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The distribution of antlions in Mongolia (Insecta: Neuroptera: Myrmeleontidae)

by

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ABSTRACT

The Mongolian antlion fauna consists of Trans-Palaearctic (1 species), Scythian (8 species) and Sethian (17 species) groups. There are five species and one genus, *Mongoleon* Hölzel, in the Sethian zoogeographic group that are endemic to the Gobi Desert. Thirty one percent of the species that occur in Mongolia are endemic to the country, and 31 % are widespread Palaearctic species.

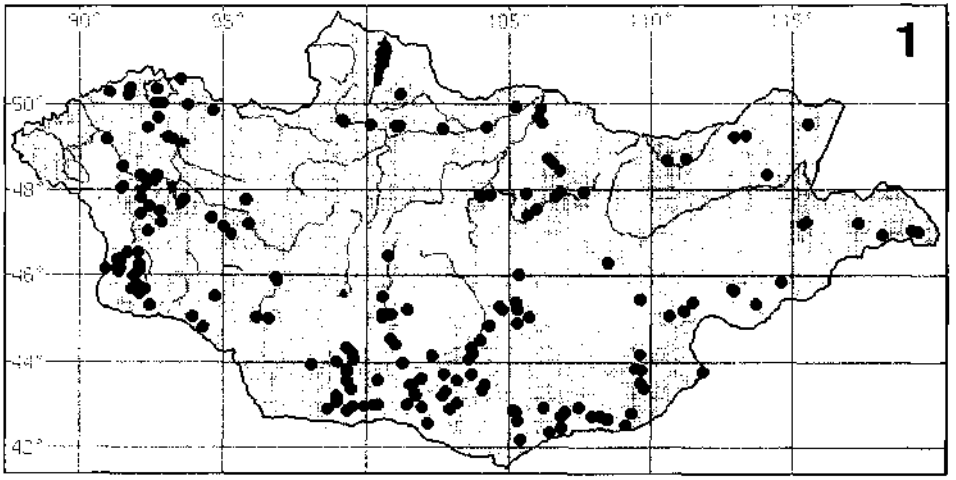
Key words: Myrmeleontidae, Mongolia, zoogeography, desert, semidesert, steppe, endemism, antlion distribution.

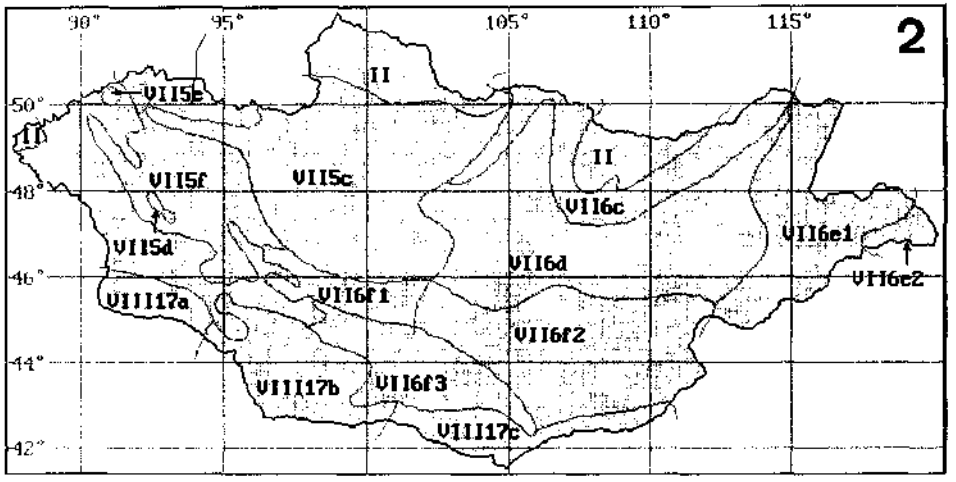
INTRODUCTION

No antlions had been recorded from Mongolia before the study of KASZAB's collection by HÖLZEL (1970a, b), who described and recorded 21 species. Twenty six species are now known from Mongolia. After having studied 1 165 specimens of antlions from Mongolia, we believe that it is sufficient for a preliminary analysis of their geographical distribution. More than half of these specimens were investigated by the authors who dealt with the following aspects: systematics (V.A.K.), zoogeography (A.F.E.), and computer analysis (A.L.L.).

MATERIAL AND METHODS

Material collected by the Hungarian Zoological Expeditions (1964-1967) formed the basis of HÖLZEL's (1970a, b) publications. These collections are in the Hungarian Natural History Museum, Budapest, Hungary (HNHM), the Zoological Museum, Humboldt University Museum, Berlin, Germany (ZMHB), and some specimens have been acquired through exchange by the Zoological Institute of the Russian Academy of Sciences, St Petersburg, Russia (ZMAS). Numerous specimens from the many Russian expeditions to Central Asia from the end of the 19th century to 1986 are also preserved in the latter collection. Some data on Russian collections from Mongolia were published in other papers by KRIVOKHATSKY (1990, 1992, 1993), and all the others were included in the computer database. Six type specimens of five species from HNHM were investigated during the course of this study.





