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A Guide to Mongolian Stoneflies (Insecta: Plecoptera)

SARAH W. JUDSON[1] & C. RILEY NELSON[2]

[1]*Department of Watershed Sciences, 5210 Old Main Hill, Utah State University, Logan, UT 84341, swjudson@gmail.com*

[2]*Department of Biology, 401 WIDB, Brigham Young University, Provo, UT 84602, rileynelson@byu.edu*

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Abstract

Since the early 1900s, efforts have been made to catalogue the stoneflies of Mongolia. Taxonomic work from 1960 to 1980 greatly expanded basic lists of stoneflies in Mongolia, but no comprehensive survey or synthesis of this dispersed literature has been completed. In conjunction with a modern survey of the aquatic insects of Mongolia, we collected Plecoptera on a series of expeditions to the Selenge (north) and Altai (west) regions of Mongolia. A total of 48 species distributed in 24 genera and 8 families were documented, including 3 of the 5 Mongolian endemics, 2 new species records for Mongolia, and 1 species new to science. The majority of the fauna is representative of the East Palearctic region. The 800+ specimen records were used to validate historical species lists, document species ranges with georeferenced localities, and create identification tools to be used by Mongolian and international researchers with a broad range of taxonomic expertise. These identification tools include a generic-level key to nymphs, species diagnoses, as well as known species range and predicted species range maps created using Ecological Niche Modeling. These tools are primarily intended for use by Mongolian scientists, sampling teams, and community water quality monitoring groups, as well as general use by researchers interested in biogeography, ecology, and water quality applications of Mongolian Plecoptera. With this work, we hope to equip Mongolians with the scientific resources to protect their valuable and vulnerable water resources.

Key words: Stoneflies, Plecoptera, Insecta, Mongolia, taxonomy, biogeography, GIS, water quality, biomonitoring

Introduction

The country of Mongolia is located in central Asia, bordered by Russia to the north and China along the remainder. Mongolia is the third largest country in Asia, covering 1,564,100 km2, an area approximately one-fifth the size of the United States. The country is divided into provinces ("aimags") made up of districts or counties ("soums"). Despite Mongolia's reputation as a desert steppe roamed by nomads and camels, the landscape is dotted by a number of major rivers and glacial streams that contribute to well-known water sources like Lake Baikal and the Yenisei River. In fact, the Selenge River of the Hovsgol region, contributes half of the inflow into Lake Baikal and has been noted as one of the main pollution sources contaminating the relatively pristine lake (Garmaeva 2001,

Stubblefield et al. 2003). Mongolia has the lowest population density in Asia, mainly due to the rugged terrain and relatively low density of streams making many areas highly vulnerable to drought. As a result of relatively low human impacts, Mongolian streams retain much of the biota that has been reduced in surrounding countries. However, the encroaching effects of grazing and mining threaten this biodiversity and general water quality. Thus, we are seeking to fully survey the aquatic fauna of Mongolia, and particularly the stoneflies (Plecoptera), to provide the necessary taxonomic and distributional information about these species to inform their conservation, policy, and other management decisions.

The stonefly fauna of Mongolia has been studied intermittently over the past century. Early specimens were incidentally collected by zoological and botanical expeditions and the stoneflies were primarily examined by Klapálek (1901, 1907, 1912, 1921, 1923). In the 1960s, Dr. Z. Kaszab of Hungary carried out another series of zoological expeditions in conjunction with the Mongolian Academy of Sciences. This survey amassed a large collection of stoneflies, at least 654 specimens in total (Raušer 1968). The Kaszab collections were the primary basis for subsequent taxonomic works by Joost (1970), Raušer (1968), Zhiltzova (1972, 1975, 1979, 1980, 1982, 1995, 2003, Zhiltzova & Zwick 1971, Zwick et al. 1971, Zhiltzova & Varykhanova 1984), and Zwick (Zwick & Surenkhorloo 2005, Zwick et al. 1971, Zhiltzova & Zwick 1971). Though Raušer initiated this work, Zhiltzova and her various coauthors can be credited with the bulk of the specimen determinations, new species descriptions, and taxonomic revisions related to Mongolia. These have been recorded primarily in a series of contributions to the Insects of Mongolia (Zhiltzova 1972, Zhiltzova 1975, Zhiltzova 1979, Zhiltzova 1980, Zhiltzova 1982). Her historical work, in Russia and adjacent countries (Zhiltzova 2003), has also made significant contributions to the knowledge of the biogeography of Mongolian stoneflies (1997, 2009).

Beginning in 1995, a more comprehensive survey of aquatic insects was initiated by the Academy of Natural Sciences of Philadelphia in collaboration with the National University of Mongolia and Mongolian Academy of Sciences. The intent of this survey is to not only catalogue the entirety of aquatic fauna including stoneflies, but also to actively involve native scientists in the process. This work has involved nearly yearly expeditions over the past 15 years to the northern and western areas of Mongolia, involving a number of taxonomic experts of aquatic groups from around the globe. For the first ten years, this survey was most concentrated in the Lake Khovsgol region and has been expanded west and south through the Altai mountains. In addition to this survey, other contemporary work on Mongolian stoneflies includes some small ecological studies done by native scientists in the Arctic Ocean drainage basin, specifically in the Khovsgol (Enkhtaivan 2005) and Khentii (Purevdorj 2001) regions. Most recently, an updated Plecoptera species list for Mongolia was released summarizing the noted historical work, these recent ecological studies, and some of our expedition's preliminary data (Surenkhorloo 2009).

Though most of the Plecoptera fauna has been recorded in the aforementioned publications, no single compendium complete with illustrations, identification keys, and distributions has been compiled for Mongolia. The lack of accessible taxonomic information has been noted as a bottleneck for the development of professional and volunteer biomonitoring programs in developing nations (Resh 1994, Morse et al. 2007). Native scientists especially lack easy access to historical publications, and the current state of Mongolian stonefly documentation in particular requires the comparison of many papers in various languages to assess the morphological similarities and differences between species recorded from Mongolia. Additionally, although general distributions of stoneflies have been noted (Surenkhorloo 2009), these are based on only a few locality records from historical expeditions, especially the Kaszab collection. Due to vague descriptions in field notes or labels and discrepancies between various translations of river names, exact localities are difficult to discern and lack latitude and longitude coordinates useful for mapping purposes. Herein, we update the current knowledge of Mongolian stoneflies by validating historical species lists with current records, documenting species ranges with accurate georeferenced localities and predicted distributions, and summarizing this information into identification tools including a pictorial guide and nymph key.

Materials and methods

Over the course of multiple years, the Mongolian Aquatic Insect Survey (MAIS) expedition team sampled the aquatic nymphs and terrestrial adults of Plecoptera in Mongolia as part of a larger project surveying the aquatic fauna of Mongolia (Gelhaus 2010). From 2003 to 2006, we collected throughout the Selenge River basin (Fig.1) (Namkhai 2004), followed by the Altai Mountains in 2008 to 2009. More recent sampling was done in the Uvs Lake drainage or other southern and western drainages in 2010 and 2011 (Fig.2), but this expedition was outside the scope of the original project and specimens have yet to be examined. Previous expeditions related to the current MAIS were done in the Selenge Basin from 1995 to 2002, and were previously known as the Selenge River Project (SRP) and other grant-specific expedition team names. On each expedition, as many sites as possible were sampled over the course of 3–4 weeks, usually in the month of July when the majority of rivers have been ice-free for a few months and temperatures are adequate for adult emergence. An average of 2–3 sites were visited each day and were restricted to rivers and water bodies that were accessible by road due to the size of our expedition crew and desire to perform a broad survey within a limited time window. We collected specimens for approximately 2 hours at each site using beating sheets, hand collecting, and sweep nets to collect adults and aquatic kick nets to sample nymphs. At overnight camping sites, Townes style Malaise traps were erected from dusk (approx. 7 pm) to mid morning (10 am or noon). All specimens are preserved in 70% or 95% EtOH.

Species-level identifications were made for all adult Plecoptera collected on expeditions from 2005 to 2009. In addition to these samples, we also confirmed the identifications of specimens from previous expeditions between 1995 and 2004 housed in the MAIS laboratory at the Institute of Meteorology and Hydrology (IMH) in Mongolia. We also made identifications for specimens from Mongolian collections housed at the BYU Monte L. Bean Museum (BYUC), the Slovenian Museum of Natural History in Slovenia, the Academy of Natural Sciences of Philadelphia (ANSP), Clemson University, the National University of Mongolia (NUM), and the Asia Foundation in Mongolia. Specimens from these collections were returned to their respective original depositories, along with a synoptic series compiled from our MAIS collection for reference where deemed applicable. Specimens preserved in 95% EtOH, and available for DNA extraction, are deposited at BYUC. All specimen records were added to the MAIS database which was built by author S. W. Judson to manage the expedition's samples and species identifications. An export of these records can be obtained from the authors upon request.

A potential species list for Mongolia was developed from literature on the fauna of neighboring countries and from historical records (Raušer 1968, Joost 1970, Zhiltzova 1972, Zhiltzova 1975, Zhiltzova 1979, Zhiltzova 1982). Identifications were based on illustrations in these annotated lists, individual species descriptions (Zhiltzova & Zwick 1971, Zhiltzova 1980, Zhiltzova & Varykhanova 1984), comparisons to previously identified specimens from the MAIS collection and the insect collection at BYUC, keys for the Palearctic Plecoptera (Lillehammer 1988, Zwick 2004, Sivec et al. 2005, Teslenko & Zhiltzova 2009), and the single Mongolia-specific key for the genus *Isoperla* (Zwick & Surenkhorloo 2005).

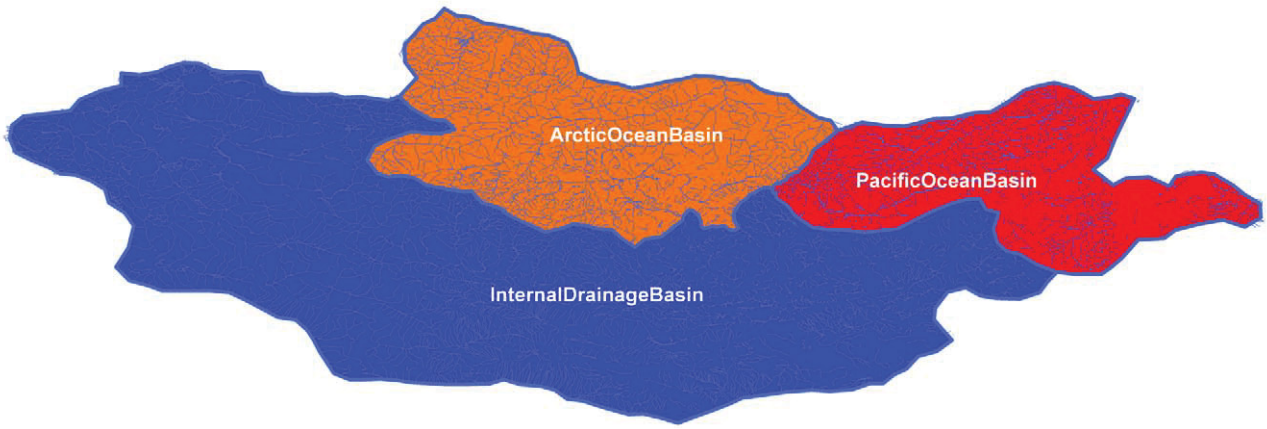

FIGURE 1. Drainage Basins of Mongolia. Three major drainage basins are recognized in Mongolia, the Arctic (alternatively called the Selenge River Basin), Pacific, and Internal, indicating the major oceans they drain to, or in the case of the Internal drainage basin, its lack of an outlet to the ocean.

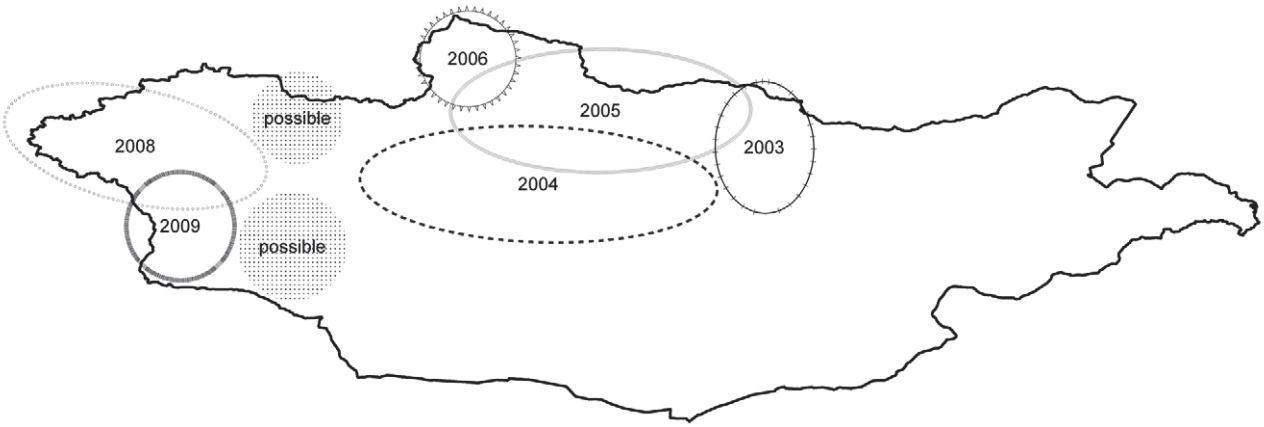

FIGURE 2. Map of Field Expeditions. The majority of specimens were collected in Central, North, and Western Mongolia from 2003 to 2009. Additional historical specimens come from the Selenge River Basin (Fig. 1) in the same area as 2005–2006 expeditions, as well as other scattered areas across the country with the exception of the south Gobi desert area.

In order to construct an illustrated field guide to Mongolian stoneflies, we photographed specimens where possible or produced illustrations based on historic publications. We photographed male and female structures, diagnostic features, and the habitus of whole specimens using Extended Focal Imaging (EFI). For each feature, multiple images were acquired using an Olympus MVX10 microscope with an attached Olympus DP70 camera and compiled into a single image using Microsuite Five software. Where EFI was not necessary to portray features with less depth of field, single photographs were taken with an Olympus SZX12 microscope with an attached Olympus DP11 camera. Photographs of live specimens were taken using Nikon D1X and D300 digital cameras. Field photographs were labeled with their species-level determination based on associated voucher specimens retained after photographing. Voucher specimens for images are stored in the BYUC insect collection. Adobe Photoshop CS4 was used to improve image quality and crop images to highlight relevant features. If specimens were not available, diagnostic features were illustrated based on available literature using Adobe Illustrator CS4. Unless otherwise noted, illustrations were adapted from Teslenko and Zhiltzova (2009). All images were compiled into species diagnoses and comparison pages. Species diagnoses are presented in Appendix 1. Comparison pages are available in Appendix A of Judson (2010) and can be accessed at http://contentdm.lib.byu.edu/ETD/image/etd3458.pdf.

Following identification of the adults, mature nymphs were initially identified based on occurrence with a known adult found at the same locality. To confirm identifications, we compared the nymphs to those of the same species from various localities and to illustrations in European keys to the nymphs (Lillehammer 1988) and various publications on Russian and Asian nymphs (Teslenko & Zhiltzova 2003, Zwick 2004, Sivec, Zhiltzova & Stark 2005, Teslenko & Zhiltzova 2006, Teslenko 2009, Teslenko & Zhiltzova 2009). We compiled various existing keys for Plecoptera nymphs of the Palearctic and Nearctic regions (Baumann et al. 1977, Lillehammer 1988, Zwick 2004, Stark & Stewart 2008) for use as a preliminary guide to identify commonly used diagnostic features. As we compared the nymphs, we determined appropriate diagnostic features at the family and generic level. With knowledge of these diagnostic features, we aided in editing a key to stonefly families (Bouchard 2009) and compiled a key to the genera of stonefly nymphs. When specimens were not available from Mongolia or not present in sufficient numbers for comparison, specimens within the same genus were acquired from BYUC, most of which were Nearctic species. Couplets that were not validated with specimens from Mongolia are indicated with a double asterisk (**).

For each family, genus, and species, a taxonomic treatment was written to accompany the photographs and keys. The taxonomic treatments contain information about the species, diagnostic features, and known distribution. The specific categories included were Synonymy, Diagnosis, Distribution (global, regional, and local), and Discussion. A complete synonymy including type locality is given for each species, compiled from the Plecoptera Species File database (DeWalt et al. 2012) and Zwick (1973). Global distribution was condensed from two recent papers on the zoogeography of stoneflies in and adjacent to Russia (Zhiltzova 1997, Teslenko 2009, Zhiltzova 2009). Regional and aimag (political state) distributions (Table 1) were assessed from our georeferenced data and supplemented by historical records (Surenkhorloo 2009) which lacked latitude/longitude coordinates. Species from historical records not sampled during our study are indicated with a ^ symbol, and records from our expedition that extended the known range of the species are indicated with a * symbol. Therefore, lack of any symbol indicates that we confirmed the historical record, often with multiple specimens and localities where the historical record was typically from a single locality. Documented distribution records were assigned to regional drainage basins: AOB=Arctic Ocean Basin, IDB=Internal Drainage Basin, POB=Pacific Ocean Basin (Fig.1); and to Aimags (political state): AR=Arkhangai, BO=Bayan-Ölgii, BR=Bayankhongor, BU=Bulgan, DA=Darkhan-Uul, DO=Dornod, GA=Gobi-Altai, KhD=Khovd, KhE=Khentii, KhG=Khövsgöl, OV=Övorkhangai, SE=Selenge, TO=Töv, UB=Ulaanbaatar, UV=Uvs, ZA=Zavkhan.

All species occurrences were georeferenced with associated latitude and longitude coordinates in decimal degree format and imported into ArcGIS. We created maps of the documented range of each species along with predicted areas of occurrence based on Ecological Niche Modeling (ENM). We employed ArcGIS version 9.3 to construct these two map types.

The documented range maps illustrate the known extent of species ranges primarily with data from MAIS (including SRP). The range maps were combined to compare the overlap of species ranges within a genus, over a backdrop of political boundaries, major rivers, and elevation. If there was only one species in a genus, a comparative range map was made with other species in the same family that were also monotypic. Each species map illustrates all point occurrences for a single species, its documented range, and its predicted ENM map.

To generate the predicted maps, we used a combination of ArcGIS software and Maxent (Phillips et al. 2006) to produce the ENM. The environmental rasters necessary for ENM model construction were obtained from the Hydro1k database (EROS 2009), the International Steering Committee for Global Mapping layers (ISCGM 2009), and the Worldclim bioclimatic datasets (Hijmans et al. 2005, Hijmans et al. 2009). All rasters were resampled to a cell size of 0.01 degrees (1.15 km resolution) with a cubic convolution algorithm for continuous variables and a nearest neighbor algorithm for categorical variables. A total of thirteen variables were selected from an initial 40+ based on evaluation of pairwise correlations of the layers. A single representative variable was chosen from groups of variables with Pearson Product-Moment correlations >r=0.80. These variables selected for ENM analysis included mean temperature, precipitation, elevation, flow accumulation, and vegetation. To account for our sampling restrictions limited to road-accessible rivers, we created a sampling probability file for use with Maxent's sampling bias feature. With the appropriately formatted occurrence, environmental, and bias data, Maxent was run under the default settings. Due to the low number of occurrence records all records were used for model building and none were withheld for validation. However, the maps were externally validated in ArcGIS by creating a map of known extent and testing Maxent predictions against this known map using 1000 iterations of 20 randomly generated points, which is congruent with the average number of occurrences per species in our data set.

TABLE 1. Summary of global, regional (drainage basin), and local (aimag) Mongolian Plecoptera species distributions with comparison to historical records. An asterix ("*") by a species name or "X" in a certain category indicates that we did not document that species in our survey or confirm its occurence in a particular region or aimag. In contrast, a caret ("^") by a species name or "X" in under a certain category indicates a new species record for Mongolia or range expansion beyond that historically documented. Acronyms for global categories follow Zhiltzova (2009): END=Endemic, HOL=Holarctic, AMP=Amphi-Pacific, TPA=Trans-Palearctic, EPA=Eastern Palearctic, ALT=Altain, CAS=Central Asian, RFE=Russian Far East. Regional acronyms: AOB=Arctic Ocean Basin, IDB=Internal Drainage Basin, POB=Pacific Ocean Basin.

Taxa	GLOBAL								REGIONAL		
Capniidae	END	HOL	AMP	TPA	EPA	ALT	CAS	RFE	AOB	IDB	POB
Capnia khulsbagia	X								X		
Capnia nigra				X					X	X^	
Eucapnopsis brevicauda *			X						X*	X*	
Isocapnia guentheri					X				X	X^	
Isocapnia kudia ^					X				X^		
Isocapnia sibirica					X				X	X*	
Mesocapnia altaica ^						X				X^	
Mesocapnia silvatica *	X								X*	X*	
Mesocapnia variabilis		X							X	X	
Chloroperlidae											
Alaskaperla longidentata					X				X		
Alloperla deminuta					X				X		X*
Alloperla joosti					X				X		
Alloperla mediata ^					X				X^		
Alloperla rostellata ^					X				X^		
Haploperla lepevanae					X				X	X	X*
Suwallia kerzhneri					X				X		
Suwallia teleckojensis					X				X	X	
Leuctridae											
Leuctra fusca				X					X		
Paraleuctra zapekinae					X				X		
Nemouridae											
Amphinemura borealis				X					X	X	X*
Amphinemura standfussi				X					X		X*
Nemoura arctica		X							X	X	X*
Nemoura cinerea				X					X^	X*	
Nemoura nigrodentata								X			X*
Nemoura sahlbergi		X							X		X*
Nemoura sp. ^	X								X^		
Nemurella pictetii				X					X		

.....continued on the next page

TABLE 1. (Continued)

Taxa	GLOBAL								REGIONAL		
Perlidae	END	HOL	AMP	TPA	EPA	ALT	CAS	RFE	AOB	IDB	POB
Agnetina brevipennis					X				X	X	X*
Agnetina cocandica							X		X	X	
Agnetina extrema					X				X	X*	X*
Kamimuria exilis					X				X	X*	X*
Paragnetina flavotincta					X				X	X*	
Perlodidae											
Arcynopteryx compacta		X							X	X	
Arcynopteryx polaris					X				X	X	
Arcynopterx sajanensis						X			X		
Skwala asiatica *	X								X*	X*	
Skwala pusilla					X				X*	X	
Diura bicaudata		X							X	X	
Diura majuscula					X				X	X	
Filchneria mongolica *							X				X*
Isoperla altaica					X				X	X	
Isoperla asiatica					X				X	X^	X*
Isoperla eximia									X		
Isoperla kozlovi					X				X	X*	X*
Isoperla lunigera					X				X	X	X*
Isoperla mongolica					X				X	X^	X*
Isoperla obscura				X					X	X	
Isoperla potanini	X								X	X	
Kaszabia nigricauda					X				X		X*
Pictetiella asiatica ^					X				X^		
Megarcys ochracea					X				X	X^	
Pteronarcyidae											
Pteronarcys reticulata					X				X		
Taeniopterygidae											
Taenionema japonicum					X				X	X	
Taeniopteryx nebulosa *				X					X*		
Total=54								Total Richness by Region:	51	32	16
								Historical Records Validated:	46	23	0
								Historical Records Unconfirmed:	5	9	16
								Range Expansions Documented:	6	6	0

Results

We documented a total of eight families, 24 genera and 48 species inhabiting Mongolia. Forty-two of these species confirmed 85% of the known historical records (49 species, modified from Surenkhorloo (2009)), leaving only six historical species unconfirmed. Some of these unconfirmed species have tenuous identifications for Mongolia based on only a few specimens (Table 1). Included in our 48 documented species are five new to Mongolia and one new to science. Mongolia supports a predominantly eastern Palearctic fauna. Of the 54 species historically or currently recognized for Mongolia, 29 species, just over 50%, are noted as having East Palearctic affinities (Zhiltzova 1997, Teslenko 2009, Zhiltzova 2009). A complete recording of the material examined is given in Appendix 2.

Although various expeditions have explored a diversity of aquatic habitats in Mongolia, including over 10 years of field work associated with our project, many of these expeditions have been limited to the summer months presumably missing some species known to emerge earlier in the year, especially Taeniopterygidae and Capniidae stoneflies. This observation is confirmed by two species we collected from the family Capniidae which are new records for Mongolia, indicating that our collections lack early season stoneflies that are otherwise well documented throughout the Palearctic. Both a male and female of *Isocapnia kudia* Ricker, 1959 (Fig. 56, 58) were collected at Arsayn Gol, 16.2 km N of Renchinlhumbe town. Another early season new species for Mongolia is *Mesocapnia altaica* (Zapekina-Dulkeit, 1955) (Fig. 67). We collected over 50 specimens, including nymphs, from 10 localities all in streams near Khoton Lake in the westernmost part of Mongolia. This species is characteristically brachypterous and endemic to the Altai Mountains, previously only known from Russia.

Another record new to Mongolia includes *Pictetiella asiatica* Zwick and Levanidova, 1971 (Perlodidae) (Fig. 283), which was collected on an earlier expedition in 1995 with 1 male and 2 females at the northern shore of Lake Khovsgol. Additionally, two species of Chloroperlidae, *Alloperla mediata* (Navás, 1925) and *A. rostellata* (Klapálek, 1923), were collected in the Khovsgol region at more than five localities each (Fig. 100, 104). Surenkhorloo (2009) listed these species as occurring in Mongolia based on personal communication. We provide the first confirmed locations for these two species (Appendix 2).

A total of five species remain known only to Mongolia since their discovery. From our survey, we add one undescribed *Nemoura* species to these endemics. The specimens were collected from Hugin Gol in 2006. The species will be described in a subsequent paper. More than 10 species of Plecoptera were originally described from type specimens collected in Mongolia. Of these, half are still considered endemic. These are *Capnia khubsugulica* Zhiltzova and Varykhanova, 1987, *Isoperla potanini* (Klapálek, 1923), *Mesocapnia silvatica* Raušer, 1968, and *Skwala asiatica* Zhiltzova, 1972. Others, like *Alaskaperla longidentata* (Raušer, 1968) and *Nemoura nigrodentata* (Zhiltzova, 1980), have been found elsewhere, typically in Russia, since their original discovery in Mongolia. A few are restricted to the Altai range, namely *Arcynopteryx sajanensis* Zapekina-Dulkeit, 1957 and *M. altaica*. Two other species, *Agnetina cocandica* (McLachlan, 1875) and *Filchneria mongolica* (Klapálek, 1901), have a slightly broader distribution beyond the Altai into Central Asia (Zhiltzova 2009, Teslenko et al. 2010).

Predicted distributions expand or clarify known species distributions. The predicted distributions indicate more specific areas within the documented range that are more likely for encountering a given species, generally corresponding to the known ecological restrictions of the species such as to high elevation streams or lowland rivers. Most distribution models successfully avoided placing species in the Gobi Desert (Fig. 42), which obviously lacks streams and is a major barrier for migration of species to and from Southeast Asian. Species that showed seemingly inaccurate moderate predicted occurrence (>0.5) in the Gobi are primarily lowland river specialists, namely *Agnetina* and *Pteronarcys*. As expected, the predicted maps showed areas of suitable habitat in the Uvs (northwest) and Khentii (east) regions, where we did not sample and where historical records exist. Where possible, we plan to use future specimens collected in these areas to expand analyses and validate predictions.

Discussion

Over the course of our survey of the stoneflies in Mongolia, we documented 48 species, the greatest number of species documented in any single survey of Mongolia. These documented species confirm the majority of historical records and extend the known range of most species. Our survey provides the first accumulation of georeferenced data for stoneflies in Mongolia as most historical collecting was done before the advent of GPS technology and

most species were previously known only from general locations (Surenkhorloo 2009, Teslenko 2009). It is suspected that more winter emerging species could be documented by sampling beginning in March or April, although access to much of Mongolia is severely limited by road conditions. It should be noted that July collections have yielded a greater-than-expected diversity of Capniidae and Taeniopterygidae considering the time of sampling and typical biology of these families. In particular, earlier sampling is projected to collect adult specimens of *Taeniopteryx nebulosa* (Linnaeus, 1758) which has been only documented in the easily diagnosed nymphal stage, but nevertheless unconfirmed by adult presence. In addition to variety in seasonal sampling time, sampling in the Uvs (northwest) and Khentii/Dornod (east) regions is needed to complete this survey and to extend species ranges, particularly in the eastern quarter of Mongolia.

Of particular interest are new species records for Mongolia, including one new to science. On the 2006 expedition to the west of Khovsgol Lake, we collected a presumed new species of *Nemoura.* The specimens were noted as superficially distinct from known *Nemoura*, namely *N. artica* Esben –Petersen, 1910 and *N. sahlbergi* Morton, 1896. Upon examination of the literature, we anticipated this species to be *Nemoura nigrodentata*, another Nemoridae endemic to Mongolia, described from the Khentii region by Zhiltzova in 1980. However, the epiproct illustrations did not fit the general shape of our specimens. The lack of a Russian translation of the paper precluded use of other diagnostic characters. We consulted with Dr. Peter Zwick who confirmed the novel nature of the species based on the uniqueness of both the cercal spines and the shape of the paraprocts (Zwick personal communication 2009).

A number of recent taxonomic revisions involve species from Mongolia. *Triznaka longidentata*, a species first described from Mongolia by Raušer (1968) as *Chloroperla longidentata* was recently moved to *Alaskaperla* (Zwick 2007). *Kaszabia spinulosa* was formally synonymized with *K. nigricauda* (Navás, 1923) (Zhiltzova 1979, Teslenko 2008), but a recent paper (Zwick & Surenkhorloo 2005) still employed the *K. spinulosa* name, perhaps indicating that this synonymy has not permeated popular use perhaps due to a lack of translation from the original Russian. Zwick and Surenkhorloo (2005) suggest that perhaps the genus *Kaszabia* should be synonymized with *Isoperla*, due to their close affinity with *Isoperl*a and particularly because the nymphs are indistinguishable (Teslenko 2008). Other relevant nomenclatural changes include *Isoperla potanini* (Zwick & Surenkhorloo 2005)—previously *Mesoperlina potanini—Arcynopteryx polaris* (Klapálek, 1912), previously *A. altaica* (Zhiltzova 1995);

Kamimuria exilis (McLachlan, 1872), previously *K. luteicauda* (Sivec et al. 1988); and *Skwala pusilla* (Klapálek, 1912), previously *S. brevis* (Zhiltzova 1982). These changes are important to note as a number of the specimens housed in Mongolia that we examined had identification labels that used the older synonyms.

A few species presented some taxonomic problems and historical discrepancies. Among these, *Diura majuscula* (Klapálek, 1912) is under scrutiny as a valid species. The designation of *D. majuscula* as separate from *Diura nanseni* was first suggested by Brinck (1949) who determined that males of *D. majuscula* were actually *D. nanseni* and females belonged to *D. bicaudata* (Linnaeus, 1758). Zhiltzova (1975) reversed this synonomy and again split *D. majuscula* from *D. nanseni* based on the shape of the subanal lobes and comparative body size. Most recently, C. H. Nelson (personal communication) has suggested that *D. nanseni* and *D. majuscula* are the same species based on the Brinck revision and original Klapálek (1912) illustrations (Nelson 2009), though in personal communication he indicated that he had not yet acquired an English translation of the Zhiltzova revision. We provided him with our translation of Zhiltzova (available from the authors upon request) and he is investigating the validity of *D. majuscula* based on egg morphology and other features with plans to use some of our Mongolian specimens. In our collections, to account for the possible validity of both species and their coexistence in Mongolia, we indicated on the identification labels possible superficially recognized morphospecies 1, 2, 3, with 3 being an intermediate between the 1 and 2. For now we recognize all specimens herein as *D. majuscula* for consistency with historical records in the area.

Other problematic taxa included several from historical records that we were unable to confirm. These include *Eucapnopsis brevicauda* Claassen, 1924*, Filcheneria mongolica, Isoperla maculata, Mesocapnia silvatica, Paraperla sp., Skwala asiatica,* and *Taeniopteryx nebulosa* (Linnaeus, 1758). The species *E. brevicauda* is readily accepted as present in Mongolia because of its distribution in areas, namely the Khentii region (Surenkhorloo 2009), and because of their morphological distinctness in comparison to other Mongolian Plecoptera. Likewise, *Filchenria mongolica* was recently documented by other researchers (Teslenko et al. 2010). However, the other species have never been historically collected in adequate numbers or in the most diagnostic life stages to allow

confident identification. Some of these species were briefly mentioned in an updated list on the stoneflies of Mongolia (Surenkhorloo 2009) without proper indication of their tenuous standing. For instance, *I. maculata* has only been documented as a single female, a record that was earlier called into question by Zwick and Surenkholoo (2005). Likewise, *Paraperla sp.* (which would also be a newly recorded genus for Mongolia) is known only from a single female, and only by personal communication in Surenkhorloo (2009), the specimen of which was collected by our expedition and identified by previous team members. When we acquired this specimen, we readily identified it as *Alaskaperla longidentata*. As such, *Paraperla sp.* and the previously mentioned *Isoperla maculata* are not included in our species list and diagnoses because of their unconfirmed status in Mongolia. In another case, *T. nebulosa* is documented only in the nymphal form (Zhiltzova & Varykhanova 1984), but this nymph has distinctive retractable coxal gills and dorsal abdominal processes giving a serrate appearance when viewed laterally (Zwick 2004). Because we lacked Mongolian adults, specimens from Sweden from the BYUC collection were used to depict the diagnostic features. Similarly, *Kamimuria exilis* is known only from female specimens in Mongolia (Zhiltzova 1975, Zhiltzova 1979), however, we collected a single female specimen on one of our expeditions and confirmed its identification as *K. exilis*, thus validating its presence in Mongolia.

Although the species *Skwala asiatica* has been documented as both males and females from the type locality (Zhiltzova 1972), the size and epiproct shape characters given to separate *S. asiatica* from *S. pusilla* are subtle (translation available from the authors upon request) and it is unclear if Mongolia has both species or if *S. pusilla* has been mistaken for *S. asiatica* or vice versa. Also, since the time of original description, this species has not been mentioned in the literature, including a noted absence in a summary paper concerning Perlodidae (Stark and Szczytko1988). Until all *Skwala* collected from Mongolia are available for comparison to one another, both species are assumed to be valid.

In a similar situation, we were not able to collect specimens of *Mesocapnia silvatica*, perhaps due to lack of spring/winter sampling although the type specimens were collected in late July. This species is strikingly similar to *M. gorodkovi* Zhiltzova and Baumann, 1985 and has some similarities to *M. altaica*, particularly in the epiproct, as well as shared female characteristics with *M. variabilis* (Klapalek, 1920). *Mesocapnia altaica*, however, is distinct from *M. silvatica* because it has long wings and *M. altaica* is brachypterous. Additionally, the epiproct of *M. silvatica* is longer and thinner in *M. altaica*. Multiple specimens of *M. variabilis* which we examined were misidentified as *M. silvatica* by multiple researchers, which leads us to believe that *M. silvatica* has been assumed to be the only *Mesocapnia* species from Mongolia, resulting in many misidentifications over the years. Also, we have documented *M. variabilis* from areas near the type locality and both *M. variabilis* and *M. altaica* in the Altai region, specifically Bayan Olgii aimag, where *M. silvatica* has been historically documented. As with *Skwal*a, until all specimens and the type specimens are examined, this species is assumed to be valid and present in Mongolia despite our preliminary evidence that *M. silvatica* may need to be synonymized into *M. altaica, M. gorodkovi,* or *M. variabilis* with more likelihood for the former two based on gross morphological similarity.

Only minor identification problems arose within the genus *Nemoura*. Currently, there are five species have been recorded from Mongolia. The females of these, as well as other Palearctic species, are relatively indistinct from one another with simple rounded subgenitial plates. Because confident identifications could not be made for lone females of *Nemoura*, they were omitted from all analyses and map construction. Also, Zhiltzova (1972) described a Mongolian subspecies of *N. arctica* Esben-Petersen, 1910 aptly called *N. arctica mongolica* Zhiltzova, 1972, which was not discriminated for the purposes of our study since no other taxa from Mongolia have recognized subspecies. Surenkhorloo (2009) erroneously counted both *N. arctica* and this subspecies as two distinct species, but the morphological differences are not sufficient to justify this elevation. As such, specimens identified as *N. arctica mongolica* were treated as *N. arctica* in ENM construction.

The majority of taxa were not difficult to identify as adults nor taxonomically problematic, but for some genera we did not have adequate specimens available for confident nymph association. As mentioned in the Materials and Methods, Nearctic congeners were substituted where possible to assess characteristics and take needed photographs. The following genera lacked nymphs from Mongolia and are noted in the nymph key with a single asterisk: *Eucapnopsis, Haploperla, Isocapnia, Kaszabia, Leuctra. Paraleuctra, Pictetiella, Taenionema,* and *Taeniopteryx*. Many of these nymphs are known to be rare or cryptic until just prior to emergence (Stark & Stewart 2008).

In regards to the biogeographic components of this study, this first compendium of georeferenced data and its resulting range and predicted maps provides baseline data about the distributions of Plecoptera species within Mongolia. These are an important reference for connecting the biogeography of the Palearctic and to make comparisons to range shifts in the future, in particular those that may result in response to climate change.

To produce stronger predictive ENM models, more analysis could be done on model comparisons between available softwares and environmental coverage combinations. More importantly, these models grow in their predictive ability with increased number of occurrences (50–100+). This is difficult given the short sampling season and difficulty in accessing Mongolian streams, but will likely be obtained for some species in the remainder of the NSF project (Namkhai 2004) and by utilizing the existing sampling sites of other expeditions to collect adult specimens. Additional specimen data could be integrated into our existing database.

It should be noted here that the use of ENM is currently controversial mainly due to their assumptions of niche conservatism (Wiens & Graham 2005, Lozier, et al. 2009) and the modeling techniques that are currently unable to consider local biological interactions and dispersal barriers (Araújo & Guisan 2006). Additionally, our data has a relatively low number of occurrences (usually less than 50) similar to the sample size in Papeş & Gaubert (2007), but low as compared to the large data sets (1000+) used for comparing model strengths. Furthermore, the use of ENM for stream ecosystems is still being explored (Iguchi et al. 2004, McNyset 2005, Cordellier & Pfenninger 2009) because of additional geographical constraints of riparian corridors and dispersal restrictions not fully accounted for by climatic and topographical measures. Despite these drawbacks, we believe that ENM is an important tool to produce expectations for species occurrences across a difficult to sample landscape such as Mongolia. The use of ENM is not intended as a wholesale acceptance of its assumptions but provides spatial hypotheses that can, and should, lead to additional validation studies using field sampling in predicted areas, genetics (phylogeography), and widely-used biomonitoring predictive models (Hawkins et al. 2000) for which our dataset with local water chemistry and environmental conditions is particularly equipped to do.

Conclusion

A stifling bottleneck in rapid bioassessment in developing countries is the dissemination of taxonomic information (Resh 1994). The role of researchers, then, is to provide training and scientific expertise (Savan et al. 2003). Our primary goals have been to train native researchers in field and laboratory methods, assess the stonefly fauna, and to provide identification keys for use by volunteers and researchers to confidently identify the aquatic insects found during water quality assessment.With this study, the initial taxonomic work on Plecoptera is complete and awaits integration with other aquatic groups. Furthermore, the range and predicted maps can help inform our decisions about what species and habitats are most important to protect in light of the potential effects of climate change. This will be particularly informative as Mongolians strugggle to protect their land from the effects of mining, grazing, and ultimately climate change. We hope that this chapter of our work will help preserve the native fauna of Mongolia and demonstrate cross-cultural research in developing countries.

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APPENDIX 1. SPECIES DIAGNOSES AND KEY TO THE NYMPHS OF MONGOLIAN PLECOPTERA

Key to Families of Nymphs

1. Finely branched gills present on thoracic segments (Fig. 3); finely branched gills present (Fig. 4) or absent on abdoen. 2
1'. Finely branched gills absent from thoracic segments, although single gills may be present on neck and thoracic segments (Fig. 5) or finely branched gills may be present on neck only; gills absent from abdomen. 3
2(1). Finely branched gills present on abdominal segments 1–2 (Fig. 4) in addition to thoracic gills (Fig. 3). . . . . **Pteronarcyidae**
2'. Finely branched gills absent from abdominal segments 1–2, but present on thoracic segments (Fig. 6). . . . . **Perlidae**
3(1'). Labium compact with three small notches (Fig. 7),paraglossa not extending anteriorly beyond glossa; labial palps robust (Fig. 7) 4
3'. Labium with deep notch and paraglossa extending anteriorly beyond glossa, labial palps slender (Fig. 8) 7
4(3). Length of tarsal segment 2 approximately equal to segment 1 (Fig. 9) . . . . . **Taeniopterygidae**
4'. Tarsal segment 2 shorter than segment 1 Fig. 10). 5
5(4'). Robust larvae (Fig. 11); extended hind legs reach about to tip of abdomen (Fig. 11); developing metathoracic wing pads strongly divergent from midline (Fig. 11, 12). . . . . **Nemouridae**
5'. Long, slender larvae (Fig. 13); extended hind legs far short of tip of abdomen (Fig. 13); metathoracic wings pads not strongly divergent from midline (Fig. 13, 14). 6
6(5'). Abdominal segments 1 –9 separated by membranous pleural fold (Fig. 15, 16) which is more apparent in later instars; nymphs typically more robust and sclerotized (Fig. 13) than Leuctridae nymphs. . . . . **Capniidae**
6'. Abdominal segments 7–9 without membranous pleural fold (Fig. 17); nymphs especially elongate and typically less sclerotized (Fig. 18) than Capniidae often making the pleural fold difficult to discern . . . . . .**Leuctridae**
7(3'). Cerci approximately ¾ the length of abdomen and directed medially (Fig. 19); outer margin of hindwing pads converging towards body axis and able to be circumscribed by an imaginary circle (Fig. 20); head and thoracic terga without distinct pigmentation (Fig. 20). . . . . **Chloroperlidae**
7'. Cerci as long or longer than abdomen and directed outward (Fig. 21); outer margin of hindwing pads diverging from body axis (Fig. 22); head and thoracic terga usually with distinct pigmentation (Fig. 22) . . . . . .**Perlodidae**

Capniidae

COMMON NAME: Small Winter Stoneflies.

SIZE: Small (5–10 mm).

FEEDING GROUP: Shredders.

TOLERANCE VALUE: 1 (Low).

DIAGNOSIS: Adults are usually dark brown to black in color, though some species are golden brown or faintly colored. Although wing reduction (Fig. 48) is common in this family, the majority of Mongolian species are macropterous. The adults, with the exception of the genus *Eucapnopsis*, have long many –segmented cerci with ≤16 cercomeres. The male epiproct is either very long and thin as in *Isocapnia* (Fig. 51), or short and wide as in *Capnia* (Fig. 33) or *Eucapnopsis* (Fig. 44). The female subgenital plate is usually little produced but heavily sclerotized in characteristic patterns. The nymphs are slender and elongate with the pronotum only slightly wider than the abdomen. Nymph abdominal segments 1–9 are separated by a membranous pleural fold (Fig. 15). The nymphal mouthparts exhibit the following combination of characters: mentum not covering the base of the lacinia (Zwick 2004), the paraglossa subequal to the glossa, and robust labial palps (Fig. 7).

DISCUSSION: Capniid nymphs are most common in small streams, including temporary streams and springs. The nymphs are relatively cryptic and often inhabit the hyporheic zone. When they inhabit the main stem of the stream, they are usually located in gravel or detritus in sections of fast or moderate flow. Most capniid stoneflies emerge during cold months. The adults are often visible on snow due to their dark color. Some species are found in temporary streams where they spend dry months burrowed down in the wetted substrate. The ecology of capniids in Mongolia is not well known and many species have only been documented in late July at higher elevations.

NYMPHAL KEY TO CAPNIIDAE GENERA FOUND IN MONGOLIA

1. Cerci with fringe of long lateral setae in addition to apical segmental whorls (Fig. 23), fringe especially prominent on distal segments (Fig. 24). . . . . ***Isocapnia*****
1'. Cerci with apical segmental whorls, but lacking fringe of lateral, intersegmental setae (Fig. 25, 26) 2

2(1'). Ventral comb of lacinia with greater than 30, even –length teeth (Fig. 27); only 13 –16 cercal segments (Fig. 28) . . . . . ***Eucapnopsis brevicauda*****

2'. Ventral comb of lacinia with 16 or fewer uneven –length teeth (Fig. 29); greater than 20 cercal segments, though often distal segments are damaged or missing (Fig. 30) . . . . . ***Capnia /Mesocapnia***

Capnia, Eucapnopsis

Capnia

DIAGNOSIS: Adults of Mongolian *Capnia* species, unlike others throughout the Holarctic, have a distinct two-part epiproct with a simpler lower section and a more varied upper section (Fig. 40). The epiproct tapers to an apical point which is more broadly rounded in the upper section than the lower. The female subgenital plate is not produced past the margin of sternum 8. In the center of the plate is a darkly sclerotized region, generally rectangular in shape (Fig. 41). The R vein in adult wings is curved anteriorly at its origin, whereas in most other capniid genera, besides *Mesocapnia*, this vein is straight. Nymphs are indeterminable to genus at this time since no consistent characters have been found to separate them from *Mesocapnia*; although, various hair characters have been proposed for discrimination (Stewart & Stark 2002). Within the Mongolian species, head coloration may be useful though we did not have enough specimens to makecomparisons between genera and species.

DISTRIBUTION—Global: Holarctic—**Regional:** AOB, IDB—**Aimag:** BO^, KhG, UB*, ZA.

DISCUSSION: Based on our collections, *Capnia* are relatively common in Mongolia compared to other capniids.

Eucapnopsis

DIAGNOSIS: This genus is characterized by particularly short cerci with fewer than 11 segments in adults and less than 15 in nymphs (Fig. 28). The male epiproct is short and stout (Fig. 44), especially in comparison to other Mongolian capniids and *Capnia* in particular whose epiproct is of comparable width but is much longer. Male sternum 9 has a vesicle (Fig. 45) with a structure similar to the ventral vesicles in *Isocapnia*. The female subgenital plate is membranous with two lateral sclerites that extend medially (Fig. 46). The lacinia of the nymph has 30 or more even—length teeth (Fig. 27), whereas other capniids have fewer teeth that vary in size along the length of the ventral comb (Fig. 29).

DISTRIBUTION—Global: Amphi-Pacific—**Regional:** AOB*, IDB*—**Aimag:** KhD*, SE*.

DISCUSSION: We did not document *Eucapnopsis* during our surveys, but the species *Eucapnopsis brevicauda* is known from the Eroo River (Surenkhorloo 2009).

Capnia khubsugulica Zhiltzova and Varykhanova, 1987

SYNONYMY

Capnia khubsugulica Zhiltzova and Varykhanova, 1987

TYPE LOCALITY: Mongolia: Lake Khovsgol.

DIAGNOSIS: Males and females are apterous (Fig. 36) with no wing remnants causing them to superficially appear nymph-like. This is in stark contrast to *C. nigra* which is macropterous (Fig. 38). The male epiproct of *C. khubsugulica* (Fig. 33) is composed of two portions (Fig. 34) that appear to be fused, whereas in *C. nigra* they are clearly separate (Fig. 40). The ventral portion of the epiproct in *C. khubsugulica* gradually tapers to a point and the upper portion has an indentation with dark scelerotization medially leading up to a broadly rounded tip. The female subgenital plate is truncate posteriorly and is strongly scelerotized medially, often forming a distinct dark rectangle (Fig. 35). The sclerotized region is more rounded anteriorly than in *C. nigra* (Fig. 41), and also more gradually fades from black to brown. The nymph of *C. khubsugulica* is unknown.

DISTRIBUTION—Global: Endemic to Mongolia—**Regional:** AOB—**Aimag:** KhG.

DISCUSSION: This species is endemic to Mongolia (Zhiltzova & Varykhanova 1987) and only known from the Lake Khovsgol region (Fig. 37) in the northern part of the country (Teslenko & Bazova 2009). *Capnia khubsugulica* is the only completely apterous stonefly species in Mongolia. *Mesocapnia altaica* and *Isocapnia*

guentheri (Joost, 1970) should not be confused with *C. khubsugulica*, because although both are often markedly brachypterous, males have at least hardened wing remnants approximately 1 mm in length.

Capnia nigra (Pictet, 1833)

SYNONYMY
Perla nigra Pictet, 1833
Capnia conica Klapálek, 1909
Capnia maynari Navás, 1917
Capnia apicalis Navás, 1930
Capnia nigra Zwick, 1972

TYPE LOCALITY: Switzerland

DIAGNOSIS: Both sexes of *C. nigra* are macropterous (Fig. 38). The male epiproct (Fig. 39) is composed of two separable portions (Fig. 40), with a simple ventral segment which gradually tapers to the apex. The upper portion is more complex with fluctuations in width and characterized by a bulge in the apical half,then quickly narrows to a blunt point. The female subgenital plate is slightly produced and has a strong scelerotized rectangle in the center (Fig. 41). The lateral edges of the sclerotized region are more starkly contrasting and demarcated than in *C. khubsugulica* (Fig. 35), with sharply defined corners especially at the anterior margin. The nymphal head and abdomen are punctuated with dark spots, including four spots anterior to the ocellus. The nymph metanotum has regular rows of minute setae, a diagnostic character that distinguishes it from other Palearctic *Capnia* that we examined.

DISTRIBUTION—Global: Trans-Palaearctic—**Regional:** AOB, IDB—**Aimag:** BO^, KhG, UB*, ZA.

DISCUSSION: *Capnia nigra* is the most widespread of the Mongolian capniids, both in terms of its entire Palearctic distribution extending to Europe as well as its frequency of occurrence and greater relative abundance in our sampling. We collected *C. nigra* in a variety of habitats, ranging from braided channel rivers at moderate elevations to small streams in mountainous areas.

Eucapnopsis brevicauda Claassen, 1924

SYNONYMY
Capnia brevicauda Claassen, 1924
Eucapnopsis brevicauda Neave, 1934

TYPE LOCALITY: USA: Boulder, Colorado.

DIAGNOSIS: Adults have characteristically short cerci (Fig. 43), typically with 5–6 segments but always fewer than 11 segments. The male epiproct is short and stout (Fig. 44), especially in comparison to other Mongolian capniids and *C. nigra* (Fig. 39) in particular. The male 9th sternum has a vesicle that is roughly the same color as sternum 10 and often only noticeable by its outline (Fig. 45), whereas the vesicles in *Isocapnia* are more strikingly contrasting and pronounced (Fig. 52). The female subgenital plate does not protrude beyond sternum 8 and is composed of two sclerites that originate near the lateral margins of sternum 8 and gradually taper toward the membranous middle of the segment (Fig. 46). Like the adult, the nymph also has short cerci, often with fewer than 15 segments (Fig. 28). Nymphal lacinia have many (30+) evenlength teeth (Fig. 27).

DISTRIBUTION—Global: Amphi-Pacific—**Regional:** AOB*, IDB*—**Aimag:** KhD*, SE*.

DISCUSSION: *Eucapnopsis brevicauda* is a widely distributed species in both the Nearctic and Palearctic (Zhiltzova 2001) but was not observed in Mongolia over the course of our study. However, the species was recently documented in a tributary to the Selenge River (Surenkhorloo 2009), the records of which are also mentioned by Teslenko and Bazova (2009).

There is some question of the identification of this species, as it might be confused with *E. stigmatica*. The most recent treatments of the genus as a whole (Zhiltzova 2003, Teslenko & Zhiltzova 2009) characterize the distribution of *E. brevicauda* as extending as far west as the Russian Altai Mountains. Thus Mongolia is within that

distributional range. Teslenko and Zhiltzova (2009) list *E. stigmatica* as occurring much further south in the Pamir, Tien Shan, and Karakoram ranges, some distance from Mongolia. Thus, based on general distributions, it is most likely that the species in Mongolia is *E. brevicauda*, rather than *E. stigmatica*. We have not seen any of the Mongolian specimens records to confirm this identification. As such, our photos of this species are based on Nearctic specimens readily available to us.

Isocapnia

DIAGNOSIS: Adults are dark brown (Fig. 48) often with golden-brown rugosites (mottled patterning) behind the eyes and on the pronotum (Fig. 50). The male epiproct is long and narrow (Fig. 51), especially in comparison to *Capnia* and *Mesocapnia*. The epiproct is often characteristically shaped at the apex, although this can only be seen at high magnifications. The male has a ventral vesicle extending from sternum 9 (Fig. 52), which is similar to the vesicle of *Eucapnopsis* (Fig. 45) but more darkly sclerotized in *Isocapnia*. The female subgenital plate often has diagnostic sclerotization patterns (Fig. 53, 58). The cerci of the nymph (Fig. 24) have long intrasegmental hairs in addition to shorter apical whorls. Later instar male nymphs have a posterior extension between the cerci encasing the developing epiproct.

DISTRIBUTION—Global: Holarctic—**Regional:** AOB, IDB—**Aimag:** AR, BU^, KhD*, KhG^, SE^, TO^, UB^, ZA.

DISCUSSION: The *Isocapnia* of Mongolia seem to be restricted to the Selenge (AOB) drainage (Fig. 49), with only a few specimens occurring in the eastern-most portions of the Internal Drainage basin. However, we suspect that this genus is more widespread due to the new record of *I. kudia* for Mongolia which demonstrates that members of this genus may be undersampled. Recently, the genus was revised by Zenger and Baumann (2004) and the Palearctic nymphs described and illustrated by Teselenko and Zhiltzova (2003).

***Isocapnia guentheri* (Joost, 1970)**

SYNONYMY

Capnia guentheri Joost, 1970
Isocapnia guentheri Zhiltzova, 1972

TYPE LOCALITY: Mongolia: Archangai [Arkhangai], Tamir River.

DIAGNOSIS: The male of *I. guentheri* is brachypterous (Fig. 50), whereas other *Isocapnia* males in Mongolia are macropterous (Fig. 55). The male epiproct (Fig. 51) is narrow and long, approximately the length of 2 abdominal segments. This trait is shared with *I. kudia* (Fig. 56), but is longer than the epiproct of *I. sibirica* (Zapekina-Dulkeit, 1955) (Fig. 61). The apex of the epiproct forms a beak-like shape, rounded at the tip and curved back to a point creating a subapical hook. In contrast, *I. kudia* has two points or hooks on the epiproct apex and *I. sibirica* has a truncate apex lacking additional processes. The vesicle of sternum 9 in males is narrow with prominent hairs at the apex (Fig. 52). Other *Isocapnia* have a more rounded vesicle with shorter or less pronounced hairs (Fig. 62). The female subgenital plate is deeply incised, although the sclerotized portion is flush with the preceding membrane (Fig. 53). The plate of *I. sibirica* is similar to *I. guentheri* in general shape and outline (Fig. 63), but the plate of *I. guentheri* is more uniform in color. Nymphs exhibit a central dark mark on the head and light coloring posterior to the eyes, whereas *I. kudia* is dark behind the eyes. The nymph of *I. sibirica* is currently unknown and unavailable for comparison.

DISTRIBUTION—Global: East Palaearctic—**Regional:** AOB, IDB—**Aimag:** AR, BU^, KhG^, SE^, TO^, UB^, ZA.

DISCUSSION: *I. guentheri* was originally described from Mongolia by Joost (1970). The species has since been documented throughout the Russian Far East (Zenger & Baumann 2004). It is the most widespread *Isocapnia* species in Mongolia (Fig. 54).

***Isocapnia kudia* Ricker, 1959**

SYNONYMY
Isocapnia kudia Ricker, 1959

TYPE LOCALITY: USSR: Siberia, Amagu, Kudia river.

DIAGNOSIS: The male epiproct (Fig. 56) of this species is elongate, approximately the length of 2 abdominal segments. The apex of the epiproct has two small hooks, one at the apex and one slightly farther down the shaft of the epiproct. In contrast, *I. guentheri* has one subapical hook and *I. sibirica* has none. The epiproct of *I. kudia* is also angular in cross section, whereas those of other *Isocapnia* are more cylindrical. The ventral vesicle of male sternum 9 is indistinct compared to other *Isocapnia*, forming a simple oval with peripheral hairs which match the body color (Fig. 57) and as such are often difficult to see. In our single male specimen collected from Mongolia, the vesicle was recessed (Fig. 57) but this character is likely not diagnostic. The female subgenital plate of this species is the most distinctive of Mongolian *Isocapnia*. The plate has two distinct medially directed lobes (Fig. 58) that partially enclose a membranous medial section. The nymph has a central dark mark on the head which continues into a dark area behind the eyes, where as *I. guentheri* has light coloration behind the eyes and the nymph of *I. sibirica* is unknown.

DISTRIBUTION—Global: East Palaearctic—**Regional:** AOB^—**Aimag:** KhG^.

DISCUSSION: This is the first documented occurence of *I. kudia* in Mongolia. It is otherwise well-known throughout the Palearctic (Zenger & Baumann 2004).

***Isocapnia sibirica* (Zapekina-Dulkeit, 1955)**

SYNONYMY
Capnia nigra sibirica Zapekina-Dulkeit, 1955
Isocapnia sibirica Zhiltzova, 2003

TYPE LOCALITY: Russia: Altai Mountains, Teletskoye Lake.

DIAGNOSIS: The male epiproct (Fig. 61) is half the length of the epiprocts in other *Isocapnia* species in Mongolia, only approximately the length of 1 abdominal segment, Its apex is truncate and bent at a 45 degree angle when viewed laterally. On the male, the ventral vesicle of sternum 9 is rounded and nearly circular (Fig. 62). The apical hairs of the vesicle are short but noticeable due to their dark color. The subgenital plate of the female is incised (Fig. 63) as in *I. guentheri* (Fig. 53), and in *I. sibirica,* the plate has pronounced medial sclerotization forming an "I" or "X" shape. The nymph of *I. sibirica* is unknown.

DISTRIBUTION—Global: East Palearctic—**Regional**: AOB, IDB*—**Aimag:** AR, KhD*, TO^, ZA*.

DISCUSSION: The few specimens we documented were located at moderate elevations ranging from 1500 to 1800 msl. We did not document this species in the Mongolian Altai mountains, just south of the type locality, though we suspect that it may reside there as supported by its known Palearctic distribution and medium probability of encounter in western Mongolia (Fig. 64).

Mesocapnia

DIAGNOSIS: The adults of this genus are generally dark brown to black in color (Fig. 65), with limited golden brown rugosites on the head and pronotum. The male epiproct (Fig. 68) is more slender than in *Capnia*, but wider than in *Isocapnia*. The epiproct is often variable in width from the dorsal view (Fig. 72, 77) and usually gradually tapers to a narrow pointed apex. The subgenital plates of females are simple, ovoid structures (Fig. 69) and lack the striking sclerotization patterns seen in *Isocapnia*. Nymphs are indeterminable to genus and cannot be consistently seperated from *Capnia*.

DISTRIBUTION—Global: Holarctic- **Regional:** AOB, IDB—**Aimag:** AR, BO, KhG, TO, UB*, UV*, ZA^.

DISCUSSION: The majority of specimens we collected were from elevations greater than 2000 msl. Some taxonomists debate the validity of this genus and suggest it be subsumed into *Capnia* (Zhiltzova 2003).

Mesocapnia altaica (Zapekina-Dulkeit, 1955)

SYNONYMY
Capnia vidua altaica Zapekina-Dulkeit, 1955
Mesocapnia altaica Zwick, 1973

TYPE LOCALITY: Siberia: Altai.

DIAGNOSIS: Adult males are brachypterous (Fig. 65, 67) and their average wing length is 1–1.5 mm. Females are also brachypterous but with longer wings than males, approximately 3–4 mm in length. The male epiproct usually extends to the anterior margin of tergite 9. It is relatively uniform in width (Fig. 68) from both the lateral and dorsal views, with a pronounced and abrupt tapering at the apex. Based on historical illustrations (Raušer 1968) (Fig. 72), the epiproct is most similar to that of *M. silvatica*, in which the epiproct is shorter and wider with more gradual tapering at the apex. The female subgenital plate forms a broad triangle (Fig. 69), whereas the plates of *M. silvatica* and *M. variabilis* are rounded at the apex (Fig. 79). Nymphs (Fig. 70) are indeterminable to genus or species.

DISTRIBUTION—Global: Sayan & Altai Mountains—**Regional:** IDB—**Aimag:** BO^.

DISCUSSION: This is the first documented occurence of *M. altaica* in Mongolia. The species is endemic to the Altai Mountains for which it is named. We collected nymphs (Fig. 70) concurrently with adults, but these were not reared to formally confirm association with adults.

Mesocapnia silvatica Raušer, 1968

SYNONYMY
Mesocapnia silvatica Raušer, 1968

TYPE LOCALITY: Mongolia: Ulan Bator, Nukht in Bogdo Ul.

DIAGNOSIS: Based on historical description and illustrations (Raušer 1968), males and females are macropterous. The male epiproct (Fig. 72) is shorter than that of *M. altaica* (Fig.68), extending only halfway across tergite 9. The dorsal profile of the epiproct is sinuate with a slight constriction near the midlength (Fig. 72) and the lateral profile is relatively uniform in width with an abruptly narrowing and upturned apex (Fig. 73). At the tip, the epiproct gradually tapers, whereas in *M. altaica* the tapering is more abrupt. Raušer (1968) describes the overall shape from the lateral view as that of a snipe (bird) head that is craned forward (Fig. 73). The female subgenital plate is broadly rounded (Fig. 74) similar to that of *M. variabilis* (Fig. 79) and the two species are difficult to separate as females although they can be readily distinguished from *M. altaica* which has a more triangular plate. The nymphs of this species are unknown.

DISTRIBUTION—Global: Endemic to Mongolia—**Regional:** AOB*, IDB*—**Aimag:** AR*, BO*, KhG*, TO*, UB*.

DISCUSSION: Raušer (1968) first described the genus *Mesocapnia* based on this species which is endemic to Mongolia. Our collections near the type locality only documented *M. variabilis* in that region but we need more extensive collecting to confirm presence, particularly near Ulaan Baatar in Bogd Khan and the headwaters of the Terelj River. Evaluation of the original type specimens and collecting earlier in the year at the type locality are needed to confirm the validity of this species.

Mesocapnia variabilis (Klapalek, 1920)

SYNONYMY
Capnia variabilis Klapálek, 1920
Mesocapnia variabilis Zwick, 1973

TYPE LOCALITY: North Siberia: Yakutsk, Jakutien.

DIAGNOSIS: *Mesocapnia variabilis* males and females are macropterous (Fig. 76), and therefore are

superficially similar to *M. silvatica*. The male epiproct has a pronounced swollen bulb towards the base (Fig. 77), which is visible from both dorsal (Fig. 77) and lateral (Fig. 78) aspect. The epiproct of *M. variabilis* narrows noticeably following the swollen bulb and then widens again before gradually tapering to a point (Fig. 77, 78). Other Mongolian *Mesocapnia* have epiprocts of relatively uniform width (Fig. 68), with the exception of narrow apices. The female subgenital plate is broadly rounded (Fig. 79) similar to *M. silvatica* from which it cannot be sepearated consistently. The nymphs are indeterminable to genus or species.

DISTRIBUTION—Global: Holarctic- **Regional:** AOB, IDB- **Aimag:** AR, BO, KhG, TO, UB*, UV*, ZA^.

DISCUSSION: Historical specimens of *M. silvatica* from previous MAIS expeditions that we validated were clearly *M. variabilis*. This continues to call the validity of *M. silvatica* into question.

Chloroperlidae

COMMON NAME: Green Sallies.

SIZE: Small to Medium (10–20 mm).

FEEDING GROUP: Predators.

TOLERANCE VALUE: 1 (Low).

DIAGNOSIS: Adults are bright yellow or green in life (Fig. 90), this color fading to a dull yellow when preserved (Fig. 81). Generally, size discrepancies can be used to separate the smaller Chloroperlidae from the larger Perlodidae to which they are most similar. Furthermore, wing venation can be used to distinguish the two families where chloroperlids have the second anal vein forked after it exits the anal cell, whereas in perlodids it forks before the anal cell and exits as two distinct veins. The epiproct of chloroperlid males is usually small and inflated at the apex (Fig. 105) and either folds back on itself (Fig. 93) or is directed towards the posterior (Fig. 123). The female subgenital plate often extends past the posterior margin of sternum 8 (Fig. 102). The body of nymphs is elongate with the pronotum only slightly wider than the abdomen. Nymphal wing pads do not diverge from midline and the outer margins can be circumscribed by an imaginary circle (Fig. 20, 88). The cerci of nymphs are shorter than the abdomen and often point more medially than laterally (Fig. 19) in preserved specimens. The paraglossae of the labium extend beyond the glossae and the labial palps are slender (Fig. 8).

DISCUSSION: Most Chloroperlidae nymphs are restricted to cool, clean, flowing waters often in mountainous areas. They are typically found among stones and gravel, but can also be located in leaf packs and snags.

NYMPHAL KEY TO CHLOROPERLIDAE GENERA FOUND IN MONGOLIA

1. Distal segments of cerci with intrasegmental hairs (Fig. 81); head and pronotum concolorous (Fig. 82) . . . . . ***Alloperla***
1'. Distal segments of cerci without intrasegmental hairs, although there may be long hairs extending from the apex of the segment (Fig. 83); head and pronotum with contrasting coloration pattern (Fig. 84) 2
2(1'). Nymph with thick pronotal stripe (Fig. 85), in addition to contrasting coloration on the head (Fig. 85). and abdomen (Fig. 87); rare. . . . . ***Haploperla lepnevae*****
2'. Nymph without thick pronotal stripe (Fig. 86), but with diagnostic contrasting coloration on the head (Fig. 86, Fig. 84) and a stripe on the abdomen (Fig. 87); common 3
3(2'). Pronotum, mesonotum, and metanotum with dense black hairs (Fig. 88); dark marking anterior to and between ocelli (Fig. 86) . . . . . ***Suwallia***
3'. Dorsal thoracic segments without dense black hairs, although visible lighter hairs may be present(Fig. 89); dark U-shaped marking bypassing through ocelli and bisected by a pale area anterior to the ocelli (Fig. 84). . . . . ***Alaskaperla*** *longidentata*

Alloperla

DIAGNOSIS: Adults often bright green in life (Fig. 90) and often lack the dark pigmentation characteristic of many other chloroperlids. All *Alloperla* species known from Mongolia, except *A. deminuta* Zapekina-Dulkeit, 1970, have a medial, dark, abdominal stripe (Fig. 96) which is thinner in comparison to other Chloroperlidae, particularly *Haploperla*. One species, *A. mediata* also has a narrow medial stripe on the pronotum (Fig. 100). The male epiproct is at least slightly swollen at the base (Fig. 101). Most species have ventral spines near the apex of

the epiproct, with the exception of *A. deminuta*. Female subgenital plates are typically triangular (Fig. 98), again with the exception of *A. deminuta* which has a small, subtriangular protrusion confined to the middle of the plate. Nymphs are concolorous (Fig. 82) and characterized by many long intrasegmental hairs on the distal cercal segments.

DISTRIBUTION—Global: Nearctic & East Palearctic—**Regional:** AOB, POB*—**Aimag:**AR, BU^, KhE*, KhG, OV^, SE^, TO^, UB, ZA.

DISCUSSION: All Mongolian species of this genus are well documented in the eastern Palearctic (Levanidova & Zhiltzova 1976, Teslenko & Bazova 2009), however MAIS collections documented two species previously unrecorded in Mongolia. *Alloperla* in Mongolia seem to be restricted to the Selenge River Basin (Fig. 91) and most commonly occur at elevations between 800 and 1500 msl.

Alloperla deminuta Zapekina-Dulkeit, 1970

SYNONYMY
Alloperla deminuta Zapekina-Dulkeit, 1970

TYPE LOCALITY: USSR/Siberia: Krasnojarsk, reservation "Stolbij", Mana River.

DIAGNOSIS: This species is characterized by it lack of pronotal and abdominal pigmentation (Fig. 92), whereas all other *Alloperla* from Mongolia have characteristic pigmentation (Fig. 100,). *A. deminuta* does have some faint pigmentation on the inner margin of tergite 10 forming a rectangular outline around the epiproct origin (Fig. 93), which *A. joosti* Zwick, 1972 lacks. Like *A. joosti* (Fig. 97), the base of the epiproct is narrow and not as greatly swollen (Fig. 109) as in *A. mediata* (Fig. 101) and *A. rostellata* (Fig. 105). In contrast to *A. joosti,* the tip of *A. deminuta*'s epiproct is pointed (Fig. 93) and without ventral spines. The epiproct is also shorter than in all other Mongolian *Alloperla*. The subgenitial plate of females is often difficult to discern due to lack of contrasting pigmentation (Fig. 94). The plate is flat with a small subtriangular protrusion in the middle that barely extends over sternum 8. In other species, this plate is more pointed and much longer, usually covering more of sternum 9. Nymphs are readily distinguishable at the generic level, but comparative material was insufficient to define characters for separating species.

DISTRIBUTION—Global: East Palearctic—**Regional:** AOB, POB*—**Aimag:** AR, BU^, KhE*, KhG, OV^, SE, TO^, UB.

DISCUSSION: *A. deminuta* is the most commonly encountered *Alloperla* species in Mongolia and is found predominantly in the Selenge River Basin (Fig. 95). This species is unique among Mongolian Chloroperlidae for its extreme lack of dark pigmentation.

Alloperla joosti Zwick, 1972

SYNONYMY
Alloperla joosti Zwick, 1972

TYPE LOCALITY: Mongolia: Arkhangai aimag, Somon Chencher at Urd-Tamir Gol.

DIAGNOSIS: This species characterized by reduced pigementation, with only a prominent dorsal abdominal stripe originating on segment 1 and continuing through segment 7 (Fig. 96). The majority of Chloroperlidae of Mongolia, including *A. rostellata* (Fig. 104) and *A. mediata* (Fig. 100), possess this abdominal stripe but usually have additional pigmentation. In *A. joosti,* the meso- and metanota have only faint pigmentation at their periphery and, similar to *A. deminuta*, *A. joosti* lacks pigmentation on the pronotum. The epiproct of *A. joosti* is recurved anteriorly, the anteriorly directed portion is slightly swollen at its base and after a brief constriction, is uniformly narrow (Fig. 97), with the length approximately four times the width. The apex of the epiproct is rounded (Fig. 97), whereas it is pointed in all other *Alloperla* (Fig. 93, 101). The epiproct of *A. joosti* has spines along the ventral margin (best seen laterally), similar to *A. rostellata*

(Fig. 104) and *A. mediata* (Fig. 100), but which *A. deminuta* lacks entirely. The female subgenitial plate of *A. joosti* (Fig. 98) is often difficult to discern due to lack of contrasting pigmentation. The plate gradually slopes to an abrupt point, forming a triangle with a broad base, and extends only slightly over sternum 8. The nymphs are readily distinguishable to the generic level and we did not have enough material to attempt species separation.

DISTRIBUTION—Global: East Palearctic—**Regional:** AOB- **Aimag:** AR, BU^, KhG^, OV^, SE^, TO^, UB, ZA.

DISCUSSION: This species was originally described from Mongolia (Zwick 1972) and has been documented throughout the eastern Palearctic (Teslenko & Bazova 2009), including additional collections in Mongolia (Zhiltzova 1982). Among Mongolian Chloroperlidae, the epiproct of *A. joosti* superficially resembles that of *Alaskaperla longidentata* (Fig. 111), but the epiproct of *Ala. longidentata* has no swollen base, is upturned, and very smooth on all sides especially lacking ventral spines.

Alloperla mediata (Navás, 1925)

SYNONYMY

Chloroperla mediata Navás, 1925
Alloperla alexanderi Nelson and Hanson, 1968
Alloperla mediata Zwick, Levanidova, & Zhiltzova, 1971

TYPE LOCALITY: Siberia: Vladivostok.

DIAGNOSIS: The pronotum of *A. mediata* has a characteristic dark medial stripe (Fig. 100), in addition to the abdominal stripe typical in most Mongolian Chloroperlidae. The anteriorly directed epiproct is short and pointed, composed of two portions, nearly subequal in width, which are separated by a pronounced constriction. This is in contrast to *A. rostellata*, in which the anterior portion of the epiproct is much wider than the base (Fig. 105). Numerous lateral and ventral spines on the epiproct are visible from the dorsal view, similar to *A. rostellata* but unlike in *A. joosti* where they are only visible laterally. From the lateral view, the epiproct is uniform in width, whereas in *A. rostellata* it is thinner near the tip. The female subgenital plate (Fig. 102) is a long, narrow triangle with a rectangular, parallel-sided base, extending nearly the entire length of sternum 9. *A. rostellata* has a similar shaped plate (Fig. 106), but it only extends slightly over sternum 8. The nymphs of Mongolian *Alloperla* are indistinguishable at the species level.

DISTRIBUTION—Global: East Palearctic—**Regional:** AOB^—**Aimag:** BU^, KhG^.

DISCUSSION: This species is a new record for Mongolia and specimens documented by our study were included in a preliminary checklist of Mongolian stoneflies (Surenkhorloo 2009). Predictive modeling suggests that this species will also be found in eastern mountains of Mongolia (Fig. 103).

Alloperla rostellata (Klapalek, 1923)

SYNONYMY

Isopteryx rostellata Klapálek, 1923
Chloroperla rostellata Illies, 1966
Alloperla rostellata Zwick, Levanidova, & Zhiltzova, 1971

TYPE LOCALITY: USSR: Irutsk.

DIAGNOSIS: The pronotum of this species is covered with darker reticulations (Fig. 104) that are sometimes faded. In some specimens, similar dark reticulations are also evident on the head, particularly in the anterior and occipital regions. The abdomen has a dark medial stripe (Fig. 104) which is somewhat wider than in other *Alloperla*. The base of the male epiproct is swollen and then constricted before greatly expanding (Fig. 105). Although the epiproct is superficially similar to that of *A. mediata* in terms of its overall shape and the presence of lateral and ventral spines, the anterior portion of the epiproct in *A. rostellata* is more broadly rounded and almost triangular in its outline (Fig. 105). From the lateral view, the epiproct is depressed dorsally and therefore thinner neat the tip, whereas in *A. mediata* is uniform in width. The female subgenital plate (Fig.

106) is parallel sided and rectangular at the base, then abrubtly narrows at a 90 degree angle and forms a triangle that extends about 1/3 the length sternum 9. The overall shape of the plate is similar to *A. mediata*, (Fig. 102), but that of *A. mediata* extends much further over sternum 9. The nymphs of this species, like all other Mongolian *Alloperla*, are unknown at the species level due to lack of comparative material.

DISTRIBUTION—Global: East Palearctic—**Regional:** AOB^—**Aimag:** AR^, BU^, KhG^, ZA^.

DISCUSSION: This species is a new record for Mongolia. Modeling predicts additional occurrences of this species in other moderate to high elevation regions. Like other Mongolian *Alloperla*, it is found primarily in the area near Lake Hovsgol and throughout the Selenge River Basin (Fig. 107).

Alaskaperla, Haploperla

Alaskaperla

DIAGNOSIS: This monotypic genus is distinguished by a continuous dark strip that extends from the pronotum through the tip of the abdomen (Fig. 110). Unlike *Haploperla*, adults do not also have dark markings on the head. The male epiproct is smooth, cylindrical, tab that is directed anteriorly (Fig. 111). The female subgenital plate completly covers sternum 9 (Fig. 112), is parallel sided, and truncate apically. The head of nymphs has a characteristic U-shaped dark pigmentation that bisects ocellar region (Fig. 113).

DISTRIBUTION—Global: Nearctic & East Palearctic—**Regional:** AOB—**Aimag:** AR^, KhG, OV^, SE^, TO^, UB*, ZA^.

Haploperla

DIAGNOSIS: A distinct, wide, brown stripe from head to 10th tergum is present in this monotypic genus in Mongolia (Fig. 115). *Alaskaperla* and many other Mongolian chloroperlids are similarly striped, but all lack the characteristic dark, central, head marking present on *Haploperla*. The male epiproct is short, flat, and forming a small triangle (Fig. 116). Female subgenital plate round and (Zwick 2007) barely protruding (Fig. 117). Nymphs have similar coloration (Fig. 118) to the adult. Nymphs are also characterized by unique hair features, with whorls of apical hairs on the cercal segments and long pronotal hairs on the posterior and anterior margins, but lacking or having sparse hairs along the lateral margin of the pronotum.

DISTRIBUTION—Global: Nearctic & East Palearctic—**Regional:** AOB, IDB, POB*—**Aimag:** AR*, BO, BU, DO*, KhE*, KhG^,SE^, TO, UB.

Alaskaperla longidentata (Raušer, 1968)

SYNONYMY

Chloroperla longidentata Raušer, 1968
Triznaka longidentata Zwick, 1972
Alaskaperla longidentata Zwick, 2007

TYPE LOCALITY: Mongolia: Ulan Bator, Nukht in Bogdo Ul, 1600 m.

