Study on Insects (Orthoptera) of Mongolia

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Abstract: The research findings of 2 families, 23 species and 231 individuals represented meagerly 8% of the total in Mongolia. It can be attributed to the short research period and limited research sites of the Orkhon river basin. An insect is one of the natural resources that are exposed to the threats by global climate change and environmental destruction by human beings. An insect is an index species that is the most sensitive to the environmental changes. Therefore, there is an urgent need to identify the systemic and comprehensive entomo fauna of Mongolia and provide basic data and information for future biological resources.

Key words: Orkhon river, Orthoptera

Introduction

The most prosperous and numerous taxon, insects, have had a long-standing relationship with human. However, they have been unfairly treated as trivial bugs for they were long regarded as hazardous to human life or agriculture. Today, the insect resources, sources of bio-industry and a key to future survival, are used in various ways; natural enemies, vectors for pollination, industrial uses, medical uses, foods and forensic insects, not to mention a gene pool. Recently, pet insects appeared. Thus, insects are not trivial but they will draw the most attention in the future as limitless biological resources and a must for ecological balance and human life.

Research Objective and Period

As part of research in the Mongolian world natural heritage, Orkhon River basin, which was the Korea-Mongolia joint academic research, it was intended to identify the entomo fauna (Patanga japonica, Patanga japonica) in the Orkhon river basin and provide basic data, information and distribution of insects to compare new species in the wake of environmental changes.

The research was conducted from Aug. 13 to Aug. 29, 2007 in the river basin including Bat-Ulzi and Kharhorin which were Orkhon cultural relics (Fig. 1). The research sites for collection were identified with GPS (Table 1).

Research Method

Insects were swept on the grass or caught listening their sounds. The insects caught were immersed in 70% alcohol and made into samples after sent to the Museum. For identification and accurate inspection, Dr. S. Y. Stypczhenko from Russian Academy Of Sciences Far Eastern Branch Institute of Biology and Soil Science lent supports.

Results and Consideration

Overview

Grasshoppers that appeared in the Carboniferous period of the Paleozoic era (from 380 million years ago to 280 million years ago) were used for foods (locust) and for medical purposes (grasshoppers, Gryllotalpa orientalis, Verlarifictorus aspersus, Gampsocleis sedakovi obscura, etc.). In addition, they had a close relationship with human so much so that the damage incurred by swarms of Locusta migratoria (Linne) was regarded as one of four disasters together with drought, earthquake and flood.

In the past Patanga japonica, Patanga japonica included roaches, praying mantis and stick insects, but now it encompasses grasshoppers, Gampsocleis sedakovi obscura, Verlarifictorus aspersus and Gryllotalpa orientalis. Grasshoppers are found everywhere except the polar areas. Particularly, many species are found in tropical areas. There are 24,000 or so species around the world and 12 families and 125 species (1994, Korean Insect Name Book) in Korea. Although the research is underway, it is presumed that there will be about 200 species in South and North Korea. As much of Mongolia was covered with meadows and its territory was wider than the Korean peninsula, it is
estimated that there would be 250 or so species of grasshoppers and 13,000 species of insects.

**General shape**

A grasshopper varies in body size from 5 mm to 130 mm depending on species. Its body color depends on surroundings. Grasshoppers on the land are gray, brown, yellow or dark brown while those in trees or grass are green or light-colored.

Its head is large and hypognathous, but some are prognathous. Its mouth is well developed to chew. It has two compound eyes and 2 to 3 stenmas. Nocturnal species or those living underground or in a cave have small eyes or degenerate eyes. The species moving around in the daylight have well-developed compound eyes. Its antenna is filiform, clavate, and setaceous depending on species. Grasshoppers have short and dull-ended antennas and *Gampsocleis sedakovi obscura* has a long and slim antenna. Its wings are thick and have cross grades and resembles its surroundings in color or shape. The front wings are composed of coriaceous, which covers abdomen and thorax for protection and nerves are specialized to rub sound organs. The rear wings are membranous and settled down vertically below front wings when the insect stays still. When the rear wings spread, they are called Orthoptera because nerves are radiated. Some species have degenerated front and rear wings. Others are well-developed wings. Its pronotum is large and some pronotums are long enough to cover the whole abdomen. Its metathorax and the first tergite are closed connected. Front and middle legs are short and suitable to crawl and hind legs are developed to leap. *Patanga japonica*, *Patanga japonica* is often called jumping. Front legs of *Xyu japonica* and *Gryllotalpa orientalis* are deformed like hands suitable to dig the earth. The arrangement of tarsus, tibia and apical spur is key to classify the insect. Ensifera makes sounds by rubbing nerves on front wings on the left and right because it has a tympanal organ. Caelifera makes sound by rubbing femur on the rear leg and front wings. Mostly male insects make sounds but, some female ones make sounds. The rhythm is a clue for classification as it is a unique characteristic of a species.