Figs 1 & 2. Distribution of antlions in Mongolia. **1:** Localities where Myrmeleontidae have been recorded. **2:** Zoogeographical subdivisions of Mongolia (after EMELJANOV 1974, with some additions). The regions are in Roman numerals (**reg.**), the provinces are in Arabic numbers (**prov.**), and the subprovinces in lower case Latin characters (**sbpr.**).

II -	Eurosibirian taiga **reg.** (overall)	VII6e1 -	Barginian steppe **sbpr.**
VII -	Scythian steppe **reg.**	VII6e2 -	Barginian forest-steppe **sbpr.**
VII5 -	West Mongolian **prov.**	VII6f1 -	North Gobian **sbpr.**
VII5c -	Transsayanian **sbpr.**	VII6f2 -	Mandal Gobian **sbpr.**
VII5d -	Mongol-Altay (Khangay) **sbpr.**	VII6f3 -	Gobi-Altay **sbpr.**
VII5e -	Ubsian **sbpr.**	VIII -	Sethian desert **reg.**
VII5f -	Kharausian **sbpr.**	VIII17 -	Gobian desert **prov.**
VII6 -	East Mongolian **prov.**	VIII17a -	Dzhungarian **sbpr.**
VII6c -	Cis-Khentey **sbpr.**	VIII17b -	Central Gobi **spr.**
VII6d -	Khalkhassian **spr.**	VIII17c -	Alashanian **sbpr.**

Data were processed on an IBM-AT® personal computer, using the programme FoxPro®. The database consists of five files, of which the three most important are:
- *a locality database:* 1 006 localities, including 188 localities where antlions were collected (Fig. 1). Geographical coordinates were obtained from a Mongolian map, scale 1:3 000 000 (CHUMICHEV 1972), and the names of localities are from the volume on Mongolia in the U.S. Gazetteer (Anonymous 1970). The itineraries of the Russian and Hungarian expeditions were used for the geographical label determinations (KERZHNER 1972);
- *a systematics database* of Myrmeleontidae comprising 504 taxa and 272 species including 26 valid species from Mongolia;
- *database of antlion species from Mongolian localities*, comprising 359 records of 1 165 specimens.

The maps of antlion distribution were based on the databank, using a FORTRAN programme.

For the geographical analysis, we used boundaries of natural subdivisions: regions, provinces, subprovinces, from the Palaearctic zoogeographical arrangement by EMELJANOV (1974) with some modifications (Fig. 2). The names of areas were also taken from this work. The entire range of each species was described using published and unpublished data from the ZMAS collection. The abbreviations for distribution are the following:

AB	: Arabian Countries
C	: Caucasus
CN	: China
E	: Europe
EE	: East Europe
FE	: Far East of USSR
IA	: East Siberia
IB	: Siberia
IL	: Israel
IR	: Iran
JP	: Japan
KO	: Korea
KZ	: Kazakhstan
ME	: Middle Asia
MN	: Mongolia
NH	: North Africa
RS	: Russia
RSS	: Southern part of the former USSR

Within Mongolia (MN):

(MN) AK	: Ara-Khangay
(MN) BG	: Bulgan
(MN) BK	: Bajan-Khongor
(MN) BU	: Bajan-Ulegey
(MN) CN	: Central
(MN) DZ	: Dzabkhan
(MN) EA	: Eastern
(MN) EG	: East-Gobi
(MN) GA	: Gobi-Altay
(MN) KB	: Khubsugul
(MN) KH	: Khentey
(MN) KO	: Kobd(o)
(MN) MG	: Middle-Gobi
(MN) SB	: Sukhe-Bator
(MN) SG	: South-Gobi
(MN) SL	: Selenga
(MN) UB	: Ubsunur
(MN) UK	: Uver-Khangay.

* * *

COMPOSITION OF THE FAUNA

Holzezus compactus Krivokhatsky, 1992

Holzezus compactus Krivokhatsky, 1992: KRIVOKHATSKY 1992: 407.

Material examined: one paratype from MN (BK), five specimens males and females from ME.

Range and distribution in Mongolia: Turanian-Gobian; deserts with clay soils.

***Lopezus fedtschenkoi* (McLachlan, 1875)**
Lopezus fedtschenkoi gobiensis Hölzel, 1970: HÖLZEL 1970b: 117;
Lopezus fedtschenkoi (McLachlan, 1875): KRIVOKHATSKY 1990: 894;
Lopezus fedtschenkoi morpha *maclachlani* Krivokhatsky, 1990: KRIVOKHATSKY 1990: 896.

Material examined: 55 specimens males and females from MN (BK, CN, EG, GA, KO, SB, SG), including two paratypes of *L. fedtschenkoi gobiensis* (ZMAS); more than 150 specimens from AB, IL, IR, KZ, ME, NH, including the type series of *Myrmecaelurus fedtschenkoi* McLachlan (Moscow University).