DIAGNOSIS: General coloration yellow in life and pale when preserved (Fig. 110), with a solid brown stripe originating on the pronotum and resuming along the length of the abdomen. The male epiproct is dark along its entire length (Fig. 111). The epiproct is smooth and curved upward at the apex (Fig. 111), the dorsal edge appearing concave when viewed laterally. This general epiproct shape superficially resembles that of *Alloperla joosti* (Fig. 97), but in constrast, the epiproct of *A. joosti* is flat (not upturned), is swollen at the base, and has ventral spines near the apex which spines *Ala. longidentata* lacks entirely. The female subgenital plate (Fig. 112) is parallel-sided, is truncate apically margin, and has a broad depression in the apical third. The plate completely occupies sternum 8 and extends over 1/3 of sternum 9. The nymph is characterized by its head coloration (Fig. 113), with dark U-shaped marking that bisects the ocelli and is interrupted by an anterior pale marking on the frons which continues to the labrum.

DISTRIBUTION—Global: East Palearctic—**Regional:** AOB—**Aimag:** AR^, KhG, OV^, SE, TO^, UB*, ZA^.

DISCUSSION: This species was recently placed in *Alaskaperla* (Zwick 2007) but was originally described from Mongolia by Raušer (1968). *Alaksaperla longidentata* has a strong superficial resemblance to members of the Mongolian *Alloperla*, particularly similar to *A. mediata* in general coloration and to *A. joosti* in the epiproct shape, however *Ala. longidentata* is unique in its combination of coloration and epiproct shape with both a pronotal strip and a narrow recurved epiproct. In historical specimens that we reidentified, females of *Ala. longidentata* were commonly confused with *S. teleckojensis* (Šamal, 1939) (Fig. 128), but can be readily distinguished by its more rectangular shape and lack of basal scelerotization.

Haploperla lepnevae Zhiltzova and Zwick, 1971

SYNONYMY
Haploperla lepnevae Zhiltzova and Zwick 1971

TYPE LOCALITY: USSR: Amur Basin, River Khor.

DIAGNOSIS: Body coloration is very pale to white when preserved in alcohol (Fig. 115), but bright yellow in life (Fig. 108). In contrast to this light body color, a wide, nearly continuous, dorsal, black stripe runs from the head through the 9th abdominal tergum (Fig. 115). The male epiproct is a simple, dark triangular tab with an anteriorly directed point (Fig. 116). Similar to *Alaskaperla longidentata* (Fig. 111), the epiproct is darkly colored even from the base, however, the epiproct of *H. lepnevae* is unmistakably shorter and more triangular than *Ala. longidentata*. The female subgenital plate is round, but small, barely protruding, and only noticeable by its faint outlines (Fig. 117). The coloration of the nymph (Fig. 118) resembles that of the adult, with a dark central mark and pronotal stripe which continues on the abdomen.

DISTRIBUTION—Global: East Palearctic—**Regional:** AOB, IDB, POB*—**Aimag:** AR*, BO, BU, DO*, KhE*, KhG^,SE^, TO, UB.

DISCUSSION: In Mongolia, *H. lepnevae* is most commonly found in mid-elevation, mid-size streams and is predicted to occur in similar elevations in the eastern mountains (Fig. 119). It should be noted that preserved specimens of *H. lepnevae* are strikingly similar in coloration to *Isoperla lunigera* (Klapálek, 1923) (Fig. 331) with which its actual and predicted range overlaps. Although the species are readily distinguishable in life, faded preserved specimens should be scrutinized because despite their similar dark markings on their heads, they can be readily distinguished by differences in pronotal and abdominal coloration, as well as obvious epiproct characteristics.

Suwallia

DIAGNOSIS: The general color of species in this genus is yellow in both life and when preserved in alcohol (Fig. 120), with dark pigmentation in the ocellar triangle, dark antennae, thin medial and peripheral stripes on the pronotum, U-shaped markings on the meso- and metanota, and a wide medial abdominal stripe extending most of the length of the abdomen. On males, setose finger-like medially-directed hemitergal processes originate from segment 10 (Fig. 123). The unhinged, knob-like epiproct (Fig. 123) is distinct from all other Chloroperlidae. The female subgenital plate covers sternum 8 and gradually narrows to a rounded or truncate apex (Fig. 124), covering much of sternum 9 as well. The nymphs exhibit distinct dark pigmentation (Fig. 129) between and anterior to the ocellar region, and have dense dark hairs in patches on thoracic sterna.

DISTRIBUTION—Global: Nearctic & East Palearctic—**Regional:** AOB, IDB—**Aimag:**AR, BO, BU^, GA^, KhD, KhG, OV^, SE, TO, UB*,UV*, ZA.

DISCUSSION: Suwallia is the most common genus of Chloroperlidae in Mongolia and is found in a large variety of habitat types. Detailed species descriptions and SEMs are given in Alexander and Stewart (1999).

Suwallia kerzhneri Zhiltzova and Zwick, 1971

SYNONYMY
Suwallia kerzhneri Zhiltzova and Zwick, 1971

TYPE LOCALITY: Mongolia: Ara-Khnagay (Arkhangai) aimag, 25 km west-southwest of Ikh-Tamir, flood-plain of the Khoyt-Tamryn-Gol river, 30-VIII-1967. Type depository: Zoological Institute, Russian Academy of Sciences, St. Petersburg, Russia.

DIAGNOSIS: *Suwallia kerzhneri* has light yellow body coloration with a darkly rimmed pronotum with a thin medial stripe, dark U-shaped markings on the meso- and metanota, and a dark, longitudinal abdominal stripe that usually extends through tergum 10 (Fig. 122). In general the coloration is similar to *S. teleckojensis* (Fig. 126), but *S. kerzhneri* has thinner medial stripes on the pronotum and abdomen (Fig. 122). The medially directed hemitergal processes (Fig. 123) of the male are flattened throughout and pointed at the apex, in contrast to *S. teleckojensis* which are cylindrical and rounded. The hemitergal processes of *S. kerzhneri* often appear slightly twisted causing them to be directed more anteriorly. The epiproct knob has long hairs only along the posterior margin (Fig. 123), leaving the central region bare. The female subgential plate is laterally incised at the base with the posterior end forming a broadly rounded process that covers all of sternum 9. The plate is darkly sclerotized on its truncate apex, in contrast to *S. teleckojensis* which instead has dark basal scelerites (Fig. 128). The nymph is unknown.

DISTRIBUTION—Global: East Palearctic—**Regional:** AOB—**Aimag:** AR, KhG^, SE^, TO, UB*, ZA.

DISCUSSION: This species was originally described from Mongolia (Zhiltzova & Zwick 1971) and is now known throughout the eastern Palearctic (Levanidova & Zhiltzova 1979). In Mongolia, it is a rare species relative to *S. teleckojensis* with which it is morphologically similar and often occurs sympatrically (Levanidova & Zhiltzova 1979). Phylogenetic anlaysis indicates that this species shares a recent common ancestor with *S. teleckojensis* (Zwick, Levanidova & Zhiltzova 1971). ENM modeling suggests that this species is likely to occur farther east in Mongolia (Fig. 125).

Suwallia teleckojensis (Šámal, 1939)

SYNONOMY
Alloperla teleckojensis Šámal, 1939
Suwallia teleckojensis Zwick et al., 1971

TYPE LOCALITY: Original type destroyed (Zwick, Levanidova & Zhiltzova 1971), paratypes recognized from Russia in the Baikal region.

DIAGNOSIS: The pronotum is light with a well-defined brown band around the periphery of the pronotum and a dark medial stripe (Fig. 126), both of theses dark areas being thicker in comparison to *S. kerzhneri* (Fig. 122). The dark abdominal stripe of *S. teleckojensis* is wide and typically terminates at the posterior margin of sternum 8 (Fig. 126). Males have medially directed hemitergal processes (Fig. 127) which are cylindrical in cross section, not flattened or pointed as in *S. kerzhneri* (Fig. 123). The knob of the male epiproct (Fig. 127) is completely covered with fine hairs, as opposed to that of *S. kerzhneri* which only has hairs along its margins (Fig.123). The female subgential plate with dark basal sclerites where it is broadly joined at abdominal segment 8 (Fig. 128), and not basally incised as with *S. kerzheri* (Fig. 124). The plate gradually tapers and extends to the posterior margin of sternum 9. The head of the nymph has distinct dark pigmentation between and anterior to the lateral ocelli (Fig. 129), extending throughout the frons and labrum.

DISTRIBUTION—Global: East Palearctic—**Regional:** AOB, IDB—**Aimag:** AR, BO, BU^, GA^, KhD, KhG, OV^, SE, TO^, UV*, ZA^.

DISCUSSION: Levanidova and Zhiltzova (1979, 1976) attribute the restriction of *S. teleckojensis* to mountains in the southern reach of its range and to foothill rivers in the northern reach as a product of the species inability to adapt to climate change. Likewise, our field collections were restricted to higher elevations and our ENM model indicates that *S.teleckojensis* is not expected to occur in non-mountainous regions (Fig. 130).

Leuctridae

COMMON NAME: Needleflies.

SIZE: Small (6–10 mm).

FEEDING GROUP: Shredders.

TOLERANCE VALUE: 0 (Low).

DIAGNOSIS: Adult slender and dark brown in color with wings rolled around the abdomen (Fig. 135). Nymph elongate (Fig. 18) with pronotum only slightly wider than abdomen. Abdominal segments 7–9 without membranous pleural fold (Fig. 17). Paraglossa and glossa subequal, bordered by robust labial palps.

DISCUSSION: Leuctridae nymphs usually occur in smaller streams and prefer microhabitats of gravel interstices and detritus in areas of swift current. Nymphs are not commonly collected except when they are close to emergence.

NYMPHAL KEY TO LEUCTRIDAE GENERA FOUND IN MONGOLIA

1. Labial palps long, extending well beyond the tip of the labium (Fig. 131); abdominal terga with a posterior fringe of short setae independent of long intrasegmental hairs (Fig. 132). . . . . ***Leuctra fusca****
1'. Labial palps shorter and nearly equal in length to labium (Fig. 133); abdominal terga without a posterior fringe of setae (Fig. 134) . . . . . ***Paraleuctra zapekinae****

Leuctra, Paraleuctra

Leuctra

DIAGNOSIS: The coloration of *Leuctra* adults is generally brown, although it sometimes fade to light brown to pale orange when preserved. Males are easily recognized by two paired sclerotized processes (Fig. 138) on the dorsal side of the abdominal segments. The subgenital plate of the female with three lobes (Fig. 139), one more recessed than the other two. Nymphs are characterized by relatively longer palps in relation to labium (Fig. 131), as opposed to *Paraleuctra* which has short palps not surpassing the labium. Nymphs with many short setae on the posterior margin of each abdominal tergum (Fig. 132), which *Paraleuctra* lacks.

DISTRIBUTION—Global: Holarctic, especially common in Europe—**Regional:** AOB **-Aimag:** SE, TO*, UB*.

DISCUSSION: It is interesting to note that the distribution in Mongolia is limited to the north central aimags, despite intense collecting further west. If the species *L. fusca* (Linnaeus, 1758) is conspecific with European populations, then the connection must be further north of Mongolia, in Russia rather than across Asia at the same latitude.

Paraleuctra

DIAGNOSIS: *Paraleuctra* adults are dark brown in color and very slender (Fig. 135). The cercal segments of males are heavily modified, surrounding the simple short epiproct which is oriented perpendicular to the body (Fig. 143). The female plate is bilobed and protrudes off the body (Fig. 144). Nymph have palps subequal to the glossae (Fig. 133), as opposed to *Leuctra* which has long palps. Nymphs lack short setae on the posterior margin of abdominal tergites (Fig. 134) which *Leuctra* nymphs possess.

DISTRIBUTION—Global: Holarctic—**Regional:** AOB—**Aimag**: SE, TO.

DISCUSSION: The genus *Paraleuctra* is richer in the Nearctic than the Palearctic. It is interesting that this points to connections east across Beringia while the distribution of *L. fusca,* which is similar in placement and extent to *P. zapekinae* Zhiltzova, 1974*,* is to the west, Europe. More collections from this range are warranted.

Leuctra fusca (Linnaeus, 1758)

SYNONYMY

Phryganea fusca Linnaeus, 1758
Perla cylindrical de Geer, 1778
Leuctra klapaleki Kempny, 1898
Leuctra fusciventris Stephens, 1836
Leuctra carpentieri Despax, 1945
Leuctra fusca Illies, 1955

TYPE LOCALITY: Sweden: Fahlun.

DIAGNOSIS: When preserved, the body of *L. fusca* is light brown with orangish tint (Fig. 137). The male has paired sclerotized processes on the 6th and 7th abdominal tergites (Fig. 138). The process on the 6th tergite has two parallel lobes that point caudally, whereas those on the 7th tergite are directed medially. Rather than a prominent epiproct, the male has multiple paraproct styles and other structures which appear as simple, thin rods at the tip of the abdomen (Fig.138). The female subgenitial plate is trapezoid shaped with two posterior lobes that are clearly delineated from a broadly rounded shallow central lobe (Fig. 139). The nymph has long palps, extending past the labium (Fig. 131), as opposed to *Paraleuctra zapekinae* which has short palps not surpassing the labium (Fig. 133).

DISTRIBUTION—Global: Trans-Palaearctic- **Regional:** AOB—**Aimag:** SE, TO*, UB*.

DISCUSSION: This species is common in Europe where much work has been done on its biology and ecology. The species was first documented in Mongolia by Joost (1970).

Paraleuctra zapekinae Zhiltzova, 1974

SYNONYMY

Paraleuctra zapekinae Zhiltzova, 1974

TYPE LOCALITY: Russia.

DIAGNOSIS: Overall, *P. zapekinae* adults are dark brown and slender (Fig. 141). Cercal segments of the male are heavily modified, into upper and lower prongs that surround the epiproct and appear to interlock. The epiproct is a relatively simple short appendage that tapers slightly at the apex (Fig. 142). When viewed laterally, the epiproct is perpendicular to the body (Fig. 143). The female subgenital plate has distinctive black markings at the base and on the medial surfaces of the posterior lobes (Fig. 144). Unlike *Leuctra fusca*, the female plate does not have an additional central shallow lobe (Fig. 139), though the two posterior lobes are still clearly divided. Nymphal palps are subequal to the labium (Fig. 133), as opposed to *L. fusca* which has long palps (Fig. 131).

DISTRIBUTION—Global: East Palaearctic—**Regional:** AOB—**Aimag:** SE, TO.

DISCUSSION: *Paraleuctra zapekinae* was only recently recorded from Mongolia (Purevdorj, Muehlenberg & Slowik 2003), but is also known from areas in Russia immediately north of Mongolia (Levanidova & Zhiltzova 1979). Levanidova and Zhiltzova (1979) report a March flight period, which may be why collections in Mongolia during the summer have been sparse.

Nemouridae

COMMON NAME: Forestflies.

SIZE: Small to medium (5–20 mm).

FEEDING GROUP: Shredders.

TOLERANCE VALUE: 2 (Low).

DIAGNOSIS: Adults are dark brown in life, with distinct "X" vein pattern at the cord of the wing Nymphs are generally stout, golden to dark brown in color, and appear hairy (Fig. 146). Some genera have gills present on the neck (Fig. 146) between the thorax and head which are sometimes retained as shriveled remnants in adults. Nymphal wings pads diverge greatly from midline (Fig. 12). Tarsal segment 2 is much shorter than segment 1(Fig. 10). Mouthparts (Fig. 7) with subequal paraglossa and glossa and with robust labial palps.

DISCUSSION: Nemourids are most common in small coldwater streams, but they can also be found in larger rivers and lake edges. They are usually found in leaf packs, roots, and snags. Most nemourids emerge in late spring and summer although some emerge in the fall.

NYMPHAL KEY TO NEMOURIDAE GENERA FOUND IN MONGOLIA

1. With branched cervical gills (Fig. 146) . . . . . ***Amphinemura***
1'. Without gills (Fig. 147) 2

2(1'). Tarsal segments 1 and 3 subequal (Fig. 148); posterior margin of abdominal tergites with four long setae, two of which are at least three times longer than other intercalary hairs (Fig. 149). . . . . ***Nemurella pictetii***

2'. Tarsal segment 3 two to three times longer than segment 1 (Fig. 150); posterior margin of abdominal tergites with many short setae of equal length (Fig. 151). . . . . ***Nemoura***

Amphinemura, Nemurella

Amphinemura

DIAGNOSIS: In life, adult coloration is dark brown over the entire body with dull gray wings (Fig. 152), often fading to light golden brown in alcohol preservation (Fig. 159). The epiproct is more elongate and held farther off the abdomen (Fig. 156) than found in *Nemoura,* though the shape is variable from species to species. Paraprocts of the male are divided into three lobes, as opposed to *Nemoura* and *Nemurella* which have two. The middle lobe, which is the longest, is subequal to and about half the width of the cercal segments, whereas in *Nemurella* the longest lobe is significantly longer than the cercal segment and very slender. Sternum 8 of the female is well sclerotized and a second process on sternum 7 is parabolic and slightly overlaps sternum 8 (Fig. 157). The nymphs are densely pilous, with especially long hairs along the entire pronotal margin. Nymphs have four long 5-branched cervical gills, whereas no other genera from Mongolia have gills of any sort although other genera may have gill-like nubs on the lateral margins of the cervical sclerites. Gill remnants occur variably in adults, some species retain filamentous extensions while others only exhibit stubs indicating location of gill insertion.

DISTRIBUTION—Global: Holarctic—**Regional:** AOB, IDB, POB*—**Aimag:** AR, BO, BU, DO*, KhD*, KhE*, KhG, OV^, SE, TO*, UB, ZA^.

Nemurella

DIAGNOSIS: Adult coloration is typically dark to golden brown in life and when preserved. Male are most readily distinguished by the cerci which form a triangle around the genitalic structures (Fig. 165). Also, the paraprocts (Fig. 166) are diagnostic, being divided into two long, thin lobes extending past the cercal bases. The inner lobes also surpass the entire length of the cercal segment, in stark constrast to the short and stubby lobes in *Nemoura* and the wider lobes of *Amphinemura*. As in *Amphinemura*, the hypoproct (ventral) extends between the paraprocts. The epiproct is bifurcate from the lateral view. Female subgenital plate is composed of two sclerotized vaginal lobes separated by a depressed median area. Sternum 7 forms a slightly sclerotized lobe that extends posteriorly to partially cover the median depression of sternum 8 (Fig. 167). Nymphs are generally less pilous than other Nemouridae, but have four thick, stout hairs on abdominal tergites (Fig. 149), two of which are much longer than all other hairs present along the tergite margin. The hind femur has a transverse row of hairs that are often longer than the femur width. In later instars, the first and third tarsal segments of the hind leg are equal in length (Fig. 148) and the male paraprocts are readily apparent and curve up between the cerci. In earlier instars, the cerci are as long as the body and the antennae have long hairs on the basal segments.

DISTRIBUTION—Global: Trans-Palearctic—**Regional:** AOB—**Aimag:** KhG.

***Amphinemura borealis* (Morton, 1894)**

SYNONYMY

Nemoura borealis Morton, 1894
Amphinemura borealis Claasen, 1940

TYPE LOCALITY: Finland.

DIAGNOSIS: Adults do not retain remnants of nymphal gills in the cervical region and have only small whitish stubs at the point of insertion, unlike *A. standfussi* Ris, 1902 which has longer fingerlike gill remnants. From the dorsal view, the male epiproct is relatively uniform in width (Fig. 155). In lateral view, however, the epiproct is bent abruptly at the tip, appearing truncate (Fig. 156). This bend points ventrally at a 45 degree angle, in contrast to the tip in *A. standfussi* which forms a point that is directed anteriorly (Fig. 160). The epiproct of *A. borealis* is long and extends further down than abdomen than in *A. standfussi* (Fig. 161). Both sternum 7 and 8 of

the female are well sclerotized and parabolic in shape (Fig. 157). Nymphs have long hairs on femora and cercal segments and the hairs of *A. borealis* are much longer and denser than those in *A.*standfussi.

DISTRIBUTION—Global: Trans-Palearctic—**Regional:** AOB, IDB, POB*—**Aimag:** AR, BO, BU, DO*, KhD*, KhE*, KhG, OV^, SE, UB, ZA^.

DISCUSSION: We typically collected *A. borealis* from mid-size, low gradient streams. However, we also found it in a marshy habitat at one location in the western Altai mountains.

Amphinemura standfussi Ris, 1902

SYNONYMY
Amphinemura standfussi Ris, 1902

TYPE LOCALITY: England.

DIAGNOSIS: Adults retain filamentous remnants of nymphal gills in the cervical region, unlike *A. borealis* which only retains small stubs. In this species, the epiproct is relatively short (Fig. 160) especially in comparison to *A. borealis* (Fig.155). From the dorsal aspect, the epiproct is triangular with a rounded tip (Fig. 160). In lateral view, the epiproct is broadly rounded on the ventral margin and gradually narrows to a point which is directed towards the anterior (Fig. 161). The epiproct shape is readily distinguished from *A. borealis* (Fig. 156) which is more rectangular. Female sternum 8 forms two lobes posteriorly while sternum 7 is a simple parabola (Fig. 162). The nymph has short, stout hairs on femora and cercal segments, whereas the hairs of *A. borealis* are much longer and more densely spaced.

DISTRIBUTION—Global: Trans-Palearctic—**Regional:** AOB, POB*—**Aimag:** AR*, BU^, KhE*, KhG, SE^, TO*, UB*, ZA^.

DISCUSSION: In Mongolia, *A. standfussi* was documented at a large variety of localities including large rivers, small streams, and lakes. Like most Mongolian Nemouridae, this species is widely distributed across the Palearctic and is well-studied in Europe, as well as extensively documented from Mongolia (Zhiltzova 1972, Zhiltzova 1979, Zhiltzova & Varykhanova 1984).

Nemurella pictetii (Klapálek, 1900)

SYNONYMY
Nemoura pictetii Klapálek, 1900
Nemurella pictetii Illies, 1955

TYPE LOCALITY: Bohemia.

DIAGNOSIS: The cercal segments of the male are long and touch at their apices (Fig. 164, 165), forming a triangle around the epiproct and the thin, long paraprocts (Fig. 166). The male epiproct is triangular from dorsal view, somewhat similar to the general shape of *Aphinemura standfussi* (Fig. 160). From the lateral view, the epiproct is clearly bifurcated, the ventral and lateral sclerites coming to a junction where a dark sclerotized region crosses the width of the epiproct at a diagonal. Sternum 7 of the female has a central lobe which protrudes between the two sclerotized vaginal lobes of sternum 8 (Fig. 167). The nymphs have four distinctly longer hairs on the abdominal tergites (Fig. 149) and long hairs on the distal half of the femur. Late instar males nymphs exhibit external paraprocts. Early instars can be distinguished by their proportionally long cerci and long hairs on the basal antennal segments. In all instars, tarsal segments one and three are equal in length (Fig. 148).

DISTRIBUTION—Global: Trans-Palearctic—**Regional:** AOB—**Aimag:** KhG.

DISCUSSION: The biology and ecology of this species is well known in Europe (Zwick 2004). Depending on elevation, this species has variable voltinism (Wolf & Zwick 1989). It is more common than other Nemouridae in springs, percolating groundwater, and other low flow habitats. Though relatively ubiquitous in Europe, it has been noted to be sensitive to pollution (Zwick 2004).

Nemoura

DIAGNOSIS: In life, adults have dark brown bodies with yellow intrasegmental membranes and clear wings with darkly clouded veins The epiprocts of all Mongolian species have the same general shape and scelortization pattern (Fig. 177), with two curved lateral sclerites nearly converging at the midline and with apical sclerites that gradually narrow and touch at the midline (Fig. 178). Epiprocts of *Nermoura* (Fig. 177) are stouter and held closer to the body than those of *Amphinemura*. The paraprocts are divided into two lobes (Fig. 179), with the inner lobe being reduced or hidden by the hypoproct. Both lobes are much shorter than those in *Nemurella*. Nymphs lack any true gill structures (Fig. 147), though have what appear to be gill stubs near the lateral cervical sclerites. Various parts of the nymph body exhibit many short, regularly spaced hairs of equal length. This includes those on the pronotum and tergal margins. Other Nemoridae from Mongolia have longer hairs in diagnostic locations on the pronotum and abdomen. Nymphs within the genus have been variably distinguished based on cercal or femora setation, however this varies between taxonomic treatments.

DISTRIBUTION—Global: Holarctic—**Regional:** AOB, IDB, POB*—**Aimag:** AR, BO, BR*, BU^, DO*, GA*, KhD, KhE*, KhG, SE, TO, UB, UV*, ZA.

DISCUSSION: The genus *Nemoura*, and most of the species found in Mongolia, are well studied in Europe. Nymphs and recently emerged adults typically inhabit seeps or springs.

Nemoura arctica Esben-Petersen, 1910

SYNONYMY

Nemoura arctica Esben-Petersen, 1910

TYPE LOCALITY: Norway.

DIAGNOSIS: The apical prongs of the epiproct ventral sclerite are broadly flattened with spines on the lateral margins (Fig. 172, 173), whereas those in *N. cinerea* (Fig. 178) and *N. sahlbergi* (Fig. 187) are somewhat pointed and have only apical spines. Like *N. cinerea* (Fig. 179), the outer (major) lobe of the paraproct is convex, but unique to *N. arctica,* it is divided by a broadly rounded notch that creates a inward tilted cup (Fig. 174). The cerci have only 2 apical spines perpendicular to each cercus. The female subgenital plate is broadly rounded and not particularly diagnostic due to variation within the species. The nymphs of *N. arctica*, like *N. sahlbergi*, have hairs on the galea, which *N. cinerea* nymphs lack. *Nemoura arctica* nymphs also have long hairs at the corners of the pronotum and short hairs along the remainder of the pronotal margin, whereas *N. sahlbergi* has only short hairs at the corners that are equal in length to those lining the pronotal margin. If distal cercal segments are intact, they have intrasegmental hairs which *N. sahlbergi* lacks.

DISTRIBUTION—Global: Holarctic—**Regional:** AOB, IDB, POB*—**Aimag:** AR, BO, BR*, BU^, DO*, GA*, KhD, KhG, SE, TO, UB, UV*, ZA*.

DISCUSSION: This species is the most common Nemouridae in Mongolia and was found in all regions targeted by our expedition (Fig. 175). Adults are found in high abundances during July.

Nemoura cinerea (Retzius, 1783)

SYNONYMY

Perla cinerea Retzius, 1783
Nemura cinerea Illies, 1955

TYPE LOCALITY: Sweden.

DIAGNOSIS: This species is characterized by the epiproct having apical prongs of the ventral sclerite that are triangular, and come to a point which has a few spines at the apex (Fig. 177, 178). In contrast, *N. sahlbergi* has prongs which are more rounded and have more spines at the apex(Fig. 187). Like, *N. arctica* (Fig. 174), the outer (major) lobe of the paraproct of *N. cinerea* is convex (Fig. 179), but in *N. cinerea* the narrow dividing notch at the apex of the segment creates an asymmetrical structure with an outline in the shape of a mitten (Fig. 179). Cerci of this species have only 2 apical spines perpendicular to the cercus. Unlike other *Nemoura*, the cerci are twisted in

such a way that the black dot in the center of the membranous portion is readily visible ventrally (Fig. 179), rather than dorsally (Fig. 186). The female subgenital plate has a broad central bump, but this is not particularly diagnostic because of variability within the species. *Nemoura cinerea* is noted to have rather homogenous hair across the femora with some longer hairs dorsally near the distal margin. However, this character is variably distinguishable from *N. arctica* and *N. sahlbergi*, such that Lillehammer (1988) included *N. cinerea* in two portions of his key both with and without this type of setation. *Nemoura cinerea* nymphs lack hairs on the galea, which *N. arctica* and *N. sahlbergi* possess.

DISTRIBUTION—Global: Trans-Palearctic—**Regional:** AOB, IDB*—**Aimag:** AR^, BU^, KhD*, KhG^, SE*, TO^, ZA^.

DISCUSSION: *Nemoura cinerea* appears to be restricted to the Selenge River Basin (Fig. 180) and was also recently documented in this region by Teslenko and Bazova (2009). The synonymic history of *N. cinerea* is very long and primarily deals with European species, much of which is not relevant to Mongolia. For a full history of this species, please refer to DeWalt et al. (2010).

Nemoura nigrodentata Zhiltzova, 1980

SYNONYMY
Nemoura nigrodentata Zhiltzova, 1980

TYPE LOCALITY: Mongolia: Khentii Aimag, Onon River.

DIAGNOSIS: The apical prongs of the epiproct ventral sclerite are rounded and gradual taper. At the apicies of the prongs, there are densely-packed, short spines (Fig. 181), the distribution of the spines is similar to that of *N. sahlbergi* (Fig. 187). Zhiltzova (1980) notes that the main differences between the epiprocts of *N. nigrodentata* and *N. sahlbergi* are that the epiproct of *N. nigrodentata* has "a slightly different form of apical scerites and a larger diameter that they circumscribe [and] the dorsal sclerties are narrower and tighter" (translated from Russian). Like *N. sahlbergi* (Fig. 188) and *N.* sp. A. (Fig. 193), the outer (major) lobe of the paraproct is concave, although in *N. nigrodentata* it is more truncate (Fig. 182). The main difference between *N. sahlbergi* and *N. nigrodentata* is the shape of the lateral process extending from the cerci (Fig. 183). In *N. nigrodentata,* the additional spine that joins the cercus approximately 0.5 mm below the apex, is hook shaped and points posteriorly (Fig. 183), in contrast to *N. sahlbergi* in which the spine is triangular and points anteriorly. As with all other Mongolian Nemouridae, the female plate is broadly rounded and not particularly diagnostic due to variation within and between species. The nymph is unknown.

DISTRIBUTION—Global: Russian Far East—**Regional:** POB*—**Aimag:** KhE*.

DISCUSSION: *Nemoura Nigrodenta* was not documented during our study, but we anticipate potential collections in future expeditions to the eastern Khentii region near the type locality. This species is believed to be endemic to Mongolia, as there are no known records from surrounding areas. Replications of the original illustrations (Zhiltzova 1980) are provided (Fig. 181–183). The authors have an English translation of the original Russian description, available upon request.

Nemoura sahlbergi Morton, 1896

SYNONYMY
Nemoura sahlbergi Morton, 1896

TYPE LOCALITY: Finland.

DIAGNOSIS: The apical prongs of the epiproct ventral sclerite are rounded and gradually taper, terminating with many spines on the apex (Fig. 186, 187). Like *N. nigrodentata* (Fig. 182), the outer (major) lobe of the paraproct is concave (Fig. 188). The male cerci have an additional anteriorly-directed spine that joins the cercus at a 45 degree angle approximately 0.5 mm below the apex, best seen laterally. The female subgenital plate has a narrow central bump, but this is not particularly diagnostic due to variation within the species. The nymph of *N. sahlbergi*, like *N. arctica*, has hairs on the galea, which *N. cinerea* lacks. *N. sahlbergi* has short hairs at the

corners of the pronotum equal in length to the other hairs along the remainder of the pronotal margin, whereas *N. arctica* has long hairs at the corners. If distal cercal segments are intact, they lack intrasegmental hairs which *N. arctica* exhibits.

DISTRIBUTION—Global: Circumpolar—**Regional:** AOB, POB*—**Aimag:** AR, BU^, DO*, KhG, TO, UB*.

DISCUSSION: In Mongolia, *N. sahlbergi* is found in small (1st to 3rd order) streams, often associated with springs. This species was first recorded in Mongolia by Raušer (1968) and has been repeatedly documented by Zhiltzova (1975, 1979, 1982).

Nemoura sp. A

SYNONYMY

LOCALITY: Mongolia: Khovsgol Aimag, Hugin Gol, (N 51.09845°, E 99.32051°; SRP2006070101).

DIAGNOSIS: The apical prongs of the ventral sclerite of the male epiproct (Fig. 191, 192) resemble a combination of characteristics possessed by *N. sahlbergi* (Fig. 187) and *N. arctica* (Fig. 173) Like *N. sahlbergi*, the prongs are rounded and gradually tapering, but at the tip they are somewhat flattened with a protruding flange about 0.2 mm from the apex (Fig. 192) which has spines on the lateral margin similar to *N. arctica* (Fig. 173). Like *N. sahlbergi*, the outer (major) lobe of the paraproct is concave (Fig. 188). In contrast to *N. sahlbergi* (Fig. 188) and *N. nigrodentata* (Fig. 183), the cercal segments of the male lack any lateral process. The female subgenital plate is broadly rounded but not particularly diagnostic due to variation within the species and similarity to other *Nemoura*.The nymph is unknown.

DISTRIBUTION—Global: Endemic to Mongolia—**Regional:** AOB^—**Aimag:** KhG^.

DISCUSSION: This undescribed species is newly discovered from northern Mongolia. We provide a short diagnosis of it here so that readers know if its distinctness. It will be described fully in a subsequent paper. The male epiproct is notably distinct from *N. nigrodentata*, another Mongolian endemic, and it was confirmed as a distinct from known *Nemoura* species through independent examination by Dr. Peter Zwick and Dr. Ignac Sivec.

Perlidae

COMMON NAME: Common Stoneflies.

SIZE: Large (20–50 mm).

FEEDING GROUP: Predators.

TOLERANCE VALUE: 1 (Low).

DIAGNOSIS: Adults are golden to yellow in color All perlids currently known from Mongolia belong to the subfamily Perlinae (Sivec, Stark & Uchida 1988). Males of this subfamily have pronounced hemitergal processes, extensions of the 10th tergum, the shape (Fig. 203, 225) and length of which are diagnostic for genera and some species. The female subgenital plate is variably shaped, either deeply notched or subtriangular. The relatively large nymphs are strikingly patterned (Fig. 196, 198) and in this respect are superficially similar to Perlodidae nymphs. All 3 thoracic segments have finely branched gills (Fig. 6). Gills are absent from abdominal segments 1–2 in Perlidae but present in Pteronarcyidae. As in other Systellognatha, the labium has a deep notch and the paraglossa extend beyond the glossa (Fig. 8).

DISCUSSION: The nymphs of this family are found in streams and rivers of all sizes. They are often found under logs and stones and in snags where an abundance of prey can be found. The nymphs require 1–3 years to mature and as such, multiple instars with a wide range of sizes are often found when sampling.

NYMPHAL KEY TO PERLIDAE GENERA FOUND IN MONGOLIA

1. Anal gills present (Fig. 195); posterior setal fringe of abdominal sternum 7 complete (Fig. 195); interocellar region dark (Fig. 196) . . . . . ***Agnetina***

1'. Anal gills absent (Fig. 197, solid circle); posterior setal fringe of abdominal sternum . . 7 incomplete (Fig. 197, dashed circle); interocellar region pale (Fig. 198). 2

2(1'). Head and thoracic pigmentation paler overall; interocellar region pale and open posteriorly (Fig. 198); anterior margin of the head with large pale window; prothorax light medially and rimmed in dark pigment (Fig. 198) **. . . . .** ***Paragnetina flavotincta***

2'. Head and thoracic pigmentation darker; interocellar region with small pale dot which is closed posteriorly; anterior margin of the head dark; prothorax dark overall with paired medial light markings (Fig. 199)**. . . . . .** ***Kamimuria*** exilis**

Agnetina

DIAGNOSIS: The male hemitergal processes of this species are very long (Fig. 203), extending across tergite 8, in contrast to *Kamimuria* and *Paragnetina* which have much shorter processes. The hemitergal processes generally taper to the apex and their shape and length is often diagnostic. The female subgenital plate is broadly rounded (Fig. 204), without a central notch as in *Kamimuria* and *Paragnetina*. The nymph has anal gills (Fig. 195) and a complete setal fringe on the posterior margin of abdominal sternum 7 (Fig. 195), both characters of which are lacking in other Mongolian Perlidae. The interocellar area of nymphs is dark (Fig. 205), where as Kamimuria and Paragnetina have pale markings in the ocellar region.

DISTRIBUTION—Global: Holarctic—**Regional:** AOB, IDB, POB*—**Aimag:** AR, BO, BR*, BU, DA^, DO*, GA*, KhD, KhE*, KhG^, OV, SE, TO, UB*, UV*, ZA^.

DISCUSSION: Refer to Sivec et al. (2005) for complete species descriptions, illustrations, and identification key to all Palearctic species, including all Mongolian species.

Agnetina brevipennis (Navás, 1912)

SYNONYMY

Paragnetina brevipennis Navás, 1912
Acroneuria mongolica Klapálek, 1921
Marthamea producta Klapálek, 1921
Neophasganophora brevipennis Claassen, 1940
Phasganophora brevipennis Zhiltzova, 1975
Agnetina brevipennis Zwick, 1984

TYPE LOCALITY: Siberia: Chabarovskiy district, River Kur.

DIAGNOSIS: The head of adults is golden-brown in the interocellar region and has dark brown markings along the anterior margins of the head (Fig. 202). The pronotum is darkwith pale rugosites medially (Fig. 202). The male of *A. brevipennis* is brachypterous (Fig. 202), whereas the female is macropterous. Both sexes of other *Agnetina* species are macropterous (Fig. 207, 212). The male hemitergites are simple, gradually tapering to the apex and with only gentle curves in the dorsal and lateral aspects (Fig. 203). The female subgenital plate is subtriangular and may be variably pointed or truncate (Fig. 204). The nymph of this species most closely resembles *A. extrema* (Navás, 1912) (Fig. 215), both species having an unpigmented region on the clypeus and dark pigmentation on the labrum. Conversely, *A. cocandica* has an isolated M mark on the clypeus and a pale labrum with only a thin dark line along the anterior margin (Fig. 210). In *A. brevipennis*, the light area on the clypeus gradually widens from its origin above the ocelli to form a rough-edged triangle (Fig. 205), whereas in *A. extrema* the light region is invaded by two dark arms.

DISTRIBUTION—Global: East Palearctic—**Regional:** AOB, IDB, POB*—**Aimag:** AR, BO, BR*, BU, DO*, GA*, KhD, KhE*, KhG^, OV, SE, TO*, UB*, ZA^.

DIAGNOSIS: According to Sivec et al. (2005), the dissected esophagus has major proventricular bands that are of uniform width in both *A. brevipennis* and *A. extrema,* unlike *A. cocandica* which are very narrow in the middle. This character was confirmed in a random sample of Mongolian nymphs. However, for Mongolian *Agnetina* species, external characters such as head pigmentation are typically sufficient for identification.

Agnetina cocandica (McLachlan, 1875)

SYNONYMY
Perla cocandica McLachlan, 1875
Phasganophora undata Klapálek, 1921
Kamimuria costulata Navás, 1923
Agnetina cocandica Klapálek, 1923

TYPE LOCALITY: Uzbekistan: Kokand.

DIAGNOSIS: The adult of this species is pale to golden brown and has darker accents in the ocellar region, clypeus, and pronotum (Fig. 207) than in *A. brevipennis*. In males, the hemiterga have a large carina the basal curve (Fig. 208). From the lateral view, the hemiterga appear bent near the basal curve below the carina. Rather than a gradual tapering towards the apex as with *A. brevipennis* (Fig. 203), the tip of the hemiterga is wide. The female subgenital plate is subtriangular and truncate at the apex (Fig. 209). The nymph is characterized by an isolated light M-mark on the clypeus and a pale labrum with dark pigmentation only along the anterior margin (Fig. 210). In contrast, *A. brevipennis* (Fig. 205) and *A. extrema* (Fig. 215) have a more open light area on the clypeus and entirely dark labrums. The major proventricular bands of the dissected esophagus are very narrow in the middle and expanded on either end, unlike other Mongolia *Agnetina* which have major proventricular bands of uniform width.

DISTRIBUTION—Global: Central Asian- **Regional:** AOB, IDB—**Aimag:** AR^, KhD, KhG^, SE, UV*.

DISCUSSION: *Agnetina undata* was recently synonomized with *A. cocandica*. Sivec et al. (2005) note that the nymph of *A. cocandica* was undescribed, but it is unclear if the nymphs of *A. undata* have been described and illustrated. Our survey procured many *A. cocandica* nymphs for illustration purposes. No nymphs were reared to confirm adult association due to rugged field conditions, but we are confident the nymphs collected are *A. cocandica* based on adult cooccurrence at multiple sites and the distinctiveness from *A. brevipennis* and *A. extrema* nymphs.

Agnetina extrema (Navas, 1912)

SYNONOMY
Togoperla extrema Navas, 1912
Kamimuria sibirica Klapalek, 1916
Phasganophora extrema Klapalek, 1923
Kamimuria costalis Navas, 1923
Perla navasa Claassen, 1936
Neophasganophora extrema Claassen, 1940
Phasganophora extrema Illies, 1966
Phasgnophora brevipennis Rauser, 1968
Agnetina extrema Zhiltzova, 1979

TYPE LOCALITY: Russia: Eugenievka, Primorskiy kray.

DIAGNOSIS: The head of the adult of this species is distinctly patterned with a central dark mark that borders the posterior margin of the paler M-line and extends to the lateral ocelli (Fig. 212). The pronotum is dark brown except for a prominent yellow median line (Fig. 212). The described coloration is more highly contrasting than other *Agnetina* from Mongolia (Fig. 202, 207). The male hemitergal process (Fig. 213) somewhat resembles *A. cocandica* (Fig. 208), but the carina at the basal curve does not extend the entire width of the hemiterga as it does in *A. cocandica*. From the lateral aspect, the hemiterga are only slightly sinuate. The female subgenital plate is broadly rounded and sometimes notched (Fig. 214). Nymphs (Fig. 215) most closely resemble *A. brevipennis* (Fig. 205), both species having an unpigmented region on the clypeus and dark pigmentation on the labrum as opposed to *A. cocandica* which has an isolated M mark on the clypeus and a pale labrum with dark pigmentation only along the anterior margin (Fig. 210). In *A. extrema* the light area is T-shaped (Fig. 215) since it is invaded by two dark arms on the same plane as the antennal insertion. Also like *A. brevipennis*, the major proventricular bands of the dissected esophagus are of uniform width, unlike those of *A. cocandica* which are very narrow in the middle.

DISTRIBUTION—Global: East Palearctic—**Regional:** AOB, IDB*, POB*—**Aimag:** AR^, DA^, DO*, GA*, KhD^, KhE*, KhG^, OV, TO.

DISCUSSION: *Agnetina extrema* appears to have a distribution restricted to the Selenge River Basin (Fig. 265), whereas other *Agnetina* species extend into the Altai and are predicted to occur in the east. We documented *A. extrema* in less mountainous areas of moderate elevation (800 to 1800 msl).

Kamimuria, Paragnetina

Kamimuria

DIAGNOSIS: Male hemitergal processes are shorter (Fig. 220) not extending over tergum 8, as compared to *Paragnetina* which extend over tergite 9 and *Agentina* which extend entirely across tergite 8. The hemitergal processes are nearly straight (Fig. 220), not bent as in *Paragnetina*. The female subgenital plate is shallowly notched and bilobed, with pointed lobes (Fig. 221). Nymphs lack anal gills (Fig. 197) and have an incomplete setal fringe on the posterior margin of abdominal sternum 7 (Fig. 197). This characteristic is similar to *Paragnetina*, but in contrast to *Agentina* which has gills and a complete fringe on sternum 7. The head and pronotum of the nymph have a few indistinct pale markings (Fig. 222), whereas *Paragnetina* has highly contrasting pattern with a pale oval in the interocellar space and *Agnetina* has an entirely dark ocellar region.

DISTRIBUTION—Global: East Palearctic—**Regional:** AOB, IDB*, POB*—**Aimag:** AR*, BO*, DO*, KhG^, TO*.

Paragnetina

DIAGNOSIS: Male hemiterga are short, barely covering tergite 9 (Fig. 225), as compared to *Agnetina* which extend entirely across tergite 8. The hemitergal processes are abruptly bent at a 90 degree angle (Fig. 225), whereas those in *Kamimuria* are straight. The female subgenital plate is deeply notched and bilobed (Fig. 226), the lobes rounder and longer than *Kamimuria* which are pointed and short. The nymph lacks anal gills (Fig. 197) and has an incomplete setal fringe on the posterior margin of sternum 7 (Fig. 197), similar to *Kamimuria* but in contrast to *Agnetina* which has gills and a complete fringe. Head of nymph is distinct, with a pale, oval ocellar spot that is open posteriorly (Fig. 227), whereas *Kamimuria* has indistinct pale interocellar markings and *Agnetina* is entirely dark in the ocellar region.

DISTRIBUTION—Global: Holarctic—**Regional:** AOB, IDB*—**Aimag:** BU^, KhG, KhD*, SE, TO^.

Kamimuria exilis (McLachlan, 1872)

SYNONYMY

Perla exilis McLachlan, 1872
Marthamea luteicauda Klapálek, 1921
Kamimuria exilis Sivec et al., 1981

TYPE LOCALITY: Siberia.

DIAGNOSIS: The head of adults has a U-shaped central dark mark connecting the ocelli and open posteriorly (Fig. 219), as opposed to *Paragnetina flavotincta* (McLachlan, 1872) whose central mark covers the entire ocellar region (Fig. 224). Male hemitergal processes (Fig. 220) are much shorter than those of *Agnetina* (Fig. 213) and *Paragnetina* (Fig. 225). Hemitergal processes are not bent (Fig. 220) like those of *P. flavotincta* (Fig. 225), and have spines on the inner margin of the apex. The female subgenital plate is notched by a shallow triangle and the lobes are pointed (Fig. 221). In contrast to *P. flavotincta* (Fig. 226), the notch is much more shallow. The nymph of *K. exilis* has a subtle contrasting pattern of dark brown markings on a tan body. The nymph is readily distinguished from *Agnetina* by the absence of anal gills (Fig. 197), but only distinguished from *P. flavotincta* (Fig. 227) on the basis of coloration. *Kamimuria exilis* nymphs are darker overall and have small isolated pale regions on the head and pronotum (Fig. 222), much smaller than the pale markings of *P. flavotincta*.

DISTRIBUTION—Global: East Palearctic- **Regional:** AOB, IDB*, POB*—**Aimag:** AR*, BO*, DO*, KhG^, TO*.

DISCUSSION: We have only collected females of *K. exilis* in Mongolia. All known historical specimens are also females (Zhiltzova 1975, 1979). We suggest additional collecting in the north and west to document males in order to confirm species identification, although the female is believed to be sufficiently distinct.

Paragnetina flavotincta (McLachlan, 1872)

SYNONYMY
Perla flavotincta McLachlan, 1872
Paragnetina ocellata Klapálek, 1921
Paragnetina flavotincta Illies, 1966

TYPE LOCALITY: USSR: Pokrofka, Amur.

DIAGNOSIS: Adults have a distinct dark interocellar area (Fig. 224). The male hemitergal processes are shorter than those of *Agnetina* (Fig. 213) and slightly longer than *Kamimuria exilis* (Fig. 220). Where the hemiterga bend to approximately form a 90 degree angle, there is a protruding knob (Fig. 225). The female subgenital plate is strongly bilobed with a deep U-shaped notch (Fig. 226). The nymph of *Paragnetina flavotincta* has similar pigmentation to *K. exilis* but has distinctive high contrast patterning on the head and pronotum (Fig. 227). In particular, the head has a pale oval intruding the ocellar region and the protnoum has broad, pale rugosites medially. The nymph lacks anal gills (Fig. 197), which *Agnetina* species possess.

DISTRIBUTION—Global: East Palearctic—**Regional:** AOB, IDB*- **Aimag:** BU^, KhD*, KhG, SE, TO^.

DISCUSSION: In our collections, *P. flavotincta* was found in larger low-gradient rivers. This species was first documented from Mongolia by Zhiltzova (1975) and is also documented throughout the east Paleartcic, particularly in the Amur Basin and Korea (Levanidova & Zhiltzova 1979).

Perlodidae

COMMON NAME: Springflies.

SIZE: Medium to large (10–50 mm).

FEEDING GROUP: Predators.

TOLERANCE VALUE: 2 (Low).

DIAGNOSIS: Adults dark or gray brown with golden or light brown patterns Male genitalic structures are highly variable throughout the family, usually with uniquely shaped paraprocts or aedeagus with species-specific spine patches. The female subgenital plate is also highly variable. The nymphs usually have high contrast patterns similar to Perlidae stoneflies, but lack branched gills on the thoracic segments although one genus, *Megarcys* has unbranched fingerlike gills on the thorax (Fig. 233) and many species have submental gills (Fig. 244). Gill remnants often persist in adult forms. As in other Systellognatha, the labium has a deep notch and paraglossa extending beyond glossa (Fig. 8). In contrast to Chloroperlidae in particular, the hind wing pads are divergent from the body axis (Fig. 22).

DISCUSSION: Perlodid stoneflies are most commonly found in flowing waters under stones and in snags and leaf packs. Occasionally, they are found along the edges of cold lakes.

Nymphal Key to Perlodidae genera found in Mongolia

1. Arms of mesosternal ridge meet or approach anterior corners of furcal pits (Fig. 229); mandibles deeply cleft, separating mandibular teeth into two major cusps (Fig. 230) 2
1'. Arms of mesosternal ridge meet or approach posterior corners of furcal pits (Fig. 231); mandibles not deeply cleft, teeth irregularly spaced (Fig. 232). 3
2(1). Finger-like thoracic gills present, located above each leg (Fig. 233) . . . . . ***Megarcys ochracea***
2'. Gills absent from thorax (Fig. 234). . . . . ***Arcynopteryx Skwala***
3(1'). Dorsal fringe on cerci present on all segments, including basal segments (Fig. 235), and composed of long hairs that are equal to or longer than the length of the cercal segment. (Fig. 236) 4
3'. Cerci lacking dorsal fringe on basal segments (Fig. 237) and where present on distal segments, the hairs are short, not exceeding the length of the cercal segment (Fig. 238). . . . . ***Isoperla*/*Kaszabia nigricauda*****

4(3). Apical teeth of lacinia closely spaced, with the inner tooth 1/2 the length of the outer tooth (Fig. 239); few to no hairs on the inner edge of the lacinia (Fig. 239)..... ***Filchneria mongolica*****

4'. Apical teeth of lacinia more widely spaced with the inner tooth more than 1/2 the length of the outer tooth (Fig. 240, 243); fringe of many stout hairs along inner edge of lacinia (Fig. 240, 243).....5

5(4'). Galea long, surpassing the base of the lacinial teeth and approximately equal to the basal 4 segments of the maxillary palpus (Fig. 241); submental gills inconspicuous and barely projecting beyond submentum (Fig. 242) ..... ***Diura***

5'. Galea short, terminating near the base of the lacinial teeth and approximately equal to or shorter than the basal 3 segments of the maxillary palpus (Fig. 243); submental gills conspicuous (Fig. 244)..... ***Pictetiella asiatica*****

Arcynopteryx

DIAGNOSIS: The male hemitergal processes are short and medially directed (Fig. 253). The processes are longer than those of *Skwala* but much shorter than those of *Megarcys*. The male epiproct is long and needle-like (Fig. 248, 258), especially useful for distinguishing from *Skwala,* which lacks an external epiproct (Fig. 292). The female subgential plate has a broad depression (Fig. 249), slightly deeper than that of *Skwala*, with the prominent posteriorly directed lobes. Nymphs have only submental gills and the mesosternal ridge arms terminate at the anterior corners of the furcal pits. *Arcynopteryx* nymphs may be separable from *Skwala* on the basis of a pleural fold which divides abdominal segments 1 through 3 and unserrated mandibles, however we did not have sufficient Mongolian specimens, particularly of the unknown *A. sajanensis* and *S. asiatica*, to confirm these diagnostic characteristics.

DISTRIBUTION—Global: Holarctic- **Regional:** AOB, IDB—**Aimag:** AR^, BO^, BU^, KhG, KhD^, OV^, SE*, TO, UB^, UV*, ZA.

DISCUSSION: While this manuscript was in press, this species was moved to *Skwala* (Teslenko 2012) based on reexamination of types and new material, including aedeagal extrustion and scanning electron microscopy of eggs and genitalia. While this manuscript was in press, this species was moved to Skwala (Teslenko 2012) based on reexamination of types and new material, including aedeagal extrustion and scanning electron microscopy of eggs and genitalia. *Arcynopteryx* in Mongolia are most often found in low to medium gradient rivers at higher elevations (greater than 1500 m). The range of *A. sajanensis* (Fig.303) is depicted as a severely restricted range in the north due to lack of georeferenced localities from historical records in western Mongolia.

***Arcynopteryx compacta* (McLachlan, 1872)**

SYNONYMY

Dictyopteryx compacta McLachlan, 1872
Arcynopterygoides vernalis Raušer, 1968
Arcynopteryx compacta Brinck, 1949
Skwala compacta Teslenko, 2012

TYPE LOCALITY: East Siberia.

DIAGNOSIS: Males often brachypterous (Fig. 247). Male hemitergal processes wide and with a dorsally projecting lobe at the apex that gives the processes the appearance of being curved anteriorly (Fig. 248). The female subgenital plate has a broad, shallow median notch and two rounded lobes (Fig. 249). As compared to other *Arcynopterx* (Fig. 254, 259)*,* the sides of the plate are gradually sloped inward to form the two lobes. The nymph (Fig. 250) is similar to *A. polaris* and *Skwala pusilla* (Fig. 291), however *A. compacta* has more pronounced light markings particularly on the head and generally shorter submental gills than *S. pusilla*.

DISTRIBUTION—Global: Circumpolar—**Regional:** AOB, IDB—**Aimag:** AR^, BO^, BU^, KhD^, KhG, OV^, SE*, UB^.

DISCUSSION: While this manuscript was in press, this species was moved to *Skwala* (Teslenko 2012) based on reexamination of types and new material, including aedeagal extrustion and scanning electron microscopy of eggs and genitalia. *Arcynopteryx compacta* has one of the longer synonymic histories for stoneflies, with most species in the history documented in Europe and therefore having little bearing on our work in Mongolia. A full synonymy is available from DeWalt et al. (2010). The species *Arcynopterygoides vernalis* described by Raušer (1968) from Mongolian specimens was later recognized as a mix of *Arcynopteryx compacta* and *Skwala pusilla*, probably due in part to the similarity in the female subegential plate, both species having a variably shallow depression.

Arcynopteryx polaris (Klapalek, 1912)

SYNONYMY
Arcynopteryx dichroa polaris Klapálek, 1912
Arcynopteryx altaica Zapekina-Dulkeit, 1957
Arcynopteryx dichroa Illies, 1966
Arcynopteryx polaris Zhiltzova, 1995

TYPE LOCALITY: USSR: Bykow, Lena-mudung.

DIAGNOSIS: Males of *A. polaris* are often brachypterous (Fig. 252), while females are macropterous. The male hemitergal lobes are slender and fingerlike (Fig. 253). The lobes are straight and directed medially until the apices nearly touch above the epiproct. In contrast, the lobes of *A. compacta* are curved anteriorly (Fig. 248) and those of *A. sajanensis* (Fig. 258) are short and blunt. Female subgenital plate has a broad, shallow median notch and short lobes (Fig. 254). The plate has rounded edges, can be circumscribed by a circle and is not sloped (Fig. 249) or parallel sided (Fig. 259) as in *A. compacta* and *A. sajanensis* respectively. Nymphs (Fig. 255) are diagnosed by a darker overall appearance and less pronounced M-line on the clypeus, but is otherwise similar to *A. compacta* and *Skwala pusilla* (Fig. 294).

DISTRIBUTION—Global: East Palearctic- **Regional:** AOB, IDB—**Aimag:** AR^, BO^, BU^, KhD^, KhG, TO, UV*, ZA.

DISCUSSION: This species was first documented in Mongolia by Zhiltzova (1975) who later revised the species group (Zhiltzova 1995). Many historical specimens that we examined were misidentifed as *A. altaica*, a previous synonym of *A. polaris*. Our scrutiny of the synonym of *A. polaris* aided the Plecoptera Species File (DeWalt, Neu-Becker & Steuber 2010) in accurately updating records concerning taxonomy of this group.

Arcynopteryx sajanensis Zapekina-Dulkeit, 1957

SYNONYMY
Arcynopteryx sajanensis Zapekina-Dulkeit, 1957

TYPE LOCALITY: USSR: Mana river tributaries.

DIAGNOSIS: Both males and females are macropterous (Fig. 257). The male hemitergal lobes are short and blunt (Fig. 258), but not quite as stout as those of *Skwala pusilla* (Fig. 292). The female subgenital plate has a wide median notch, much broader than other *Arcynopteryx* (Fig. 249, 254). In addition, the lobes of the female plate are pointed and their medial surfaces are parallel sided (Fig. 259). The nymph is unknown.

DISTRIBUTION—Global: Altaian—**Regional:** AOB—**Aimag:** KhG.

DISCUSSION: Previous to our survey, this species was recorded from Mongolia only as female specimens (Zhiltzova & Varykhanova 1984). Our records add 1 male specimen along with 2 females from north of Khovsgol lake (Fig. 260), confirming the validity of the historical record. Specimens from Mongolia may be erroneously identified as *A. amurensis* (Zhiltsova and Levanidova, 1978) as was the case with the historical specimens we examined.

Diura

DIAGNOSIS: The tength tergum of male is not deeply cleft and lacks accessory hemitergal processes (Fig. 269), characters shared with *Filchneria* (Fig. 274). The male also lacks an external epiproct, as do *Filchneria* and *Skwala*. However, the terminalia are not completely devoid of genitalic structures and have paraprocts which are modified into dorsally or posteriorly directed subanal lobes (Fig. 265). The female subgenitial plate is broad, extending to cover sternum 9 (Fig. 270) and is similar to those of *Skwala* (Fig. 293). Nymphs have long galea relative to the lacinial teeth (Fig. 241). General coloration of nymphs (Fig. 261) is most similar to *Arycnopteryx* and *Skwala*, but *Diura* exhibits a mesosternal ridge pattern with the arms meeting at the posterior corner of the furcal pits (Fig. 231), whereas those of *Arycnopteryx* and *Skwala* meet at the anterior corners.

DISTRIBUTION—Global: Holarctic—**Regional:** AOB, IDB—**Aimag:** AR, BO, KhD, KhG, SE*, TO^, UB*, ZA^.

DISCUSSION: Due to morphological and geographical overlap of *D. majuscula* with the highly similar *D. nanseni* (not recorded from Mongolia), a complete revision of this genus and especially the Palearctic species, is warranted. Dr. C. H. Nelson (personal communication) is currently investigating species validity with an emphasis on egg morphology.

Diura bicaudata (Linnaeus, 1758)

SYNONYMY
Phryganea bicaudata Linneaus, 1758
Perla bicaudata Newman, 1839
Diura bicaudata Ricker, 1952

TYPE LOCALITY: Sweden: Lappland.

DIAGNOSIS: The adult males of this species are brachypterous, with wing tips always terminating at or prior to tergum 2 (Fig. 263), whereas in *D. majuscula*, they typically extend past tergum 2. Both sexes have a pale subtriangular mark in the interocellar region that is open posteriorly (Fig. 263), as opposed to *D. majuscula* whose mark is rounded anteriorly and closed posteriorly (Fig. 268). The pronotum has a pale median stripe, slightly thinner than that of *D. majuscula.* The subanal lobes of the male are smooth (Fig. 264, 265) and completely lack setation, whereas the lobes of *D. majuscula* are noticeable pilous (Fig. 269). The female subgenital plate is truncate on the posterior margin and sometimes with a slight depression (Fig. 266), in contrast to *D. majuscula* which is broadly rounded (Fig. 270). Nymph has been extensively collected in Europe and Canada, but is indistinguishable from other species of *Diura* unless in final instars with apparent adult genitalic structures.

DISTRIBUTION—Global: Circumpolar—**Regional:** AOB, IDB—**Aimag:** AR, BO, KhG^.

DISCUSSION: In Mongolia, *D. bicaudata* was typically found in moderately sized rivers located in higher elevation mountain valleys. Many European species of *Dictyopterygella, Dictyopteryx, Isogenus,* and *Perla* were placed in *D. bicaudata* over the course of is synonymic history (DeWalt, Neu-Becker & Steuber 2010). These species are not treated in this synonmy due to lack of relevance for Mongolia.

Diura majuscula (Klapalek, 1912)

SYNONYMY
Dictyopterygella majuscule Klapálek, 1912
Diura nanseni (males) Brinck, 1949
Diura bicaudata (females) Brinck, 1949
Diura majuscula Zhiltzova, 1975

TYPE LOCALITY: Russia: Lena River, Bazaikha (Krasnoyarsk) and Ust-Kutsk.

DIAGNOSIS: Males are brachypterous, with the wing tips reaching the middle of the abdomen (Fig. 268), but rarely to the apex, Comparatively, the wing tips of *D. bicauda*ta only extend slightly beyond the thorax to approximately tergum 2. Adult head of both sexes has a round pale interocellar mark that is closed posteriorly (Fig. 268), in contrast to *D. bicaudata* which has a pointed mark that is open posteriorly (Fig. 263). The pronotum has pale median stripe which is thicker than that of *D. bicaudata*. The male subanal lobes are pilous (Fig. 269), with long, dense setation, whereas *D. bicaudata* has entirely glabrous subanal lobes (Fig. 264). The female subgenital plate is broadly rounded at the apex (Fig. 270), as opposed to *D. bicaudata* which is truncate (Fig. 266). The nymph is unknown.

DISTRIBUTION—Global: East Palearctic—**Regional:** AOB, IDB—**Aimag:** AR, BO, KhD, KhG, SE*, TO^, UB*, ZA^.

DISCUSSION: Historically, *D. majuscula* males and females have been assigned to separate species (Brinck 1949). Currently, it is currently unclear if *D. majuscula* and the very similar *D. nanseni* are the same species. All specimens from Mongolia have been traditionally identified as *D. majuscula*, but this may be for historical (Zhiltzova 1972) and not taxonomic or morphological reasons. *Diura nanseni* may occur sympatrically or be the same species.

Filchneria, Megarcys, Pictetiella, Skwala

Filchneria

DIAGNOSIS: A single species of the genus is known from Mongolia. The genus is characterized by the absence of external genitalia and by the presence of raised spinule patches on abdominal tergites 8–10 (Fig. 274). The tength tergum of the male is not deeply cleft and without accessory hemitergal processes, characteristics shared with *Diura*. The female subgenital plate is distinctly heart shaped with a deep posterior notch separating two rounded lobes (Fig. 275). Nymphs (Fig. 276) are distinguished by a unique lacinial structure with closely spaced teeth and fewer, shorter hairs on the inner edge. In contrast, other Perlodinae have more separated apical teeth and dense, long hairs along the inner edge.

DISTRIBUTION—Global: Central Asian—**Regional:** POB*—**Aimag:** DO*, TO*.

Megarcys

DIAGNOSIS: Adults and nymphs have fingerlike thoracic gills, in addition to the submental gills (Fig. 233) which many Perlodinae possess. The male hemitergal processes (Fig. 279) are curved anteriorly, extending across tergite 9, and are longer than those in *Arcynopteryx* and *Skwala*. Males have a prominent epiproct with lateral stylets (Fig. 279) which all other Mongolian Perlodinae lack. The female subgenital plate has a deep, narrow notch (Fig. 280).

DISTRIBUTION—Global: Amphi-Pacific—**Regional:** AOB, IDB—**Aimag:** BU^, KhG^, SE, TO.

Pictetiella

DIAGNOSIS: The tenth tergum of the male is cleft (Fig. 284) and delineated by spinulose patches, which do not form protruding hemitergal processes. Males have a poorly developed epiproct, which barely protrudes posteriorly (Fig. 284). The female subgenital plate is largely expanded posteriorly (Fig. 285). Nymphs have conspicous submental gills (Fig. 244), longer than those in *Arcynopteryx* and *Skwala*, but lack the thoracic gills found in *Megarcys*.

DISTRIBUTION—Global: Amphi-Pacific—**Regional:** AOB^—**Aimag:** KhG^.

Skwala

DIAGNOSIS: The male hemitergal processes are knob-like (Fig. 292), much shorter and stouter than those of *Arcynopteryx* and *Megarcys*. *Skwala*, like *Diura* and *Filchneria,* lacks an external epiproct. The female subgenital plate is trapezoidal with a slight emargination posteriorly (Fig. 293). The nymph is similar to *Arcynopteryx*, but may be distinguished by the pleural fold extending only through abdominal segments 1 and 2 as well as the presence of serrations on both mandibles, however we did not have sufficient Mongolian specimens, particularly of the unknown *A. sajanensis* and *S. asiatica*, to confirm these purported diagnostic characteristics.

DISTRIBUTION—Global: Amphi-Pacific—**Regional:** AOB*, IDB—**Aimag:** AR*, BR*,BO, SE*, OV*, UB*.

Filchneria mongolica (Klapalek, 1901)

SYNONYMY

Dictyopteryx mongolica Klapálek, 1901
Filchneria mongolica Klapálek, 1908

TYPE LOCALITY: Mongolia: North-eastern region.

DIAGNOSIS: Tenth tergum of male is not divided and lacks hemitergal processes (Fig. 274). The 8th to10th tergites have protruding spinule patches (Fig. 274). The male lacks external genitalic features. The female subgenital plate is heart shaped (Fig. 275), with a strong median notch forming broadly rounded lobes. Nymphs have a diamond-shaped, interocellar spot (Fig. 276) that is closed posteriorly and lacinia with closely spaced apical teeth and relatively few short hairs on the inner edge (Fig. 239).

DISTRIBUTION—Global: Central Asian—**Regional:** POB*—**Aimag:** DO*, TO*.

DISCUSSION: This species was originally described from Mongolia on one of the earliest known zoological expeditions (Klapálek 1901) in the country. It is known from the eastern region (Fig. 277) where our team has not yet sampled. This species was recently collected from the Selenge River in Russia (Teslenko & Bazova 2009), and a male and female collected in 1966 were reported from 24 km SW of Ulan Bator (Hungarian Natural History

Museum, Budapest) by Teslenko et al. (2010).The nymphs bear strong resemblance to *Isoperla potanini* (Fig. 309) and *Pictetiella asiatica* (Fig. 286) in terms of body size and head patterning, particularly the interocellar diamond. *Filchneria mongolica* can be separated from these two species based on lacinial characteristics explained in the genus level description.

Megarcys ochracea Klapálek, 1912

SYNONYMY
Perlodes (Megarcys) ochracea Klapálek, 1912
Megarcys ochracea Kasai, 1938
Arcynopteryx (Megarcys) ochracea Ricker, 1952
Megarcys ochracea Illies, 1966

TYPE LOCALITY: USSR: Sachalin, Hokkadate.

DIAGNOSIS: Adults retain the remnants of nymphal thoracic (Fig. 233) and submental gills (Fig. 244). The male hemitergal processes are strongly curved (Fig. 279) and point anteriorly. The epiproct of the male has lateral stylets which extend slightly over the hemitergal processes. The female subgenital plate has a narrow median notch guarded by two medially directed, subtriangular lobes (Fig. 280). Nymphal head pattern (Fig. 281) includes a distinct M-line on the clypeus and white patches posterior to the eyes and in the interocellar region, all coloration characters of which are shared with *A. compacta* nymphs. Despite these superficial similarities, *Megarcys* and *Arcynopteryx* nymphs can be easily separated with genus-level characteristics, particularly the presence of gills. The nymph of *Megarcys* has finger-like thoracic gills (Fig. 233) in addition to submental gills (Fig. 244).

DISTRIBUTION—Global: East Palearctic—**Regional:** AOB, IDB^—**Aimag:** BU^, KhG^, SE, TO.

DISCUSSION: Most of the *M. ochracea* documented by our survey were from mid-range elevations (approx. 800–1500 msl) and has only been documented in the Selenge River basin, especially near Lake Khovsgol (Fig. 282). The species was first recorded from Mongolia by Zhiltzova (1972).

Pictetiella asiactica Zwick & Levanidova, 1971

SYNONYMY
Pictetiella asiatica Zwick & Levanidova, 1971

TYPE LOCALITY: Russia: Kamchatka.

DIAGNOSIS: Adult coloration golden brown in preservation, with distinct pale markings on the clypeus, in the interocellar region, and along a pronotal median stripe (Fig. 283). The tenth tergum of the male is divided (Fig. 284), but lacks the distinct hemitergal processes found in *Arcynopteryx* (Fig. 248) and *Skwala* (Fig. 292). Rather, the hemitergal processes are flat and broad, primarily demarcated by a spinulose patch (Fig. 284). The male paraprocts and epiproct are nearly inconspicuous externally (Fig. 284), though the narrow, straight epiproct often protrudes and points posteriorly. Females have a large, broadly rounded plate that is incised basally and expanded posteriorly as two large lobes with a shallow notch. The plate extends completely over sternum 9, whereas all other Perlodinae have much shorter plates (Fig. 293) though some Isoperlinae have long, more triangular plates (Fig. 329, 353). Nymph head coloration generally dark but with a pale diamond in the interocellar region(Fig. 286), similar to *Filchneria mongolica*. The ventral side of nymph head has long submental gills (Fig. 244).

DISTRIBUTION—Global: East Palearctic—**Regional:** AOB^—**Aimag:** KhG^.

DISCUSSION: This species is a new record for Mongolia which seems to be restricted to the Khovsgol lake region. Since there is only one documented occurrence, we were unable to generate a map of the predicted range.

Skwala asiatica Zhiltzova, 1972

SYNONYMY
Skwala asiatica Zhiltzova, 1972

TYPE LOCALITY: Mongolia: Bayan-Khongor aimag.

DIAGNOSIS: Male hemitergal processes are short and blunt (Fig. 288), similar to those of *S. pusilla* (Fig. 292) and *Arcynopteryx sajanensis* (Fig. 258). However, *Skwala* lacks the needle-like epiproct present in *Arcynopterx. S. asiatica* is distinguished from *S. pusilla* primarily by internal epiproct characters. The female subgential plate is trapezoidal and nearly truncate, with a slight broad depression (Fig. 289), indistinguishable from *S. pusilla* (Fig. 293). The nymph is unknown.

DISTRIBUTION—Global: Endemic to Mongolia—**Regional:** AOB*, IDB*—**Aimag:** AR*, BR*, OV*.

DISCUSSION: We collected no new specimens of this endemic species and we believe there is reason to doubt the validity of this species due to its similarity to *S. pusilla*. Efforts should be made to compare the types of both *S. pusilla* and *S. asiatica* to determine if this is the case. The authors have an English translation of the original Russian description, available upon request.

Skwala pusilla (Klapalek, 1912)

SYNONYMY
Arcynopteryx compacta pusilla Klapálek, 1912
Arcynopteryx brevis Koponen, 1949
Arcynopterygoides vernalis Raušer, 1968
Skwala brevis Zwick, Levanidova, and Zhiltzova, 1971
Skwala pusilla Zhiltzova, 1982

TYPE LOCALITY: USSR: Krasnojarsk.

DIAGNOSIS: Adults exhibit a pale stripe originating in the interocellar region and terminating on the mesonotum. The male hemitergal processes are short and blunt (Fig. 292), similar to those of *S. asiatica* (Fig. 288) and *Arcynopteryx sajanensis* (Fig. 258). *Skwala pusilla* is distinguished from *S. asiatica* primarily by internal epiproct characters. The female subgential plate has a broad, truncate posterior margin that is indented with a slight broad depression (Fig. 293), and is indistinguishable from *S. asiatica* (Fig. 289). The nymph has a light M-line highlighted by a darker pigmentation posteriorly. The head coloration is very similar to various *Arcynopteryx* species (Fig. 250, 255). The pronotum is oval with a wide, dark, longitudinal stripe medially and a dark margin.

DISTRIBUTION—Global: East Palearctic—**Regional:** AOB*, IDB—**Aimag:** BO, SE*, UB*.

DISCUSSION: The specimens of *S. pusilla* documented by our survey were found near lake outlets in abundant numbers. We did not document *S. pusilla* in the majority of its historic range (Raušer 1968, Joost 1970, Zhiltzova 1982), in which it is sympatric with the type locality of *S.* asiatica.

Isoperla, Kaszabia

Isoperla

DIAGNOSIS: Males have no external epiproct and the only apparent terminalia are hook-like subanal lobes. These characteristics of the male terminalia are similar to the genus *Kaszabia*, but *Isoperla* males lack the additional abdominal processes found in *Kaszabia*. Female subgenital plates are variably produced and most often triangular. Nymphs lack gills and the dorsal fringe, or intercalary hairs, on cercal segments that often occurs in other perlodines.

DISTRIBUTION—Global: Holarctic- **Regional:** AOB, IDB, POB*—**Aimag:** AR, BO, BR*, BU, DA*, DO*, GA, KhD, KhE*, KhG, OV, SE, TO, UB, UV, ZA.

DISCUSSION: Full descriptions, illustrations, and an identification key to adults can be found in Zwick and

Surenkholoo (2005). Nymphs of all species in the eastern Palearctic have been described by Teslenko and Zhiltzova (2006), with an accompanying species-level identification key, primarily using coloration patterns.

Kaszabia

DIAGNOSIS: Males of *Kaszabia* are distinguished from *Isoperla* mainly on the presence of unique, dorsally-directed lateral processes on abdominal terga 3 and 4. Females can also be discriminated on a species-by-species basis from various *Isoperla*, as the subgenital plate is similar to some *Isoperla*. Nymphs are indistinguishable from *Isoperla* using typically diagnostic characters of Perlodidae such as lacinia and setation (Teslenko 2008).

DISTRIBUTION—Global: East Palearctic—**Regional:** AOB, POB*—**Aimag:** AR, DO*, KhE*, KhG, SE*, TO, UB*, ZA^.

DISCUSSION: This genus was originally described from the Mongolian species, *Kaszabia nigricauda (spinulosa)* (Raušer 1968). Recently, it was suggested that *Kaszabia* be moved to *Isoperla* based on nymphal and genitalic similarities (Zwick & Surenkhorloo 2005). In the following series of maps, species are grouped according to morphological similarity in order to highlight areas of sympatry between similar species. See habitus pictures (Fig. 296, 298, 300) for depiction of morphological representations of each group.

Isoperla altaica Šamal, 1939

SYNONYMY

Isoperla altaica Šámal, 1939

TYPE LOCALITY: Russia: River Karas, outflow of Lake Kara-Koli.

DIAGNOSIS: The head of adults has a large, dark, quadrate spot covering the interocellar area with pigment anterior to it extending as an M-shaped line between the antennal bases (Fig. 311), This coloration is similar to *I. eximia* Zapekina-Dulkeit, 1957 (Fig. 321) but distinct from all other Mongolian *Isoperla* which have a pale interocellar spot that is either open or closed posteriorly or, if the interocular area is dark, the additional pigment posterior to the interocellar area is lacking. *Isoperla altaica* can be distinguished from *I. eximia* by the presence of dark pigmentation extending from the posterior of the interoccellar region towards the eyes (Fig. 311) and by darker overall coloration, particularly on the mesoscutum (Fig. 311). Males have a distinctive large penial sclerite that, like *I. eximia*, is asymmetrical in the caudal view, in contrast to *I. lunigera* which has a symmetrical sclerite (Fig. 333). In *I. altaica*, the penial sclerite is wide at the base and twisted into a crest at the apex (Fig. 313), in contrast to *I. eximia* which has a narrow and uncrested sclerite (Fig. 323). The female subgenital plate is a broadly rounded and barely produced over segment 9 (Fig. 314), but not particularly distinctive. Coloration can be used to distinguish females from *I. eximia* and other *Isoperla* with short plates, specifically *I. asiatica* Šamal, 1939*, I.mongolica* Zhiltzova, 1972, and *I. potanini*. Nymphs are superficially similar in coloration to *I. lunigera*, with the majority of the head darkly pigmented, especially in the ocellar region, and with pale areas near the eyes and center of the clypeus (Fig. 302). In addition, *I. altaica* has a longitudinal row of isolated pale circles on each thoracic segment, present on both sides of a pale median stripe.

DISTRIBUTION—Global: Altai mountains—**Regional:** AOB, IDB—**Aimag:** AR^, BO^, KhD, KhG^, SE, TO^, UV.

DISCUSSION: *Isoperla altaica* often occurs sympatrically with the morphologically similar *I. eximia*, although we more commonly encountered *I. altaica* in our study. This species was first recorded from Mongolia by Zhiltzova (1975).

Isoperla asiatica Šámal, 1939

SYNONYMY

Isoperla asiatica Šámal, 1939

TYPE LOCALITY: Mongolia, Sogino, Tula.

DIAGNOSIS: The adult head is pale overall, with dark pigmentation surrounding the interocellar region which contains a pale oval spot (Fig. 316). This pale central mark is broadly rounded in *I. asiatica*, whereas in *I. potanini* (Fig. 345) and *I. mongolica* (Fig. 336) it is pointed anteriorly and in other *Isoperla* it is more narrow. The mesoscutum has golden-yellow markings anteriorly (Fig. 316), similar to *I. kozlovi* Zhiltzova, 1972 (Fig. 326), *I. mongolica*, and *K. nigricauda*, but distinct from *I. potanini* which has uniformly dark mesoscutum (Fig. 345). Males have poorly sclerotized paraprocts that are oriented dorsally and do not curve anteriorly over the 10th tergum. The vesicle on the 8th sternum is rounded and sessile (Fig. 318), most similar to *I. potanini* which entirely lacks a lobe and is smooth along the segment 8 (Fig. 347). *Isoperla asiatica* males can also be distinguished from *I. potanini* by cercal segments which posses only a single long hair per segment, in contrast to *I. potanini* cerci which have a whorl of long hairs on each segment. The female has a short, broadly rounded or truncate plate (Fig. 319) which is indistinguishable from *I. mongolica* (Fig. 339), but is distinct from the notched plate of *I. potanini* (Fig. 348). Nymphs have a pale central ocellar mark (Fig. 303) and color patterns reminiscent of the adult.

