

## Geophilomorph Centipedes of Latvia (Chilopoda, Geophilomorpha)

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**Abstract:** The fauna of Geophilomorpha of Latvia was analysed on the basis of a direct study of 64 specimens from 32 localities and a critical revision of all literature data. A total of 10 geophilomorph species occur in Latvia. *Geophilus flavus* and *G. proximus* are the most widespread species, whereas four species are known from only one locality each. The Latvian fauna is very similar to that of the entire Baltic basin, with the exception of *Strigamia transsilvanica*, which is tentatively recorded here for the first time north of the Carpathians. The Latvian populations of *G. proximus* are most probably parthenogenetic. An illustrated key to the geophilomorph species of Latvia was compiled, including also species hitherto recorded from neighbouring countries only.

**Key words:** Chilopoda, Geophilomorpha, Latvia, fauna, parthenogenesis.

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### Introduction

The only available records of geophilomorph centipedes occurring in Latvia are those published by O.Trauberg (1929; 1932). Based on specimens collected in 15 localities, this author identified 6 geophilomorph species, 4 of which were recorded from one locality only. The geophilomorph fauna of Latvia thus remains inadequately known and this situation, common to the other Baltic Republics, is even more striking when compared to the good knowledge of the centipede faunas of countries such as Denmark, Poland, Sweden and Finland.

Based on the study of newly collected specimens as well as on the critical revision of all published records, we provide here an updated assessment of the Latvian geophilomorph fauna. This contribution also aims to provide a tool for species identification and thus to stimulate further research.

### Methods

A total of 64 specimens from 32 localities were collected by one of us (V.Spunģis) from April to October 2003. Almost all specimens were collected by visual research. All specimens were studied by light microscopy by two of us (L.Bonato and A.Minelli), after having been cleared in ethylene glycol. Sex was determined on the basis of the shape of gonopods.

We also performed an exhaustive bibliographic search, as far as possible, in order to retrieve published data on Latvian geophilomorphs.

A brief description was compiled for each identified species. A practical key to

the species of Geophilomorpha of Latvia was prepared, also including species not yet recorded from this country, but known from other neighbouring regions of the entire Baltic basin and of the closest eastern countries, from Denmark to Belarus and northwestern parts of European Russia.

Specimens were deposited in the collections of V.Spunģis (S) & A.Minelli (M).

## Results

### *Geophilus flavus* (DE GEER, 1778)

Brief description: maximum length 5 cm; head 1.2 times longer than wide; one median clear area on the anterior part of clypeus; labrum with two distinct side-pieces, which bear hair-like projections; median part of labrum bearing ca. 6-8 teeth; first maxillae with two pairs of lateral processes; second maxillae with a pointed claw, without any notch at mid-length; forcipular chitin-lines incomplete; first article of forcipules without teeth; internal margin of forcipular tarsungulum crenulate, with a basal small tooth; number of leg-bearing segments usually 49-55 in males and 51-57 in females in northern Europe, but also lower in the Mediterranean region; trunk sterna without evident anterior sockets; sternal pores grouped on a transversal band on the posterior half of each sternum of the anterior third of the trunk; ca. 10 pores close to the internal ventral margin of each coxopleuron of the last pair of legs; legs of the last pair with a pointed claw.

Main references for morphology (under the junior synonym *G. longicornis* LEACH, 1815): Attems 1929, Brölemann 1930, Hammer 1931, Eason 1964, Matic 1972, Kaczmarek, 1979.

General distribution: most of western Palaearctic, from northwestern Africa through most Europe to Siberia, and also introduced in northern America. The species is widespread in the entire Baltic basin (Hammer 1931, Palmén 1949, Lohmander 1957, 1960, Kaczmarek 1980, Andersson 1985).

Ecological notes. In the Baltic basin, the species occurs in different habitats, more often in grasslands and open fields than in woodlands; particularly in northern countries, it is frequently recorded from anthropic sites (Palmén 1949, Andersson 1985).

Material examined: 21 specimens (9 males, 10 females, 2 sex unknown) from 11 localities: Saldus, 13.06.2003, deciduous forest, 1 ind.; Sātiņi (Saldus Distr.), 10.05.2003, fish pond bank, 2 ind.; Annenieki (Dobele Distr.), 27.06.2003, deciduous wood in city park, 1 ind.; Rīga Botanical garden, 04.05.2003, soil in greenhouse, 5 ind.; Jaunciems (Rīga Distr.), 28.06.2003, deciduous forest, 2 ind.; Mežmuiža PPNT (Particularly Protected Nature Territory) (Rīga Distr.), 6.06.2003, deciduous forest, 4 ind.; Cēsis, 18.05.2003, dolomite quarry, 1 ind.; Cēsis, 10.07.2003, deciduous wood in city park, 1 ind.; Līgatne (Cēsis Distr.), 11.07.2003, in mosses on poplar stump, 1 ind.; Skrīveri (Aizkraukle Distr.), 30.08.2003, deciduous forest, 1 ind.; Koknese (Aizkraukle Distr.), 11.10.2003, deciduous forest, 2 ind.