Range: Sethian (Ancient Mediterranean); from dry steppes to deserts (except mountain deserts); disjunct in the west of the range in the recent Mediterranean.

Distribution in Mongolia (Fig. 3): eastern boundary of the range corresponds with that of Barginian steppe.

Remark: *L. fedtschenkoi* morpha typica and *L. fedtschenkoi* morpha *maclachlani* occur sympatrically.

***Nohoveus zigan* (H. Aspöck, U. Aspöck & Hölzel, 1980)**
Myrmecaelurus (Nohoveus) zigan H. Aspöck, U. Aspöck & Hölzel, 1980: KRIVOKHATSKY 1993: 626.

Material examined: 26 specimens males and females from MN (DZ, GA, KO), more than 200 specimens from EE, C, ME, KZ, RS.

Range: western Scythian-Turanian, extending to the Valley of the Big Lakes.

Distribution in Mongolia (Fig. 4): throughout the Dzungarian subprovince; isolated part of the range in the Kharausian subprovince.

***Nohoveus atrifrons* Hölzel, 1970**
Nohoveus atrifrons Hölzel, 1970: HÖLZEL 1970a: 248, 1970b: 116;
Myrmecaelurus (Nohoveus) atrifrons (Hölzel, 1970): KRIVOKHATSKY 1993: 628.

Material examined: 40 specimens males and females from MN (BG, BK, CN, EA, EG, GA, KB, KO, SG, UB, UK), 35 specimens males and females from CN, IA.

Range: Mongolian-Gobian, in the desert regions occurring only in the mountains.

Distribution in Mongolia (Fig. 4): from deserts to steppe; in the forest-steppes, reported from the Selenga River Valley (extrazonal steppes).

***Aspoeckiana venusta* Hölzel, 1970**
Aspoeckiana venusta Hölzel, 1970: HÖLZEL 1970a: 252, 1970b: 116.

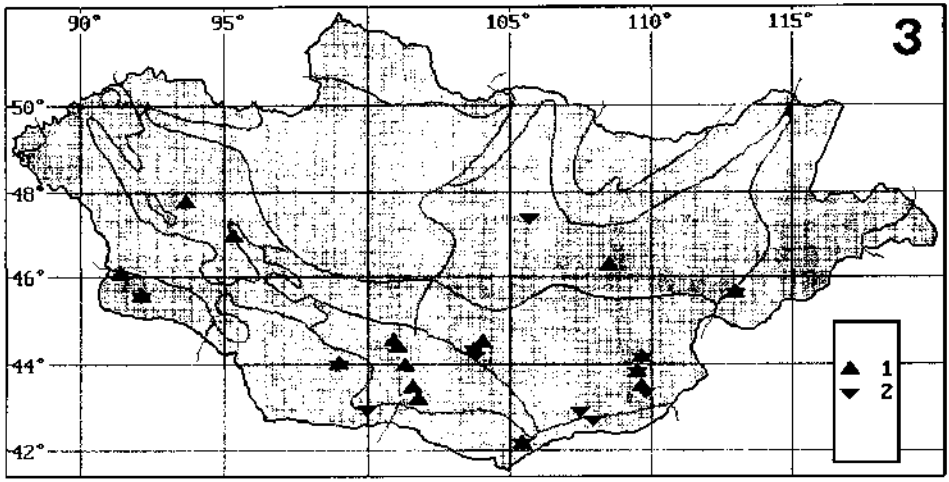
Material examined: 151 specimens males and females from MN (BK, EG, GA, KO, MG, SG, UB), including one paratype (HNHM).

Range and distribution in Mongolia (Fig. 5): Dzhungarian-Gobian; endemic.

***Aspoeckiana uralensis* Hölzel, 1969**
Aspoeckiana uralensis mongolica Hölzel, 1969: HÖLZEL 1970a: 250, 1970b: 116.

Material examined: four specimens males and females from MN (KO), more than 200 specimens from KZ, ME, RSS.