DISTRIBUTION—Global: East Palearctic—**Regional:** AOB, IDB^, POB*- **Aimag:** AR^, BU^, DO*, KhE*, KhG^, SE, TO, UB, ZA^.

DISCUSSION: In Mongolia, *I. asiatica* is most commonly found in large, low gradient streams. From our collections, this species appears to be restricted to the Selenge River basin (Fig. 320), but is predicted to occur in the eastern Khentii region where it has been documented historically (Zwick and Surenkhorloo 2005).

Isoperla eximia Zapekina-Dulkeit, 1975

SYNONYMY
Isoperla eximia Zapekina-Dulkeit, 1975

TYPE LOCALITY: Russia.

DIAGNOSIS: Adults have a large, quadrate, brown pigmented area over the interocellar region and extending posteriorly to the occiput (Fig. 321). No light interocellar spot is present in contrast to the majority of Mongolian *Isoperla*. The pronotum has a wide, pale stripe and sublateral darkened areas with a pale pronotal margin. The coloration is most similar to that of *I. altaica* (Fig. 311). *Isoperla eximia* can be distinguished from *I. altaica* because it lacks the transverse line of dark pigmentation seemingly connecting the eyes posteriorally (Fig. 321) which is present in *I. altaica* (Fig. 311). The male has a distinctive large penial sclerite that, like *I. altaica*, is asymmetrical in the caudal view (Fig. 323) in contrast to *I. lunigera* which has a symmetrical sclerite (Fig. 333). In *I. eximia*, the penial sclerite is narrow at the base, and as such, is of relatively uniform length for the basal two thirds of the sclerite, as opposed to *I. altaica* which is abruptly wider at the base (Fig. 313). The penial sclerite lacks (Fig. 323) the twisted crest present in *I. altaica* (Fig. 313). The female subgenital plate is barely produced over sternum 9 (Fig. 324) and is not diagnostic. Coloration can be used to distinguish females from *I. altaica* and other *Isoperl*a with short plates, specifically *I. asiatica, I.mongolica,* and *I. potanini*. Despite strong similarities between adult forms, the nymph is quite distinct from *I. altaica*, with a pronounced longitudinal stripe coloration pattern (Fig. 304).

DISTRIBUTION—Global: East Palearctic—**Regional:** AOB—**Aimag:** SE.

DISCUSSION: This species is often found sympatrically with *I. altaica*, as was the case with the only two localities at which we collected *I. eximia,* where in both cases we simultaneously documented *I. altaica*. The first records of this species from Mongolia are recent, collected in 2003 and published in Zwick and Surenkholoo (2005).

Isoperla kozlovi Zhiltzova, 1972

SYNONYMY
Isoperla kozlovi Zhiltzova, 1972

TYPE LOCALITY: Mongolia: Khentii.

DIAGNOSIS: Head of adult is infuscate on the anterior half, with a pale oval spot in the ocellar region bordered by a black, U-shaped line which connects all the ocelli (Fig. 326). The pronotum has a well-delimited

pale stripe, otherwise the rest of the disc is dark with darker rugosities. The mesoscutum has anterior golden-yellow markings (Fig. 326) similar to *I. asiatica* (Fig. 316), *I. mongolica* (Fig. 336), and *K. nigricauda* (Fig. 350). The male paraprocts are lightly sclerotized, sharp and extend on to tergum 10. The aedeagus has large paired sclerites, which are apparent through the body wall of sternum 10 as if the segment itself is pigmented (Fig. 328). The apices of the sclerites are directed medially towards one another but do not touch. The female subgenital plate is triangular with a rounded apex that is sometimes shallowly notched (Fig. 329). Overall, the plate resembles that of *I. obscura* (Zetterstedt, 1840) (Fig. 343) and *Kaszabia nigricauda* (Fig. 353), but is not as long and only extends slightly onto segment 9. Nymph head coloration (Fig. 305) is dark from the epicranial arm to the M-line with no dark markings posterior to the lateral ocelli or on the labrum.

DISTRIBUTION—Global: East Palearctic—**Regional:** AOB, IDB*, POB*—**Aimag:** AR, BO*, BU, DO*, KhE*, KhG, SE, TO.

DISCUSSION: This species was originally described from Mongolia by Zhiltzova (1972) in her first contribution to the Insects of Mongolia series. When considering only our study, this species appears to be restricted to the Selenge River basin (Fig. 330), but is predicted to occur in the eastern Khentii region which is where the type specimen was collected.

Isoperla lunigera (Klapalek, 1923)

SYNONYMY
Chloroperla lunigera Klapálek, 1923
Isoperla lunigera Claassen, 1940

TYPE LOCALITY: USSR: Irutsk.

DIAGNOSIS: The head mask of adults is distinctive, having an isolated, quadrate patch covering the interocellar area (Fig. 331). No other pigmentation is present on the head with exception of the pedicel of the antennae. The pronotum has pale margins and a wide pale median stripe bordered by two dark sublateral stripes (Fig. 331). The male has a distinctive large penial sclerite (Fig. 333) that is symmetrical in the caudal view in contrast to *I. altaica* (Fig. 313) and *I. eximia* (Fig. 323) which both have a similarly shaped, but asymmetrical sclerite. The female subgenital plate is broadly joined at the base, with dark pigmentation along the anterior edge and a central bump that protrudes only slightly over segment 9 (Fig. 334). Nymphs are superficially similar in coloration to *I. altaica*, with the majority of the head dark especially in the ocellar region and pale areas near the eyes and center of the clypeus (Fig. 306). However, *I. lunigera* has fewer dark regions particularly on the thorax and is more pale overall.

DISTRIBUTION—Global: East Palearctic—**Regional:**AOB, IDB, POB*—**Aimag:** AR*, BU^, DO*, KhE*, KhG, SE, TO^, UB^, ZA*.

DISCUSSION: Specimens of this species were misidentified in historical collections as *Isoperla flavescens* (Zwick & Surenkhorloo 2005) and erroneously published as a new species record for Mongolia in Purevdorj et al. (2003). The yellow coloration, small size, and slenderness of this species can be easily confused with Chloroperlidae, specifically *Haploperla lepnevae* (Chloroperlidae) which has similar coloration, particularly the presence of an isolated dark mark on the head.

Isoperla mongolica Zhiltzova, 1972

SYNONYMY
Isoperla mongolica Zhiltzova, 1972

TYPE LOCALITY: Mongolia: Tula River near Ulan Bator.

DIAGNOSIS: Adult head generally infuscate (Fig. 336), with a pale, central, anteriorly-pointed oval between the ocelli, most closely resembling *I. potanini* which is darker overall color (Fig. 345). The paraprocts of the male are stout, heavily sclerotized and dark, and curved over the 10th tergum (Fig. 338). The underside of the paraproct tips are populated with small spines which are most evident in lateral view (Fig. 338). The female subgenital plate

is broad and barely extends over the posterior margin of sternum 8 (Fig. 338). The plate is similar to that of *I. potanini* and *I. asiatica* (Fig. 319) though *I. potanini* has a shallow medial notch (Fig. 348) and *I. asiatica* can be distinguished on the basis of head coloration (Fig. 316). The head of the nymphs is dark overall and is punctuated by four pale spots arranged longitudinally along the median (Fig. 307). The nymph is distinct from the otherwise similarly colored *I. obscura* based on abdominal coloration, specifically the placement of pale heart shaped marks of which *I. mongolica* has only one on the terminal abdominal segment.

DISTRIBUTION—Global: East Palearctic—**Regional:** AOB, IDB^, POB*—**Aimag:** AR, BO, KhD, KhE*, KhG, TO^, UB*, ZA.

DISCUSSION: As the name suggests, this species was originally described from Mongolia by Zhiltzova (1972) in her first contribution to the Insects of Mongolia series in which *I. kozlovi* was also described. *Isoperla mongolica* was most commonly collected from high (>1700 msl) elevation streams, but was also occasionally found at lower elevations with a few collections near the type locality in central Mongolia.

Isoperla obscura (Zetterstedt, 1840)

SYNONYMY
Perla obscura Zetterstedt, 1840
Perla grisepennis Pictet, 1841
Perla tenella Rambur, 1842
Chloroperla limbata Bengtsson, 1933
Isoperla obscura Brinck, 1952

TYPE LOCALITY: Sweden: Lappland.

DIAGNOSIS: Adult head coloration is generally infuscate with dark pigmentation connecting the ocelli and an interocellar pale oval closed posteriorly by dark pigmentation (Fig. 341). A nearly continuous pale line is present from the clypeus through the mesoscutum, *Isoperla obscura* lacks golden markings on the anterior lobes of the mesoscutum above the wing insertion points (Fig. 341), which is distinct from the mesonotum coloration of *Kaszabia nigricauda* and *I. kozlovi* (Fig. 350, 326) which otherwise have vaguely similar head coloration. Males have dark, heavily sclerotized paraprocts, the tips of which are pointed and arch over the 10th tergum, but are not diagnostic. The male penis, if extruded as illustrated in Zwick and Surenkholoo (2005), has a V-shaped row of sharp teeth and lacks large sclerites. The female subgenital plate is triangular with a rounded apex (Fig. 343), resembling *K. nigricauda* and *I. kozlovi* (Fig. 353, 329). Also like *K. nigricauda*, the plate is long, and completely covers segments 8 and 9, whereas the plate of *I. kozlovi* only extends over half of segment 9. Female specimens more readily distinguished by head and other coloration. Nymph head coloration (Fig. 308) is similar to *I. mongolica* with a pale oval in the ocellar region in line with two other ovals located anterior and poster to the ocellar oval, though *I. obscura* is lighter overall especially without dark pigmentation on the posterior margin of the head. The nymph is also distinct from *I. mongolica* based on abdominal coloration, specifically the placement of pale heart shaped marks of which *I. obscura* has one medial marking on each of the anterior segments, but none on the terminal segment as in *I. mongolica.* Nymph also noted to have similar coloration to *K. nigricauda* (Teslenko 2008).

DISTRIBUTION—Global: TransPalearctic—**Regional:** AOB, IDB—**Aimag:** BO, BU, DA*, KhD*, KhG, SE, TO^.

DISCUSSION: We primarily collected *I. obscura* near larger rivers like the Selenge and Eroo, but this species was also collected historically near a lake in western Mongolia. ENM range predictions indictate that this species may occur in eastern Mongolia (Fig. 394).

Isoperla potanini (Klapalek, 1923)

SYNONYMY
Mesoperlina potanini Klapálek, 1923
Isoperla chasaudina Navás, 1923
Isoperla potanini Zwick and Surenkhorloo, 2005

TYPE LOCALITY: Mongolia: Khangai Mountains.

DIAGNOSIS: The head of the adult is generally infuscate and dark (Fig. 345) with pale, diamond-shaped central mark between the ocelli (Fig. 345). Most other Mongolian *Isoperla* have a more rounded pale oval in the interocellar region. Cercal segments have a whorl of long hairs on each segment, useful for distinguishing it from *I. asiaitca* which has a single hair per segment. The male paraprocts are poorly sclerotized and pointed. This species entirely lacks a ventral lobe on sternum 8 (Fig. 347), leaving this segment smooth along the posterior edge whereas all other *Isoperla* have distinct lobes (Fig. 328), even in the case of *I. asiatica*, which is broadly joined but clearly protrudes past the posterior edge (Fig. 318). The female has a short, broadly bilobed plate with a shallow median notch (Fig. 348). Nymphal head coloration reminiscent of the adult pigmentation (Fig. 309).

DISTRIBUTION—Global: Endemic to Mongolia—**Regional:** AOB, IDB—**Aimag:** AR, BO, BR*, BU*, GA, KhD, KhG, OV, UB*, UV*, ZA.

DISCUSSION: This species was originally described from Mongolian material and continues to be recorded only from northern and western Mongolia. The nymph was originally described by Raušer (1968). The nymphs we documented were collected concurrently with adults on multiple occasions, but were not formally reared to confirm association with adults. The species was recently moved from the genus *Mesoperlina* (Zwick & Surenkhorloo 2005) after having been noted as atypical for that genus by Zhiltzova (1970).

Kaszabia nigricauda (Navás, 1923)

SYNONYMY

Isoperla nigricauda Navás, 1923
Kaszabia spinulosa Raušer, 1968
Kaszabia nigricauda Zhiltzova, 1979

TYPE LOCALITY: Mongolia.

DIAGNOSIS: *Kaszabia nigricauda* adults have a dark central U-shaped marking connecting the ocelli on an otherwise pale head. The mesoscutum has anterior golden-yellow coloration above the wing insertions (Fig. 350). The similarly colored *I. kozlovi* (Fig. 326) shares these golden mesoscutum markings, but not the head coloration, whereas *I. obscura* lacks the golden markings but has a similar infuscate head including a pale oval mark in the ocellar region which is closed posteriorly (Fig. 341) whereas the pale central mark of *K. nigricauda* is open posteriorly. Males have stout paraprocts that curve dorsally over the 10th tergum. The male also has unique dorsally-directed lateral processes on abdominal segments 3 and 4 (Fig. 352). The male is otherwise externally indistinct from *Isoperla* species. The female subgenital plate triangular with a rounded apex (Fig. 353), similar in shape to *I. obscura* and *I. kozlovi.* Also like *I. obscura* (Fig. 343), the plate is long and completely covers segments 8 and 9, whereas the plate of *I. kozlovi* only extends over half of segment 9 (Fig. 329). Female specimens are more readily distinguished by coloration. Nymphal coloration mimics the adult pattern and is similar to *I. obscura* nymphs (Fig. 310, Teslenko 2008). Nymph otherwise highly similar to *Isoperla* species.

DISTRIBUTION—Global: East Palearctic—**Regional:** AOB, POB*—**Aimag:** AR, DO*, KhE*, KhG, SE*, TO, UB*, ZA^.

DISCUSSION: In Mongolia, *K. nigricauda* most often occurs in larger streams. The species appears to be restricted to the Selenge River basin (Fig. 354), but historical collections are noted from eastern Mongolia and the predicted range shows moderate probability of encounter in the east.

Pteronarcyidae

COMMON NAME: Salmonflies.

SIZE: Large (15–70 mm).

FEEDING GROUP: Shredders.

TOLERANCE VALUE: 0 (Low).

DIAGNOSIS: Adults of this family are the largest of all stoneflies inhabiting Mongolia. The wings have copious cross-veins to support the longitudinal veins during flight. Adults often are dark and often display orange or red intersegmental membranes, especially around the pronotum (Fig. 355). Nymphs have finely branched gills

on all thoracic segments (Fig. 3) and the first two abdominal segments (Fig. 4). Shriveled remnants of these gills persist in the adults.

DISCUSSION: The nymphs of these stoneflies are most commonly found in small but swiftly flowing streams among leaf packs and snags. The nymphs require 1–3 years to mature. Pteronarcyid nymphs can autohemorrhage by forcing hemolymph through pores in joints on the hind leg. This behavior is thought to cause a bad taste or serves to confuse predators. Only one genus, *Pteronarcys*, occurs in Mongolia. No generic diagnosis will be provided due to redundancy with family characteristics.

Pteronarcys reticulata (Burmeister, 1839)

SYNONYMY
Perla reticulata Burmeister, 1839
Pteronarcys reticulata Pictet, 1841
Allonarcys reticulata Zwick et al., 1971
Pteronarcys reticulata Nelson and Hanson, 1971

TYPE LOCALITY: Siberia: Barnaul.

DIAGNOSIS: This species is the only representative of Pteronarcyidae in Mongolia and can therefore be distinguished at the family level by size, coloration, and gill presence. Adult male hemitergal processes are membranous with a medial sclerotization (Fig. 358). The hemitergal processes curve anterio-medially towards and extend onto sternum 10. The female subgenital plate is deeply notched with two tapered, posteriorly-directed lobes (Fig. 359) which are often darkly colored. Nymph are uniformly dark brown and have sharply angular corners on the pronotum (Fig. 360). Nymphs can be identified most readily confirmed by presence of branched gills on abdominal segments 1 and 2 (Fig. 4).

DISTRIBUTION—Global: East Palearctic—**Regional:** AOB—**Aimag:** AR^, BU, KhG^, SE.

DISCUSSION: A similar species, *P. sachalina* Klapálek 1908, is widely known throughout the Palearctic and in sympatry with *P. reticulata.* It has yet to be documented in Mongolia, but should not be dismissed from consideration. The nymphs of these two species are indistinguishable (Zwick & Teslenko 2001).

Taeniopterygidae

COMMON NAME: Willowflies.

SIZE: Small to Medium (10–20 mm).

FEEDING GROUP: Shredders (Some Scrapers).

TOLERANCE VALUE: 2 (Low).

DIAGNOSIS: Both adults and nymphs are distinguishable from other families by the length of the second tarsal segment being approximately equal to the length of the first segment (Fig. 9). Adults resemble those of Nemouridae in overall body shape, although taeniopterygids lack the well defined "X" venation found in nemourids. In males, sternum 10 is long and often visible from the dorsal view, appearing to surround the genitalic structures like a cup (Fig. 369). Sternum 9 in females is likewise long in most genera (Fig. 370), though barely produced in *Taeniopteryx* (Fig. 376). The nymphs are generally stout bodied with the pronotum considerably wider than the abdomen. The developing wing pads are greatly divergent from the midline (Fig. 12). As with all Euholgnatha, the paraglossae and glossae are subequal and the labial palps are robust (Fig. 7).

DISCUSSION: These stoneflies are found in flowing waters in root mats, snags, leaf packs and sometimes on stones. They are usually found at the edges of streams and rivers where the current is reduced. Like Capniidae, the adults often emerge during cold months, though little collecting during this time period has been done in Mongolia due to road accessibility issues. Most species in this family are generally intolerant of pollution, but some species are well-adapted to large polluted rivers.

Nymphal Key to Taeniopterygidae genera found in Mongolia

1. Coxal gills present (Fig. 362); dorsal abdominal processes present (Fig. 363); 9th abdominal sternum not forming a plate extending to sternum 10 (Fig. 365)..... ***Taeniopteryx nebulosa*****
1'. No coxal gills (Fig. 364); dorsal abdominal processes absent (Fig. 363); 9th abdominal sternum forming a subtriangular plate which extends to sternum 10 (Fig. 365) ..... ***Taenionema japonicum*****

Taenionema, Taeniopteryx

Taenionema

DIAGNOSIS: Cerci of *Taenionema* adults have multiple segments (Fig. 369) which are characteristically short. The male genitalia is outlined with a sclerotized triangle (Fig. 369). Male sternum 9 is long, surrounding the genitalia and cerci (Fig. 369). The female subgenital plate extends over sternum 9 and over half of sternum 10 (Fig. 370). *Taenionema* nymphs have a ventral triangular plate which reaches the abdomen apex (Fig. 365). The nymphs lack coxal gills and dorsal abdominal processes, both characters of which are present in *Taeniopteryx*.

DISTRIBUTION—Global: Holarctic- **Regional:** AOB, IDB—**Aimag:** AR^, BO, KhG^, SE.

Taeniopteryx

DIAGNOSIS: The male epiproct is short (Fig. 374) and nearly round from the dorsal view. Sternum 10 of the male is visible from the dorsal aspect, but not extending around the genitalia and cerci as in *Taenionema*. The male has a ventral vesicle (Fig. 375) which *Taenionema* lacks. Cerci of the male are composed of a single enlarged segment which nearly touches the epiproct (Fig. 374). The female subgenital plate is barely produced and broadly rounded (Fig. 376). Nymphs of the genus are characterized by the presence of coxal gills and dorsal abdominal processes, but lack the plate-like, triangular 9th sternum typical of many Taeniopterygidae.

DISTRIBUTION—Global: Holarctic—**Regional:** AOB*—**Aimag:** KhG*.

Taenionema japonicum (Okamoto, 1922)

SYNONYMY

Rhabdiopteryx japonica Okamoto, 1922
Taeniopteryx japonica Ueno, 1935
Rhabdiopteryx japonicum Illies, 1966
Taenionema japonicum Ricker and Ross, 1975

TYPE LOCALITY: Japan.

DIAGNOSIS: Adult is coloration highly contrasting (Fig. 368), especially when preserved. The head has a light interocellar mark and light markings near the eyes. The pronotum has light reticulations, especially at the lateral margins. The male genitalia is demarcated by a sclerotized triangle (Fig. 369) with processes emerging at each corner of the triangle, including the epiproct which emerges from the posterior apex of the triangle. Sternum 9 of male lacks a vesicle and extends dorsally, forming a cup-like shape around the genitalia and cerci (Fig. 369). In comparison, *Taeniopteryx nebulosa* has a ventral vesicle (Fig. 375) and sternum 10 is less pronounced (Fig. 374). The cerci of *T. japonicum* males have five segments (Fig. 369), whereas those of *Taeniopteryx nebulosa* have only one stout segment (Fig. 374). The female subgenital plate gradually tapers to a rounded tip (Fig. 370), terminating just short of the abdominal apex. The nymph has a ventral triangular plate extending to the tip of the abdomen (Fig. 365), which *Taeniopteryx nebulosa* lacks.

DISTRIBUTION—Global: East Palaearctic—**Regional:** AOB, IDB—**Aimag:** AR^, BO, KhG^, SE.

DISCUSSION: This species was originally reported from Mongolia by Zhiltzova (1982). Although *T. japonicum* is commonly encountered in rivers of various size, we also documented it in springs and marshes in Mongolia. The high predicted probability of encounter in the northwest Uvs region (Fig. 372) warrants sampling in this area which the scope of our study did not target.

***Taeniopteryx nebulosa* (Linnaeus, 1758)**

SYNONYMY
Phryganea nebulosa Linnaeus, 1758
Nemoura nebulosa Olivier, 1811
Taeniopteryx nebulosa Claassen, 1940

TYPE LOCALITY: Sweden.

DIAGNOSIS: Body coloration of adult *Taeniopteryx nebulosa* is two-toned with head and thorax being dark brown and abdomen being much lighter. The pronotum lacks the patterned reticulations which are present in *Taenionema japnoicum* (Fig. 368). The male epiproct is short and stout (Fig. 374). Tergum 10 of males has four shallow lobes on the posterior margin and closely borders the anterior side of the epiproct. Sternum 10 of male (Fig. 374) is not as dorsally extended as in *Taenionema japonicum* (Fig. 369). Tergum 10 also bears a ventral vesicle (Fig. 375). The cerci of males have only a single segment which appears inflated and nearly touching either side of the epiproct (Fig. 374), whereas *Taenionema japonicum* has multiple, narrow cercal segments (Fig. 369). The female subgenital plate is barely produced and broadly rounded (Fig. 376), in stark contrast to *Taenionema japonicum* whose plate extends nearly to the tip of the abdomen. Nymphs have 3-segmented coxal gills that are telescopic (Fig. 362). Each segment of the nymphal abdomen has a prominent dorsal process (Fig. 363), causing the nymph to appear serrate from the lateral view. Nymphs lack the ventral triangular plate present in *Taenionema* japonicum.

DISTRIBUTION—Global: Trans-Palaearctic—**Regional:** AOB*—**Aimag:** KhG*.

DISCUSSION: This species has only been documented historically in the nymphal stage at Lake Khovsgol (Zhiltzova & Varykhanova 1984). Adult records and additional nymph collecting are needed to confirm its occurrence in Mongolia, though the nymph is quite distinctive. It should be noted that this species has historically been placed in Nemouridae because of its striking resemblance in terms of coloration, body shape, size, reduced cerci, and the presence of a ventral vesicle in males (Fig. 375, 174). The species can be distinguished by its bulbous cerci, head shape, and epiproct structure.

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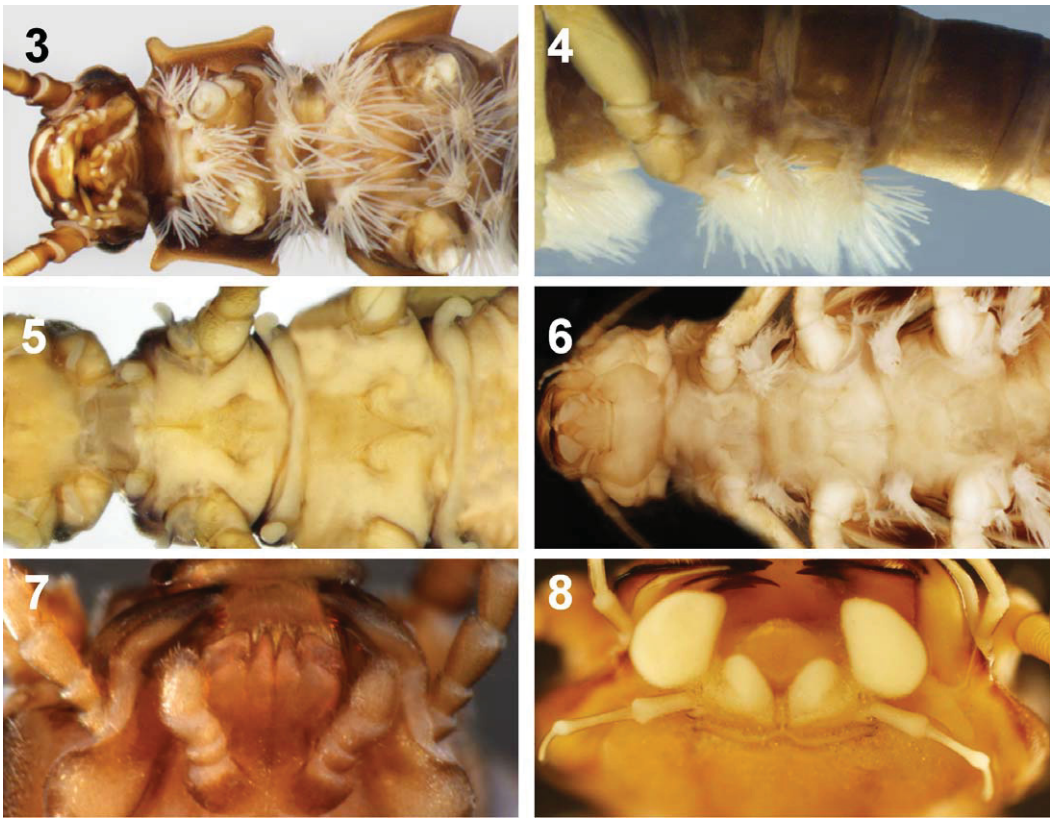

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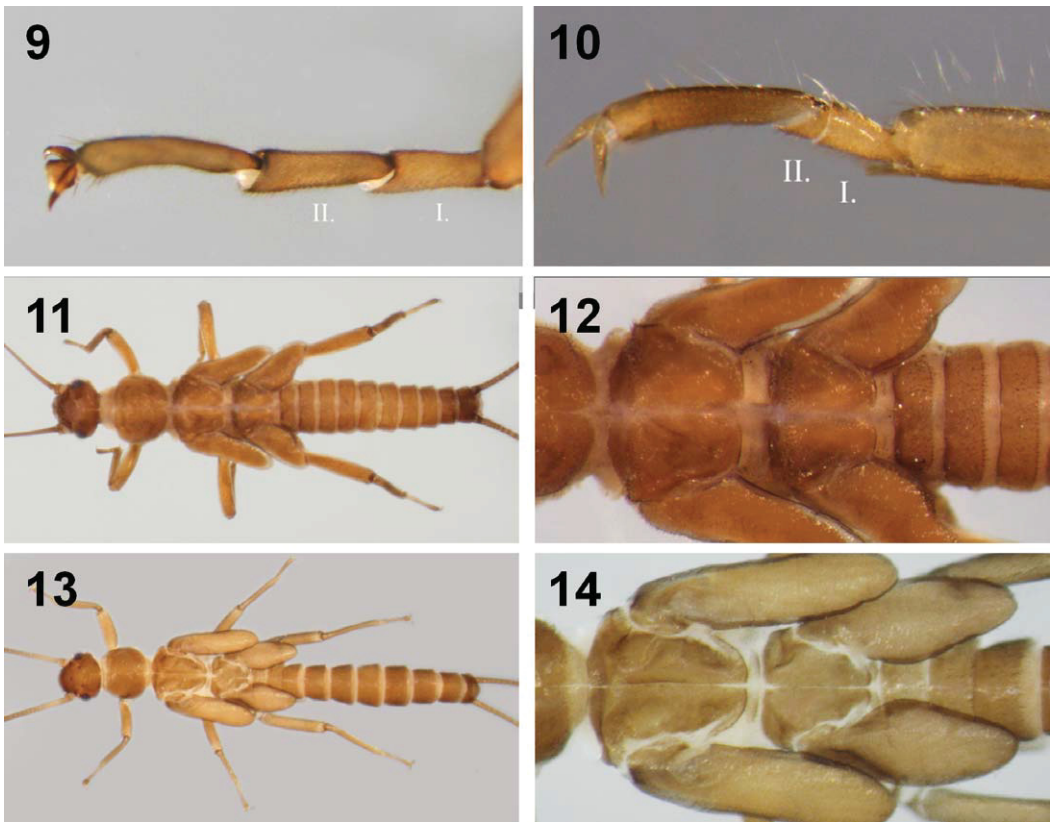

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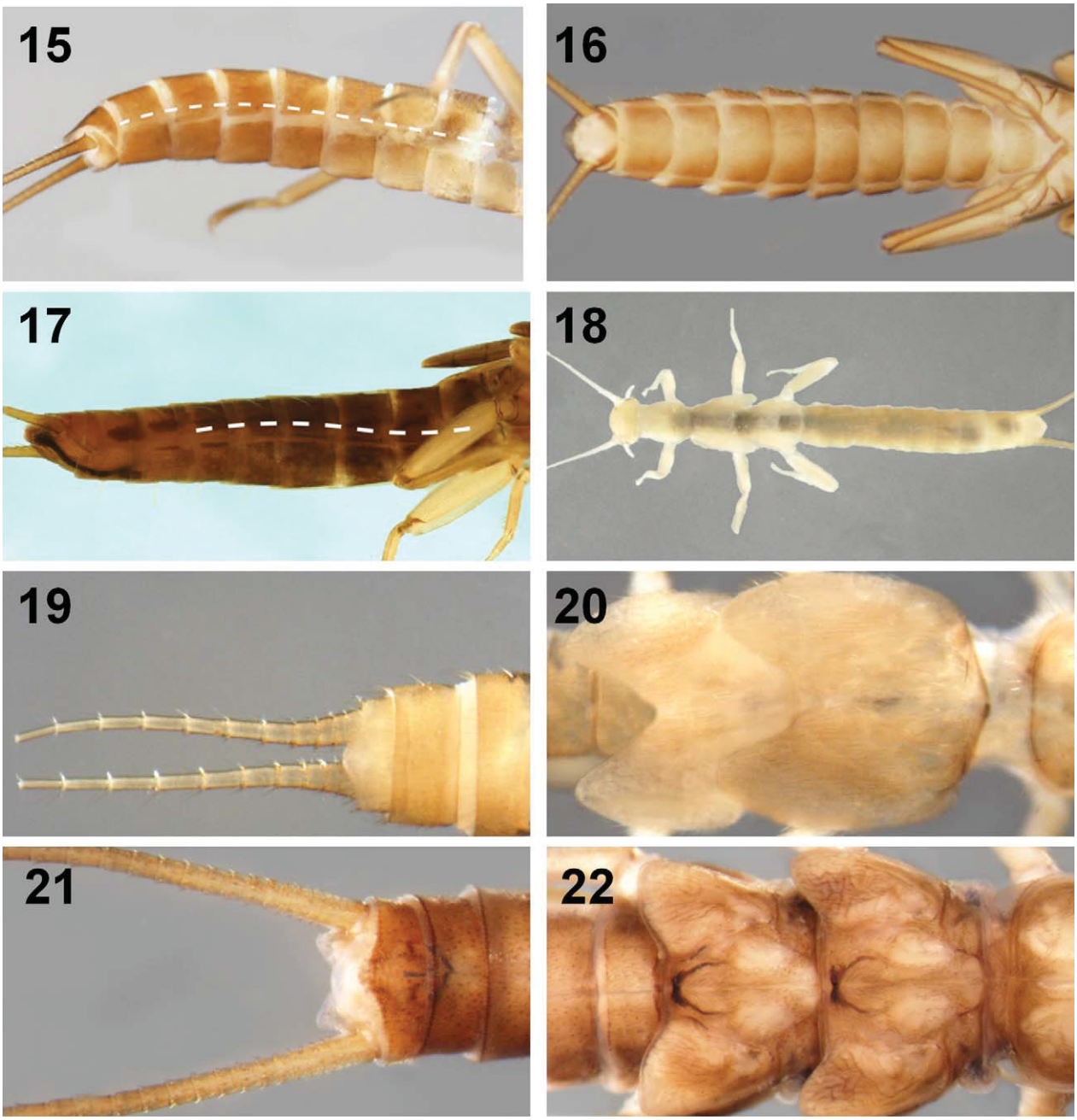

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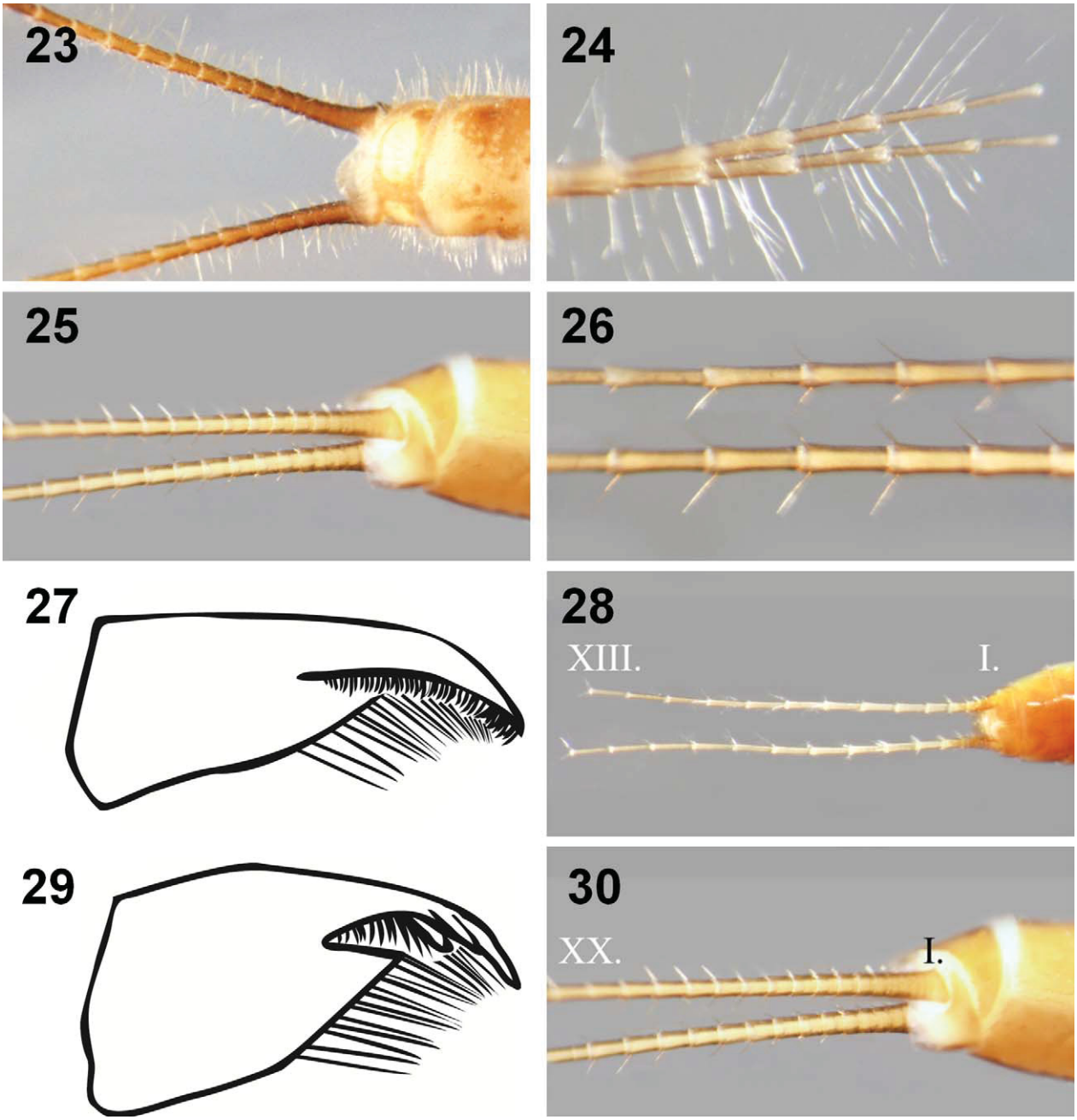

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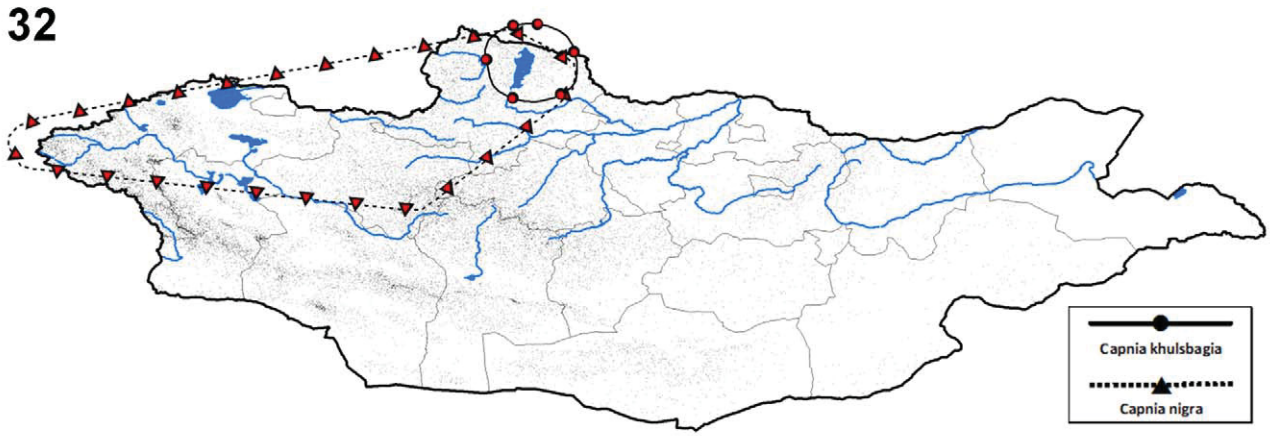

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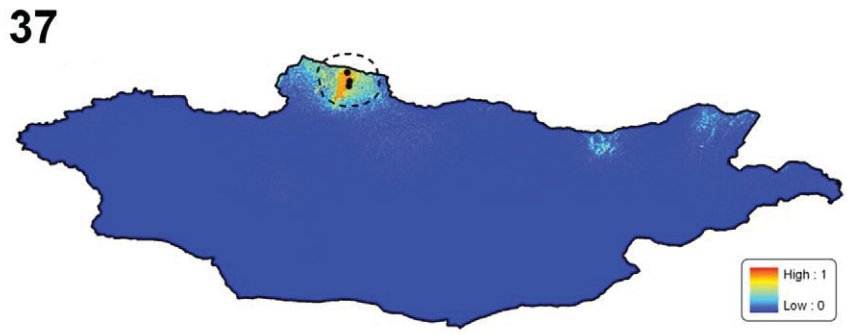

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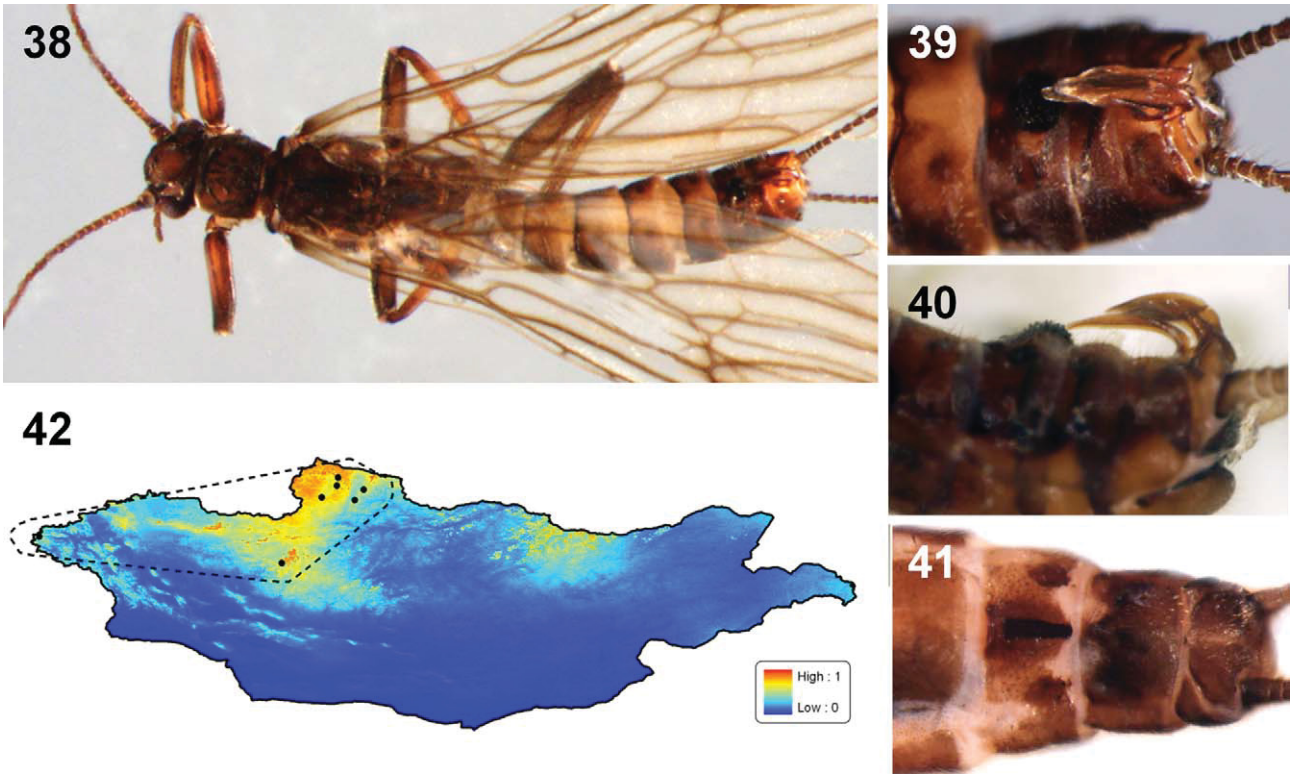

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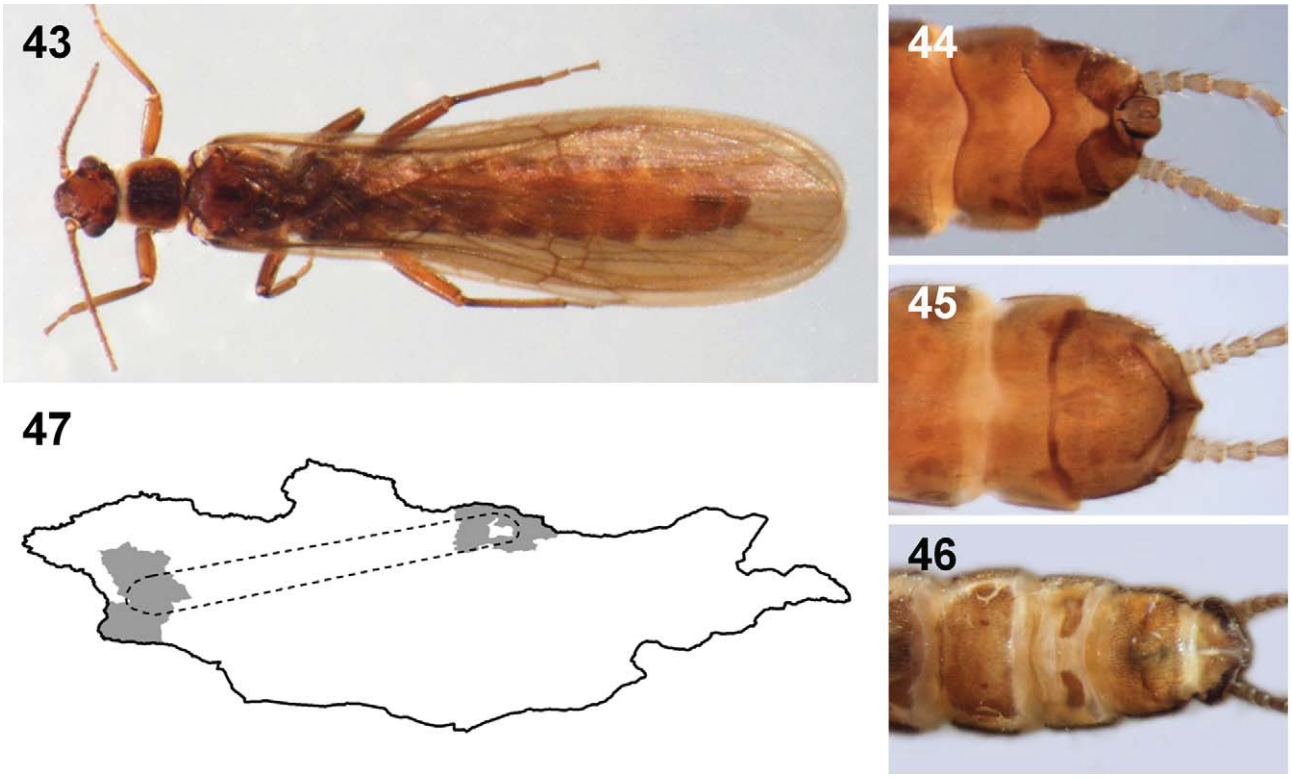

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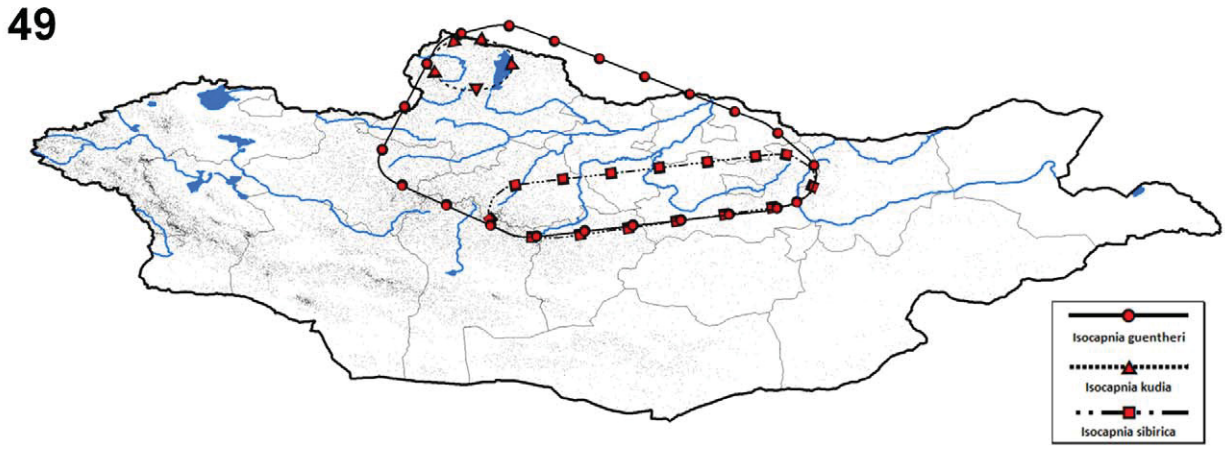

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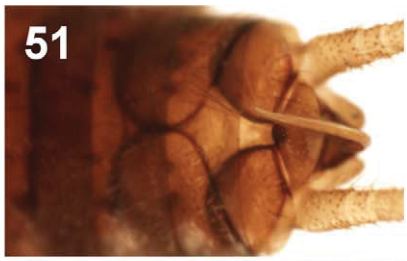

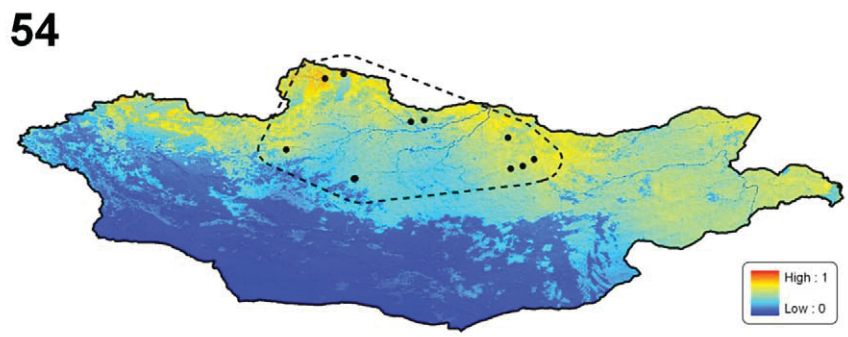

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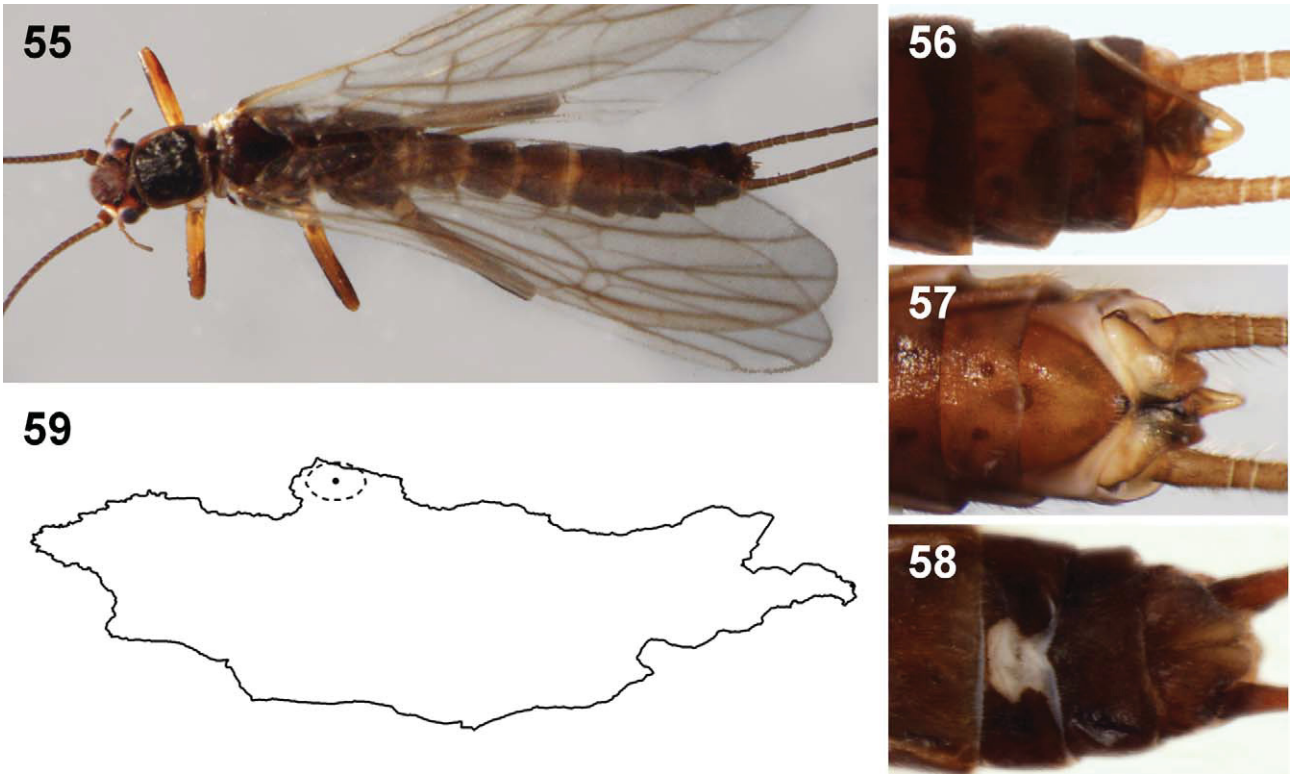

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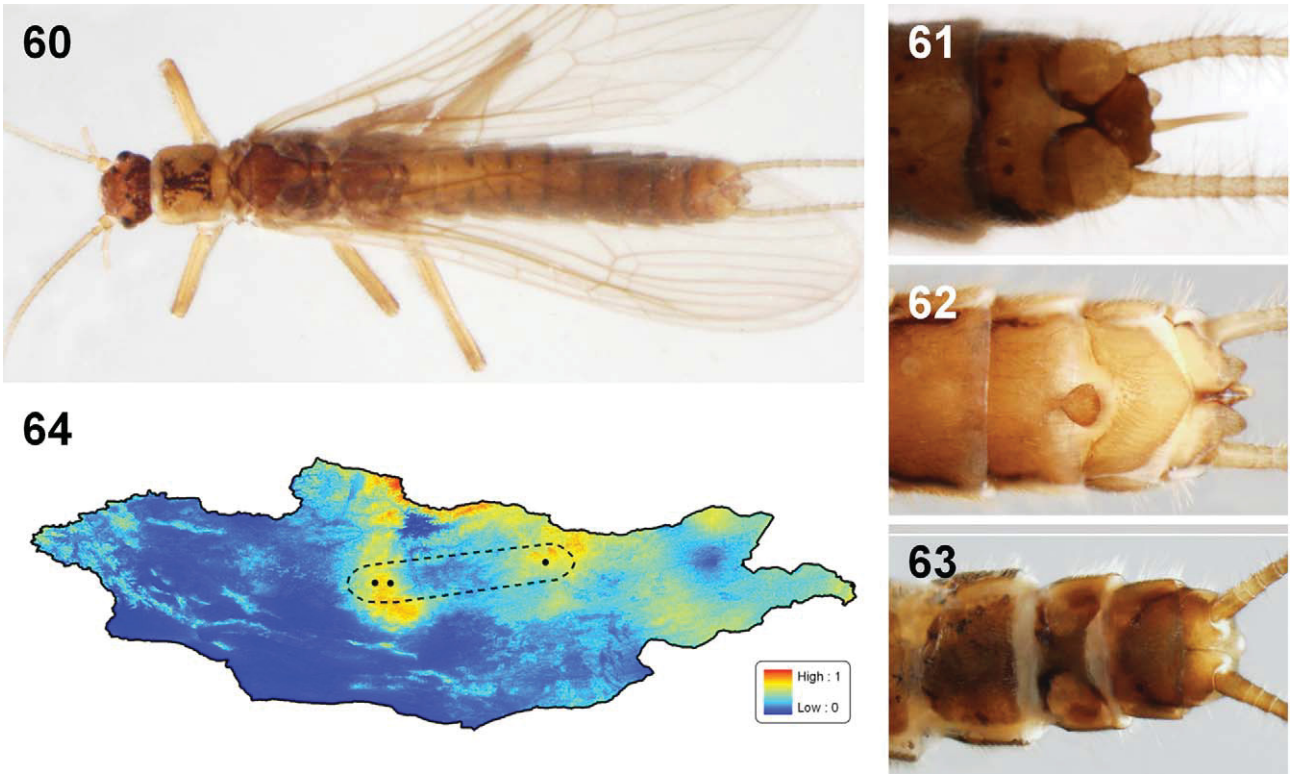

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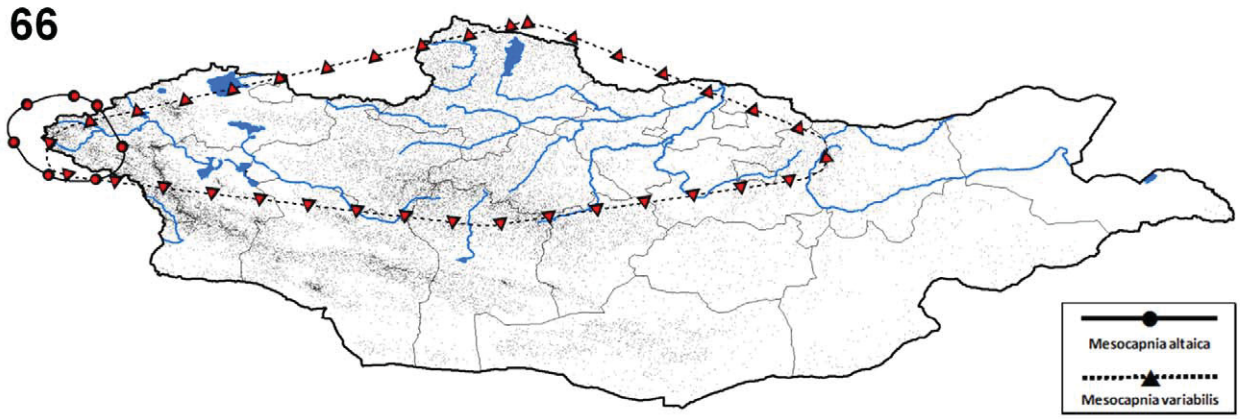

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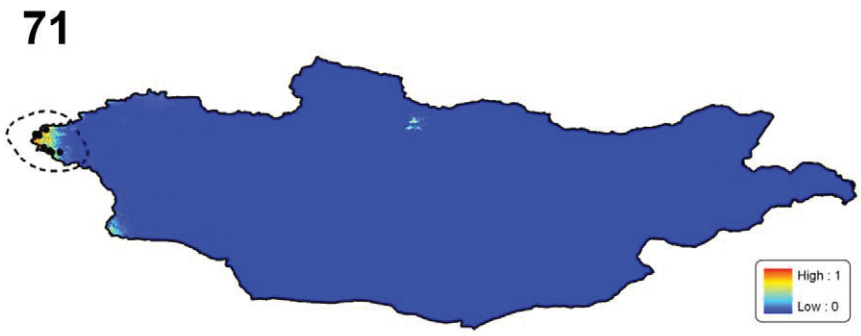

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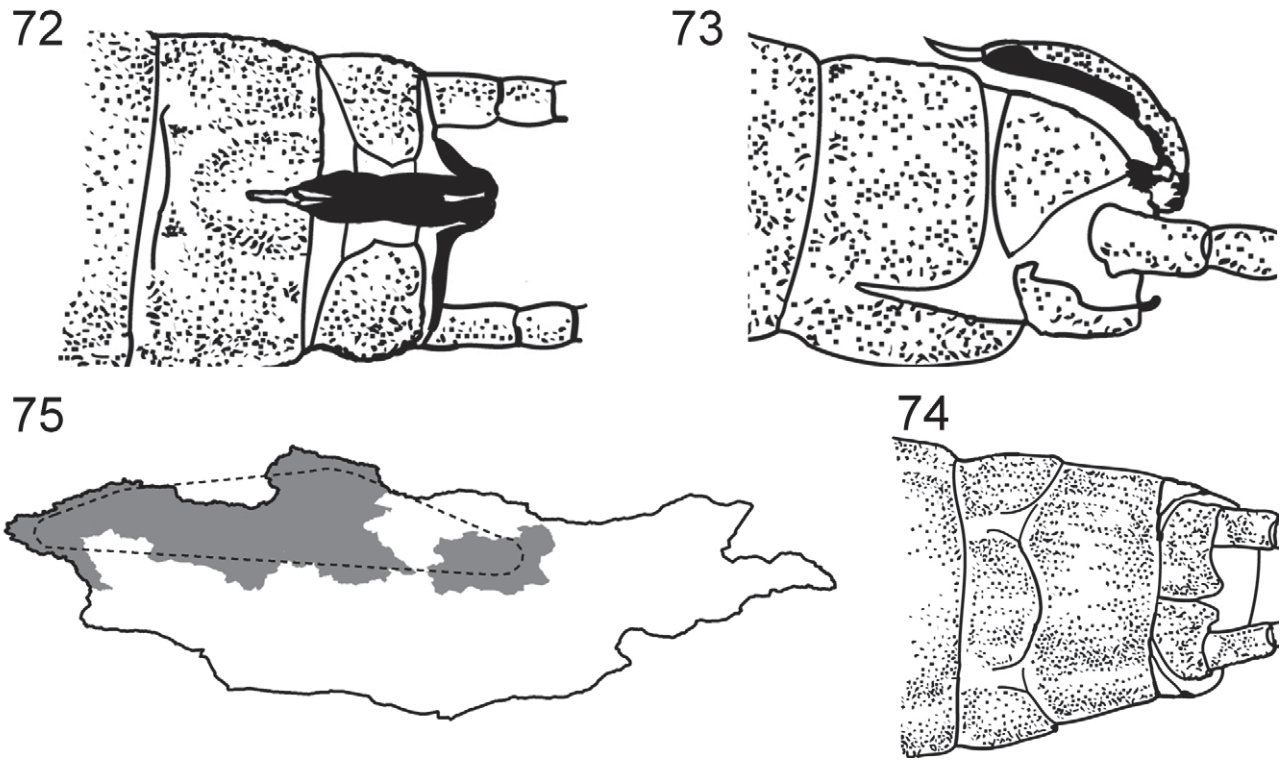

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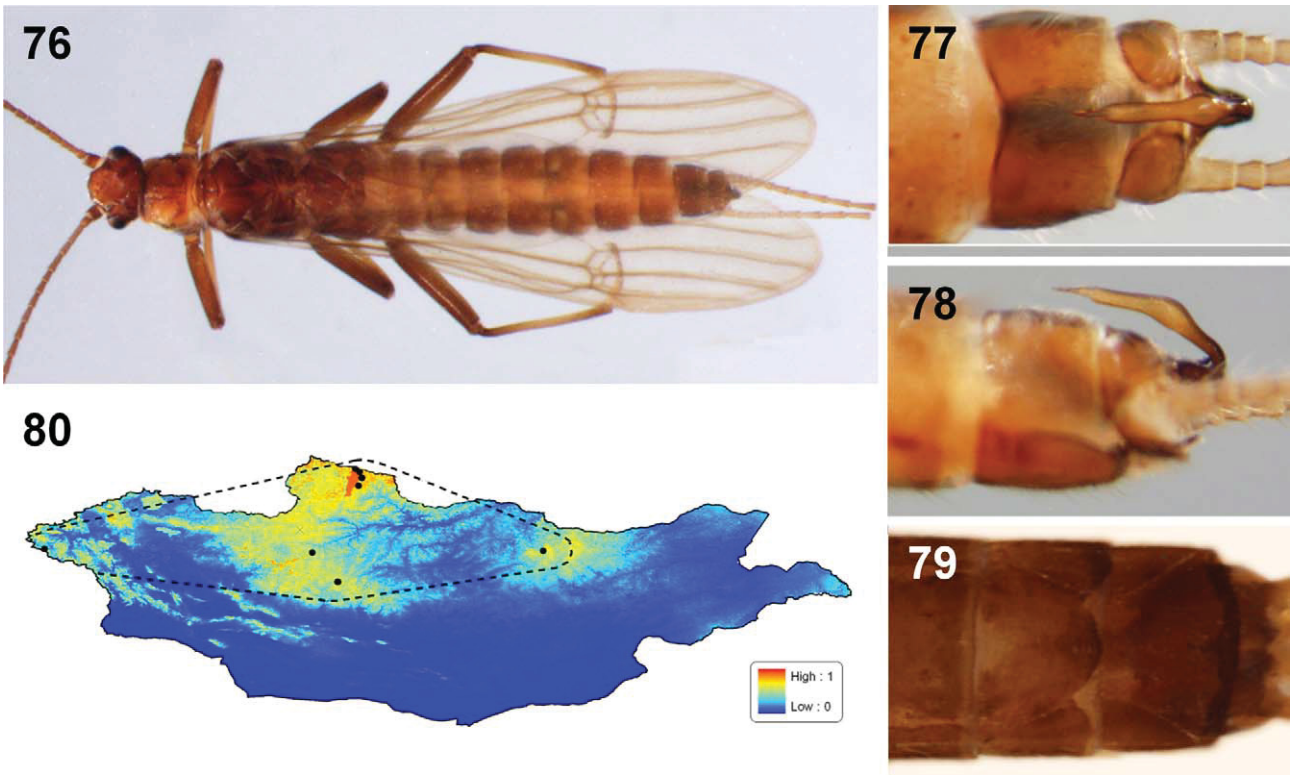

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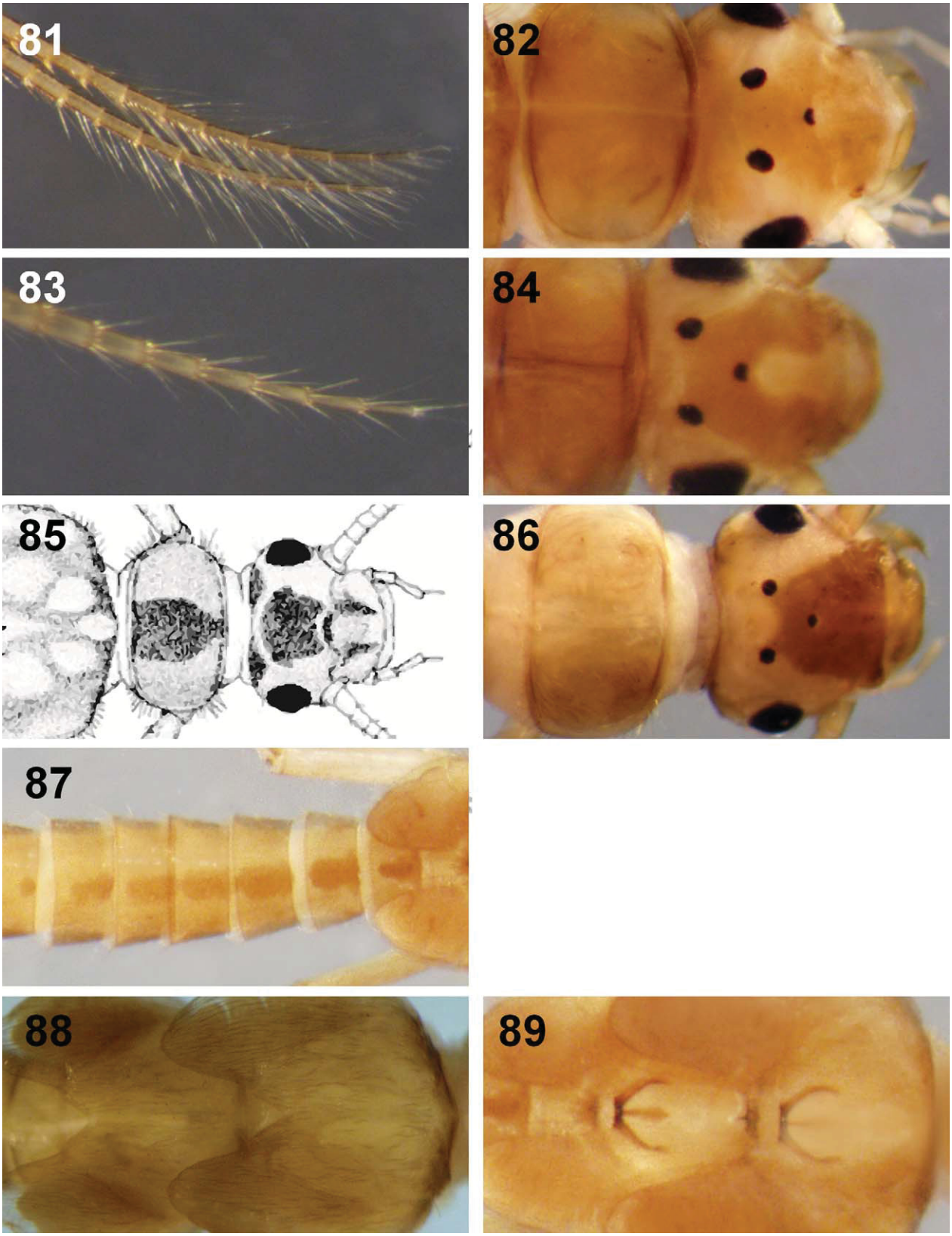

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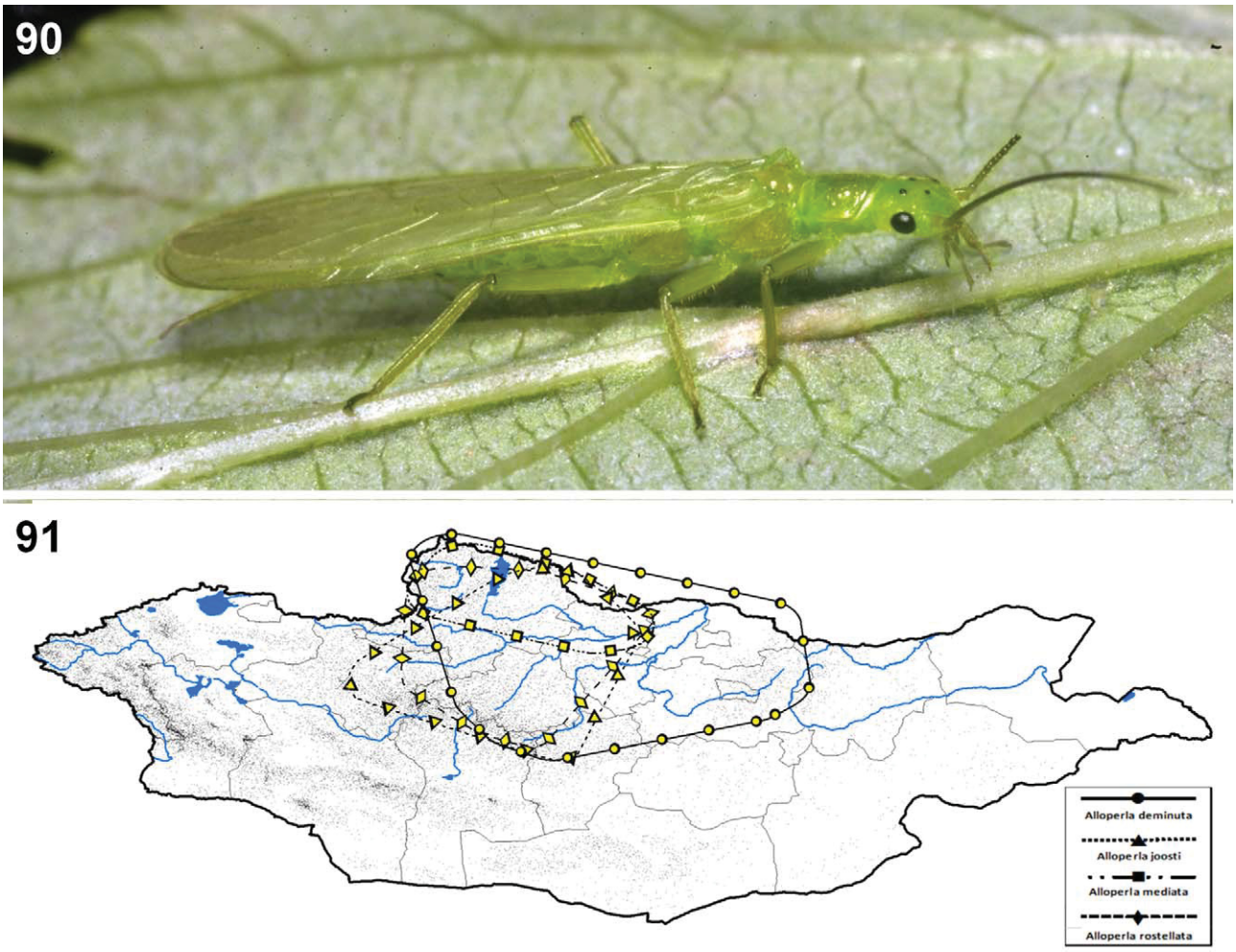

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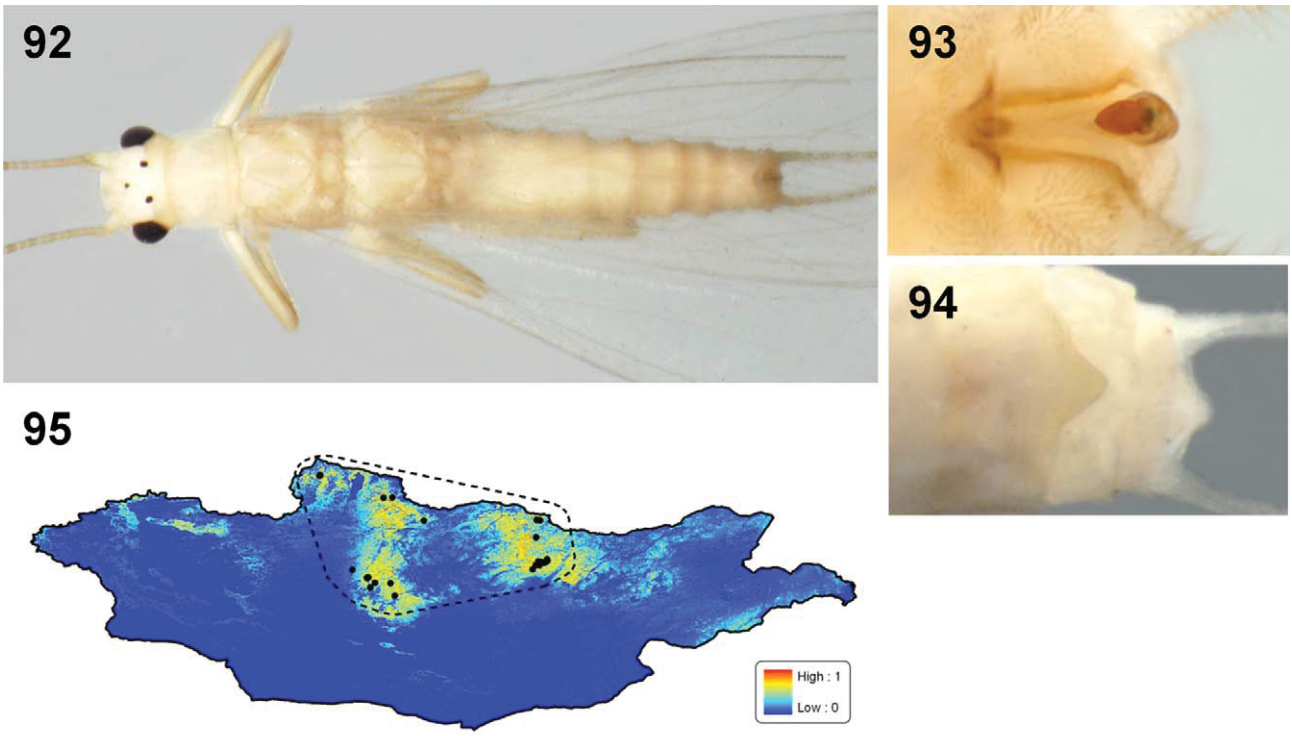

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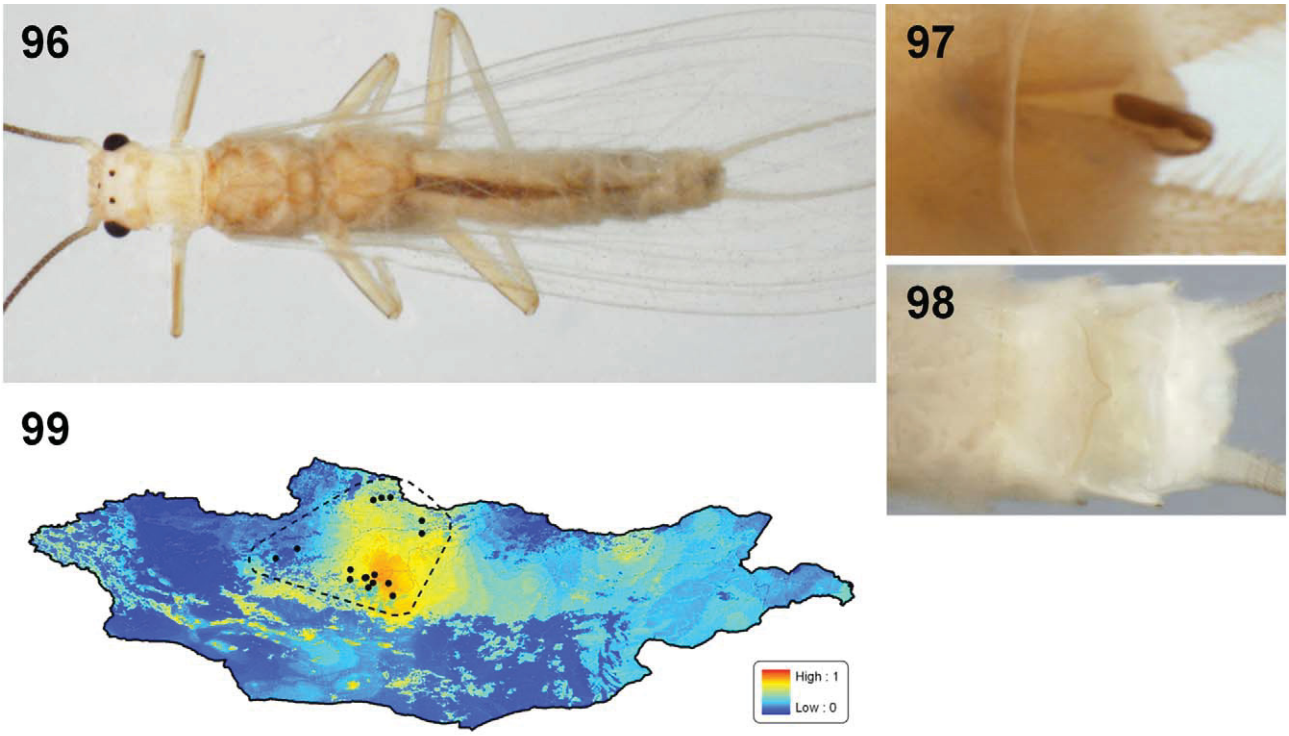

