

STUDY OF THE DIVERSITY OF SOIL ANIMAL COMMUNITY IN THE SONGNEN PLAIN GRASSLAND OF CHINA

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ABSTRACT

This paper makes a diversity study of 8 habitats of soil animal communities in Songnen plain grassland. The research shows that the better the habitat condition is, the higher the diversity index of soil animals, and the worse the habitat condition is the lower the diversity index of soil animals. The diversity of soil animal communities has a positive relationship with soil organic matter, total nitrogen, and has a negative relationship with pH value. It has no obvious relationship with soil water content and total phosphorus. The diversity of soil animal communities decreases with increasing depth of soil layer and has surface-collection.

KEYWORDS

China, Grassland, Soil animals, Diversity

INTRODUCTION

The ecological study of soil animals has a history of fifty years. China has studied it since 1970, but the study of soil animals in grassland is not studied much, and the diversity study of soil animal communities is not reported. This paper makes a study of diversity of soil animal communities in Songnen plain grassland (Qian Yingqian et al., 1994), so as to know about the distribution and condition of soil animals diversity and the relationship between diversity and ecological factors. It shows status and function of soil animals in the ecological system and provides a scientific basis for the protection and sustained use of biodiversity.

METHODS

In Changling country in Songnen plain grassland we sampled 8 typical habitats of *Ulmus* sparse woods sandy dune (I), *Stipa grandis* sandy land (II), *Calamagrostis epigeios* flat land (III), *Leymus chinensis* flat land (IV), *Heleocharis intersita* lower wet land (V), *Hemarthria japonica* lower wet land (VI), *Suaeda corniculata* lower alkali land (VII) and *Puccinellia tenuiflora* lower alkali land (VIII). We made four sites in each habitat and respectively sampled 5 layers (0-5cm, 5-10cm, 10-15cm, 15-20cm and 20-30cm) and we obtained 480 samples. The sample site of large-scale soil animals was 50cm x 50cm; the sample site of middle and small soil animals was 10cm x 10cm; the sample site of wet habitat soil animals was 5cm x 5cm. Animals were separated from soil by hand-picking, Tullger funnels and Baermann (Jun-ichi AOKI, 1973). We made an identification and number statistics, and we also measured soil water content, pH value and soil nutrient content.

RESULTS AND DISCUSSION

The constitution of number of species in soil animals. A total of 6603 soil animals and 86 groups in 8 habitats were obtained, belonging to 4 phyla, 6 classes, 27 orders and 64 families. Large-scale soil animals were 55 groups, the dominant groups of them were Formicidae and Scarabaeidae; the frequent groups were Ariophantidae, Succineidae, Diptera larva, Enchytraeidae, Tabanidae, Curculionidae, Staphylinidae, Araneida and Carabulac. Middle and small soil animals were 52 groups, the dominant groups were Thripidae and Oribatida; the frequent groups were Camasida, Actinedida, Culicidae, Formicidae, Tabanidae, Staphylinidae,

Eutomobryidae, Isotomidae, Hypogastruridae, Carabulac and Asilidae. Wet soil animals were 8 groups, the dominant groups were Rhabditidae, Dorylaimidae; the frequent groups were Tylenchidae, Monhysteridae, Cephalobidae and Plectidae. The groups constitute the main body of soil animals in Songnen plain grassland.

The diversity distribution of soil animals groups in different habitats. There are certain differences of soil animals structure and function in different habitats, these differences determine the species (groups) constitution. We studied the difference of soil animals groups number in 8 habitats. We used the Shannon-Wiener formula of diversity index (Table 1). From Table 1 we can see the equal degree in I, II, III, IV habitats are higher than the equal degree in V, VI, VII, VIII habitats. The diversity index is high and it demonstrates that the first four habitats are more diverse than the latter four habitats. The VIII habitat is the least diverse of all habitats, and it was the minimum of the diversity index and equal degree, but its dominant degree is the highest. It shows the unequal distribution in soil animals. In Table 1, the diversity index, equal degree and dominant degree clearly display the difference of soil animals groups between species constitution and communities organization level in Songnen plain grassland.

