

CONTRIBUTIONS TO THE KNOWLEDGE OF DIPLOPODS DIVERSITY FROM ȚARA NĂSĂUDULUI, ROMANIA

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Abstract. In the first part, the paper renders the list of diplopod species that live in different environments from Țara Năsăudului region. This is completed with the settlements where it is signalled the presence of each species, as well as with data regarding the preferential habitat of each species. The second part contains the species of this biotope, species belonging to Traian Ceuca Collection, as well as statistical references about the sampling data.

Keywords: diplopods, Țara Năsăudului, biotope, preferential habitat.

Rezumat. Contribuții la cunoașterea diversității diplopodelor din Țara Năsăudului, România. Lucrarea prezintă în prima parte lista speciilor de diplopode care au ca mediu de viață reperele geografice ale Țării Năsăudului. Aceasta este completată cu localitățile în care este semnalată prezența fiecărei specii, precum și cu datele legate de habitatul preferențial al fiecărei specii. Partea a doua, conține speciile acestui biotop existente în colecția Traian Ceuca, precum și referiri statistice legate de datele de colectare.

Cuvinte cheie: diplopode, Țara Năsăudului, biotop, habitat preferențial.

INTRODUCTION

The present paper aims at synthesizing the data referring to the diplopods that live within Țara Năsăudului, their location, the type of habitat, as well as at processing the data of the collection. In order to render a general view about this subject, it is quite necessary to independently consult a vast bibliographic material. Thus, the presented data make the identification of species and the framing of the collection data within this geographical region easier.

MATERIAL AND METHODS

“Țara Nasăudului” (Năsăud Country) as a geographical region is located in the northern-central part of Romania, administratively belonging to Bistrița-Năsăud County. However, the area we refer to does not strictly correspond to the administrative borders; it is a territory with a particular contour line. The northern, eastern and, partially, the southern parts are limited by the Rodna and Bârgău Mountains. The vegetation structure includes the alpine and mountainous levels marked by the presence of alpine meadows, hayfields, shrubs, coniferous, and mixed forests. In the western and central parts, there are Ciceu, Suplai, and Năsăud Hills, the area being covered by caducifoliate forests, agricultural fields, and pasture lands.

The climate of Țara Năsăudului is characteristic to the mountainous and hilly regions, displays a moderate character, and is also influenced by the slope exposition and relief massiveness. Under these circumstances, the fauna of diplopods in the area is favoured by the living and adaptation conditions proven by the great number of species present in this habitat (ILOVAN, 2009).

In order to complete this paper, we initially consulted the list of all species of diplopods from Romania, made up by Traian Ceuca. It was a manuscript and we selected only the species referring to Țara Năsăudului, their preferential habitat, and the spots where they had been observed. At the same time, we also consulted the author's PhD thesis (CEUCA, 1968), which describes three orders of diplopods present in the Romanian fauna. We also studied other previously published specialized data referring to the species characteristic to this area (CEUCA, 1958, 1979, 1992).

The material analysed in the present paper is represented by the diplopods from T. Ceuca collection, preserved at the Museum of the “Babeș-Bolyai” University from Cluj Napoca, set up between 1921 and 1988. All these species are registered in the Book of scientific collections (no. 4) of the Zoological Museum of the “Babeș–Bolyai” University.

RESULTS AND DISCUSSIONS

After synthesizing and analysing the data rendered in the manuscript (CEUCA), we have identified in Țara Năsăudului 41 species, included in 19 genera, 11 families, 6 orders, that were collected in 12 sampling stations. For visualizing this region entirely, we have attached the following map, where there appear only the sampling stations for the species belonging to T. Ceuca collection (Fig. 1). These data, as well as certain information regarding the preferential habitat of each species are rendered in Table 1.

Studying the book of collections, in T. Ceuca collection, we identified 29 species gathered between 1948 and 1964. For each identified species, we mention the sampling stations and the number of individuals, distributed on sexes (Table 2). The total number of the respective species individuals is rendered below the table.

