ZAKŁAD ZOOLOGII SYSTEMATYCZNEJ
POLSKIEJ AKADEMII NAUK

ACTA ZOOLOGICA CRACOVIENSIA

Tom XIV Kraków, 31. XII. 1969 Nr 19

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Fauna of *Protura* of the Ojców National Park in Poland

[Pp. 465—470, pls XXXVI—XXXVII]

Fauna *Protura* Ojcowskiego Parku Narodowego

Фауна *Protura* Ойцовского Народного Парка

Abstract. The author presents 10 species of the *Protura* from the Ojców National Park (Southern Poland), of which 5 are new to the fauna of Poland, and discusses their association with various types of habitats as well as their zoogeographic significance.

INTRODUCTION

The Proturan fauna of Poland is as yet very poorly known. Up to the present time this group has been dealt with only by STACH (1927, 1954, 1955, 1959, 1964), STRENZKE (1942) and SZEPTYCKI (1964, 1968). The paper by DAMPF (1911), quoted in TUXEN'S monograph (1964) as concerning the fauna of Poland, in fact refers to the border territory of the Soviet Union. Eventually, hardly 8 species have hitherto been recorded from Poland.

The present work is based on the material collected during my studies on the *Collembola* and the specimens which I received from Dr A. RAJSKI, who had gathered them at the time of his investigation on the *Oribatei*. The comparatively rich material made it possible not only to find 5 species new to the fauna of Poland but also to perceive the association of some species with definite types of habitats, which is particularly valuable in view of the poor knowledge of this group.

The description of the study area and the explanation of the phytosociological terms used below will be found in my paper on the *Collembola* of Ojców (SZEPTYCKI, 1967).

I wish to express my heartfelt thanks to Dr. A. RAJSKI for the donation of rich Proturan material from Ojców, to Dr. J. NOSEK from Bratislava for the checking and correction of some of my identifications, to Dr. J. RUSEK from Prague for checking my identifications within the genus *Eosentomon* BERL., and to Prof. J. STACH for furnishing some bibliographic items and reading the typescript of the paper.

LIST OF SPECIES

(The asterisk * indicates species new to the fauna of Poland)

1. ***Eosentomon transitorium*** BERLESE 1908. In all environments except those extremely dry.
   So far recorded from the following places in Poland: Nowotarska Basin and Tatra Mts. (STACH, 1927, 1959, 1964), Koszalin region (STRENZKE, 1942) and Wolin I (SZEPTYCKI, 1964). It is, besides, known from nearly whole Europe and North Africa (TUXEN, 1958, 1964).

*2. ***Eosentomon bohemicum*** RUSEK 1966 (Pl. XXXVI, 1—3). Eurotopic in the Ojców region, but most numerous in *Fagetum carpaticum*.
   Hitherto known only from the Bohemian part of the Karkonosze (Sudetes) (RUSEK, 1966).

*3. ***Proturentomon minimum*** (BERLESE 1909) (Pl. XXXVI, 4—7). Present only in warm environments, most numerous in *Origano-Brachypodietum*, *Festucetum pallentis sempervivetosum* and *Corylo-Peucedanetum*, considerably less numerous in *Festucetum pallentis neckeretosum* and *Tilio-Carpinetum*.
   Species known from Italy, Switzerland, England (TUXEN, 1964) and Czechoslovakia (RUSEK, 1966).

4. ***Acerentulus confinis*** (BERLESE 1908) (Pl. XXXVI, 8). Xerothermic associations, *Corylo-Peucedanetum* and *Tilio-Carpinetum*.
   In Poland recorded from the West Beskids and Nowotarska Basin (STACH, 1964). It is widely distributed in Central and South Europe and known also from North Africa (TUXEN, 1964).

5. ***Acerentulus traegardhi*** IONESCU 1937 (Pl. XXXVI, 1). It occurs in environments mentioned for the previous species, but is somewhat rarer.
   Hitherto known in Poland only from Wolin I (SZEPTYCKI, 1964). It has also been recorded from Southern Sweden, Denmark, Belgium, Czechoslovakia and Romania (TUXEN, 1964).

*6. ***Acerella danica*** (CONDÉ 1947). One specimen in *Festucetum pallentis neckeretosum*.
   So far reported also from Denmark and Northern Germany (TUXEN, 1964).

