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CHARACTERISTICS OF THE POPULATION OF AN *ISOPODA* SPECIES (*TRACHELIPUS NODULOSUS* C. L. KOCH) AT SANDY SOIL GRASSLAND

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Abstract

During the course of studies performed between 1979–1982 on the population of a *Trachelipus nodulosus* C. L. KOCH *(Isopoda)* species living at sandy soil grassland, it had been determined that the dispersion of the species shows clumping dispersion type at the area. Its habitat is only limited to more humid, deeper sites developed by wind. Investigations on the dynamics of the population revealed that the factors of microclimate being effective through the local microclimate relations do not only determine the distribution of the population, but also have influence on its volume, seasonal changes, as well as the activity of the species.

Key-words: Isopoda, sandy soil grassland, dispersion, population dynamics, reproductive period, fecundity

Introduction

The humidity of the air is commonly known to be a key factor in the respect to the existence of the *Isopoda*. Therefore, it is of particular interest to study their occurrence under extremely dry conditions. A possibility for this was given at the region of the Kiskunság National Park, within the research activities of the ecological group of the Department of Zoology, Attila József University. The studies have been being carried out since 1976, at a model area of 2 ha withdrawn from grazing (MÓCZÁR et al., 1980). The long-lasting continuous study makes possible among others the revelation of the population characteristics of various animal species. There are no antecedants of such nature in Hungary regarding investigations on *Isopoda*. Similar studies were carried out in America (PARIS and PITELKA, 1962, SORENSEN and BURKETT, 1977) at grass-plots concerning the *Armadillidium vulgare* species, and in Japan (SAITO, 1965) at forests on the *Ligidium japonicum*.

The single Isopoda species, the *Trachelipus nodulosus,* living at the studied area plays role in the decomposing chain, the productivity parameters of which had been investigated earlier, under laboratory conditions (HORNUNG, 1979, 1981a, b). The species itself is xerophyll, and occurs at open, more sunny areas.

The studied area

The pedological characteristics, macro- and microclimatic relations, main plant- and animal-communities, their production, etc. of the studied area located at the Bugac district of the Kiskunság National Park are known from the works of BODROGKÖZY and FARKAS, (1981), KÖRMÖCZI et al., (1981), MÓCZÁR et al., (1980). The extreme relations of sandy plains are characteristic of the microclimate: semiarid climate, drought-hazardous summer, insufficient precipitation supply in summer, great daily and annual fluctation in temperature, dry sandy soil. All these would exclude the existence of the *Isopoda*. The geographic structure of the area is the cause for the fact that under the mentioned circumstances they nevertheless turn up and their population is capable of maintenance. The surface of the region is distributed by wind-furrows. with grade differences of 1–2 m as the consequence of which the area forms a mosaic complex: varying plant associations and microclimate relations develop, also affecting the quatily and quantity distribution of the animals living there.

From the viewpoint of the *Isopoda,* the wind-furrows have distinct significance since these animals requiring high humidity find their vital conditions here. The characteristic plant community of the wind-furrows is the *Molinio-Salicetum rosmarinifoliae*. Here, the plant covering is great (85–100%), the plants are high (50–60 cm), and this is the area where the underground water content reaches the maximum. The humidity decreases at later time-point in the mornings and increases earlier at sunset than at the neighbouring areas of higher level. The temperature also remains lower here by 3–4 °C (KÖRMÖCZI et al., 1981).

Methods

The Isopoda were collected with Barber type ethylene-glycol pit fall traps, of which two variants were applied:

For the collection of the epigeous, surface-mobile animals the traps were placed in groups of 5, at the points of a 50×50 cm sized square and at the intersection of its diagonals, resp. The averages of the data regarding these trap groups were applied as samples. 12 such trap groups were placed at the area.

The other type was the variant of the Barber trap placed in the soil, above which a glass-plate was layed and the replaced piece of grass, resp. This type enables the collection of the mobile animals having their living place in the root zone, in the upper 10–20 cm of the soil. The largest amount of *Isopoda* could be collected here, as these pits serve as excellent shelter for the hygrophylic animals.

The traps were emptied bi-weekly or monthly and the caught animals were kept in 70% ethanol, making possible their further laboratory processing. Their body lengths were then measured under microscope, the sex determined, and the eggs, embryos found in the brood pouch of the pregnant females; and/or the juvenile individuals were counted.