The abdomen is cylindrical and has a total of 11 nodes. The first node is integrated with metathorax and the rest 10 nodes are clear. Rear nodes are adopted to support reproduction and there is a trace of the 11th node. A male has a pair of cercus on the ninth dorsal plate. The cercus varies in length or number of nodes. And it is mostly short and hard, but Ensifera has long and flexible cercus. The male of Tettigonioides uses claspers when mating. Some have underdeveloped ovipositors while *Gampsocleis sedakovi obscura* and *Verlarifictorus aspersus* have sword-shaped or spear-shaped ovipositors. The ovipositor of Ensifera looks like a long sword or a spear. It is proper to lay eggs in a plant texture or soft dirt or narrow crack. Usually, male reproduction organs are not exposed.

They generally live on the ground or in a tree. Some live in a humid log or under a rock or in a cave. They live alone while some species live in swamps. Depending on conditions, they grow big enough to wreck a havoc to fields or pavements. The damage by *Locusta migratoria* (Linne) is famous. Most of them are herbivorous while some of Ensifera are omnivorous or carnivorous. Some species become omnivorous when foods are scarce though they originally are carnivorous. In most cases, they are active. *Patanga japonica*, *Patanga japonica* moves around in the

### Table 1. GPS Coordinates of Orkhon River Research Sites

<table>
<thead>
<tr>
<th>GPS No.</th>
<th>Latitude</th>
<th>Longitude</th>
<th>Date</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Degree</td>
<td>Min</td>
<td>Sec</td>
<td>Degree</td>
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<tr>
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<td>94</td>
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<td>32.70</td>
<td>105</td>
</tr>
<tr>
<td>215</td>
<td>46</td>
<td>55</td>
<td>19.32</td>
<td>102</td>
</tr>
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<td>7.36</td>
<td>106</td>
</tr>
<tr>
<td>317</td>
<td>47</td>
<td>58</td>
<td>35.49</td>
<td>107</td>
</tr>
</tbody>
</table>
daylight while Ensifera moves at night. Most of them are gamogenetic. They lay eggs once a year and eggs or larvae spend winter. In Jeju, Locusta migratoria (Linne), Patanga japonica (Bolivar) and Eucnemopsephilus nasutus spend winter as adult insects. Egg-laying grounds or seasons are different from species. Ensifera lays an egg inside a stalk or leaf of plant or on a leaf, moisty earth. Caelifera digs earth and lays a group of eggs in it. Usually they shed off 4-6 times till they become adults.

Result
The outdoor research was conducted for 17 days from Aug. 13 to Aug. 29, 2007 and 2 families, 23 species and 231 individuals of Patanga japonica. Patanga japonica were collected in 6 sites (Table 1).

Here is the list of insects caught. (The numbers refer to GPS coordinates. Families were arranged in an alphabetical order.

Order Orthoptera 메뚜기목
Family 1. Tettigoniidae 여기와
1. Deracanthella aranea (Fischer-Waldheim, 1833) [Sample research] 215[1 ♂, 1 ♀, 20-VIII-2007] [Reference] Not found in the Korean peninsula.
4. Metroptera brunnea (Linnaeus, 1761) 동방애메 [Sample research] 170[1 ♂, 1 ♀, 18-VIII-2007] [Distribution] North Korea, Mongolia, Russia, Europe, China, Kazakhstan etc.