Figs 3-5. Collection localities of: **3:** *Lopezus fedtschenkoi* morpha *typica* (McLachlan) ▲, *L. fedtschenkoi* morpha *maclachlani* Krivokhatsky ▼; **4:** *Nohoveus atrifrons* Hölzel ▲, *N. zigan* (H. Aspöck & U. Aspöck & Hölzel) ▲; **5:** *Aspoeckiana uralensis* Hölzel ●, *A. venusta* Hölzel ▲.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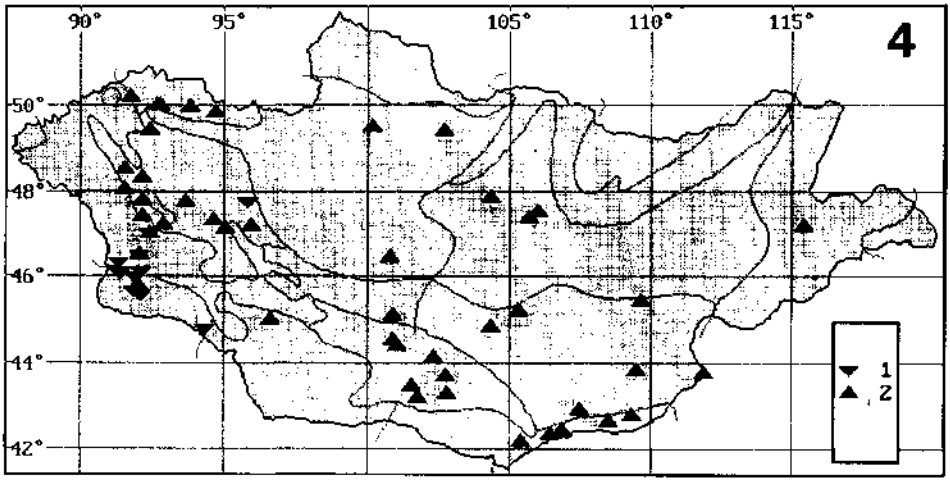
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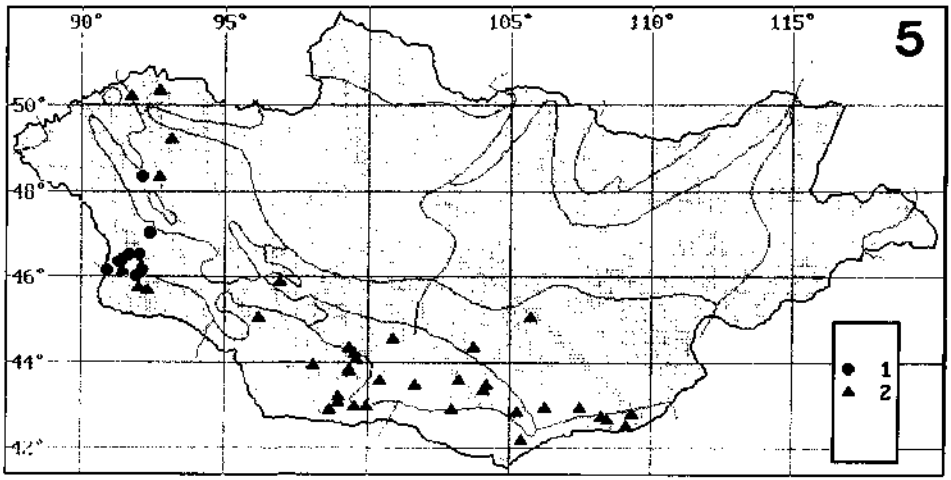
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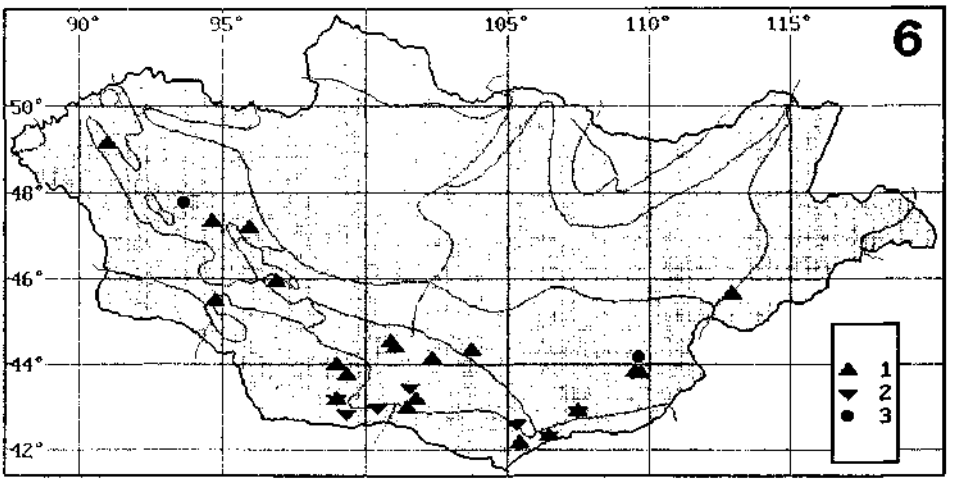
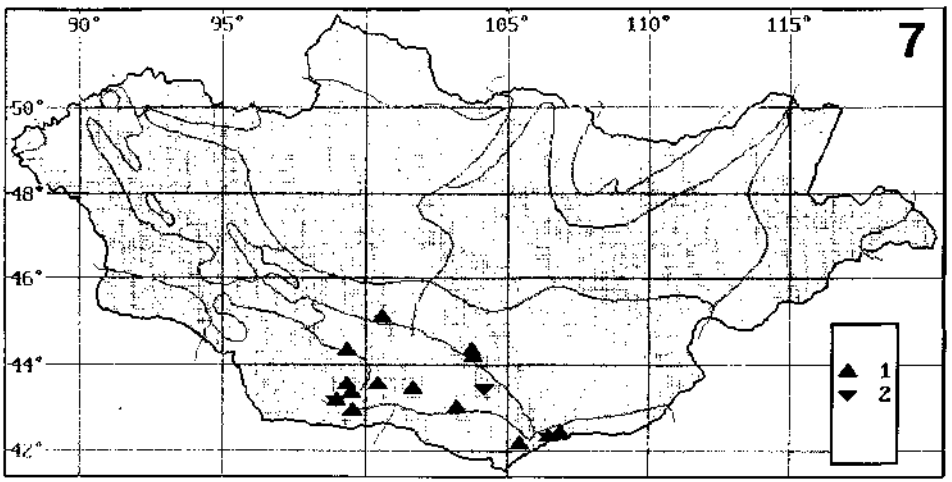
Range: Turanian, except the Dzhungarian part of the basic range; disjunct part placed in Kharausian subprovince; prefers semideserts and avoids sand deserts.
Distribution in Mongolia (Fig. 5): Mongolian part of the range is not connected with the general range of this species.

