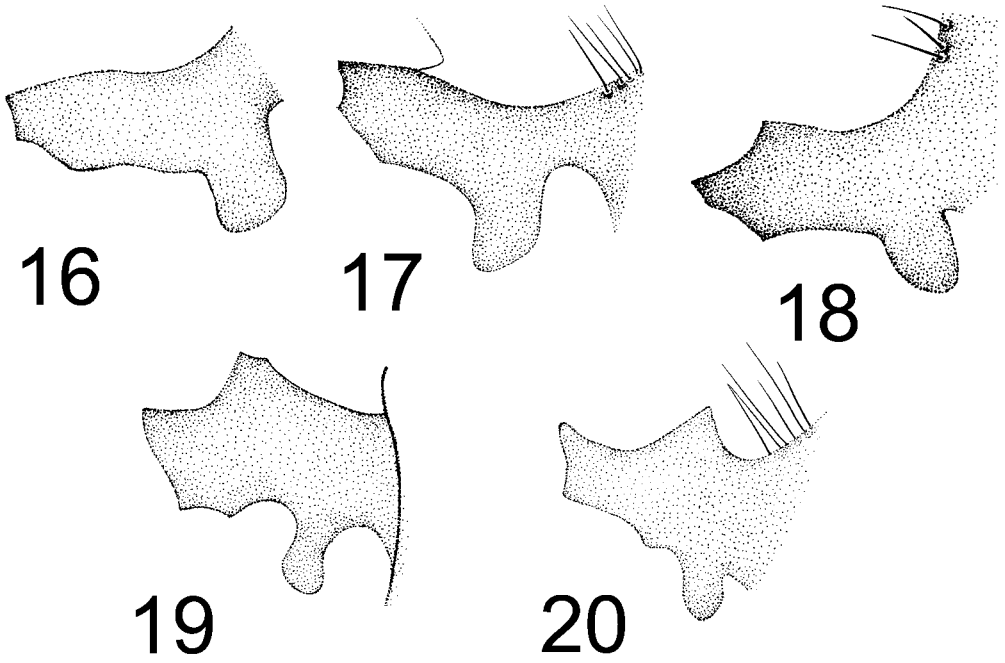
Larvae of this species have not been collected from Mongolia, but they are known from Europe. They are terrestrial, developing among shrubby and forested habitats, usually living and feeding on green mosses such as *Hypnum squarrosum* in wet, grassy spots in woodland (Alexander, 1920, Peus, 1952).

Adults were collected from July 9-19.

Phalacrocera replicata (Linnaeus, 1758)
Figs. 4, 10

Material Examined.— 9 males, 4 females, 1 larva, 7 pupae and exuviae from Mongolia:

BULGAN AIMAG, Teshig Soum, Main Branch of Tariakhtain Gol, 49°77796 N, 103°60863 E, elevation 1203 m, 9-10.VII.2005, collector SP, SRP#05070902, 1 female.



Figs 16–20. *Diogma glabrata*. Lamina at the base of the lower margin of the projection of 9th tergite, lateral view: 16, 17, 18, same lamina of specimen from Mongolia as seen from different angles. 19, specimen from Kaltanenai, Lithuania. 20, specimen from Kaisiadorys, Lithuania. All figures are of same magnification.

HOVSGOL AIMAG, Renchinlhumbe Soum, Ikh Turuugiin Gol, spring system and streams, 35 km NNE Ulaan Uul, N50°99268, E99°35406, elevation 1578 m, June 30-July 1, 2006, Collector SP, SRP#06063002, 5 males, 2 females; same but collector V. Podeniene, 4 males, 1 female, 1 larva, 2 female pupae, 3 female and 2 male pupal exuvia,

This species has been only recently found in Mongolia. It is well-known from the Nearctic and Westpalaearctic, and recently one larva attributed to the species was found in Siberia (Matafonov D.V., Matafonov P.V., Przhiboro, A.A., 2002). Discovery of these adults in Mongolia confirms the presence of *Phalacrocera replicata* in the Eastern Palaearctic. Although the species is rare in our sampling, its known propensity to be found in isolated places combined with a very short flying period, as is the case in Western Palaearctic, indicates to us that it may be far more widely distributed in Mongolia.