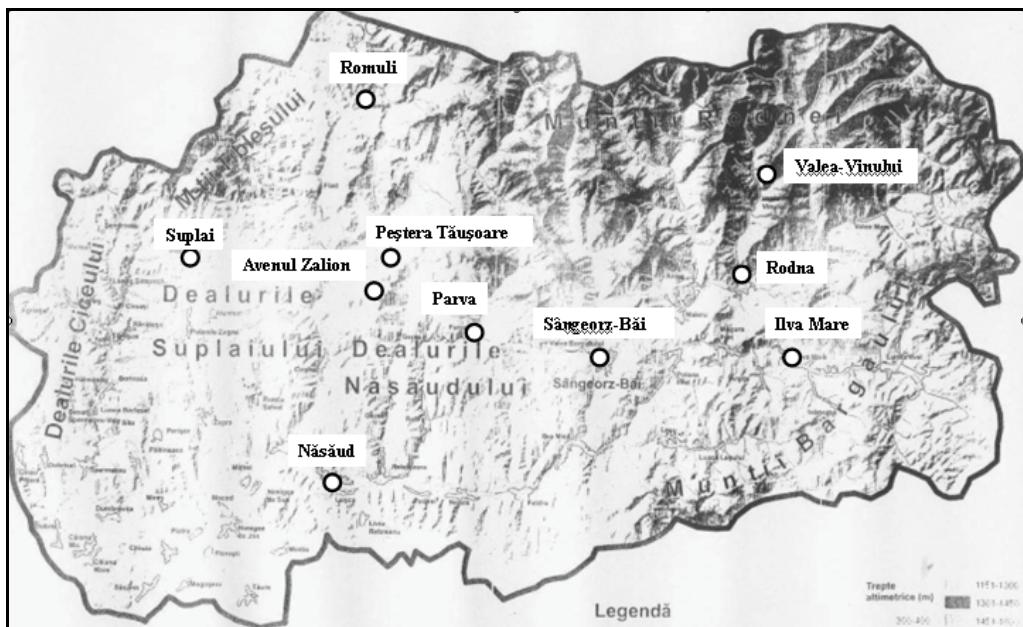


Figure 1. The map of Țara Năsăudului rendering the sampling stations of the diplopods belonging to T. Ceuca Collection (after ILOVAN, 2009).

Figura 1. Harta Țării Năsăudului, cu locurile de colectare ale diplopodelor din Colecția T. Ceuca (după ILOVAN, 2009).

Table 1. Species, settlements, and biotopes populated by diplopods from Țara Năsăudului.
Tabel 1. Speciile, localitățile și biotopurile populate de Diplopodele din Țara Năsăudului

No.	Taxon	Species	Sampling station	Preferential habitat
Order POLYXENIDA				
Family Polyxenidae				
1.		<i>Polyxenus lagurus</i> (LINNAEUS 1758)	Sângeorz-Băi	- litter species, caducifoliate forests, under the tree bark, under rocks
Order GLOMERIDA				
Family Glomeridae				
2.		<i>Glomeris hexastiha</i> (BRANDT 1833)	Sângeorz-Băi	- forest margins, glades, under fallen trunks, under rocks
3.		<i>Glomeris connexa</i> (C.L.KOCH 1847)	the Vinului Valley	- forest margins, glades, under fallen trunks, under rocks
4.		<i>Trachisphaera cristangula</i> (ATTEMPS 1943)	Sângeorz-Băi, Suplai, the Vinului Valley	- humicole species, within caducifoliate forests, especially in calcareous areas
5.		<i>Trachisphaera acutula</i> (LATZEL, 1884)	the Vinului Valley	- litter species, caducifoliate and coniferous forests
Order POLYDESMIDA				
Family Polydesmidae				
6.		<i>Polydesmus complanatus</i> (LINNAEUS 1761)	Parva, Sângeorz-Băi, the Cormaia Valley, the Ilva Valley	- litter species, caducifoliate and coniferous humid forests, shrubs, public gardens, it reaches 2,000 m altitude
7.		<i>Polydesmus montanus montanus</i> (DADAY 1889)	the Vinului Valley, Romuli	- caducifoliate and coniferous forests
8.		<i>Polydesmus hamatus furcatus</i> (VERHOEFF 1925)	the Vinului Valley	- high altitude caducifoliate and coniferous forests
9.		<i>Polydesmus daday</i> (SILVESTRI 1895)	the Vinului Valley	- high altitude caducifoliate and coniferous forests, edge of roads, under rocks
10.		<i>Polydesmus polonicus</i> (LATZEL 1884)	Suplai, the Cormaia, Ilva, Vinului Valleys, Zalion Cave	- species preferring humid forests, especially oak forests, under rocks and in caves
11.		<i>Polydesmus tatraeus rodnaensis</i> (VERHOEFF 1898)	Suplai, the Vinului Valley	- species from the coniferous forests, under rocks, under fallen tree trunks
Order CHORDEUMIDA				
Family Entomobielziidae				
12.		<i>Entomobielzia kimakowizii</i> (VERHOEFF 1897)	the Vinului Valley, Rodna	- litter species, caducifoliate and coniferous forests, under tree barks, under rocks
Family Haaseidae				
13.		<i>Romanosoma cavernicola</i> (CEUCA 1967)	Zalion Cave	- typically troglobiont, in humid grottoes
14.		<i>Romanosoma birtei</i> (CEUCA 1967)	Tăușoara Cave	- in humid forests, accidentally in caves
15.		<i>Romanosoma odici</i> (CEUCA 1967)	Tăușoara Cave	- litter of the mixed forest margin