***Subgulina kerzhneri* Krivokhatsky, 1996**

Subgulina kerzhneri Krivokhatsky, 1996: KRIVOKHATSKY: this volume, p. 313.
Material examined: holotype male from MN (SG), five paratypes males and females from CN (Inner Mongolia).
Range and distribution in Mongolia: Southern-Gobian, Alashanian subprovince only.





Figs 6 & 7. Collection localities of: **6:** *Mongoleon kaszabi* Hölzel ▲ , *M. modestus* Hölzel ▼ , *M. fuscostriatus* Hölzel ■ ; **7:** *Acanthaclisis pallida* McLachlan, typical morpha ▲ and brown striped morpha ▼

***Mongoleon kaszabi* Hölzel, 1970**

Mongoleon kaszabi Hölzel, 1970: HÖLZEL 1970b: 119.

Material examined: 37 specimens males and females from MN (BK, EG, GA, SB, SG, UB), including two paratypes (ZMAS).

Range and distribution in Mongolia (Fig. 6): wide Gobian; deserts and semideserts; in the steppes on the salt soils only.

***Mongoleon modestus* Hölzel, 1970**

Mongoleon modestus Hölzel, 1970: HÖLZEL 1970b: 123.

Material examined 10 specimens males and females from MN (BK, SG), including holotype (HNHM).

Range and distribution in Mongolia (Fig. 6): Gobian; deserts.

***Mongoleon fuscostriatus* Hölzel, 1970**

Mongoleon fuscostriatus Hölzel, 1970: HÖLZEL 1970b: 121.

Material examined: two specimens males from MN (EG, GA), including holotype (HNHM).

Range and distribution in Mongolia (Fig. 6): North-Gobian; semideserts.

***Cueta schamona* Hölzel, 1970**

Cueta schamona Hölzel, 1970: HÖLZEL 1970b: 126.

Material examined: 11 specimens males and females from MN (BK, GA, SG).

Range and distribution in Mongolia: Gobian; deserts.

***Acanthaclisis pallida* McLachlan, 1887**

Acanthaclisis pallida McLachlan, 1887: HÖLZEL 1970b: 128.

Material examined: 26 specimens males and females from MN (BK, SG), more than 100 specimens from CN, KZ, ME, including the holotype (ZMAS).

Range: Turanian-Gobian, throughout deserts and semideserts. The presence of a Dzhugarian-Gobian interruption in the area is likely, but it may also be due to the lack of sufficient collecting data.

Distribution in Mongolia (Fig. 7): associated with small-dune deserts only.

Remarks: in Mongolia this species has two colour morphe: the typical one and, in other parts of its range, another morpha which has a long brown stripe along Cu-vein of the forewing. There are no intermediate forms between the two morphe.

***Euroleon polyspilus* (Gerstäcker, 1885)**

Euroleon polyspilus (Gerstäcker, 1885): HÖLZEL 1970b: 128.

Material examined: one female from MN (CN), 20 specimens males and females from FE, IA.

Range and distribution in Mongolia (Fig. 8): East-Mongolian-Dunbeian, in the Cis-Khentey subprovince only; widely distributed in forest-steppe areas.

***Euroleon coreanus* Okamoto, 1924**

Euroleon coreanus Okamoto, 1924.

Euroleon sinicus (Navás, 1930): HÖLZEL 1970a: 254, 1970b: 128.

Material examined: 14 specimens males and females from MN (BG, BK, EA, EG, KB, MG, SL, UK), 45 specimens males and females from CN, FE, KO.