Family 2. Acrididae 메뚜기과

[Reference] Not found in the Korean peninsula.
11. Chorthippus montanus (Charpentier, 1825) 긴수염애메뚜기 [Sample research] 170[1 ♂, 1 ♀, 18-VIII-2007]; 215[1 ♂, 1 ♀, 20-VIII-2007] [Distribution] Korea(North), Russia, Northern China, Mongolia, Europe etc.
[Reference] Not found in the Korean peninsula.
Mongolia, and Kazakhstan while the central and western Siberia, China (Inner Mongolia), Korea.

Tettigoniidae, Gampsocleidini, is distributed only in North northern parts of China.

Omocestus haemorrhoidalis (Charpentier, 1825) 대륙 메뚜기

[Sample research] 215[1♀, 20-VIII-2007]; 316[1♂, 1♀, 24-VIII-2007]

[Reference] Not found in the Korean peninsula.

14. Omocestus haemorrhoidalis (Charpentier, 1825) 대륙 메뚜기

[Sample research] 215[1♀, 20-VIII-2007]; 316[1♂, 1♀, 24-VIII-2007]

[Distribution] Korea(North, Central, South, Jeju), Russia, Europe, Central Asia, China, Mongolia etc.

15. Omocestus patraeus (Brisout-Brareville, 1855)


[Reference] Not found in the Korean peninsula.

16. Stauroderus scaralis (Fischer von Waldheim, 1846) 강 원애기 메뚜기(가정)

[Sample research] 170[1♀, 18-VIII-2007]; 316[1♀, 26-VIII-2001]

[Reference] Not found in the Korean peninsula.

17. Stenobothrus fischeri (Eversmann, 1848)

[Sample research] Terelj National Park[1♀, 26-VI-2001]; 316[1♀, 24-VIII-2007]

[Reference] Not found in the Korean peninsula.

18. Stenobothrus lineatus lineatus (Panzer, 1796)

[Sample research] Terelj National Park[1♀, 26-VI-2001]; 170[1♂, 18-VIII-2007];

[Reference] Not found in the Korean peninsula.

19. Stethophyma grossum (Linnaeus, 1758) 날개끝검은메뚜기(신칭)

[Sample research] 215[1♀, 20-VIII-2007]

[Reference] Korea(Mt. Baekdusan), Mongolia etc.

Consideration

Distribution of species

D. (Pallas, 1772)(Provisional), which belongs to Tettigoniidae, Deracanthini is not found in the Korean peninsula. However, Deracantha transversa Uvarov, 1930, which belongs to the same genus, is distributed in North Korea. Records of Deracantha transversa Uvarov, 1930 remained in South Korea, which is presumed to be mistakenly identified.

G. sedakovi sedakovi (Fischer-Waldheim, 1846), which belongs to Tettigoniidae, Gampsocleidini, is smaller than those in the Korean peninsula and black spots scattered on the fore wings distinguish it as subspecies. G. sedakovi sedakovi (Fischer-Waldheim, 1846) is distributed in Russia, the central and western Siberia, China (Inner Mongolia), Mongolia, and Kazakhstan while Gampsocleis sedakovi obscura is distributed in Korea, Far East and eastern and northern parts of China.

M. brachyptera (Linnaeus, 1761), which belongs to Tettigoniidae, Gampsocleidini, is distributed only in North Korea.

A. sibiricus sibiricus (Linnaeus, 1767), which belongs to Acrididae, Gomphocerini, is distributed in Mongolia and Russia. Its records remained in the Korean peninsula, but it is mistakenly identified with Anoplopuda (Caudell, 1927). It is distributed in North Korea.

C. biguttatus (Linnaeus, 1758), which belongs to Acrididae, Gomphocerini, is not found in the Korean peninsula.

C. fallax fallax (Zubovsky, 1900), which belongs to Acrididae, Gomphocerini, was collected in the central peninsula, Kangwondo, because its number of individuals seemed low.