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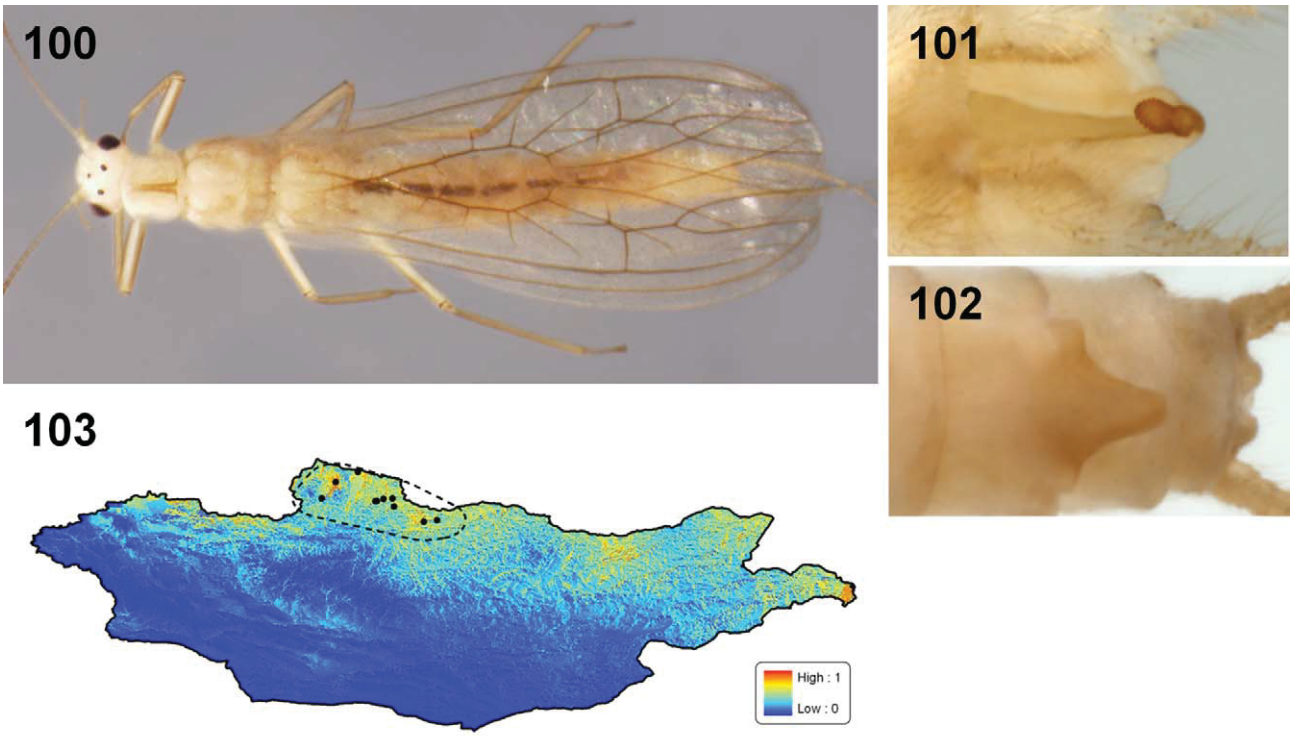

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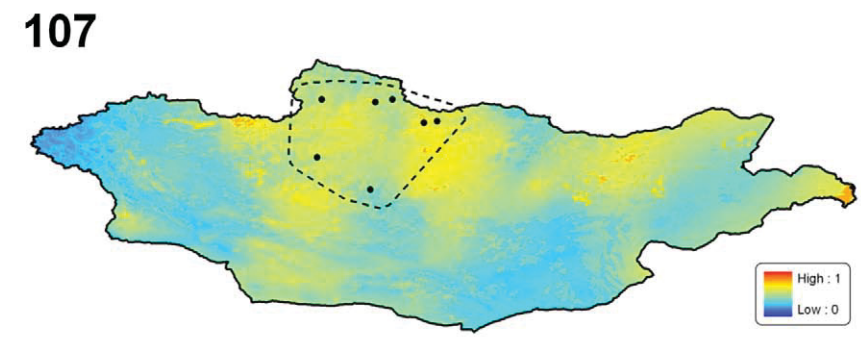

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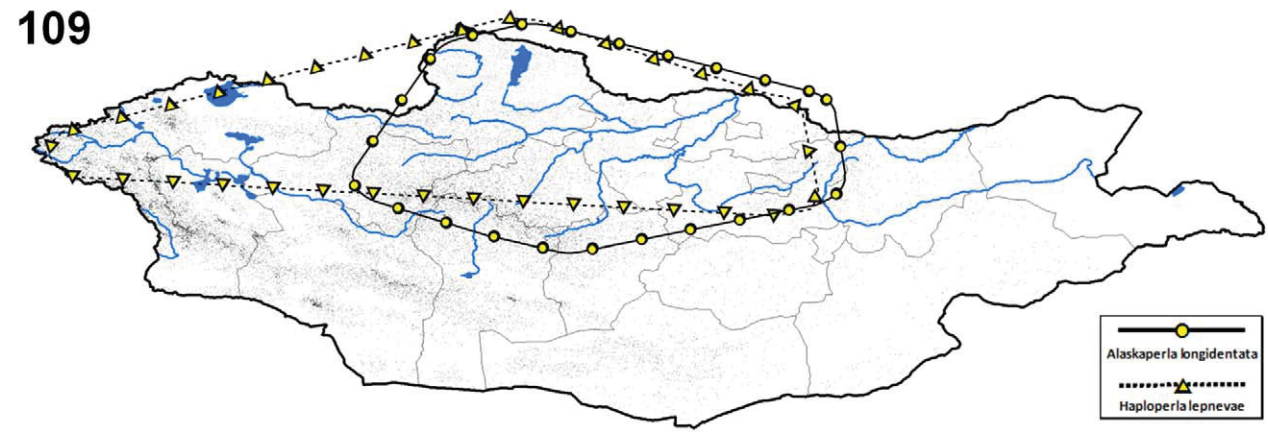

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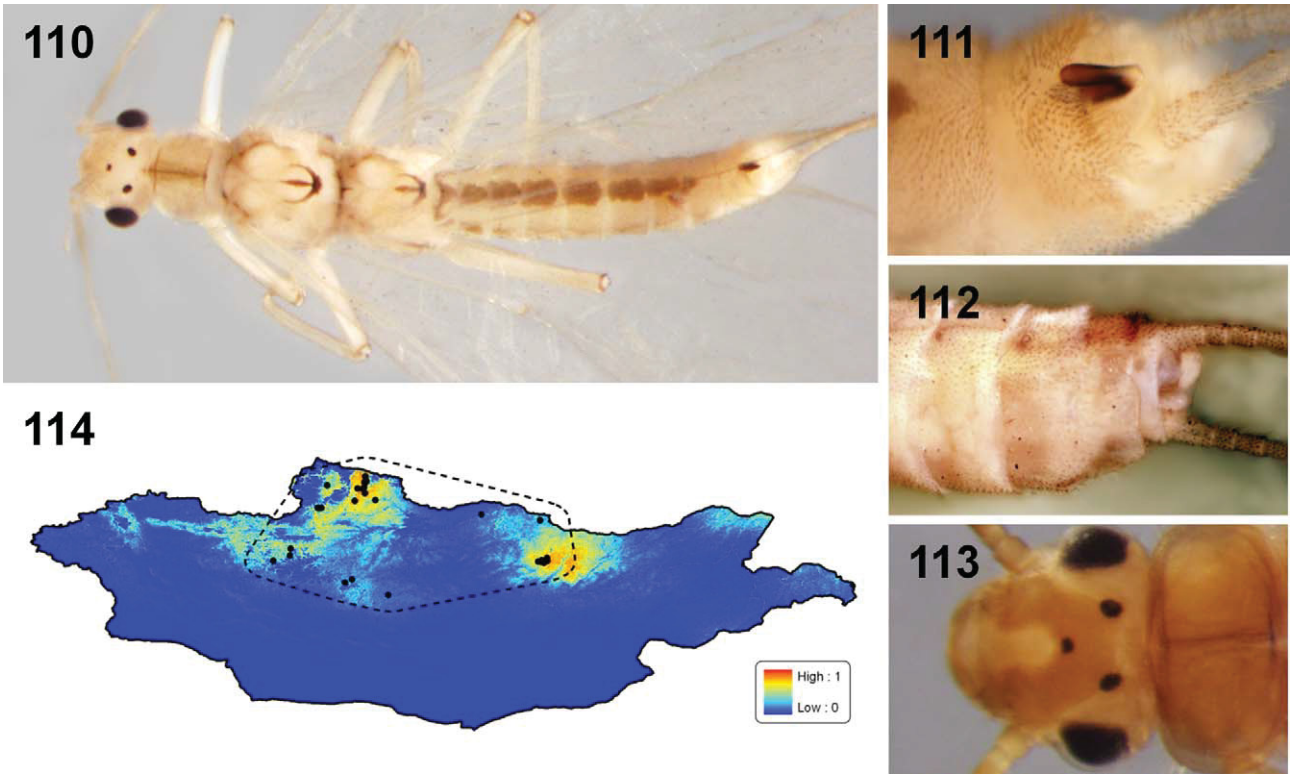

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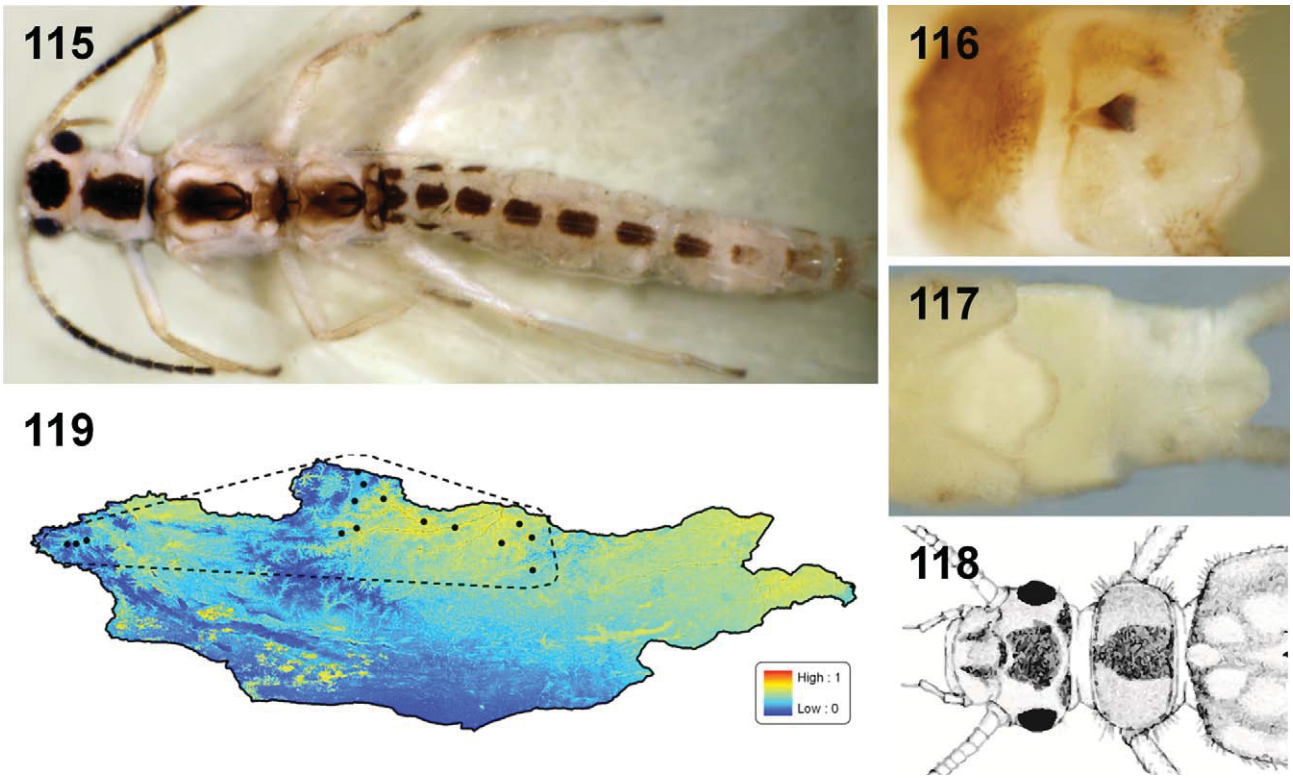

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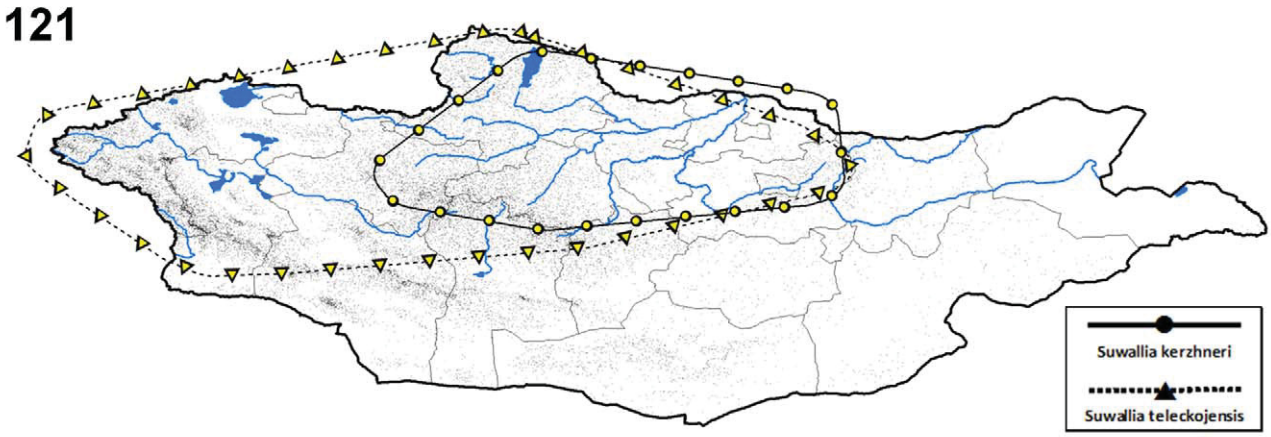

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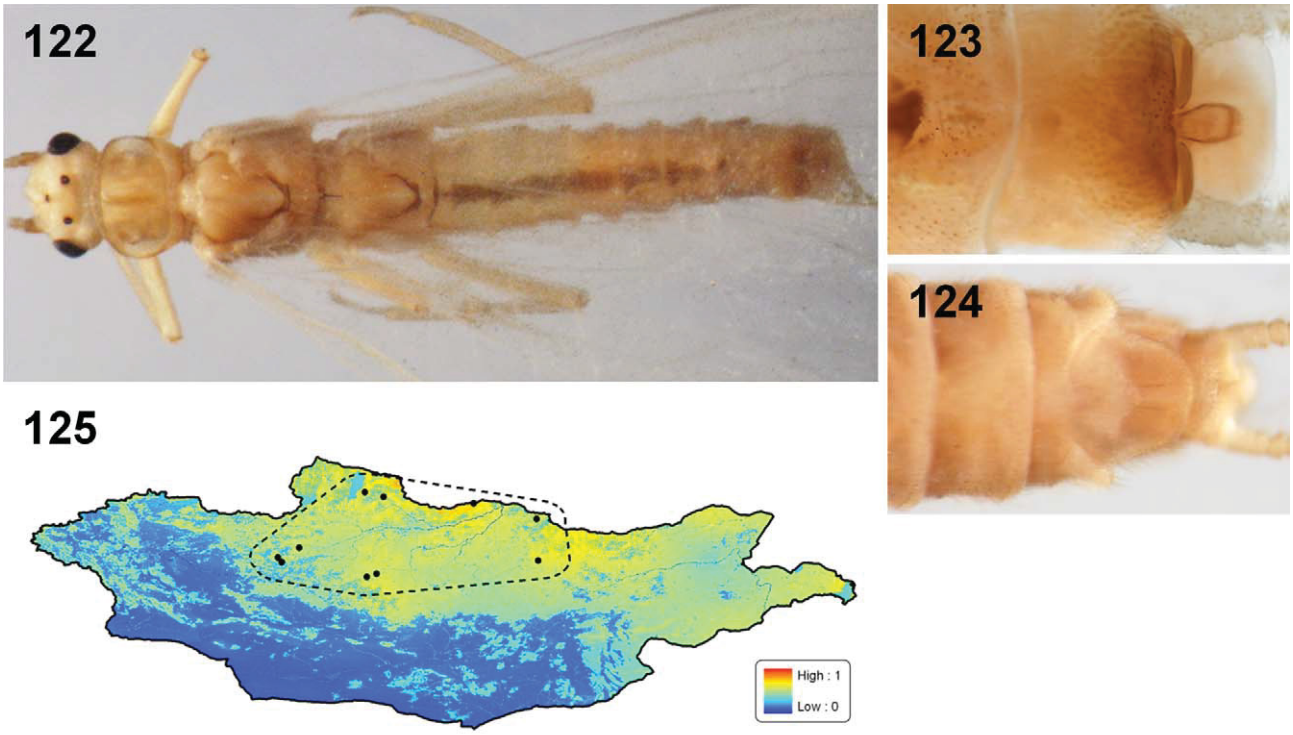

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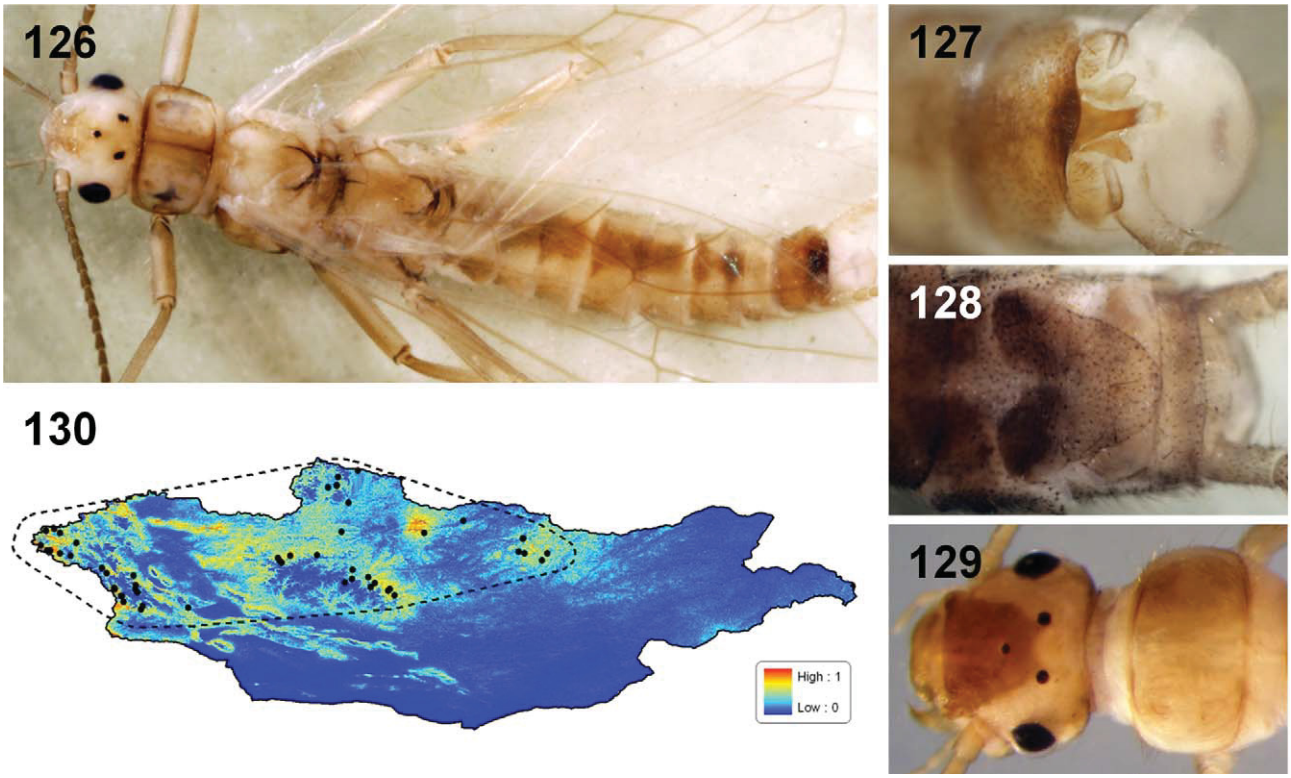

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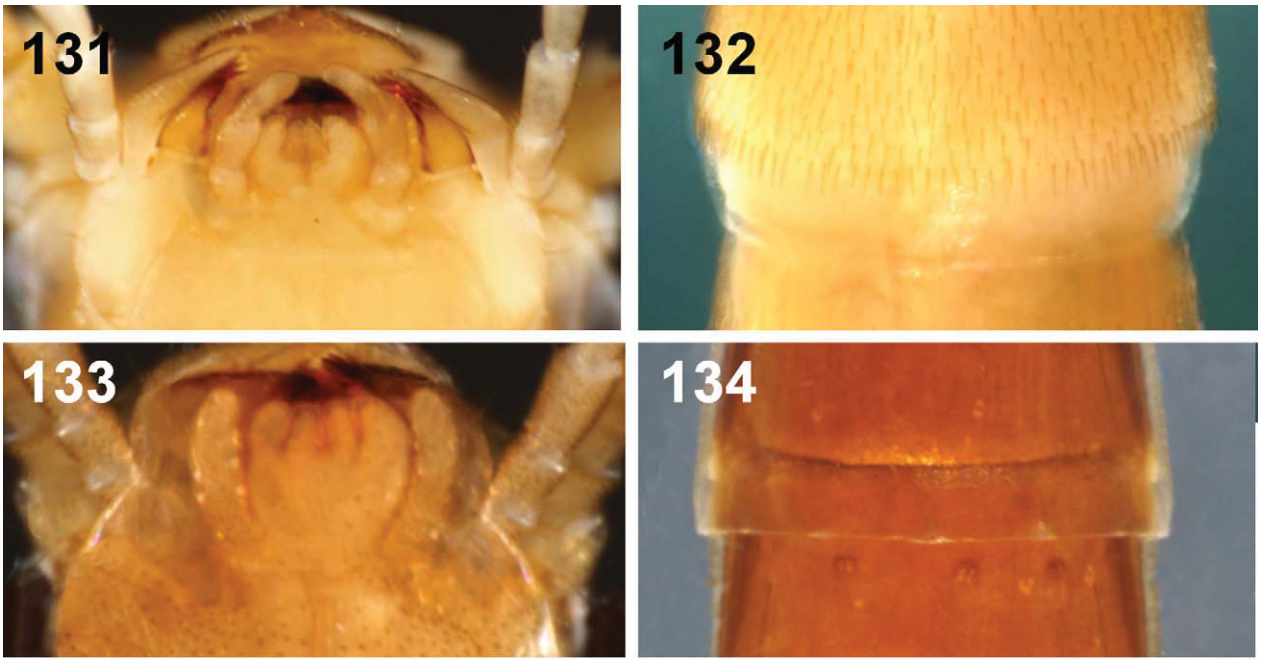

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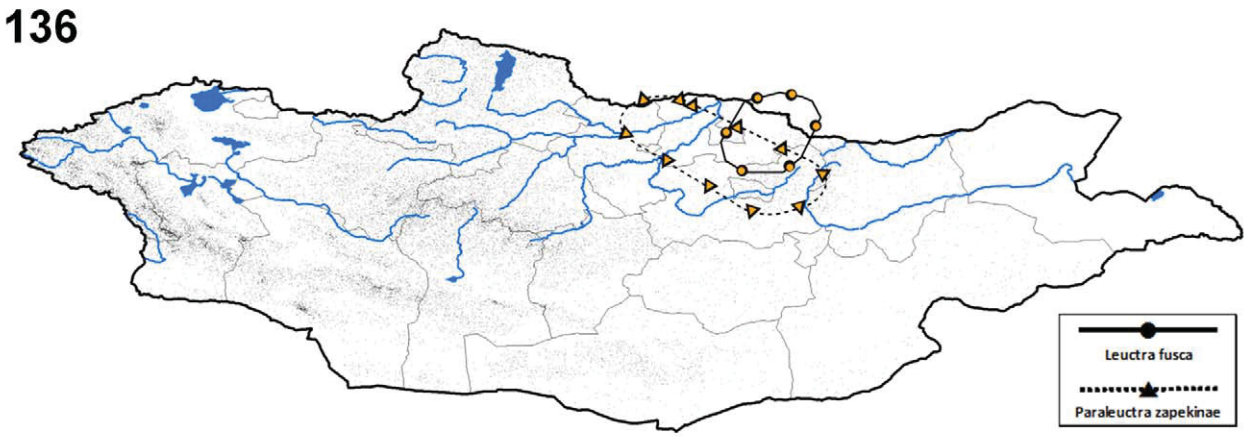

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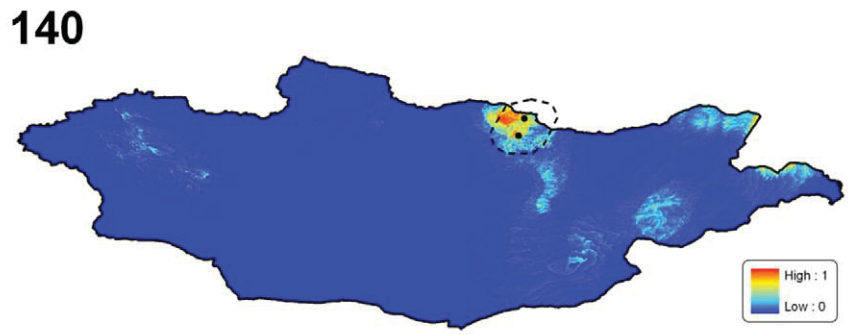

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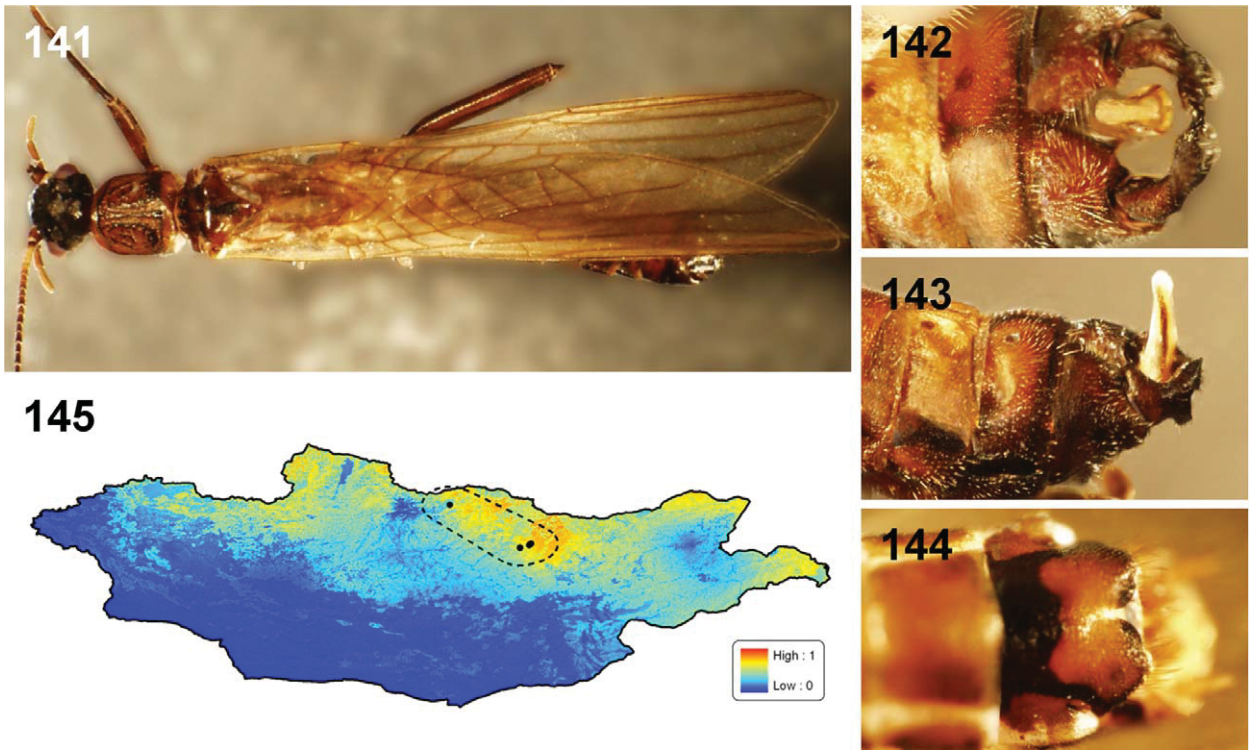

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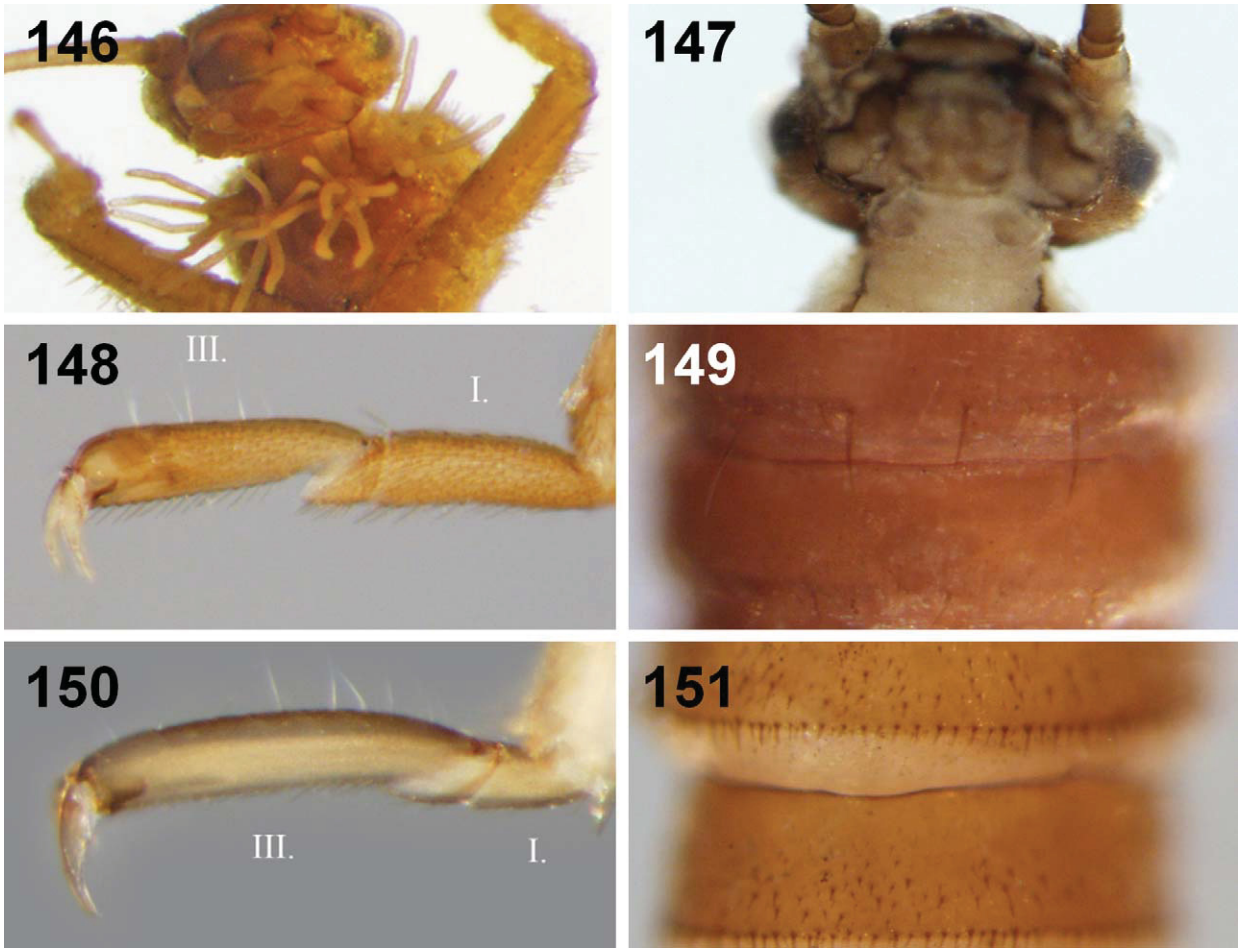

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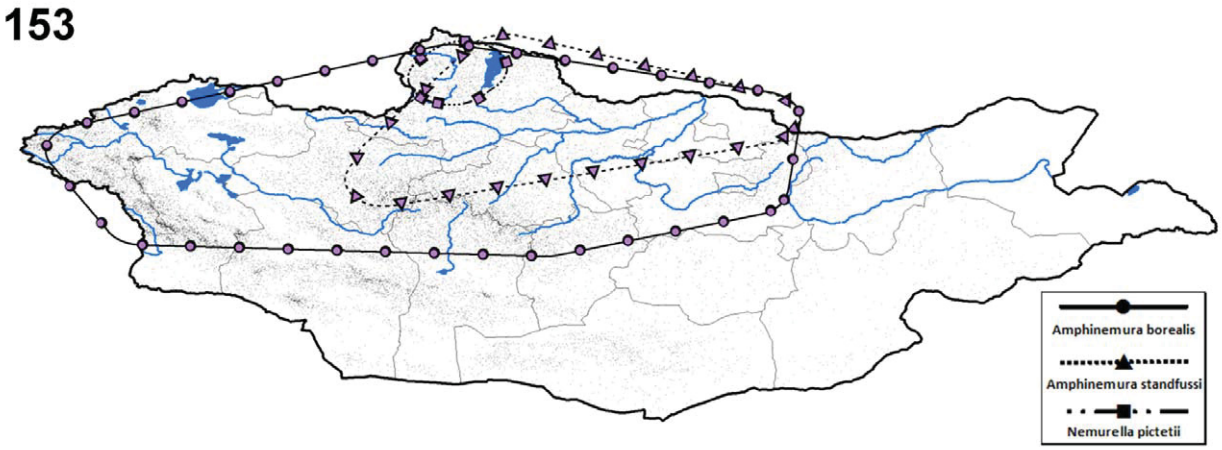

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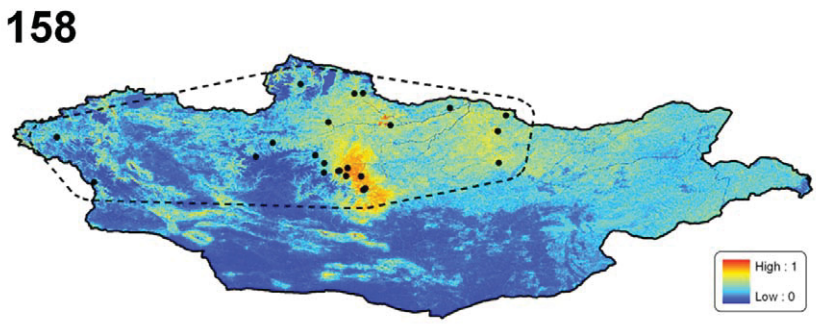

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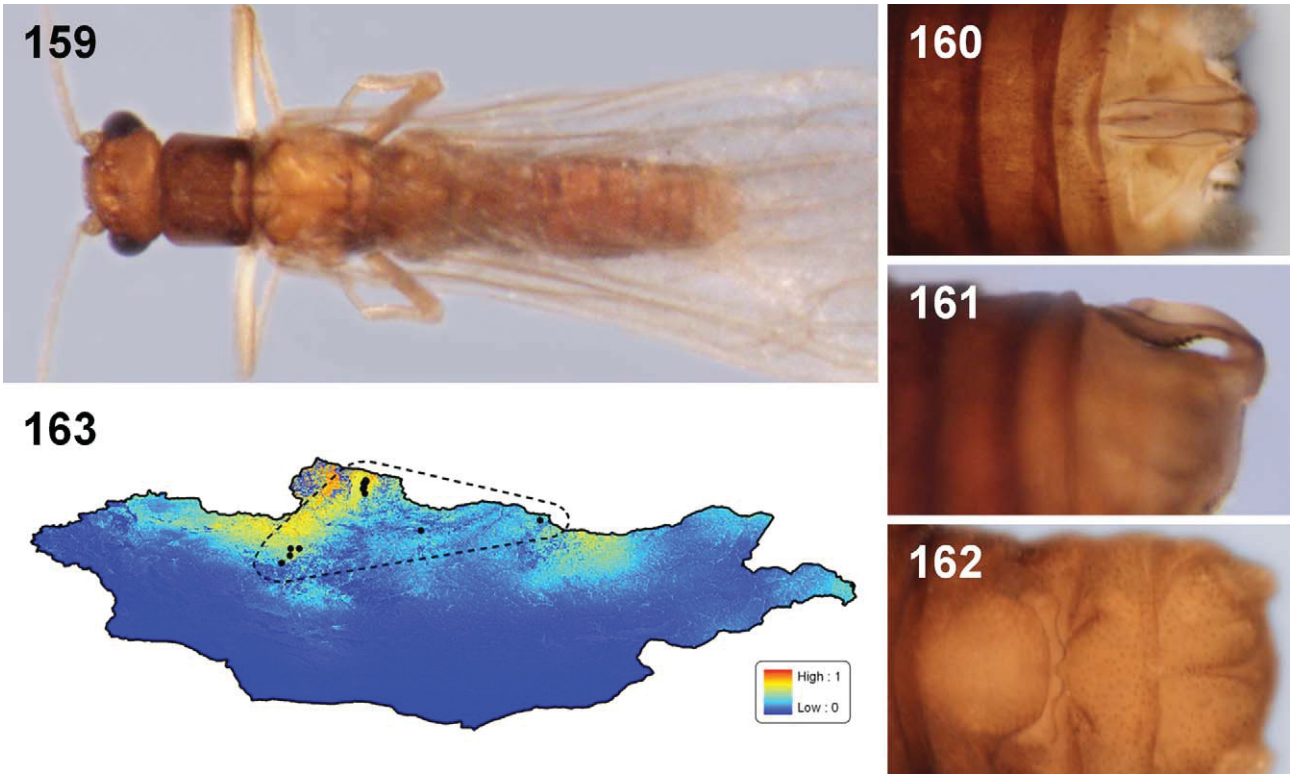

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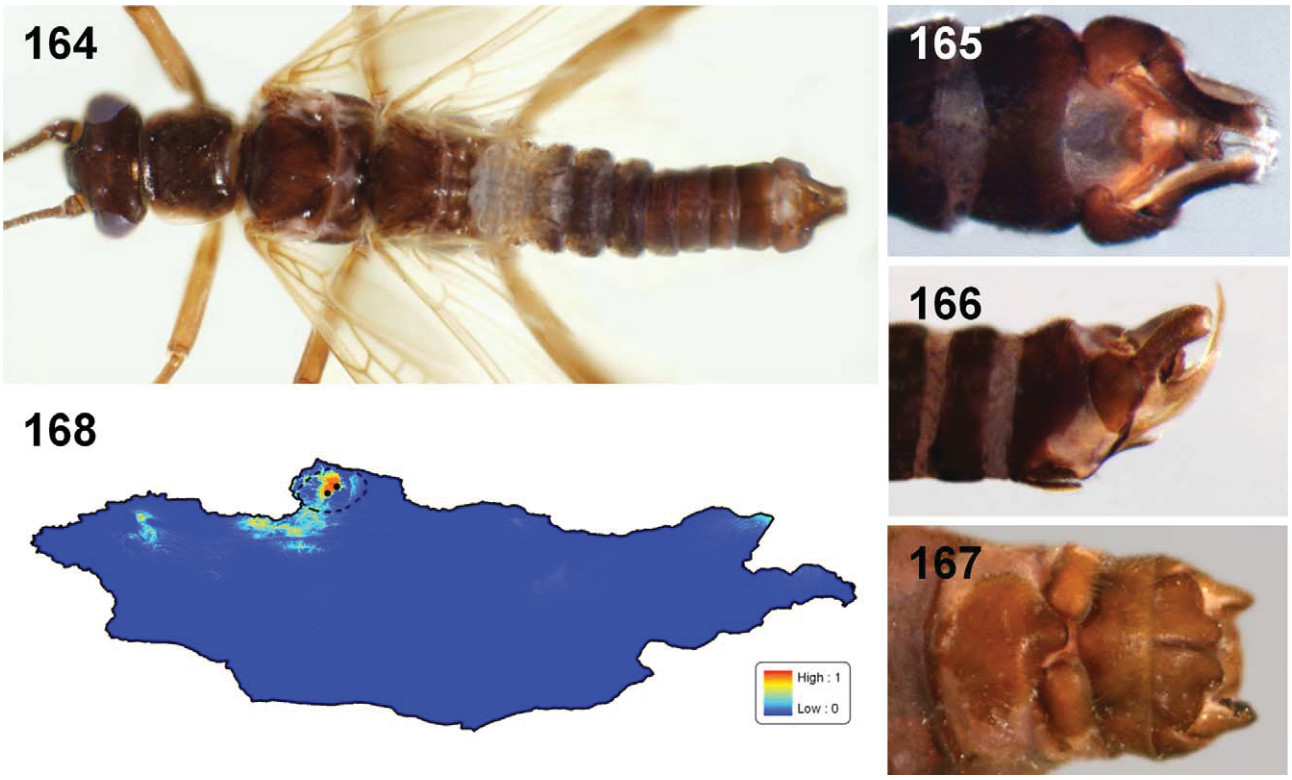

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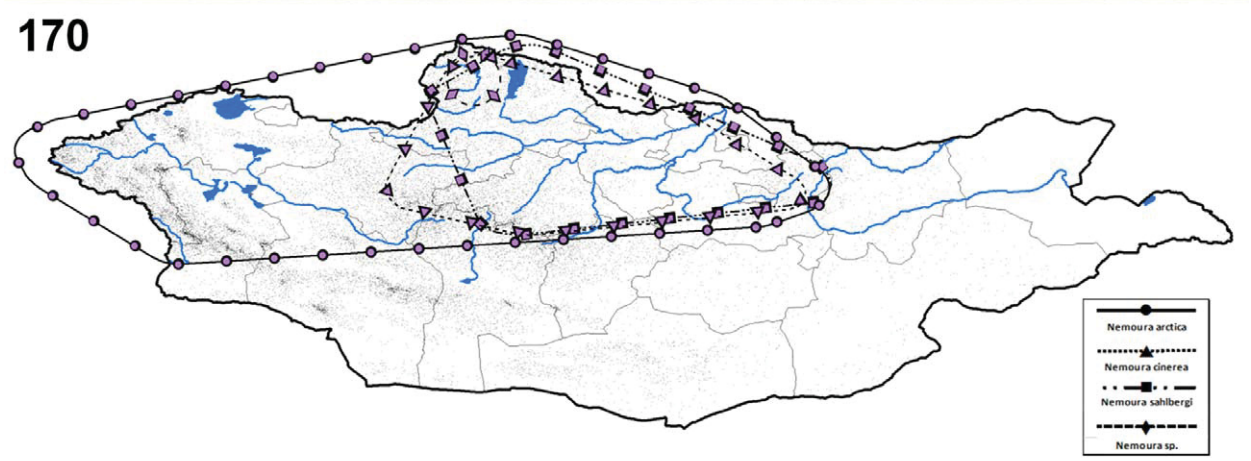

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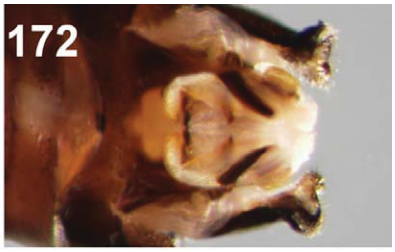
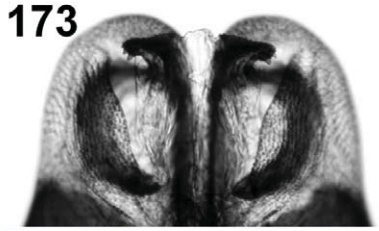
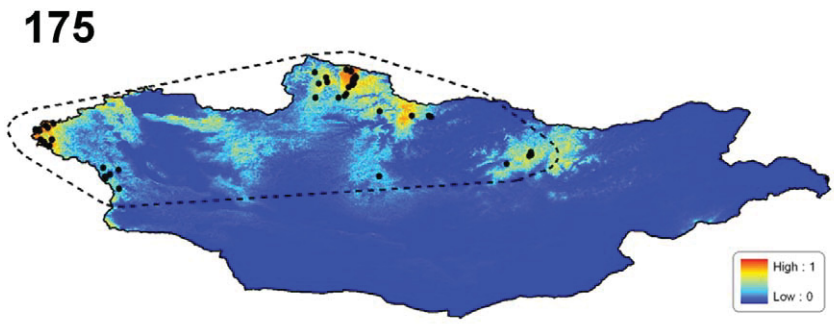
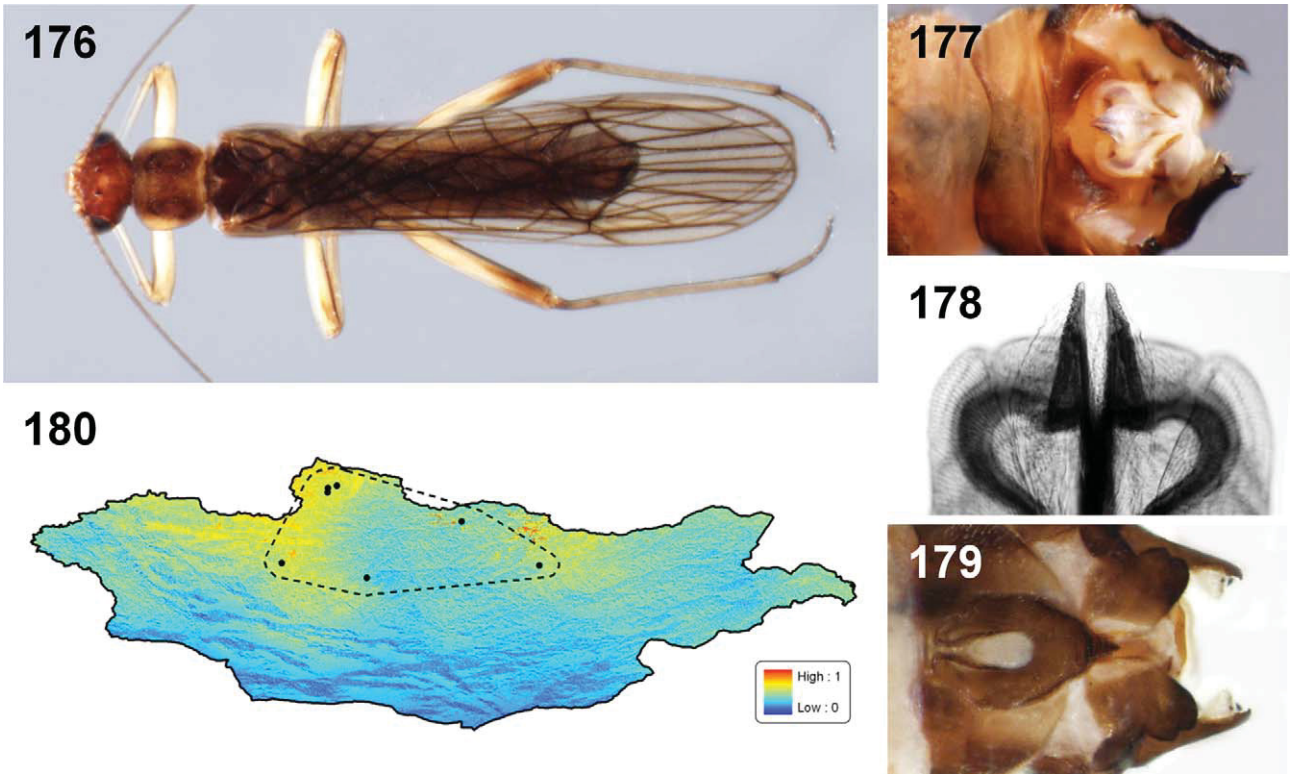


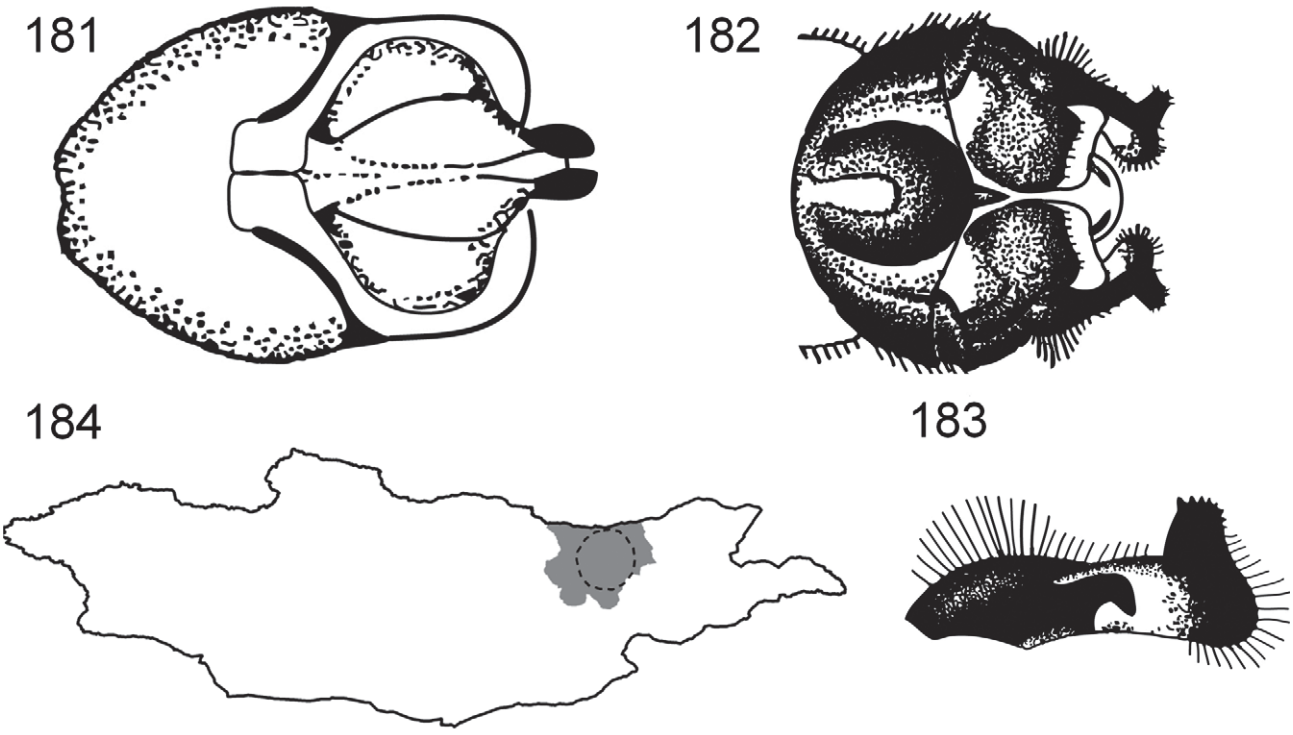




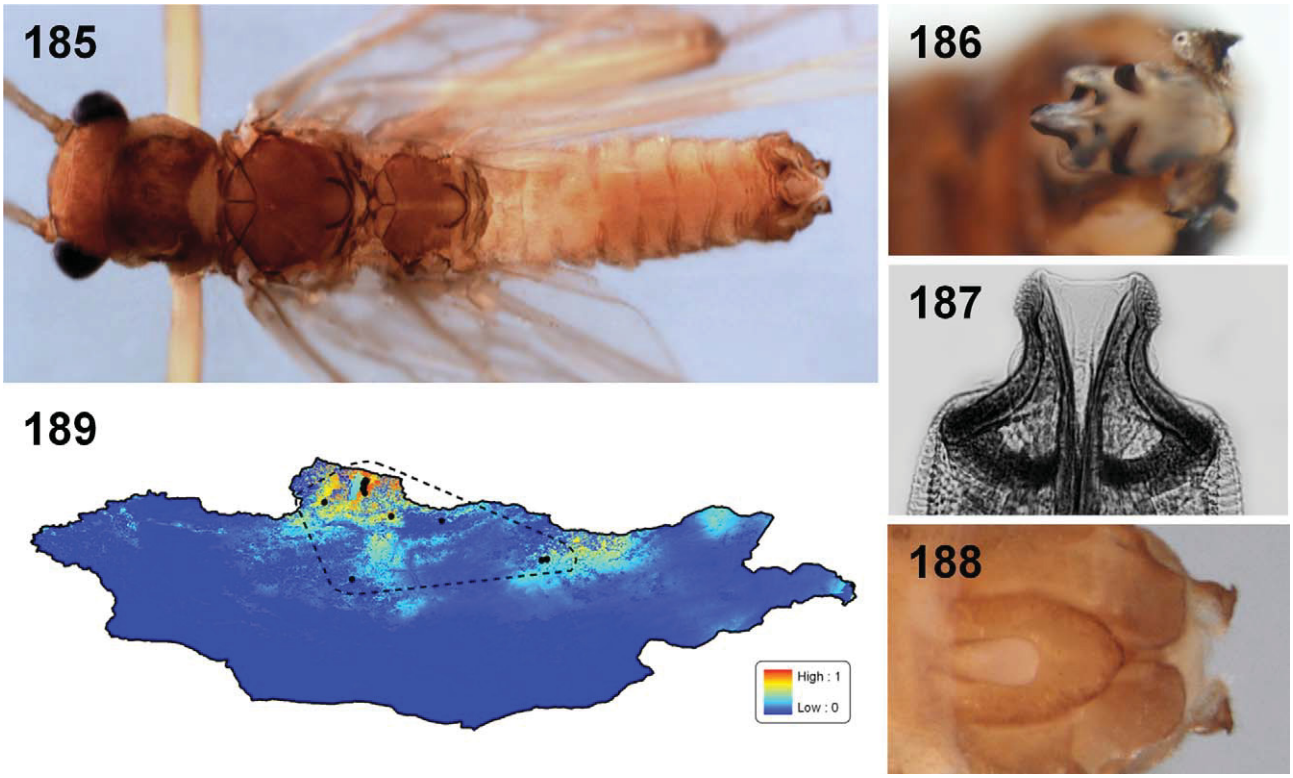
FIGURES 171–175. *Nemoura arctica.*171: Habitus (preserved); 172: Male terminalia, dorsal; 173: Male epiproct ventral sclerites, detail; 174: Male paraprocts, ventral; 175: Predicted ENM map with documented occurrences and range estimate.



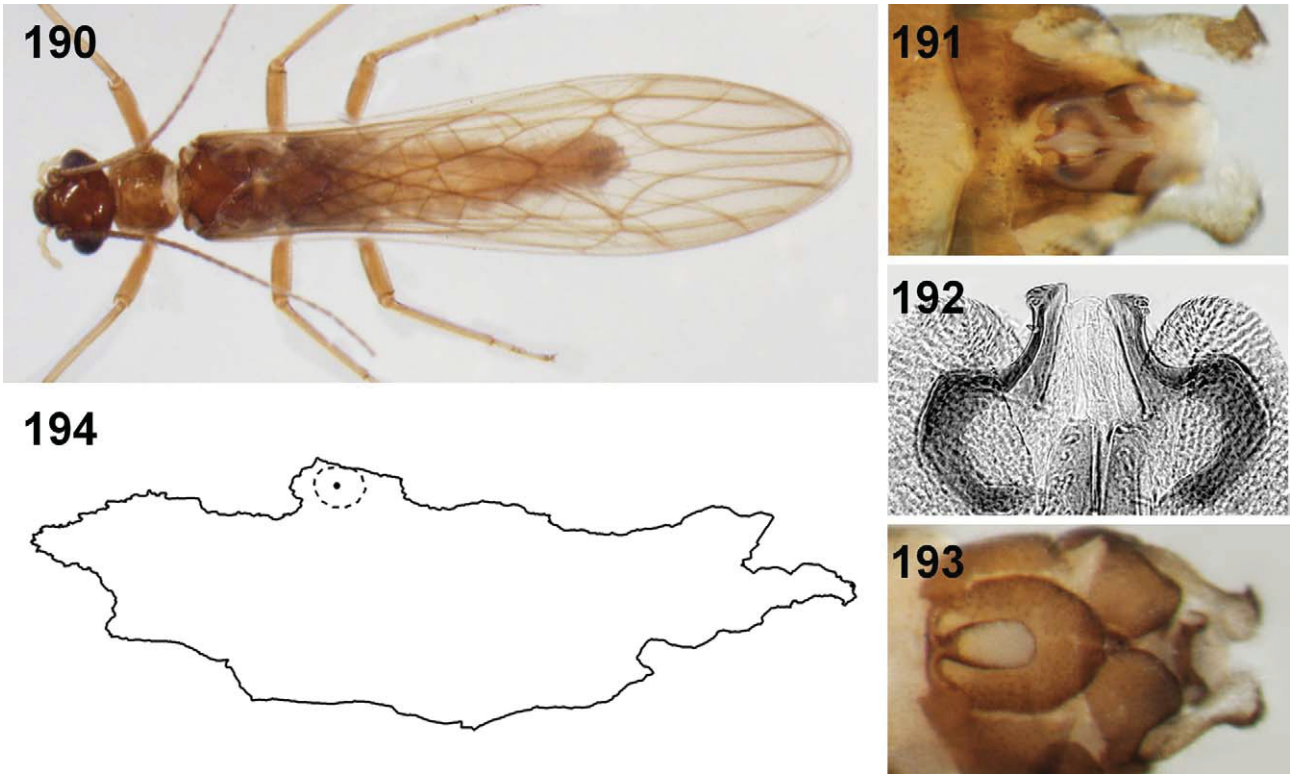
FIGURES 176–180. *Nemoura cinerea.*176: Habitus (preserved); 177: Male terminalia, dorsal; 178: Male epiproct ventral sclerites, detail; 179: Male paraprocts, ventral; 180: Predicted ENM map with documented occurrences and range estimate.



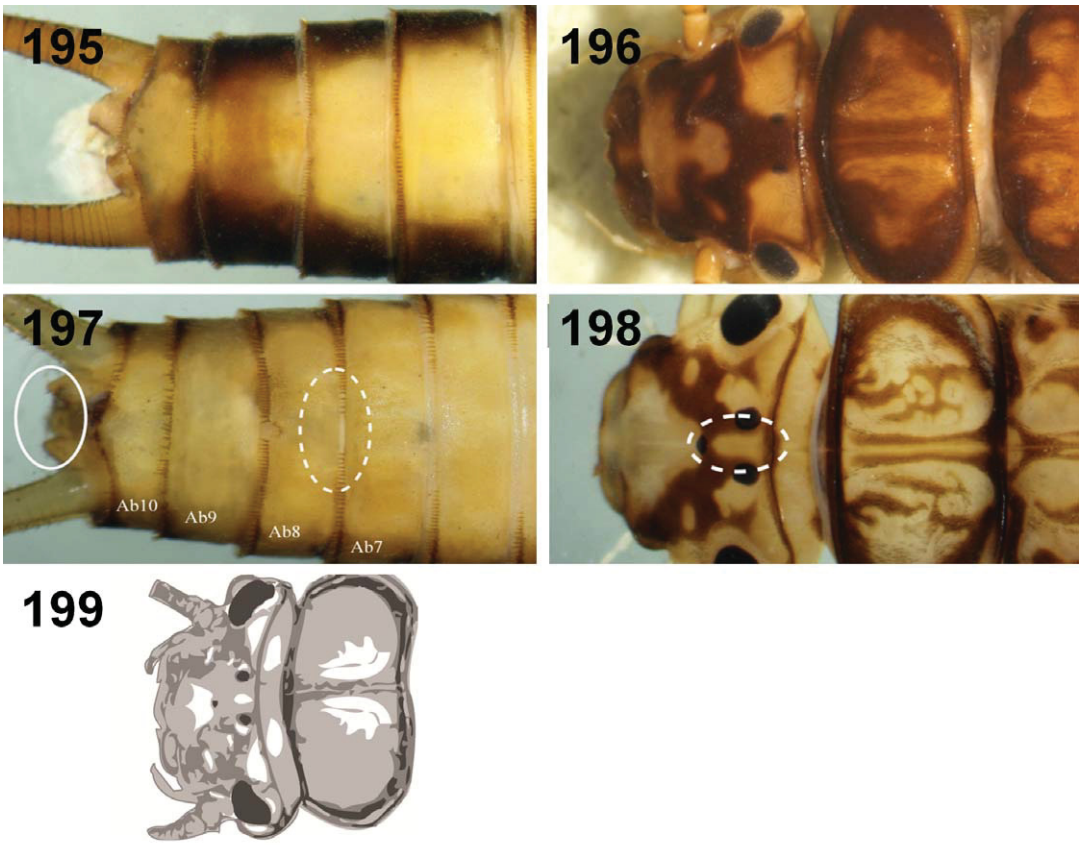
FIGURES 181–184. *Nemoura nigrodentata.* 181: Male terminalia. dorsal; 182: Male paraprocts, ventral; 183: Male cerci, lateral; 184: Historical records map with range estimate.



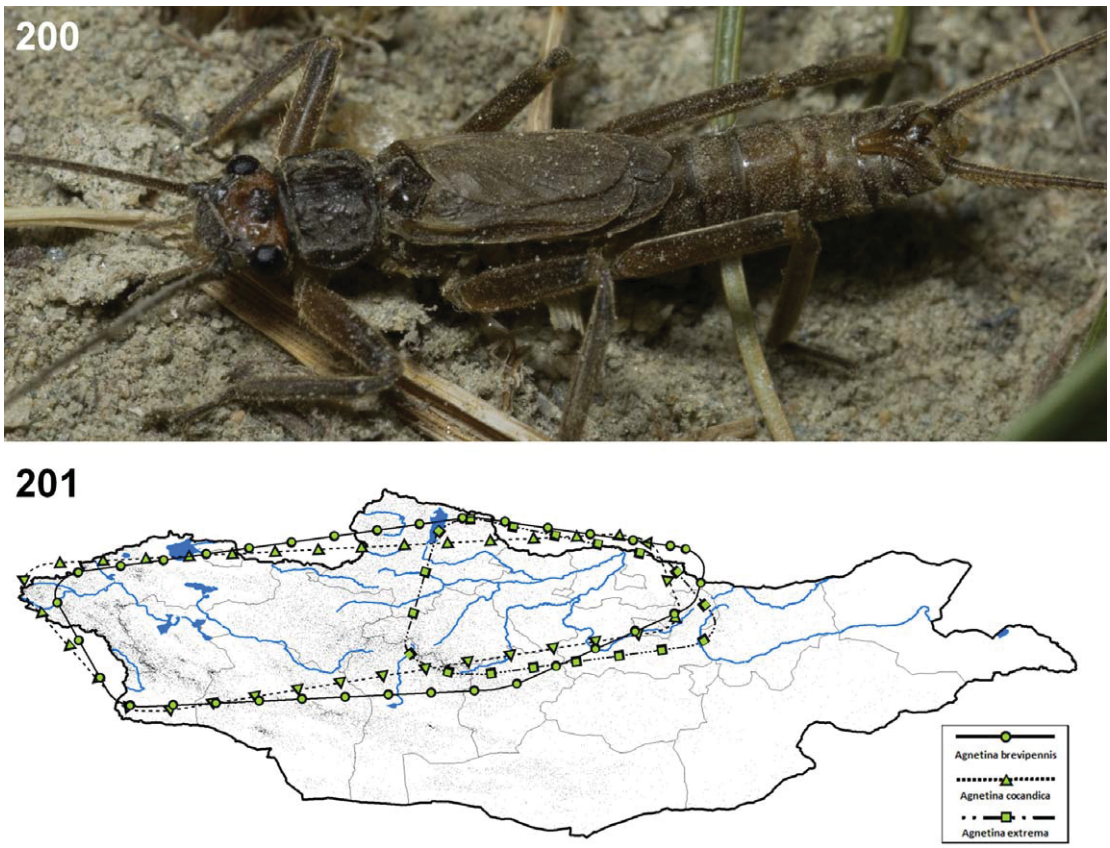
FIGURES 185–189. *Nemoura sahlberg*i. 185: Habitus (preserved); 186: Male terminalia, dorsal; 187: Male epiproct ventral sclerites, detail; 188: Male paraprocts, ventral; 189: Predicted ENM map with documented occurrences and range estimate.



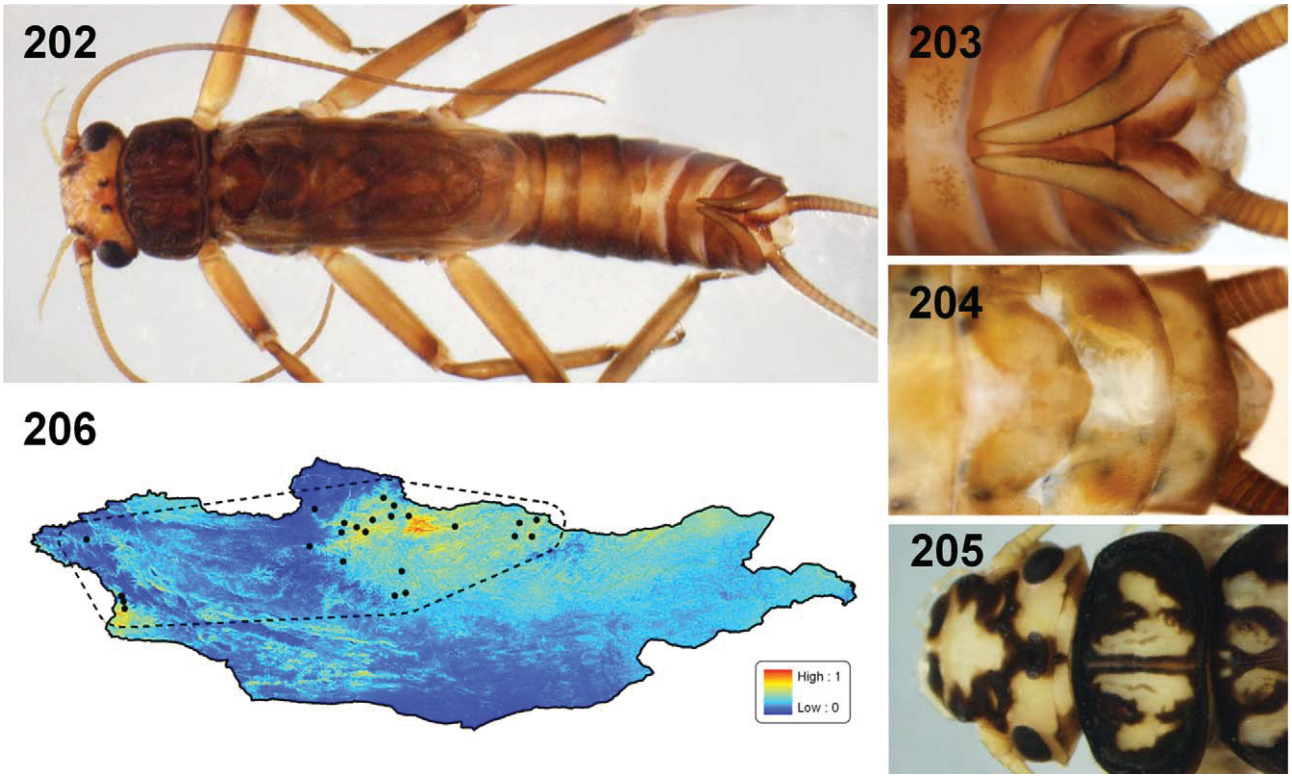
FIGURES 190–194. *Nemoura* sp. 190 : Habitus (preserved); 191: Male terminalia, dorsal; 192: Male epiproct ventral sclerites, detail; 193: Male paraprocts, ventral; 194: Range Map with documented occurrences.



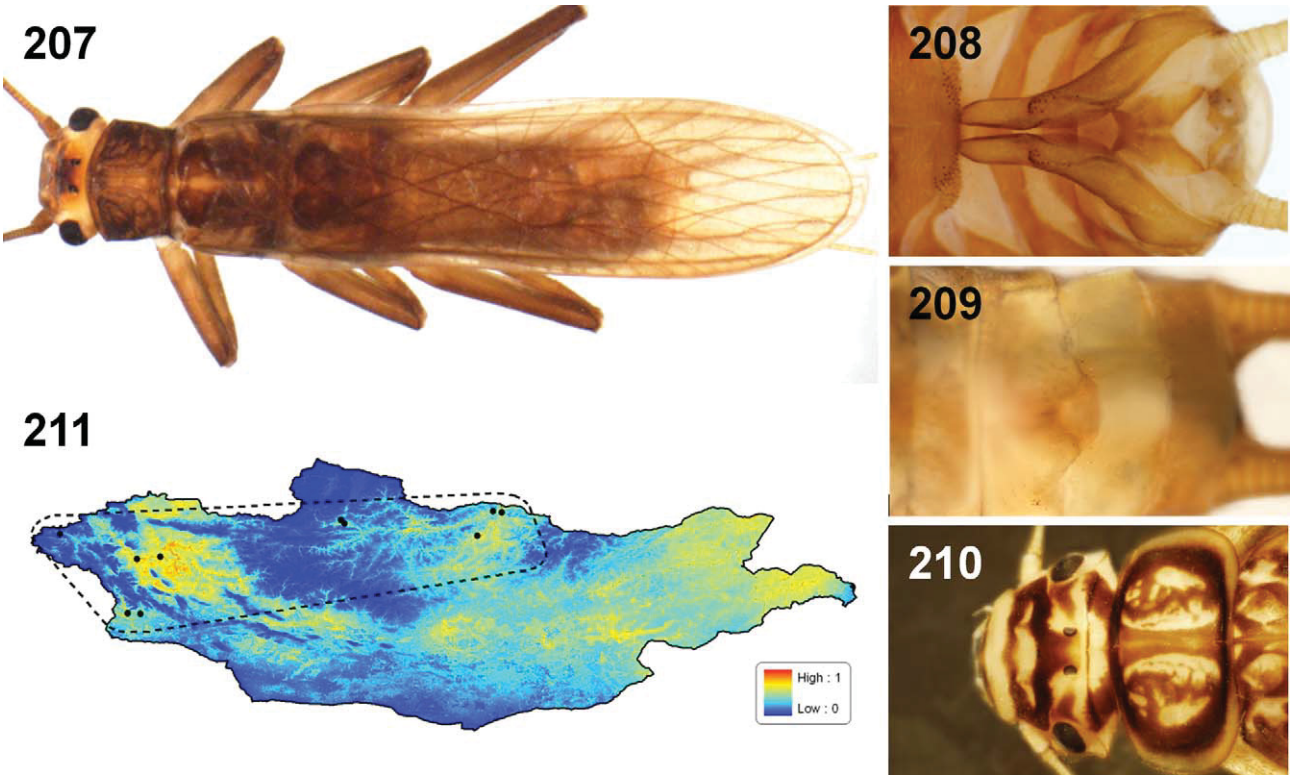
FIGURES 195–199. Perlidae genus key. 195: Abdominal sternum 7–10 of *Agnetina brevipennis,* ventral; 196: Head of *Agnetina extrema*, dorsal; 197: Abdominal sternum 7–10 of *Paragnetina flavotincta*, ventral; 198: Head of *Pargnetina flavotincta*, dorsal; 199: Head of *Kamimruia exilis,* dorsal. Illustration by S. W. Judson after Teslenko and Zhiltzova 2007.



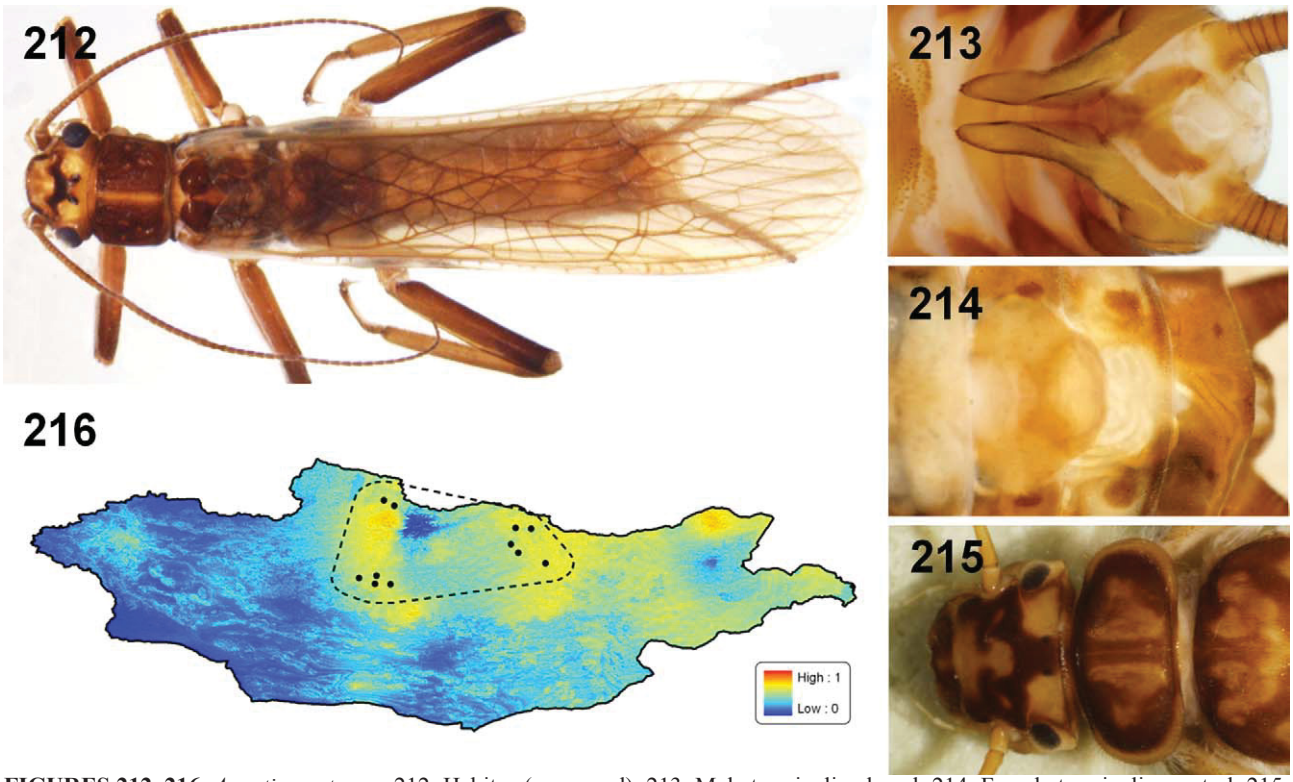
FIGURES 200–201. *Agnetina*. 200: Habitus (live), *Agnetina brevipennis,* Khovd River (MAIS2008070501); 201: Comparative distribution map.



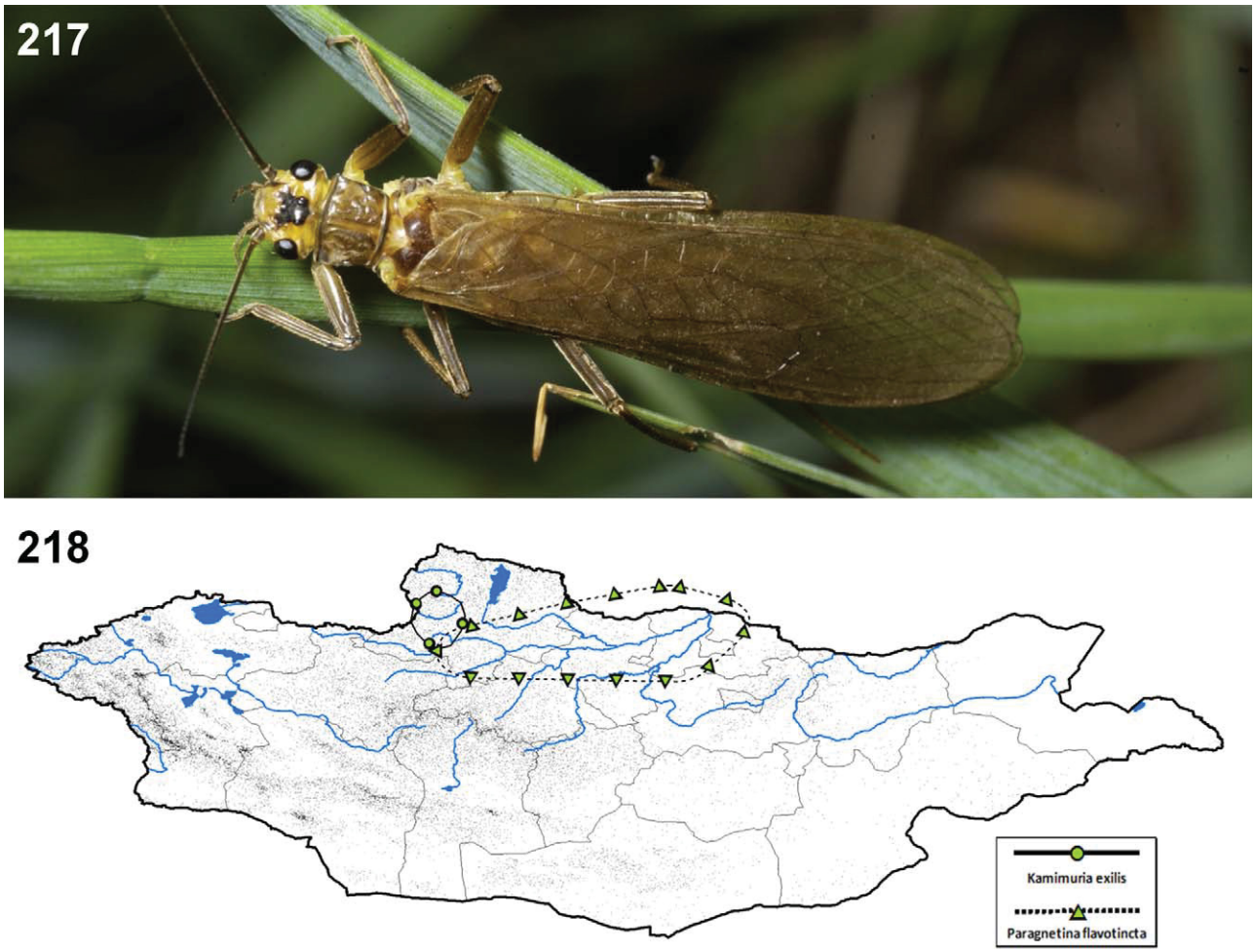
FIGURES 202–206. *Agnetina brevipennis*. 202: Habitus (preserved); 203: Male terminalia, dorsal; 204: Female terminalia, ventral; 205: Nymph head; 206: Predicted ENM map with documented occurrences and range estimate.