Results and their evaluation

The material of the above described two kinds of traps made possible two different modes of approaching the Isopod population at the studies area. As mentioned in the foregoings, the trap groups of 5 concern every habitat type of the area, thus on the basis of the obtained material conclusions could be drawn regarding the dispersion ot the *Isopoda* at the whole of the area. On the other hand, being familiar with the characteristic feature of the *Isopoda,* according to which they move little under optimal environmental conditions (WHITE, 1968) — that is, their activity of movement increases with the temperature rise of the environment, at the time of decrease in relative humidity (RH); i. e. when the circumstances become drier — the data of these traps reflect the activity of these animals and its seasonal changes. It could also be determined on the basis of the data obtained from the traps that the *Isopoda* aggreagate at the wind-furrows, where the unfavorable physical conditions of necessity (mainly the lack of water) are compensated by the somewhat more humid microclimate. Therefore, the species shows clumping dispersion at the area (HORNUNG, 1979).

The graphs of Figure 1/a demonstrate the data of the trap groups of 5 in the years 1979–1982. ($\sum N$ = total individual number of samples). It can be seen from these that the course of the curves for the certain years is close to similar. The maximal values are reached in the 7th-8th months. The almost similar course of the curves, as well as the concurrence of the peaks would allow to draw the conclusion that the autoregulating factors within the Isopoda population compel the maintenance of the population volume at a constant level — within certain limits. In the present case this is not so; the autoregulation is only apparent. If being periodically recurrent, external factors may also cause periodically repetitive activity peaks. Here the population's volume and annual dynamism, their periodicity are also determined by external environmental — firstly climatic — factors.

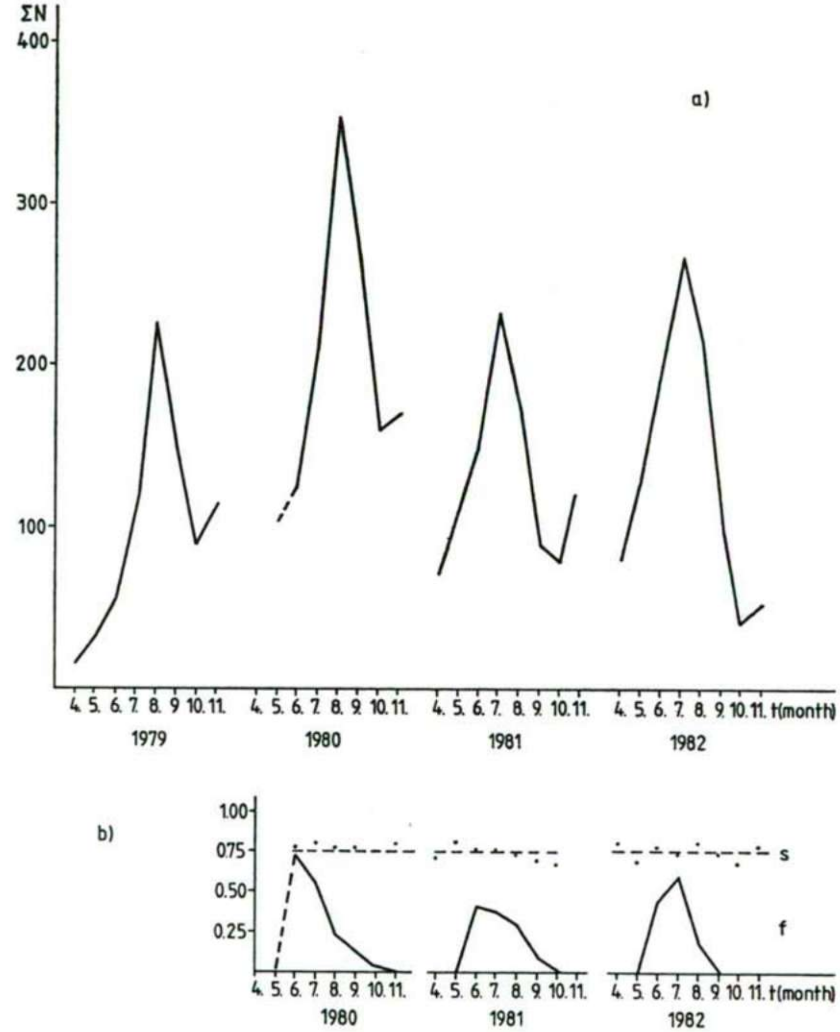

Fig. 1.a. Changes in the total individual number (ΣN) of the *Trachelipus nodulosus* species for the years 1979–1982.
Fig. 1.b. Changes in the values of the species' sexual rate (s) and fecundity (f) in 1980–1982.

It can be observed from the Figure that the data of the year 1980 are essentially higher than those of the rest. The explanation to this is presumably found in the fact that the above mentioned year was relatively more rainy (3–4 folds that of the previous year). Through the Rh positive changes in the soil moisture and vegetation this higher amount of precipitation also showed favourable influence on the population dynamics of the *Isopoda.* In such cases there is an increase in the number of those habitats, and size of their patches, resp., where the *Isopoda* find their conditions for living; their mortality presumably becomes lower, and their reproduction shows more favourable tendency, resp.