	Family Chordeumatidae		
16.		<i>Melogona transsilvanicum</i> (VERHOEFF 1897)	Sângeorz-Băi - caducifoliate forest margins, parks, cimitories
Family Mastigophorophyllidae			
17.		<i>Mastigophorophyllum penicilligerum</i> (VERHOEFF 1897)	the Vinului Valley, the Rodna Mountains - litter species, caducifoliate and coniferous forests, under tree bark, under rocks
18.		<i>Mastigophorophyllum aberratum</i> (CEUCA 1958)	Parva - litter species, caducifoliate and coniferous forests
19.		<i>Mastigophorophyllum serrulatum</i> (ATTEMS 1926)	Pietrosul Rodnei - humid forests and rarely coniferous forests, under fallen and rotten trees, under rocks
20.		<i>Mastigophorophyllum aberratum</i> (CEUCA 1985)	Parva - coniferous forest margin
21.		<i>Karpatophyllum polinskii</i> (JAWLOWSKI 1928)	the Vinului Valley, the Rodna Mountains, the Strâmba Valley in the proximity of Romuli settlement - litter species, high-altitude caducifoliate and coniferous forests, under tree bark, under rocks
Order IULIDAE Family Blaniulidae			
22.		<i>Nemasoma varicorne</i> (C.L. KOCH 1847)	Rodna Veche - almost exclusively calcicole species, preferring willows, maples, oaks, poplars, and even fruit-bearing trees - accidentally in moss or even bird nests
Family Iulidae			
23.		<i>Cylindroiulus boleti</i> (VERHOEFF 1930)	the Vinului Valley - litter species, caducifoliate and coniferous forests, under tree bark, under rocks, up to 2,000m
24.		<i>Cylindroiulus truncorum</i> (SILVESTRI 1896)	the Vinului Valley - litter species, caducifoliate and coniferous forests, under tree bark, under rocks, up to 2,000m
25.		<i>Cylindroiulus luridus</i> (C. L. KOCH 1847)	Năsăud, the Vinului Valley, Suplai - in almost all kinds of forests, under fallen and decomposed trunks, up to 1,500 m
26.		<i>Enantiulus manus</i> (LATZEL 1884)	Sângeorz-Băi - litter species, caducifoliate and coniferous forests
27.		<i>Enantiulus transsilvanicus</i> (VERHOEFF 1899)	Năsăud, the Caselor Valley, the Vinului Valley - litter species, caducifoliate and coniferous forests
28.		<i>Haplophyllum mehely</i> (VERHOEFF 1897)	Heniu Mountain - typical litter species preferring rocky soil
29.		<i>Xestoiulus laeticolis</i> (PORAT 1889)	Sângeorz-Băi - litter species, caducifoliate forests and thickets
30.		<i>Xestoiulus imbecillus</i> (LATZEL 1884)	Năsăud, the Caselor Valley, the Vinului Valley, Sângeorz-Băi - litter species, caducifoliate forests
31.		<i>Leptoiulus trilobatus</i> (VERHOEFF 1899)	Năsăud, the Caselor Valley, the Vinului Valley - litter species, caducifoliate and coniferous forests, under tree bark, under rocks, up to 2,000m
32.		<i>Leptoiulus baconiensis pruticus</i> (JAWLOWSKI 1931)	the Vinului Valley - caducifoliate forests
33.		<i>Leptoiulus korongisius</i> (ATTEMS 1904)	the Rodna Mountains, Corongiș Peak - deforested alpine areas, under rocks or grass bushes, high-altitude forest margin
34.		<i>Unciger transsilvanicus</i> (VERHOEFF 1899)	Sângeorz-Băi, Suplai - litter species, caducifoliate and coniferous forests, under tree bark, in parks, cemeteries, under rocks, up to 2,000m
35.		<i>Unciger foetidus</i> (C.L. KOCH 1838)	the Vinului Valley - present in deciduous forests, parks, cemeteries, gardens, under decomposed leaves, in open areas, under rocks
36.		<i>Megaphyllum unilineatum</i> (KOCH 1838)	Sângeorz-Băi - in low-altitude areas, forest margin, under bushes, in sandy areas, under rocks, under trunks
37.		<i>Megaphyllum transsilvanicum</i> (VERHOEFF 1897)	Sângeorz-Băi - litter species, only in coniferous forests
38.		<i>Megaphyllum silvaticum</i> (VERHOEFF 1898)	the Vinului Valley, Heniu Mountain - caducifoliate and coniferous forests, under tree bark, under rocks, up to 2,000m to the alpine meadow
39.		<i>Megaphyllum projectum dioritanum</i> (VERHOEFF 1894)	Năsăud, Sângeorz-Băi, the Vinului Valley, the Rodna Mountains - bushes and overgrown gardens, cemeteries, parks, under decomposed leaves, rocks, and fallen trees
40.		<i>Ommatoiulus sabulosus</i> (LINAeus 1758)	Sângeorz-Băi - it appears in almost all biotopes, from plain to more than 2,000 m altitude
Order POLYZONIDA Family Polyzoniidae			
41.		<i>Polyzonium transsilvanicum</i> (VERHOEFF 1894)	Năsăud, the Caselor Valley, Sângeorz Băi, Suplai - in forests the soil of which is covered by decomposed leaves