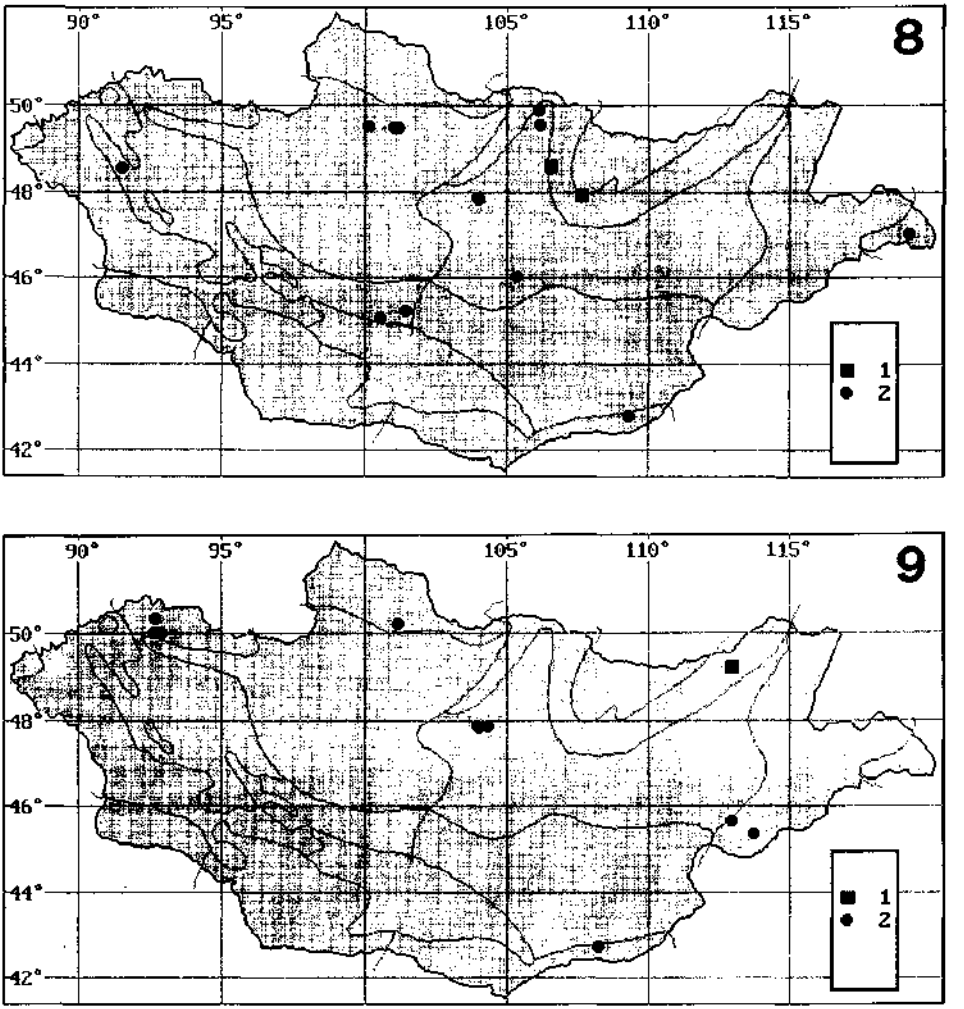
Range: East-Scythian, widely distributed in the steppe, but not in semideserts.

Distribution in Mongolia (Fig. 8): steppe and forest-steppe.

***Myrmeleon (Myrmeleon) formicarius* Linnaeus, 1767**
Mymeleon formicarius Linnaeus, 1767.

Material examined: one female from MN (EA), more than 300 specimens males and females from C, E, FE, IB, JP, KZ, ME.
Range: Trans-Palaearctic.
Distribution in Mongolia (Fig. 9): forest-steppe.

***Myrmeleon (Morter) immanis* Walker, 1853**
Myrmeleon immanis Walker, 1853.
Grocus pallens Hölzel, 1970: HÖLZEL 1970a: 255, 1970b: 128.



Figs 8 & 9. Collection localities of: **8:** *Euroleon polyspilus* (Gerstäcker) ■, *E. coreanus* Okamoto ● ; **9:** *Myrmeleon formicarius* Linnaeus ■, *M. immanis* Walker ●.

Material examined: 29 specimens males and females from MN (EG, KB, SB, UB), more than 200 specimens from C, CN, EE, KZ, ME, UK.
Range: Scythian; steppe, extending into the Caucasian Mountains.
Distribution in Mongolia (Fig. 9): uncommon; in the steppes, including small steppe habitats in deserts, on salt soils.

***Dendroleon similis* Esben-Petersen, 1923**
Dendroleon similis Esben-Petersen, 1923.
Material examined: one female from MN (SG), five specimens males and females from CN.
Range and distribution in Mongolia: East-Mongolian-Dunbeian; MN SG only.