Published records: 2 specimens (1 male, 1 female) from one locality: "Hof der Medizin. Facultät, Rīga", 30.09.1924, 2 ind. (Trauberg 1929, under the junior synonym *G. longicornis*).

Distribution in Latvia (fig. 1): widespread in most of the country, occurring in different habitats such as deciduous forests, open and disturbed sites, also urban parks and indoor in greenhouses.

Number of leg-bearing segments recorded in Latvia: 51 and 53 in males; 51, 53

and 57 in females (also 55 recorded by O. Trauberg (1929)).

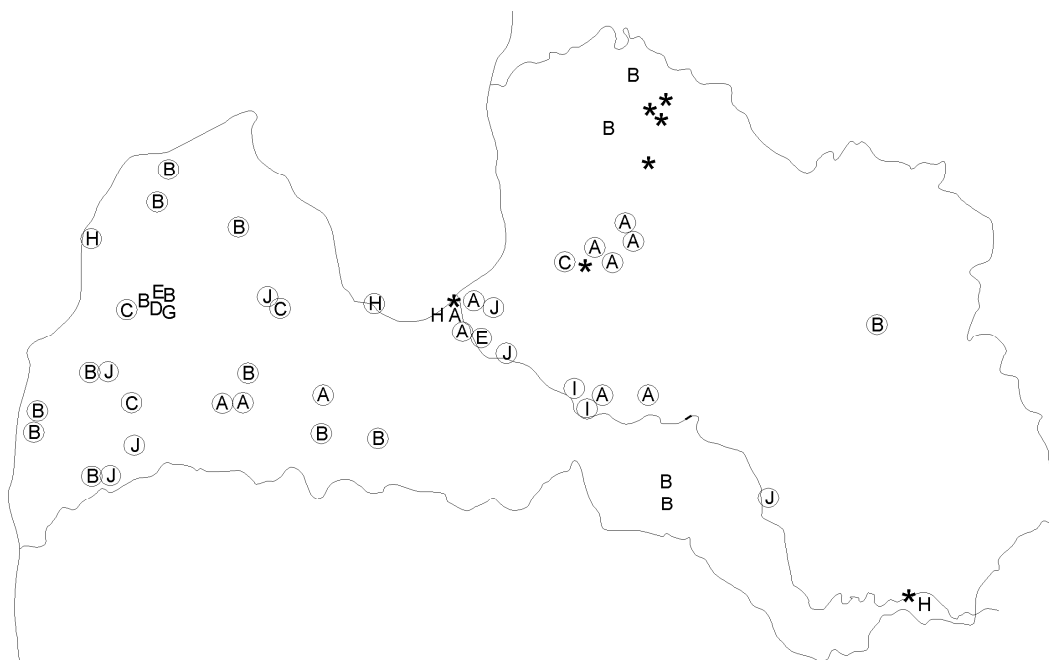


Figure 1. Sampling localities and distribution of geophilomorph species in Latvia: A - *Geophilus flavus*; B - *G. proximus*; C - *G. truncorum*; D - *G. carpophagus*; E - *G. electricus*; F - *G. linearis*; G - *Clinopodes flavidus*; H - *Pachymerium ferrugineum*; I - *Strigamia* cf. *transsilvanica*; J - *Schendyla nemorensis*. New records are circled. Records referred to *Geophilus condylogaster* by O. Trauberg (1929) are indicated by asterisks (\*) (see text).

### ***Geophilus proximus* C.L. KOCH, 1847**

Brief description: maximum length 4 cm; head 1.2 times longer than wide; one median clear area on the anterior part of clypeus; labrum with two distinct side-pieces, which bear hair-like projections; median part of labrum with ca. 2-4 teeth; first maxillae with two pairs of lateral processes; second maxillae with a pointed claw, without any notch at mid-length; forcipular chitin-lines incomplete; first article of forcipules without teeth; internal margin of forcipular tarsungulum smooth, with a small basal tooth; number of leg-bearing segments usually 45-51 in males and 47-55 in females; anterior trunk sterna with anterior sockets, almost as wide as sterna; sternal pores grouped on a transversal band on the posterior half of each sternum of the anterior third of the trunk; ca. 10 pores close to the internal ventral margin of each coxopleuron of the last pair of legs; legs of the last pair with a pointed claw.

Main references for morphology: Attems 1929, Brölemann 1930, Hammer 1931, Enghoff 1971, Matic 1972, Kaczmarek 1979, Barber, Jones 1999.

General distribution: northern part of Palaearctic, from northeastern Europe to Japan; actual distribution in remaining Europe is difficult to assess because of old misidentifications and misinterpretations of the species (Verhoeff 1934, Eason 1964, Meidell 1969, Enghoff 1971, Jeekel 1999). The species is widespread in the entire Baltic basin (Hammer 1931, Verhoeff 1934, Domander 1938, Palmén 1949, Lohmander 1957, 1960, Kaczmarek 1980, Andersson 1985).