7. ***Acerentomon dispar*** STACH 1954. Very common in *Fagetum carpaticum*, occurs more rarely in other forest associations. Single specimens present also in meadow soil.
   It has hitherto been known from the West Beskids, Nowotarska Basin

and Tatra Mts. (STACH, 1954, 1959, 1964) and from Czechoslovakia (NOSEK, 1961).

*8. ***Acerentomon quercinum*** IONESCU 1932 (Pl. XXXVII, 2—3). Very rare, in *Corylo-Peucedanetum* and *Tilio-Carpinetum*.
Recorded from Romania, France (TUXEN, 1964), Czechoslovakia (NOSEK, 1961, 1964) and Hungary (LOKSA, 1966).

*9. ***Gracilentulus gracilis*** (BERLESE 1908) (Pl. XXXVII, 4—6). Very rare, in *Corylo-Peucedanetum* and *Tilio-Carpinetum*.
Widely distributed in South and West Europe, known also from Africa (TUXEN, 1964).

10. ***Berberentulus polonicus*** SZEPTYCKI 1968. *Fagetum carpaticum* and *Pino-Quercetum* with the beech, only one specimen also in *Pino-Quercetum* with the pine.
So far known only from Ojców (SZEPTYCKI, 1968).

ECOLOGICAL-ZOOGEOGRAPHIC REMARKS

The material on which the present paper is based has been collected by various — often incomparable — methods. In spite of this fact a comparison of the percentages of specimens of particular species found in definite environments allows a fairly distinct division of these species into ecological groups (Table I).

Table I

	PQ.	Md.	Ms.	Fc.	TC.	CP.	X.	N.
Eosentomon transitorium	6	—	3	32	4	14	36	65
Eosentomon bohemicum	3	27	15	34	7	9	7	66
Proturentomon minimum	—	—	12	—	4	31	54	57
Acerentulus confinis	—	—	—	—	41	13	51	116
Acerentulus traegardhi	—	—	—	—	30	8	64	44
Acerella danica	—	—	+	—	—	—	—	1
Acerentomon dispar	1	1	—	86	9	1	—	364
Acerentomon quercinum	—	—	—	—	+	+	—	11
Gracilentulus gracilis	—	—	—	—	+	+	—	3
Berberentulus polonicus	+	—	—	+	—	—	—	25

PQ. — *Pino-Querceta*; Md. — Meadows; Ms. — communities of mosses *(Ctenidietalia* and *Festucetum pallentis neckeretosum)*; Fc. — *Fagetum carpaticum*; TC. — *Tilio-Carpinetum*; CP. — *Corylo-Peucedanetum cervariae*; X. — xerothermic communities *(Festucetum pallentis sempervivetosum, Origano-Brachypodietum* and *Koelerio-Festucetum sulcatae)*; N. — number of specimens

As will be seen from the table, the bulk of the species discussed may be divided into two groups. The first of them includes the species of cold environments, occurring chiefly in beech forests, colder stands of *Tilio-Carpinetum*,

soil of meadows, and associations of epilithic mosses. *Eosentomon bohemicum* RUSEK, *Acerentomon dispar* STACH and *Berberentulus polonicus* SZEPTYCKI belong to this group. The second group consists of species occurring in warmer environments, i.e., in the soil of xerothermic associations, warm hazel brushwoods and some stands of *Tilio-Carpinetum*. The species of this group are *Proturentomon minimum* (BERL.), *Acerentulus confinis* (BERL.), *A. traegardhi* ION., *Acerentomon quercinum* ION. and *Gracilentulus gracilis* (BERL.).

The ecological requirements of *Acerella danica* (CONDÉ), rare in this area, remain unestablished. *Eosentomon transitorium* BERL. can hardly be included in either of these groups. It cannot, however, be decided at present whether it is really an eurotopic species or whether it embraces a group of species so far indistinguished.

Comparison of the results presented above with those obtained by other authors is very difficult because there are only few ecological data concerning the *Protura* in literature. *Acerentomon dispar* STACH occurs in various types of mixed mountain forests, though it also spreads into higher situated forest associations as well as non-forest communities situated in the proximity of forests (these may include artificially deforested patches) (STACH, 1954; NOSEK, 1957). *Eosentomon bohemicum* RUSEK has hitherto been found only in fir-dominant mixed mountain forests (RUSEK, 1966). Both species of the genus *Acerentulus* BERL. of the second ecological group were collected in the litter of various forests (NOSEK, 1961), whereas *Proturentomon minimum* (BERL.) and *Acerentomon quercinum* ION. in different types of xerothermic scrubs (NOSEK, 1961; LOKSA, 1966; RUSEK, 1966).

