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The Distribution and Ecology of the Millipedes in Poland

by

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A b s t r a c t : The history of the study of Diplopoda in Poland is a long one, and begins in the 19th century. Up to now about 80 species and subspecies of Diplopoda have been recorded in Poland. They belong to seven main zoogeographical elements. The European element is richly represented by species. The most interesting from the zoogeographical point of view are species which belong to the Carpathian fauna, which is richly represented in the south-eastern part of Poland. There are some borders in the distribution of zoogeographical elements in Poland. The maps presented display the territory of Poland as a transition zone between south-eastern, western and northern influences.

From the variety of environments in Poland, nine of the best known have been chosen to be presented here. The richest biotopes are oak-hornbeam forests and synanthropic environments. They are inhabited by over 50 % of the species recorded in Poland.

1. Introduction:

The study of the millipedes in Poland began in the early 19th century, thanks to the activity of WEIGEL and JAROCKI. They created a group of Polish zoologists who soon recorded the first information on the millipede fauna from Polish territory. Good traditions flourished during the period between the first and second world wars. In this time, famous Polish diplopodologist H. JAWLOWSKI was carrying out numerous studies on the diplopod fauna in the south and south-east part of Poland. He concentrated his main work in the Carpathian region. His descriptions of new species and forms have been made in a very modern way, so even now they are of great value and useful for systematic and faunistic purposes. After the second world war a group of diplopodologists was created in Lublin, and has concentrated its activity mainly in the south and east part of Poland.

In 1974 all information about Diplopoda was summed up in the "Catalogus faunae Poloniae" by W. STOJALOWSKA and W. STAREGA. In this, Poland has been divided into 25 faunistic regions and subregions. Using mainly the literature data the authors have given information on the distribution and tentative ecology of 81 species and subspecies of millipedes recorded from Poland.

This paper is based on the newest literature and field investigations which have been carried out by the author in several regions of Poland (JEDRYCZKOWSKI 1979, 1982, 1987).

2. Zoogeography:

The knowledge about the distribution of the Diplopoda in Poland reflects, as in many other groups, a tendency of directing scientific interests mainly into regions which are especially favoured because of touristic or natural value. Fig. 1 presents a map on which all sites are plotted from which information on millipedes was obtained. It is clear that main sources of information are directly linked with scientific centres such as Warsaw, Cracow or Wroclaw, or with regions where the main faunistic projects have been carried out (i.e. Bieszczady Mts., Swietokrzyskie Mts. or Sudety Mts.).

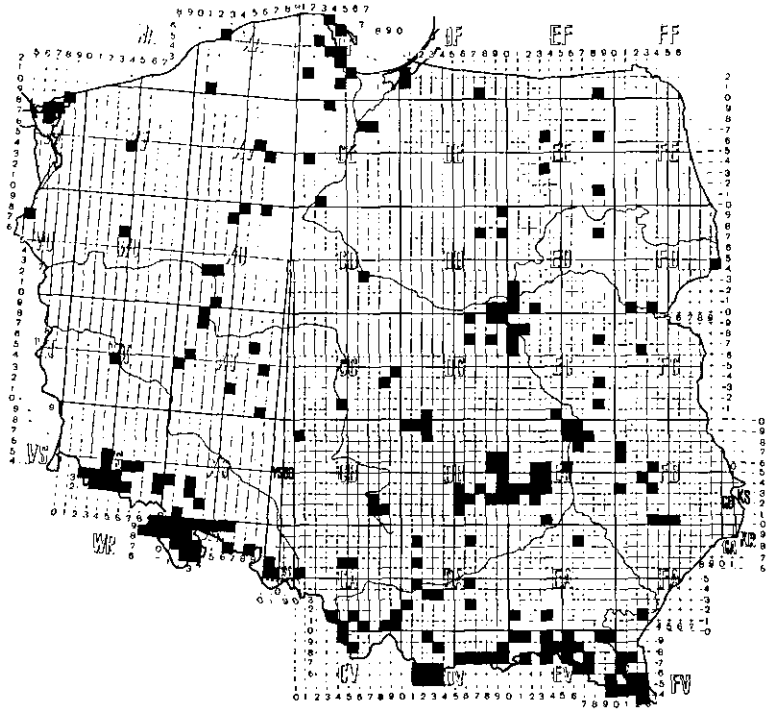

Fig. 1: Distribution of Diplopoda in Poland based on literature and collections.