Ecological notes. In the Baltic basin, the species occurs in different natural habitats, from grasslands to woodlands (Palmén 1949, Andersson 1985). It shows a high tolerance for cold climate, overreaching the Arctic Circle. Populations from northern Europe are mostly parthenogenetic, as observed by N.Sograff (1882) and also suggested by the exclusive occurrence of females in large samples from Denmark, Norway, Sweden, Finland and central Russia (Meinert 1870, Sograff 1882, Seliwanoff 1884, Palmén 1949, Meidell 1969, Enghoff 1976).

Material examined: 18 specimens (all females) from 10 localities: Tosmare (Liepāja Distr.), 10.05.2003, under decaying wood on lake bank, 1 ind.; Luknas (Liepāja Distr.), 18.10.2003, deciduous forest, 1 ind.; Vītiņi PPNT (Liepāja Distr.), 11.05.2003, calcareous meadow, 2 ind.; southern part of Ance PPNT (Ventspils Distr.), 13.05.2003, deciduous forest, 1 ind.; Klāņu lake (Ventspils Distr.), 13.05.2003, under decaying wood on lake bank, 1 ind.; Kamparu lake (Talsi Distr.), 14.05.2003, under decaying wood on lake bank, 1 ind.; Brocēni (Saldus Distr.), 11.05.2003, birch forest, 1 ind.; Klūnas (Dobele Distr.), 15.04.2003, calcareous fen, 1 ind.; Zaļenieki, (Jelgava Distr.), 01.10.2003, deciduous forest, 2 ind.; Kuprava PPNT (Alūksne Distr.), 16.06.2003, deciduous forest, 7 ind.

Published records - 43 specimens (sex not stated) from 7 localities (Trauberg 1932): “Umgebung Rūjens”, 06.07.1928, 22 ind.; “Bauen Besirk”, 23.06.1928, 7 ind.; “Umgebung von Wiesite”, VII-1930, 1 ind.; “Goldingscher Schlossberg”, 16.07.1928, 1 ind.; “Goldingen, am Ufer der Flusses Wenta”, 3.08.1928, 2 ind.; “Paduren Wald bei Goldingen“, 2.08.1928, 2 ind.; “Meža Zalači vom Bezirk Sauka“, 8.08.1928, 8 ind. Other 64 specimens collected in 1923-1924 from 7 different localities were identified by O.Trauberg (1929) as 55 males and 9 females of *Geophilus condylogaster* LATZEL, 1880, but were later recognised as *G. proximus* by the same author (Trauberg 1932). However, the true identity of these specimens or at least their sex remains doubtful, because the sex ratio in Trauberg’s sample (55 males vs. 9 females) is not consistent with that of our sample (no males vs. 18 females). Further, while O.Trauberg (1929) recorded the sex of all these 64 specimens, the same author did not recorded the sex for other 43 specimens she identified as *G. proximus* (Trauberg 1932).

Distribution in Latvia (fig. 1): widespread in most of the country and occurring in different habitats, from woodlands to open sites such as lake banks.

Notes. All the 18 specimens directly observed by us were females. Although this sample is very limited, this sex ratio is significantly biased as compared to the comparably small samples of other geophilomorph species collected in Latvia with the same methods and in the same period (ca. half males and half females in 21 specimens of *G. flavus*, see above). This suggests that populations of *G. proximus* occurring in Latvia may be parthenogenetic, as in other neighbouring countries. This is apparently in contrast with previous records of *G. proximus* specimens of both sexes from Latvia (Trauberg 1932), but these records are doubtful, as discussed above.

Number of leg-bearing segments recorded in Latvia: 47 and 49 in females. Numbers reported by O.Trauberg (1932), i.e. 47 in males and 47-51 in females, are dubious, because they were mostly recorded in a sample of specimens of uncertain identity previously identified as *G. condylogaster* (Trauberg 1929) and only later assigned to *G. proximus*.

### ***Geophilus truncorum* BERGSOE et MEINERT, 1866**

Brief description: maximum length 2 cm; head about as long as wide; no clear

areas on the anterior part of clypeus; labrum with two distinct side-pieces, which bear hair-like projections; median part of labrum with ca. 2-7 teeth; first maxillae usually bearing only one pair of lateral processes; second maxillae with a pointed claw, and a little notch at mid-length; forcipular chitin-lines incomplete; first article of forcipules without teeth; internal margin of forcipular tarsungulum smooth, with a small basal tooth; number of leg-bearing segments usually 35-39 in males and 37-41 in females in northern Europe, but also lower in the Mediterranean region; anterior trunk sterna with anterior sockets, not wider than ca. ½ of the width of sternum; no groups of sternal pores; usually only 2 pores on each coxopleuron of the last pair of legs; legs of the last pair bearing a pointed claw.

