THE ECOLOGICAL STUDY OF THE CHILOPODS (CHILOPODA) POPULATIONS FROM FĂGET-COLIBAŞI FOREST, ARGEŞ COUNTY

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REZUMAT

În lucrare se analizează calitativ şi cantitativ fauna de chiolopode din pădurea Făget-Colibaşi, judeţul Argeţ. Pădurea Făget-Colibaşi este o pădure de fag situată în sudul Carpaţilor Meridionali, în bazinul mijlociu al râului Argeş. Lunar, timp de trei ani, am colectat probe de litieră şi sol de unde, cu ajutorul aparatlui Tulgren, am triat fauna. Chilopodele sunt reprezentate prin 18 specii care aparţin la trei ordine, cinci familii (Lithobidae, Schendilidae, Mecistocephalidae, Geophylidae, Criptopidae) şi opt genuri. Geofilomorfele alcătuiesc grupul cel mai divers (opt specii) iar scolopendromorfele grupul cel mai abundent. În lucrare se prezintă detaliat raporturile cantitative dintre speciile identificate şi se evidenţiază importanţa şi rolul fiecărei specii în biocenoză.

Chilopods can be seen eveywhere where there is a certain humidity. The most and diverse aspects populate the litter and the soil of the leafy forests being an important part of the biedafic communities. In this work the goal is to follow the qualitative and quantitative, static and dynamic structure of the chilopods from a beech tree forest.

THE MATERIAL AND THE METHOD

Făget-Colibaşi forest is situated in the middle basin of the Argeş River, in the northwest part of Piteşti at a height of 350 meters. It is a beech tree foret, typical of the inferior boundary of the beech forest spreading, which trickles into the oak graves tier.

The dominant species Fagus silvatica is accompanied by sporadic examples of Quercus petrea. The bush canopy is formed of beech tree brushwood. The grassy layer is dominated by Carex pilosa and this is just a little developed. The litter layer is permanent and it has varied thickness because of the unlinear microrelief, which favors agglomeration of the leaves in the concave sections and their disappearance in the convex portions.

The soil is a typical erodisoil with a homogeneous sand-clay structure on the entire profile. The reaction is temperately acid (pH=5.06) and the quantity of organic substance (Ct) varies from 1.50 to 1.80. The airohydric regime is good because of the sand-clay structure, which ensures a good permeability, and the existent slope provides the drainage of the surface water. The relative humidity of the soil reaches a monthly average of 34% and varies relatively little because of the good permeability of the soil and the reduced evaporation due to the thick litter layer and the compact canopy..

Regarding the climate, the researched area is part of the hill continental climate region (the Dfbx province). The yearly average temperature is 9.5 centigrades and the yearly average of the rainfall quantity is 685 milimeters. The mow layer generally lasts 60 to 80 days (Barco & Nedelcu, 1974). The climate chart reported to the Peguy grid emphasizes that December, January, February and March are „cold and wet" and the rest of the months are temperate, a fact emphasized also by the ombrothermic diagram. While comparing the climate of the 3 years of study with the one established on the basis of the average data from the last 60 years, we find that in the first two years the differences are obvious in the sense that the first year is „colder and wetter", and the second is warmer and more unproductive. In the last year the climate is more homogeneous, very similar to the general climate of the area.

The working station, having an area of 10.000 square meters was fixed on an irregular mountainside, with concave and bulging sectors, with western exposure and an eight grades slope. In nature the chilopods present such a distribution which approximates thea theoretical model of the binomial negative distribution (Gava, 1990). The gatherings of material lasted for three years (1972-1974). We picked up 6 probe units monthly from February to November inclusively. This number was tested by using the corresponding formula for the model of the binomial negative disbution ($N=1/D^2$ (1/X+1/ k) which ensured a precision of the estimated parameters with an error of less than 20%, an error which is usually admitted in ecological research. From the point of view of the dimension of the body, the chilopods belong to the macrofauna according to the classification made by Van der Drift (1951) and Dunger (1962), this being the reason for which the surface of the probe units was 625 cm^2 (1/16 m^2). Specialized literature (Hutha, 1972, Geoffroy, 1979) appreciates that the size of these samples units is satisfactory and responds to the exigencies imposed by such researches at the same time large enough to enable one to avoid the so-called „curb-effect" which occurs in case the size of the drawings is small by comparison with the size of the organisms. The samples included the canopy of leaves and the soil down to the depth of 10 cm. They were collected only during the day to avoid the modifications, which appear in distribution because of the movements produced during the night. In order to avoid the so-called „collector's error" the drawings were always made by the author. The samples were extracted at random. the studied area was marked out in 400 square having the side of 5 m. These were noted after the model of chessboard and by drawing lots, two times (it was the letter on the first drawing and the number on the second one.) We decided the plates were we had to pick up those six specimen units. The emplacement of the frame was done at a distance at 30-40 cm. from the trunks of the trees or from fallen and decaying ones. We avoided the little steep slopes without a litter or the places covered with moss or bushes of graminee bushes. The canopy of leaves was sorted out in laboratory with the help of the Tullgren funnels and the soil was sorted right there by eye. All the material was preserved in 70^0 alcohol.