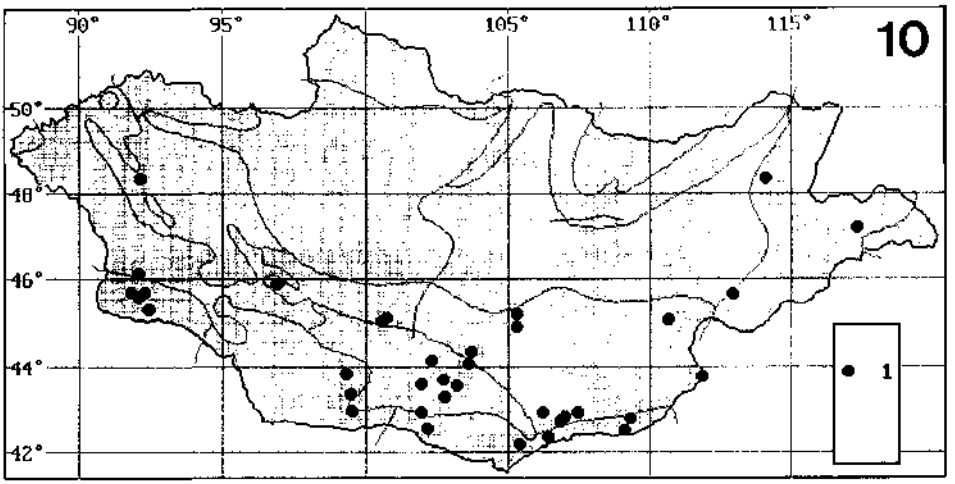
***Neuroleon nigriventris* (Navás, 1913)**
Neuroleon nigriventris (Navás, 1913): HÖLZEL 1970b: 129.
Material examined: 12 specimens males and females from CN, IR, ME; not known from MN.
Range and distribution in Mongolia: Turanian-Gobian; MN (BK, KO) only.

***Neuroleon marcopolo* Hölzel, 1970**
Neuroleon marcopolo Hölzel, 1970: HÖLZEL 1970b: 131.
Material examined: none.
Range and distribution in Mongolia: Goby-Altay MN (SG) only.

***Mesonemurus mongolicus* Hölzel, 1970**
Mesonemurus mongolicus Hölzel, 1970: HÖLZEL 1970a: 262, 1970b: 129, 1987: 396.
Material examined: 73 specimens males and females from MN (BK, EA, GA, KO, SB, SG), including a paratype (HNHM); two females from CN.
Range and distribution in Mongolia (Fig. 10): wide East-Mongolian-Gobian; in the deserts; in the east it extends to the steppe; in China, found in Southern Alashan near Mongolia.
Remark: a very variable species, but easily distinguished from the following species by brown spots on the face.

***Mesonemurus guentheri* Hölzel, 1970**
Mesonemurus guentheri Hölzel, 1970: HÖLZEL 1970a: 259, 1970b: 129, 1987: 395.
Material examined: 57 specimens males and females from MN (BK, EA, EG, KO, MG, SG, UB).
Range and distribution in Mongolia: Gobian with a separate, possibly atypical, range in MN (EA).
Remark: this taxon is probably not a single species, but may be a complex of two or even more species.

***Mesonemurus paulus* (McLachlan, 1875)**
Mesonemurus paulus (McLachlan, 1875): HÖLZEL 1970b: 129, 1987: 397.
Material examined: one female from MN (EA), 65 specimens males and females from KZ, ME, including the type series (Moscow University).
Range and distribution in Mongolia: Turanian-Gobian; MN (EA) only.
Remark: there are many intermediate forms between *M. guentheri* and *M. paulus*; all of them are recorded here as *M. guentheri*.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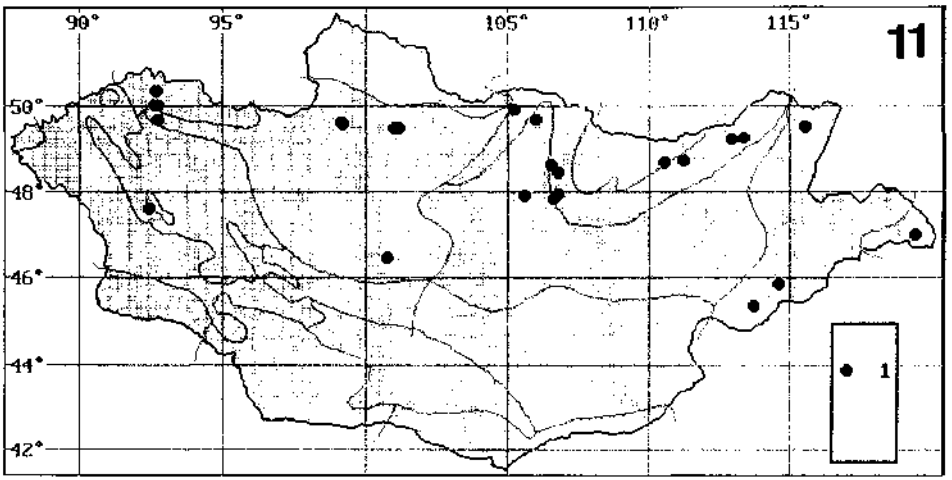
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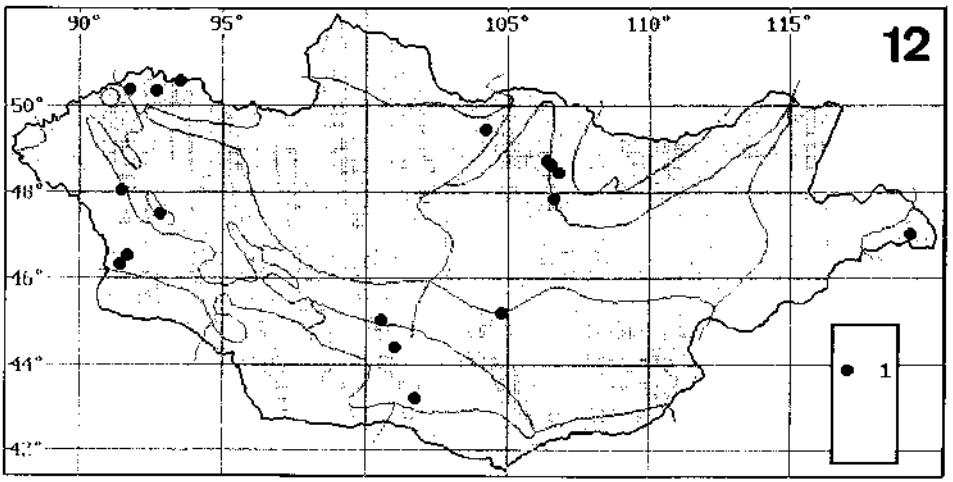
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Figs 10-12. Collection localities of: **10:** *Mesonemurus mongolicus* Hölzel; **11:** *Deutoleon lineatus* (Fabricius); **12:** *D. turanicus* Navás.