C. albomarginatus caliginosus Mistshenko, which belongs to Acrididae, Gomphocerini, is not found in the peninsula.

C. intermedius Bey-Bienko, 1926, which belongs to Acrididae, Gomphocerini, is distributed only in North Korea.

C. montanus (Charpentier, 1825), which belongs to Acrididae, Gomphocerini, is distributed only in North Korea.

G. biguttatus biguttatus (Linnaeus, 1758), which belongs to Acrididae, Gomphocerini, is not found in the peninsula.

A. barbatus Pallas, 1773, which belongs to Acrididae, Eyprepocnemidini, is not found in the peninsula.

A. albogenuculate Ikonnikov, 1933, which belongs to Acrididae, Acrystepini, is not found in the peninsula. Two species of A. coreana Shiraki, 1930 and A. orientalis Storozhenko, 1988 are found in the peninsula. A. coreana Shiraki, 1930 is distributed in Korean peninsula including Jeju while A. orientalis Storozhenko, 1988 is distributed in North Korea.

B. tuberculatum dilutum (Stoll, 1813), which belongs to Acrididae, Bryodemiini, is distributed in the central and northern part of the peninsula. It makes sound while flying on the meadow. It is very common in the Mongolian meadow.

C. abbreviatus Ikonnikov, 1913, which belongs to Acrididae, Calliptaminini, is distributed in the peninsula including Jeju. Ikonnikov(1913) was the first to record it in Korea. Smaller one is similar to Eyprepocnemis shiraki, but it is easily distinguished because its femur of rear leg is very thick.

O. haemorrhoidalis (Charpentier, 1825), which belongs to Acrididae, Stonothorbinii, is alpine. Bey-Bienko and Mistshenko(1951) were the first to spot it in Korea and Cheong(2001) first found it in Jeju.

O. patraeus (Brisout-Brareville, 1855), which belongs to Acrididae, Stonothorbinii, is not distributed in the peninsula. S. scaralis (Fischer von Waldheim, 1846), which belongs to Acrididae, Stonothorbinii, was identified by Ichikawa Tominaga(2002) in Korea, but it was mistakenly identified with other species. It is not distributed in the peninsula.

S. fischeri (Eversmann, 1848) and S. lineatus lineatus (Panzer, 1796), which belong to Acrididae, Stonothorbinii, are not distributed in the peninsula.

O. asiaticus Bey-Bienko, 1941, which belongs to
Acrididae, Locustini is not distributed in the peninsula. Once species of *O. infernalis* Saussure, 1884 belongs to this genus.

*S. grossum* (Linnaeus, 1758)(new name), which belongs to Acrididae, Parapleurini is distributed in North Korea.

Species and genus of *Bicolorana bicolorana bicolorana* (Philippi, 1830) are not found in the peninsula.

Species and genus of *Glyptocephalus biguttulus biguttulus* (Linnaeus, 1758) are not found in the peninsula.

Species found in the Korean peninsula and Mongolia were 2 families and 7 species including *M. brachyptera* (Linnaeus, 1761), *B. tuberculatum dilutum* (Stoll, 1813), *Calliptamus abbreviatus* Ilonnikov, 1913, *Chorthippus fallax fallax* (Zubovsky, 1900), *Chorthippus intermedius* Bey-Bienko, 1926
Species not found in the peninsula were 2 families and 14 species including *D. aranea* (Fischer-Waldheim, 1833), *Chorthippus montanus* (Charpentier, 1825) and *Omocestus haemorrhoidalis* (Charpentier, 1825).


2 Consideration by site

The appearing species were 17 species at GPS 170 (7,096 m), 14 species at GPS 215 (5,557 m), 9 species at GPS 316 (5,073 m), 5 species at GPS 99 (3,832 m), 4 species at Terelj National Park (4,958 m), 4 species at GPS 259 (5,450 m), 1 species at GPS 315 (4,212 m) and 1 species at Mongolian Academy. They differ depending on collection time and surroundings (Fig. 2).

The numbers of individuals by height were 84 individuals at GPS 215 (5,557 m), 43 individuals at Terelj National Park (4,958 m), 36 individuals at GPS 170 (7,096 m), 31 individuals at GPS 316 (5,073 m), 27 individuals at GPS 99 (3,832 m), 8 individuals at GPS 259 (5,450 m), 1 individual at GPS 315 (4,212 m) and 1 individual at Mongolian Academy (Fig. 3, Table 2).