Table 2. The species identified in T. Ceuca collection rendering the sampling stations and the number of individuals.
Tabel 2. Specile identificate în colecția T. Ceuca cu precizarea localităților de colectare și a numărului de indivizi.

1. *Polydesmus complanatus* (LINNAEUS 1761)

Sampling station	M.	F.	L.
Sângoroz -Băi	4	3	18
Rodna, Saca Mountain	2		
The Vinului Valley	3	3	1
Parva	4	3	
Romuli	2	3	
Ilva Mare	2	5	
Total (53 ind)	17	17	19

2. *Polydesmus montanus montanus* (DADAY 1889)

Sampling station	M.	F.	L.
The Vinului Valley	7	5	1
Total (13 ind)			

3. *Polydesmus daday* (SILVESTRI 1895)

Sampling station	M.	F.	L.
The Vinului Valley	2	1	6
Total (9 ind)			

4. *Polydesmus griseoalbus* (VERHOEFF 1858)

Sampling station	M.	F.	L.
Sângoroz -Băi	1	2	
Total (3 ind)			

5. *Polydesmus polonicus* (LATZEL 1884)

Sampling station	M.	F.	L.
Sângoroz -Băi	1	1	
Telciu - Avenul Zalion	1	1	
Suplai	6	10	44
Total (64 ind)	8	12	44

6. *Polydesmus hamatus furcillatus* (VERHOEFF 1925)

Sampling station	M.	F.	L.
The Vinului Valley	1	1	
Total (2 ind)			

7. *Polydesmus tatranus rodnaensis* (VERHOEFF 1898)

Sampling station	M.	F.	L.
The Vinului Valley	1	1	
Total (2 ind)			

8. *Entomobielzia kimakowizii* (VERHOEFF 1897)

Sampling station	M.	F.	L.
The Vinului Valley	2	20	
Total (22 ind)			

9. *Romanosoma cavernicola* (CEUCA 1967)

Sampling station	M.	F.	L.
Zalion Aven	1	1	2
Total (4 ind)			

10. *Romanosoma birtei* (CEUCA 1967)

Sampling station	M.	F.	L.
Tăușoara Cave	1		
Total (1 ind)			

11. *Romanosoma odici* (CEUCA 1967)

Sampling station	M.	F.	L.
Tăușoara Cave	1	1	
Total (2 ind)			

12. *Mastigophorophyllum penicilligerum* (VERHOEFF 1897)

Sampling station	M.	F.	L.
The Vinului Valley	6	3	15
Total (24 ind)			

13. *Cylindroiulus luridus* (C L. KOCH 1847)

Sampling station	M.	F.	L.
Năsăud	4	8	
Suplai		3	
The Vinului Valley	1		
Total (16 ind)	5	11	

14. *Megaphyllum unilineatum* (KOCHE 1838)

Sampling station	M.	F.	L.
Sângoroz -Băi		2	4
Total (6 ind)			

15. *Enantiulus transsylvaniaicum* (VERHOEFF 1899)