***Creoleon aegyptiacus* (Rambur, 1842)**

Myrmeleon aegyptiacus Rambur, 1842.

Material examined: two females from MN (BK, SG), 25 specimens males and females from CN, IR, ME.

Range: Setian (Ancient Mediterranean).

Distribution in Mongolia: isolated part of the area.

Remark: the small amount of material of this species in collections is probably due to a late emergence of the adults (September-October), when most expeditions are over.

***Distoleon solitarius* (Hölzel, 1970) comb. nov.**

Formicaleon solitarius Hölzel, 1970: HÖLZEL 1970b: 132.

Material examined: none.

Range and distribution in Mongolia: MN (KB) only.

***Deutoleon lineatus* (Fabricius, 1798)**

Deutoleon lineatus (Fabricius, 1798): HÖLZEL 1970a: 258, 1970b: 134.

Material examined: 54 specimens males and females from MN (BK, CN, EA, KB, KH, KO, SL, UB), more than 300 specimens from C, CN, EE, FE, IA, KZ, ME.

Range: wide Scythian, with its main part in the forest-steppe.

Distribution in Mongolia (Fig. 11): forest-steppe.

***Deutoleon turanicus* Navás, 1927**

Deutoleon turanicus Navás, 1927: HÖLZEL 1970a: 258, 1970b: 134.

Material examined: 19 specimens males and females from MN (BG, BK, CN, EA, KO, MG, UB), 40 specimens males and females from CN, FE, IB, ME.

Range: East-Scythian, extending into the Khanka Lake area (FE).

Distribution in Mongolia (Fig. 12): steppe, from forest-steppe to semidesert, but it avoids dry steppe.

DISCUSSION

The Mongolian antlion fauna comprises: (a) Trans-Palaearctic, (b) steppe-forest Scythian and, (c) desert to semidesert Sethian groups. The distribution of these groups probably corresponds to the northern (a + b) and southern (c) parts of Mongolia.

a. The Temperate Palaearctic antlion *M. formicarius* is widespread.

b. Widespread species from the steppe-forest group are: (i) Scythian such as *M. immanis* and *D. lineatus*; (ii) West-Scytian-Turanian such as *N. zigan*; (iii) East-Scythian such as *E. coreanus* and *D. turanicus*. Species with a small range include: (i) Mongolian-Gobian such as *N. atrifrons*; (ii) East-Mongolian-Dunbeian such as *E. polyspilus* and *D. similis*.

c. Widespread species from the desert to semidesert group include: (i) Ancient-Mediterranean antlions such as *L. fedtschenkoi* and *C. aegyptiacus* and, (ii) Turanian-Gobian taxa such as *H. compactus*, *A. pallida*, *A. uralensis* and *N. nigriventris*, and probably *M. paulus* and *M. guentheri*. All are characterized by a gap in the range at the

Altay Mountains, as already recorded for many plants and animals with the same type of distribution (EMELJANOV 1972). Other species from this group have restricted ranges: (i) Gobian, including South- and North-Gobian species such as *S. kerzhneri*, *M. kazszabi*, *M. modestus*, *M. fuscostriatus* and *C. schamona*; (ii) Dzhungarian-Gobian such as *A. venusta*; (iii) East-Mongolian-Gobian such as *M. modestus*; (iv) Altaian such as *N. marcopolo* and *F. solitarius*. All of these are endemic to Mongolia and Inner Mongolia (China). Among them, the genus *Mongoleon* is also endemic, and it appears to have evolved in the Gobi Desert.

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