The *Protura* obviously differ from the *Collembola* in their attitude towards the habitats existing in a given area (cf. SZEPTYCKI, 1967). In principle, they confine themselves only to xerothermic swards, warm scrubs and some forest associations. Other environments have a quantitatively much poorer fauna void of characteristic species. Unlike the *Collembola*, the forest and scrub fauna is evidently differentiated. Warm brushwoods *(Corylo-Peucedanetum cervariae)* have a fauna which differs distinctly from that of beech forests *(Fagetum carpaticum)* but resembles the fauna of xerothermic epilithic swards. This situation, therefore, corresponds much more closely than that in the *Collembola* to the phytosociological data (cf. MEDWECKA-KORNASIOWA and KORNAŚ, 1963). On the other hand, *Tilio-Carpinetum* is a clearly ununiform association in so far as its fauna is concerned; some of its stands approximate rather to a beech forest, others to warm brushwoods.

The scarcity of data on the distribution of most species of the *Protura* makes a close analysis of the zoogeographic relations impossible. However, the analogies in the distribution of many plant and animal species and those shown by the zoogeographic analysis of the *Collembola* (SZEPTYCKI, 1967) allow some hypotheses about the time of spreading of the species belonging to the two ecological groups distinguished above. Thus, in the fauna of Ojców the species of cool environments, occurring chiefly in beech forests, seem to

represent the mixed mountain forest element, which came here from the Carpathian Mts. together with the beech forests spreading in the postglacial optimum of beech. *Berberentulus polonicus* SZEPT. should probably be counted in the same chronological group, although it is now impossible to decide whether it has come here from the Carpathians (which seems more probable on account of numerous analogies) or from the west, from the regions with a more Atlantic climate.

At least some of the species of warm environments represent the relicts from the postglacial climatic optimum in this fauna. A weighty argument for the relict nature of *Acerentomon quercinum* ION. and *Gracilentulus gracilis* (BERL.) is their local occurrence; in the Ojców region these species seem to be confined to the southern slopes of Koronna Mt., covered by particularly well-developed xerothermic associations.

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STRESZCZENIE

Autor podaje 10 gatunków *Protura* z Ojcowskiego Parku Narodowego. Nowe dla Polski są: *Eosentomon bohemicum* Rusek, *Proturentomon minimum* (Berl.), *Acerella danica* (Condé), *Acerentomon quercinum* Ion. i *Gracilentulus gracilis* (Berl.).

W przebadanym materiale można wyróżnić dwie grupy ekologiczne, a to gatunki środowisk zimnych, występujące głównie w buczynach, i środowisk ciepłych, głównie w zaroślach leszczynowych i zespołach kserotermicznych. Gatunki pierwszej grupy przybyły na omawiany teren z Karpat w okresie optimum buka, przynajmniej zaś niektóre z gatunków drugiej grupy są reliktami z postglacjalnego optimum termicznego.

РЕЗЮМЕ

Автор указывает 10 видов *Protura* из Ойцовского Народного Парка. Виды новые для фауны Польши это: *Eosentomon bohemicum* Rusek, *Proturentomon minimum* (Berl.), *Acerella danica* (Condé), *Acerentomon quercinum* Ion. i *Gracilentulus gracilis* (Berl.).

В исследованном материале можно выделить две экологические группы: виды холодных сред, выступающие главным образом в буковых лесах, и тёплых сред, главным образом в орешниковых зарослях и ксеротермических ассоциациях. Виды первой группы появились на исследованной территории в постгляциальном оптимуме бука, а хотя бы некоторые из второй группы в постгляциальном термическом оптимуме.