Main references for morphology: Attems 1929, Brölemann 1930, Hammer 1931, Eason 1964, Kaczmarek 1979.

General distribution: most part of western Palaearctic, from northwestern Africa to Caucasus, reaching at North both Iceland and southern Scandinavia. The species is widespread in the entire Baltic basin (Hammer 1931, Palmén 1949, Lohmander 1957, 1960, Kaczmarek 1980, Andersson 1985).

Ecological notes. In the Baltic basin, as well as in its entire range, the species occurs almost exclusively in woodlands, mainly in decaying wood. It also occurs in urban sites in northern Europe (Palmén 1949, Andersson 1985).

Material examined - 11 specimens (5 males, 6 females) from 4 localities: Pinku lake (Kuldīga Distr.), 13.05.2003, Norway spruce forest, 1 ind.; Rudbārži (Kuldīga Distr.), 10.05.2003, deciduous forest, 2 ind.; Abava river valley at Kandava (Tukums Distr.), 1.05.2003, deciduous forest, 3 ind.; Turaida (Rīga Distr.), 12.07.2003, deciduous forest, 5 ind.

Published records: none.

Distribution in Latvia (fig. 1): present at least in the western part of the country, in both deciduous and coniferous forests.

Number of leg-bearing segments recorded in Latvia: 37 in males, 39 in females.

### ***Geophilus linearis* C.L. KOCH, 1835**

Brief description: maximum length 5 cm; head about as long as wide; no clear areas on the anterior part of clypeus; labrum with two distinct side-pieces; median part and side-pieces of labrum with hair-like projections and no true teeth; first maxillae with two pairs of lateral processes; second maxillae with a pointed claw, without any notch at mid-length; forcipular chitin-lines complete; first article of forcipules without teeth; internal margin of forcipular tarsungulum smooth, without basal tooth; number of leg-bearing segments usually 63-79 in males and 67-79 in females in northern Europe, but also higher and lower in the Mediterranean region; anterior trunk sterna without anterior sockets; sternal pores grouped on a circular area on the posterior half of each sternum of the anterior third of the trunk; tens of pores opening into two pits on each coxopleuron of the last pair of legs; legs of the last pair with a pointed claw.

Main references for morphology: Attems 1929, Brölemann 1930, Hammer 1931, Eason 1964, Matic 1972, Kaczmarek 1979, Lewis, Keay 1994.

General distribution: southern part of western Palaearctic, from northwestern Africa through most of Mediterranean Europe to Anatolia; only sporadic in central and northern Europe, as in the Baltic basin (Hammer 1931, Palmén 1949, Kaczmarek 1980).

Ecological notes. In the Baltic basin, it occurs almost exclusively in urban sites, both outdoor and indoor, as in greenhouses (Hammer 1931, Palmén 1949).

Material examined: 1 specimen (incomplete body, sex unknown) from Rīga

Botanical garden, 4.05.2003, greenhouse.

Published records: none.

Distribution in Latvia (fig. 1): most probably an alien species, only found indoor in an urban site.

*Pachymerium ferrugineum* (C.L. Koch, 1835)

Brief description: maximum length 5 cm; head 1.3-1.4 times longer than wide; two paired clear areas on the anterior part of clypeus; labrum with two distinct side-pieces, which bear hair-like projections; median part of labrum with ca. 5-7 teeth; first maxillae with two pairs of lateral processes; second maxillae with a pointed claw, without any notch at mid-length; forcipular chitin-lines incomplete; first article of forcipules with a distal tooth; internal margin of forcipular tarsungulum smooth, with a basal small tooth; number of leg-bearing segments usually 41-45 in males and 43-47 in females in northern Europe, but higher in the Mediterranean region; trunk sterna without anterior sockets; sternal pores grouped both on the anterior and the posterior half of each sternum of the anterior third of the trunk; tens of pores on each coxopleuron of the last pair of legs, scattered on the entire ventral surface; legs of the last pair with a pointed claw.

Main references for morphology: Attems 1929, Brölemann 1930, Hammer 1931, Eason 1964, Matic 1972, Kaczmarek 1979.

General distribution: most part of western Palaearctic, from Macaronesia through Europe to central Asia; also other parts of the world (possibly introduced). The species is widespread in the entire Baltic basin (Domander 1938, Palmén 1949, Lohmander 1957, 1960, Kaczmarek 1980, Andersson 1985).

Ecological notes. In the Baltic basin, it occurs in different natural habitats, mainly on relatively dry substrates with open vegetation, as well as in human-disturbed sites (Palmén 1949, Palmén, Rantala 1954, Andersson 1985). It shows high tolerance for cold climate, reaching the Arctic Circle (Palmén 1949, Palmén, Rantala 1954), as well as a strong potential for dispersal through the sea, as shown by its occurrence on many islands (Suomalainen 1939).