Sampling station	M.	F.	L.
Sângoroz -Băi	27	50	
The Vinului Valley	50	60	11
Năsăud	1	6	
Total (205 ind)	78	116	11

16. *Karpatophyllum polinskii* (JAWLOWSKI 1928)

Sampling station	M.	F.	L.
The Vinului Valley	3	6	15
Romuli		1	
Total (25 ind)	4	6	15

17. *Microiulus laeticolis* (PORRAT 1889)

Sampling station	M.	F.	L.
Sângoroz -Băi	52		44
Total (96 ind)			

18. *Xestoiulus imbecillus* (LATZEL 1884)

Sampling station	M.	F.	L.
Năsăud	8		22
Total (30 ind)			

19. *Leptoiulus trilobatus* (VERHOEFF 1894)

Sampling station	M.	F.	L.
The Vinului Valley	5	5	1
Năsăud	1	5	
Total (17 ind)	6	10	1

20. *Leptoiulus baconiensis pruticus* (JAWLOWSKI 1931)

Sampling station	M.	F.	L.
The Vinului Valley	2	1	
Total (3 ind)			

21. *Megaphyllum silvaticum* (VERHOEFF 1898)

Sampling station	M.	F.	L.
Sângoroz -Băi	2	8	2
The Vinului Valley	3	4	
Năsăud	3	2	2
Total (29 ind)	8	14	7

22. *Ommatoiulus sabulosus* (LINAeus 1758)

Sampling station	M.	F.	L.
Sângoroz -Băi	2	2	1
Total (5 ind)			

23. *Glomeris hexasticha* (BRANDT 1833)-

Sampling station	M.	F.	L.
Năsăud	1	1	
Total (2 ind)			

24. *Glomeris prominens* (ATTEMS 1903)

Sampling station	M.	F.	L.
The Vinului Valley	30	38	16
Total (84 ind)			

25. *Glomeris connexa* (C.L.KOCH 1847)

Sampling station	M.	F.	L.
The Vinului Valley	12	8	1
Total (21 ind)			

26. *Unciger foetidus* (C.L. KOCH 1838)

Sampling station	M.	F.	L.
The Vinului Valley	3	2	
Total (5 ind)			

27. *Unciger transsilvanicum* (VERHOEFF 1899)

Sampling station	M.	F.	L.
Parva	1	4	1
Năsăud		1	
Total (11 ind)	2	4	1

28. *Melogona transsilvanicum* (VERHOEFF 1899)

Sampling station	M.	F.	L.
Rodna	1		
Total (1 ind)			

29. *Haplophyllum mehely* (VERHOEFF 1897)

Sampling station	M.	F.	L.
The Vinului Valley	17	14	
Total (31 ind)			

The 29 species of diplopods collected within Tara Năsăudului and gathered in T. Ceuca collection contain 769 individuals, 264 (34.33%) of which are males, 349 (45.38%) females, and 139 (18.07%) larvae. The ratio between male and female sexes is relatively well-balanced, while larvae register a lower percentage. This situation is induced by the fact that adults can be noticed during two seasons, namely in autumn and spring, while larvae are characteristic only during summer.

At the same time, as one may see in table 3, the sampling data were also processed in terms of relative abundance, dominance, and constancy of these species. In the first column, there is also mentioned the total number of individuals for each sample.

Relative abundance represents the percent participation of each species in the respective biocoenosis:

$$A = \frac{n \times 100}{N}$$

A = Abundance;

N = total number of individuals of all the sampled species;

n = number of individuals of sp. A from the gathered samples.

Frequency represents the percentage of samples where a certain species is registered compared to the total number of samples.

$$F = \frac{p}{P}$$

P = total number of samples from the respective biocoenosis;

p = number of samples where species A appears.

Dominance is expressed through the values of relative abundance.

D < 0.1 % - subprecedente species

D = 1.5 – 10% - dominant species

D = 0.1- 1 % - recedente species

D > 100% - eudominant species

D = 1-1.5 – subdominant species

Table 3. Total number of individuals for each species present in T. Ceuca collection, relative abundance, dominance, and frequency.

Tabel 3. Numărul total de indivizi din fiecare specie existentă în colecția T. Ceuca, abundența relativă, dominanța și frecvența.