Figure 1/b demonstrates the changes in the sexual rate and fecundity of the studied population regarding the years 1980–1982. It can be seen that while the sexual rate (s) is close to constant not only within a year, but even between the certain years, the fecundity (f) — i. e. the ratio of the pregnant females — shows a rather divergent development. The fecundity of the previously emphasized more rainy year of 1980 is the highest. The value of the sexual rate is around 0.75, which means that about 75% of the collected individuals are females, differing from the values reported on other populations of the *Armadillidium vulgare* by PARIS and PITELKA (1962), and of the *Trachelipus nodulosus* by HORNUNG (1979).

Considering the values of fecundity, it is also proved that the number of offspring increases on the effect of more favourable climatic factors. The number of offspring may even increase with the larger amount of eggs per females, which in the case of the studied population reached the value of 14–40 eggs/females. The eggs/number of offspring per females show linear increase with the growth of the size of the females (HORNUNG, 1979). Author found even essentially higher values in the case of another population of the same species, living under less extreme circumstances: 32–75 eggs/females (HORNUNG, 1979).

The annual dynamism of the population can be followed on the basis of the data regarding the other applied trap type. Studying the year 1980, the population curve previously discussed (Fig. 1/a) can further be improved on the basis of the bi-weekly collections. Figure 2 demonstrates two maximums for the curve, the explanation to which is as follows: the studied T. nodulosus species has its reproduction period from the middle of May to the beginning of September, and under our climatic relations it takes place in two larger periods; one having its peak in May–June, the other in July–August. Since the *Isopoda* females carry their eggs, later their larvae in their marsupium till complete development (cc. 1 month), the first juvenile individuals appear at the end of June, and the last at the beginning of September. PARIS and PITELKA (1962), as well as SORENSON and BURKETT (1977) also experienced bimodal reproduction frequency when studying *Isopoda* populations from California and Texas, resp.

The number of pregnant females is observable at the bottom part of Figure 2. It can be seen that the two reproduction periods can be separated from each other quite sharply. On the upper curve this is followed with about 1–1 month shifts by the maximums of the population's individual number ($\bar{N}$), which is in relationship with the appearance of the juvenile indviduals.

Studying the body measurements of the females it can also be determined that the 2–3 years old individuals take part in the first reproduction period (with body lengths of 11.7–12, 1 mm) and the 1–2 years old ones in the second period (9.8–11,6 mm).

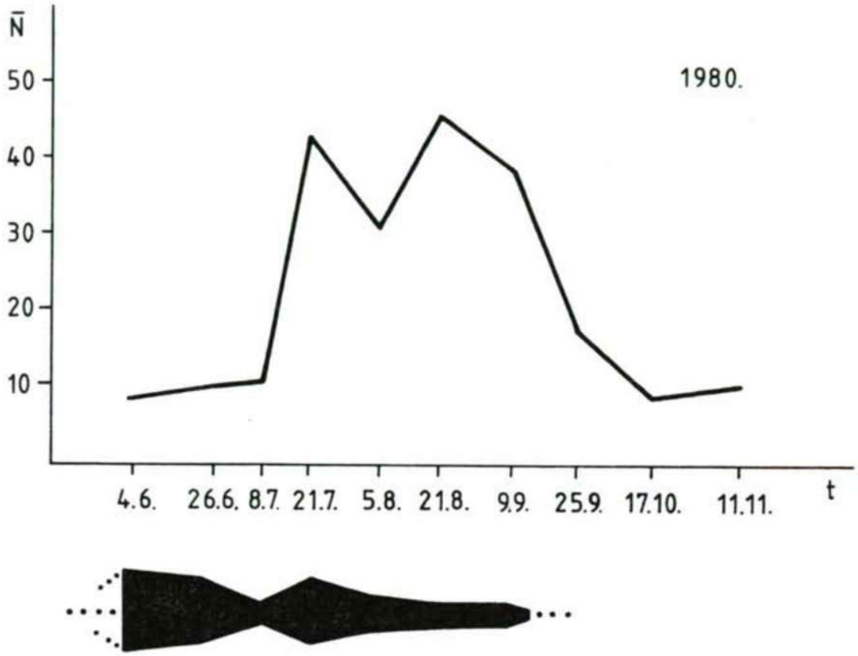

Fig. 2. Dynamics of the population and quota of pregnant females (below) on the basis of the Barber traps placed in the soil.

There are individuals — mainly among the 2-year-old ones — which become pregnant even twice a year. This was also observed by the above mentioned American authors, but in his Japanese studies, SAITO (1965) did not experience such a phenomenon in the case of the Ligidium japonicum species.

Comparing the experienced facts with the referred studies from abroad many similarities can be found in regard to the dynamics of the populations as well as in their reproduction characteristics — despite the varying climatic relations and differing species.

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