Material examined - 3 specimens (1 male, 2 females) from two localities: Užava (Ventspils Distr.), 17.05.2003, pine forest, 1 ind.; Ragaciems (Tukums Distr.), 9.08.2003, urban garden, 2 ind.

Published records - 21 specimens (12 male, 9 female) from 2 localities: "Priedaine", 05.10.1924, 20 ind.; "Schlosspark bei Kraslau", 11.10.1924, 1 ind. (Trauberg 1929).

Distribution in Latvia (fig. 1): present both in littoral and internal areas, both in natural and anthropic sites.

Number of leg-bearing segments recorded in Latvia: 43 in males, 43 and 45 in females (41 and 43 in males and 45 and 47 in females recorded by O.Trauberg (1929)).

*Strigamia* cf. *transsilvanica* (VERHOEFF, 1928)

Brief description: maximum length 4 cm; head about as long as wide; no clear areas on the anterior part of clypeus; labrum with two distinct side-pieces; margin of labrum with a few tens of teeth and no hair-like projections; first maxillae without lateral processes; second maxillae with a pointed claw; no forcipular chitin-lines; first article of forcipules without any tooth; internal margin of forcipular tarsungulum smooth, with a very large basal tooth; number of leg-bearing segments usually 43-49 in males and 47-51 in females, but up to 57 (Verhoeff, 1928); trunk sterna without

anterior sockets and with a weak mid-longitudinal sulcus; sternal pores grouped in two paired areas on the posterior half of each sternum of the anterior third of the trunk; ca. ten scattered pores on each coxopleuron of the last pair of legs; legs of the last pair with a pointed claw.

Main references for morphology: Verhoeff 1928, Matic 1972, Kaczmarek 1979.

General distribution: mountainous chains of central Europe, from Alps to Carpathians. This is the first record of the species from the Baltic basin.

Ecological notes. It is mainly a montane species, occurring in woodlands (Matic 1972, Minelli, Iovane 1987).

Material examined: 2 specimens (both females) from 2 localities: Skrīveri (Aizkraukle Distr.), 30.08.2003, deciduous forest, 1 ind.; Ozolkalni PPNT (Aizkraukle Distr.), 30.08.2003, deciduous forest, 1 ind.

Published records: none.

Distribution in Latvia (fig. 1): present at least along the Daugava valley in deciduous forests.

Notes. Species identification is uncertain, because of the still unresolved taxonomic problems involving a group of *Strigamia* species including at least *S. crassipes* (C.L. KOCH, 1835), *S. acuminata* (LEACH, 1815) and *S. transsilvanica* (VERHOEFF, 1928). In some parts of Europe, local populations can be generally ascribed to one or the other of these nominal taxa, but the overall picture is not clear. Worth notice is that *S. transsilvanica* was never recorded previously north of Sudetian and Carpathian chains, whereas both *S. crassipes* and *S. acuminata* were frequently recorded from the Baltic basin (Kaczmarek 1980, Leśniewska 2000).

Number of leg-bearing segments recorded in Latvia: 47 and 49 in females.

### ***Schendyla nemorensis* (C.L. KOCH, 1837)**

Brief description: maximum length 3 cm; head 1.2 times longer than wide; no clear areas on the anterior part of clypeus; labrum without distinct side-pieces; margin of labrum with ca. 15 teeth and no hair-like projections; first maxillae with two pairs of lateral processes; second maxillae with obtusely pointed claw, without any notch at mid-length; no forcipular chitin-lines; first article of forcipules without teeth; internal margin of forcipular tarsungulum smooth, with a basal small tooth; number of leg-bearing segments usually 37-41 in males and 39-43 in females in northern Europe, but also higher in the Mediterranean region; trunk sterna without anterior sockets; sternal pores grouped on a longitudinal band on the posterior half of each sternum of the anterior third of the trunk; only 2 pores on each coxopleuron of the last pair of legs; legs of the last pair without claw but ending with a tiny spine.

Main references for morphology: Attems 1929, Brölemann 1930, Hammer 1931, Eason 1964, Matic 1972, Kaczmarek 1979.

General distribution: most of Palaearctic, from Macaronesia through the Mediterranean region to northern Europe, and also introduced in North America. The species is widespread in the entire Baltic basin (Domander 1938, Palmén 1949, Lohmander 1960, Kaczmarek 1980, Andersson 1985).

Ecological notes. In the Baltic basin, it occurs mainly in woodlands, but also in ecotone and more open habitats (Palmén 1949).

Material examined: 8 specimens (all females) from 6 localities: Embūte (Liepāja Distr.), 11.05.2003, deciduous forest, 1 ind.; Luknas (Liepāja Distr.), 18.10.2003, deciduous forest, 1 ind.; Abava river valley at Kandava (Tukums Distr.), 1.05.2003, deciduous forest, 3 ind.; Salaspils (Rīga Distr.), 12.09.2003, deciduous forest, 1 ind.; Garkalne (Rīga Distr.), 9.10.2003, meadow, 1 ind.; Jersika (Preiļi Distr.), 11.10.2003,

deciduous forest, 1 ind.