No.	Species	T.	Rel. ab.	Dominance	Freq.
1.	<i>Enantiulus transylvanicum</i>	205	26.65	eudominant species	0.072
2.	<i>Microiulus laeticolis</i>	96	12.48	eudominant species	0.036
3.	<i>Glomeris prominens</i>	84	10.92	eudominant species	0.018
4.	<i>Polydesmus polonicus</i>	64	8.32	dominant species	0.054
5.	<i>Polydesmus complanatus</i>	53	6.89	dominant species	0.09
6.	<i>Haplophyllum mehely</i>	31	4.03	dominant species	0.018
7.	<i>Xestoiulus imbecillus</i>	30	3.90	dominant species	0.018
8.	<i>Megaphyllum silvaticum</i>	29	3.77	dominant species	0.109
9.	<i>Karpatophyllum polinskii</i>	25	3.25	dominant species	0.036
10.	<i>Mastigophorophyllum penicilligerum</i>	24	3.12	dominant species	0.036
11.	<i>Entomobielzia kimakowizii</i>	22	2.86	dominant species	0.018
12.	<i>Glomeris connexa</i>	21	2.73	dominant species	0.054
13.	<i>Leptoiulus trilobatus</i>	17	2.21	dominant species	0.036
14.	<i>Cylindroiulus luridus</i>	16	2.08	dominant species	0.072
15.	<i>Polydesmus montanus montanus</i>	13	1.69	dominant species	0.036
16.	<i>Polydesmus daday</i>	9	1.17	dominant species	0.018
17.	<i>Unciger transsilvanicum</i>	7	0.91	dominant species	0.054
18.	<i>Megaphyllum unilineatum</i>	6	0.78	dominant species	0.018
19.	<i>Ommatoiulus sabulosus</i>	5	0.65	dominant species	0.018
20.	<i>Unciger foetidus</i>)	5	0.65	dominant species	0.018
21.	<i>Romanosoma cavernicola</i>	4	0.52	dominant species	0.018
22.	<i>Leptoiulus baconiensis pruticus</i>	3	0.39	dominant species	0.018
23.	<i>Polydesmus griseoalbus</i>	3	0.39	dominant species	0.018
24.	<i>Polydesmus hamatus furculatus</i>	2	0.26	dominant species	0.018
25.	<i>Polydesmus tatranus rodnaensis</i>	2	0.26	dominant species	0.018
26.	<i>Glomeris hexasticha</i>	2	0.26	dominant species	0.018
27.	<i>Romanosoma odici</i>	2	0.26	dominant species	0.018
28.	<i>Romanosoma birtei</i>	1	0.13	subdominant species	0.018
29.	<i>Melogona transsilvanicum</i>	1	0.13	subdominant species	0.018
	Total	769			

The species *Enantiulus transylvanicum* with 205 collected individuals, *Microiulus laeticolis* with 96 collected individuals, *Glomeris prominens* with 84 collected individuals are eudominant species. At the opposite side, there are the species *Romanosoma birtei* and *Melogona transsilvanicum* with one collected individual each, which are subdominant species. There are another 24 subdominant species, the number of individuals oscillating between 2 and 64.

Referring to the aforementioned information, table 4 briefly renders the sampling stations and the total number of individuals identified for each of them.

Table 4 Sampling stations and the number of individuals signaled in each zone.
Tabelul 4. Punctele de colectare și numărul de indivizi semnalati în fiecare zonă.

	Sampling stations	No. ind.
1.	The Vinului Valley	386
2.	Sângeorz -Băi	226
3.	Năsăud	65
6.	Suplai	63
5.	Parva	13
4.	Zalion Aven	6
9.	Ilva Mare	7
7.	Romuli	6
8.	Tăușoara Cave	3
10.	Rodna, Saca Mountain	2
11.	Rodna	2
	Total	769

One may notice that the stations the Vinului Valley and Sângeorz - Băi, with 386, respectively 226 collected individuals were the best-represented, while at Tăușoara Cave and Rodna, Saca Mountain, the number of collected samples was quite low - 3, respectively 2 individuals.

We mention that, in this valuable collection of diplopods from Țara Năsăudului, there are also endemites, such as *Glomeris hexasticha* (BRANDT 1833), *Romanosoma cavernicola* (CEUCA 1967), *Romanosoma birtei* (CEUCA 1967) și *Romanosoma odici* (CEUCA 1967).

CONCLUSIONS

Based on the above-mentioned information, we have synthetized the data characteristic to the diplopod species populating Țara Năsăudului in correlation with the favourable living conditions. Out of the 43 species present within the region, 29 are preserved in T. Ceuca Collection, the faunistic data of which have been statistically interpreted. The value of T. Ceuca Diplopods Collection is increased by the presence of 4 endemic species.

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