Distribution in Mongolia.— Bulgan and Hovsgol Aimags. The species occurred at elevations of 1203 and 1578 meters.

Overall Distribution.— From Western Europe (including Great Britain), western Russia, Transbaikalia (Oosterbroek, 2005), also northcentral Mongolia (this paper).

Habitat.— These localities in Mongolia include a fast flowing, fourth-order stream with a cobble bottom, surrounded by a forest of larch, birch and willow, and a dense herbaceous undergrowth (Gelhaus, field notes). It co-occured with another species of cylindrotomid, *Cylindrotoma d. distinctissima*.

The larvae are fully aquatic, known to develop in Europe in submerged mosses and plants such as *Hypnum*, *Fontinalis* and *Drepanocladus* and aquatic species of *Ranunculus* in pools and marshes (Alexander, 1920; Peus, 1952; Soos and Oosterbroek, 1992). Larvae and pupae were found for the first time in Mongolia during this survey, in saturated mosses surrounding a series of springs in the Darhad region of Mongolia (locality above SRP 06063002).

DISCUSSION

Although crane flies have been documented in Mongolia for nearly a century, only in the last decade has a focused sampling been carried out by crane fly specialists,

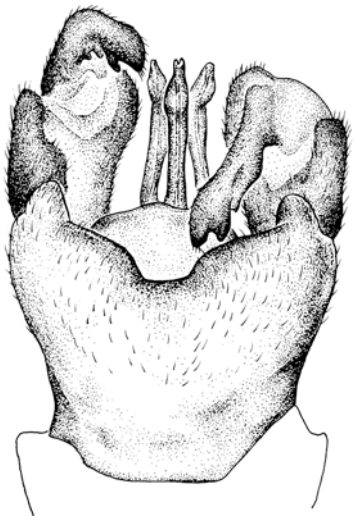


Fig. 21. *Phalacrocera replicata*, male genitalia, dorsal view.

first in the Hovsgol Lake Basin (Gelhaus and Podenas, 2006) and more recently, the entire Selenge River Basin, including Hovsgol. This effort by specialists is now documenting not only widespread or common species, but also those rarer in abundance, or more local in distribution, such as here with the first records of Cylindrotomidae for Mongolia. This current work in Mongolia is helping to clarify the distributions of north temperate species of crane flies, particularly determining the southern edges of distribution in the eastern Palaearctic. For example, the two species of *Cylindrotoma* in Mongolia have different southern distributions with *C. nigriventris* apparently not occurring in the central Hangai Mountains, while *C. distinctissima* is known from several sites in the Hangai Mountains over two aimags (provinces).

Other species like *Diogma glabrata* and *Phalacrocera replicata* show "disjunct" distributions from western Europe, possibly dating to the last glaciation period (about 12,000) when the Ural Mountains' glaciation formed a major barrier across the Palaearctic. But these disjunctions may prove to be illusory, with some of the species merely poorly sampled throughout an actual continuous Palaearctic range. We expect that some of the disjunct distributions indicated in Gelhaus and Podenas (2006) will over time prove to be continuous when more intensive sampling occurs in the eastern Palaearctic.

ACKNOWLEDGEMENTS

This research was conducted with funding from the U.S. National Science Foundation (# DEB-0206674. Survey of the Aquatic Macroinvertebrates of the Selenge River Basin, Mongolia). We thank Dr. Azzaya and the Institute of Meteorology and Hydrology and Dr. Clyde Goulden and the Lake Hovsgol GEF project for their collaboration, assistance, and use of resources. Equipment for digital imaging was supported from a National Science Foundation award (DBI-MRI #0116544) for digital imaging equipment at The Academy of Natural Sciences. Thanks also are given to all the participants in the Selenge River Project.

We additionally acknowledge the loans of the types of certain species from the Smithsonian Institution (NMNH, Dr. Wayne Mathis, Ms. Holly Williams); these loans were essential for understanding the species from the Hovsgol Lake region. We also thank Bazartseren Boldgiv, University of Pennsylvania (now at National University of Mongolia) for access to his collections of crane flies.

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