Published records: none.

Distribution in Latvia (fig. 1): present at least in the western part of Latvia and along the Daugava valley, mainly in deciduous forests.

Number of leg-bearing segments recorded in Latvia: 39 and 41 in females.

Three other species were reliably recorded from Latvia by O. Trauberg (1932), all of them from the same locality “Goldingscher Schlosspark” (Fig. 1).

*Geophilus carpophagus* LEACH, 1815. 2 females, 16.08.1928. 53 leg-bearing segments. Around Latvia, the species was recorded from Poland, Sweden and Finland (Attems 1929, Kaczmarek 1980, Andersson 1983, G. Andersson, *pers. comm.*, 2003).

*Geophilus electricus* (LINNAEUS, 1758). 5 specimens (1 male, 4 females), 16.08.1928. Number of leg-bearing segments recorded as 62 in the male and 68-69 in females, but geophilomorphs with an even number of segments simply do not exist, so counts were somehow inaccurate. Around Latvia, the species was recorded from Poland, Sweden and Finland (Palmén 1949, Lohmander 1957, Kaczmarek 1980, Andersson 1985).

*Clinopodes flavidus* C.L. KOCH, 1847. 1 specimen (sex not stated), 16.08.1928. 71 leg-bearing segments. Around Latvia, the species was recorded only from Poland (Kaczmarek 1980).

Five other species are not known to date in Latvia but occur in neighbouring regions of the Baltic basin and in the closest eastern countries.

*Stigmatogaster subterraneus* (SHAW, 1789). It was recorded only occasionally, as an introduced species, in urban sites of Poland, Sweden and Finland (Palmén 1949, Andersson 1985, Leśniewska, Wojciechowski 1992).

*Geophilus insculptus* ATTEMS, 1895. It is known as a sporadic species in Poland and southern Sweden, both in natural habitats and urban sites (Lohmander 1957, 1960, Kaczmarek 1980).

*Strigamia acuminata* (LEACH, 1815). It is widespread in Poland (Kaczmarek 1980), but only sporadic in northern countries.

*Strigamia crassipes* (C.L. KOCH, 1835). It is widespread in Poland and was recorded also in Sweden (Lohmander 1957, Kaczmarek 1980).

*Strigamia maritima* (LEACH, 1817). It was recorded from the coast of Sweden (Porat 1889).

### Key to the species of Geophilomorpha of Latvia

(\* species potentially occurring in Latvia but not yet recorded from this country)

- |   |   |
|---|---|
| 1a. Forcipular tarsungulum bearing a very large basal tooth (Fig. 2D, arrow).   | 2   |
| 1b. Forcipular tarsungulum bearing either a small basal tooth (Fig. 2E, arrow 1) or no tooth at all (Fig. 2F).  | 5   |
| 2a. Usually less than 43 leg-bearing segments.  |   |
|   | <i>Strigamia acuminata</i> (LEACH, 1815)* |
| 2b. Usually more than 43 leg-bearing segments.  | 3   |
| 3a. Each sternum of the trunk with a transversal ridge and a mid-longitudinal sulcus, at least weakly pronounced (Fig. 2B); sternum of the last leg-bearing segment evidently longer than wide. | 4   |