RESULTS AND DISCUSSIONS.

During the period of study we picked up analyzed 180 samples units of which we separated and determined a numer of 1601 individuals, which belong to three orders of those four orders known in Romania, 5 families (Lithobiidae, Schendilidae, Mecistocephalidae, Geophilidae, Criptopidae), 9 genus and 18 species (Table1).

From a biogeographical point of view most of the species in this area have a great European extent. So, theree of them are Holarctic, two – Palearctic, four – European three – Alpine-Carpathian, two – Mediterranean, two – Southeast European and one *Lithobius burzenlandicus* – endemical in the Carpathians. The scolopendramorphs represented by thirteen species form the group with the greatest specific variety. These analyses are related to the others made by other research workers in similar studies in foliated forests in the Temperate Zone of Europe (Table 2).

TABLE I – Identified species, numerical plenty and yearly average density (ind/m²) of chilopods of Făget forest

TAXONOMICAL UNITY	Numerical plenty				Numerical density				The geographical distribution
	Y* I	Y* II	Y* III	Total	Y* I	Y* II	Y* III	The averagee	
Class **CHILOPODA**	**594**	**455**	**552**	**1601**	**158,39**	**121,53**	**147,20**	**142,37**	
Order ***LITHOBIOMORPHA***	**170**	**78**	**59**	**307**	**45,33**	**20,80**	**15,73**	**27,28**	
Lithobius mutabilis	27	11	5	**43**	7,20	2,93	1,33	3,82	Southeast European
Lithobius muticus	1	-	3	**4**	0,26	-	0,80	0,36	European
Lithobius burzenlandicus	142	67	51	**260**	37,86	17,86	13,60	23,10	Endemical-carpathians
Order **GEOPHIOMORPHA**	**171**	**155**	**231**	**557**	**45,60**	**41,33**	**48,80**	**45,24**	
Schendyla nemorensis	1	-	1	**2**	0,26	-	0,26	0,17	European
Schendyla zonalis	1	-	-	**1**	0,26	-	-	0,08	Mediterranean
Brachyschendyla montana	14	4	12	**30**	3,73	1,06	14,30	6,36	Alpine-Carpathian
Brachyschendyla sp,	6	12	53	**71**	1,60	3,20	14,30	6,36	-
Dicellophilus carniolensis	43	41	46	**130**	11,46	10,93	12,26	11,55	Holarctic
Clinopodes flavidus	1	2	2	**5**	0,26	0,53	0,53	0,44	Holarctic
Clinopodes linearis	1	8	8	**17**	0,26	2,13	2,13	1,50	Paleartic
Clinopodes abbreviatus	54	50	44	**148**	14,40	13,33	11,73	13,15	Southeast European
Necrophloeophagus longicornis	31	17	9	**57**	8,26	4,53	2,40	5,06	Holarctic
Geophilus elctricus	–	2	-	**2**	-	0,53	-	0,17	European
Geophilus insculptus	11	7	14	**32**	2,93	1,86	3,73	2,86	European
Strigamia engadina	4	9	29	**42**	1,06	2,40	7,73	3,73	Alpine-Carpathian
Strigamia transsylvanica	4	3	13	**20**	1,06	0,80	3,46	1,77	Alpine-Carpathian
Order **SCOLOPENDROMORPHA**	**253**	**222**	**262**	**737**	**67,46**	**59,20**	**69,86**	**65,50**	
Cryptops parisi	1	-	2	**3**	0,26	-	0,53	0,26	European
Cryptops hortensis	252	222	260	**734**	67,20	59,20	69,33	65,26	Palearctic