Despite this, it is possible to present a general feature of zoogeographical elements of Diplopoda fauna in Poland.

2.1. Cosmopolitan:

The Cosmopolitan element is represented by six species living in a variety of habitats and common all over the country among which *Polyxenus lagurus, Brachydesmus superus* and *Cylindroiulus caeruleocinctus* are the most frequent ones.

2.2. European:

The most frequent zoogeographical element in Poland is the European one. Although this term does not make precise the real area of species distribution it is very useful for elements that are linked with deciduous forests which used to cover a large part of Europe. These species occupy in Poland various environments except at high altitudes. Among 22 species which belong to this element *Glomeris connexa, Polydesmus complanatus , Proteroiulus fuscus, Unciger foetidus* and *Polyzonium germanicum* are the most common in Poland.

2.3. North European:

The North European element is represented by six species and subspecies of Diplopoda. They are present in most parts of Poland except in the South East. As can be seen, there is only little evidence for the distribution of this group in Poland. To this element belong the following forms: *Leptoiulus minutus* (PORAT), *Microiulus l. laeticolis* (PORAT), *M. l. mierzejewskii* JAWLOWSKI,

Ophyiulus fallax (MEINERT), *Chromatoiulus sjaelandicus* (MEINERT), *Sarmatiulus vilnensis* (JAWLOWSKI).

2.4. West European:

To this element (Fig. 2) belong 9 species of Diplopoda which with few exceptions do not cross the Vistula River eastwards. They are common in synanthropic habitats such as parks and gardens. With natural environments are only linked *Glomeris marginata* (VILLERS), *G. undulata* C.L. KOCH and *Julus scandinavius* LATZEL.

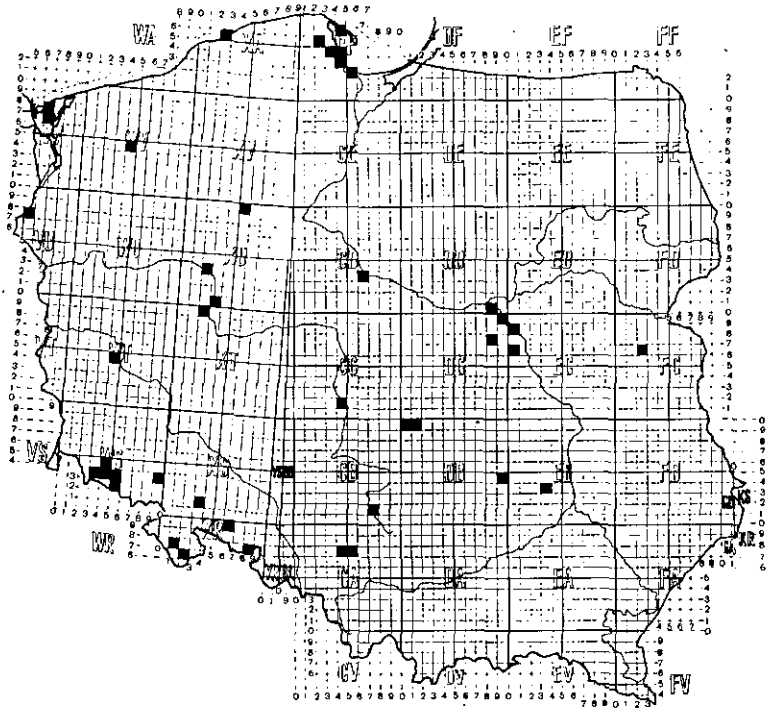

Fig. 2: Distribution of the West European element in Poland.

2.5. South European:

The South European element (Fig. 3) is represented by 12 species and subspecies of millipedes. Although they are mainly distributed in the southern part of Poland, they reach the Baltic coast in synanthropic sites or along the Vistula banks.