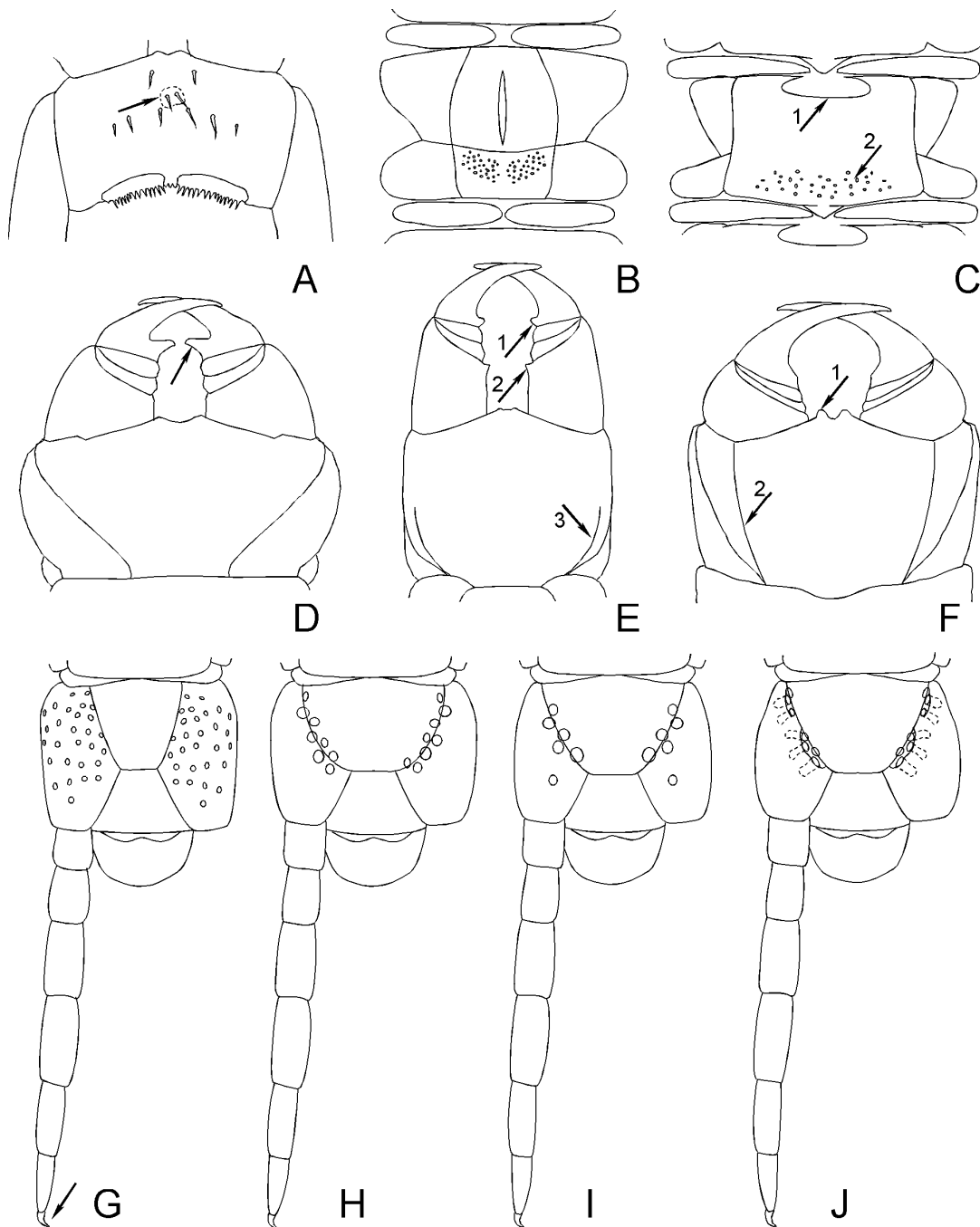


Figure 2. Some diagnostic characters for the geophilomorph species of Latvia (simplified drawings): A - clypeus (*Geophilus proximus*); B - a sternum of the anterior third of the trunk (*Strigamia crassipes*); C - a sternum of the anterior third of the trunk (*Geophilus carpophagus*); D - forcipular segment, ventral side (*Strigamia* sp.); E - forcipular segment, ventral side (*Pachymerium ferrugineum*); F - forcipular segment, ventral side (*Clinopodes flavidus*); G - coxopleuron and leg of the last pair, ventral side (*Pachymerium ferrugineum*); H - coxopleuron and leg of the last pair, ventral side (*Geophilus proximus*); I - coxopleuron and leg of the last pair, ventral side (*Geophilus insculptus*); J - coxopleuron and leg of the last pair, ventral side (*Geophilus linearis*).

- 3b. Each sternum of the trunk without any transversal ridge and any mid-longitudinal sulcus; sternum of the last leg-bearing segment as long as wide.  
*Strigamia maritima* (LEACH, 1817)\*
- 4a. A distinct mid-longitudinal pigmented band on each sternum of the trunk.  
*Strigamia crassipes* (C.L. KOCH, 1835)\*
- 4b. No distinct mid-longitudinal pigmented band on each sternum of the trunk.  
*Strigamia transsilvanica* (VERHOEFF, 1928)
- 5a. Coxal pores scattered on the entire ventral surface of the coxopleura of the last pair of legs (Fig. 2G). 6
- 5b. Most or all coxal pores close to the lateral margins of the sternum of the last leg-bearing segment. 7
- 6a. Head evidently longer than wide; first article of forcipules with a distal tooth (Fig. 2E, arrow 2); less than 60 leg-bearing segments; legs of the last pair with a claw (Fig. 2G, arrow). *Pachymerium ferrugineum* (C.L. KOCH, 1835)
- 6b. Head slightly wider than long; first article of forcipules without distal tooth; more than 60 leg-bearing segments; legs of the last pair without claw.  
*Stigmatogaster subterraneus* (SHAW, 1789)\*
- 7a. Anterior margin of the forcipular coxosternum with a pair of well chitinised teeth (Fig. 2F, arrow 1).  
*Clinopodes flavidus* C.L. KOCH, 1847
- 7b. Anterior margin of the forcipular coxosternum without distinct teeth (Fig. 2D). 8
- 8a. Sterna of the anterior third of the trunk with an evident anterior median socket (Fig. 2C, arrow 1). 9
- 8b. Sterna of the anterior third of the trunk without any anterior median socket. 13
- 9a. Maximum width of the anterior socket of each trunk sternum evidently more than ½ of the width of sternum. 10
- 9b. Maximum width of the anterior socket of each trunk sternum no more than ½ of the width of sternum (Fig. 2C). 12
- 10a. Forcipular coxosternum with complete chitin-lines (Fig. 2F, arrow 2); more than 60 leg-bearing segments.  
*Geophilus electricus* (LINNAEUS, 1758)
- 10b. Forcipular coxosternum with incomplete chitin-lines (Fig. 2E, arrow 3); less than 60 leg-bearing segments. 11
- 11a. One median clear area on the anterior part of clypeus (Fig. 2A, arrow); all pores of each coxopleuron of the last pair of legs close to the lateral margin of the sternum (Fig. 2H). *Geophilus proximus* C.L. KOCH, 1847
- 11b. No clear areas on the anterior part of clypeus; one pore of each coxopleuron of the last pair of legs isolated from the other pores and far from the lateral margin of the sternum (Fig. 2I).  
*Geophilus insculptus* ATTEMS, 1895\*
- 12a. Usually more than 45 leg-bearing segments; groups of pores on the trunk sterna (Fig. 2C, arrow 2); more than 3 pores on each coxopleuron of the last pair of legs.  
*Geophilus carpophagus* LEACH, 1815
- 12b. Usually less than 45 leg-bearing segments; no groups of pores on the trunk sterna; usually 2 pores on each coxopleuron of the last pair of legs.  
*Geophilus truncorum* BERGSOE et MEINERT, 1866
- 13a. More than 45 leg-bearing segments; more than 3 pores on each coxopleuron of the last pair of legs; legs of the last pair with well-developed claw (Fig. 2H). 14