The relation between the diversity of soil animals communities and ecological factors. The distribution of soil animals is influenced by different ecological factors, but the effect of them has a great difference. This paper emphasizes the relation between group number of soil animals with the soil water content, organic matter, total phosphorus, total nitrogen and pH value. From Figure 1 we can see these factors have different distribution in different habitats. Through analysing the different ecological factors step by step we can show the correlation level between soil animals with different ecological factors. By means of least square method we analyse the correlation.

The results show that the group number of soil animals have a positive relationship with soil organic matter, total nitrogen, and have a negative relationship with pH value, and have no obvious relationship with soil water content and total phosphorus. It displays that the effect of different ecological factors is not the same. 1-2 ecological factors usually play the main role. The effect of main factors is different in habitats.

The relation between diversity of soil animals communities with soil layer depth. The diversity of soil animals groups in surface soil is abundant and decreases with the increasing depth of soil layer. It has a relationship with soil nutrient content and pH value. In general soil animal groups and individual number have a positive relation with soil nutrient content. Soil nutrient level decreases with the increasing depth of soil, and the number of soil animals also decreases. The groups number of soil animals and individual number have a negative relation with pH value, it shows that the higher pH value has a restriction on soil animals.

From above it shows the better habitat condition the higher the diversity index of soil animals and the worse habitat condition, the

lower the diversity index of soil animals. The diversity index of 8 habitats in IV>II>III>I>VI>VII>V>VIII. The diversity of soil animals communities have a positive relationship with soil organic matter and total nitrogen, and have a negative relationship with pH value, and have no obvious relationship with soil water content and total phosphorus. The diversity of soil animals communities in different soil layer depths decreases with the increasing depth of soil layer and has obvious surface-collection.

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Figure 1

The relationship between soil animals groups and ecological factors in different habitats:

1. Group number
2. Total nitrogen(%)
3. Organic matter(%)
4. Total phosphorus(%)
5. pH value
6. Soil water content(%)

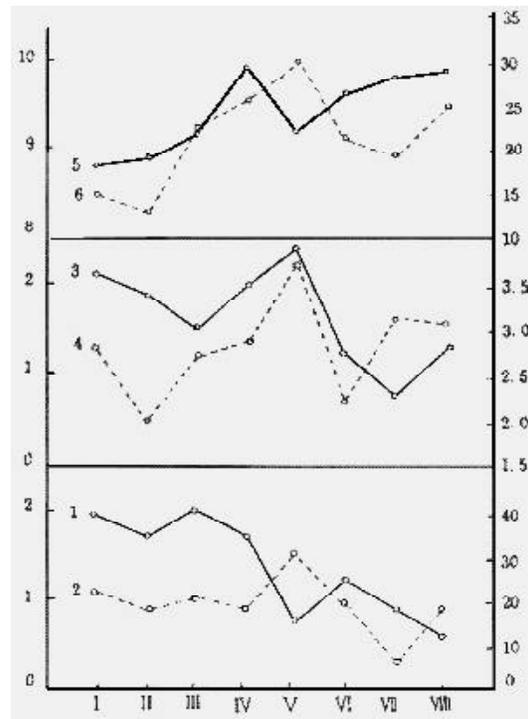


Table 1

The diversity index, equal degree and dominant degree of soil animals in different habitats

Habitat	Group number	Individual number	diversity Index	Equal degree	Dominant degree
I	40	1652	2.0426	0.4586	0.2166
II	35	1209	2.2992	0.5162	0.1503
III	41	1462	2.0708	0.4649	0.2164
IV	36	579	2.3226	0.5214	0.1999
V	16	395	1.5605	0.3503	0.2784
VI	25	326	1.8107	0.4065	0.2778
VII	20	523	1.7116	0.3842	0.2853
VIII	13	457	0.8856	0.1988	0.5519