2.6. Carpathian:

The Carpathian element contains 11 species which with few exceptions are distributed in the mountain region of Poland (Fig. 4). Some of these species reach the eastern part of the Sudeten and Swietokrzyskie Mts. *Trachysphaera costata* has been introduced into the Bielany Nature Reserve as well as into the other natural biotopes near Warsaw.

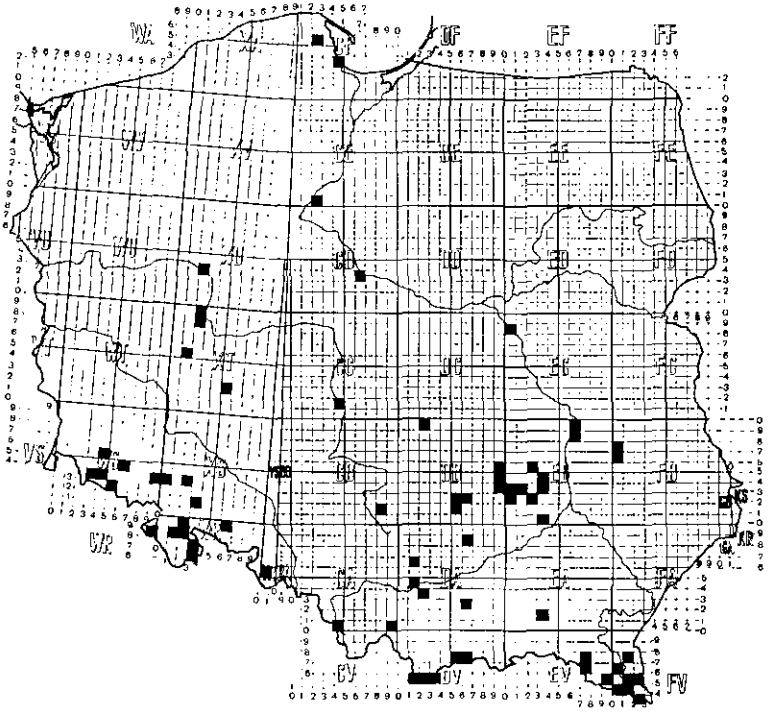

Fig. 3: Distribution of the South European element in Poland.

2.7. East Carpathian:

The most distinguished zoogeographical element in Poland is the East Carpathian one. It consists of 8 species and subspecies which occur mainly in the Bieszczady Mts. Since they are not common, a full list of species representing this element in Poland is given: *Karpathophyllon polinskii, Beskidia jankowskii* (JAWLOWSKI), *Polydesmus hamatus furculatus* VERHOEFF, *P. m. montanus, P. polonicus, Leptoiulus polonicus* JAWLOWSKI, *L. bakonyensis pruticus* JAWLOWSKI, *L. korongisius* ATTEMS.

3. Ecology:

From the great variety of environments in Poland, eight of the best known have been chosen to be presented here (Tab. 1). This analysis does not contain a complete material on all species of Diplopoda in Poland, but refers only to reliable data.

3.1. Coniferous Forests with Fir (*Abietetum polonicum*):

This type of forest is spread mainly in the southern part of Poland with a northern border of distribution in the Swietokrzyskie Mts. Five species of Diplopoda occur there. All of them occupy leaf litter and decayed wood.