13b. Less than 45 leg-bearing segments; only 2 pores on each coxopleuron of the last pair of legs; legs of the last pair without claw, only bearing a minute spine.

*Schendyla nemorensis* (C.L. KOCH, 1837)

14a. Antennae more than 3 times as long as the head; one clear area on the anterior part of clypeus (Fig. 2A); usually less than 60 leg-bearing segments; groups of pores on the trunk sterna transversally elongated (Fig. 2C); pores on each coxopleuron of the last pair of legs not grouped in pits (Fig. 2H).

*Geophilus flavus* (DE GEER, 1778)

14b. Antennae less than 3 times longer than the head; no clear areas on the anterior part of clypeus; usually more than 60 leg-bearing segments; groups of pores on the trunk sterna not transversally elongated; pores on each coxopleuron of the last pair of legs grouped in two pits (Fig. 2J).

*Geophilus linearis* C.L. KOCH, 1835

### Discussion

The geophilomorph fauna of Latvia includes 10 species belonging to 5 genera: we have directly recorded 7 species and 3 other species are reliably reported in the literature.

Considering both the new and published records, *Geophilus flavus* and *G. proximus* are the most common species: they are known from more than 10 localities each and are apparently widespread in the country, possibly because of their quite large ecological tolerance. *Schendyla nemorensis*, *Pachymerium ferrugineum*, *Geophilus truncorum* and *Strigamia* cf. *transsilvanica* are known from fewer localities and appear more localised, possibly in relation to their narrower ecological requirements. *Geophilus linearis*, instead, is only an occasional alien species in Latvia. Less obvious is the status of the three other species cited in literature – *G. carpophagus*, *G. electricus* and *Clinopodes flavidus*, all of which were recorded from one locality only.

The geophilomorph fauna of Latvia is very similar to the better-known faunas of other countries of the Baltic basin, both in species composition and in relative abundance among species. In contrast with other regions of Europe, these faunas are characterised by a quite low number of species and by the prevalence of widely distributed species. The only noteworthy exception is the putative presence of *Strigamia transsilvanica* in Latvia. This species was considered to be limited to the mountainous ranges of central Europe and was never recorded in the Baltic basin previously.

The geophilomorph fauna of Latvia, as well as of the entire Baltic basin, originated mainly by the very recent post-glacial re-colonisation from southern and neighbouring regions. This explains the common occurrence of a cold-tolerant and putatively parthenogenetic species such as *Geophilus proximus*.

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### Kopsavilkums

Latvijas zemesmīļu Geophilomorpha faunas analīze tika balstīta izpētīt 64 īpatņus no 32 vietām, kā arī kritiski izvērtējot visus literatūras datus. Latvijā konstatētas 10 zemesmīļu sugas. *Geophilus flavus* un *G. proximus* ir visplašāk izplatītās, bet četras sugas ir atrastas tikai vienā vietā katra. Latvijas zemesmīļu fauna ir līdzīga Baltijas reģiona faunai, izņemot sugu *Strigamia transsilvanica*, kura pirmo reizi atrasta teritorijā uz ziemeļiem no Karpatu kalniem. Sugas *Geophilus proximus* populācija Latvijā, visticamāk, ir partenogēnētiska. Izveidots Latvijas zemesmīļu sugu noteicējs, tajā ietverot arī sugas, kuras līdz šim zināmas tikai no atradnēm kaimiņvalstīs.

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