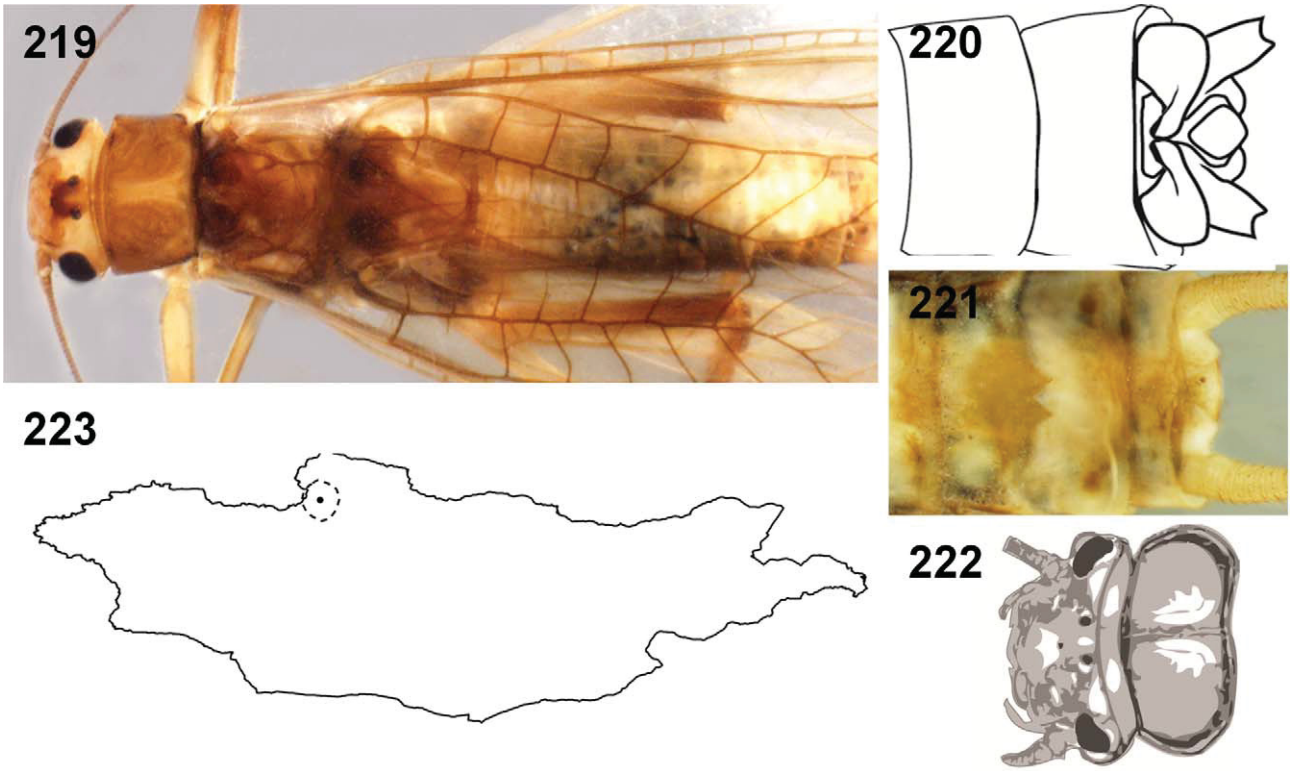
FIGURES 207–211. *Agnetina cocandica.* 207: Habitus (preserved); 208: Male terminalia, dorsal; 209: Female terminalia, ventral; 210: Nymph head; 211: Predicted ENM map with documented occurrences and range estimate.



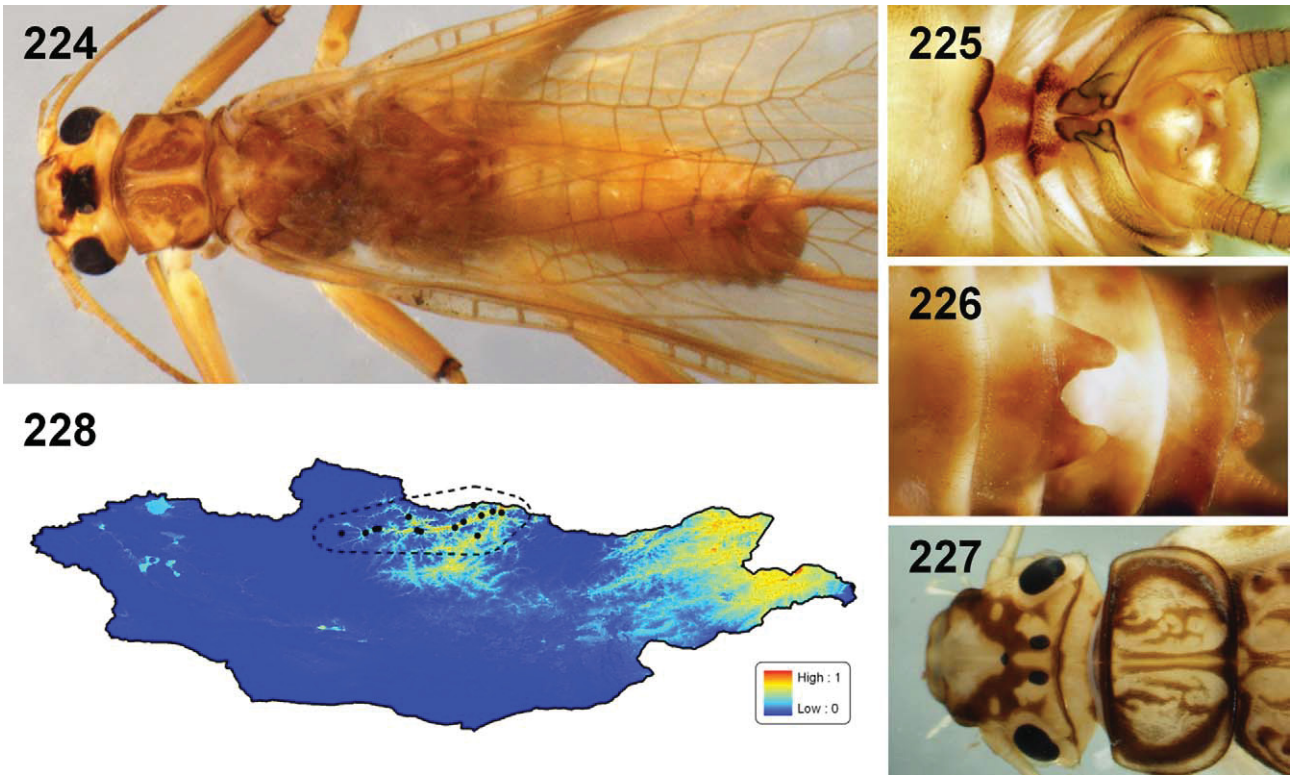
FIGURES 212–216. *Agnetina extrema*. 212: Habitus (preserved); 213: Male terminalia, dorsal; 214: Female terminalia, ventral; 215: Nymph head; 216: Predicted ENM map with documented occurrences and range estimate.



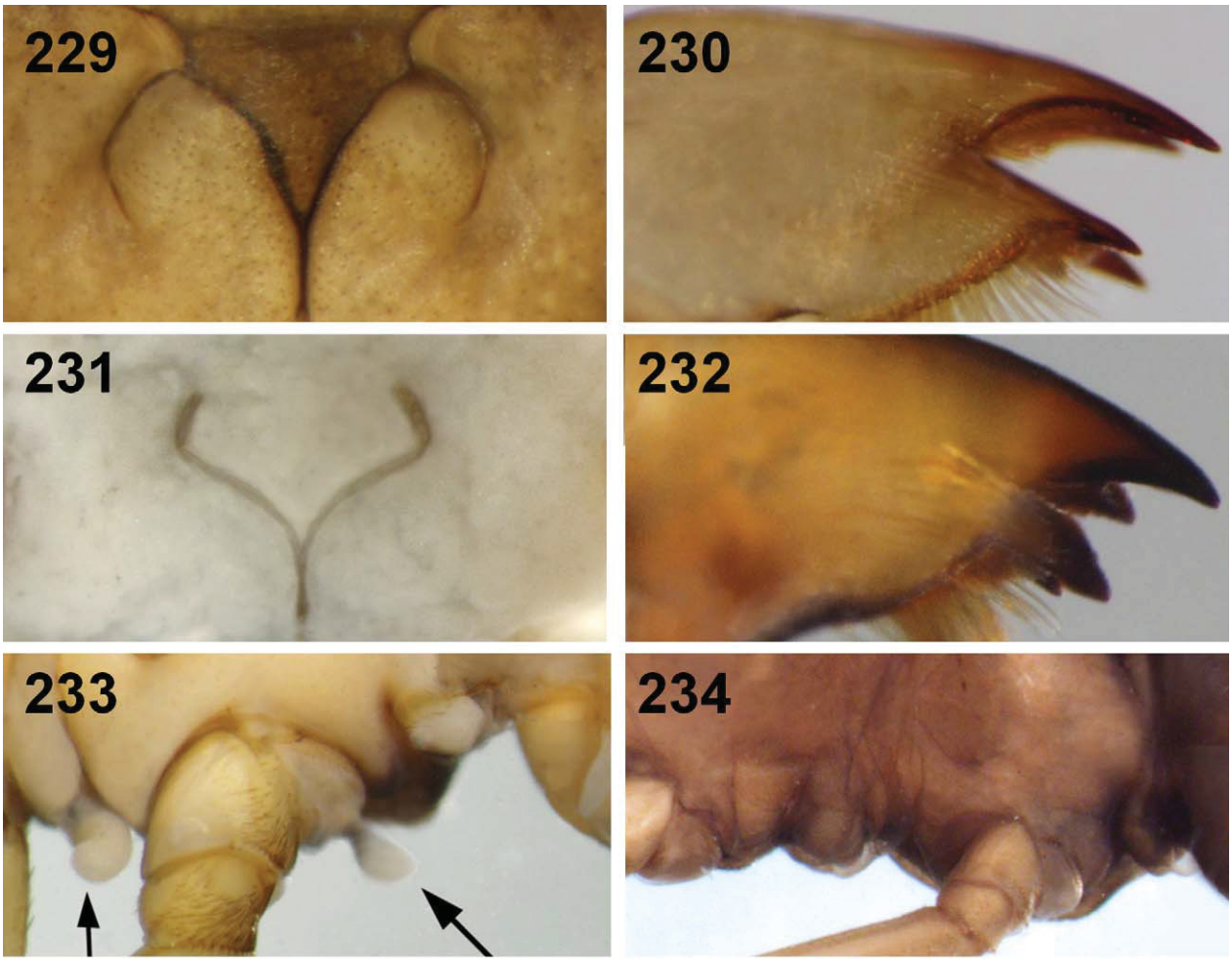
FIGURES 217–218. *Kamimuria* and *Paragnetina*. 217: Habitus (live), *Paragnetina flavotincta,* Unit Stream (SRP2005072501); 218: Comparative Distribution Map.



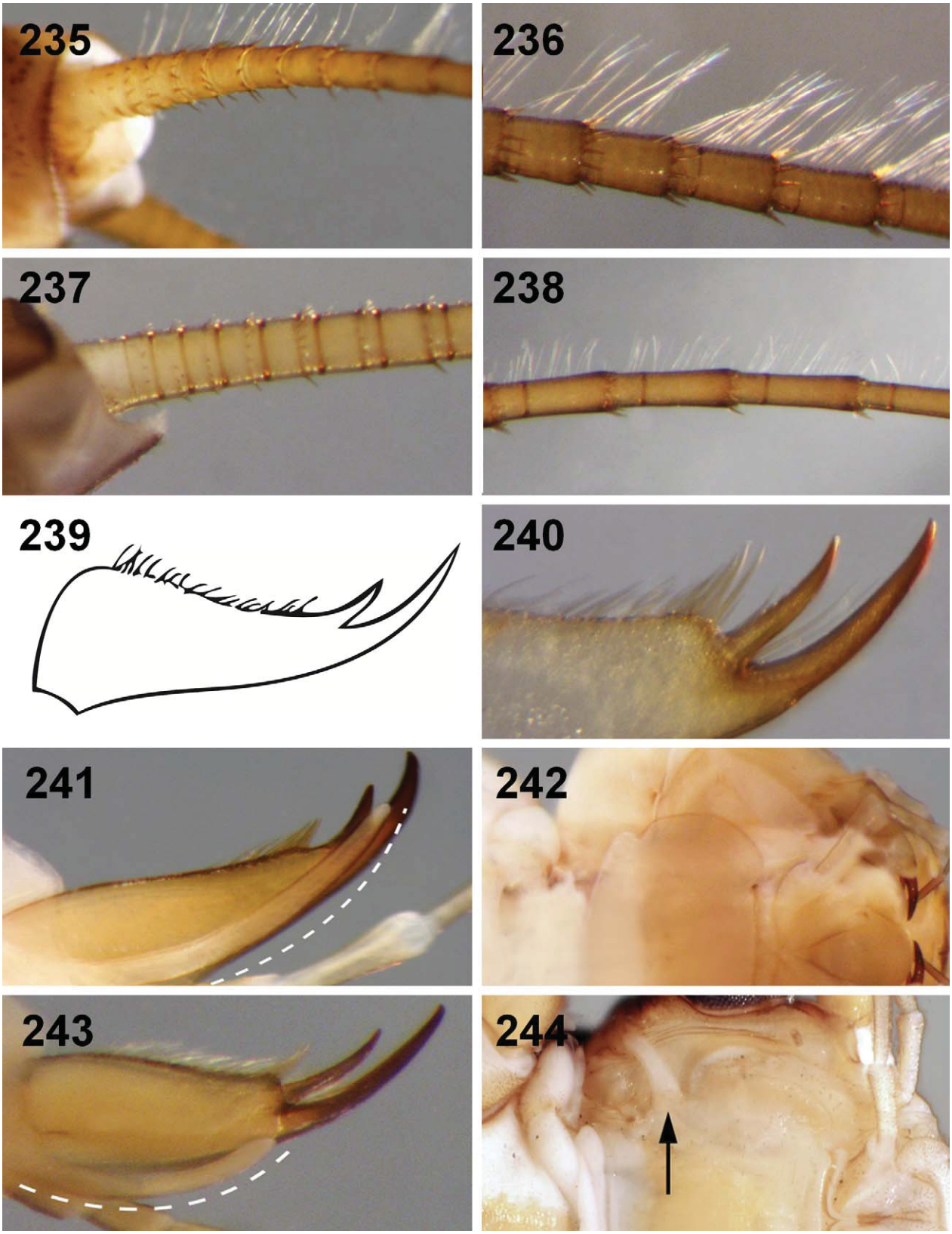
FIGURES 219–223. *Kamimuria exilis*. 219: Habitus (preserved); 220: Male terminalia, dorsal; 221: Female terminalia, ventral; 222: Nymph head; 223: Range Map with documented occurrences.



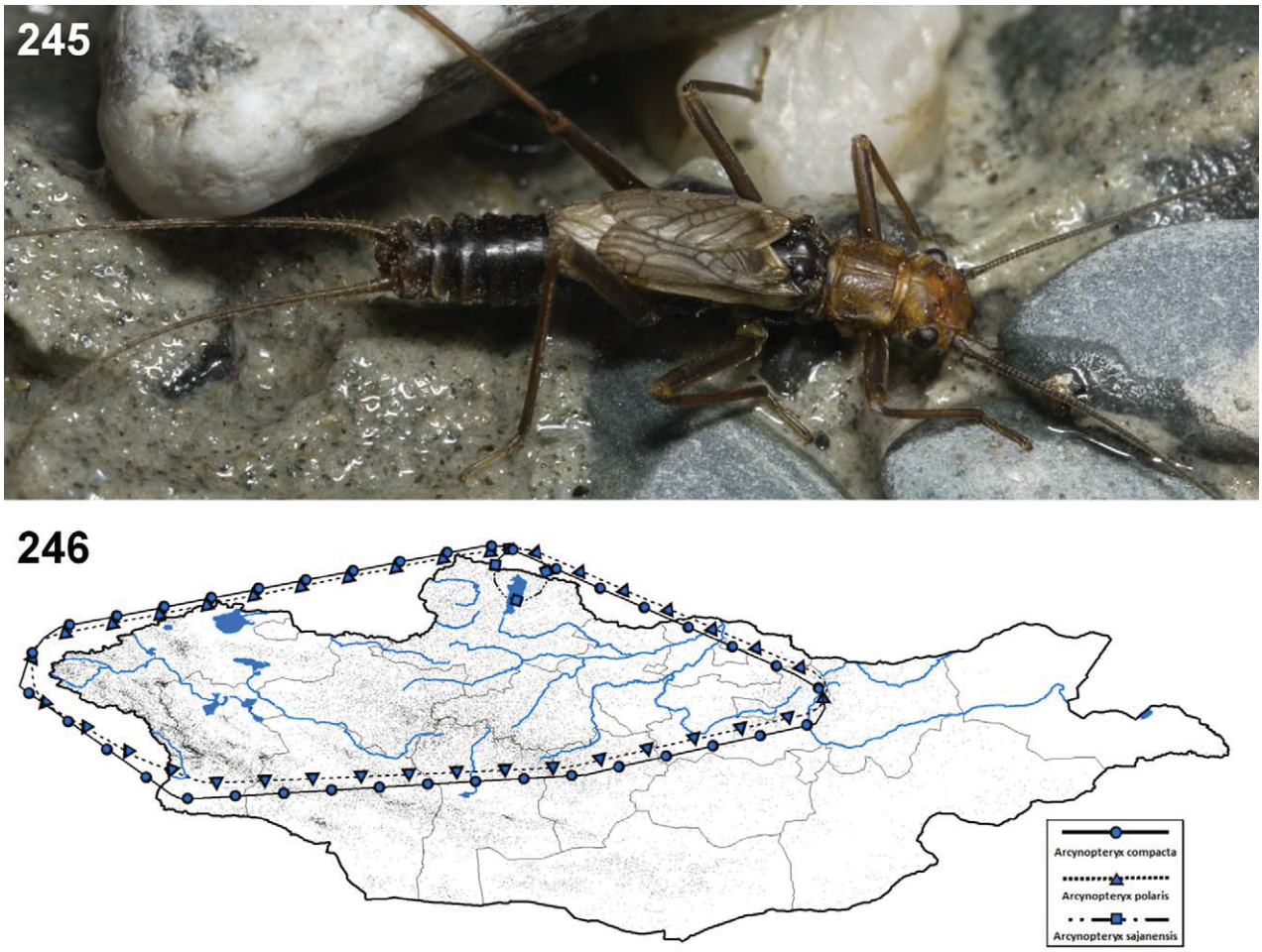
FIGURES 224–228. *Paragnetina flavotincta*. 224: Habitus (preserved); 225: Male terminalia, dorsal; 226: Female terminalia, ventral; 227: Nymph head; 228: Predicted ENM map with documented occurrences and range estimate.



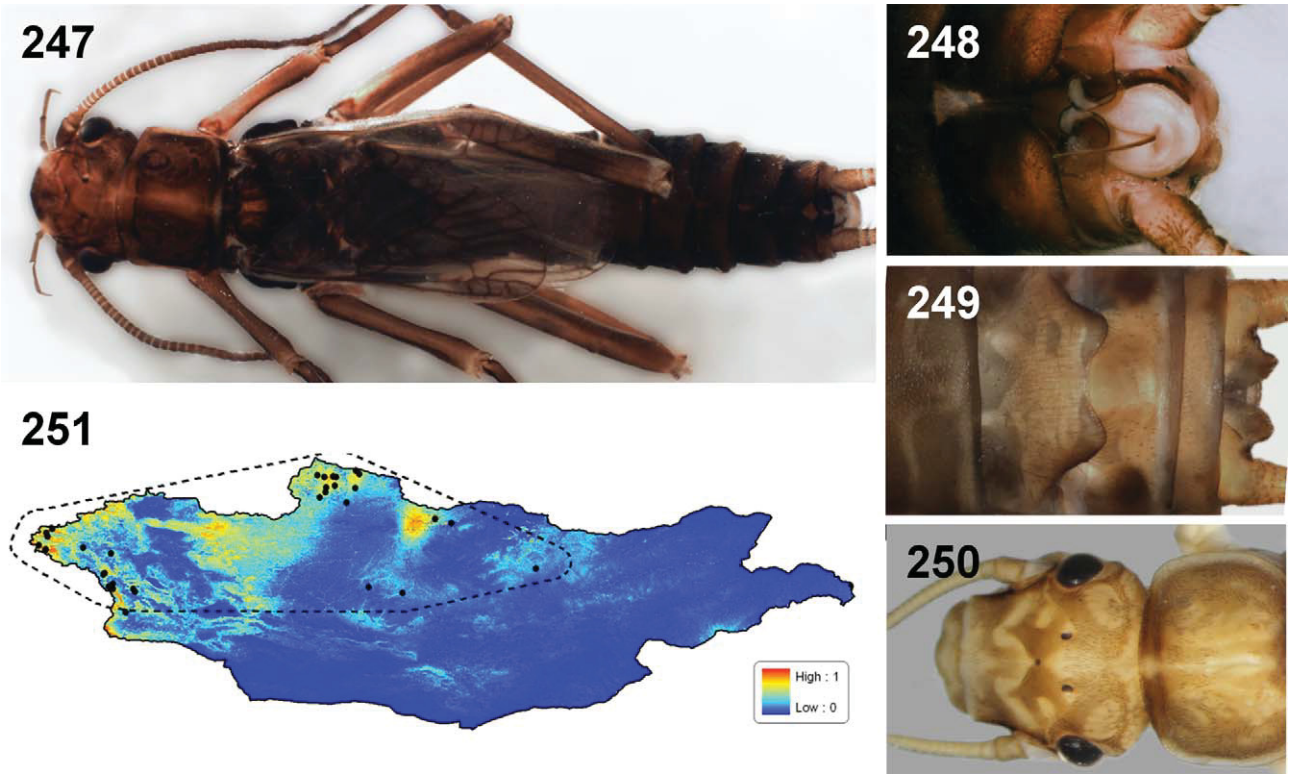
FIGURES 229–234. Perlodidae genus key. 229: Mesosternum of *Arcynopteryx polaris,* ventral; 230: Right mandible of *Arcynopteryx polaris;* 231: Mesosternum of *Diura bicaudata,* ventral; 232: Right mandible of *Diura bicaudata;* 233: Thorax of *Megarcys ochracea*, ventral; 234: Thorax of *Skwala pusilla,* ventral.



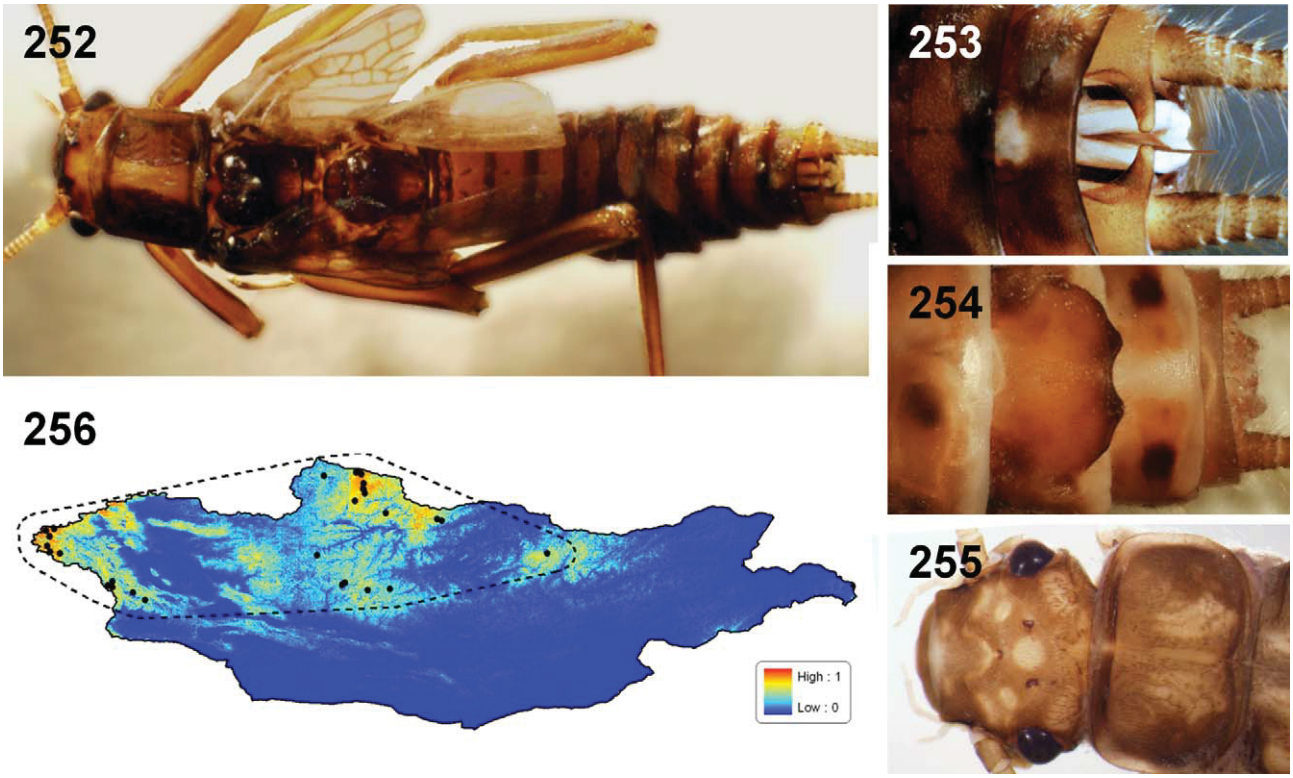
FIGURES 235–244. Perlodidae genus key. 235: Basal cercal segments of *Diura bicaudata;* 236: Distal cercal segments of *Diura* sp.; 237: Basal cercal segments of *Isoperla potanini*; 238: Distal cercal segments of *Isoperla potanini;* 239: Lacinia of *Filchneria mongolica.* Illustration after Teslenko and Zhiltzova (2009); 240: Lacinia of *Skwala brevis;* 241: Maxillary palp, galea, and lacinia of right lacinia of *Diura bicaudata,* dorsal; 242: Head of *Diura bicaudata*, ventral; 243: Maxillary palp, galea, and lacinia of right lacinia of *Megarcys ochracea*, dorsal; 244: Head showing submental gills of *Megarcys ochracea,* ventral.



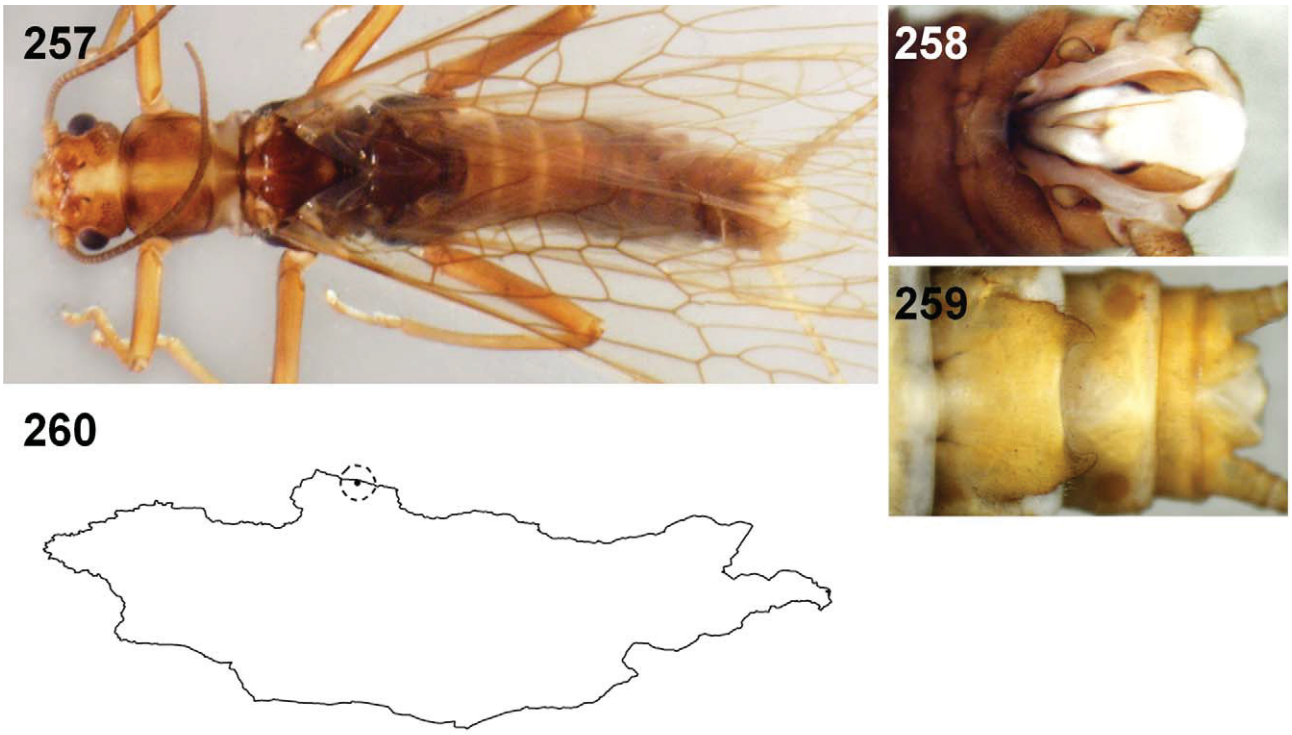
FIGURES 245–246. *Arcynopteryx*. 245: Habitus (live), *Arcynopterx compacta,* Tsagaan Us River (MAIS2008071502); 146: Comparative distribution map.



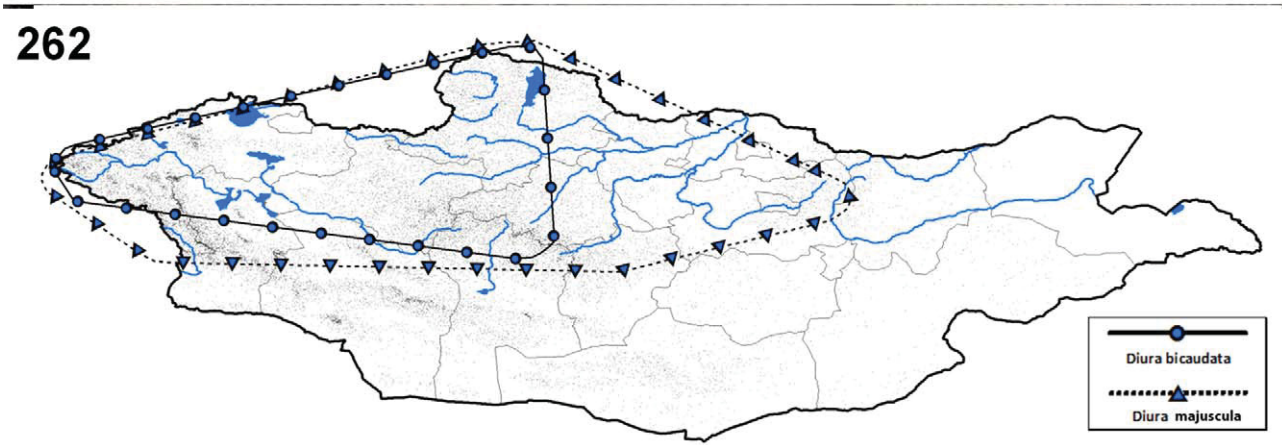
FIGURES 247–251. *Arcynopterx compacta.* 247: Habitus (preserved); 248: Male terminalia, dorsal; 249: Female terminalia, ventral; 250: Nymph head; 251: Predicted ENM map with documented occurrences and range estimate.



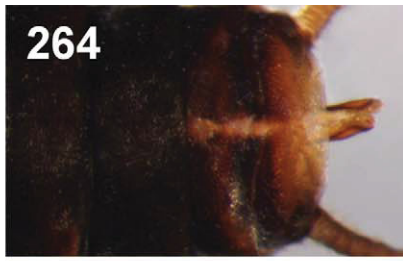
FIGURES 252–256. *Arcynopteryx polaris*. 252: Habitus (preserved); 253: Male terminalia, dorsal; 254: Female terminalia, ventral; 255: Nymph head; 256: Predicted ENM map with documented occurrences and range estimate.

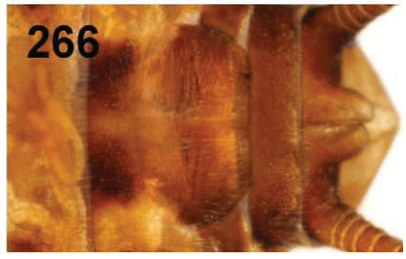


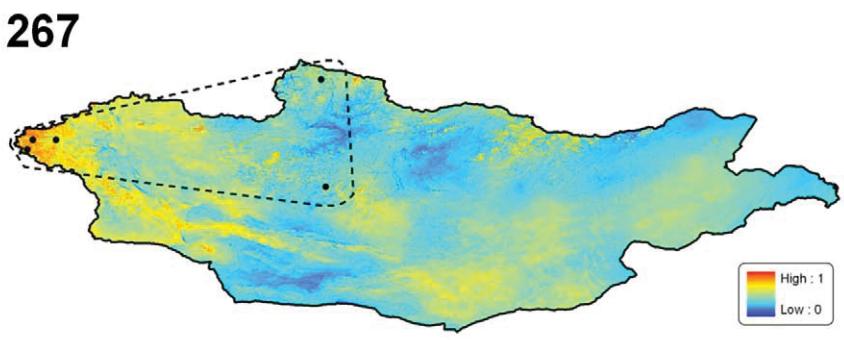
FIGURES 257–260. *Arcynopteryx sajanensis*. 257: Habitus (preserved); 258: Male terminalia, dorsal; 259: Female terminalia, ventral; 260: Range Map with documented occurrences.



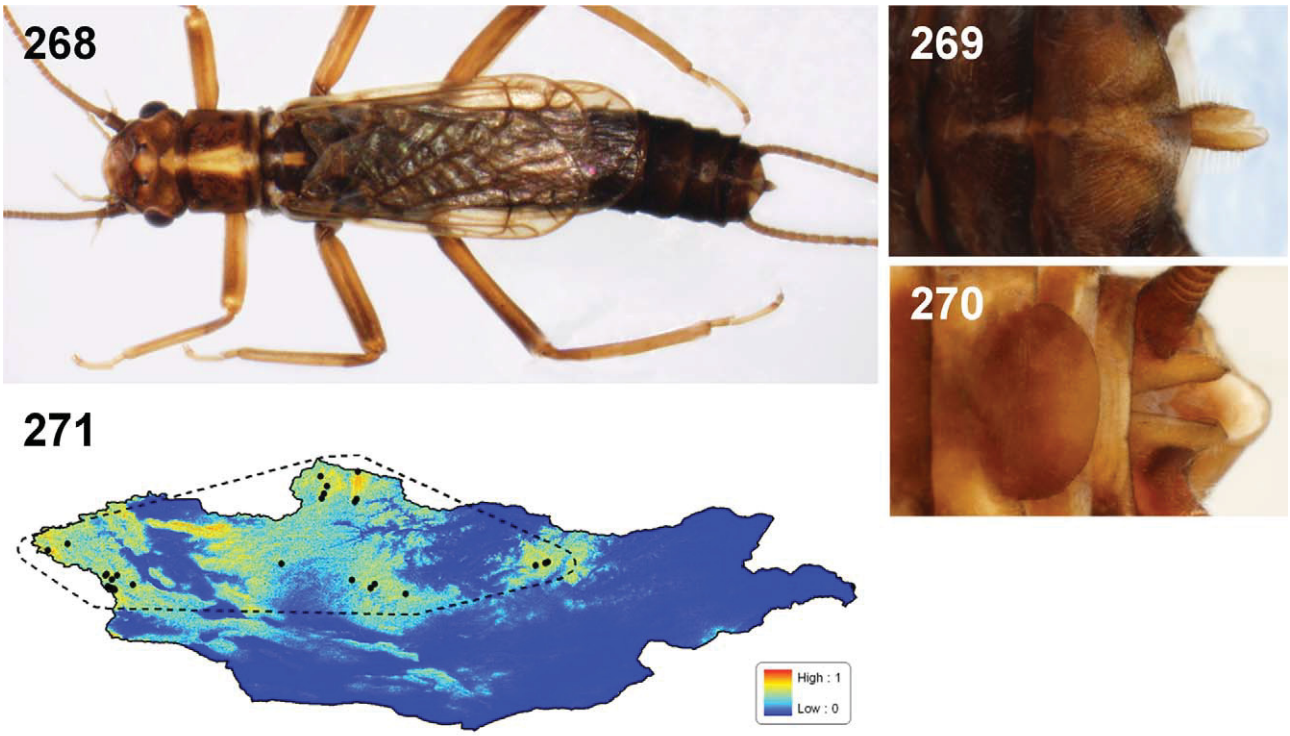
FIGURES 261–262. *Diura.* 261: Habitus (live), *Diura majuscula,* Hugin River (SRP2006070101); 262: Comparative distribution map.



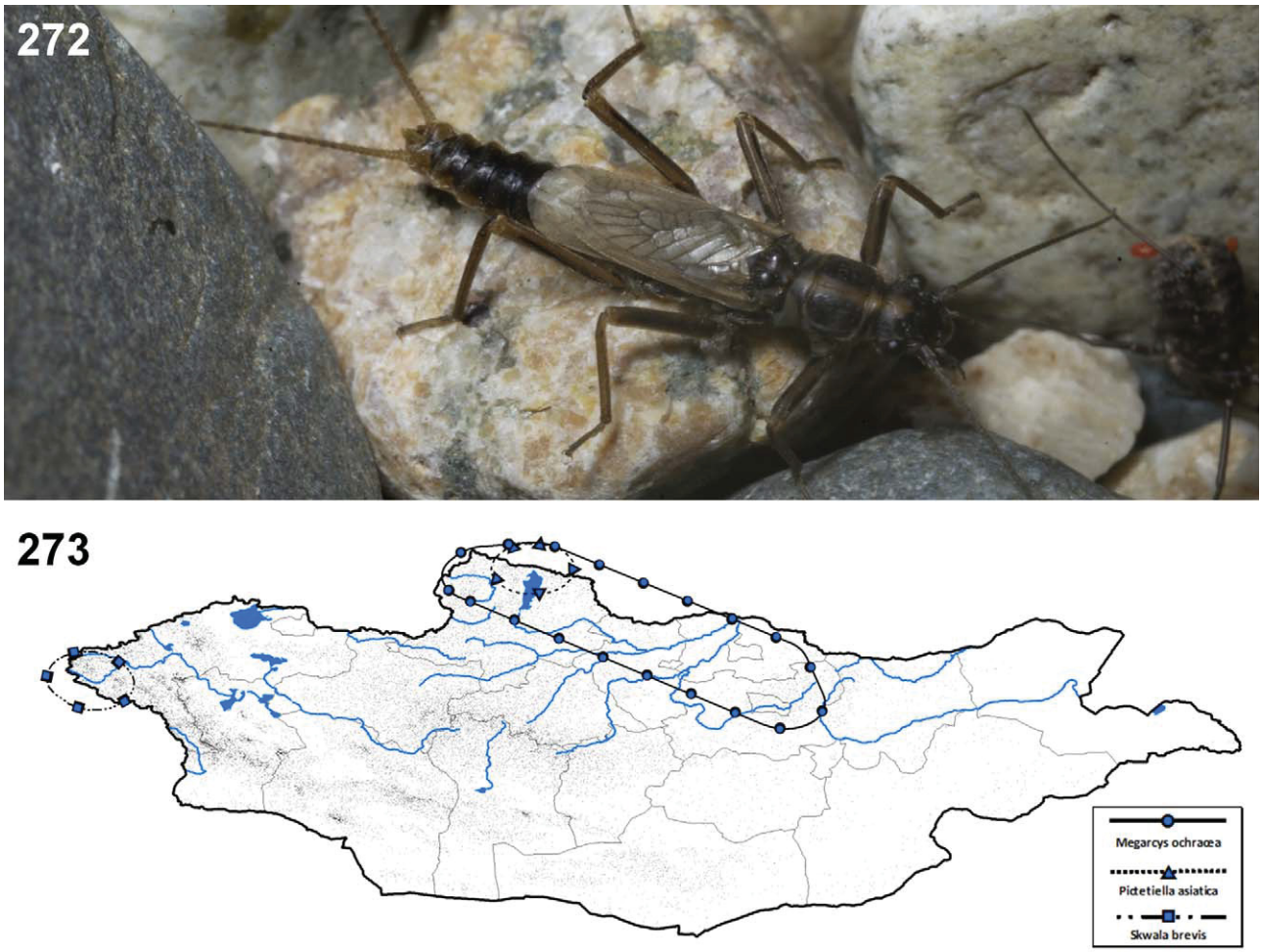




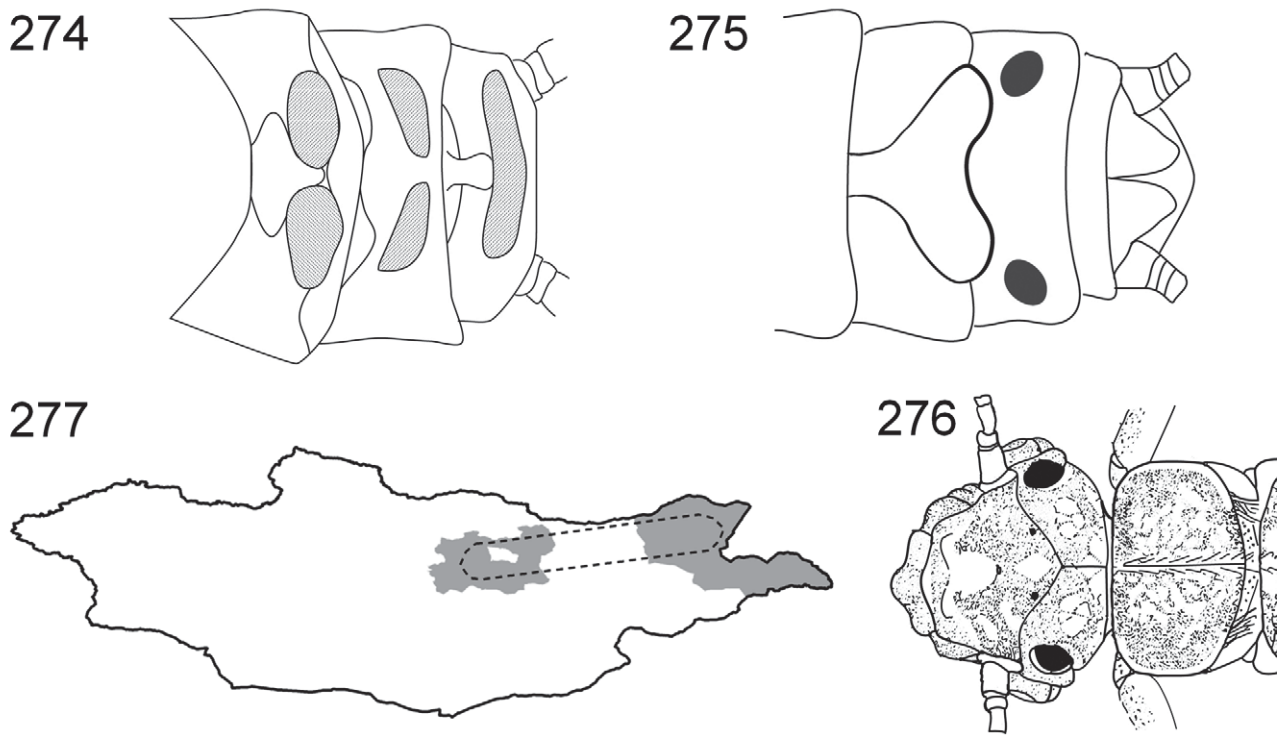
FIGURES 263–267. *Diura bicaudata*. 263: Habitus (preserved); 264: Male paraprocts; 265: Male, lateral; 266: Female terminalia, ventral; 267: Predicted ENM map with documented occurrences and range estimate.



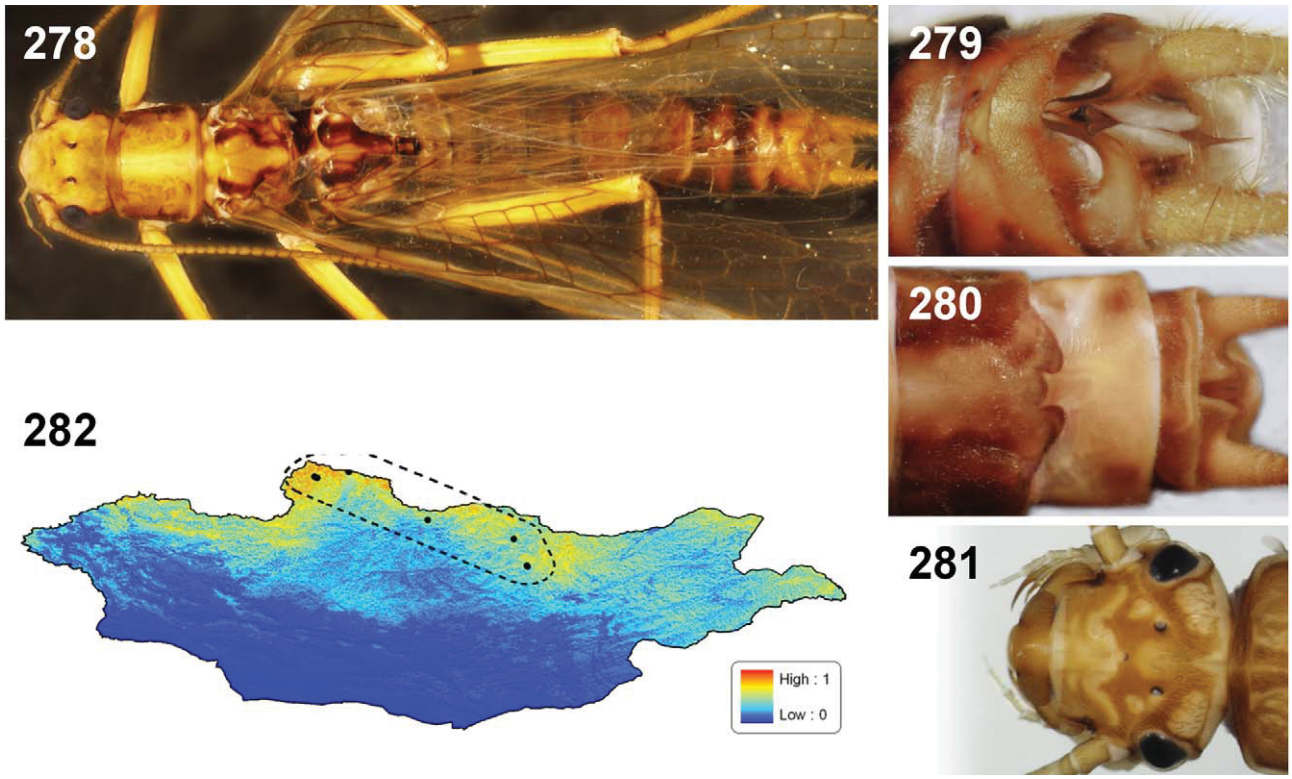
FIGURES 268–271. *Diura majuscula*. 268: Habitus (preserved); 269: Male paraprocts; 270: Female terminalia, ventral; 271: Predicted ENM map with documented occurrences and range estimate.



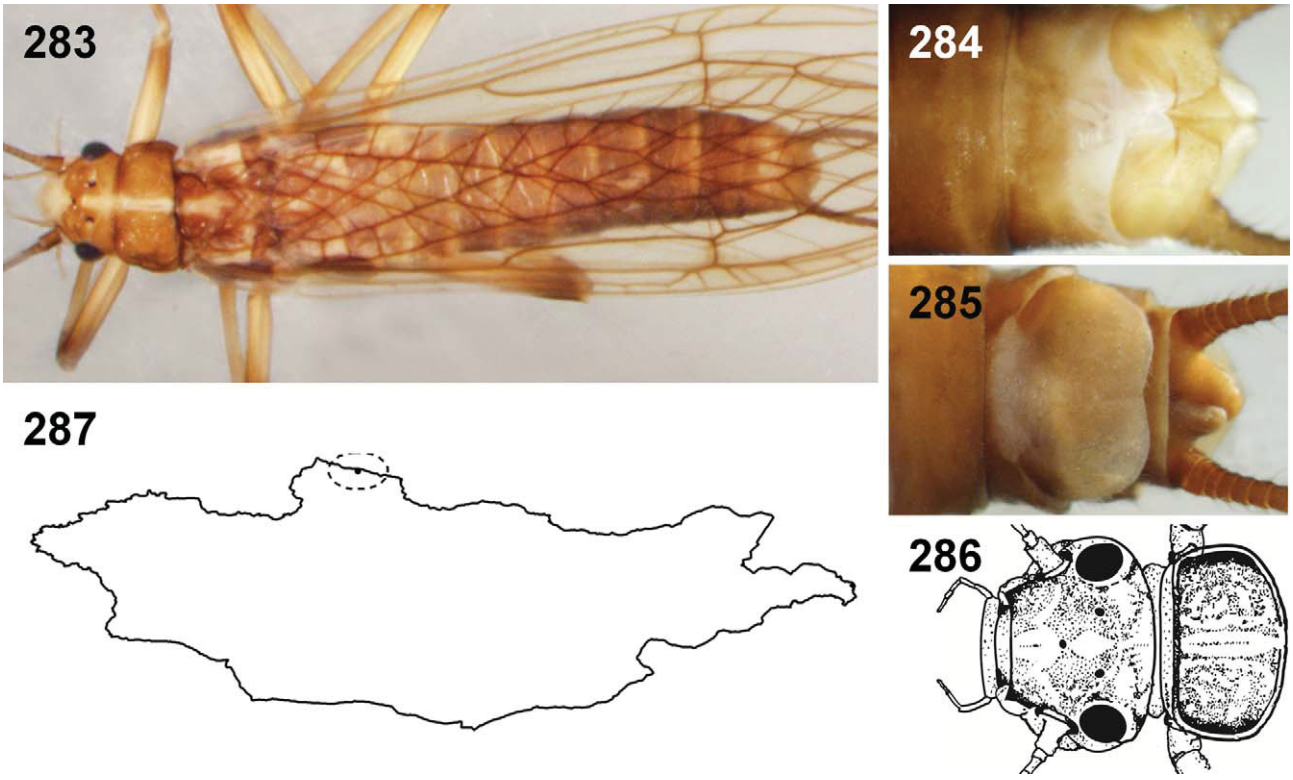
FIGURES 272–273. Perlodidae. 272: Habitus (live), *Skwala brevis,* Khoton Lake (MAIS 2008071402); 273: Comparative distribution map. *Filchneria mongolica* and *Skwala asiatica* not shown due to lack of georeferenced localities from historical records.



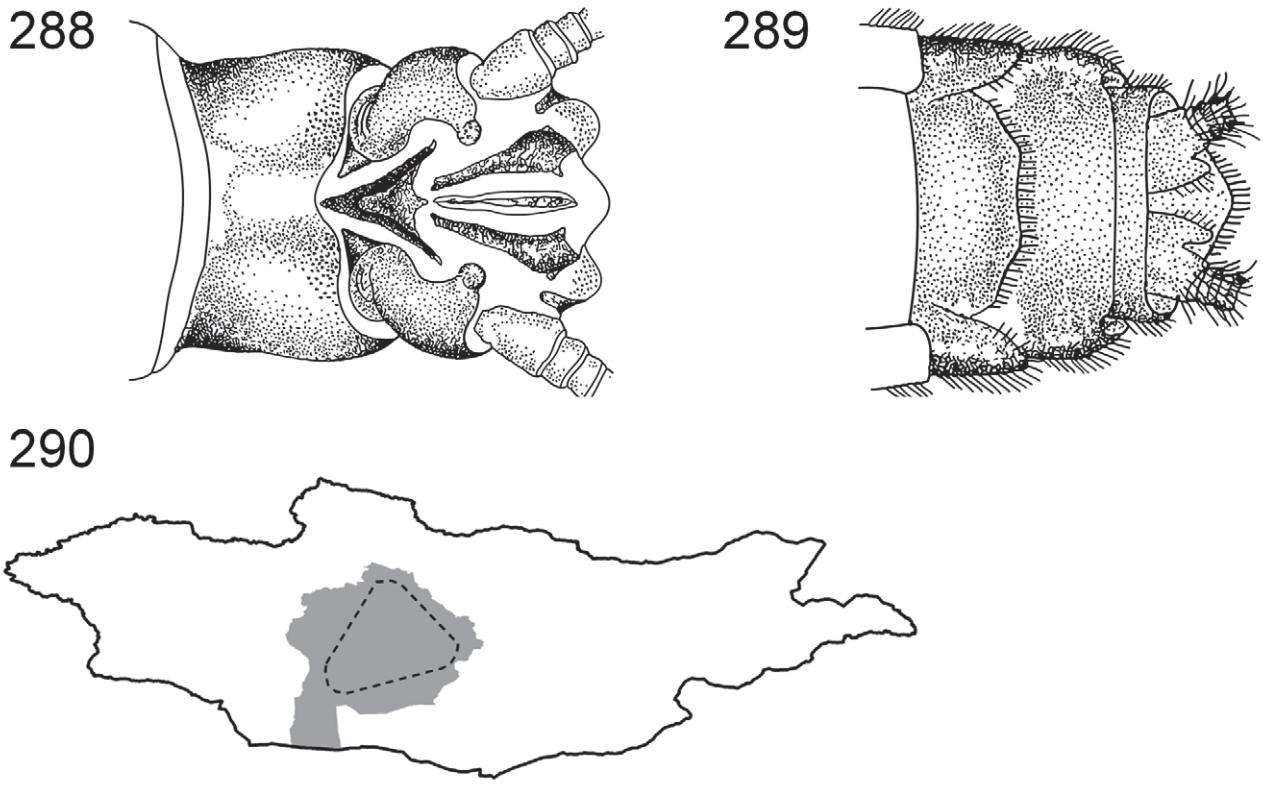
FIGURES 274–277. *Filchneria mongolica*.274: Male terminalia, dorsal; 275: Female terminalia, ventral; 276: Nymph head; 277: Historical records map with range estimate.



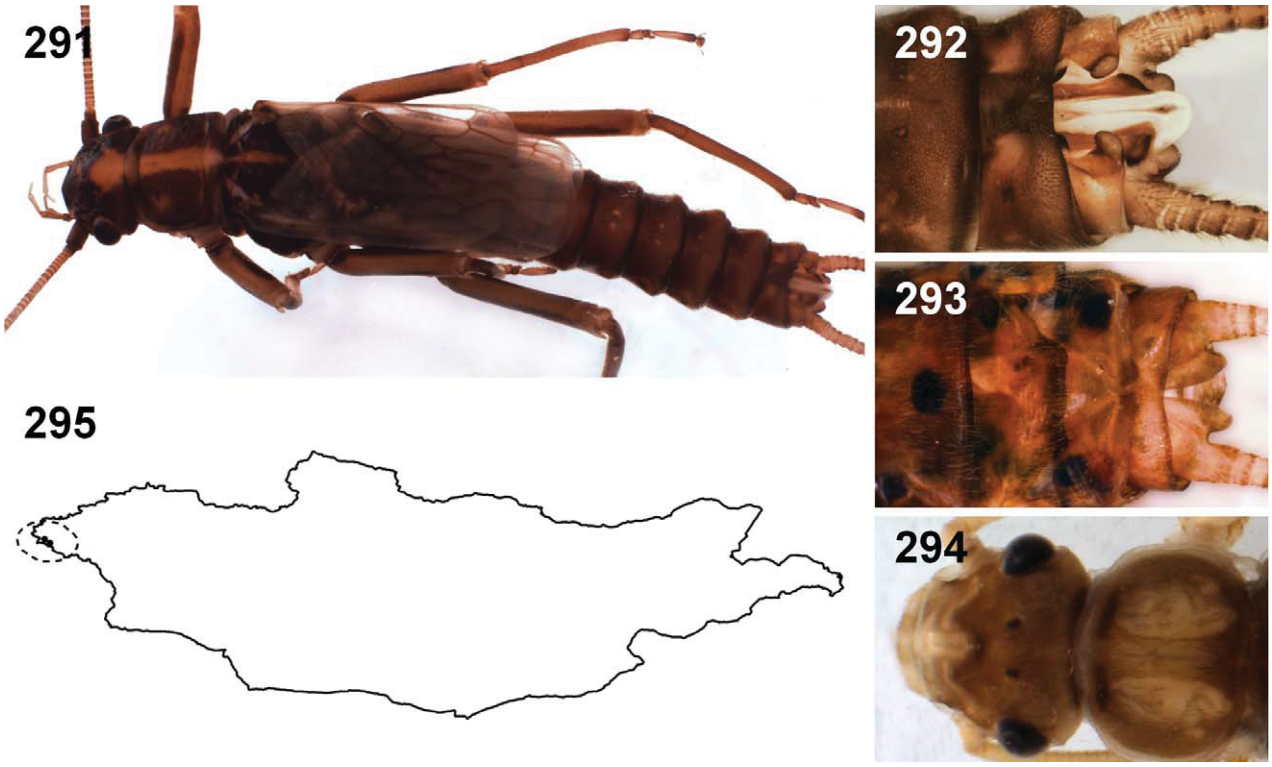
FIGURES 278–282. *Megarcys ochracea*. 278: Habitus (preserved); 279: Male, dorsal; 280: Female terminalia, ventral; 281: Nymph head; 282: Predicted ENM map with documented occurrences and range estimate.



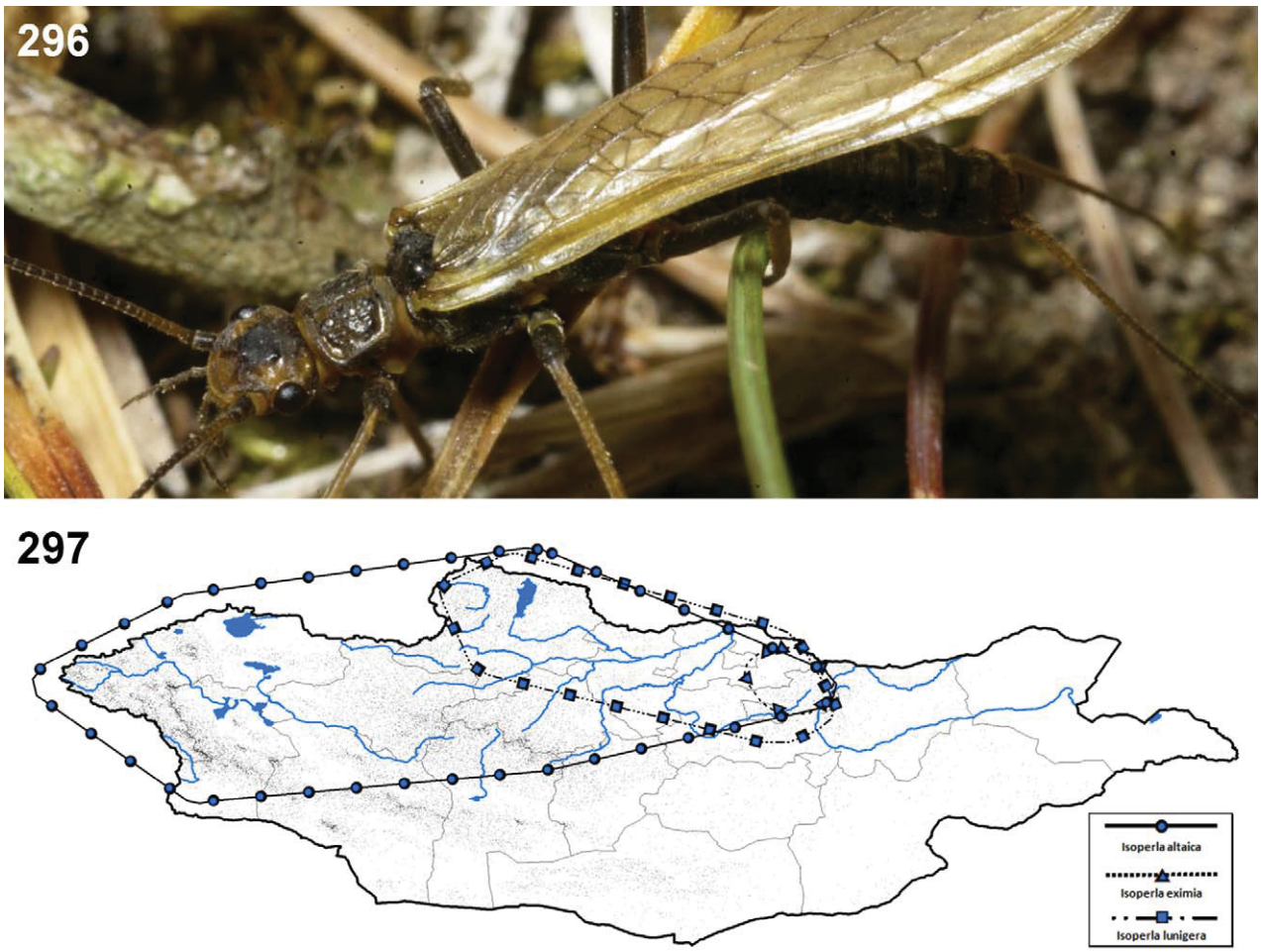
FIGURES 283–287. *Pictetiella asiatica.* 283: Habitus (preserved); 284: Male, dorsal; 285: Female terminalia, ventral; 286: Nymph head; 287: Range Map with documented occurrences.



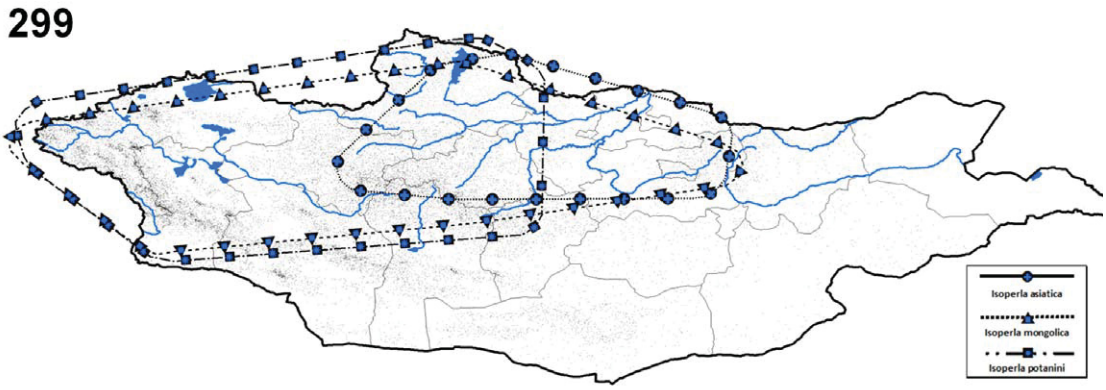
FIGURES 288–290. *Skwala asiatica*. Illustrations after Zhiltzova 1972. 288: Male terminalia, dorsal; 289: Female terminalia, ventral; 290: Historical records map with range estimate.



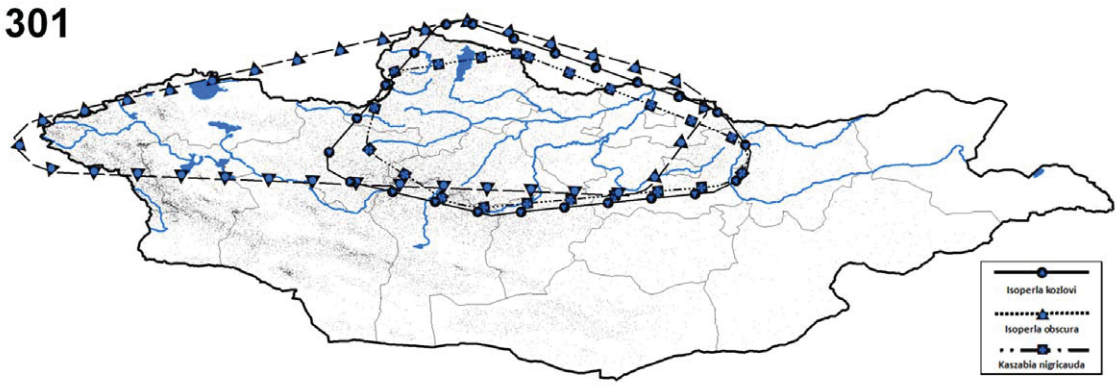
FIGURES 291–295. *Skwala pusilla.* 291: Habitus (preserved); 292: Male, dorsal; 293 : Female terminalia, ventral; 294: Nymph head and pronotum; 295: Range Map with documented occurrences.



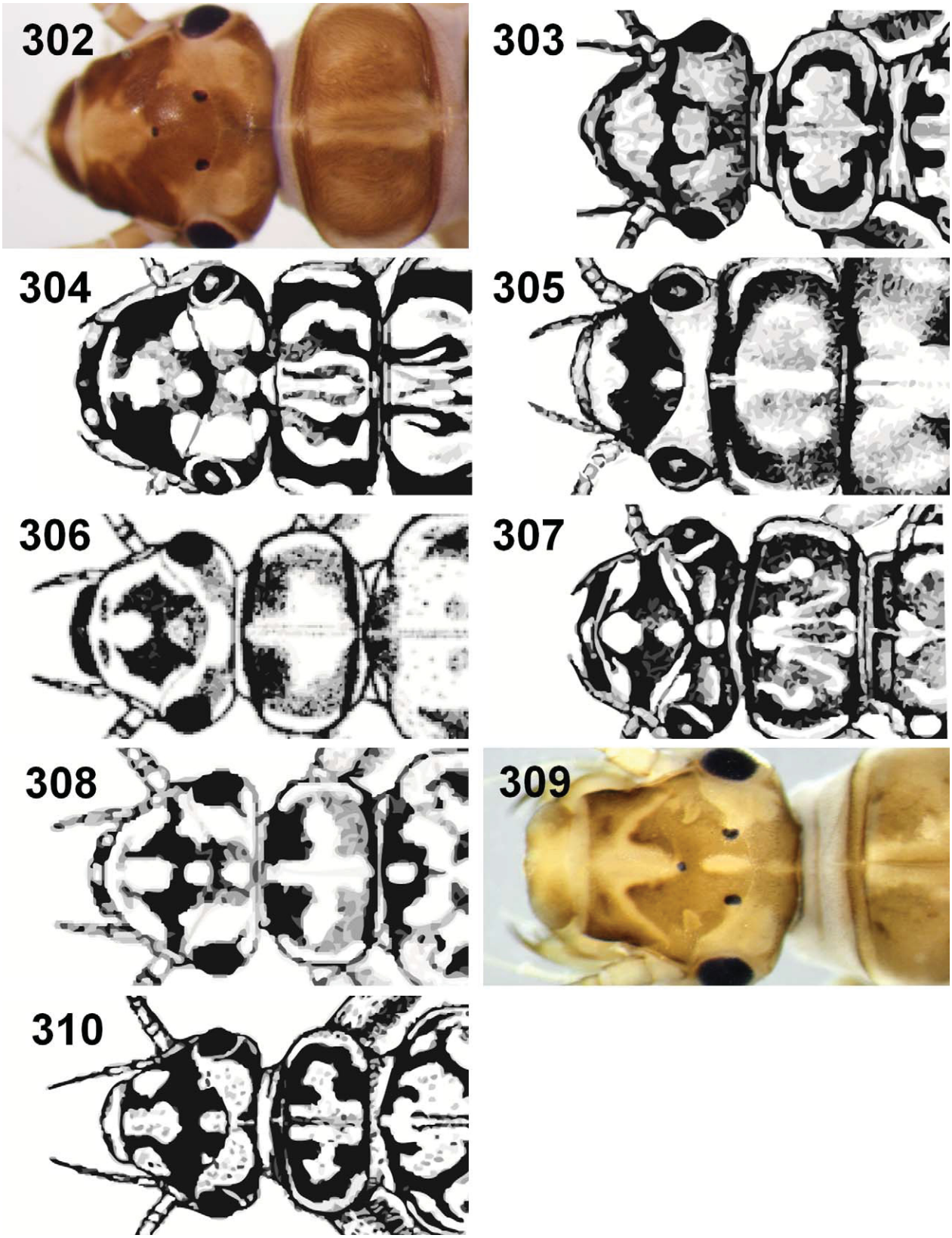
FIGURES 296–297. *Isoperla* group 1. 296: Habitus (live), *Isoperla altaica,* Yamaatiin River (MAIS2008071703); 297: Comparative distribution map, *I. altaica, I. eximia, I. lunigera.*



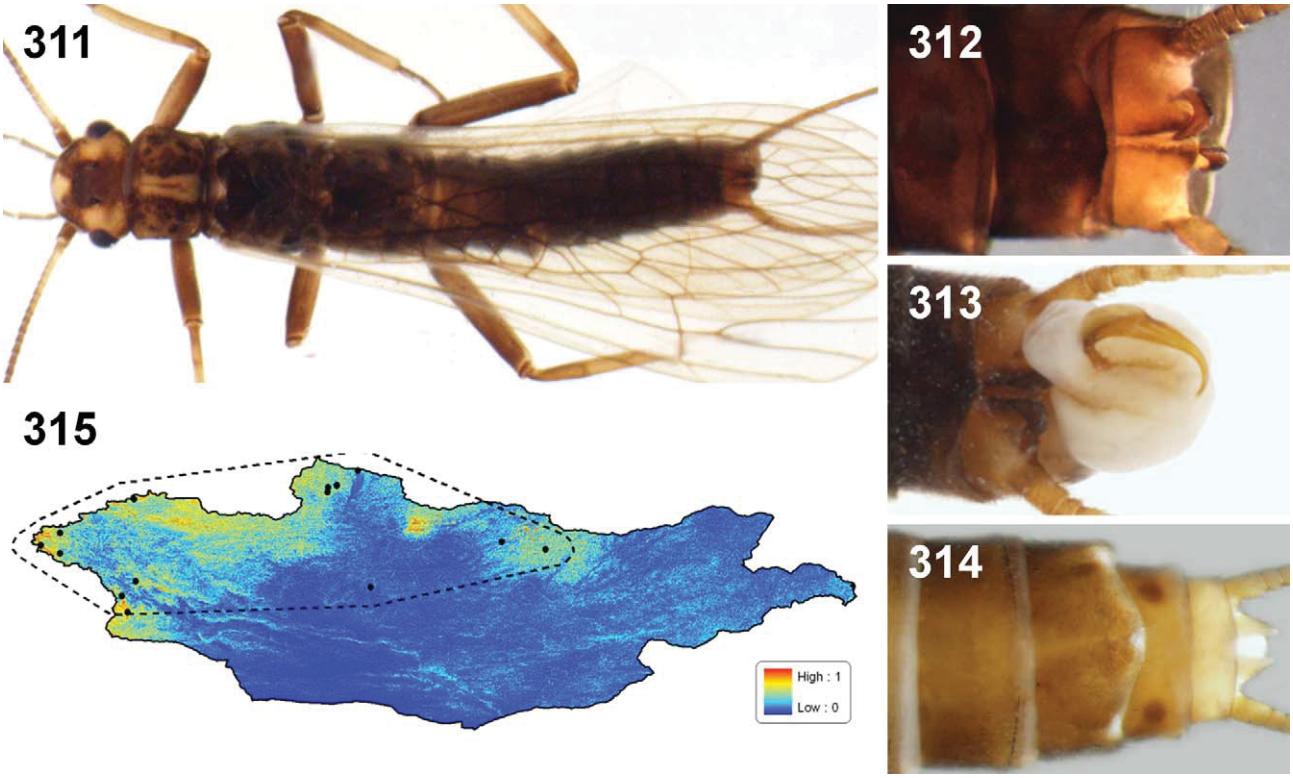
FIGURES 298–299. *Isoperla* group 2. 298: Habitus (live), *Isoperla asiatica,* Uur River (SRP2005071403); 299: Comparative distribution map, *I. asiatica, I. mongolica, I. potanini.*



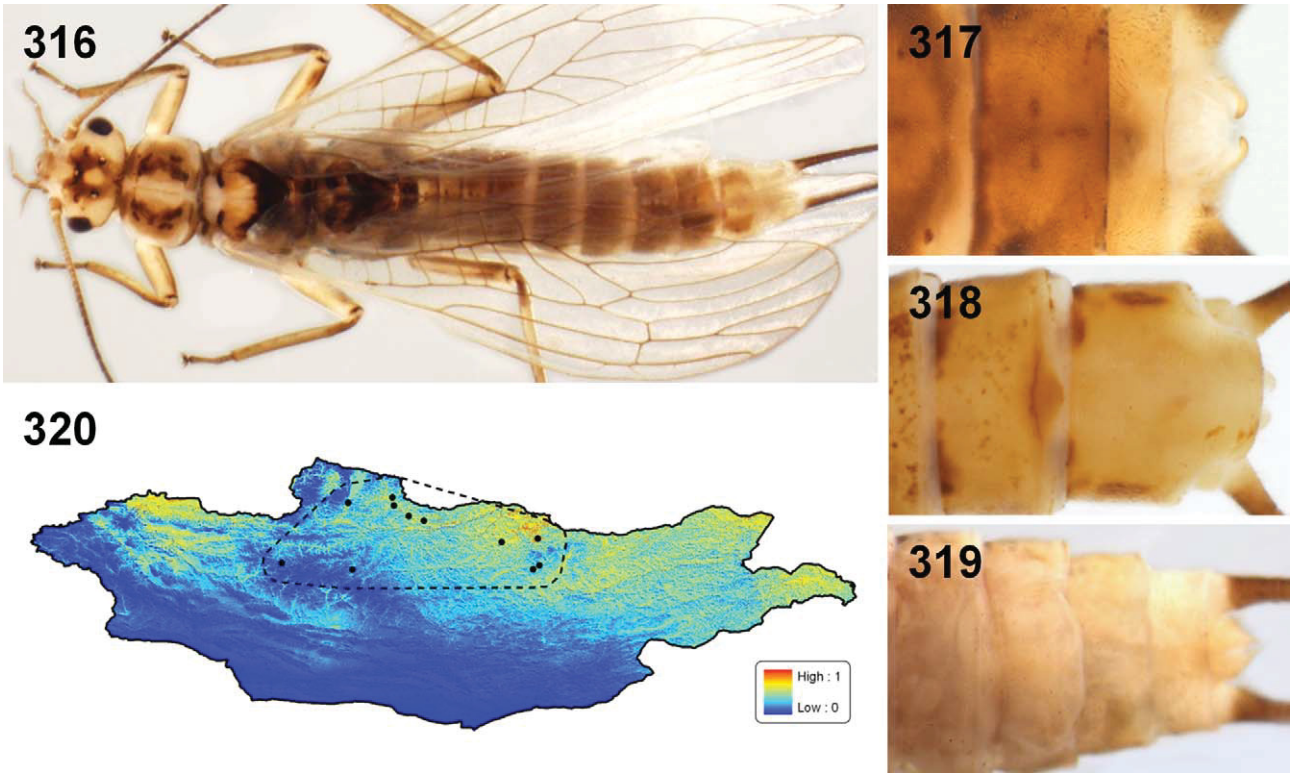
FIGURES 300–301. *Isoperla* group 3 and *Kazabia*. 300: Habitus (live), *Isoperla kozlovi*, Haraa River (SRP2005070402); 301: Comparative distribution map, *I. kozlovi, I. obscura, K. nigricauda*.