PLATES

Plate XXXVI

1—3. *Eosentomon bohemicum* RUSEK
1. Foretarsus, exterior view (magnification d)
2. Foretarsus, interior view (magnif. d)
3. Squama genitalis (magnif. b)

4—7. *Proturentomon minimum* (BERL.)
4. Pseudoculus (magnif. a)
5. Filamento di sostegno, proximal part (magnif. a)
6. Foretarsus, exterior view (magnif. c)
7. Comb of abdominal tergite VIII (magnif. a)
8. *Acerentulus confinis* (BERL.) — foretarsus, exterior view (magnif. d)

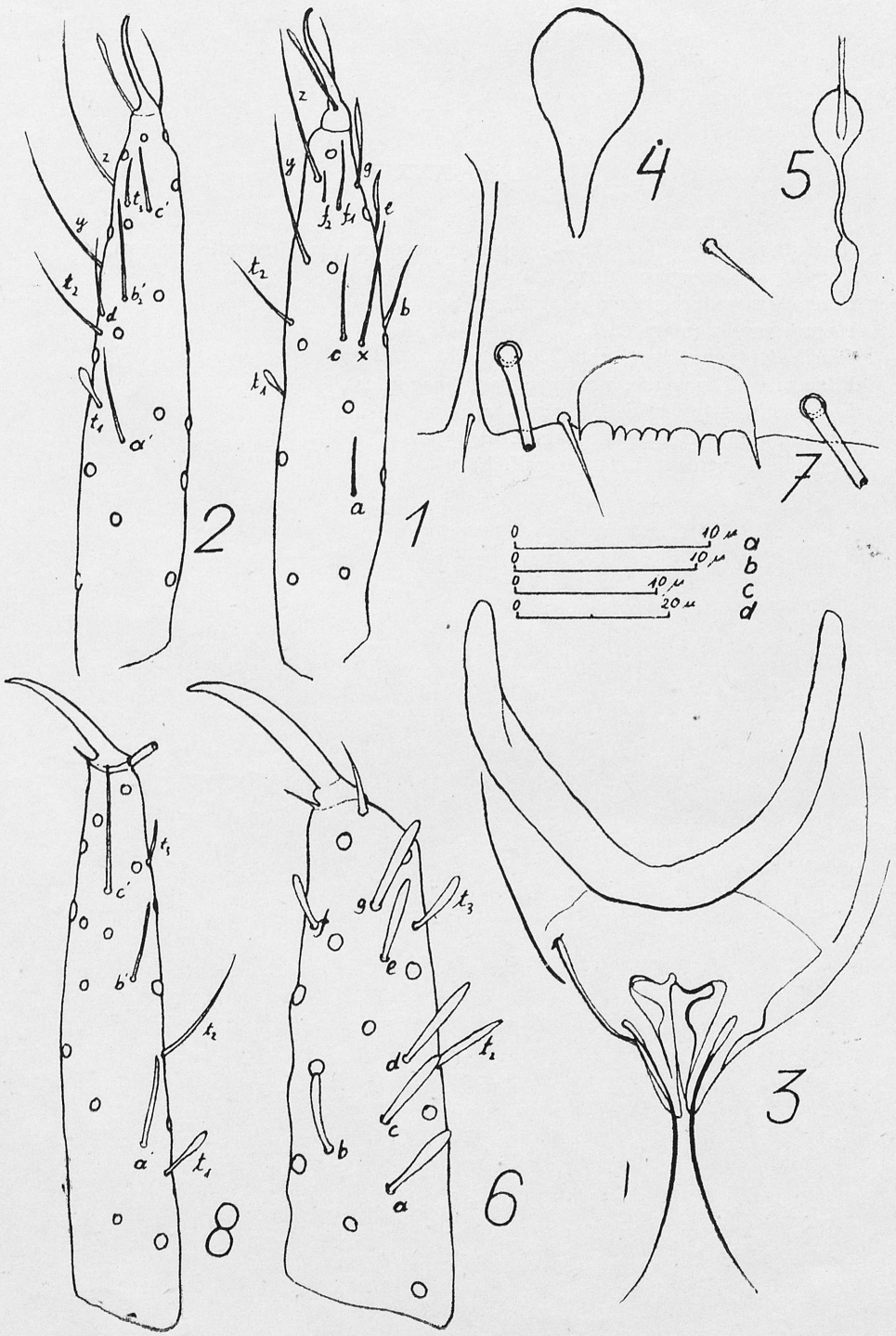

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Plate XXXVII

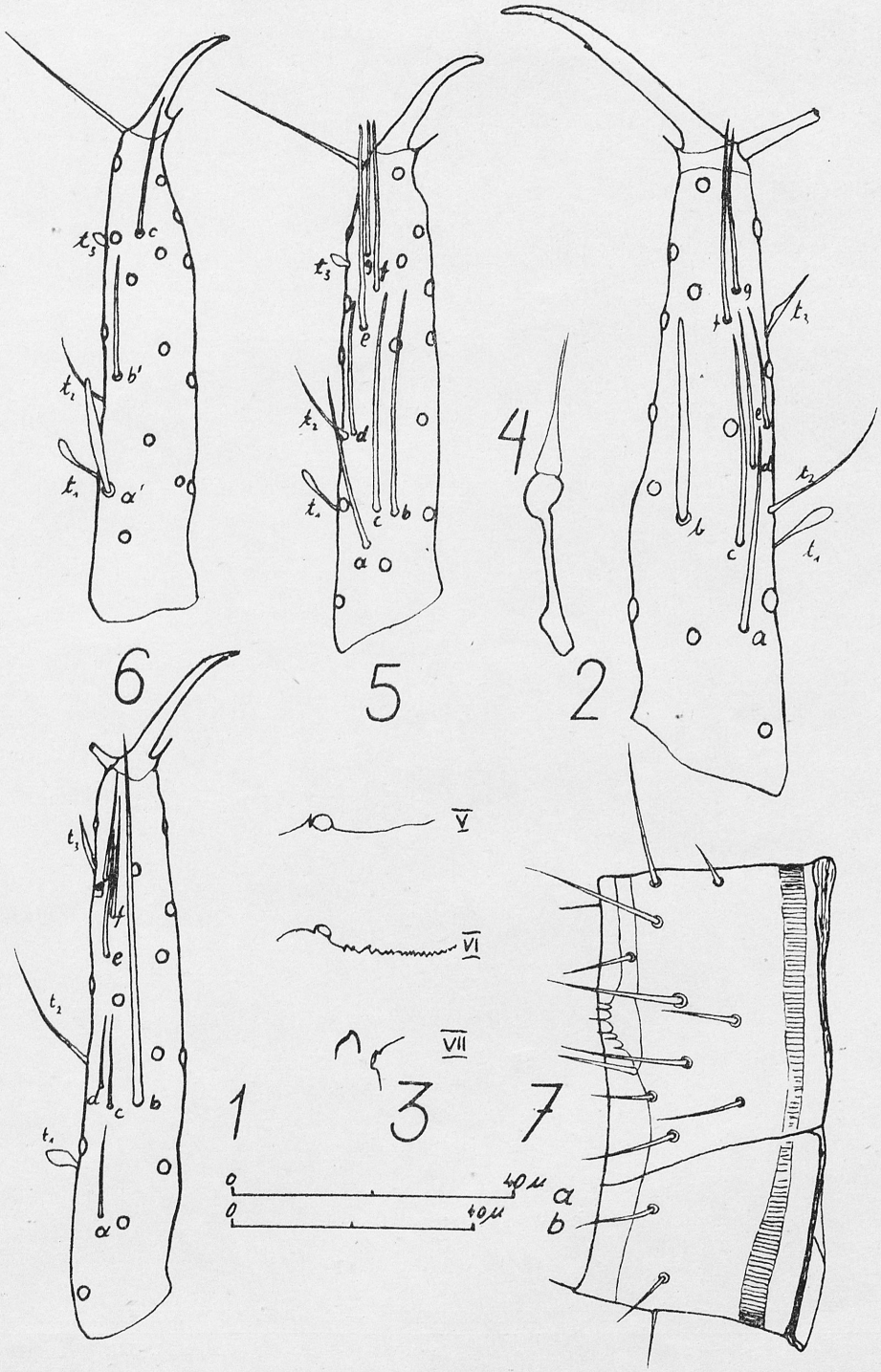
1. *Acerentulus traegardhi* Ion. — foretarsus, exterior view (magnification a)

2—3. *Acerentomon quercinum* Ion.

2. Foretarsus, exterior view (magnif. a)
3. Pleural combs (magnif. a)

4—7. *Gracilentulus gracilis* (Berl.)

4. Filamento di sostegno, proximal part (magnif. a)
5. Foretarsus, exterior view (magnif. a)
6. Foretarsus, interior view (magnif. a)
7. Abdominal segment VIII (magnif. b)



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Redaktor zeszytu: dr L. Sych

PAŃSTWOWE WYDAWNICTWO NAUKOWE — ODDZIAŁ W KRAKOWIE — 1969

Nakład 710+90 egz. — Ark. wyd. 0,75 — Ark. druk. 12/16 — Papier ilustr. kl. III, 80 g, 70×100
Zam. 562/69 Cena zł 6,—

DRUKARNIA UNIWERSYTETU JAGIELLOŃSKIEGO W KRAKOWIE