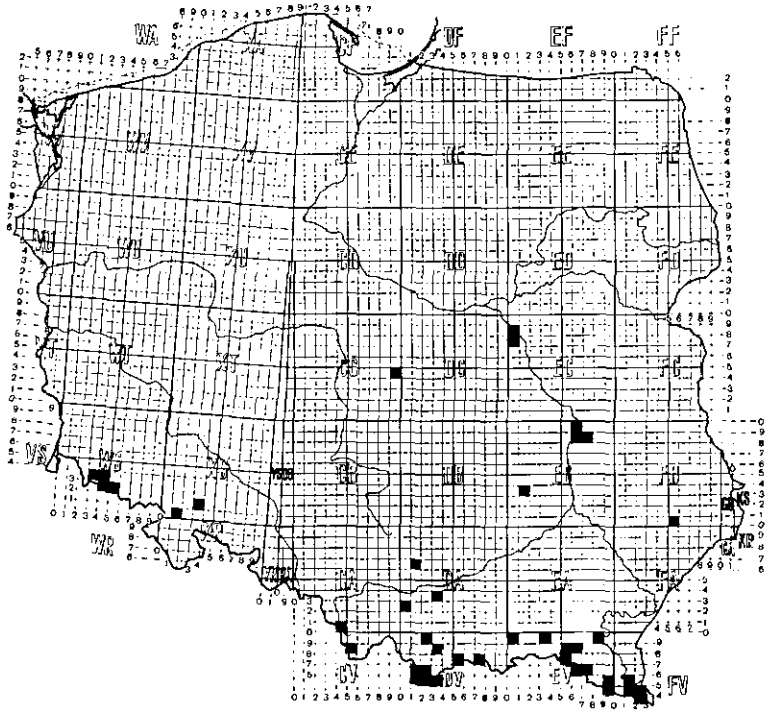

Fig. 4: Distribution of the Carpathian element in Poland.

3.2. Mixed Forest with Pine and Oak (*Pino-Quercetum*):

The mixed forest is one of the most common types of forest which covers large areas of Poland except in the mountainous region. In this habitat live 13 species of millipedes. All of them are widely distributed in Poland and Europe and are common in most habitats. Three of them, *Polyxenus lagurus, Nemasoma varicorne* and *Proteroiulus fuscus* live under bark, in hollows and in decayed wood. *Ommatoiulus sabulosus* is a common species in sunny places, often basking on the tops of bushes.

3.3. Deciduous Carpathian Forest with Beech (*Dentario glandulosae-Fagetum*):

This type of forest is typical for mountains and highlands in Poland (Sudeten excluded). It offers very good conditions, so the diplopod fauna can flourish there: 26 species of millipedes have been recorded. The following are characteristic for this habitat: *Mastigona vihorlatica, Karpatophyllon polinskii* and *Polydesmus polonicus*. They live mostly in the leaf litter.

3.4. Oak-hornbeam Forest (*Tilio-Carpinetum*):

Since this type of forest occupies only rich soils, it is not frequent in Poland except in national parks and nature reserves. It is one of the richest habitats where live 17 species and subspecies of millipedes.

Table 1: Distribution of Diplopoda in various habitats 1 - 8 in Poland (see text for explanation of habitats; T Total).