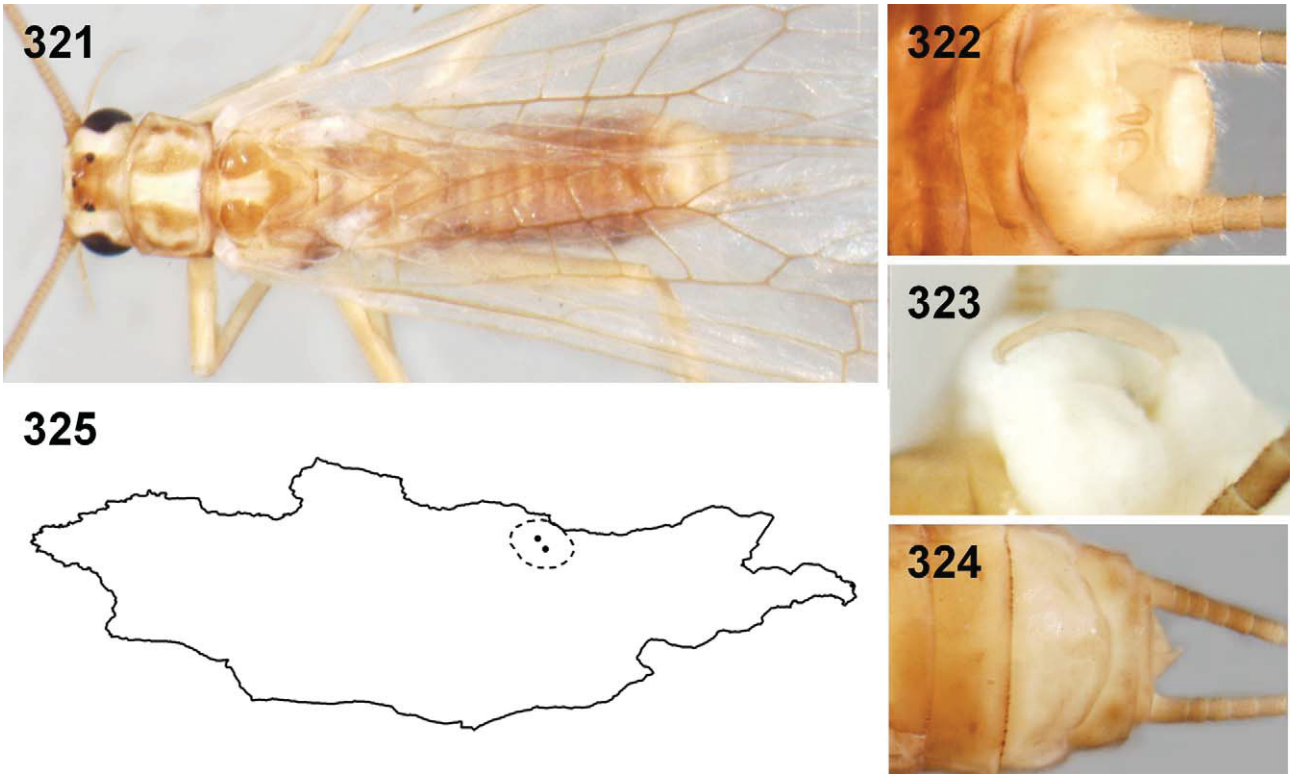
FIGURES 302–310. *Isoperla* and *Kaszabia* nymphs. Illustrations after Teslenko and Zhiltzova (2006). 302: *I. altaica;* 303: *I. asiatica;* 304: *I. eximia;* 305: *I. kozlovi;* 306: *I. lunigera;* 307: *I. mongolica;* 308: *I. obscura*; 309: *I. potanini;* 310: *K. nigricauda*.



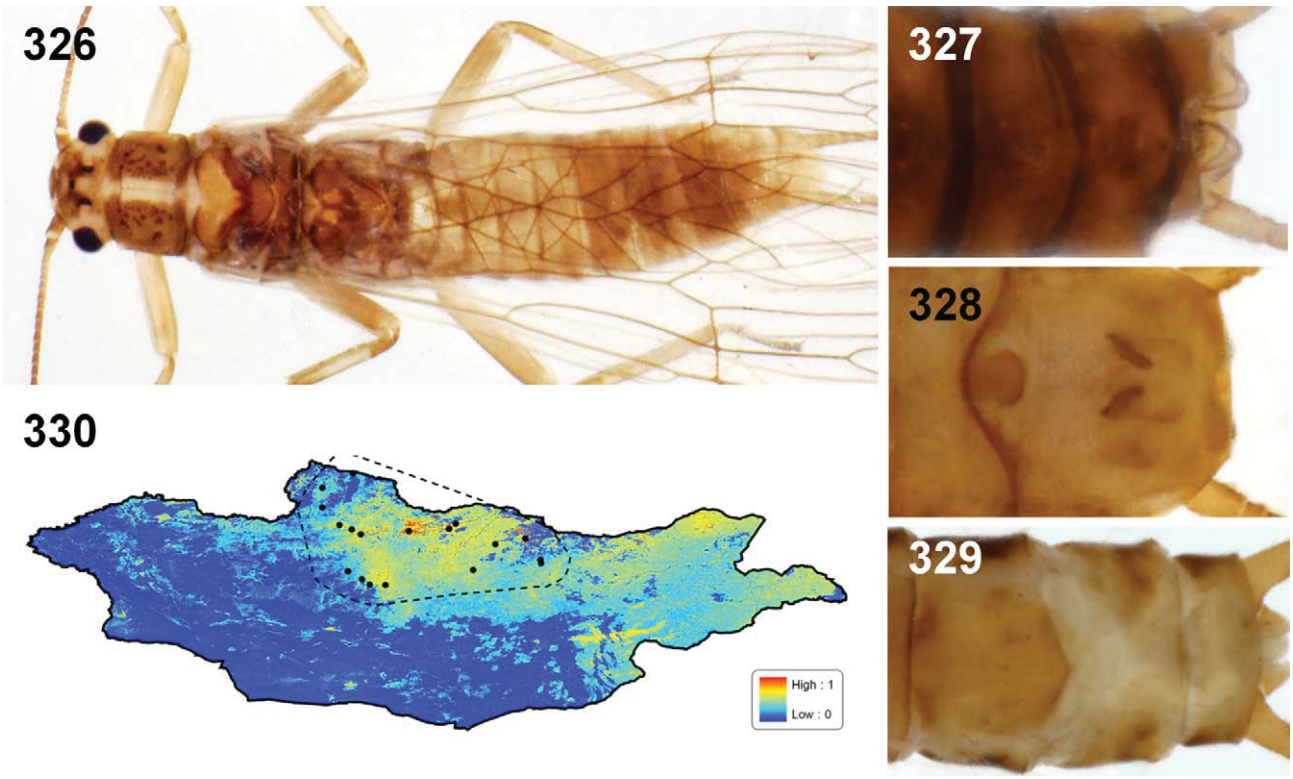
FIGURES 311–315. *Isoperla altaica*. 311: Habitus (preserved); 312: Male terminalia, dorsal; 313: Male extruded penial sclerite; 314: Female terminalia, ventral; 315: Predicted ENM map with documented occurrences and range estimate.



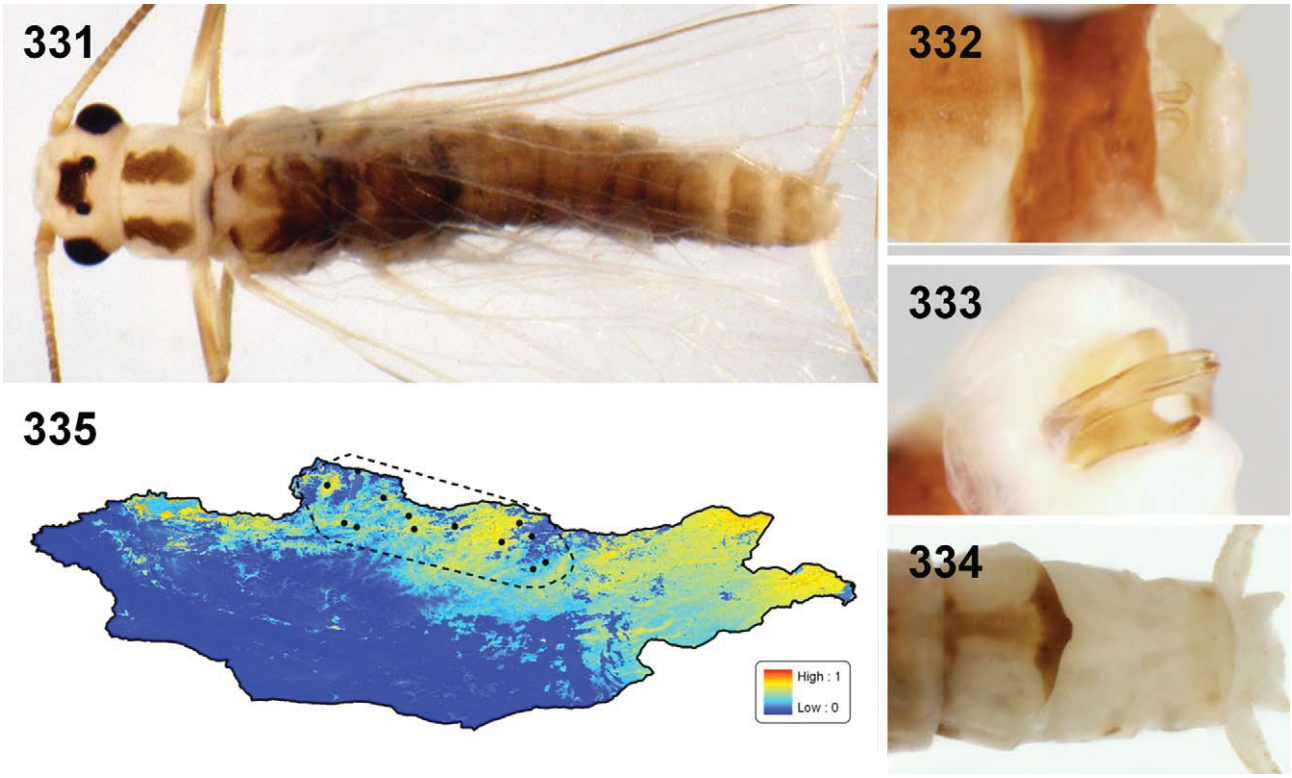
FIGURES 316–320. *Isoperla asiatica.* 316: Habitus (preserved); 317: Male terminalia, dorsal; 318: Male, ventral; 319: Female terminalia, ventral; 320: Predicted ENM map with documented occurrences and range estimate.



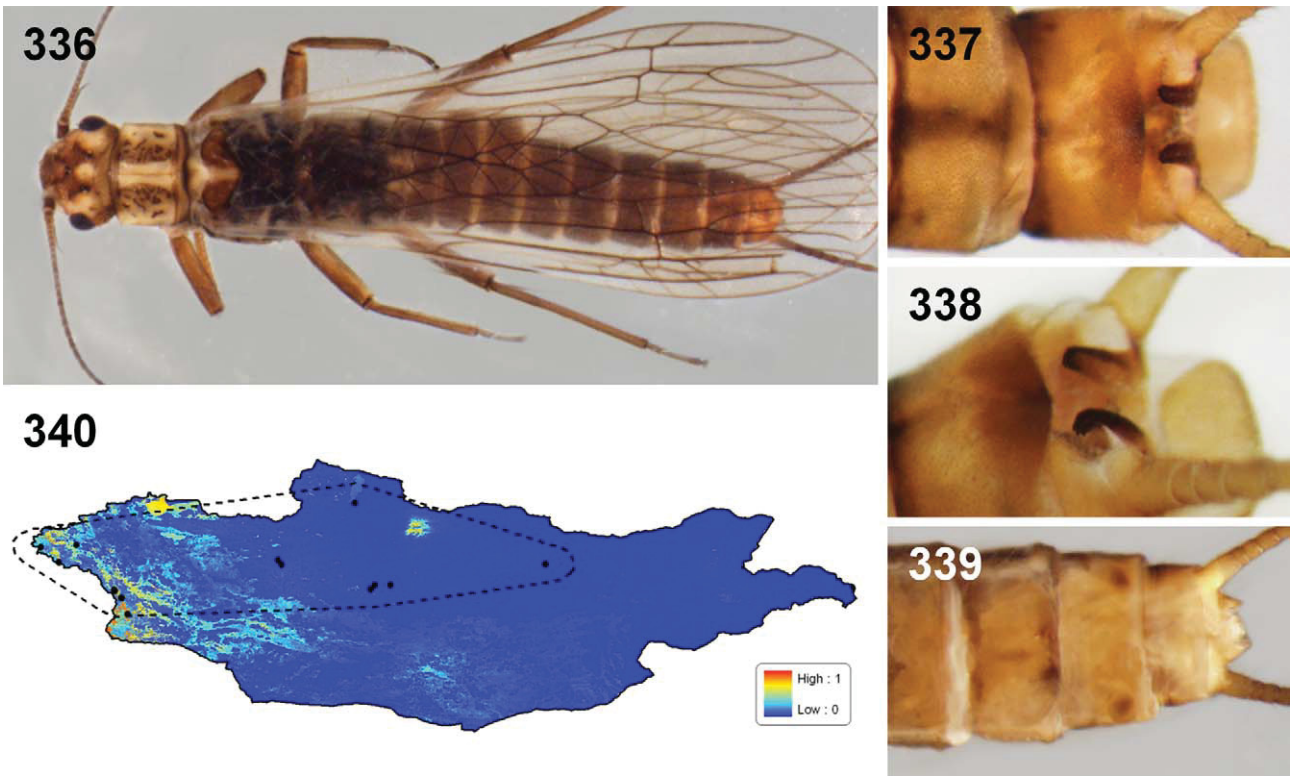
FIGURES 321–325. *Isoperla eximia.* 321: Habitus (preserved); 322: Male terminalia, dorsal; 323: Male extruded penial sclerite; 324: Female terminalia, ventral; 325: Range Map with documented occurrences.



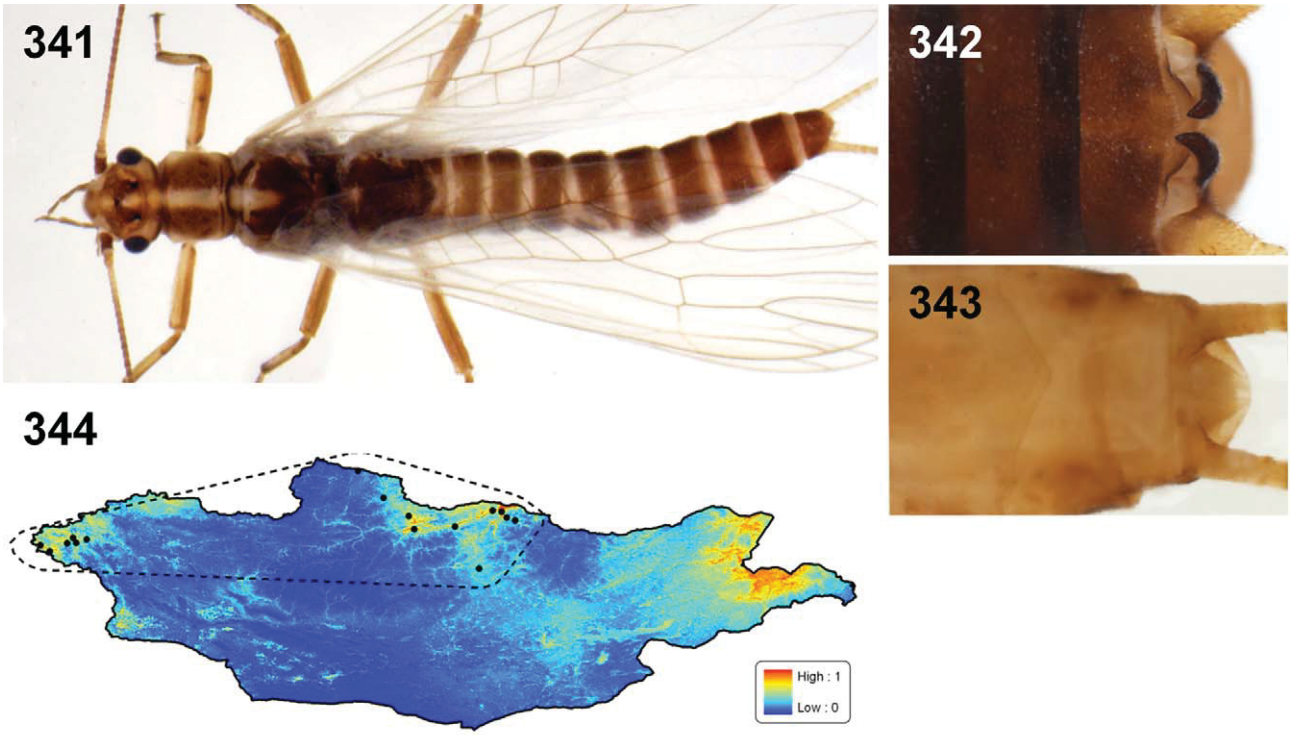
FIGURES 326–330. *Isoperla kozlovi.* 326: Habitus (preserved); 327: Male terminalia, dorsal; 328: Male, ventral, showing penial sclerites; 329: Female terminalia, ventral; 330: Predicted ENM map with documented occurrences and range estimate.



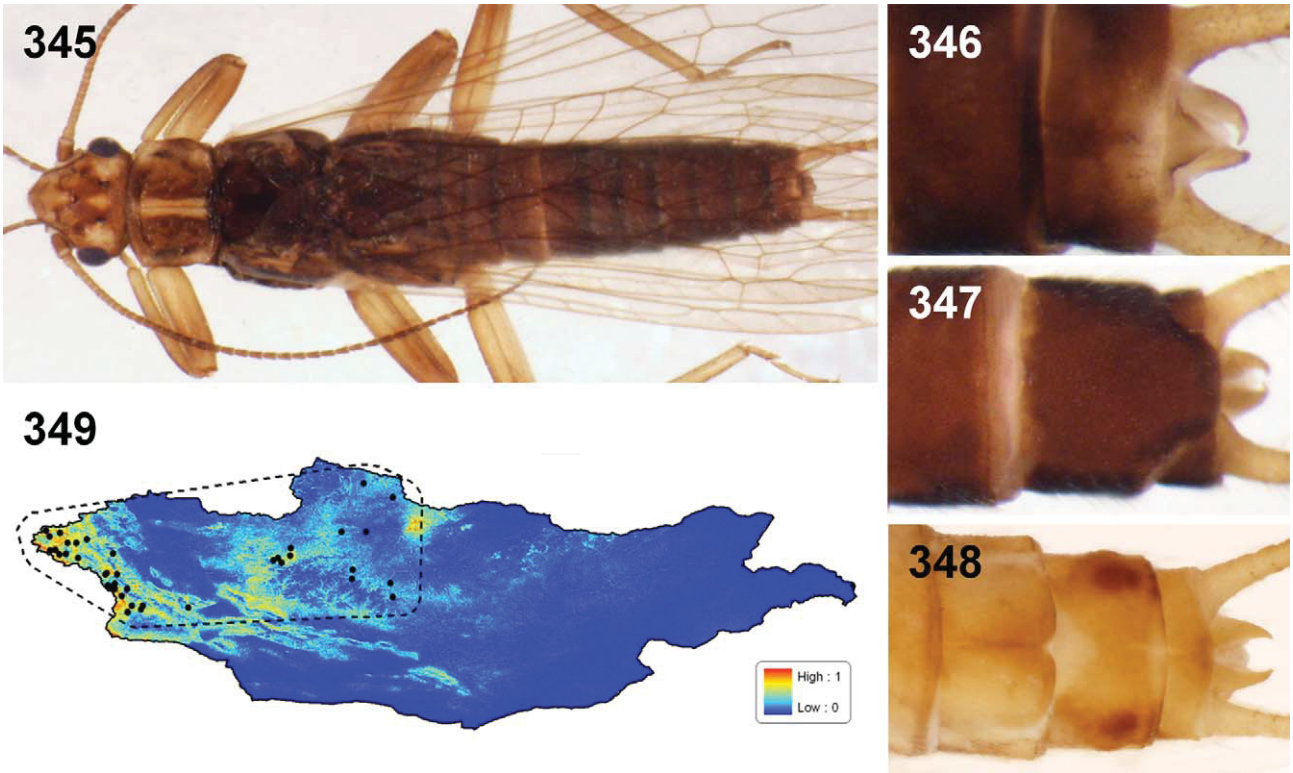
FIGURES 331–335. *Isoperla lunigera.* 331: Habitus (preserved); 332: Male terminalia, dorsal; 333: Male extruded penial sclerite; 334: Female terminalia, ventral; 335: Predicted ENM map with documented occurrences and range estimate.



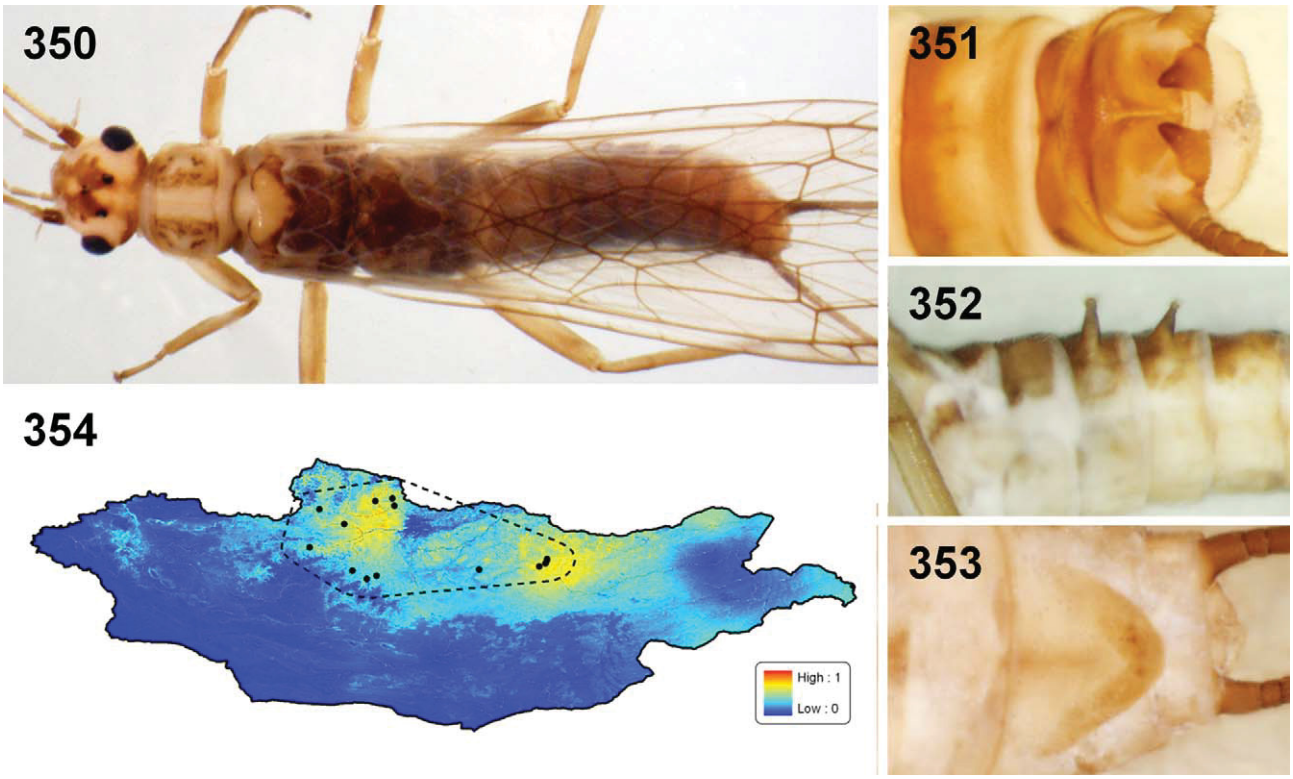
FIGURES 336–340. *Isoperla mongolica.* 336: Habitus (preserved); 337: Male terminalia, dorsal; 338: Male, lateral; 339: Female terminalia, ventral; 340: Predicted ENM map with documented occurrences and range estimate.



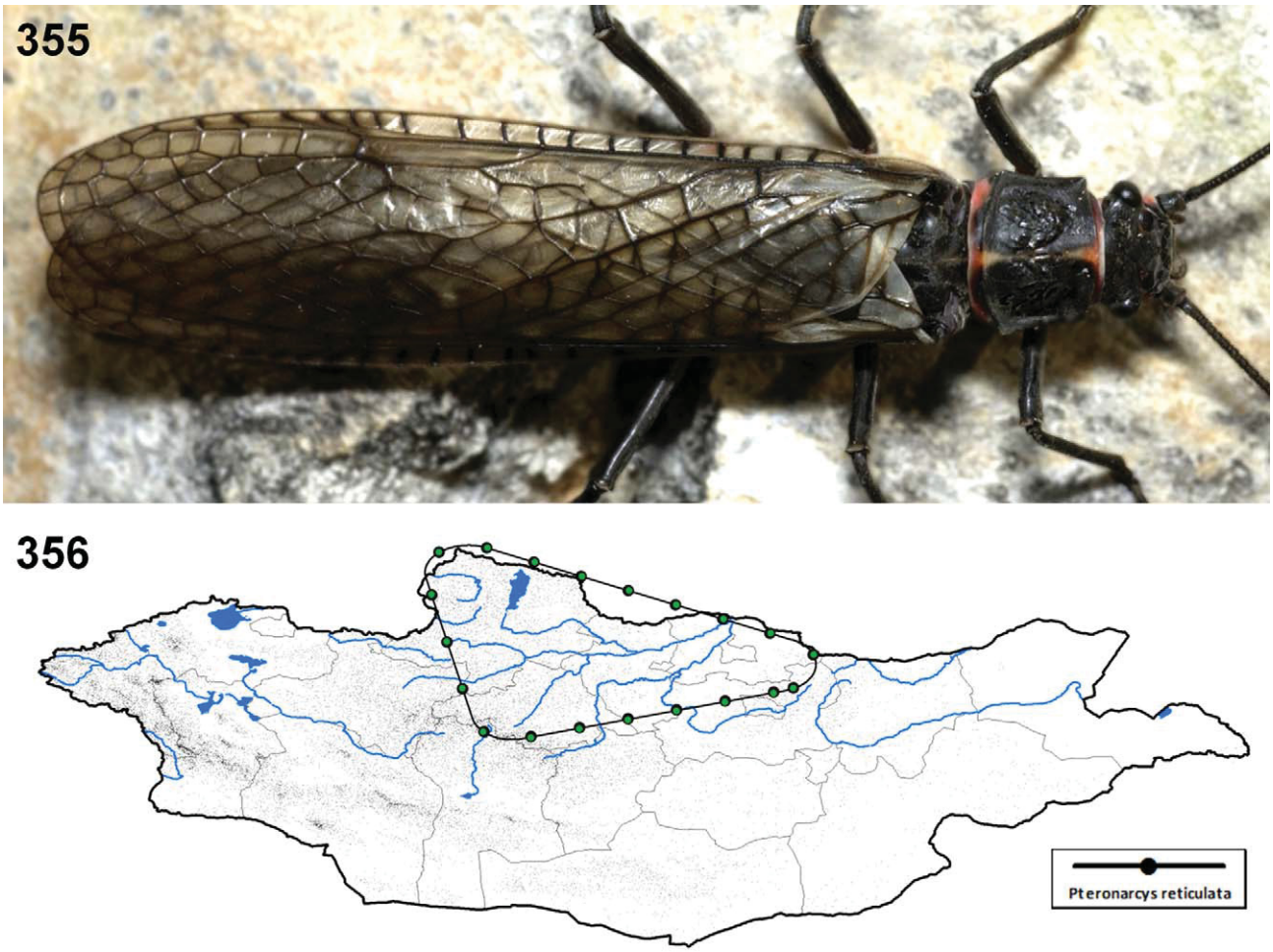
FIGURES 341–344. *Isoperla obscura.* 341: Habitus (preserved); 342: Male terminalia, dorsal; 343: Female terminalia, ventral; 344: Predicted ENM map with documented occurrences and range estimate.



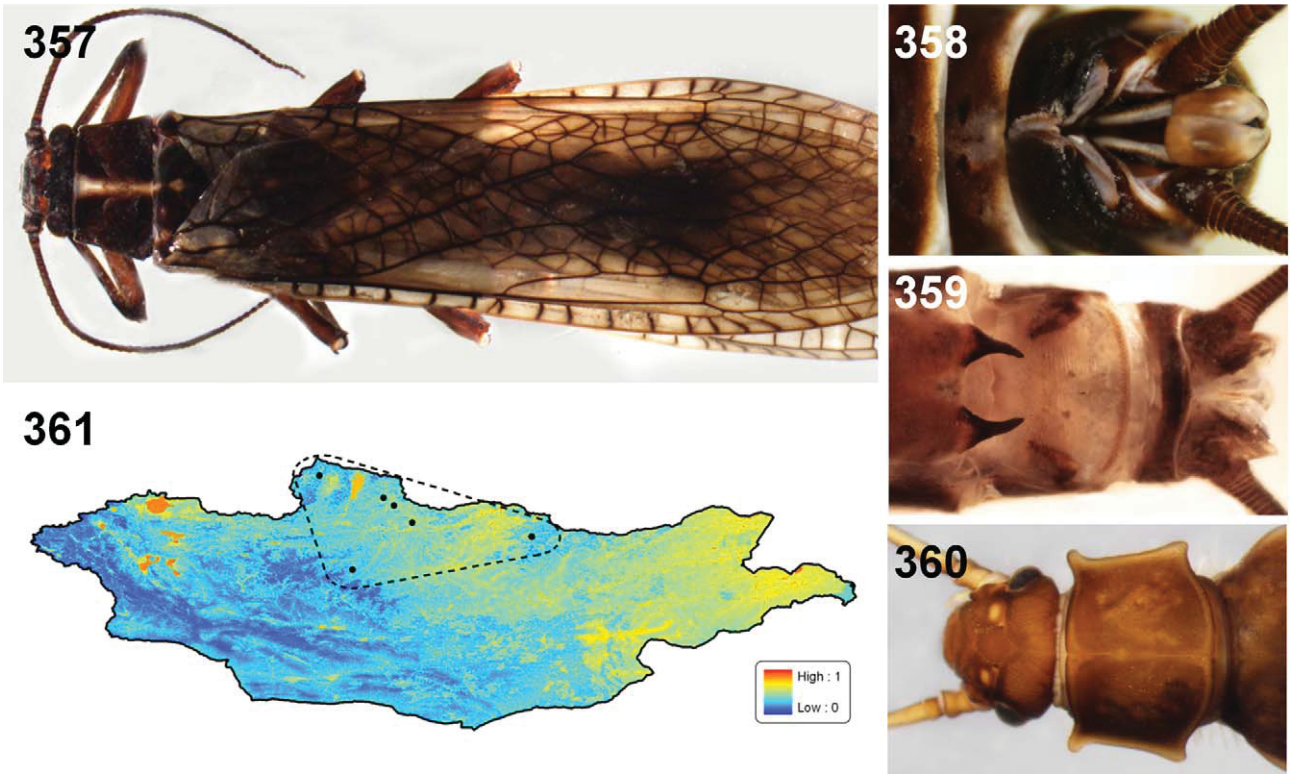
FIGURES 345–349. *Isoperla potanini.* 345: Habitus (preserved); 346: Male terminalia, dorsal; 347: Male, ventral; 348: Female terminalia, ventral; 349: Predicted ENM map with documented occurrences and range estimate.



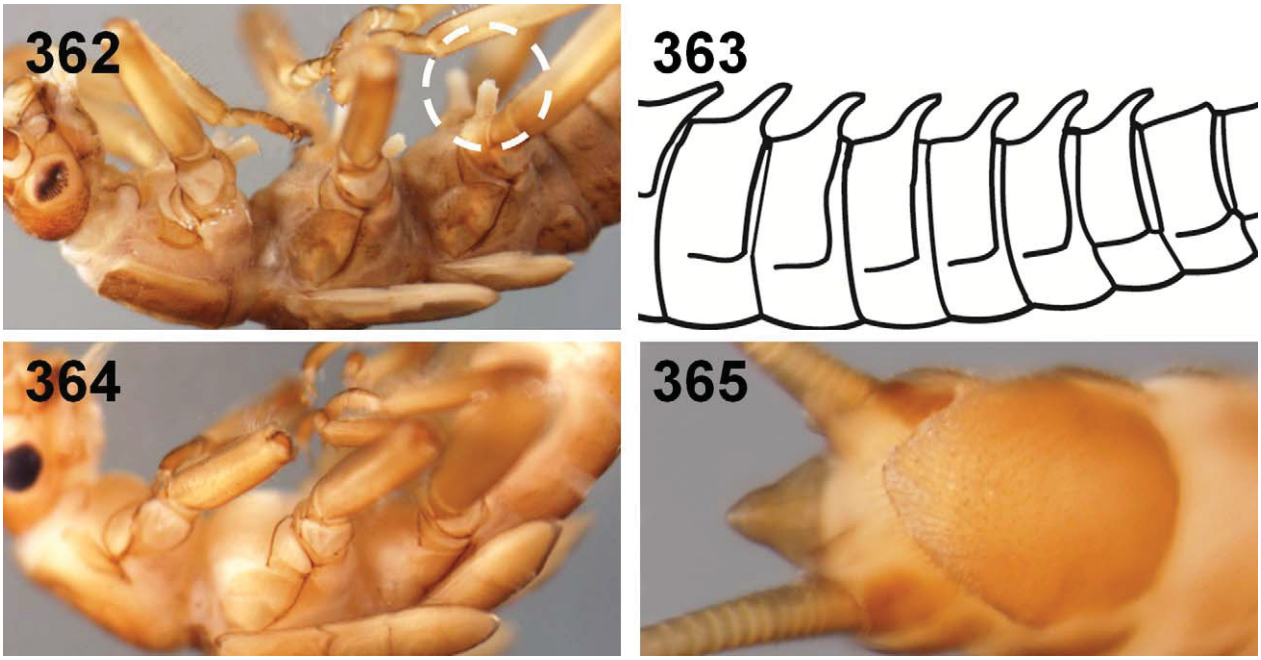
FIGURES 350–354. *Kaszabia nigricauda*. 350: Habitus (preserved); 351: Male terminalia, dorsal; 352: Male abdomen, lateral; 353: Female terminalia, ventral; 354: Predicted ENM map with documented occurrences and range estimate.



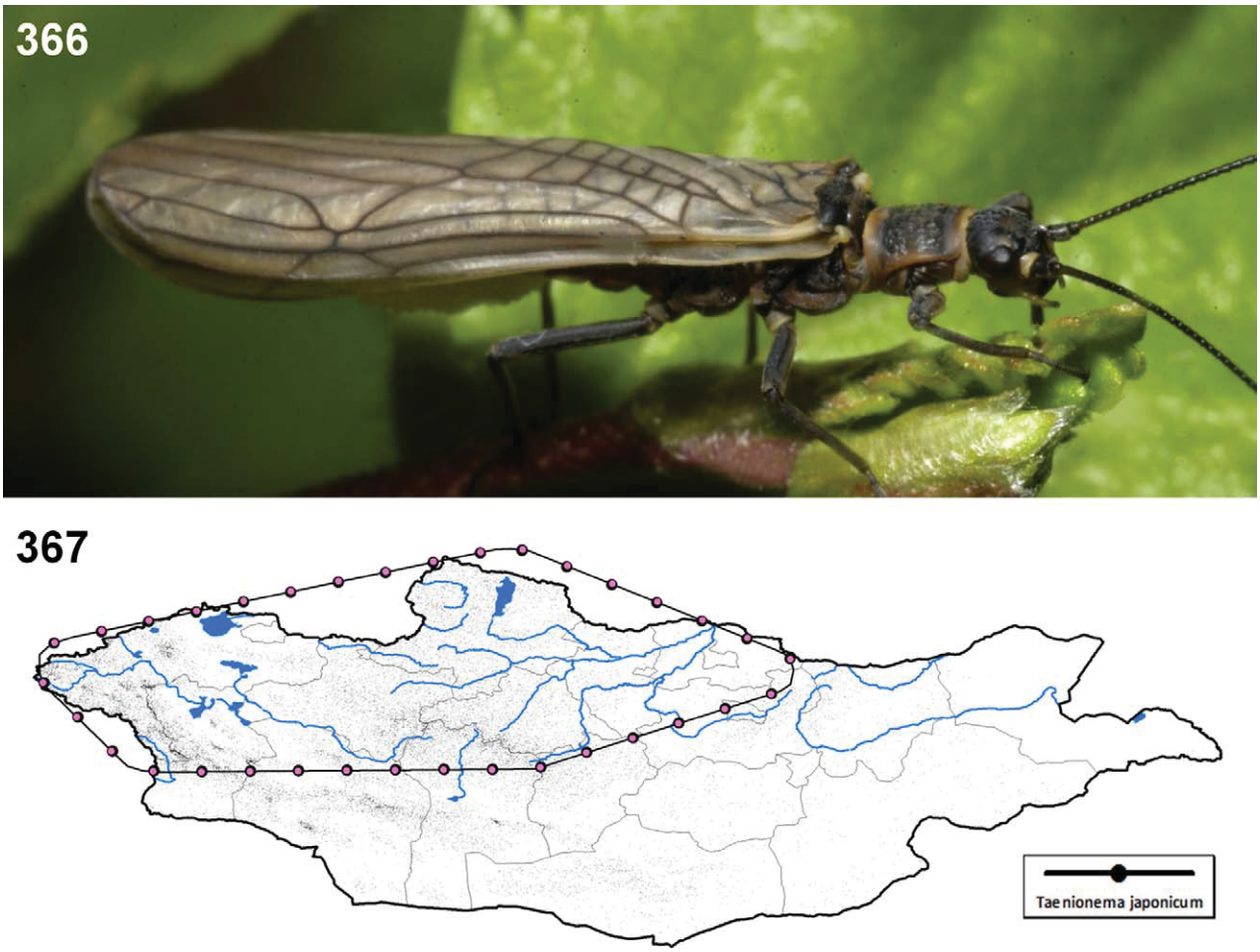
FIGURES 355–356. Pteronarcidae. 355: Habitus (live), *Pteronarycs reticulata*, Uur River (SRP2005071403); 356: Distribution Map.



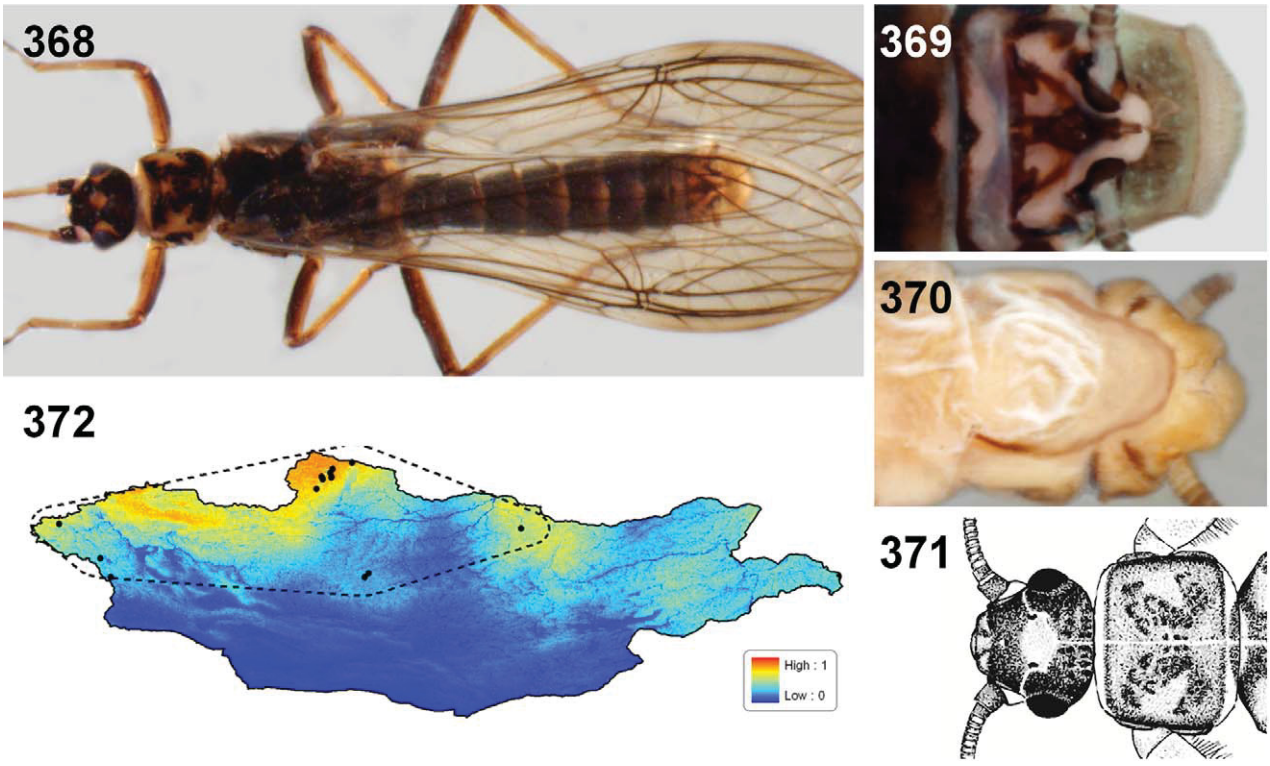
FIGURES 357–361. *Pteronarcys reticulata*.357: Habitus (preserved); 358: Male, dorsal; 359: Female terminalia, ventral; 360: Nymph head; 361: Predicted ENM map with documented occurrences and range estimate.



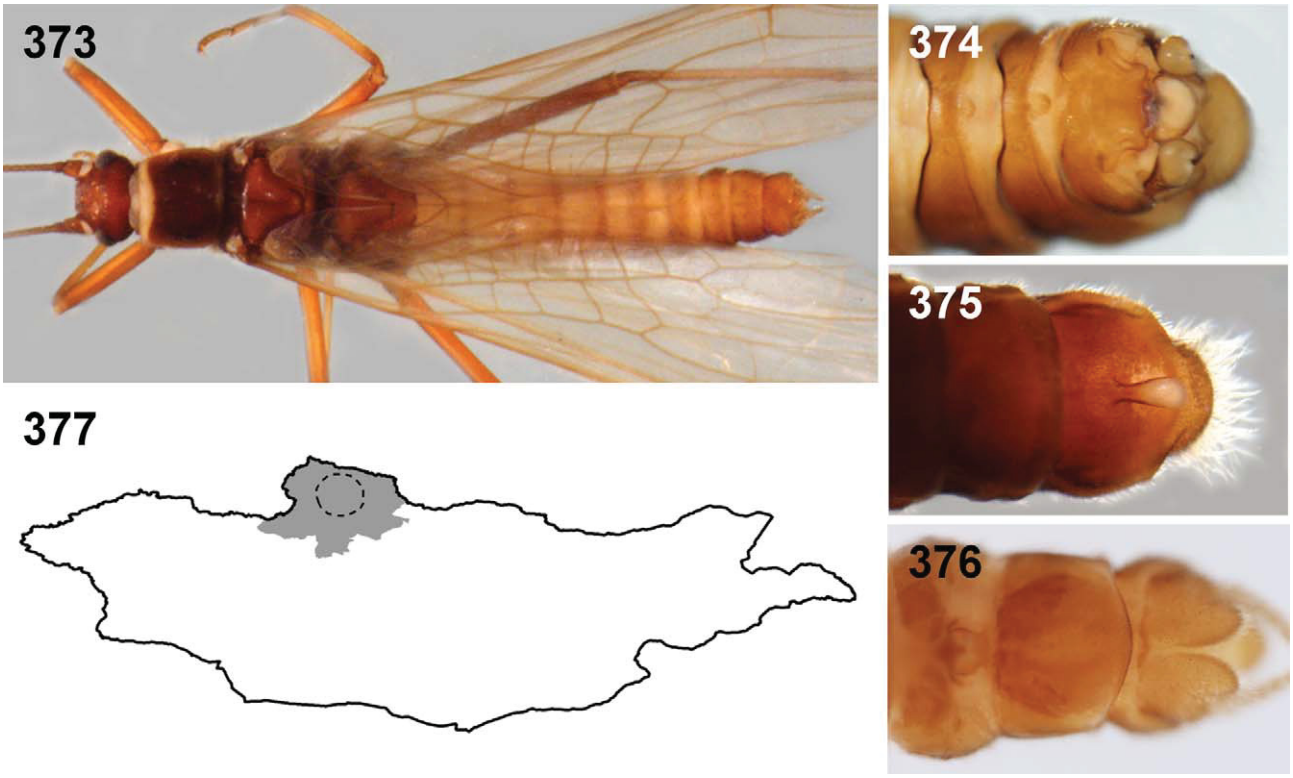
FIGURES 362–365. Taeniopterygidae genus key. 362: Thorax of *Taeniopteryx nivalis*, lateral. One pair of coxal gills indicated by a white dashed circle; 363: Abdomen of *Taeniopteryx nebulosa*, lateral. Illustration after Zwick 2004; 364: Thorax of *Taenionema pallidum*, lateral; 365: Terminal segments of abdomen of *Taenionema pallidum*, ventral.



FIGURES 366–367. Taeniopterygidae. 366: Habitus (live), *Taenionema japonicum,* springs of Shishged River (SRP2006063002); 367: Comparative distribution map. *Taenionema*. *Taeniopteryx* not shown due to lack of georeferenced localities from historical records.



FIGURES 368–372. *Taenionema japonicum*. 368: Habitus (preserved); 369: Male terminalia; 370: Female terminalia, ventral; 371: Nymph head; 372: Predicted ENM map with documented occurrences and range estimate.



FIGURES 373–377. *Taeniopteryx nebulosa.* 373: Habitus (preserved); 374: Male terminalia; 375: Male, ventral; 376: Female terminalia, ventral; 377: Historical records map with range estimate.

APPENDIX 2. MATERIAL EXAMINED

The material examined is recorded similar to specimen labels as follows:

BULGAN Aimag, Teshig Soum, Egiin Gol River above (12.7 km SW of) Teshig, N 49.88884E 102.50909, 997 msl, 11 July 2005, CRNelson, 2 m, 1 f, SRP2005071101, (003BYU).

The aimag (i.e. state/province) is given in all capital letters, followed by the soum, locality name, GPS coordinates (if available, in decimal degrees format (dd.ddd) without a degree symbol for ease of use in GIS programs), elevation (if available), date (in the format DD Month YYYY), and collector. Where possible locality names have used standardized to current Mongolian spellings, however original spellings may occur from the wide variety of languages used in maps and publications for Mongolia. If specimen counts were taken, these are reported as Male (m) and Female (f) counts, if not, they are instead described as "1 lot" meaning 1 vial likely with multiple specimens therein. Finally, the MAIS or SRP field number of the locality is given, followed by a unique record number that includes the first three letters of the depository where the specimen is permanently housed. In the MAIS team database, each specimen is assigned such a record number for tracking purposes which is also written on a label and placed in the vial associated with the specimen. Such summation of localities is given for each species as recorded in the MAIS database. The material examined is organized alphabetically by family, genus, and species.

Abbreviations for the depository institutions, which are also the sister universities of this project, are as follows:

ANSP = Academy of Natural Sciences, Philadelphia PA
BYU = Brigham Young University, Monte L. Bean Life Science Museum, Provo UT
CU = Clemson University, Clemson SC
IMH = Institute of Meteorology and Hydrology, Mongolia
NUM = National University of Mongolia, Mongolia
WSC = Wayne State College, Wayne NE

Capniidae

***Capnia khubsugulica*—**MONGOLIA: KHOVSGOL Aimag, Khank Soum, Hosgol Lake at Khank, 15 June 1996, J. Gelhaus, 1 lot, JKG720, (608ANSP). KHOVSGOL Aimag, Soum, Sevsuuliyn gol, 1995, J. Gelhaus, 1 lot, JKG724, (619ANSP). KHOVSGOL Aimag, 1995, J. Gelhaus, 1 lot, JKG719, (606ANSP).

***Capnia nigra*—**MONGOLIA: BAYAN-OLGII Aimag, Tsengel Soum, Altai Tavan Bogd National Park, Tsagaan Gol, Tavan Bogd Road's End Camp, 20 km west of Zagastnuur Bag, N 49.09159 E 88.10411, 2381 msl, 9 July 2008, CRNelson, 1m, 1f, MAIS2008070902, (044BYU). KHOVSGOL Aimag, Renchinlhumbe Soum, Jarin Gol, 32.8 km N of Renchinlhumbe, river crossing N 51.39852 E 99.75011, 1575 msl, 2 July 2006, JKGelhaus, 2m, SRP2006070203A, (036ANSP). KHOVSGOL Aimag, Renchinlhumbe Soum, Jarin Gol, 32.8 km N of Renchinlhumbe, river crossing N 51.39852 E 99.75011, 1575 msl, 2 July 2006, JKGelhaus, 2m, SRP2006070203A, (535BYU). KHOVSGOL Aimag, Renchinlhumbe Soum, Jarin Gol, 32.8 km N of Renchinlhumbe, river crossing N 51.39852 E 99.75011, 1575 msl, 2 July 2006, JKGelhaus, 2m, SRP2006070203A, (536ANSP). KHOVSGOL Aimag, Ulaanuul Soum, Gunain Gol, 12 km SW of Ulaan Uul N 50.61826 E 99.12094, 1761 msl, 29 June 2006, JKGelhaus, 2f, SRP2006062903, (020ANSP). KHOVSGOL Aimag, J. Gelhaus, 1 lot, JKG713, (601ANSP). KHOVSGOL Aimag, J. Gelhaus, 1 lot, JKG716_751, (605ANSP). ZAVKHAN Aimag, Ider Soum, Dogshin/Nogoon Nuur ~21 km SE of Zuunmod/Ider N 48.06257 E 97.55064, 2054 msl, 23 July 2004, JKGelhaus, 1f, SRP2004072302, (041ANSP).

***Isocapnia guentheri*—**MONGOLIA: ARKHANGAI Aimag, Ikhtamir Soum, NW braid of Khoit Tamir Gol ~25 km SW of Ikhtamir N 47.50523 E 100.93208, 1728 msl, 14 July 2004, SRP Team, 1 lot, SRP2004071402, (48IMH). ARKHANGAI Aimag, Ikhtamir Soum, Khoit Tamir Gol ~29 km SW of Ikhtamir N 47.48567 E 100.87875, 1749 msl, 15 July 2004, SRP Team, 1 lot, SRP2004071501, (49IMH). BULGAN Aimag, Teshig Soum, Tariakhtain Gol Stream, junction by two major forks, N 49.77776E 103.60860, 1189 msl, 9 July 2005, C.R.Nelson, 1 lot, SRP2005070902, (000BYU). BULGAN Aimag, Teshig Soum, Tarvagatain (Marmot) Gol River at Egiin Gol River, N 49.70678E 103.10288, 909 msl, 10 July 2005, C.R.Nelson, 1 lot, SRP2005071001A, (1003BYU). KHOVSGOL Aimag, Renchinlhumbe Soum, Jarin Gol, 32.8 km N of Renchinlhumbe, river crossing N 51.39852 E 99.75011, 1575 msl, 2 July 2006, CRNelson, 5f, SRP2006070203A, (056BYU). KHOVSGOL Aimag, Ikh khoroo gol near Khovsgol Nuur, J. Gelhaus, 1 lot, JKG722, (616ANSP). SELENGE Aimag, Bugant/Yaroo Soum, unnamed tributary of Yalbag Gol 49.7 km W of Zuunkharaa Bridge N 49.4577 E 106.5351, 1115 msl, 17 July 2003, SRP Team, 1 lot, SRP2003071703, (14IMH). TOV Aimag, Ihtenger (town), Tul Gol and small streams, riparian dwarf Salix, S. of Ulaanbaatar N 47.88349 E 106.98829, 23 June 2006, S. Podenas, 1m, SRP2006062302, (064BYU). TOV Aimag, Gorkhi Terelj National Park, Terelj River just above Terelj, N 47.99158 E 107.46717, 1516, 28 July 2008, CRNelson, 2m, 1f, none (CRN8949), (059BYU). ZAVKHAN Aimag, Tosontsengel Soum, Delgarakhiin Gol ~16 km S of Tosontsengel N 48.61518 E 98.23096, 1761 msl, 20 July 2004, SRP Team, 1 lot, SRP2004072001, (52IMH).

***Isocapnia kudia*—**MONGOLIA: KHOVSGOL Aimag, Renchinlhumbe Soum, Arsayn Gol, 16.2 km N of Renchinlhumbe town, N 51.25356 E 99.66687, 1565 msl, 2 July 2006, C.R.Nelson, 1 lot, SRP2006070201, (96ANSP).

***Isocapnia sibirica*—**MONGOLIA: ARKHANGAI Aimag, Tsenkher Soum, Tsetseleg Gol ~17 km SW of Tavanbulag N 47.26999 E 101.80227, 1684 msl, 10 July 2004, SRP Team, 1 lot, SRP2004071002, (40IMH). ARKHANGAY Aimag, Bulgan Soum, Urd Tamir Gol ~38 km SW of Tsetserleg N 47.28244 E 101.18793, 1872 msl, 12 July 2004, SRP Team, 1 lot, SRP2004071201, (742IMH). TOV Aimag, Erdene Soum, Gorkhi Terelj National Park, Tuul River 10.1 km upstream of Tuul River Bridge, N 48.09549 E 107.84265, 1531 msl, 8 July 2003, SRP team, 1 lot, SRP2003070801, (699IMH).

***Mesocapnia altaica*—**MONGOLIA: BAYAN OLGIY Aimag, Ulaanhus Soum, 21 km by air SE Syrgali N 48.44036 E 088.60204, 2443 msl, 17 July 2008, C.R.Nelson, 1 lot, MAIS2008071701, (916BYU). BAYAN-OLGII Aimag, Sagsay Soum, Godon Gol, 18 km due North of Dayan, N 48.43687 E 88.90085, 2245 msl, 17 July 2008, C.R.Nelson, 1 lot, MAIS2008071702, (917BYU). BAYAN-OLGII Aimag, Tsengel Soum, Altai Tavan Bogd National Park, Tsagaan Gol, Tavan Bogd Road's End Camp, 20 km west of Zagastnuur Bag, N 49.09159 E 88.10411, 2381 msl, 9 July 2008, C.R.Nelson, 1 lot, MAIS2008070902, (904BYU). BAYAN-OLGII Aimag, Tsengel Soum, Altai Tavan Bogd National Park, Sul Uulim Gol, tributary of Tsagaan Gol, N 49.10450 E 88.04854, 2795 msl, 10 July 2008, C.R.Nelson, 1 lot, MAIS2008071001, (905BYU). BAYAN-OLGII Aimag, Tsengel Soum, Altai Tavan Bogd National Park, unnamed tributary of Sul Uulim Gol, tributary of Tsagaan Gol, N 49.12007 E 88.01157, 2912 msl, 10 July 2008, C.R.Nelson, 1 lot, MAIS2008071002, (906BYU). BAYAN-OLGII Aimag, Tsengel Soum, Altai Tavan Bogd National Park, Tavan Bogd ascent base camp, IMH Glacier Camp, unnamed creek tributary of Potitinini Gol of Tsagaan Gol, N 49.15035 E 87.94238, 3099 msl, 10 July 2008, C.R.Nelson, 1 lot, MAIS2008071003, (907BYU). BAYAN-OLGII Aimag, Tsengel Soum, Altai Tavan Bogd National Park, Tavan Bogd Road's End Camp, springs above Tsagaan Gol, 20 km west ofZagaastnuur Bag, N 49.09754 E 88.10383, 2538 msl, 12 July 2008, C.R.Nelson, 1 lot, MAIS2008071101, (908BYU). BAYAN-OLGII Aimag, Tsengel Soum, Khar Ovoo Gol, draining Khelkhee Lake, N 48.62918 E 88.28554, 2147 msl, 15 July 2008, C.R.Nelson, 1 lot, MAIS2008071601, (914BYU). BAYAN-OLGII Aimag, Tsengel Soum, Sumdairag Gol, 12 km due South of Syrgal, N 48.50679 E 88.50977, 2129 msl, 16 July 2008, C.R.Nelson, 1 lot, MAIS2008071604, (915BYU). BAYAN-OLGII Aimag, Ulaankhus Soum, Ulastai Gol, 2 km East of Khokh Ereg Military Base, N 49.31867 E 88.36613, 2391 msl, 8 July 2008, C.R.Nelson, 1 lot, MAIS2008070802, (902BYU). BAYAN-OLGII Aimag, Soum unrecorded, SWChorgon lake, 17 July 1978, Puntsagdulan, 1 lot, Puntsagdulan17July1978, (883BYU). BAYAN-OLGII Aimag, Soum unrecorded, SW Chorgon lake, 17 July 1978, 2f, 17-VII-1978 AltID (no MAIS/SRP), (429BYU).

***Mesocapnia variabilis*—**MONGOLIA: ARKHANGAI Aimag, Chuluut Soum, ponds at Egiin Davaa ~47 km SW of Chuluut/Jargalant N 47.21198 E 99.91114, 2582 msl, 16 July 2004, SRP Team, 1 lot, SRP2004071601, (750IMH). ARKHANGAI Aimag, Chuluut Soum, Chuluutin Gol ~45 km SW of Chuluut/Jargalant N 47.21768 E 99.92824, 2471 msl, 16 July 2004, SRP Team, 1 lot, SRP2004071602, (751IMH). HOVSGOL Aimag, Khank Soum, Borsog River, near Hovsgol lake N 50.96147222 E 100.7250556, 1689 msl, 27 Aug 2005, E. Sanaa, 1 lot, Hovsgol_Borsog, (485IMH). HOVSGOL Aimag, Khank Soum, Shagnull River near Hovsgol Lake N 51.25869444 E 100.86000, 1732 msl, 15 Aug 2005, E. Sanaa, 1 lot, Hovsgol_Shagnuul, (502IMH). KHOVSGOL Aimag, Khank Soum, Khovsgol Lake, north side, Bayan gol N 51.6133404 E 100.6003475, 20 July 1997, J. Gelhaus, 1 lot, JKG764, (650ANSP). KHOVSGOL Aimag, Hovsgol Nuur, Shagnuul gol, J. Gelhaus, 1 lot, JKG767, (653ANSP). KHOVSGOL Aimag, J. Gelhaus, 1 lot, JKG765, (652ANSP). TOV Aimag, Erdene Soum, Gorkhi Terelj National Park N 48.4208 E 107.91406, 1818 msl, 28 July 2003, SRP Team, 1 lot, SRP2003072802, (737IMH). TOV Aimag, Erdene Soum, Gokhi Terelj National Park, Tuul River 10.1 km upstream of Tuul River Bridge N 48.09549 E 107.84265, 1531 msl, 8 July 2003, SRP Team, 1 lot, SRP2003070801, (99IMH). ZAVKHAN Aimag, Ikh-Uul Soum, Deed Tsetsuukhiin Gol ~10 km NW of Solongotiin Davaa N 48.36436 E 98.92737, 2072 msl, 25 July 2004, SRP Team, 1 lot, SRP2004072502, (758IMH).

Chloroperlidae

***Alaskaperla longidentata*—**MONGOLIA: ARKHANGAI Aimag, Chuluut Soum, Chuluutin Gol ~33 km SW of Chuluut/Jargalant N 47.29702 E 100.03136, 2287 msl, 16 July 2004, ESanaa, 1f, SRP2004071603, (063IMH). ARKHANGAI Aimag, Chuluut Soum, Khurmen/Davaat Gol 15 km SSE of Chuluut/Jargalant N 47.4258 E 100.3013, 2104 msl, 15 July 2004, ESanaa, 12m, 73f, SRP2004071503, (062IMH). HOVSGOL Aimag, Khank Soum, Borsog River, near Hovsgol lake N 50.96147222 E 100.7250556, 1689 msl, 14 July 2003, E. Sanaa, 1 lot, Hovsgol_Borsog, (488IMH). HOVSGOL Aimag, Khank Soum, Dalbay River, near Hovsgol lake N 51.01908333 E 100.7595278, 1662 msl, 18 July 2005, E. Sanaa, 1 lot, Hovsgol_Dalbay, (492IMH). HOVSGOL Aimag, Khank Soum, Noyon gol, near Hovsgol Nuur N 51.20152778 E 100.8072778, 1709 msl, 11 Aug 2003, E. Sanaa, 1 lot, Hovsgol_Noyon, (496IMH). HOVSGOL Aimag, Khank Soum, Shagnull River near Hovsgol Lake N 51.25869444 E 100.86000, 1732 msl, 4 Aug 2003, E. Sanaa, 1 lot, Hovsgol_Shagnuul, (505IMH). HOVSGOL Aimag, Khank Soum, Turag River near Hovsgol Lake N 51.28775 E 100.8276389, 1667 msl, 15 Aug 2005, E. Sanaa, 1 lot, Hovsgol_Turag, (509IMH). KHOVSGOL Aimag, Khank Soum, Alag tsar river, near Hovsgol Lake, 1675, 13 July 1997, J. Gelhaus, 1 lot, JKG746Hay97061, (642ANSP). KHOVSGOL Aimag, Khank Soum, Hovsgol Nuur, Shagnuul gol, J. Gelhaus, 1 lot, JKG767, (654ANSP). KHOVSGOL Aimag, Khank Soum, Noyon gol, near Hovsgol Nuur, J. Gelhaus, 1 lot, JKG756, (645ANSP). KHOVSGOL Aimag, Khank Soum, Turagyn gol, E side Hovsgol Nuur N 51.2873608 E 100.8270800, 17 July 1997, J. Gelhaus, 1 lot, JKG757, (646ANSP). KHOVSGOL Aimag, Renchinlhumbe Soum, Hugin Gol, toll bridge, 46.8km N of Ulaan Uul town, N 51.09845 E 99.32051, 1557 msl, 1 July 2006, CRNelson, 1m, 3f, SRP2006070101, (066BYU). KHOVSGOL Aimag, Renchinlhumbe Soum, Hugin Gol, toll bridge, 46.8km N of Ulaan Uul town, N 51.09845 E 99.32051, 1557 msl, 1 July 2006, JKGelhaus, 2m, 5f, SRP2006070101, (017ANSP). KHOVSGOL Aimag, Renchinlhumbe Soum, Hugin Gol, toll bridge, 46.8km N of Ulaan Uul town, N 51.09845 E 99.32051, 1557 msl, 1 July 2006, JKGelhaus, 1f, SRP2006070101, (203ANSP). KHOVSGOL Aimag, Bayanzurkh Soum, Altargana Gol stream, 4.2 km N of Bayanzurkh town, N 50.21340E 98.96266, 1679 msl, 21 July 2005, CRNelson, 1m, SRP2005072103, (133BYU). KHOVSGOL Aimag, Chandmani-Ondor Soum, Khalkhan Gol Stream, above Bul Nai Hot Springs, 37.1 km NW of Chandmani Ondor town, N 50.78320E 100.79585, 1677 msl, 18 July 2005, CRNelson, 3f, SRP2005071803, (006BYU). KHOVSGOL Aimag, Chandmani-Ondor Soum, Khalkhan Gol Stream, above Bul Nai Hot Springs, 37.1 km NW of Chandmani Ondor town, N 50.78320E 100.79585, 1677 msl, 18 July 2005, JKGelhaus, 10m, SRP2005071803, (216ANSP). KHOVSGOL Aimag, Modon Hui Island, 7 July 1995, J. Gelhaus, 1 lot, JKGHayModonHuiIsland, (656ANSP). KHOVSGOL Aimag, Toyn gol, N 51.449084 E 100.81788, 18 July 1997, J. Gelhaus, 1 lot, JKG759, (647ANSP). KHOVSGOL Aimag, Bayanzurkh Soum, Beltes Gol River "road", start 10 km NE of Bayanzurkh, N 50.21920 E 99.09978, 1698 msl, 5 July 2006, CRNelson 8501, 1f, none (CRN8501), (061BYU). KHOVSGOL Aimag, Bayanzurkh Soum, Beltes Gol River "road", start 10 km NE of Bayanzurkh, N 50.21920 E 99.09978, 1698 msl, 5 July 2006, JKGelhaus, 25m, 22f, none (CRN8501), (039ANSP). KHOVSGOL Aimag, Bayanzurkh Soum, Beltes Gol, 4.7 km NE of Bayanzurkh town, N 50.19916 E 99.03117, 1642 msl, 6 July 2006, CRNelson, 6f, SRP2006070601, (067BYU). KHOVSGOL Aimag, Bayanzurkh Soum, Beltes Gol, 4.7 km NE of Bayanzurkh town, N 50.19916 E 99.03117, 1642 msl, 6 July 2006, JKGelhaus, 3m, 6f, SRP2006070601, (007ANSP). KHOVSGOL Aimag, Bayanzurkh Soum, Beltes Gol, 4.7 km NE of Bayanzurkh town, N 50.19916 E 99.03117, 1642 msl, 6 July 2006, JCMorse, 3m, 10f, SRP2006070601, (018ANSP). KHOVSGOL Aimag, Bayanzurkh Soum, Beltes Gol, 4.7 km NE of Bayanzurkh town, N 50.19916 E 99.03117, 1642 msl, 6 July 2006, Ch. Suvdsetseg, 2m, 2f, SRP2006070601, (071ANSP). KHOVSGOL Aimag, TsagaanUur? Soum, Kholkhan Gol Stream, tributary of Aireg Gol, 22 km W of Tsagaan Uur town, N 50.51517E 101.21073, 1195 msl, 17 July 2005, SRP Team, 1 lot, SRP2005071702A, (18IMH). OVORHANGAI Aimag, Batolzii Soum, Orhon N 46.82177 E 101.7052, 12 Aug 2007, NRG, 1 lot, AsiaFound70, (307NUM). SELENGE Aimag, Khuder Soum, Zerlegiin Gol c. 12 km E of Khuder N 49.7313 E 107.63484, 763 msl, 25 July 2003, ESanaa, 1f, SRP2003072401, (060IMH). SELENGE Aimag, Tsagaannuur Soum, SW shore of Tsagaan Nuur N 49.95588 E 105.33791, 668 msl, 25 July 2003, ESanaa, 1f, SRP2003072502, (061IMH). TOV Aimag, Erdene Soum, Gorkhi Terelj National Park, E Bayangin Gol 12.9 km upstream of Tuul River Bridge N 48.14846 E 107.75838, 1596 msl, 7 July 2003, ESanaa, 8m, 2f, SRP2003070703, (054IMH). TOV Aimag, Erdene Soum, Gorkhi Terelj National Park,

E Bayangin Gol 4.2 km upstream of Tuul River Bridge N 48.07956 E 107.77729, 1526 msl, 7 July 2003, ESanaa, 1f, SRP2003070704, (055IMH). TOV Aimag, Erdene Soum, Gorkhi Terelj National Park, mouth of Khag River @ confluence with Tuul N 48.25861 E 107.90251, 1608 msl, 10 July 2003, ESanaa, 2m, 8f, SRP2003071002, (058IMH). TOV Aimag, Erdene Soum, Gorkhi Terelj National Park, Tuul River at Daichin crossing N 48.12416 E 107.5478.0, 1598 msl, 10 July 2003, ESanaa, 1m, SRP2003071003, (059IMH). TOV Aimag, Erdene Soum, Gorkhi Terelj National Park, unnamed braid of Tuul River N 48.14846 E 107.91267, 1564 msl, 9 July 2003, ESanaa, 1f, SRP2003070805, (056IMH). TOV Aimag, Erdene Soum, Gorkhi Terelj National Park, unnamed tributary of Tuul R on its W side c. 5 km upstream from Daichin crossing N 48.24734 E 107.90589, 1610 msl, 10 July 2003, ESanaa, 1m, SRP2003071001-A, (057IMH). TOV Aimag, Erdene Soum, Gorkhi Terelj National Park, W Bayangin Gol 20.1 km upstream of Tuul R Road N 48.16668 E 107.69548, 1623 msl, 6 July 2003, ESanaa, 1m, 1f, SRP2003070605, (052IMH). TOV Aimag, Erdene Soum, Gorkhi Terelj National Park, W Bayangin Gol at Tuul R Road crossing N 48.10757 E 107.65918, 1492 msl, 7 July 2003, ESanaa, 1m, 2f, SRP2003070702, (053IMH). ZAVKHAN Aimag, Ider Soum, Zagastain Gol ~11 km NNE of Zagastain Davaa N 48.15779 E 97.21441, 2108 msl, 24 July 2004, ESanaa, 1f, SRP2004072401, (065IMH). ZAVKHAN Aimag, Tosontsengel Soum, Gunza Gol ~38 km SW of Tosontsengel N 48.62624 E 97.89617, 1831 msl, 21 July 2004, ESanaa, 2m, 9f, SRP2004072102, (064IMH). ZAVKHAN Aimag, Tosontsengel Soum, Tegshiin Gol ~70 km SW of Tosontsengel N 48.3441 E 97.87312, 1927 msl, 22 July 2004, SRP Team, 1 lot, SRP2004072201, (17IMH).

Alloperla deminuta—MONGOLIA: ARKHANGAI Aimag, Bulgan Soum, Urd Tamir Gol ~38 km SW of Tsetserleg N 47.28244 E 101.18793, 1872 msl, 12 July 2004, ESanaa, 6m, 12f, SRP2004071201A, (009IMH). ARKHANGAI Aimag, Bulgan Soum, Urd Tamir Gol ~38 km SW of Tsetserleg N 47.28244 E 101.18793, 1872 msl, 12 July 2004, JKGelhaus, 3m, 5f, SRP2004071201A, (044ANSP). ARKHANGAI Aimag, Bulgan Soum, Urd Tamir Gol braid upstream of bridge~63 km SW of Tsetserleg N 47.11192 E 101.01048, 2066 msl, 13 July 2004, JKGelhaus, 1m, 5f, SRP2004071302, (045ANSP). ARKHANGAI Aimag, Chuluut Soum, Chuluutin Gol 40 km N of Chuluut/Jargalant N 47.8044 E 100.3181, 1937 msl, 17 July 2004, ESanaa, 4m, 11f, SRP2004071701, (013IMH). ARKHANGAI Aimag, Ikhtamir Soum, Khoit Tamir Gol ~29 km SW of Ikhtamir N 47.48567 E 100.87875, 1749 msl, 15 July 2004, ESanaa, 6m, 13f, SRP2004071501, (012IMH). ARKHANGAI Aimag, Ikhtamir Soum, Khoit Tamir Gol ~29 km SW of Ikhtamir N 47.48567 E 100.87875, 1749 msl, 15 July 2004, JKGelhaus, 1f, SRP2004071501, (047ANSP). ARKHANGAI Aimag, Ikhtamir Soum, NW braid of Khoit Tamir Gol ~25 km SW of Ikhtamir N 47.50523 E 100.93208, 1728 msl, 14 July 2004, ESanaa, 1m, 7f, SRP2004071402, (011IMH). ARKHANGAI Aimag, Ikhtamir Soum, NW braid of Khoit Tamir Gol ~25 km SW of Ikhtamir N 47.50523 E 100.93208, 1728 msl, 14 July 2004, JKGelhaus, 1f, SRP2004071402, (046ANSP). ARKHANGAI Aimag, Tsenkher Soum, Tsetseleg Gol ~17 km SW of Tavanbulag N 47.26999 E 101.80227, 1684 msl, 10 July 2004, ESanaa, 4f, SRP2004071002, (008IMH). ARKHANGAI Aimag, Tsenkher Soum, Tsetseleg Gol ~17 km SW of Tavanbulag N 47.26999 E 101.80227, 1684 msl, 10 July 2004, JKGelhaus, 9m, 6f, SRP2004071002, (043ANSP). BULGAN Aimag, Teshig Soum, Tarvagatain (Marmot) Gol River at Egiin Gol River, N 49.70678E 103.10288, 909 msl, 10 July 2005, CRNelson, 1m, 3f, SRP2005071001A, (130BYU). KHOSVGOL Aimag, Tsagaan nuur Soum, Tengis N 51.47065 E 99.0262, 9 June 2008, BLM, 1 lot, AsiaFound13, (290NUM). KHOSVGOL Aimag, Tsagaan nuur Soum, Tengis N 51.48513 E 99.06127, 27 June 2007, Asia Foundation, 1 lot, AsiaFound14, (295NUM). KHOVSGOL Aimag, TsagaanUur Soum, Uilgan Gol, 26 km ENE of Tsagaan Uur town, N 50.62324E 101.87412, 1156 msl, 15 July 2005, C.R.Nelson, 1 lot, SRP2005071502A, (1013BYU). KHOVSGOL Aimag, TsagaanUur? Soum, Uur Gol River, 7 km N of Tsagaan Uur town, N 50.60031E 101.52392, 1155 msl, 16 July 2005, C.R.Nelson, 1 lot, SRP2005071601, (1016BYU). OVORKHANGAI Aimag, Batolziy Soum, Below Orkhon's Waterfall on Ulaan Gol~200 m S of Orkhon Gol, ~84 km W of Khujirt N 46.78742 E 101.96021, 1809 msl, 7 July 2004, ESanaa, 1m, 3f, SRP2004070701A, (007IMH). OVORKHANGAI Aimag, Batolziy Soum, Below Orkhon's Waterfall on Ulaan Gol~200 m S of Orkhon Gol, ~84 km W of Khujirt N 46.78742 E 101.96021, 1809 msl, 7 July 2004, JKGelhaus, 2f, SRP2004070701A, (042ANSP). SELENGE Aimag, Bugant/Yaroo Soum, unnamed tributary of Ichilegiin Gol 8.5 km downstream of Yeroogiin Khaluun Rashaan N 49.06472 E 107.47257, 990 msl, 19 July 2003, SRP Team, 1 lot, SRP2003071902, (23IMH). SELENGE Aimag, Khuder Soum, Tsagaan Shiluustiin Gol c. 5 km S of Khuder N 49.73763 E 107.49333, 704 msl, 23 July 2003, SRP Team, 1 lot, SRP2003072202B, (727IMH). SELENGE Aimag, Khuder Soum, Zerlegiin Gol c. 12 km E of Khuder N 49.7313 E 107.63484, 763 msl, 25 July 2003, SRP Team, 1 lot, SRP2003072401, (29IMH). TOV Aimag, Erdene Soum, Gorkhi Terelj National Park, E Bayangin Gol 4.2 km upstream of Tuul River Bridge N 48.07956 E 107.77729, 1526 msl, 7 July 2003, ESanaa, 1m, 1f, SRP2003070704, (004IMH). TOV Aimag, Erdene Soum, Gorkhi Terelj National Park, Terelj Gol braid downstream ofTerelj 10.6 km N of Mungut Rock Rd N 47.97944 E 107.47761, 1487 msl, 5 July 2003, ESanaa, 1m, 1f, SRP2003070502, (003IMH). TOV Aimag, Erdene Soum, Gorkhi Terelj National Park, unnamed braid of Tuul River N 48.14846 E 107.91267, 1564 msl, 9 July 2003, ESanaa, 1m, SRP2003070805, (005IMH). TOV Aimag, Erdene Soum, Gorkhi Terelj National Park, unnamed tributary of Tuul R on its W side 1.6 km upstream from Daichin crossing N 48.2178 E 107.90392, 1594 msl, 9 July 2003, ESanaa, 1m, 1f, SRP2003070902, (006IMH). TOV Aimag, Erdene Soum, unnamed tribE of Tuul river 8.5 km S of Galtain gol, 1542, Da July Year, E. Sanaa, 1 lot, Sanaa535, (747ANSP). TOV Aimag, Erdene Soum, Gorkhi Terelj National Park Tuul R c. 0.5 km upstream of Park Gate bridge N 47.82258 E 107.33613, 1305 msl, 5 July 2003, ESanaa, 1m, 2f, SRP2003070501, (002IMH). TOV Aimag, Erdene Soum, Gorkhi Terelj National Park; Tuul R c. 100 m upstream of confluence with Terelj R N 47.96806 E 107.59365, 1467 msl, 5 July 2003, SRP Team, 1 lot, SRP2003070503, (94IMH). TOV Aimag, Erdene Soum, Gorkhi Terelj National Park, W Bayangin Gol at Tuul R Road crossing N 48.10757 E 107.65918, 1492 msl, 7 July 2003, SRP Team, 1 lot, SRP2003070702, (98IMH). TOV Aimag, Erdene Soum, Gorkhi Terelj National Park, Tuul River at Daichin crossing N 48.12416 E 107.5478.0, 1598 msl, 10 July 2003, SRP Team, 1 lot,

SRP2003071003, (08IMH). TOV Aimag, 0 Soum, Gorkhi Terelj National Park, Terelj River just above Terelj, N 47.99158 E 107.46717, 1516, 28 July 2008, C.R.Nelson, 1 lot, none (CRN8949), (1042BY).