Two individuals of *Deracantha aranea* (Fischer-Waldheim, 1833) (provisional) were collected at GPS 215 (5,557 m) (Fig. 4-1).

Ten individuals of *D. onos* (Pallas, 1772) were collected at 215 (5,557 m) (Fig. 4-2).

Seventeen individuals and ten individuals of *Deracantha aranea* (Fischer-Waldheim, 1846) (provisional) were found at GPS 316 (5,073 m) and GPS 215 (5,557 m), respectively (Fig. 4-3).

Two individuals of *M. brachyptera* (Linnaeus, 1761) were collected at GPS 170 (7,096 m) (Fig. 4-4).

Thirty nine individuals of *Aeropus sibricus sibricus* (Linnaeus, 1767), which belonged to Gomphocerini, were collected at GPS Terelj National Park (4,958 m) (Fig. 5-1).

28 individuals of *C. fallax? fallax?* (Zubovsky, 1900)
collected at GPS 215 (5,557 m), 2 individuals at GPS 259 (5,450 m) and 1 individual at GPS 170 (7,096 m) (Fig. 5-2).

Three individuals of *Chorthippus albomarginatus caliginosus* Mistshenko, 1951 were collected at GPS 170 (7,096 m) and 1 individual at GPS 316 (5,073 m) (Fig. 5-3).

Three individuals of *C. intermedius* Bey-Bienko, 1926 were collected at GPS 170 (7,096 m) and 1 individual at GPS 170 (7,096 m) (Fig. 5-3).

Two individuals of *C. montanus* (Charpentier, 1825) were collected at GPS 170 (7,096 m) and two individuals at

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**Fig. 5.** Number of appearing individuals by height of Acrididae.
Four individuals of *G. biguttulus biguttulus* (Linnaeus, 1758) were collected at GPS 170 (7,096 m), 4 individuals at GPS 99 (3,832 m), 4 individuals at GPS 215 (5,557 m) and 3 individuals at GPS 315 (4,212 m) (Fig. 5-5).

Nine individuals of *Angaracris barabensis* Pallas, 1773, which belonged to Eyprepocnemidini, were collected at GPS 99 (3,832 m), 7 individuals at GPS 215 (5,557 m), 4 individuals at GPS 259 (5,450 m), 3 individuals at GPS 170 (7,096 m) and 1 individual at GPS 316 (5,073 m) (Fig. 6).

Two individuals of *Arcyptera albogeniculata* Ikonnikov, 1933, which belonged to Arcypterini, were collected at GPS 316 (5,073 m), 1 individuals at GPS 215 (5,557 m) and 1 individual at GPS 170 (7,096 m) (Fig. 7).

Five individuals of *B. tuberculatum dilutum* (Stoll, 1813), which belonged to Bryodemini, were collected at GPS 316 (5,073 m), 3 individuals at GPS 170 (7,096 m), and 1 individual at GPS 259 (5,450 m) (Fig. 8).

Twelve individuals of *C. abbreviatus* Ikonnikov, 1913, which belonged to Calliptamini, were collected at GPS 99 (3,832 m), 4 individuals at GPS 215 (5,557 m) and 3 individuals at GPS 170 (7,096 m) (Fig. 9).

Two individuals of *O. haemorrhoidalis* (Charpentier, 1825), which belonged to Stenobothrini, were collected at GPS 215 (5,557 m) and 1 individual at GPS 316 (5,073 m) (Fig. 9-1).

One individual of *Omocestus pataeae* (Brissout-Brareville, 1855) was collected at GPS Terelj National Park (4,958 m) and 1 individual at GPS 99 (3,832 m) (Fig. 9-2).

One individual of *S. scaralis* (Fischer von Waldheim, 1846) (provisional) was collected at GPS 316 (5,073 m) and 1 individual at GPS 170 (7,096 m) (Fig. 9-3).

Two individuals of *Stenobothrus fischeri* (Eversmann, 1848) were collected at GPS Terelj National Park (4,958 m), and 1 individual at GPS 316 (5,073 m) (Fig. 9-4).

One individual of *S. lineatus lineatus* (Panzer, 1796) was collected at GPS Terelj National Park (4,958 m) (Fig. 9-5).