	Species	1	2	3	4	5	6	7	8	T
1	*Polyxenus lagurus* (L.)	-	+	+	+	+	-	-	-	4
2	*Glomeris connexa* C.L. KOCH	+	+	+	+	+	-	+	-	6
3	*G. hexasticha* BRANDT	-	+	-	+	+	-	-	-	3
4	*G. mnischechi* NOWICKI	+	-	+	-	+	+	-	-	4
5	*G. pustulata* LATREILLE	-	-	-	-	+	-	-	-	1
6	*Trachysphaera acutula* (LATZEL)	-	-	+	-	-	+	-	-	2
7	*T. costata* (WAGA)	-	-	-	-	+	-	-	+	2
8	*Mastigona bosniensis* (VERHOEFF)	-	-	-	-	+	-	-	+	2
9	*M. vihorlatica* (ATTEMS)	-	-	+	-	-	-	-	-	1
10	*Karpatophyllon polinskii* JAWLOWSKI	-	-	+	-	-	-	-	-	1
11	*Craspedosoma simile* VERHOEFF	-	-	-	+	-	-	-	-	1
12	*Brachydesmus superus* LATZEL	-	-	-	-	-	-	-	+	1
13	*Polydesmus denticulatus* C.L. KOCH	-	-	+	-	-	+	-	-	2
14	*P. inconstans* LATZEL	-	-	-	-	-	-	-	+	1
15	*P. complanatus* (L.)	+	+	+	+	-	+	+	+	7
16	*P. hamatus furculatus* VERHOEFF	-	-	+	-	-	-	-	-	1
17	*P. m. montanus* VERHOEFF	-	-	+	-	-	+	-	-	2
18	*P. polonicus* LATZEL	-	-	+	-	-	-	-	-	1
19	*P. t. tatranus* LATZEL	-	-	+	-	-	+	-	-	2
20	*Strongylosoma stigmatosum* (EICHWALD)	-	-	+	+	+	+	-	-	4
21	*Blaniulus guttulatus* (BOSC)	-	-	-	-	-	-	-	+	1
22	*Boreoiulus tenuis* (BIGLER)	-	-	-	-	-	-	-	+	1
23	*Choneiulus palmatus* (NEMEC)	-	-	-	+	-	-	-	+	2
24	*Nemasoma varicorne* C.L. KOCH	-	+	+	-	-	-	-	-	2
25	*Proteroiulus fuscus* (AM STEIN)	-	+	+	+	+	-	+	+	6
26	*Nopoiulus venustus* (MEINERT)	-	-	-	+	-	-	-	+	2
27	*Cylindroiulus arborum* VERHOEFF	-	-	+	+	-	-	-	+	3
28	*C. frisius* (VERHOEFF)	-	-	-	-	-	-	-	+	1
29	*C. caeruleocinctus* (WOOD)	-	-	-	-	-	-	-	+	1
30	*C. burzenlandicus* VERHOEFF	-	-	+	-	-	-	-	-	1
31	*C. occultus* (C.L. KOCH)	-	-	-	-	-	-	-	+	1
32	*Enantiulus nanus* (LATZEL)	-	-	-	+	+	-	-	-	2
33	*E. transsilvanicus* VERHOEFF	-	-	+	-	-	-	-	-	1
34	*Julus terrestris* L.	-	-	-	-	-	+	-	-	1
35	*Leptoiulus proximus* (NEMEC)	-	+	+	+	+	+	+	+	7
36	*L. trilobatus* (VERHOEFF)	+	+	+	+	-	-	-	-	4
37	*L. baconyensis pruticus* JAWLOWSKI	-	-	+	-	-	-	-	-	1
38	*Microiulus carpathicus* (VERHOEFF)	-	-	+	-	-	-	-	-	1
39	*Chromatoiulus projectus kochi* (VERHOEFF)	-	+	+	+	+	+	-	-	5
40	*Unciger foetidus* (C.L. KOCH)	-	+	+	+	+	+	-	+	6
41	*Ommatoiulus sabulosus* (L.)	-	+	+	+	+	+	-	-	5
42	*Sarmatiulus vilnensis* (JAWLOWSKI)	-	+	-	-	-	+	-	-	2
43	*Polyzonium germanicum* (BRANDT)	+	+	+	+	-	-	+	-	5
	Total	5	13	26	17	14	13	5	16	

3.5. Bushes:

There is a large variety of bush formations in Poland. In mountain localities they can be moist, especially along streams. In a lowland they cover slopes of small hills and river banks. This variety creates good living conditions for 14 species.

3.6. Meadows:

The great variety of meadows are inhabited by 13 species of Diplopoda. There is a large difference between groups of species living in mountains and lowland areas. In mountains, under stones on river banks live *Trachysphaera acutula, Polydesmus m. montanus* and *P. t. tatranus*. The lowland areas are frequented by a rich variety of species among which *Julus terrestris* and *Sarmatiulus vilnensis* are the most characteristic for these habitats.

3.7. Peat-bogs.

The peat-bogs have the greatest variety and abundance in the northern part of Poland and in the Swietokrzyskie Mts. They are inhabited by 5 species of Diplopoda without characteristic species.

3.8. Synanthropic Environments (Garden, Park, Houses etc.).

This habitat is one of the richest in Poland with 16 species recorded. The following species are known only from these environments: *Brachydesmus superus, Polydesmus inconstans, Blaniulus guttulatus, Boreoiulus tenuis, Cylindroiulus frisius* and *C. caeruleocinctus*.

4. Literature:

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