Alloperla joosti—MONGOLIA: ARKHANGAI Aimag, Bulgan Soum, Urd Tamir Gol ~38 km SW of Tsetserleg N 47.28244 E 101.18793, 1872 msl, 12 July 2004, ESanaa, 21m, 30f, SRP2004071201A, (015IMH). ARKHANGAI Aimag, Bulgan Soum, Urd Tamir Gol ~38 km SW of Tsetserleg N 47.28244 E 101.18793, 1872 msl, 12 July 2004, JKGelhaus, 3m, 7f, SRP2004071201A, (049ANSP). ARKHANGAI Aimag, Bulgan Soum, Urd Tamir Gol ~38 km SW of Tsetserleg N 47.28244 E 101.18793, 1872 msl, 12 July 2004, JKGelhaus, 1m, 1f, SRP2004071201A, (224ANSP). ARKHANGAI Aimag, Bulgan Soum, Urd Tamir Gol braid upstream of bridge~63 km SW of Tsetserleg N 47.11192 E 101.01048, 2066 msl, 13 July 2004, SRP Team, 1 lot, SRP2004071302, (44IMH). ARKHANGAI Aimag, Chuluut Soum, Chuluutin Gol 40 km N of Chuluut/Jargalant N 47.8044 E 100.3181, 1937 msl, 17 July 2004, ESanaa, 1m, 3f, SRP2004071701, (021IMH). ARKHANGAI Aimag, Chuluut Soum, Khurmen/Davaat Gol 15 km SSE of Chuluut/Jargalant N 47.4258 E 100.3013, 2104 msl, 15 July 2004, ESanaa, 1m, SRP2004071503, (020IMH). ARKHANGAI Aimag, Ikhtamir Soum, E side of Khoit Tamir Gol 4 km NE of Ikhtamir N 47.59928 E 101.24521, 1602 msl, 14 July 2004, ESanaa, 8m, 4f, SRP2004071401, (017IMH). ARKHANGAI Aimag, Ikhtamir Soum, E side of Khoit Tamir Gol 4 km NE of Ikhtamir N 47.59928 E 101.24521, 1602 msl, 14 July 2004, JKGelhaus, 4m, SRP2004071401, (223ANSP). ARKHANGAI Aimag, Ikhtamir Soum, Khoit Tamir Gol ~29 km SW of Ikhtamir N 47.48567 E 100.87875, 1749 msl, 15 July 2004, ESanaa, 2m, 7f, SRP2004071501, (019IMH). ARKHANGAI Aimag, Ikhtamir Soum, NW braid of Khoit Tamir Gol ~25 km SW of Ikhtamir N 47.50523 E 100.93208, 1728 msl, 14 July 2004, ESanaa, 6m, 10f, SRP2004071402, (018IMH). ARKHANGAI Aimag, Tsenkher Soum, Tsetseleg Gol ~17 km SW of Tavanbulag N 47.26999 E 101.80227, 1684 msl, 10 July 2004, ESanaa, 1m, 9f, SRP2004071002, (014IMH). ARKHANGAI Aimag, Tsenkher Soum, Tsetseleg Gol ~17 km SW of Tavanbulag N 47.26999 E 101.80227, 1684 msl, 10 July 2004, JKGelhaus, 7m, SRP2004071002, (048ANSP). BULGAN Aimag, ? Soum, Altat Gol 35.2 km SW of Khutag- Ondor N 49.21674 E 103.10725, 1020 msl, 26 July 2005, SRP Team, 1 lot, SRP2005072601, (1034BYU). BULGAN Aimag, Teshig Soum, Tarvagatain (Marmot) Gol River at Egiin Gol River, N 49.70678E 103.10288, 909 msl, 10 July 2005, C.R.Nelson, 1 lot, SRP2005071001A, (1004BYU). KHOVSGOL Aimag, TsagaanUur Soum, Uilgan Gol, 26 km ENE of Tsagaan Uur town, N 50.62324E 101.87412, 1156 msl, 15 July 2005, JKGelhaus, 1f, SRP2005071502A, (215ANSP). KHOVSGOL Aimag, TsagaanUur? Soum, Uur Gol River, 7 km N of Tsagaan Uur town, N 50.60031E 101.52392, 1155 msl, 16 July 2005, C.R.Nelson, 1 lot, SRP2005071601, (1017BYU). KHOVSGOL Aimag, TsagaanUur? Soum, Kholkhan Gol Stream, tributary of Aireg Gol, 22 km W of Tsagaan Uur town, N 50.51517E 101.21073, 1195 msl, 17 July 2005, C.R.Nelson, 1 lot, SRP2005071702A, (1023BYU). OVORKHANGAI Aimag, Batolziy Soum, Below Orkhon's Waterfall on Ulaan Gol~200 m S of Orkhon Gol, ~84 km W of Khujirt N 46.78742 E 101.96021, 1809 msl, 7 July 2004, SRP Team, 1 lot, SRP2004070701a, (39IMH). ZAVKHAN Aimag, Ider Soum, Ideriin Gol ~4 km NE of Zuunmod/Ider N 48.24995 E 97.40627, 1929 msl, 22 July 2004, ESanaa, 2m, 2f, SRP2004072203, (023IMH). ZAVKHAN Aimag, Ider Soum, Ideriin Gol ~4 km NE of Zuunmod/Ider N 48.24995 E 97.40627, 1929 msl, 22 July 2004, SRP Team, 1 lot, SRP2004072203, (54IMH). ZAVKHAN Aimag, Tosontsengel Soum, Delgarakhiin Gol ~16 km S of Tosontsengel N 48.61518 E 98.23096, 1761 msl, 20 July 2004, ESanaa, 3f, SRP2004072001, (022IMH).

Alloperla mediata—MONGOLIA: BULGAN Aimag, Teshig Soum, Tariakhtain Gol Stream, junction by two major forks, N 49.77776E 103.60860, 1189 msl, 9 July 2005, CRNelson, 14f, SRP2005070902, (082BYU). BULGAN Aimag, Teshig Soum, Tariakhtain Gol Stream, junction by two major forks, N 49.77776E 103.60860, 1189 msl, 9 July 2005, JKGelhaus, 1m, 9f, SRP2005070902, (208ANSP). BULGAN Aimag, Teshig Soum, Tariakhtain Gol Stream, junction by two major forks, N 49.77776E 103.60860, 1189 msl, 9 July 2005, JKGelhaus, 3f, SRP2005070902, (210ANSP). BULGAN Aimag, Teshig Soum, Tarvagatain (Marmot) Gol River at Egiin Gol River, N 49.70678E 103.10288, 909 msl, 10 July 2005, C.R.Nelson, 1 lot, SRP2005071001A, (1005BYU). KHOVSGOL Aimag, Renchinlhumbe Soum, Arsayn Gol, 16.2 km N of Renchinlhumbe town, N 51.25356 E 99.66687, 1565 msl, 2 July 2006, CRNelson, 2f, SRP2006070201, (157BYU). KHOVSGOL Aimag, Ulaanuul Soum, Gunain Gol, 12 km SW of Ulaan Uul N 50.61826 E 99.12094, 1761 msl, 29 June 2006, CRNelson, 3m, 1f, SRP2006062903, (139BYU). KHOVSGOL Aimag, Jargalant gol 25 km NW Khank, 1997, J. Gelhaus, 1 lot, JKG721_763, (610ANSP). KHOVSGOL Aimag, TsagaanUur Soum, Uilgan Gol, 26 km ENE of Tsagaan Uur town, N 50.62324E 101.87412, 1156 msl, 15 July 2005, JKGelhaus, 1f, SRP2005071502A, (213ANSP). KHOVSGOL Aimag, TsagaanUur? Soum, tributary of Aireg Gol, 18.5 km W of Tsagaan Uur town, N 50.50861E 101.26615, 1208 msl, 17 July 2005, CRNelson, 1m, 1f, SRP2005071701A, (100BYU). KHOVSGOL Aimag, TsagaanUur? Soum, tributary of Aireg Gol, 18.5 km W of Tsagaan Uur town, N 50.50861E 101.26615, 1208 msl, 17 July 2005, JKGelhaus, 4m, 4f, SRP2005071701A, (217ANSP). KHOVSGOL Aimag, TsagaanUur? Soum, Uur Gol River, 7 km N of Tsagaan Uur town, N 50.60031E 101.52392, 1155 msl, 16 July 2005, C.R.Nelson, 1 lot, SRP2005071601, (1018BYU). KHOVSGOL Aimag, TsagaanUur? Soum, Kholkhan Gol Stream, tributary of Aireg Gol, 22 km W of Tsagaan Uur town, N 50.51517E 101.21073, 1195 msl, 17 July 2005, C.R.Nelson, 1 lot, SRP2005071702A, (1024BYU). KHOVSGOL Aimag, Erdenebulgan Soum, Uur Gol River, 32.3 km NE of Erdenebulgan, N 50.30188E 101.92869, 1063 msl, 14 July 2005, C.R.Nelson, 1 lot, SRP2005071403, (1012BYU).

Alloperla rostellata—MONGOLIA: ARKHANGAI Aimag, Bulgan Soum, Urd Tamir Gol braid upstream of bridge~63 km SW of Tsetserleg N 47.11192 E 101.01048, 2066 msl, 13 July 2004, SRP Team, 1 lot, SRP2004071302, (45IMH). BULGAN Aimag, Teshig Soum, Tariakhtain Gol Stream, junction by two major forks, N 49.77776E 103.60860, 1189 msl, 9 July 2005, CRNelson, 1m, 17f, SRP2005070902, (083BYU). BULGAN Aimag, Teshig Soum, Tariakhtain Gol Stream, junction by two major forks, N 49.77776E 103.60860, 1189 msl, 9 July 2005, JKGelhaus, 1f, SRP2005070902, (211ANSP). BULGAN Aimag, Teshig Soum, Tarvagatain (Marmot) Gol River at Egiin Gol River, N 49.70678E 103.10288, 909 msl, 10 July 2005, CRNelson, 4f, SRP2005071001A, (086BYU). KHOVSGOL Aimag, Ulaanuul Soum, Gunain Gol, 12 km SW of

Ulaan Uul N 50.61826 E 99.12094, 1761 msl, 29 June 2006, CRNelson, 2m, SRP2006062903, (140BYU). KHOVSGOL Aimag, TsagaanUur Soum, Uilgan Gol, 26 km ENE of Tsagaan Uur town, N 50.62324E 101.87412, 1156 msl, 15 July 2005, C.R.Nelson, 1 lot, SRP2005071502A, (1014BYU). KHOVSGOL Aimag, TsagaanUur? Soum, Kholkhan Gol Stream, tributary of Aireg Gol, 22 km W of Tsagaan Uur town, N 50.51517E 101.21073, 1195 msl, 17 July 2005, CRNelson, 1f, SRP2005071702A, (101BYU). ZAVKHAN Aimag, Ikh-Uul Soum, Deed Tsetsuukhiin Gol ~10 km NW of Solongotiin Davaa N 48.36436 E 98.92737, 2072 msl, 25 July 2004, ESanaa, 1f, SRP2004072502, (026IMH).

***Haploperla lepnevae*—**MONGOLIA: BAYAN OLGIY Aimag, Tsengol Soum, Harganat Gol on route A15 at Usttolgoy N 48.83438 E 089.19849, 2054 msl, 6 July 2008, C.R.Nelson, 1 lot, MAIS2008070601, (896BYU). BAYAN-OLGII Aimag, Olgiy Soum, Khovd Gol above Olgiy, N 48.97842 E 89.94995, 1750 msl, 5 July 2008, CRNelson, 1f, MAIS2008070501, (025BYU). BAYAN-OLGII Aimag, Sagsay Soum, Sagsay Gol, bridge 11 km NW Sagsay, N 48.84328 E 89.53623, 1798 msl, 5 July 2008, CRNelson, 6m, 25f, MAIS2008070502, (027BYU). BULGAN Aimag, Teshig Soum, Tarvagatain (Marmot) Gol River at Egiin Gol River, N 49.70678E 103.10288, 909 msl, 10 July 2005, C.R.Nelson, 1 lot, SRP2005071001A, (1006BYU). BULGAN Aimag, Hyalganat Soum, Selenge River, bridge at Hyalganat town, N 49.48086E 104.30864, 786 msl, 8 July 2005, 1 lot, SRP2005070801, (997BYU). KHOVSGOL Aimag, Tumurbulag Soum, Bugsei Gol River, 45.5 km SW of Moron City, N 49.26170E 99.88242, 1597 msl, 23 July 2005, CRNelson, 1f, SRP2005072301, (008BYU). KHOVSGOL Aimag, Sevsuuliyn gol, J. Gelhaus, 1 lot, JKG724, (620ANSP). KHOVSGOL Aimag, Jargalant gol N 51.6497219 E 100.5295426, 20 July 1997, J. Gelhaus, 1 lot, JKG736, (632ANSP). KHOVSGOL Aimag, Alagtsar gol, July 1995, J. Gelhaus, 1 lot, JKG713, (602ANSP). KHOVSGOL Aimag, Selenge River, July 1997, J. Gelhaus, 1 lot, JKG733, (625ANSP). KHOVSGOL Aimag, TsagaanUur? Soum, Uur Gol River, 7 km N of Tsagaan Uur town, N 50.60031E 101.52392, 1155 msl, 16 July 2005, CRNelson, 1m, 1f, SRP2005071601, (005BYU). SELENGE Aimag, Bugant/Yaroo Soum, Khongiin Gol at Yeroo Gol confluence N 49.08636 E 107.3075, 943 msl, 19 July 2003, JKGelhaus, 1f, SRP2003071803, (050ANSP). SELENGE Aimag, Bugant/Yaroo Soum, Yeroo R c. 14 km upstream of Yavin/Yeroo bridge N 49.61985 E 106.82693, 695 msl, 22 July 2003, JKGelhaus, 1f, SRP2003072201, (051ANSP). SELENGE Aimag, Baruunharaa Soum, Haraa Gol River, 2.3 km S of Bayangol N 48.87748E 106.12370, 802 msl, 4 July 2005, CRNelson, 1m, 3f, SRP2005070402, (122BYU). TOV Aimag, Gorkhi Terelj National Park Tuul R c. 0.5 km upstream of Park Gate bridge N 47.82258 E 107.33613, 1305 msl, 5 July 2003, ESanaa, 1m, 5f, SRP2003070501, (027IMH).

***Suwallia kerzhneri*—**MONGOLIA: ARKHANGAI Aimag, Ikhtamir Soum, E side of Khoit Tamir Gol 4 km NE of Ikhtamir N 47.59928 E 101.24521, 1602 msl, 14 July 2004, ESanaa, 1m, SRP2004071401, (031IMH). ARKHANGAI Aimag, Ikhtamir Soum, Khoit Tamir Gol ~29 km SW of Ikhtamir N 47.48567 E 100.87875, 1749 msl, 15 July 2004, ESanaa, 10m, 8f, SRP2004071501, (033IMH). KHOVSGOL Aimag, Chandmani-Ondor Soum, Khalkhan Gol Stream, above Bul Nai Hot Springs, 37.1 km NW of Chandmani Ondor town, N 50.78320E 100.79585, 1677 msl, 18 July 2005, C.R.Nelson, 1 lot, SRP2005071803, (1025BYU). KHOVSGOL Aimag, TsagaanUur Soum, Uur Gol River, 7 km N of Tsagaan Uur town, N 50.60031E 101.52392, 1155 msl, 16 July 2005, C.R.Nelson, 1 lot, SRP2005071601, (1019BYU). SELENGE Aimag, Khuder Soum, Tsagaan Shiluustiin Gol c. 5 km S of Khuder N 49.73763 E 107.49333, 704 msl, 23 July 2003, SRP Team, 1 lot, SRP2003072302, (728IMH). SELENGE Aimag, Teshig Soum, Zelter Gol @ Zelter N 50.35162 E 105.04436, 736 msl, 26 July 2003, SRP Team, 1 lot, SRP2003072601, (733IMH). TOV Aimag, Erdene Soum, Gorkhi Terelj National Park, Tuul River at Daichin crossing N 48.12416 E 107.5478.0, 1598 msl, 10 July 2003, ESanaa, 1f, SRP2003071003, (029IMH). ZAVKHAN Aimag, Ider Soum, Dogshin/Nogoon Nuur ~21 km SE of Zuunmod/Ider N 48.06257 E 97.55064, 2054 msl, 23 July 2004, ESanaa, 15m, SRP2004072302, (036IMH). ZAVKHAN Aimag, Ider Soum, Ideriin Gol ~22 km SE of Zuunmod/Ider N 48.05989 E 97.55073, 2053 msl, 23 July 2004, ESanaa, 15m, 6f, SRP2004072303, (037IMH). ZAVKHAN Aimag, Ider Soum, Ideriin Gol ~22 km SE of Zuunmod/Ider N 48.05989 E 97.55073, 2053 msl, 23 July 2004, JKGelhaus, 1m, 1f, SRP2004072303, (055ANSP). ZAVKHAN Aimag, Ider Soum, Ideriin Gol ~4 km NE of Zuunmod/Ider N 48.24995 E 97.40627, 1929 msl, 22 July 2004, ESanaa, 1m, SRP2004072203, (035IMH). ZAVKHAN Aimag, Tosontsengel Soum, Delgarakhiin Gol ~16 km S of Tosontsengel N 48.61518 E 98.23096, 1761 msl, 20 July 2004, ESanaa, 6m, 6f, SRP2004072001, (034IMH). ZAVKHAN Aimag, Tosontsengel Soum, Delgarakhiin Gol ~16 km S of Tosontsengel N 48.61518 E 98.23096, 1761 msl, 20 July 2004, JKGelhaus, 1m, 1f, SRP2004072001, (053ANSP).

***Suwallia teleckojensis*—**MONGOLIA: ARKHANGAI Aimag, Bulgan Soum, Urd Tamir Gol ~38 km SW of Tsetserleg N 47.28244 E 101.18793, 1872 msl, 12 July 2004, ESanaa, 5m, 1f, SRP2004071201A, (042IMH). ARKHANGAI Aimag, Bulgan Soum, Urd Tamir Gol braid upstream of bridge~63 km SW of Tsetserleg N 47.11192 E 101.01048, 2066 msl, 13 July 2004, SRP Team, 1 lot, SRP2004071302, (746IMH). ARKHANGAI Aimag, Chuluut Soum, Chuluutin Gol ~33 km SW of Chuluut/Jargalant N 47.29702 E 100.03136, 2287 msl, 16 July 2004, ESanaa, 7m, 18f, SRP2004071603, (046IMH). ARKHANGAI Aimag, Chuluut Soum, Chuluutin Gol ~33 km SW of Chuluut/Jargalant N 47.29702 E 100.03136, 2287 msl, 16 July 2004, JKGelhaus, 3f, SRP2004071603, (057ANSP). ARKHANGAI Aimag, Chuluut Soum, Chuluutin Gol 40 km N of Chuluut/Jargalant N 47.8044 E 100.3181, 1937 msl, 17 July 2004, ESanaa, 3m, 2f, SRP2004071701, (047IMH). ARKHANGAI Aimag, Chuluut Soum, Chuluutin Gol 40 km N of Chuluut/Jargalant N 47.8044 E 100.3181, 1937 msl, 17 July 2004, JKGelhaus, 1f, SRP2004071701, (058ANSP). ARKHANGAI Aimag, Chuluut Soum, Khurmen/Davaat Gol 15 km SSE of Chuluut/Jargalant N 47.4258 E 100.3013, 2104 msl, 15 July 2004, ESanaa, 1m, SRP2004071503, (045IMH). ARKHANGAI Aimag, Ikhtamir Soum, NW braid of Khoit Tamir Gol ~25 km SW of Ikhtamir N 47.50523 E 100.93208, 1728 msl, 14 July 2004, ESanaa, 1m, 2f, SRP2004071402, (044IMH). ARKHANGAI Aimag, Tsenkher Soum, Tsetserleg Gol ~50 km SSW of Tavanbulag N 47.04409 E 101.76352, 1902 msl, 11 July 2004, ESanaa, 2f, SRP2004071102, (041IMH). ARKHANGAI Aimag, Tsenkher Soum, Uliin Gol in Budent valley~60 km SSW of Tavanbulag N 46.97927 E 101.69877, 2075 msl, 11 July 2004, ESanaa, 6m,

7f, SRP2004071101, (040IMH). BAYAN OLGIY Aimag, Buyant Soum, 5 km S of Buyant, 19 July 2008, C.R.Nelson, 1 lot, MAIS2008071902, (923BYU). BAYAN-OLGII Aimag, Altai Soum, Khoit Bardam Gol, 13 km NW of Altai, (26 km by road), N 48.34519 E 89.32607, 2438 msl, 18 July 2008, CRNelson, 1m, MAIS2008071803, (189BYU). BAYAN-OLGII Aimag, Bulgan Soum, "Elstiin Davaa Gol" ~15 km N Bulgan N 47.03794 E 91.02931, 2016 msl, 8 July 2009, SWJudson, 1 lot, MAIS2009070802, (836BYU). BAYAN-OLGII Aimag, Bulgan Soum, Bulgan Gol ~15 km N Bulgan N 47.03954 E 91.03448, 2010 msl, 8 July 2009, SWJudson, 1 lot, MAIS2009070803, (842BYU). BAYAN-OLGII Aimag, Bulgan Soum, Bulgan Gol ~20 km S Bulgan N 46.78006 E 91.30396, 1801 msl, 9 July 2009, SWJudson, 1 lot, MAIS2009070901, (844BYU). BAYAN-OLGII Aimag, Bulgan Soum, Bulgan Gol ~25 km SE Bulgan N 46.77005 E 91.32336, 1792 msl, 9 July 2009, SWJudson, 1 lot, MAIS2009070902, (847BYU). BAYANOLGII Aimag, Bulgan Soum, Bulgan Gol, ~20 km N Bulgan N 47.08868 E 91.02686, 2056 msl, 6 July 2009, SWJudson, 1 lot, MAIS2009070604, (821BYU). BAYAN-OLGII Aimag, Bulgan Soum, Springs by Bulgan Gol ~25 km SE Bulgan N 46.77181 E 91.31750, 1797 msl, 10 July 2009, SWJudson, 1 lot, MAIS2009071001, (854BYU). BAYAN-OLGII Aimag, Deluun Soum, Gantsmodi Gol 27 km S Deluun N 47.66395 E 90.71841, 2196 msl, 5 July 2009, SWJudson, 1 lot, MAIS2009070502, (811BYU). BAYAN-OLGII Aimag, Deluun Soum, Tcigertein Gol 15 Km SW Deluun Soum, 21 July 1978, Puntsagdulan, 1 lot, Puntsagdulan21July1978, (887BYU). BAYAN-OLGII Aimag, Sagsay Soum, Sagsay Gol, bridge 11 km NW Sagsay, N 48.84328 E 89.53623, 1798 msl, 5 July 2008, CRNelson, 2f, MAIS2008070502, (029BYU). BAYANOLGII Aimag, Sagsay Soum, Godon Gol, 18 km due North of Dayan, N 48.43687 E 88.90085, 2245 msl, 17 July 2008, C.R.Nelson, 1 lot, MAIS2008071702, (918BYU). BAYAN-OLGII Aimag, Tsengel Soum, Ikh Turgenii Gol 6 km SSW of Syrgal, N 48.54381 E 88.41416, 2147 msl, 15 July 2008, CRNelson, 1m, MAIS2008071503, (180BYU). BAYAN-OLGII Aimag, Tsengel Soum, Rashaanii Gol (dark water), bridge 1 km North of junction Tsagaan Us Gol, N 48.75577 E 88.15264, 2115 msl, 15 July 2008, Morse and Chuluunbat, 2m, 4f, MAIS2008071501, (062BYU). BAYAN-OLGII Aimag, Ulaankhus Soum, Khar Yamaat Gol, at road crossing 14 km NE of Jalpak, N 49.38055 E 88.68401, 2306 msl, 8 July 2008, CRNelson, 3m, MAIS2008070801, (039BYU). BAYAN-OLGII Aimag, Ulaankhus Soum, Sogoog Gol, 3.5 km East of Khokh Khotol, hidden valley rapids, N 49.23285 E 88.90569, 2090 msl, 7 July 2008, CRNelson, 1m, 1f, MAIS2008070702, (031BYU). BAYAN-OLGII Aimag, Ulaankhus Soum, Ulastai Gol, 2 km East of Khokh Ereg Military Base, N 49.31867 E 88.36613, 2391 msl, 8 July 2008, CRNelson, 11m, 4f, MAIS2008070802, (042BYU). BAYAN-OLGII Aimag, Soum unrecorded, TcigerteinGol, 15 Km SW Deluun Soum, no coordinates available, 21 July 1978, 2f, none (21-VII-1978 AltID), (432BYU). BULGAN Aimag, ? Soum, Altat Gol 35.2 km SW of Khutag-Ondor N 49.21674 E 103.10725, 1020 msl, 26 July 2005, SRP Team, 1 lot, SRP2005072601, (1035BYU). GOVI-ALTAI Aimag, Tenchil Soum, Zuil Jel River N 46.319172 E 93.885164, 2254, 17 July 2002, J.Puntsagdulan, 2f, 17-UM--2002 AltID (no MAIS/SRP), (026MLB). GOVI-ALTAI Aimag, Tenchil Soum, Zuil Jel River N 46.319172 E 93.885164, 2254 msl, 17 July 2002, Puntsagudlan, 2f, 17-UM--2002 AltID (no MAIS/SRP), (433BYU). GOVI-ALTAI Aimag, Tenchil Soum, Zuil Jel River N 46.319172 E 93.885164, 2254, 17 July 2002, Puntsagdulan, 1 lot, Puntsagdulan17UM2002, (886BYU). KHOVD Aimag, Bulgan Soum, River Bulgan Gol N 46.55312 E 91.38850, 1509 msl, 10 July 2009, SWJudson, 1 lot, MAIS2009071002b, (855BYU). KHOVD Aimag, Duut Soum, Tsagaan Burgasii Gol ~15 km NE Duut N 47.55936 E 91.76095, 1865 msl, 18 July 2009, SWJudson, 1 lot, MAIS2009071801, (880BYU). KHOVD Aimag, Monkhkharykhan Soum, Byan Sangiin Gol/Boorog Nuur Gol ~18 km SSE Monkhkhayrkhan N 46.90953 E 91.93488, 2339 msl, 14 July 2009, SWJudson, 1 lot, MAIS2009071402, (871BYU). KHOVD Aimag, Monkhkhayrkhan Soum, Bortin Gol ~14 km SSE Monkhkhayrkhan N 46.92136 E 91.91077, 2311 msl, 15 July 2009, SWJudson, 1 lot, MAIS2009071501, (873BYU). KHOVD Aimag, Monkhkhayrkhan Soum, Dund Tsenkher Gol @ bridge S edge of Monkhkhayrkhan N 47.05474 E 91.84868, 2090 msl, 16 July 2009, SWJudson, 1 lot, MAIS2009071602, (877BYU). KHOVD Aimag, Monkhkhayrkhan Soum, DundTsenkher Gol ~20 km N Monkhkhayrkhan N 47.17455 E 91.86262, 1901 msl, 16 July 2009, SWJudson, 1 lot, MAIS2009071604, (878BYU). KHOVD Aimag, Uyench Soum, Urd Jargalant Gol @Uyenchiin Gol ~25 km N Uyench N 46.26055 E 92.07277, 1683 msl, 13 July 2009, SWJudson, 1 lot, MAIS2009071301, (865BYU). KHOVD Aimag, Uyench Soum, Uyenchiin Gol @ Urd Jargalant Gol ~25 km N Uyench N 46.26107 E 92.07269, 1677 msl, 13 July 2009, SWJudson, 1 lot, MAIS2009071302, (867BYU). KHOVD Aimag, Uyench Soum, Uyenchiin Gol ~40 km N Uyench N 46.38285 E 92.13062, 1939 msl, 13 July 2009, SWJudson, 1 lot, MAIS2009071303, (869BYU). KHOVSGOL Aimag, Renchinlhumbe Soum, Jarin Gol, 32.8 km N of Renchinlhumbe, river crossing N 51.39852 E 99.75011, 1575 msl, 2 July 2006, Malaise Trap, 1m, SRP2006070203A, (166ANSP). KHOVSGOL Aimag, Renchinlhumbe Soum, springs of Shishged Gol, 36 km NNE of Ulaan Uul town, N 50.99171 E 99.35400, 1584 msl, 30 June 2006, CRNelson, 18m, 39f, SRP2006063002, (012BYU). KHOVSGOL Aimag, Tumurbulag Soum, Bugsei Gol River, 45.5 km SW of Moron City, N 49.26170E 99.88242, 1597 msl, 23 July 2005, C.R.Nelson, 1 lot, SRP2005072301, (1030BYU). KHOVSGOL Aimag, Jargalant gol 25 km NW Khank, J. Gelhaus, 1 lot, JKG721_763, (614ANSP). KHOVSGOL Aimag, Renchinlhumbe Soum, Har-Us Spring, Jargalant Gol 4.2 km SE of Renchinlhumbe N 51.07845 E 99.70774, 1586 msl, 1 July 2006, CRNelson, 6m, 17f, SRP2006070102, (014BYU). KHOVSGOL Aimag, Renchinlhumbe Soum, Har-Us Spring, Jargalant Gol 4.2 km SE of Renchinlhumbe N 51.07845 E 99.70774, 1586 msl, 1 July 2006, JKGelhaus, 4f, SRP2006070102, (034ANSP). KHOVSGOL Aimag, Renchinlhumbe Soum, Har-Us Spring, Jargalant Gol 4.2 km SE of Renchinlhumbe N 51.07845 E 99.70774, 1586 msl, 1 July 2006, JCMorse, 27m, 17f, SRP2006070102, (035ANSP). OVORKHANGAI Aimag, Batolziy Soum, Below Orkhon's Waterfall on Ulaan Gol~200 m S of Orkhon Gol, ~84 km W of Khujirt N 46.78742 E 101.96021, 1809 msl, 7 July 2004, JKGelhaus, 1m, SRP2004070701A, (056ANSP). SELENGE Aimag, Bugant/Yaroo Soum, Bar Chuluu Gol N 49.03282 E 106.96935, 975 msl, 17 July 2003, SRP Team, 1 lot, SRP2003071704, (715IMH). SELENGE Aimag, Mandal Soum, Bar Chuluu at upstream bridge c. 6 km above downstream bridge N 48.99356 E 106.95023, 1053 msl, 20 July 2003, ESanaa, 2m, 3f, SRP2003072001, (038IMH). SELENGE Aimag, Baruun Tsuuts Gol Stream, W of Sangatay, N 49.71481E 104.64203, 748

msl, 6 July 2005, CRNelson, 1 lot, SRP2005070602, (995BYU). TOV Aimag, Batsumber Soum, Segnogor Gol 14.3 km upstream of Segnogor Amralt N 48.43755 E 107.03066, 1255 msl, 15 July 2003, SRP Team, 1 lot, SRP2003071501B, (710IMH). TOV Aimag, Batsumber Soum, Kharaa Gol 5.0 km upstream of Bayanbuural N 48.50028 E 106.78434, 1051 msl, 16 July 2003, SRP Team, 1 lot, SRP2003071601, (712IMH). TOV Aimag, Erdene Soum, Gorkhi Terelj National Park N 48.4208 E 107.91406, 1818 msl, 28 July 2003, ESanaa, 22m, 26f, SRP2003072802, (039IMH). TOV Aimag, Erdene Soum, Gorkhi Terelj National Park, unnamed trib. of W Bayangin Gol N 48.16668 E 107.69548, 1623 msl, 7 July 2003, SRP Team, 1 lot, SRP2003070701, (697IMH). ZAVKHAN Aimag, Ider Soum, Dogshin/Nogoon Nuur ~21 km SE of Zuunmod/Ider N 48.06257 E 97.55064, 2054 msl, 23 July 2004, ESanaa, 12m, 33f, SRP2004072302, (049IMH). ZAVKHAN Aimag, Ider Soum, Dogshin/Nogoon Nuur ~21 km SE of Zuunmod/Ider N 48.06257 E 97.55064, 2054 msl, 23 July 2004, JKGelhaus, 11m, 16f, SRP2004072302, (059ANSP). ZAVKHAN Aimag, Ider Soum, Ideriin Gol ~22 km SE of Zuunmod/Ider N 48.05989 E 97.55073, 2053 msl, 23 July 2004, ESanaa, 11m, 20f, SRP2004072303, (050IMH). ZAVKHAN Aimag, Ider Soum, ponds by Ideriin Gol at Darkhjan Uul Brigade~12 km SE of Zuunmod/Ider N 48.13246 E 97.48425, 2025 msl, 23 July 2004, ESanaa, 1f, SRP2004072301, (048IMH). ZAVKHAN Aimag, Ider Soum, Ideriin Gol ~4 km NE of Zuunmod/Ider N 48.24995 E 97.40627, 1929 msl, 22 July 2004, SRP Team, 1 lot, SRP2004072203, (755IMH). ZAVKHAN Aimag, Ikh-Uul Soum, Deed Tsetsuukhiin Gol ~10 km NW of Solongotiin Davaa N 48.36436 E 98.92737, 2072 msl, 25 July 2004, ESanaa, 1m, SRP2004072502, (051IMH). ZAVKHAN Aimag, Tosontsengel Soum, Tegshiin Gol ~70 km SW of Tosontsengel N 48.3441 E 97.87312, 1927 msl, 22 July 2004, SRP Team, 1 lot, SRP2004072201, (753IMH).

Leuctridae

***Leuctra fusca*—**MONGOLIA: SELENGE Aimag, Khuder Soum, Khuder River, N 49.75372 E 107.5264, 12 Sept 2008. Asia Foundation. 1 lot, (302NUM).

***Paraleuctra zapekinae*—**MONGOLIA: SELENGE Aimag, Baruun Tsuuts Gol Stream, W of Sangatay, N 49.71481E 104.64203, 748 msl, 6 July 2005, CRNelson, 1m, 3f, SRP2005070602, (071BYU). TOV Aimag, Gorkhi Terelj National Park, Terelj River just above Terelj, N 47.99158 E 107.46717, 1516, 28 July 2008, CRNelson, 1f, none (CRN8949), (057BYU).

Nemouridae

***Amphinemura borealis*—**MONGOLIA: ARKHANGAI Aimag, Bulgan Soum, Urd Tamir Gol ~38 km SW of Tsetserleg N 47.28244 E 101.18793, 1872 msl, 12 July 2004, ESanaa, 2m, 9f, SRP2004071201A, (070IMH). ARKHANGAI Aimag, Chuluut Soum, Chuluutin Gol 40 km N of Chuluut/Jargalant N 47.8044 E 100.3181, 1937 msl, 17 July 2004, ESanaa, 1m, 9f, SRP2004071701, (075IMH). ARKHANGAI Aimag, Chuluut Soum, Chuluutin Gol 40 km N of Chuluut/Jargalant N 47.8044 E 100.3181, 1937 msl, 17 July 2004, JKGelhaus, 2m, SRP2004071701, (064ANSP). ARKHANGAI Aimag, Chuluut Soum, Khurmen/Davaat Gol 15 km SSE of Chuluut/Jargalant N 47.4258 E 100.3013, 2104 msl, 15 July 2004, ESanaa, 2m, 1f, SRP2004071503, (074IMH). ARKHANGAI Aimag, Ikhtamir Soum, E side of Khoit Tamir Gol 4 km NE of Ikhtamir N 47.59928 E 101.24521, 1602 msl, 14 July 2004, ESanaa, 3m, SRP2004071401, (071IMH). ARKHANGAI Aimag, Ikhtamir Soum, Khoit Tamir Gol ~29 km SW of Ikhtamir N 47.48567 E 100.87875, 1749 msl, 15 July 2004, ESanaa, 9m, 10f, SRP2004071501, (073IMH). ARKHANGAI Aimag, Ikhtamir Soum, Khoit Tamir Gol ~29 km SW of Ikhtamir N 47.48567 E 100.87875, 1749 msl, 15 July 2004, JKGelhaus, 2m, 1f, SRP2004071501, (063ANSP). ARKHANGAI Aimag, Ikhtamir Soum, NW braid of Khoit Tamir Gol ~25 km SW of Ikhtamir N 47.50523 E 100.93208, 1728 msl, 14 July 2004, ESanaa, 12m, 14f, SRP2004071402, (072IMH). ARKHANGAI Aimag, Ikhtamir Soum, NW braid of Khoit Tamir Gol ~25 km SW of Ikhtamir N 47.50523 E 100.93208, 1728 msl, 14 July 2004, JKGelhaus, 1m, SRP2004071402, (062ANSP). ARKHANGAI Aimag, Tariat Soum, Nariin Gichgenii Gol/Urd Terkh Gol~5 km SE of Khorgo/Tariat N 48.12661 E 99.94128, 2019 msl, 17 July 2004, JKGelhaus, 3f, SRP2004071702, (065ANSP). ARKHANGAI Aimag, Tsenkher Soum, Tsetseleg Gol ~17 km SW of Tavanbulag N 47.26999 E 101.80227, 1684 msl, 10 July 2004, ESanaa, 3m, 10f, SRP2004071002, (069IMH). ARKHANGAI Aimag, Tsenkher Soum, Tsetseleg Gol ~17 km SW of Tavanbulag N 47.26999 E 101.80227, 1684 msl, 10 July 2004, JKGelhaus, 1f, SRP2004071002, (061ANSP). BAYAN-OLGII Aimag, Bulgan Soum, Bulgan Gol ~15 km N Bulgan N 47.03954 E 91.03448, 2010 msl, 8 July 2009, SWJudson, 1 lot, MAIS2009070803, (837BYU). BAYAN-OLGII Aimag, Sagsay Soum, Sagsay Gol, bridge 11 km NW Sagsay, N 48.84328 E 89.53623, 1798 msl, 5 July 2008, CRNelson, 1f, MAIS2008070502, (028BYU). KHOVSGOL Aimag, KhutagOndor Soum, Unit Gol stream, 11 km SE of Selenge Gol River bridge, 20.8 km SE of Khutag Ondor town, N 49.33339E 102.97786, 924 msl, 25 July 2005, C.R.Nelson, 1 lot, SRP2005072501, (1032BYU). KHOVSGOL Aimag, Renchinlhumbe Soum, springs of Shishged Gol, 36 km NNE of Ulaan Uul town, N 50.99171 E 99.35400, 1584 msl, 30 June 2006, Malaise, 1f, SRP2006063002, (024ANSP). KHOVSGOL Aimag, Renchinlhumbe Soum, springs of Shishged Gol, 36 km NNE of Ulaan Uul town, N 50.99171 E 99.35400, 1584 msl, 30 June 2006, JKGelhaus, 2m, 3f, SRP2006063002, (025ANSP). KHOVSGOL Aimag, Renchinlhumbe Soum, springs of Shishged Gol, 36 km NNE of Ulaan Uul town, N 50.99171 E 99.35400, 1584 msl, 30 June 2006, CRNelson, 8m, 4f, SRP2006063002, (129BYU). KHOVSGOL Aimag, Renchinlhumbe Soum, springs of Shishged Gol, 36 km NNE of Ulaan Uul town, N 50.99171 E 99.35400, 1584 msl, 30 June 2006, CRNelson, 10m, 5f, SRP2006063002, (143BYU). KHOVSGOL Aimag, Renchinlhumbe Soum, springs of Shishged Gol, 36 km NNE of Ulaan Uul town, N 50.99171 E 99.35400, 1584 msl, 30 June 2006, JKGelhaus,

1m, 1f, SRP2006063002, (206ANSP). KHOVSGOL Aimag, Selenge River, J. Gelhaus, 1 lot, JKG733, (624ANSP). KHOVSGOL Aimag, TsagaanUur Soum, Uilgan Gol, 26 km ENE of Tsagaan Uur town, N 50.62324E 101.87412, 1156 msl, 15 July 2005, JKGelhaus, 1m, SRP2005071502A, (207ANSP). KHOVSGOL Aimag, TsagaanUur? Soum, Uur Gol River, 7 km N of Tsagaan Uur town, N 50.60031E 101.52392, 1155 msl, 16 July 2005, C.R.Nelson, 1 lot, SRP2005071601, (1020BYU). OVORHANGAY Aimag, Bat olziy Soum, Ulaan Gol ~93 km W of Khujirt N 46.73093 E 101.88583, 1894, 7 July 2004, ESanaa, 3m, 12f, SRP2004070702, (067IMH). OVORHANGAY Aimag, Bat olziy Soum, tributary of Ulaan Gal ~92 km W of Khujirt N 46.72826 E 101.89317, 1941, 8 July 2004, ESanaa, 15m, 19f, SRP2004070801, (068IMH). OVORKHANGAI Aimag, Batolziy Soum, Below Orkhon's Waterfall on Ulaan Gol~200 m S of Orkhon Gol, ~84 km W of Khujirt N 46.78742 E 101.96021, 1809 msl, 7 July 2004, ESanaa, 20m, 25f, SRP2004070701A, (066IMH). OVORKHANGAI Aimag, Batolziy Soum, Below Orkhon's Waterfall on Ulaan Gol~200 m S of Orkhon Gol, ~84 km W of Khujirt N 46.78742 E 101.96021, 1809 msl, 7 July 2004, JKGelhaus, 10m, 14f, SRP2004070701A, (060ANSP). SELENGE Aimag, Bugant/Yaroo Soum, Khongiin Gol at Yeroo Gol confluence N 49.08636 E 107.3075, 943 msl, 19 July 2003, SRP Team, 1 lot, SRP2003071803, (718IMH). SELENGE Aimag, Khuder Soum, Zerlegiin Gol c. 12 km E of Khuder N 49.7313 E 107.63484, 763 msl, 25 July 2003, SRP Team, 1 lot, SRP2003072401, (30IMH). SELENGE Aimag, Tsagaanuur Soum, Wetland 10.1 km SW of town of Tsagaanuur N 50.03671 E 105.37355, 706 msl, 6 July 2005, CRNelson, 1 lot, SRP2005070601, (993BYU). TOV Aimag, Erdene Soum, Gorkhi Terelj National Park Tuul R c. 0.5 km upstream of Park Gate bridge N 47.82258 E 107.33613, 1305 msl, 5 July 2003, SRP Team, 1 lot, SRP2003070501, (93IMH). ZAVKHAN Aimag, Ider Soum, Ideriin Gol ~22 km SE of Zuunmod/Ider N 48.05989 E 97.55073, 2053 msl, 23 July 2004, ESanaa, 1m, 1f, SRP2004072303, (077IMH). ZAVKHAN Aimag, Tosontsengel Soum, Delgarakhiin Gol ~16 km S of Tosontsengel N 48.61518 E 98.23096, 1761 msl, 20 July 2004, ESanaa, 1m, SRP2004072001, (076IMH).

***Amphinemura standfussi*—**MONGOLIA: HOVSGOL Aimag, Khank Soum, Borsog River, near Hovsgol lake N 50.96147222 E 100.7250556, 1689 msl, 27 Aug 2003, E. Sanaa, 1 lot, Hovsgol_Borsog, (483IMH). HOVSGOL Aimag, Khank Soum, Dalbay River, near Hovsgol lake N 51.01908333 E 100.7595278, 1662 msl, 15 Aug 2005, E. Sanaa, 1 lot, Hovsgol_Dalbay, (489IMH). HOVSGOL Aimag, Khank Soum, Noyon gol, near Hovsgol Nuur N 51.20152778 E 100.8072778, 1709 msl, 11 Aug 2003, E. Sanaa, 1 lot, Hovsgol_Noyon, (493IMH). HOVSGOL Aimag, Khank Soum, Sevsull river, near Hovsgol lake N 51.16361111 E 100.7521111, 1656 msl, 25 Aug 2003, E. Sanaa, 1 lot, Hovsgol_Sevsuul, (497IMH). HOVSGOL Aimag, Khank Soum, Shagnull River near Hovsgol Lake N 51.25869444 E 100.86000, 1732 msl, 15 Aug 2005, E. Sanaa, 1 lot, Hovsgol_Shagnuul, (501IMH). HOVSGOL Aimag, Khank Soum, Turag River near Hovsgol Lake N 51.28775 E 100.8276389, 1667 msl, 15 Aug 2005, E. Sanaa, 1 lot, Hovsgol_Turag, (506IMH). KHOVSGOL Aimag, Chandmani-Ondor Soum, Stream receiving Bolnain Rashaan Hot Spring 58 km NE of Hatgal N 50.77444 E 100.80067, 1668 msl, 19 July 2005, C.R.Nelson, 1 lot, SRP2005071901E, (1026BYU). KHOVSGOL Aimag, KhutagOndor Soum, Unit Gol stream, 11 km SE of Selenge Gol River bridge, 20.8 km SE of Khutag Ondor town, N 49.33339E 102.97786, 924 msl, 25 July 2005, C.R.Nelson, 1 lot, SRP2005072501, (1033BYU). KHOVSGOL Aimag, Khalkhan Gol Stream at confluence with Bul Nai Khalkhan Hot Springs, 35 km NW of Chandmani Ondor town, N 50.77500E 100.80006, 1669 msl, 19 July 2005, CRNelson, 1 lot, SRP2005071902, (105BYU). KHOVSGOL Aimag, Khalkhan Gol Stream at confluence with Bul Nai Khalkhan Hot Springs, 35 km NW of Chandmani Ondor town, N 50.77500E 100.80006, 1669 msl, 19 July 2005, CRNelson, 21m, 11f, SRP2005071902, (104BYU). SELENGE Aimag, Khuder Soum, Zerlegiin Gol c. 12 km E of Khuder N 49.7313 E 107.63484, 763 msl, 25 July 2003, SRP Team, 1 lot, SRP2003072401, (31IMH). ZAVKHAN Aimag, Ider Soum, Dogshin/Nogoon Nuur ~21 km SE of Zuunmod/Ider N 48.06257 E 97.55064, 2054 msl, 23 July 2004, ESanaa, 2m, SRP2004072302, (080IMH). ZAVKHAN Aimag, Ider Soum, Dogshin/Nogoon Nuur ~21 km SE of Zuunmod/Ider N 48.06257 E 97.55064, 2054 msl, 23 July 2004, JKGelhaus, 2m, SRP2004072302, (068ANSP). ZAVKHAN Aimag, Ider Soum, Ideriin Gol ~22 km SE of Zuunmod/Ider N 48.05989 E 97.55073, 2053 msl, 23 July 2004, ESanaa, 6m, 7f, SRP2004072303, (081IMH). ZAVKHAN Aimag, Tosontsengel Soum, Delgarakhiin Gol ~16 km S of Tosontsengel N 48.61518 E 98.23096, 1761 msl, 20 July 2004, ESanaa, 1f, SRP2004072001, (078IMH). ZAVKHAN Aimag, Tosontsengel Soum, Gunza Gol ~38 km SW of Tosontsengel N 48.62624 E 97.89617, 1831 msl, 21 July 2004, ESanaa, 36m, 10f, SRP2004072102, (079IMH). ZAVKHAN Aimag, Tosontsengel Soum, Gunza Gol ~38 km SW of Tosontsengel N 48.62624 E 97.89617, 1831 msl, 21 July 2004, JKGelhaus, 4m, 1f, SRP2004072102, (066ANSP). ZAVKHAN Aimag, Tosontsengel Soum, Tegshiin Gol ~70 km SW of Tosontsengel N 48.3441 E 97.87312, 1927 msl, 22 July 2004, JKGelhaus, 1f, SRP2004072201, (067ANSP).

***Nemoura arctica*—**MONGOLIA: ARKHANGAI Aimag, Tsenkher Soum, Tsetseleg Gol ~17 km SW of Tavanbulag N 47.26999 E 101.80227, 1684 msl, 10 July 2004, JKGelhaus, 1m, 1f, SRP2004071002, (069ANSP). BAYAN OLGIY Aimag, Ulaanhus Soum, 12 km S Khokh Ereg Military Outpost N 49.23051 E 088.44516, 2430 msl, 9 July 2008, C.R.Nelson, 1 lot, MAIS2008070901, (903BYU). BAYAN-OLGII Aimag, Bulgan Soum, Confluence of "Dood Asgat Uul Gol" and "Ulaagchiny Davaa Gol," ~30 km N Bulgan N 47.34660 E 90.96013, 2519 msl, 6 July 2009, SWJudson, 1 lot, MAIS2009070602, (814BYU). BAYAN-OLGII Aimag, Bulgan Soum, Northeast outfall river of Khar Nuur (Black Lake), ~50 km NNW Bulgan N 47.24368 E 90.75253, 2560 msl, 7 July 2009, SWJudson, 1 lot, MAIS2009070704, (826BYU). BAYAN-OLGII Aimag, Bulgan Soum, Springs by Bulgan Gol ~25 km SE Bulgan N 46.77181 E 91.31750, 1797 msl, 10 July 2009, SWJudson, 1 lot, MAIS2009071001, (853BYU). BAYANOLGII Aimag, Bulgan Soum, Turgen Gol, ~40 km NNW Bulgan N 47.18333 E 90.77660, 2492 msl, 7 July 2009, SWJudson, 1 lot, MAIS2009070705, (830BYU). BAYAN-OLGII Aimag, Deluun Soum, Gantsmodi Gol, 33 km S Deluun N 47.62447 E 90.67194, 2241 msl, 5 July 2009, SWJudson, 1 lot, MAIS2009070501, (807BYU). BAYAN-OLGII Aimag, Tsengel Soum, Altai Tavan Bogd National Park, Sul Uulim Gol, tributary of Tsagaan Gol, N 49.10450 E 88.04854, 2795 msl, 10 July 2008, CRNelson, 3m, 55f, MAIS2008071001, (046BYU). BAYAN-OLGII Aimag,

Tsengel Soum, Altai Tavan Bogd National Park, Sul Uulim Gol, tributary of Tsagaan Gol, N 49.10450 E 88.04854, 2795 msl, 10 July 2008, Malaise Trap, 37m, 102f, MAIS2008071001, (172BYU). BAYAN-OLGII Aimag, Tsengel Soum, Altai Tavan Bogd National Park, Tavan Bogd ascent base camp, IMH Glacier Camp, unnamed creek tributary of Potitinini Gol of Tsagaan Gol, N 49.15035 E 87.94238, 3099 msl, 10 July 2008, CRNelson, 5m, 7f, MAIS2008071003, (048BYU). BAYAN-OLGII Aimag, Tsengel Soum, Altai Tavan Bogd National Park, Tavan Bogd Road's End Camp, springs above Tsagaan Gol, 20 km west ofZagaastnuur Bag, N 49.09754 E 88.10383, 2538 msl, 12 July 2008, CRNelson, 25m, 20f, MAIS2008071101, (173BYU). BAYAN-OLGII Aimag, Tsengel Soum, Altai Tavan Bogd National Park, Tsagaan Gol, Tavan Bogd Road's End Camp, 20 km west of Zagastnuur Bag, N 49.09159 E 88.10411, 2381 msl, 9 July 2008, CRNelson, 17m, 30f, MAIS2008070902, (045BYU). BAYAN-OLGII Aimag, Tsengel Soum, Altai Tavan Bogd National Park, unnamed tributary of Sul Uulim Gol, tributary of Tsagaan Gol, N 49.12007 E 88.01157, 2912 msl, 10 July 2008, CRNelson, 10m, 29f, MAIS2008071002, (047BYU). BAYAN-OLGII Aimag, Tsengel Soum, Khar Ovoo Gol, draining Khelkhee Lake, N 48.62918 E 88.28554, 2147 msl, 15 July 2008, CRNelson, 1m, 7f, MAIS2008071601, (053BYU). BAYAN-OLGII Aimag, Tsengel Soum, Khoton Lake, 15 km NW of Syrgal, N 48.66718 E 88.29908, 2090 msl, 14 July 2008, CRNelson, 54m, 32f, MAIS2008071402, (174BYU). BAYAN-OLGII Aimag, Tsengel Soum, Khoton Lake, 15 km NW of Syrgal, N 48.66718 E 88.29908, 2090 msl, 14 July 2008, JCMorse, 13m, 9f, MAIS2008071402, (175BYU). BAYAN-OLGII Aimag, Tsengel Soum, Mogoitiin Gol near its parallels with unnamed tributary, 13 km ESE of Asgat Peak, N 48.76028 E 88.60029, 2176 msl, 13 July 2008, CRNelson, 44m, 49f, MAIS2008071305, (171BYU). BAYAN-OLGII Aimag, Tsengel Soum, Sumdairag Gol, 12 km due South of Syrgal, N 48.50679 E 88.50977, 2129 msl, 16 July 2008, CRNelson, 8m, 13f, MAIS2008071604, (182BYU). BAYAN-OLGII Aimag, Tsengel Soum, Sumdairag Gol, 12 km due South of Syrgal, N 48.50679 E 88.50977, 2129 msl, 16 July 2008, JCMorse, 14m, 16f, MAIS2008071604, (183BYU). BAYAN-OLGII Aimag, Tsengel Soum, Tsagaan Us Gol 0.5 km upstream from junction Rashaanii Gol, N 48.75197 E 88.14987, 2098 msl, 15 July 2008, CRNelson, 11m, 20f, MAIS2008071502, (177BYU). BAYAN-OLGII Aimag, Tsengel Soum, unnamed tributary of Mogoitiin Gol, where canyons open to moraine plain, 13 km ESE of Asgat Peak, N 48.75576 E 88.60196, 2145 msl, 13 July 2008, CRNelson, 1m, 4f, MAIS2008071304, (052BYU). BAYAN-OLGII Aimag, Ulaankhus Soum, Khar Yamaat Gol, (Yamaatiin?)at road crossing 14 km NE of Jalpak, N 49.38055 E 88.68401, 2306 msl, 8 July 2008, CRNelson, 10m, 387f, MAIS2008070801, (038BYU). BAYAN-OLGII Aimag, Ulaankhus Soum, Ulastai Gol, 2 km East of Khokh Ereg Military Base, N 49.31867 E 88.36613, 2391 msl, 8 July 2008, CRNelson, 7m, 14f, MAIS2008070802, (040BYU). BULGAN Aimag, Teshig Soum, Tarvagatain (Marmot) Gol River at Egiin Gol River, N 49.70678E 103.10288, 909 msl, 10 July 2005, C.R.Nelson, 1 lot, SRP2005071001A, (1007BYU). BULGAN Aimag, Teshig Soum, Tariakhtain Gol Stream, N 49.70184E 103.80040, 1436 msl, 9 July 2005, CRNelson, 1m, SRP2005070901, (079BYU). BULGAN Aimag, Selenge Soum, Tarkhtain Gol stream, 33.8 km WNW of Hyalganat town, N 49.65142E 103.88064, 1510 msl, 8 July 2005, CRNelson, 2m, SRP2005070802, (077BYU). HOVSGOL Aimag, Khank Soum, Borsog River, near Hovsgol lake N 50.96147222 E 100.7250556, 1689 msl, 19 June 2003, E. Sanaa, 1 lot, Hovsgol_Borsog, (486IMH). HOVSGOL Aimag, Khank Soum, Dalbay River, near Hovsgol lake N 51.01908333 E 100.7595278, 1662 msl, 18 July 2005, E. Sanaa, 1 lot, Hovsgol_Dalbay, (490IMH). HOVSGOL Aimag, Khank Soum, Noyon gol, near Hovsgol Nuur N 51.20152778 E 100.8072778, 1709 msl, 18 Aug 2003, E. Sanaa, 1 lot, Hovsgol_Noyon, (494IMH). HOVSGOL Aimag, Khank Soum, Sevsull river, near Hovsgol lake N 51.16361111 E 100.7521111, 1656 msl, 13 June 2005, E. Sanaa, 1 lot, Hovsgol_Sevsuul, (500IMH). HOVSGOL Aimag, Khank Soum, Shagnull River near Hovsgol Lake N 51.25869444 E 100.86000, 1732 msl, 4 Aug 2003, E. Sanaa, 1 lot, Hovsgol_Shagnuul, (503IMH). HOVSGOL Aimag, Khank Soum, Turag River near Hovsgol Lake N 51.28775 E 100.8276389, 1667 msl, 7 June 2005, E. Sanaa, 1 lot, Hovsgol_Turag, (507IMH). KHOVD Aimag, Duut Soum, Burgedtein Gol11 km S Buyant Gol N 47.53183 E 91.28320, 2519 msl, 4 July 2009, SWJudson, 1 lot, MAIS2009070401, (801BYU). KHOVSGOL Aimag, Khank Soum, Hosgol Lake at Khank, 15 June 1996, J. Gelhaus, 1 lot, JKG720, (609ANSP). KHOVSGOL Aimag, Khank Soum, Hovsgol Nuur N Side, J. Gelhaus, 1 lot, JKG760, (648ANSP). KHOVSGOL Aimag, Renchinlhumbe Soum, Arsayn Gol, 16.2 km N of Renchinlhumbe town, N 51.25356 E 99.66687, 1565 msl, 2 July 2006, JKGelhaus, 1m, SRP2006070201, (004ANSP). KHOVSGOL Aimag, Renchinlhumbe Soum, Arsayn Gol, 16.2 km N of Renchinlhumbe town, N 51.25356 E 99.66687, 1565 msl, 2 July 2006, CRNelson, 9m, 6f, SRP2006070201, (158BYU). KHOVSGOL Aimag, Renchinlhumbe Soum, Arsayn Gol, 16.2 km N of Renchinlhumbe town, N 51.25356 E 99.66687, 1565 msl, 2 July 2006, JKGelhaus, 1m, SRP2006070201, (159ANSP). KHOVSGOL Aimag, Renchinlhumbe Soum, springs of Shishged Gol, 36 km NNE of Ulaan Uul town, N 50.99171 E 99.35400, 1584 msl, 30 June 2006, CRNelson, 1m, 3f, SRP2006063002, (144BYU). KHOVSGOL Aimag, UlaanUul Soum, stream, 33.8 km NE of Bayanzurkh, N 50.42996 E 99.21727, 2086 msl, 28 June 2006, JKGelhaus, 6m, 6f, SRP2006062803, (005ANSP). KHOVSGOL Aimag, East Shore Hovsgol Lake, B. Hayford, 1 lot, Hay414Hay415, (561ANSP). KHOVSGOL Aimag, Hseg tsar cove, 14 July 1997, J. Gelhaus, 1 lot, JK747Hay97062, (599ANSP). KHOVSGOL Aimag, Ikh Dalbayn gol, J. Gelhaus, 1 lot, JKG754, (643ANSP). KHOVSGOL Aimag, Ikh khoroo gol near Khovsgol Nuur,, J. Gelhaus, 1 lot, JKG722, (617ANSP). KHOVSGOL Aimag, Noyon gol, 18 June 1996, J. Gelhaus, 1 lot, JKG725, (623ANSP). KHOVSGOL Aimag, Noyon gol, near Hovsgol Nuur, J. Gelhaus, 1 lot, JKG756, (644ANSP). KHOVSGOL Aimag, Sevsuuliyn gol, J. Gelhaus, 1 lot, JKG724, (621ANSP). KHOVSGOL Aimag, Renchinlhumbe Soum, Har-Us Spring, Jargalant Gol 4.2 km SE of Renchinlhumbe N 51.07845 E 99.70774, 1586 msl, 1 July 2006, Malaise, 7f, SRP2006070102, (030ANSP). KHOVSGOL Aimag, Renchinlhumbe Soum, Har-Us Spring, Jargalant Gol 4.2 km SE of Renchinlhumbe N 51.07845 E 99.70774, 1586 msl, 1 July 2006, JKGelhaus, 1f, SRP2006070102, (031ANSP). KHOVSGOL Aimag, TsagaanNuur Soum, stream, 16 km NW of Tsagaan Nuur town, N 51.46205 E 99.19994, 1607 msl, 3 July 2006, JMorse, 1f, SRP2006070302, (010ANSP). KHOVSGOL Aimag, TsagaanNuur Soum, stream, 16 km NW of Tsagaan Nuur town, N 51.46205 E 99.19994, 1607 msl, 3 July 2006, JMorse, 1f,

SRP2006070302, (011ANSP). KHOVSGOL Aimag, TsagaanNuur Soum, stream, 16 km NW of Tsagaan Nuur town, N 51.46205 E 99.19994, 1607 msl, 3 July 2006, JKGelhaus, 15m, 10f, SRP2006070302, (037ANSP). KHOVSGOL Aimag, TsagaanNuur Soum, stream, 16 km NW of Tsagaan Nuur town, N 51.46205 E 99.19994, 1607 msl, 3 July 2006, JCMorse, 1f, SRP2006070302, (038ANSP). KHOVSGOL Aimag, TsagaanNuur Soum, stream, 16 km NW of Tsagaan Nuur town, N 51.46205 E 99.19994, 1607 msl, 3 July 2006, CRNelson, 77m, 48f, SRP2006070302, (167BYU). KHOVSGOL Aimag, TsagaanNuur Soum, stream, 16 km NW of Tsagaan Nuur town, N 51.46205 E 99.19994, 1607 msl, 3 July 2006, JMorse, 1m, 1f, SRP2006070302, (009ANSP). KHOVSGOL Aimag, Erdenebulgan Soum, tributary of Emt Gol Stream, 33.2 km NW of Tarialyn town, N 49.87761E 101.82039, 1499 msl, 13 July 2005, CRNelson, 8f, SRP2005071302A, (093BYU). KHOVSGOL Aimag, Zuunmod Soum, Turgeniy Gol 7.7 KM NNW of Zuunmod Soum Center N 47.77758 E 106.9278, 1581 msl, 14 July 2006, JKGelhaus, 1m, 1f, SRP2006071401, (040ANSP). KHOVSGOL Aimag, Zuunmod Soum, Turgeniy Gol 7.7 KM NNW of Zuunmod Soum Center N 47.77758 E 106.9278, 1581 msl, 14 July 2006, JKGelhaus, 1m, SRP2006071401, (008ANSP). TOV Aimag, Erdene Soum, Gorkhi Terelj National Park, mouth of Khag River @ confluence with Tuul N 48.25861 E 107.90251, 1608 msl, 10 July 2003, ESanaa, 2m, 5f, SRP2003071002, (094IMH). TOV Aimag, Erdene Soum, Gorkhi Terelj National Park, Tuul River 10.1 km upstream of Tuul River Bridge N 48.09549 E 107.84265, 1531 msl, 8 July 2003, ESanaa, 1m, 4f, SRP2003070801, (084IMH). TOV Aimag, Erdene Soum, Gorkhi Terelj National Park, Tuul River 10.1 km upstream of Tuul River Bridge N 48.09549 E 107.84265, 1531 msl, 8 July 2003, ESanaa, 6m, 4f, SRP2003070801, (093IMH). TOV Aimag, Erdene Soum, Gorkhi Terelj National Park, Galtain Gol at road crossing 19.1 km upstream of Tuul R Bridge N 48.1335 E 107.9199, 1551 msl, 8 July 2003, SRP Team, 1 lot, SRP2003070802, (701IMH). TOV Aimag, Erdene Soum, Gorkhi Terelj National Park, unnamed braid of Tuul River N 48.14846 E 107.91267, 1564 msl, 9 July 2003, SRP Team, 1 lot, SRP2003070805, (704IMH).

***Nemoura cinerea*—**MONGOLIA: ARKHANGAI Aimag, Ikhtamir Soum, Khoit Tamir Gol ~29 km SW of Ikhtamir N 47.48567 E 100.87875, 1749 msl, 15 July 2004, JKGelhaus, 1f, SRP2004071501, (074ANSP). BULGAN Aimag, Khyalgant Soum, Manhtai Spring, cold spring, N 49.68122E 104.56461, 866 msl, 7 July 2005, CRNelson, 5m, 7f, SRP2005070701, (073BYU). KHOVSGOL Aimag, Renchinlhumbe Soum, springs of Shishged Gol, 36 km NNE of Ulaan Uul town, N 50.99171 E 99.35400, 1584 msl, 30 June 2006, CRNelson, 138m, 93f, SRP2006063002, (142BYU). KHOVSGOL Aimag, Renchinlhumbe Soum, springs of Shishged Gol, 36 km NNE of Ulaan Uul town, N 50.99171 E 99.35400, 1584 msl, 30 June 2006, JKGelhaus, 6m, 8f, SRP2006063002, (002ANSP). KHOVSGOL Aimag, Ulaanuul Soum, big spring & bogs, 800 m from Bagtagin Gol, 17 km NNE of Ulaan Uul, N 50.81265 E 99.33803, 1605 msl, 30 June 2006, CRNelson, 86m, 44f, SRP2006063001, (116BYU). KHOVSGOL Aimag, Renchinlhumbe Soum, Har-Us Spring, Jargalant Gol 4.2 km SE of Renchinlhumbe N 51.07845 E 99.70774, 1586 msl, 1 July 2006, Malaise, 2m, 1f, SRP2006070102, (027ANSP). KHOVSGOL Aimag, Renchinlhumbe Soum, Har-Us Spring, Jargalant Gol 4.2 km SE of Renchinlhumbe N 51.07845 E 99.70774, 1586 msl, 1 July 2006, JKGelhaus, 4m, 2f, SRP2006070102, (028ANSP). KHOVSGOL Aimag, Renchinlhumbe Soum, Har-Us Spring, Jargalant Gol 4.2 km SE of Renchinlhumbe N 51.07845 E 99.70774, 1586 msl, 1 July 2006, JCMorse, 7m, 2f, SRP2006070102, (029ANSP). TOV Aimag, Erdene Soum, Gorkhi Terelj National Park; Tuul R c. 100 m upstream of confluence with Terelj R N 47.96806 E 107.59365, 1467 msl, 5 July 2003, SRP Team, 1 lot, SRP2003070503, (695IMH). ZAVKHAN Aimag, Ider Soum, Dogshin/Nogoon Nuur ~21 km SE of Zuunmod/Ider N 48.06257 E 97.55064, 2054 msl, 23 July 2004, ESanaa, 10m, 13f, SRP2004072302, (096IMH). ZAVKHAN Aimag, Ider Soum, Dogshin/Nogoon Nuur ~21 km SE of Zuunmod/Ider N 48.06257 E 97.55064, 2054 msl, 23 July 2004, JKGelhaus, 1m, 1f, SRP2004072302, (075ANSP).

***Nemoura sahlbergi*—**MONGOLIA: ARKHANGAI Aimag, Chuluut Soum, Khurmen/Davaat Gol 15 km SSE of Chuluut/Jargalant N 47.4258 E 100.3013, 2104 msl, 15 July 2004, ESanaa, 4m, 12f, SRP2004071503, (098IMH). BULGAN Aimag, Teshig Soum, Tariakhtain Gol Stream, N 49.70184E 103.80040, 1436 msl, 9 July 2005, CRNelson, 2m, 57f, SRP2005070901, (078BYU). HOVSGOL Aimag, Khank Soum, Borsog River, near Hovsgol lake N 50.96147222 E 100.7250556, 1689 msl, 28 July 2003, E. Sanaa, 1 lot, Hovsgol_Borsog, (487IMH). HOVSGOL Aimag, Khank Soum, Dalbay River, near Hovsgol lake N 51.01908333 E 100.7595278, 1662 msl, 18 July 2005, E. Sanaa, 1 lot, Hovsgol_Dalbay, (491IMH). HOVSGOL Aimag, Khank Soum, Noyon gol, near Hovsgol Nuur N 51.20152778 E 100.8072778, 1709 msl, 1 July 2003, E. Sanaa, 1 lot, Hovsgol_Noyon, (495IMH). HOVSGOL Aimag, Khank Soum, Shagnull River near Hovsgol Lake N 51.25869444 E 100.86000, 1732 msl, 21 July 2003, E. Sanaa, 1 lot, Hovsgol_Shagnuul, (504IMH). HOVSGOL Aimag, Khank Soum, Turag River near Hovsgol Lake N 51.28775 E 100.8276389, 1667 msl, 10 June 2005, E. Sanaa, 1 lot, Hovsgol_Turag, (508IMH). KHOVSGOL Aimag, UlaanUul Soum, stream, 33.8 km NE of Bayanzurkh, N 50.42996 E 99.21727, 2086 msl, 28 June 2006, JKGelhaus, 1m, 2f, SRP2006062803, (006ANSP). KHOVSGOL Aimag, Chandmani-Ondor Soum, Khalkhan Gol Stream, above Bul Nai Hot Springs, 37.1 km NW of Chandmani Ondor town, N 50.78320E 100.79585, 1677 msl, 18 July 2005, CRNelson, 1m, SRP2005071803, (102BYU). KHOVSGOL Aimag, Sevsuuliyn gol, J. Gelhaus, 1 lot, JKG724, (622ANSP). KHOVSGOL Aimag, Erdenebulgan Soum, tributary of Emt Gol Stream, 33.2 km NW of Tarialyn town, N 49.87761E 101.82039, 1499 msl, 13 July 2005, CRNelson, 1m, 5f, SRP2005071302A, (092BYU). TOV Aimag, Erdene Soum, Gorkhi Terelj National Park, W Bayangin Gol 20.1 km upstream of Tuul R Road N 48.16668 E 107.69548, 1623 msl, 6 July 2003, ESanaa, 3m, 2f, SRP2003070605, (097IMH). TOV Aimag, Erdene Soum, Gorkhi Terelj National Park, unnamed tributary of Tuul R on its W side 1.6 km upstream from Daichin crossing N 48.2178 E 107.90392, 1594 msl, 9 July 2003, SRP Team, 1 lot, SRP2003070902, (705IMH).

Nemoura sp.—MONGOLIA: KHOVSGOL Aimag, Renchinlhumbe Soum, Hugin Gol, toll bridge, 46.8km N of Ulaan Uul town, N 51.09845 E 99.32051, 1557 msl, 1 July 2006, CRNelson,12m, 4f, SRP2006070101, (396BYU).

***Nemurella pictetii*—**MONGOLIA: KHOVSGOL Aimag, Ulaanuul Soum, big spring & bogs, 800 m from Bagtagin Gol, 17 km NNE of Ulaan Uul, N 50.81265 E 99.33803, 1605 msl, 30 June 2006, CRNelson, 36m, 72f, SRP2006063001, (118BYU). KHOVSGOL Aimag, Renchinlhumbe Soum, Har-Us Spring, Jargalant Gol 4.2 km SE of Renchinlhumbe N 51.07845 E 99.70774, 1586 msl, 1 July 2006, JCMorse, 2m, 4f, SRP2006070102, (033ANSP). KHOVSGOL Aimag, Renchinlhumbe Soum, Har-Us Spring, Jargalant Gol 4.2 km SE of Renchinlhumbe N 51.07845 E 99.70774, 1586 msl, 1 July 2006, JKGelhaus, 10m, 3f, SRP2006070102, (032ANSP).

Perlidae

***Agnetina brevipennis*—**MONGOLIA: ARKHANGAI Aimag, Tamirin/ShandinamGol Soum, Tamirin/Shandinam Gol ~25 km WNW of Zegstei N 47.73941 E 102.23811, 1377 msl, 26 July 2004, ESanaa, 14m, SRP2004072601, (104IMH). BAYAN-OLGII Aimag, Bulgan Soum, Bulgan Gol ~20 km S Bulgan N 46.78006 E 91.30396, 1801 msl, 9 July 2009, SWJudson, 1 lot, MAIS2009070901, (845BYU). BAYAN-OLGII Aimag, Bulgan Soum, Tsonkhol Gol/Turgen Gol ~25 km SE Bulgan N 46.76950 E 91.32759, 1788 msl, 9 July 2009, SWJudson, 1 lot, MAIS2009070903, (850BYU). BAYAN-OLGII Aimag, Olgiy Soum, Khovd Gol above Olgiy, N 48.97842 E 89.94995, 1750 msl, 5 July 2008, CRNelson, 5m, MAIS2008070501, (023BYU). BULGAN Aimag, Teshig Soum, Wetland 5 km SSW of Teshig N 49.90725 E 102.65665, 936 msl, 10 July 2005, C.R.Nelson, 1 lot, SRP2005071003, (1008BYU). BULGAN Aimag, Teshig Soum, Egiin Gol River above (12.7 km SW of) Teshig, N 49.88884E 102.50909, 997 msl, 11 July 2005, CRNelson, 2m, 1f, SRP2005071101, (089BYU). BULGAN Aimag, Hualgant Soum, Selenge River, bridge at Hyalganat town, N 49.48086E 104.30864, 786 msl, 8 July 2005, CRNelson, 1m, 1f, SRP2005070801, (076BYU). KHOVD Aimag, Bulgan Soum, Bulgan Gol 25 Km NWN Bulgan Soum, no coordinates available, 26 July 1978, Puntsagdulan, 1 lot, Puntsagdulan26July1978BYUC, (890BYU). KHOVD Aimag, Bulgan Soum, Bulgan Gol, 25 Km NWN Bulgan Soum, no coordinates available, 26 July 1978, Puntsagdulan, 1f, 26-VII-1978 AltID (no MAIS/SRP), (426BYU). KHOVD Aimag, Bulgan Soum, River Bulgan Gol N 46.55312 E 91.38850, 1509 msl, 10 July 2009, SWJudson, 1 lot, MAIS2009071002b, (856BYU). KHOVSGOL Aimag, Tumurbulag Soum, Bugsei Gol River, 45.5 km SW of Moron City, N 49.26170E 99.88242, 1597 msl, 23 July 2005, CRNelson, 13m, 2f, SRP2005072301, (110BYU). KHOVSGOL Aimag, Buren Soum, Delgar Moron Gol River, 12 km SW of Moron City, N 49.62785E 99.99523, 1280 msl, 20 July 2005, CRNelson, 1m, 2f, SRP2005072001, (106BYU). KHOVSGOL Aimag, Bayanzurkh Soum, Delgar Moron Gol River, 8.3 km W of Bayanzurkh town, N 50.16278E 98.84212, 1576 msl, 22 July 2005, CRNelson, 19m, SRP2005072201A, (108BYU). KHOVSGOL Aimag, Bayanzurkh Soum, Delgar Moron Gol River, 8.3 km W of Bayanzurkh town, N 50.16278E 98.84212, 1576 msl, 22 July 2005, JKGelhaus, 1f, SRP2005072201A, (019ANSP). KHOVSGOL Aimag, Selenge Moron Gol River at Teel, 23.4 km S of Tosontsengel town, N 49.26765E 100.82998, 1157 msl, 24 July 2005, CRNelson, 1f, SRP2005072401, (112BYU). KHOVSGOL Aimag, Selenge River, J. Gelhaus, 1 lot, JKG733, (628ANSP). KHOVSGOL Aimag, TsagaanUur? Soum, Uur Gol River, 7 km N of Tsagaan Uur town, N 50.60031E 101.52392, 1155 msl, 16 July 2005, C.R.Nelson, 1 lot, SRP2005071601, (1015BYU). KHOVSGOL Aimag, Erdenebulgan Soum, tributary of Emt Gol Stream, 33.2 km NW of Tarialyn town, N 49.87761E 101.82039, 1499 msl, 13 July 2005, C.R.Nelson, 1 lot, SRP2005071302A, (1010BYU). KHOVSGOL Aimag, Erdenebulgan Soum, Uur Gol River, 32.3 km NE of Erdenebulgan, N 50.30188E 101.92869, 1063 msl, 14 July 2005, C.R.Nelson, 1 lot, SRP2005071403, (1011BYU). OVORKHANGAI Aimag, Batolziy Soum, Orkhon Gol ~34 km W of Khujirt N 46.89303 E 102.39457, 1610 msl, 6 July 2004, ESanaa, 1f, SRP2004070602, (100IMH). OVORKHANGAI Aimag, Batolziy Soum, Below Orkhon's Waterfall on Ulaan Gol~200 m S of Orkhon Gol, ~84 km W of Khujirt N 46.78742 E 101.96021, 1809 msl, 7 July 2004, SRP Team, 1 lot, SRP2004070701a, (38IMH). SELENGE Aimag, Khuder Soum, Galtiin Gol c. 6 km S of Khuder N 49.73769 E 107.48766, 702 msl, 24 July 2003, SRP Team, 1 lot, SRP2003072402, (32IMH). SELENGE Aimag, Mandal Soum, Sharingol headwaters 4.6 km below southern ridgetop N 49.10789 E 106.65275, 1124 msl, 21 July 2003, SRP Team, 1 lot, SRP2003072101, (24IMH). ZAVKHAN Aimag, Ikh-Uul Soum, Ideriin Gol ~28 km E of Tosontsengel N 48.71968 E 98.65184, 1654 msl, 19 July 2004, ESanaa, 31m, 3f, SRP2004071903, (103IMH).

***Agnetina cocandica*—**MONGOLIA: BAYAN-OLGII Aimag, Ulaankhus Soum, Sogoog Gol, 3.5 km East of Khokh Khotol, hidden valley rapids, N 49.23285 E 88.90569, 2090 msl, 7 July 2008, C.R.Nelson, 1 lot, MAIS2008070702, (901BYU). KHOVD Aimag, Bulgan Soum, Bulgan Gol ~5 km N Bulgan N 46.13457 E 91.54169, 1200 msl, 10 July 2009, SWJudson, 1 lot, MAIS2009071003, (861BYU). KHOVD Aimag, Bulgan Soum, Springfed stream and oxbow of Bulgan Gol ~5 km N Bulgan N 46.13823 E 91.54096, 1210 msl, 11 July 2009, SWJudson, 1 lot, MAIS2009071101, (863BYU). KHOVD Aimag, Khovd Soum, Khovd Gol ~3 km NW Myangad N 48.24562 E 91.90144, 1172 msl, 20 July 2009, SWJudson, 1 lot, MAIS2009072002, (881BYU). KHOVD Aimag, Uyench Soum, Uyenchiin Gol ~8km N Uyench N 46.12450 E 92.05411, 1475 msl, 12 July 2009, SWJudson, 1 lot, MAIS2009071202, (864BYU). KHOVD Aimag, Dorgon Soum, Chono Kharaikh Gol (Jumping Wolf River), East of Dorgon, 1 km below dam site, N 48.33136 E 92.81702, 1145 msl, 2 July 2008, CRNelson, 7m, 2f, MAIS2008070202, (019BYU). KHOVSGOL Aimag, ? Soum, Khyadagiin Gol at Gantigiin Cold Spring NW of Moron N 49.7639 E 99.86185, 1497 msl, 20 July 2005, C.R.Nelson, 1 lot, SRP2005072101B, (1029BYU). KHOVSGOL Aimag, Khotol Soum, Orkhan Gol River, 15 km NW of Orkhan, N 49.16354E 105.18880, 739 msl, 26 July 2005, CRNelson, 1m, SRP2005072602, (114BYU). KHOVSGOL Aimag, Buren Soum, Delgar Moron Gol River, 12 km SW of Moron City, N 49.62785E 99.99523, 1280 msl, 20 July 2005, CRNelson, 1m, SRP2005072001, (107BYU). SELENGE Aimag, Shaamar Soum, Orkhon R @ Delgerkhaan Bridge N 50.06476 E 106.13388, 609 msl, 27 July 2003, ESanaa, 1m, 2f, SRP2003072701, (106IMH). SELENGE Aimag, Zuunburen Soum, small channel of Selenge

River, 7.9 km SW ofDzuunburen N 50.10277E 105.78217, 627 msl, 5 July 2005, CRNelson, 6m, SRP2005070501, (070BYU).