Twelve individuals of *O. asiaticus* Bey-Bienko, 1941, which belonged to Locustini, were collected at GPS 215 (5,557 m), 5 individuals at GPS 316 (5,073 m) and 1 individual at GPS 259 (5,450 m) (Fig. 10).

One individual of *S. grossum* (Linnaeus, 1758) (new name), which belonged to Parapleurini, was collected at GPS 215 (5,557 m) (Fig. 11).

Two individuals of *Bicolorana bicolorana bicolorana* (Philippi, 1830) were collected at GPS 170 (7,096 m) (Fig. 12).

One individual of *Glyptobothrus biguttulus biguttulus* (Linnaeus, 1758) was collected at GPS 170 (7,096 m) and 1 individual at GPS 99 (3,832 m) (Fig. 13).

The research findings of 2 families, 23 species and 231 individuals represented meagerly 8% of the total in Mongolia. It can be attributed to the short research period and limited research sites of the Orkhon river basin. An insect is one of the natural resources that are exposed to the threats by global climate change and environmental destruction by human beings. An insect is an index species that is the most sensitive to the environmental changes. Therefore, there is an urgent need to identify the systemic and comprehensive entomo fauna of Mongolia and provide basic data and information for future biological resources.
Fig. 9. Number of appearing individuals by height of Stenobothrini.

Fig. 10. Number of appearing individuals by height of *Oedaleus? asiaticus*? Bey-Bienko, 1941.

Fig. 11. Number of appearing individuals by height of *S. grossum* (Linnaeus, 1758).
Fig. 12. Number of appearing individuals by height of *Bicolorana bicolorana* (Philippi, 1830).

Fig. 13. Number of appearing individuals by height of *Glyptobothrus biguttulus* (Linnaeus, 1758).

Appendix

Fig. 1. 몽골민충이(provisional) Habit/*Deracantha onos* (Pallas, 1772).

Fig. 2. 몽골민충이(provisional) ♀/*Deracantha onos* (Pallas, 1772).

Fig. 3. 몽골민충이(provisional) ♀/*Deracantha onos* (Pallas, 1772).

Fig. 4. 몽골여치(provisional) ♂/*Gampsocleis sedakovii sedakovii* (Fischer-Waldheim, 46).
Fig. 5. *Metrioptera brachyptera* (Linnaeus, 1761).

Fig. 6. *Aeropus albivicis sabricus* (Linnaeus, 1767) ♀.

Fig. 7. *Angara cris barabensis* (Pallas, 1773) ♂.

Fig. 8. *Angara cris barabensis* (Pallas, 1773) ♀.

Fig. 9. *Arcyptera albogenticulata* (Ikonokov, 1933) ♀.

Fig. 10. *Bicolorana bicolar bicolorana* (Philippi, 1830) ♀.
Fig. 11. 참홍날개메뚜기/Bryodema tuberculatum dilutum (Soll, 1813)
♀.

Fig. 12. 한국땅딸보메뚜기/Calliptamus abbreviatus (Ikonnikov, 1913)♂.

Fig. 13. 한국땅딸보메뚜기♀/Calliptamus abbreviatus (Ikonnikov, 1913).

Fig. 14. 북방애메뚜기♂/Chorthippus fallax fallax (Zubovsky, 1900).

Fig. 15. 북방애메뚜기♀/Chorthippus fallax fallax (Zubovsky, 1900).

Fig. 16. Chorthippus albomarginatus caliginosus (Mitschenko, 1951).
Fig. 17. 긴수염애메뚜기♂ / Chorthippus montanus (Charpentier, 1825).

Fig. 18. 긴수염애메뚜기♀ / Chorthippus montanus (Charpentier, 1825).

Fig. 19. Oedaleus asiaticus (Bey-Bienko, 1941)♀.

Fig. 20. Oedaleus asiaticus (Bey-Bienko, 1941) Mating.

Fig. 21. 대륙애메뚜기♀ / Omocestus haemorrhoidalis (Charpentier, 1825).

Fig. 22. Stenobothrus lineatus lineatus (Panzer, 1796)♀.
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