***Agnetina extrema*—**MONGOLIA: ARKHANGAI Aimag, Bulgan Soum, Urd Tamir Gol ~38 km SW of Tsetserleg N 47.28244 E 101.18793, 1872 msl, 12 July 2004, ESanaa, 1f, SRP2004071201A, (109IMH). ARKHANGAI Aimag, Chuluut Soum, Khanui Gol ~60 km SW of Ikhtamir N 47.50949 E 100.5751, 1981 msl, 15 July 2004, ESanaa, 10f, SRP2004071502, (111IMH). ARKHANGAI Aimag, Ikhtamir Soum, E side of Khoit Tamir Gol 4 km NE of Ikhtamir N 47.59928 E 101.24521, 1602 msl, 14 July 2004, ESanaa, 1m, SRP2004071401, (110IMH). ARKHANGAI Aimag, Tsenkher Soum, Tsetseleg Gol ~17 km SW of Tavanbulag N 47.26999 E 101.80227, 1684 msl, 10 July 2004, JKGelhaus, 1m, SRP2004071002, (076ANSP). DARKHAN-UUL Aimag, Shariingol Soum, Khuitnii Gol N 49.4645 E 106.66871, 852 msl, 21 July 2003, ESanaa, 1f, SRP2003072103, (108IMH). KHOVSGOL Aimag, TsagaanUur? Soum, about 0.5 km W of Uur Gol River, 1.2 km NE of Tsagaan Uur town, N 50.54915E 101.53806, 1112 msl, 16 July 2005, CRNelson, 1f, none (CRN8219), (132BYU). KHOVSGOL Aimag, Erdenebulgan Soum, Zerleg Gol Stream, 35.3 km NE of Erdenebulgan N 50.32718E 101.95046, 1110 msl, 15 July 2005, CRNelson, 3m, 2f, SRP2005071501, (098BYU). SELENGE Aimag, Bugant Soum, Bugant N 49.43268 E 107.28335, July 2007, Asia Foundation, 1 lot, AsiaFound46, (305NUM). SELENGE Aimag, Mandal Soum, Kharaa Gol near Zuunkharaa Bridge N 48.83322 E 106.49162, 863 msl, 17 July 2003, SRP Team, 1 lot, SRP2003071701, (13IMH). TOV Aimag, Batsumber Soum, Kharaa Gol 5.0 km upstream of Bayanbuural N 48.50028 E 106.78434, 1051 msl, 16 July 2003, SRP Team, 1 lot, SRP2003071601, (11IMH). TOV Aimag, Erdene Soum, Gorkhi Terelj National Park, unnamed tributary of Tuul R on its E side 8.5 km downstream of Galtain Gol N 48.0972 E 107.84928, 1542 msl, 11 July 2003, SRP Team, 1 lot, SRP2003071101, (09IMH).

***Kamimuria exilis*—**MONGOLIA: KHOVSGOL Aimag, Delgar Moron Gol River, 8.3 km W of Bayanzurkh town, N 50.16278E 98.84212, 1576 msl, 22 July 2005, SRP team, 1f, SRP2005072201A, (1003ANSP).

***Paragnetina flavotincta*—**MONGOLIA: BULGAN Aimag, Teshig Soum, Egiin Gol River above (12.7 km SW of) Teshig, N 49.88884E 102.50909, 997 msl, 11 July 2005, CRNelson, 1f, SRP2005071101, (088BYU). BULGAN Aimag, Hualgant Soum, Selenge River, bridge at Hyalganat town, N 49.48086E 104.30864, 786 msl, 8 July 2005, CRNelson, 59m, 6f, SRP2005070801, (075BYU). KHOVSGOL Aimag, Ikh-Uul Soum, Selenge Moron and Brain ~ 8 KM W ofCenter N 49.44641 E 101.33625, 1069 msl, 7 July 2006, Ch. Suvdsetseg, 1m, SRP2006070701, (082ANSP). KHOVSGOL Aimag, Khotol Soum, Orkhan Gol River, 15 km NW of Orkhan, N 49.16354E 105.18880, 739 msl, 26 July 2005, CRNelson, 12m, 10f, SRP2005072602, (115BYU). KHOVSGOL Aimag, Khutag-Ondor Soum, Unit Gol stream, 11 km SE of Selenge Gol River bridge, 20.8 km SE of Khutag Ondor town, N 49.33339E 102.97786, 924 msl, 25 July 2005, CRNelson, 5m, 7f, SRP2005072501, (113BYU). KHOVSGOL Aimag, Tumurbulag Soum, Bugsei Gol River, 45.5 km SW of Moron City, N 49.26170E 99.88242, 1597 msl, 23 July 2005, CRNelson, 1m, SRP2005072301, (109BYU). KHOVSGOL Aimag, Selenge Moron Gol River at Teel, 23.4 km S of Tosontsengel town, N 49.26765E 100.82998, 1157 msl, 24 July 2005, CRNelson, 12m, 13f, SRP2005072401, (111BYU). KHOVSGOL Aimag, leaving Selenge River near (perhaps 20 km) from Ikh Uul town, approaching "highway", 23.2 km e of Tosontsengel town, N 49.43131E 101.20535, 1093 msl, 25 July 2005, CRNelson, 1m, 1f, none (CRN8254), (134BYU). SELENGE Aimag, Shaamar Soum, Orkhon R @ Delgerkhaan Bridge N 50.06476 E 106.13388, 609 msl, 27 July 2003, ESanaa, 1f, SRP2003072701, (114IMH). SELENGE Aimag, Tsagaannuur Soum, SW shore of Tsagaan Nuur N 49.95588 E 105.33791, 668 msl, 25 July 2003, ESanaa, 36m, 5f, SRP2003072502, (112IMH). SELENGE Aimag, Tushig Soum, Zelter Gol @ Zelter N 50.35162 E 105.04436, 736 msl, 26 July 2003, ESanaa, 1f, SRP2003072601, (113IMH). SELENGE Aimag, Selenge River, N 49.3744 E 102.83898, 26 Aug 2008, OBG, 1 lot, AsiaFound159, (299NUM). SELENGE Aimag, Baruun Tsuuts Gol Stream, W of Sangatay, N 49.71481E 104.64203, 748 msl, 6 July 2005, CRNelson, 1 lot, SRP2005070602, (994BYU). SELENGE Aimag, Zuunburen Soum, small channel of Selenge River, 7.9 km SW ofDzuunburen N 50.10277E 105.78217, 627 msl, 5 July 2005, CRNelson, 2m, SRP2005070501, (069BYU).

Perlodidae

***Arcynopteryx compacta*—**MONGOLIA: ARKHANGAI Aimag, Bulgan Soum, Urd Tamir Gol braid upstream of bridge~63 km SW of Tsetserleg N 47.11192 E 101.01048, 2066 msl, 13 July 2004, ESanaa, 9m, 10f, SRP2004071302, (118IMH). BAYAN-OLGII Aimag, Bulgan Soum, "Ulaagchiny Davaa Gol," ~30 km N Bulgan N 47.25228 E 91.03558, 2371 msl, 6 July 2009, SWJudson, 1 lot, MAIS2009070603, (815BYU). BAYAN-OLGII Aimag, Bulgan Soum, Bulgan Gol ~15 km N Bulgan N 47.03954 E 91.03448, 2010 msl, 8 July 2009, SWJudson, 1 lot, MAIS2009070803, (838BYU). BAYAN-OLGII Aimag, Bulgan Soum, Bulgan Gol, ~20 km N Bulgan N 47.08868 E 91.02686, 2056 msl, 6 July 2009, SWJudson, 1 lot, MAIS2009070604, (817BYU). BAYAN-OLGII Aimag, Bulgan Soum, Bulgan Gol, ~33 km NNW Bulgan N 47.14513 E 90.88934, 2179 msl, 7 July 2009, SWJudson, 1 lot, MAIS2009070702, (822BYU). BAYAN-OLGII Aimag, Deluun Soum, Gantsmodi Gol 27 km S Deluun N 47.66395 E 90.71841, 2196 msl, 5 July 2009, SWJudson, 1 lot, MAIS2009070502, (808BYU). BAYANOLGII Aimag, Deluun Soum, Gantsmodi Gol, 33 km S Deluun N 47.62447 E 90.67194, 2241 msl, 5 July 2009, SWJudson, 1 lot, MAIS2009070501, (804BYU). BAYAN-OLGII Aimag, Tsengel Soum, Ikh Turgenii Gol 6 km SSW of Syrgal, N 48.54381 E 88.41416, 2147 msl, 15 July 2008, CRNelson, 2m, 3f, MAIS2008071503, (179BYU). BAYAN-OLGII Aimag, Tsengel Soum, Syrgali Gol, bridge over outflow between Khoton Nuur and Khurgen Nuur at Syrgal, N 49.59925 E 88.43707, 2095 msl, 16 July 2008, CRNelson, 7m, 1f, MAIS2008071603, (054BYU). BAYAN-OLGII Aimag, Tsengel Soum,

Tsagaan Gol crossing 1 km west ofZagastnuur Bag, N 49.09320 E 88.50469, 2226 msl, 13 July 2008, CRNelson, 2m, MAIS2008071301, (049BYU). BAYAN-OLGII Aimag, Tsengel Soum, Tsagaan Us Gol 0.5 km upstream from junction Rashaanii Gol, N 48.75197 E 88.14987, 2098 msl, 15 July 2008, CRNelson, 29m, 19f, MAIS2008071502, (178BYU). BAYAN-OLGII Aimag, Ulaankhus Soum, Khar Yamaat Gol, (Yamaatiin?)at road crossing 14 km NE of Jalpak, N 49.38055 E 88.68401, 2306 msl, 8 July 2008, CRNelson, 19m, 19f, MAIS2008070801, (036BYU). BULGAN Aimag, Teshig Soum, Tariakhtain Gol Stream, junction by two major forks, N 49.77776E 103.60860, 1189 msl, 9 July 2005, CRNelson, 5f, SRP2005070902, (084BYU). BULGAN Aimag, Khyalgant Soum, Baruun Burkhiin Gol Stream, N 49.62414E 104.24594, 1015 msl, 7 July 2005, CRNelson, 2m, 5f, SRP2005070702A, (074BYU). KHOVD Aimag, Bulgan Soum, Bulgan Gol ~5 km N Bulgan N 46.13457 E 91.54169, 1200 msl, 10 July 2009, SWJudson, 1 lot, MAIS2009071003, (857BYU). KHOVD Aimag, Monkhkhayrkhan Soum, Bortin Gol ~14 km SSE Monkhkhayrkhan N 46.92136 E 91.91077, 2311 msl, 15 July 2009, SWJudson, 1 lot, MAIS2009071501, (872BYU). KHOVD Aimag, Monkhkhayrkhan Soum, Dund Tsenkher Gol @ bridge S edge of Monkhkhayrkhan N 47.05474 E 91.84868, 2090 msl, 16 July 2009, SWJudson, 1 lot, MAIS2009071602, (876BYU). KHOVD Aimag, Erdenetburen Soum, Hongor Olin Gol, jct Hongor Gol, N 48.32093 E 91.30888, 1474 msl, 3 July 2008, CRNelson, 7m, 7f, MAIS2008070302, (020BYU). KHOVD Aimag, Tolbo Soum, Omno Gol, near Mantakh, N 48.64831 E 89.88409, 2066 msl, 4 July 2008, CRNelson, 1f, MAIS2008070403, (022BYU). KHOVSGOL Aimag, Renchinlhumbe Soum, Jarin Gol, 32.8 km N of Renchinlhumbe, river crossing N 51.39852 E 99.75011, 1575 msl, 2 July 2006, JKGelhaus, 1m, SRP2006070203A, (163ANSP). KHOVSGOL Aimag, Renchinlhumbe Soum, springs of Shishged Gol, 36 km NNE of Ulaan Uul town, N 50.99171 E 99.35400, 1584 msl, 30 June 2006, JKGelhaus, 1f, SRP2006063002, (026ANSP). KHOVSGOL Aimag, Renchinlhumbe Soum, springs of Shishged Gol, 36 km NNE of Ulaan Uul town, N 50.99171 E 99.35400, 1584 msl, 30 June 2006, CRNelson, 7m, 11f, SRP2006063002, (145BYU). KHOVSGOL Aimag, Renchinlhumbe Soum, Jarin Gol 34 KM N of Renchinlhumbe Soum Center N 51.39835 E 99.75013, 1577 msl, 2 July 2006, CRNelson, 9m, 9f, SRP2006070203, (162BYU). KHOVSGOL Aimag, Ulaanuul Soum, Gunain Gol, 12 km SW of Ulaan Uul N 50.61826 E 99.12094, 1761 msl, 29 June 2006, JKGelhaus, 1f, SRP2006062903, (001ANSP). KHOVSGOL Aimag, Ulaanuul Soum, Gunain Gol, 12 km SW of Ulaan Uul N 50.61826 E 99.12094, 1761 msl, 29 June 2006, CRNelson, 2f, SRP2006062903, (225BYU). KHOVSGOL Aimag, Ulaanuul Soum, big spring & bogs, 800 m from Bagtagin Gol, 17 km NNE of Ulaan Uul, N 50.81265 E 99.33803, 1605 msl, 30 June 2006, SRP Team, 1 lot, SRP2006063001, (1037BYU). KHOVSGOL Aimag, Modon Hui Island, 7 July 1995, J. Gelhaus, 1 lot, JKGHayModonHuiIsland, (655ANSP). KHOVSGOL Aimag, 14 July 1995, B. Hayford, 1 lot, Hay479, (562ANSP). KHOVSGOL Aimag, 13 July 1995, B. Hayford, 1 lot, Hayford477approx, (565ANSP). KHOVSGOL Aimag, 21 July 1995, B. Hayford, 1 lot, Hayford494, (567ANSP). KHOVSGOL Aimag, Renchinlhumbe Soum, Har-Us Spring, Jargalant Gol 4.2 km SE of Renchinlhumbe N 51.07845 E 99.70774, 1586 msl, 1 July 2006, JKGelhaus, 1f, SRP2006070102, (003ANSP). KHOVSGOL Aimag, Renchinlhumbe Soum, Har- Us Spring, Jargalant Gol 4.2 km SE of Renchinlhumbe N 51.07845 E 99.70774, 1586 msl, 1 July 2006, CRNelson, 1f, SRP2006070102, (226BYU). OVORKHANGAI Aimag, Batolziy Soum, braid of Orkhon Gol ~40 km W of Khujirt N 46.88586 E 102.34386, 1646 msl, 6 July 2004, ESanaa, 6m, 2f, SRP2004070603, (115IMH). TOV Aimag, Erdene Soum, Tuul N 47.84303 E 107.5533, 12 June 2007, Asia Foundation, 1 lot, AsiaFound7, (306NUM).

***Arcynopteryx polaris*—**MONGOLIA: ARKHANGAI Aimag, Bulgan Soum, Chandman Gol, tributary of Khairkhan Davaani Gol~80 km SW of Tsetserleg N 47.00226 E 100.91051, 2228 msl, 13 July 2004, ESanaa, 2m, 1f, SRP2004071305, (123IMH). ARKHANGAI Aimag, Chuluut Soum, Chuluutin Gol ~33 km SW of Chuluut/Jargalant N 47.29702 E 100.03136, 2287 msl, 16 July 2004, ESanaa, 6m, 9f, SRP2004071603, (125IMH). ARKHANGAI Aimag, Chuluut Soum, Chuluutin Gol ~45 km SW of Chuluut/Jargalant N 47.21768 E 99.92824, 2471 msl, 16 July 2004, ESanaa, 9m, 10f, SRP2004071602, (124IMH). ARKHANGAI Aimag, Chuluut Soum, Chuluutin Gol ~45 km SW of Chuluut/Jargalant N 47.21768 E 99.92824, 2471 msl, 16 July 2004, JKGelhaus, 1m, 1f, SRP2004071602, (079ANSP). ARKHANGAI Aimag, Chuluut Soum, ponds at Egiin Davaa ~47 km SW of Chuluut/Jargalant N 47.21198 E 99.91114, 2582 msl, 16 July 2004, JKGelhaus, 1f, SRP2004071601, (078ANSP). ARKHANGAI Aimag, Tsenkher Soum, Tsetserleg Gol ~50 km SSW of Tavanbulag N 47.04409 E 101.76352, 1902 msl, 11 July 2004, ESanaa, 10m, 9f, SRP2004071102, (122IMH). BAYAN-OLGII Aimag, Bulgan Soum, Bulgan Gol, roadside pools, and drying mud flats near ~28 km N Bulgan N 47.11549 E 90.94127, 2122 msl, 8 July 2009, SWJudson, 1 lot, MAIS2009070801, (831BYU). BAYANOLGII Aimag, Bulgan Soum, Confluence of "Dood Asgat Uul Gol" and "Ulaagchiny Davaa Gol," ~30 km N Bulgan N 47.34660 E 90.96013, 2519 msl, 6 July 2009, SWJudson, 1 lot, MAIS2009070602, (813BYU). BAYAN-OLGII Aimag, Bulgan Soum, Turgen Gol, ~40 km NNW Bulgan N 47.18333 E 90.77660, 2492 msl, 7 July 2009, SWJudson, 1 lot, MAIS2009070705, (827BYU). BAYAN-OLGII Aimag, Sagsay Soum, Godon Gol, 18 km due North of Dayan, N 48.43687 E 88.90085, 2245 msl, 17 July 2008, Enkhnasan, 1m, MAIS2008071702, (184BYU). BAYAN-OLGII Aimag, Tsengel Soum, Sumdairag Gol, 12 km due South of Syrgal, N 48.50679 E 88.50977, 2129 msl, 16 July 2008, CRNelson, 2m, 3f, MAIS2008071604, (181BYU). BAYAN-OLGII Aimag, Tsengel Soum, Tsagaan Gol crossing 1 km west ofZagastnuur Bag, N 49.09320 E 88.50469, 2226 msl, 13 July 2008, CRNelson, 1m, MAIS2008071301, (050BYU). BAYAN-OLGII Aimag, Tsengel Soum, Urt Khuiten Gol, 6 km SW of Asgat Peak, N 48.72628 E 88.40073, 2439 msl, 14 July 2008, CRNelson, 4m, 2f, MAIS2008071401, (060BYU). BAYAN-OLGII Aimag, Ulaankhus Soum, Khar Yamaat Gol, (Yamaatiin?)at road crossing 14 km NE of Jalpak, N 49.38055 E 88.68401, 2306 msl, 8 July 2008, CRNelson, 30m, 26f, MAIS2008070801, (037BYU). BAYAN-OLGII Aimag, Ulaankhus Soum, Ulastai Gol, 2 km East of Khokh Ereg Military Base, N 49.31867 E 88.36613, 2391 msl, 8 July 2008, CRNelson, 90m, 60f, MAIS2008070802, (041BYU). BULGAN Aimag, Teshig Soum, Tariakhtain Gol Stream, junction by two major forks, N 49.77776E 103.60860, 1189 msl, 9 July 2005, C.R.Nelson, 1 lot, SRP2005070902, (1001BYU). BULGAN Aimag, Teshig Soum, Tariakhtain Gol Stream, N 49.70184E

103.80040, 1436 msl, 9 July 2005, CRNelson, 1f, SRP2005070901, (080BYU). HOVSGOL Aimag, Khank Soum, Borsog River, near Hovsgol lake N 50.96147222 E 100.7250556, 1689 msl, 4 July 2005, E. Sanaa, 1 lot, Hovsgol_Borsog, (484IMH). HOVSGOL Aimag, Khank Soum, Sevsull river, near Hovsgol lake N 51.16361111 E 100.7521111, 1656 msl, Da July Year, E. Sanaa, 1 lot, Hovsgol_Sevsuul, (498IMH). KHOVD Aimag, Monkhkhayrkhan Soum, Trib. of Bortin Gol below Khokh Nuur ~19 km SW Monkhkhayrkhan N 46.91475 E 91.74711, 2708 msl, 15 July 2009, SWJudson, 1 lot, MAIS2009071503, (874BYU). KHOVD Aimag, Must Soum, Bodonchiin Gol ~8 km E Ikh Ulaan Davaa N 46.62011 E 92.23067, 2544 msl, 14 July 2009, SWJudson, 1 lot, MAIS2009071401, (870BYU). KHOVSGOL Aimag, Khank Soum, Hosgol Lake at Khank, 15 June 1996, J. Gelhaus, 1 lot, JKG720, (607ANSP). KHOVSGOL Aimag, Khank Soum, Khovsgol Nuur shor, 29 km NW of Khank, 1645, Da July Year, J. Gelhaus, 1 lot, JKG723, (618ANSP). KHOVSGOL Aimag, Khank Soum, Khovsgol Nuur shore, 29 km NW of Khank N51 deg36'44" E100deg30'30", 1645, 19 July 1996, JKGelhaus and EHunter, 1 lot, none (JKG723), (291ANSP). KHOVSGOL Aimag, Khank Soum, J. Gelhaus, 1 lot, JKG_15_VI_1996_khank pier, (600ANSP). KHOVSGOL Aimag, Chandmani-Ondor Soum, Khalkhan Gol Stream, above Bul Nai Hot Springs, 37.1 km NW of Chandmani Ondor town, N 50.78320E 100.79585, 1677 msl, 18 July 2005, CRNelson, 1f, SRP2005071803, (103BYU). KHOVSGOL Aimag, Alag tsar river, near Hovsgol Lake, 1675 msl, 13 July 1997, J. Gelhaus, 1 lot, JKG746Hay97061, (640ANSP). KHOVSGOL Aimag, Ikh Horoo Gol N51.5889215 E 100.4610175, 19 July 1997, J. Gelhaus, 1 lot, JKG761, (649ANSP). KHOVSGOL Aimag, J. Gelhaus, 1 lot, JKG716_751, (604ANSP). KHOVSGOL Aimag, TsagaanNuur Soum, stream, 16 km NW of Tsagaan Nuur town, N 51.46205 E 99.19994, 1607 msl, 3 July 2006, CRNelson, 1m, SRP2006070302, (169BYU). KHOVSGOL Aimag, Erdenebulgan Soum, tributary of Egiin Gol River, 13 km S of Erdenbulgan, N 49.99851E 101.60799, 1361 msl, 14 July 2005, CRNelson, 8m, 2f, SRP2005071402, (094BYU). TOV Aimag, Erdene Soum, Gorkhi Terelj National Park N 48.4208 E 107.91406, 1818 msl, 28 July 2003, ESanaa, 1m, 2f, SRP2003072802, (121IMH). ZAVKHAN Aimag, Ikh-Uul Soum, Deed Tsetsuukhiin Gol ~10 km NW of Solongotiin Davaa N 48.36436 E 98.92737, 2072 msl, 25 July 2004, ESanaa, 3m, 19f, SRP2004072502, (126IMH). ZAVKHAN Aimag, Ikh-Uul Soum, Deed Tsetsuukhiin Gol ~10 km NW of Solongotiin Davaa N 48.36436 E 98.92737, 2072 msl, 25 July 2004, JKGelhaus, 2f, SRP2004072502, (080ANSP).

***Arcynopteryx sajanensis*—**MONGOLIA: KHOVSGOL Aimag, Khank Soum, Khovsgol Lake, north side, Bayan gol N 51.6133404 E 100.6003475, 20 July 1997, C.R.Nelson, 1 lot, JKG764, (1004ANSP).

***Diura bicaudata*—**MONGOLIA: ARKHANGAI Aimag, Chuluut Soum, Chuluutin Gol ~45 km SW of Chuluut/Jargalant N 47.21768 E 99.92824, 2471 msl, 16 July 2004, ESanaa, 1f, SRP2004071602, (131IMH). BAYAN OLGIY Aimag, Tsengel Soum, Upstream of junciton with Baya Khatuugiin Nuur Stream N 49.04517 E 088.50878, 2382 msl, 13 July 2008, C.R.Nelson, 1 lot, MAIS2008071302, (909BYU). BAYAN OLGIY Aimag, Ulaanhus Soum, 1 km upstream of bridge west of the town of Ulaanhus N 49.0419 E 089.41659, 1775 msl, 6 July 2008, C.R.Nelson, 1 lot, MAIS2008070602, (900BYU). BAYAN-OLGII Aimag, Tsengel Soum, Khoton Lake, 15 km NW of Syrgal, N 48.66718 E 88.29908, 2090 msl, 14 July 2008, C.R.Nelson, 1 lot, MAIS2008071402, (911BYU). KHOVSGOL Aimag, Renchinlhumbe Soum, Jarin Gol, 32.8 km N of Renchinlhumbe, river crossing N 51.39852 E 99.75011, 1575 msl, 2 July 2006, SRP Team, 1 lot, SRP2006070203A, (1041BYU).

***Diura majuscula*—**MONGOLIA: BAYAN OLGIY Aimag, Tsengol Soum, Harganat Gol on route A15 at Usttolgoy N 48.83438 E 089.19849, 2054 msl, 6 July 2008, C.R.Nelson, 1 lot, MAIS2008070601, (1052BY). BAYAN-OLGII Aimag, Bulgan Soum, "Ulaagchiny Davaa Gol," ~50 km SSE Deluun N 47.45456 E 90.92342, 2631 msl, 6 July 2009, SWJudson, 1 lot, MAIS2009070601, (812BYU). BAYAN-OLGII Aimag, Bulgan Soum, Bulgan Gol ~15 km N Bulgan N 47.03954 E 91.03448, 2010 msl, 8 July 2009, SWJudson, 1 lot, MAIS2009070803, (839BYU). BAYAN-OLGII Aimag, Bulgan Soum, Bulgan Gol, ~20 km N Bulgan N 47.08868 E 91.02686, 2056 msl, 6 July 2009, SWJudson, 1 lot, MAIS2009070604, (818BYU). BAYANOLGII Aimag, Bulgan Soum, Bulgan Gol, ~33 km NNW Bulgan N 47.14513 E 90.88934, 2179 msl, 7 July 2009, SWJudson, 1 lot, MAIS2009070702, (823BYU). BAYAN-OLGII Aimag, Bulgan Soum, Khar Nuur (Black Lake), ~50 km NNW Bulgan N 47.24133 E 90.75316, 2563 msl, 7 July 2009, SWJudson, 1 lot, MAIS2009070703, (825BYU). BAYAN-OLGII Aimag, Bulgan Soum, Turgen Gol, ~40 km NNW Bulgan N 47.18333 E 90.77660, 2492 msl, 7 July 2009, SWJudson, 1 lot, MAIS2009070705, (828BYU). BAYAN-OLGII Aimag, Deluun Soum, Buyant Gol 46 km SE Deluun N 47.6915 E 91.13574, 1947 msl, 4 July 2009, SWJudson, 1 lot, MAIS2009070404, (802BYU). BAYAN-OLGII Aimag, Deluun Soum, Gantsmodi Gol 27 km S Deluun N 47.66395 E 90.71841, 2196 msl, 5 July 2009, SWJudson, 1 lot, MAIS2009070502, (809BYU). BAYAN-OLGII Aimag, Deluun Soum, Gantsmodi Gol, 33 km S Deluun N 47.62447 E 90.67194, 2241 msl, 5 July 2009, SWJudson, 1 lot, MAIS2009070501, (805BYU). BAYAN-OLGII Aimag, Tsengel Soum, Syrgali Gol, bridge over outflow between Khoton Nuur and Khurgen Nuur at Syrgal, N 49.59925 E 88.43707, 2095 msl, 16 July 2008, C.R.Nelson, 1 lot, MAIS2008071603, (1053BY). KHOVSGOL Aimag, Renchinlhumbe Soum, Hugin Gol, toll bridge, 46.8km N of Ulaan Uul town, N 51.09845 E 99.32051, 1557 msl, 1 July 2006, SRP Team, 1 lot, SRP2006070101, (1057BYU). KHOVSGOL Aimag, Hseg tsar cove, 14 July 1997, J. Gelhaus, 1 lot, JK747Hay97062, (598ANSP). KHOVSGOL Aimag, Jargalant gol, 14 July 1995, B. Hayford, 1 lot, Hay479, (563ANSP). KHOVSGOL Aimag, Renchinlkhumbe Soum, Tengis, N 51.48513 E 99.06127, 27 June 2007, Asia Foundation, 1 lot, AsiaFound14, (296NUM). OVORKHANGAI Aimag, Batolziy Soum, Orkhon Gol ~34 km W of Khujirt N 46.89303 E 102.39457, 1610 msl, 6 July 2004, C.R.Nelson, 1 lot, SRP2004070602, (824IMH). TOV Aimag, Erdene Soum, Gorkhi Terelj National Park, Galtain Gol at road crossing 19.1 km upstream of Tuul R Bridge N 48.1335 E 107.9199, 1551 msl, 8 July 2003, C.R.Nelson, 1 lot, SRP2003070802, (22IMH). TOV Aimag, Erdene Soum, Gorkhi Terelj National Park, unnamed tributary of Tuul R on its E side 8.5 km downstream of Galtain Gol N 48.0972 E 107.84928, 1542 msl, 11 July 2003, C.R.Nelson, 1 lot, SRP2003071101, (823IMH). TOV Aimag, 0 Soum, Gorkhi Terelj National Park, Terelj River just above Terelj, N 47.99158 E 107.46717, 1516, 28 July 2008, C.R.Nelson, 1 lot, none (CRN8949), (1043BYU).

***Isoperla altaica*—**MONGOLIA: ARKHANGAI Aimag, Bulgan Soum, Urd Tamir Gol braid upstream of bridge~63 km SW of Tsetserleg N 47.11192 E 101.01048, 2066 msl, 13 July 2004, ESanaa, 11m, 18f, SRP2004071302, (133IMH). ARKHANGAI Aimag, Bulgan Soum, Urd Tamir Gol braid upstream of bridge~63 km SW of Tsetserleg N 47.11192 E 101.01048, 2066 msl, 13 July 2004, JKGelhaus, 3m, 2f, SRP2004071302, (081ANSP). BAYAN-OLGII Aimag, Bulgan Soum, Springs by Bulgan Gol ~25 km SE Bulgan N 46.77181 E 91.31750, 1797 msl, 10 July 2009, SWJudson, 1 lot, MAIS2009071001, (851BYU). BAYAN-OLGII Aimag, Sagsay Soum, Godon Gol, 18 km due North of Dayan, N 48.43687 E 88.90085, 2245 msl, 17 July 2008, C.R.Nelson, 1 lot, MAIS2008071702, (919BYU). BAYAN-OLGII Aimag, Tsengel Soum, Rashaanii Gol (dark water), bridge 1 km North of junction Tsagaan Us Gol, N 48.75577 E 88.15264, 2115 msl, 15 July 2008, Morse and Chuluunbat, 4m, 5f, MAIS2008071501, (063BYU). BAYAN-OLGII Aimag, Tsengel Soum, Tsagaan Us Gol 0.5 km upstream from junction Rashaanii Gol, N 48.75197 E 88.14987, 2098 msl, 15 July 2008, C.R.Nelson, 1 lot, MAIS2008071502, (913BYU). BAYAN-OLGII Aimag, Ulaankhus Soum, Sogoog Gol, 3.5 km East of Khokh Khotol, hidden valley rapids, N 49.23285 E 88.90569, 2090 msl, 7 July 2008, CRNelson, 1m, MAIS2008070702, (034BYU). KHOVD Aimag, Bulgan Soum, Bulgan Gol ~5 km N Bulgan N 46.13457 E 91.54169, 1200 msl, 10 July 2009, SWJudson, 1 lot, MAIS2009071003, (858BYU). KHOVD Aimag, Duut Soum, Khoyd Tsenkher Gol ~28 km SE Duut N 47.33992 E 91.86317, 1762 msl, 17 July 2009, SWJudson, 1 lot, MAIS2009071701, (879BYU). KHOVSGOL Aimag, Renchinlhumbe Soum, springs of Shishged Gol, 36 km NNE of Ulaan Uul town, N 50.99171 E 99.35400, 1584 msl, 30 June 2006, CRNelson, 16m, 17f, SRP2006063002, (011BYU). KHOVSGOL Aimag, Ulaanuul Soum, big spring & bogs, 800 m from Bagtagin Gol, 17 km NNE of Ulaan Uul, N 50.81265 E 99.33803, 1605 msl, 30 June 2006, CRNelson, 5m, 2f, SRP2006063001, (010BYU). KHOVSGOL Aimag, Jargalant gol 25 km NW Khank, J. Gelhaus, 1 lot, JKG721_763, (611ANSP). KHOVSGOL Aimag, Renchinlhumbe Soum, Har-Us Spring, Jargalant Gol 4.2 km SE of Renchinlhumbe N 51.07845 E 99.70774, 1586 msl, 1 July 2006, CRNelson, 21m, 11f, SRP2006070102, (013BYU). KHOVSGOL Aimag, Renchinlhumbe Soum, Har-Us Spring, Jargalant Gol 4.2 km SE of Renchinlhumbe N 51.07845 E 99.70774, 1586 msl, 1 July 2006, JKGelhaus, 2m, 3f, SRP2006070102, (219ANSP). SELENGE Aimag, Mandal Soum, Ichilegiin Gol @ Yeroogiin Khaluun Rashaan N 49.01878 E 107.54551, 1076 msl, 19 July 2003, CRNelson, 1 lot, SRP2003071901, (2003BYU). SELENGE Aimag, Baruunharaa Soum, Haraa Gol River, 2.3 km S of Bayangol N 48.87748E 106.12370, 802 msl, 4 July 2005, CRNelson, 1m, 1f, SRP2005070402, (121BYU). TOV Aimag, Erdene Soum, Gorkhi Terelj National Park N 48.60223 E 107.84171, 1444 msl, 28 July 2003, SRP Team, 1 lot, SRP2003072801B, (735IMH). TOV Aimag, Erdene Soum, Gorkhi Terelj National Park; Tuul R c. 100 m upstream of confluence with Terelj R N 47.96806 E 107.59365, 1467 msl, 5 July 2003, CRNelson, 1 lot, SRP2003070503, (2002BYU).

***Isoperla asiatica*—**MONGOLIA: ARKHANGAI Aimag, Chuluut Soum, Chuluutin Gol 40 km N of Chuluut/Jargalant N 47.8044 E 100.3181, 1937 msl, 17 July 2004, ESanaa, 1f, SRP2004071701, (137IMH). ARKHANGAI Aimag, Chuluut Soum, Chuluutin Gol 40 km N of Chuluut/Jargalant N 47.8044 E 100.3181, 1937 msl, 17 July 2004, JKGelhaus, 3f, SRP2004071701, (083ANSP). BULGAN Aimag, Teshig Soum, Egiin Gol River above (12.7 km SW of) Teshig, N 49.88884E 102.50909, 997 msl, 11 July 2005, CRNelson, 1f, SRP2005071101, (126BYU). BULGAN Aimag, Teshig Soum, Tarvagatain (Marmot) Gol River at Egiin Gol River, N 49.70678E 103.10288, 909 msl, 10 July 2005, CRNelson, 1m, 2f, SRP2005071001A, (124BYU). KHOVSGOL Aimag, bridge Eglingol Hatgol, 21 July 1995, B. Hayford, 1 lot, Hayford494, (568ANSP). KHOVSGOL Aimag, TsagaanUur Soum, Uilgan Gol, 26 km ENE of Tsagaan Uur town, N 50.62324E 101.87412, 1156 msl, 15 July 2005, CRNelson, 1m, 2f, SRP2005071502A, (003BYU). KHOVSGOL Aimag, Erdenebulgan Soum, Uur Gol River, 32.3 km NE of Erdenebulgan, N 50.30188E 101.92869, 1063 msl, 14 July 2005, CRNelson, 1 lot, SRP2005071403, (SRP199). SELENGE Aimag, Mandal Soum, Ichilegiin Gol @ Yeroogiin Khaluun Rashaan N 49.01878 E 107.54551, 1076 msl, 19 July 2003, SRP Team, 1 lot, SRP2003071901, (21IMH). SELENGE Aimag, Baruunharaa Soum, Haraa Gol River, 2.3 km S of Bayangol N 48.87748E 106.12370, 802 msl, 4 July 2005, C.R.Nelson, 1 lot, SRP2005070402, (91BYU). TOV Aimag, Erdene Soum, Gorkhi Terelj National Park; Tuul R c. 100 m upstream of confluence with Terelj R N 47.96806 E 107.59365, 1467 msl, 5 July 2003, SRP Team, 1 lot, SRP2003070503, (96IMH). TOV Aimag, Gorkhi Terelj National Park, Tuul Gol at mouth Gorkhi Valley, N 47.82110 E 107.35422, 1384, 28 July 2008, CRNelson, 1m, none (CRN8952), (018BYU). ZAVKHAN Aimag, Ider Soum, Ideriin Gol ~22 km SE of Zuunmod/Ider N 48.05989 E 97.55073, 2053 msl, 23 July 2004, ESanaa, 3f, SRP2004072303, (139IMH).

***Isoperla eximia*—**MONGOLIA: SELENGE Aimag, Mandal Soum, Ichilegiin Gol @ Yeroogiin Khaluun Rashaan N 49.01878 E 107.54551, 1076 msl, 19 July 2003, SRP Team, 1 lot, SRP2003071901, (722IMH). TOV Aimag, Erdene Soum, Gorkhi Terelj National Park N 48.60223 E 107.84171, 1444 msl, 28 July 2003, SRP Team, 1 lot, SRP2003072801B, (736IMH).

***Isoperla kozlovi*—**MONGOLIA: ARKHANGAI Aimag, Bulgan Soum, Urd Tamir Gol ~38 km SW of Tsetserleg N 47.28244 E 101.18793, 1872 msl, 12 July 2004, ESanaa, 1f, SRP2004071201A, (141IMH). ARKHANGAI Aimag, Chuluut Soum, Chuluutin Gol 40 km N of Chuluut/Jargalant N 47.8044 E 100.3181, 1937 msl, 17 July 2004, ESanaa, 1f, SRP2004071701, (143IMH). ARKHANGAI Aimag, Ikhtamir Soum, Khoit Tamir Gol ~29 km SW of Ikhtamir N 47.48567 E 100.87875, 1749 msl, 15 July 2004, ESanaa, 1m, 1f, SRP2004071501, (142IMH). ARKHANGAI Aimag, Tsenkher Soum, Tsetseleg Gol ~17 km SW of Tavanbulag N 47.26999 E 101.80227, 1684 msl, 10 July 2004, ESanaa, 1m, SRP2004071002, (140IMH). BULGAN Aimag, Khyalgant Soum, Manhtai Spring, cold spring, N 49.68122E 104.56461, 866 msl, 7 July 2005, 1 lot, SRP2005070701, (996BYU). BULGAN Aimag, Hualgant Soum, Selenge River, bridge at Hyalganat town, N 49.48086E 104.30864, 786 msl, 8 July 2005, 1 lot, SRP2005070801, (999BYU). KHOVSGOL Aimag, ? Soum, Mainstream of Selenge Gol at Teel, birth of Selenge below confluence of the five rivers N 49.26764 E 100.82688, 1182 msl, 24 July 2005, C.R.Nelson, 1 lot, SRP2005072401A, (1031BYU). KHOVSGOL Aimag, Ikh-Uul Soum, Selenge Moron ~ 8 KM W ofCenter N 49.44641 E 101.33625, 1069 msl, 7 July 2006, JKGelhaus, 1m, 4f, SRP2006070701, (194ANSP). KHOVSGOL Aimag, Buren Soum, Delgar Moron Gol River, 12 km SW of Moron City, N 49.62785E 99.99523, 1280 msl, 20 July 2005,

C.R.Nelson, 1 lot, SRP2005072001, (1027BYU). KHOVSGOL Aimag, Jargalant gol N 51.6497219 E 100.5295426, 20 July 1997, J. Gelhaus, 1 lot, JKG736, (633ANSP). KHOVSGOL Aimag, Selenge River, Da July 1997, J. Gelhaus, 1 lot, JKG733, (626ANSP). KHOVSGOL Aimag, Selenge River, July 1997, J. Gelhaus, 1 lot, JKG735, (629ANSP). SELENGE Aimag, Bugant/Yaroo Soum, Khongiin Gol at Yeroo Gol confluence N 49.08636 E 107.3075, 943 msl, 19 July 2003, SRP Team, 1 lot, SRP2003071803, (19IMH). SELENGE Aimag, Baruunharaa Soum, Haraa Gol River, 2.3 km S of Bayangol N 48.87748E 106.12370, 802 msl, 4 July 2005, CRNelson, 17m, 38f, SRP2005070402, (119BYU). TOV Aimag, Erdene Soum, Gorkhi Terelj National Park, Galtain Gol at road crossing 19.1 km upstream of Tuul R Bridge N 48.1335 E 107.9199, 1551 msl, 8 July 2003, SRP Team, 1 lot, SRP2003070802, (02IMH). TOV Aimag, Erdene Soum, Gorkhi Terelj National Park, pond in floodplain of Galtain Gol N 48 07' 50.4" E 107 55' 16.4", 1563 msl, 8 July 2003, SRP Team, 1 lot, SRP2003070803, (03IMH). TOV Aimag, Erdene Soum, Gorkhi Terelj National Park, mouth of Khag River @ confluence with Tuul N 48.25861 E 107.90251, 1608 msl, 10 July 2003, SRP Team, 1 lot, SRP2003071002, (07IMH). TOV Aimag, Tuul River 4km W Lun, July 1997, J. Gelhaus, 1 lot, JKG738, (637ANSP).

***Isoperla lunigera*—**MONGOLIA: BULGAN Aimag, Teshig Soum, Egiin Gol River above (12.7 km SW of) Teshig, N 49.88884E 102.50909, 997 msl, 11 July 2005, CRNelson, 1f, SRP2005071101, (125BYU). BULGAN Aimag, Hualgant Soum, Selenge River, bridge at Hyalganat town, N 49.48086E 104.30864, 786 msl, 8 July 2005, CRNelson, 1f, SRP2005070801, (123BYU). KHOVSGOL Aimag, Renchinlhumbe Soum, Hugin Gol, toll bridge, 46.8km N of Ulaan Uul town, N 51.09845 E 99.32051, 1557 msl, 1 July 2006, Suvdaa, 1m, 2f, SRP2006070101, (146BYU). KHOVSGOL Aimag, Buren Soum, Delgar Moron Gol River, 12 km SW of Moron City, N 49.62785E 99.99523, 1280 msl, 20 July 2005, C.R.Nelson, 1 lot, SRP2005072001, (1028BYU). KHOVSGOL Aimag, Jargalant gol N 51.6497219 E 100.5295426, 20 July 1997, J. Gelhaus, 1 lot, JKG736, (634ANSP). KHOVSGOL Aimag, Selenge River, J. Gelhaus, 1 lot, JKG733, (627ANSP). KHOVSGOL Aimag, Selenge River, J. Gelhaus, 1 lot, JKG735, (630ANSP). KHOVSGOL Aimag, TsagaanUur? Soum, Uur Gol River, 7 km N of Tsagaan Uur town, N 50.60031E 101.52392, 1155 msl, 16 July 2005, C.R.Nelson, 1 lot, SRP2005071601, (1022BYU). SELENGE Aimag, Bugant/Yaroo Soum, Khongiin Gol at Yeroo Gol confluence N 49.08636 E 107.3075, 943 msl, 19 July 2003, SRP Team, 1 lot, SRP2003071803, (20IMH). SELENGE Aimag, Bugant/Yaroo Soum, Yeroo R c. 14 km upstream of Yavin/Yeroo bridge N 49.61985 E 106.82693, 695 msl, 22 July 2003, SRP Team, 1 lot, SRP2003072201, (25IMH). SELENGE Aimag, Baruunharaa Soum, Haraa Gol River, 2.3 km S of Bayangol N 48.87748E 106.12370, 802 msl, 4 July 2005, CRNelson, 1f, SRP2005070402, (120BYU). TOV Aimag, Erdene Soum, Gorkhi Terelj National Park, Tuul River 10.1 km upstream of Tuul River Bridge N 48.09549 E 107.84265, 1531 msl, 8 July 2003, ESanaa, 1m, SRP2003070801, (145IMH). TOV Aimag, Gorkhi Terelj National Park, Tuul Gol at mouth Gorkhi Valley, N 47.82110 E 107.35422, 1384, 28 July 2008, CRNelson, 1f, none (CRN8952), (017BYU).

***Isoperla mongolica*—**MONGOLIA: ARKHANGAI Aimag, Bulgan Soum, Urd Tamir Gol braid upstream of bridge~63 km SW of Tsetserleg N 47.11192 E 101.01048, 2066 msl, 13 July 2004, SRP Team, 1 lot, SRP2004071302, (47IMH). ARKHANGAI Aimag, Tsenkher Soum, Tsetseleg Gol ~17 km SW of Tavanbulag N 47.26999 E 101.80227, 1684 msl, 10 July 2004, SRP Team, 1 lot, SRP2004071002, (41IMH). ARKHANGAY Aimag, Bulgan Soum, Urd Tamir Gol ~38 km SW of Tsetserleg N 47.28244 E 101.18793, 1872 msl, 12 July 2004, SRP Team, 1 lot, SRP2004071201, (743IMH). BAYAN OLGIY Aimag, Sagsay Soum, 40 km by road SSW Dayan N 48.1672 E 08885415, 2065 msl, 17 July 2008, C.R.Nelson, 1 lot, MAIS2008071703, (920BYU). BAYAN-OLGII Aimag, Bulgan Soum, "Elstiin Davaa Gol" ~15 km N Bulgan N 47.03794 E 91.02931, 2016 msl, 8 July 2009, SWJudson, 1 lot, MAIS2009070802, (834BYU). BAYAN-OLGII Aimag, Bulgan Soum, Bulgan Gol ~15 km N Bulgan N 47.03954 E 91.03448, 2010 msl, 8 July 2009, SWJudson, 1 lot, MAIS2009070803, (840BYU). BAYAN-OLGII Aimag, Bulgan Soum, Bulgan Gol ~20 km S Bulgan N 46.78006 E 91.30396, 1801 msl, 9 July 2009, SWJudson, 1 lot, MAIS2009070901, (843BYU). BAYAN-OLGII Aimag, Bulgan Soum, Bulgan Gol ~25 km SE Bulgan N 46.77005 E 91.32336, 1792 msl, 9 July 2009, SWJudson, 1 lot, MAIS2009070902, (846BYU). BAYAN-OLGII Aimag, Bulgan Soum, Bulgan Gol, ~20 km N Bulgan N 47.08868 E 91.02686, 2056 msl, 6 July 2009, SWJudson, 1 lot, MAIS2009070604, (819BYU). BAYAN-OLGII Aimag, Bulgan Soum, Springs by Bulgan Gol ~25 km SE Bulgan N 46.77181 E 91.31750, 1797 msl, 10 July 2009, SWJudson, 1 lot, MAIS2009071001, (852BYU). BAYAN-OLGII Aimag, Bulgan Soum, Tsonkhol Gol/ Turgen Gol ~25 km SE Bulgan N 46.76950 E 91.32759, 1788 msl, 9 July 2009, SWJudson, 1 lot, MAIS2009070903, (848BYU). BAYAN-OLGII Aimag, Sagsay Soum, Sagsay Gol, bridge 11 km NW Sagsay, N 48.84328 E 89.53623, 1798 msl, 5 July 2008, C.R.Nelson, 1 lot, MAIS2008070502, (895BYU). BAYANOLGII Aimag, Tsengel Soum, Tsagaan Us Gol 0.5 km upstream from junction Rashaanii Gol, N 48.75197 E 88.14987, 2098 msl, 15 July 2008, CRNelson, 1m, MAIS2008071502, (176BYU). KHOVD Aimag, Bulgan Soum, Bulgan Gol ~5 km N Bulgan N 46.13457 E 91.54169, 1200 msl, 10 July 2009, SWJudson, 1 lot, MAIS2009071003, (859BYU). KHOVSGOL Aimag, Alag tsar river, near Hovsgol Lake, 1675 msl, 13 July 1997, J. Gelhaus, 1 lot, JKG746Hay97061, (641ANSP). TOV Aimag, Erdene Soum, unnamed tribE of Tuul river 8.5 km S of Galtain gol, 1542, Da July Year, E. Sanaa, 1 lot, Sanaa535, (748ANSP). TOV Aimag, Erdene Soum, Gorkhi Terelj National Park, Tuul River 10.1 km upstream of Tuul River Bridge N 48.09549 E 107.84265, 1531 msl, 8 July 2003, SRP Team, 1 lot, SRP2003070801, (700IMH). ZAVKHAN Aimag, Ider Soum, Ideriin Gol ~4 km NE of Zuunmod/Ider N 48.24995 E 97.40627, 1929 msl, 22 July 2004, SRP Team, 1 lot, SRP2004072203, (56IMH). ZAVKHAN Aimag, Ider Soum, Dogshin/Nogoon Nuur ~21 km SE of Zuunmod/Ider N 48.06257 E 97.55064, 2054 msl, 23 July 2004, SRP Team, 1 lot, SRP2004072302, (57IMH).

***Isoperla obscura*—**MONGOLIA: BAYAN OLGIY Aimag, Tsengol Soum, Harganat Gol on route A15 at Usttolgoy N 48.83438 E 089.19849, 2054 msl, 6 July 2008, C.R.Nelson, 1 lot, MAIS2008070601, (897BYU). BAYAN OLGIY Aimag, Ulaanhus Soum, 1 km upstream of bridge west of the town of Ulaanhus N 49.0419 E 089.41659, 1775 msl, 6 July 2008, C.R.Nelson, 1 lot, MAIS2008070602, (899BYU). BAYAN-OLGII Aimag, Olgiy Soum, Khovd Gol above Olgiy, N 48.97842 E 89.94995, 1750 msl, 5 July 2008, C.R.Nelson, 1 lot, MAIS2008070501, (893BYU). BAYAN-OLGII Aimag, Sagsay Soum,

Sagsay Gol, bridge 11 km NW Sagsay, N 48.84328 E 89.53623, 1798 msl, 5 July 2008, C.R.Nelson, 1 lot, MAIS2008070502, (894BYU). BAYAN-OLGII Aimag, Tsengel Soum, Rashaanii Gol (dark water), bridge 1 km North of junction Tsagaan Us Gol, N 48.75577 E 88.15264, 2115 msl, 15 July 2008, C.R.Nelson, 1 lot, MAIS2008071501, (912BYU). BAYAN-OLGII Aimag,, SWChorgon (Khurgan?) lake, no coordinates recorded, 17 July 1978, Puntsagdulan, 1 lot, Puntsagdulan17July1978, (738ANSP). BULGAN Aimag, Teshig Soum, Egiin Gol River above (12.7 km SW of) Teshig, N 49.88884E 102.50909, 997 msl, 11 July 2005, C.R.Nelson, 1 lot, SRP2005071101, (1009BYU). BULGAN Aimag, Hyalgant Soum, Selenge River, bridge at Hyalganat town, N 49.48086E 104.30864, 786 msl, 8 July 2005, 1 lot, SRP2005070801, (998BYU). KHOVSGOL Aimag, Jargalant gol N 51.6497219 E 100.5295426, 20 July 1997, J. Gelhaus, 1 lot, JKG736, (635ANSP). KHOVSGOL Aimag, Selenge River, J. Gelhaus, 1 lot, JKG735, (631ANSP). KHOVSGOL Aimag, TsagaanUur? Soum, Uur Gol River, 7 km N of Tsagaan Uur town, N 50.60031E 101.52392, 1155 msl, 16 July 2005, C.R.Nelson, 1 lot, SRP2005071601, (1021BYU). SELENGE Aimag, Bugant/Yaroo Soum, Yeroo R c. 14 km upstream of Yavin/Yeroo bridge N 49.61985 E 106.82693, 695 msl, 22 July 2003, SRP Team, 1 lot, SRP2003072202B, (726IMH). SELENGE Aimag, Shaamar Soum, Orkhon R @ Delgerkhaan Bridge N 50.06476 E 106.13388, 609 msl, 27 July 2003, SRP Team, 1 lot, SRP2003072701, (734IMH). SELENGE Aimag, Eroo River, N 49.7212 E 106.65553, 19 July 2007, NRG, 1 lot, AsiaFound38, (304NUM). SELENGE Aimag, Zuunburen Soum, small channel of Selenge River, 7.9 km SW ofDzuunburen N 50.10277E 105.78217, 627 msl, 5 July 2005, 1 lot, SRP2005070501, (992BYU). TOV Aimag, Tuul River 4km W, 1997, J. Gelhaus, 1 lot, JKG738, (638ANSP).

Isoperla potanini—MONGOLIA: ARKHANGAI Aimag, Chuluut Soum, Chuluutin Gol 40 km N of Chuluut/Jargalant N 47.8044 E 100.3181, 1937 msl, 17 July 2004, ESanaa, 2m, 2f, SRP2004071701, (149IMH). ARKHANGAI Aimag, Chuluut Soum, Khurmen/Davaat Gol 15 km SSE of Chuluut/Jargalant N 47.4258 E 100.3013, 2104 msl, 15 July 2004, ESanaa, 7m, 8f, SRP2004071503, (148IMH). ARKHANGAI Aimag, Tsenkher Soum, Tsetseleg Gol ~17 km SW of Tavanbulag N 47.26999 E 101.80227, 1684 msl, 10 July 2004, ESanaa, 2f, SRP2004071002, (147IMH). ARKHANGAI Aimag, Tsenkher Soum, Tsetseleg Gol ~17 km SW of Tavanbulag N 47.26999 E 101.80227, 1684 msl, 10 July 2004, JKGelhaus, 1m, SRP2004071002, (085ANSP). BAYAN OLGIY Aimag, Altai Soum, At bridge 10 km S of Altai by air N 48.24123 E 89.60168, 2137 msl, 19 July 2008, C.R.Nelson, 1 lot, MAIS2008071901, (922BYU). BAYAN OLGIY Aimag, Buyant Soum, 5 km S of Buyant, 19 July 2008, C.R.Nelson, 1 lot, MAIS2008071902, (924BYU). BAYAN OLGIY Aimag, Sagsay Soum, 17 km by road N of Dayan N 48.39223 E 088.88369, 2184 msl, 18 July 2008, C.R.Nelson, 1 lot, MAIS2008071802, (921BYU). BAYAN OLGIY Aimag, Tsengol Soum, Harganat Gol on route A15 at Usttolgoy N 48.83438 E 089.19849, 2054 msl, 6 July 2008, C.R.Nelson, 1 lot, MAIS2008070601, (898BYU). BAYANOLGII Aimag, Bulgan Soum, "Elstiin Davaa Gol" ~15 km N Bulgan N 47.03794 E 91.02931, 2016 msl, 8 July 2009, SWJudson, 1 lot, MAIS2009070802, (835BYU). BAYAN-OLGII Aimag, Bulgan Soum, "Ulaagchiny Davaa Gol," ~30 km N Bulgan N 47.25228 E 91.03558, 2371 msl, 6 July 2009, SWJudson, 1 lot, MAIS2009070603, (816BYU). BAYAN-OLGII Aimag, Bulgan Soum, Bulgan Gol ~15 km N Bulgan N 47.03954 E 91.03448, 2010 msl, 8 July 2009, SWJudson, 1 lot, MAIS2009070803, (841BYU). BAYAN-OLGII Aimag, Bulgan Soum, Bulgan Gol, ~20 km N Bulgan N 47.08868 E 91.02686, 2056 msl, 6 July 2009, SWJudson, 1 lot, MAIS2009070604, (820BYU). BAYAN-OLGII Aimag, Bulgan Soum, Bulgan Gol, ~33 km NNW Bulgan N 47.14513 E 90.88934, 2179 msl, 7 July 2009, SWJudson, 1 lot, MAIS2009070702, (824BYU). BAYAN-OLGII Aimag, Bulgan Soum, Bulgan Gol, roadside pools, and drying mud flats near ~28 km N Bulgan N 47.11549 E 90.94127, 2122 msl, 8 July 2009, SWJudson, 1 lot, MAIS2009070801, (832BYU). BAYAN-OLGII Aimag, Bulgan Soum, Ich-Jargalantiin Gol 20 Km NWN Bulgan Soum, 23 July 1973, Puntsagdulan, 1 lot, Puntsagdulan23July1973, (889BYU). BAYAN-OLGII Aimag, Bulgan Soum, Tsonkhol Gol/Turgen Gol ~25 km SE Bulgan N 46.76950 E 91.32759, 1788 msl, 9 July 2009, SWJudson, 1 lot, MAIS2009070903, (849BYU). BAYAN-OLGII Aimag, Bulgan Soum, Turgen Gol, ~40 km NNW Bulgan N 47.18333 E 90.77660, 2492 msl, 7 July 2009, SWJudson, 1 lot, MAIS2009070705, (829BYU). BAYAN-OLGII Aimag, Deluun Soum, Buyant Gol 46 km SE Deluun N 47.6915 E 91.13574, 1947 msl, 4 July 2009, SWJudson, 1 lot, MAIS2009070404, (803BYU). BAYAN-OLGII Aimag, Deluun Soum, Gantsmodi Gol 27 km S Deluun N 47.66395 E 90.71841, 2196 msl, 5 July 2009, SWJudson, 1 lot, MAIS2009070502, (810BYU). BAYANOLGII Aimag, Deluun Soum, Gantsmodi Gol, 33 km S Deluun N 47.62447 E 90.67194, 2241 msl, 5 July 2009, SWJudson, 1 lot, MAIS2009070501, (806BYU). BAYAN-OLGII Aimag, Olgiy Soum, Khovd Gol above Olgiy, N 48.97842 E 89.94995, 1750 msl, 5 July 2008, CRNelson, 1m, MAIS2008070501, (024BYU). BAYAN-OLGII Aimag, Sagsay Soum, Sagsay Gol, bridge 11 km NW Sagsay, N 48.84328 E 89.53623, 1798 msl, 5 July 2008, CRNelson, 15m, 11f, MAIS2008070502, (026BYU). BAYAN-OLGII Aimag, Tsengel Soum, Tsagaan Gol crossing 1 km west of Zagastnuur Bag, N 49.09320 E 88.50469, 2226 msl, 13 July 2008, CRNelson, 8m, MAIS2008071301, (051BYU). BAYAN-OLGII Aimag, Ulaankhus Soum, Sogoog Gol, 3.5 km East of Khokh Khotol, hidden valley rapids, N 49.23285 E 88.90569, 2090 msl, 7 July 2008, CRNelson, 1m, MAIS2008070702, (033BYU). BAYAN-OLGII Aimag, Ulaankhus Soum, Ulastai Gol, 2 km East of Khokh Ereg Military Base, N 49.31867 E 88.36613, 2391 msl, 8 July 2008, CRNelson, 4m, MAIS2008070802, (043BYU). GOVI-ALTAI Aimag, Tenchil Soum, Zuil Jel River N 46.319172 E 93.885164, 2254, 17 July 2002, J. Puntsagdulan, 1m, 17-UM--2002 AltID (no MAIS/SRP), (423BYU). GOVI-ALTAI Aimag, Tenchil Soum, Zuil Jel River N 46.319172 E 93.885164, 2254, 17 July 2002, Puntsagdulan, 1 lot, Puntsagdulan17UM2002, (885BYU). HOVSGOL Aimag, Khank Soum, Sevsull river, near Hovsgol lake N 51.16361111 E 100.7521111, 1656 msl, Da July Year, E. Sanaa, 1 lot, Hovsgol_Sevsuul, (499IMH). KHOVD Aimag, Bulgan Soum, Bulgan Gol ~5 km N Bulgan N 46.13457 E 91.54169, 1200 msl, 10 July 2009, SWJudson, 1 lot, MAIS2009071003, (860BYU). KHOVD Aimag, Bulgan Soum, Springfed stream and oxbow of Bulgan Gol ~5 km N Bulgan N 46.13823 E 91.54096, 1210 msl, 11 July 2009, SWJudson, 1 lot, MAIS2009071101, (862BYU). KHOVD Aimag, Monkhkhayrkhan Soum, Doloon Nuurin Gol ~25 km W Monkhkhayrkhan N 47.05344 E 91.52650, 2711 msl, 16 July 2009, SWJudson, 1 lot, MAIS2009071601, (875BYU). KHOVD Aimag, Uyench Soum, Uyenchiin Gol @ Urd Jargalant Gol ~25 km

N Uyench N 46.26107 E 92.07269, 1677 msl, 13 July 2009, SWJudson, 1 lot, MAIS2009071302, (866BYU). KHOVD Aimag, Uyench Soum, Uyenchiin Gol ~40 km N Uyench N 46.38285 E 92.13062, 1939 msl, 13 July 2009, SWJudson, 1 lot, MAIS2009071303, (868BYU). KHOVD Aimag, Erdenetburen Soum, Hongor Olin Gol, jct Hongor Gol, N 48.32093 E 91.30888, 1474 msl, 3 July 2008, CRNelson, 1m, MAIS2008070302, (021BYU). KHOVSGOL Aimag, Tumurbulag Soum, Bugsei Gol River, 45.5 km SW of Moron City, N 49.26170E 99.88242, 1597 msl, 23 July 2005, CRNelson, 31m, 7f, SRP2005072301, (007BYU). KHOVSGOL Aimag, Tumurbulag Soum, Bugsei Gol River, 45.5 km SW of Moron City, N 49.26170E 99.88242, 1597 msl, 23 July 2005, JKGelhaus, 3m, SRP2005072301, (205ANSP). KHOVSGOL Aimag, Selenge Moron Gol River at Teel, 23.4 km S of Tosontsengel town, N 49.26765E 100.82998, 1157 msl, 24 July 2005, CRNelson, 1f, SRP2005072401, (009BYU). KHOVSGOL Aimag, TsagaanUur Soum, Uilgan Gol, 26 km ENE of Tsagaan Uur town, N 50.62324E 101.87412, 1156 msl, 15 July 2005, CRNelson, 16m, 5f, SRP2005071502A, (001BYU). KHOVSGOL Aimag, TsagaanUur Soum, Uilgan Gol, 26 km ENE of Tsagaan Uur town, N 50.62324E 101.87412, 1156 msl, 15 July 2005, JKGelhaus, 1f, SRP2005071502A, (204ANSP). OVORHANGAY Aimag, Bat olziy Soum, Ulaan Gol ~93 km W of Khujirt N 46.73093 E 101.88583, 1894 msl, 7 July 2004, ESanaa, 1m, SRP2004070702, (146IMH). ZAVKHAN Aimag, Ider Soum, Dogshin/Nogoon Nuur ~21 km SE of Zuunmod/Ider N 48.06257 E 97.55064, 2054 msl, 23 July 2004, ESanaa, 1f, SRP2004072302, (152IMH). ZAVKHAN Aimag, Ider Soum, Ideriin Gol ~4 km NE of Zuunmod/Ider N 48.24995 E 97.40627, 1929 msl, 22 July 2004, ESanaa, 2f, SRP2004072203, (151IMH). ZAVKHAN Aimag, Ider Soum, Zagastain Gol ~11 km NNE of Zagastain Davaa N 48.15779 E 97.21441, 2108 msl, 24 July 2004, JKGelhaus, 2f, SRP2004072401, (087ANSP). ZAVKHAN Aimag, Tosontsengel Soum, Gunza Gol ~38 km SW of Tosontsengel N 48.62624 E 97.89617, 1831 msl, 21 July 2004, ESanaa, 1m, 3f, SRP2004072102, (150IMH). ZAVKHAN Aimag, Tosontsengel Soum, Tegshiin Gol ~70 km SW of Tosontsengel N 48.3441 E 97.87312, 1927 msl, 22 July 2004, JKGelhaus, 1f, SRP2004072201, (086ANSP).

***Kaszabia nigricauda*—**MONGOLIA: ARKHANGAI Aimag, Chuluut Soum, Chuluutin Gol 40 km N of Chuluut/ Jargalant N 47.8044 E 100.3181, 1937 msl, 17 July 2004, ESanaa, 3f, SRP2004071701, (157IMH). ARKHANGAI Aimag, Ikhtamir Soum, E side of Khoit Tamir Gol 4 km NE of Ikhtamir N 47.59928 E 101.24521, 1602 msl, 14 July 2004, ESanaa, 1m, 1f, SRP2004071401, (155IMH). ARKHANGAI Aimag, Ikhtamir Soum, Khoit Tamir Gol ~29 km SW of Ikhtamir N 47.48567 E 100.87875, 1749 msl, 15 July 2004, ESanaa, 1m, 14f, SRP2004071501, (156IMH). KHOVSGOL Aimag, Buren Soum, Delgar Moron Gol River, 12 km SW of Moron City, N 49.62785E 99.99523, 1280 msl, 20 July 2005, C.R.Nelson, 1 lot, SRP2005072001, (04ANSP). KHOVSGOL Aimag, Bayanzurkh Soum, Beltes Gol, 4.7 km NE of Bayanzurkh town, N 50.19916 E 99.03117, 1642 msl, 6 July 2006, CRNelson, 1m, 4f, SRP2006070601, (016BYU). KHOVSGOL Aimag, Bayanzurkh Soum, Beltes Gol, 4.7 km NE of Bayanzurkh town, N 50.19916 E 99.03117, 1642 msl, 6 July 2006, JMorse, 15m, 58f, SRP2006070601, (012ANSP). KHOVSGOL Aimag, TsagaanUur Soum, Uilgan Gol, 26 km ENE of Tsagaan Uur town, N 50.62324E 101.87412, 1156 msl, 15 July 2005, CRNelson, 7f, SRP2005071502A, (002BYU). KHOVSGOL Aimag, TsagaanUur? Soum, Kholkhan Gol Stream, tributary of Aireg Gol, 22 km W of Tsagaan Uur town, N 50.51517E 101.21073, 1195 msl, 17 July 2005, C.R.Nelson, 1 lot, SRP2005071702A, (03ANSP). KHOVSGOL Aimag, Erdenebulgan Soum, Zerleg Gol Stream, 35.3 km NE of Erdenebulgan N 50.32718E 101.95046, 1110 msl, 15 July 2005, C.R.Nelson, 1 lot, SRP2005071501, (00ANSP). TOV Aimag, Erdene Soum, Gorkhi Terelj National Park, mouth of Khag River @ confluence with Tuul N 48.25861 E 107.90251, 1608 msl, 10 July 2003, ESanaa, 6m, SRP2003071002, (154IMH). TOV Aimag, Erdene Soum, Gorkhi Terelj National Park, Tuul River 10.1 km upstream of Tuul River Bridge N 48.09549 E 107.84265, 1531 msl, 8 July 2003, ESanaa, 1m, SRP2003070801, (153IMH). TOV Aimag, Erdene Soum, Gorkhi Terelj National Park, unnamed tributary of Tuul R on its W side 1.6 km upstream from Daichin crossing N 48.2178 E 107.90392, 1594 msl, 9 July 2003, C.R.Nelson, 1 lot, SRP2003070902, (813IMH). TOV Aimag, Erdene Soum, Gorkhi Terelj National Park, unnamed tributary of Tuul R on its E side 8.5 km downstream of Galtain Gol N 48.0972 E 107.84928, 1542 msl, 11 July 2003, SRP Team, 1 lot, SRP2003071101, (814IMH). TOV Aimag, Erdene Soum, Gorkhi Terelj National Park; Tuul R c. 100 m upstream of confluence with Terelj R N 47.96806 E 107.59365, 1467 msl, 5 July 2003, C.R.Nelson, 1 lot, SRP2003070503, (819IMH). TOV Aimag, Tuul River 4km W Lun, J. Gelhaus, 1 lot, JKG738, (639ANSP). ZAVKHAN Aimag, Ikh-Uul Soum, Ideriin Gol ~28 km E of Tosontsengel N 48.71968 E 98.65184, 1654 msl, 19 July 2004, ESanaa, 1m, SRP2004071903, (158IMH).

***Megarcys ochracea*—**MONGOLIA: BULGAN Aimag, Teshig Soum, Tariakhtain Gol Stream, junction by two major forks, N 49.77776E 103.60860, 1189 msl, 9 July 2005, C.R.Nelson, 1 lot, SRP2005070902, (1002BYU). KHOSVGOL Aimag, Tsagaan nuur Soum, Hagargo N 51.40978 E 99.30157, 27 June 2007, OBG, 1 lot, AsiaFound15, (298NUM). KHOVSGOL Aimag, Jargalant gol 25 km NW Khank, J. Gelhaus, 1 lot, JKG721_763, (612ANSP). KHOVSGOL Aimag, TsagaanNuur Soum, stream, 16 km NW of Tsagaan Nuur town, N 51.46205 E 99.19994, 1607 msl, 3 July 2006, CRNelson, 1m, 1f, SRP2006070302, (168BYU). KHOVSGOL Aimag, Jargalant gol, N 51.6497219 E 100.5295426, 20 July 1997, J. Gelhaus, 1 lot, JKG736, (636ANSP). KHOVSGOL Aimag, 14 July 1995, B. Hayford, 1 lot, Hay479, (564ANSP). SELENGE Aimag, Bugant/Yaroo Soum, Bar Chuluu Gol N 49.03282 E 106.96935, 975 msl, 17 July 2003, SRP Team, 1 lot, SRP2003071704, (16IMH). TOV Aimag, Gorkhi Terelj National Park, Terelj River just above Terelj, N 47.99158 E 107.46717, 1516, 28 July 2008, CRNelson, 1m, none (CRN8949), (058BYU).

***Pictetiella asiatica*—**MONGOLIA: KHOVSGOL Aimag, Khank Soum, Jargalant gol 25 km NW Khank, 1995, JKGelhaus, 1 lot, JKG721_763, (1002ANSP).

***Skwala pusilla*—**MONGOLIA: BAYAN-OLGII Aimag, SW Chorgon (Khurgan?) lake, 17 July 1978, J. Puntsagdulan, (1066BYU). BAYAN-OLGII Aimag, Tsengel Soum, Khoton Lake, 15 km NW of Syrgal, N 48.66718 E 88.29908, 2090 msl, 14 July 2008, C. R. Nelson, MAIS2008071402, (910BYU).

Pteronarcyidae

***Pteronarcys reticulata*—**MONGOLIA: ARKHANGAI Aimag, Chuluut Soum, Chuluutin Gol 40 km N of Chuluut/Jargalant N 47.8044 E 100.3181, 1937 msl, 17 July 2004, ESanaa, 1m, 1f, SRP2004071701, (161IMH). BULGAN Aimag, Teshig Soum, Airhan Lake, W of Hongor, 26.8 km N of Khutag Ondor, N 49.63453E 102.64845, 953 msl, 13 July 2005, CRNelson, 1f, SRP2005071301, (091BYU). KHOSVGOL Aimag, Tsagaan nuur Soum, Tengis N 51.47065 E 99.0262, 9 June 2008, BLM, 1 lot, AsiaFound13, (292NUM). KHOVSGOL Aimag, TsagaanUur? Soum, Uur Gol River, 7 km N of Tsagaan Uur town, N 50.60031E 101.52392, 1155 msl, 16 July 2005, CRNelson, 1 lot, SRP2005071601, (099BYU). KHOVSGOL Aimag, Erdenebulgan Soum, Uur Gol River, 32.3 km NE of Erdenebulgan, N 50.30188E 101.92869, 1063 msl, 14 July 2005, CRNelson, 1m, 1f, SRP2005071403, (SRPBYU). SELENGE Aimag, Bugant/Yaroo Soum, Khongiin Gol at Yeroo Gol confluence N 49.08636 E 107.3075, 943 msl, 19 July 2003, ESanaa, 1f, SRP2003071803, (160IMH).

Taeniopterygidae

***Taenionema japonicum*—**MONGOLIA: ARKHANGAI Aimag, Bulgan Soum, Urd Tamir Gol ~38 km SW of Tsetserleg N 47.28244 E 101.18793, 1872 msl, 12 July 2004, ESanaa, 8f, SRP2004071201A, (162IMH). ARKHANGAI Aimag, Bulgan Soum, Urd Tamir Gol ~38 km SW of Tsetserleg N 47.28244 E 101.18793, 1872 msl, 12 July 2004, JKGelhaus, 1f, SRP2004071201A, (088ANSP). ARKHANGAI Aimag, Bulgan Soum, Urd Tamir Gol ~38 km SW of Tsetserleg N 47.28244 E 101.18793, 1872 msl, 12 July 2004, JKGelhaus, 1f, SRP2004071201A, (199ANSP). ARKHANGAI Aimag, Bulgan Soum, Urd Tamir Gol braid upstream of bridge~63 km SW of Tsetserleg N 47.11192 E 101.01048, 2066 msl, 13 July 2004, ESanaa, 4m, 16f, SRP2004071302, (163IMH). ARKHANGAI Aimag, Bulgan Soum, Urd Tamir Gol braid upstream of bridge~63 km SW of Tsetserleg N 47.11192 E 101.01048, 2066 msl, 13 July 2004, JKGelhaus, 2m, SRP2004071302, (090ANSP). BAYAN-OLGII Aimag, Bulgan Soum, Bulgan Gol, roadside pools, and drying mud flats near ~28 km N Bulgan N 47.11549 E 90.94127, 2122 msl, 8 July 2009, SWJudson, 1 lot, MAIS2009070801, (833BYU). BAYANOLGII Aimag, Deluun Soum, Tcigertein Gol 15 Km SW Deluun Soum, 21 July 1978, Puntsagdulan, 1 lot, Puntsagdulan21July1978, (888BYU). BAYAN-OLGII Aimag, Ulaankhus Soum, Sogoog Gol, 3.5 km East of Khokh Khotol, hidden valley rapids, N 49.23285 E 88.90569, 2090 msl, 7 July 2008, CRNelson, 1m, 18f, MAIS2008070702, (035BYU). KHOVSGOL Aimag, Renchinlhumbe Soum, Hugin Gol, toll bridge, 46.8km N of Ulaan Uul town, N 51.09845 E 99.32051, 1557 msl, 1 July 2006, CRNelson, 1f, SRP2006070101, (117BYU). KHOVSGOL Aimag, Renchinlhumbe Soum, Hugin Gol, toll bridge, 46.8km N of Ulaan Uul town, N 51.09845 E 99.32051, 1557 msl, 1 July 2006, CRNelson, 1f, SRP2006070101, (147BYU). KHOVSGOL Aimag, Renchinlhumbe Soum, Jarin Gol, 32.8 km N of Renchinlhumbe, river crossing N 51.39852 E 99.75011, 1575 msl, 2 July 2006, CRNelson, 3f, SRP2006070203A, (164BYU). KHOVSGOL Aimag, Renchinlhumbe Soum, Jarin Gol, 32.8 km N of Renchinlhumbe, river crossing N 51.39852 E 99.75011, 1575 msl, 2 July 2006, JKGelhaus, 1f, SRP2006070203A, (165ANSP). KHOVSGOL Aimag, Renchinlhumbe Soum, springs of Shishged Gol, 36 km NNE of Ulaan Uul town, N 50.99171 E 99.35400, 1584 msl, 30 June 2006, Malaise, 5m, 15f, SRP2006063002, (022ANSP). KHOVSGOL Aimag, Renchinlhumbe Soum, springs of Shishged Gol, 36 km NNE of Ulaan Uul town, N 50.99171 E 99.35400, 1584 msl, 30 June 2006, JKGelhaus, 10f, SRP2006063002, (023ANSP). KHOVSGOL Aimag, Renchinlhumbe Soum, springs of Shishged Gol, 36 km NNE of Ulaan Uul town, N 50.99171 E 99.35400, 1584 msl, 30 June 2006, CRNelson, 34m, 90f, SRP2006063002, (141BYU). KHOVSGOL Aimag, Renchinlhumbe Soum, Arsayn Gol, 16.2 km N of Renchinlhumbe town, N 51.25356 E 99.66687, 1565 msl, 2 July 2006, SRP Team, 1 lot, SRP2006070201, (1039BYU). KHOVSGOL Aimag, Ulaanuul Soum, Gunain Gol, 12 km SW of Ulaan Uul N 50.61826 E 99.12094, 1761 msl, 29 June 2006, CRNelson, 1f, SRP2006062903, (138BYU). KHOVSGOL Aimag, Jargalant gol 25 km NW Khank, J. Gelhaus, 1 lot, JKG721_763, (615ANSP). KHOVSGOL Aimag, Renchinlhumbe Soum, Har-Us Spring, Jargalant Gol 4.2 km SE of Renchinlhumbe N 51.07845 E 99.70774, 1586 msl, 1 July 2006, SRP Team, 1 lot, SRP2006070102, (1038BYU). SELENGE Aimag, Bugant/Yaroo Soum, pond near Yeroo R N 49.05466 E 107.23749, 907 msl, 18 July 2003, SRP Team, 1 lot, SRP2003071802, (717IMH).