*Y = Year

I have also estimated the dimensions of chilopods population by numerical density, which I have expressed by the number of the individuals on square meter (ind/m^2). I have calculated the medium density every month in a series of six units of test. With the help of these medium monthly densities I came to the annual medium densities and then to the medium density on the whole period of study. In these three years of study, the density of chilopods altered from 158.39 ind/m^2 (in the first year) to 147m^2(in the last year of study). These observations are comparable to the observations made by other research workers in similar studies upon the chilopods in beech forests in the temperate zone of Europe (Albert, 1977, Germany – 73 ind/m^2; Bornebush, 1930, Denmark – 69.0 ind/m^2; Drift J. van der, 1951, Holland – 187.0 ind/m^2. Among all the big taxonomically units which from the chilopods group of this biothope, the scolopendromorphs have had the greatest density of population (65.50 ind/m^2). They are followed by the geophilomorphes (45.24 ind/m^2) and by the lithobiomorphes (27,28 ind/m^2) (Table 1). Among the species with a high numerical density we name here the Cryptops hortensis (from the scolopendromorphs) with a density of 65.26 ind/m^2, the Clinopodes abbreviatus – 13.5 ind/m^2 and Lithobius burzenlandicus – 23.10 ind/m^2 (from the geophilomorps) and the Dicellophilus carniolensis – 11.55 ind/m^2(from the lithobiomorphs). Among the species with a low annual medium density (lower than 1 ind/m^2) we can mention Lithobius muticus, Schendyla nemorensis, Geophilus electricus and Cryptops parisi (Table1).

TABLE-2 The number of identified chilopods species in different european forest

Kind of forest	Country	Number of species	Authors
Different deciduous trees	Poland	21	Folkmanova şi Lang, 1960
Oak	France	13	Geoffroy, 1979
Coniferous trees and beeches	Poland	5	Jawlowski, 1949
Coniferous trees and beeches	Romania	7	Matic şi Strugen, 1984
Beech	Romania	13	Matic şi Hodoroga, 1985
Evergrean oak	Romania	12	Gava, 1990
Beech	Romania	18	***This work***

In order to point out the importance and the role of each species in the studied biocenosis, I established the quantitative and qualitative rapports between the identified species in the studied space. In Table 3 there are presented: the relative numerical plenty, the domination, the frequency, the constance and the index of ecological value.

The numerical plenty expresses the degree of participation of every species or group of species to the constitution of structural nets of biocenosis. It represents an important index in estimating the role of different groups or of every species in biocenosis. If we look at the forces of different superspecific taxonomical units comparatively, we see that the scolopendromorphs represent over 46.00% from the forces, they are followed by geophilomorphs – 34,79% and by lithobiomorphs – 19.17% Concerning the numerical importance of every species there are also great differencies. Thus, the species: Cryptops hortensis (63.3%), Lithobius burzenlandicus (16.2%) and Clinopodes abbreviatus (9.2%) hold, as it results almost 90% from total identified forces, while the species Clinopodes flavidus, Lithobius muticus, Cryptops parisi, Schendyla nemorensis, Geophilus electricus and Schendyla zonalis hold together under 1%.

TABLE 3 – THE RELATIVE ABUNDANCE, THE DOMINATION, THE FREQUENCY, THE CONSTANCY, AND THE INDEX OF ECOLOGICAL SIGNIFICANCE OF THE SPECIES OF CHILOPODS IN FĂGET FOREST

THE SPECIES	Relat. abun. %	Domination	F* %	Constancy* Ac	A	C	E	The index of ecological value (W)	
Cryptops hortensis	63,3	Dominant	83,3	-	-	-	+	38,2	Characteristic
Lithobius burzenlandicus	16,2	Accompanying	51,1	-	-	+	-	13,1	Characteristic
Clinopodes abbreviatus	9,2	Accompanying	44,4	-	+	-	-	4,1	Accessory
Dicelophillus carniolensis	8,1	Accompanying	44,4	-	+	-	-	3,6	Accessory
Brachyschendyla sp.	4,4		20,0	+	-	-	-	0,8	Accessory
Necrophoephagus longicornis	3,5		19,4	+	-	-	-	0,9	Accessory
Lithobius mutabilis	2,6		15,5	+	-	-	-	0,4	Accessory
Strigamia engadina	2,6		17,2	+	-	-	-	0,4	Accessory
Geophilus insculptus	2,0		16,1	+	-	-	-	0,3	Accessory
Brachyschendyla montana	1,8		11,1	+	-	-	-	0,2	Accessory
Strigamia transsylvanica	1,2		8,3	+	-	-	-	0,1	Accessory
Clinopodes linearis	1,0		6,6	+	-	-	-	0,07	Casual
Clinopodes flavidus	0,3		2,7	+	-	-	-	0,008	Casual
Lithobius muticus	0,2		1,6	+	-	-	-	0,004	Casual
Cryptops parisi	0,1		1,6	+	-	-	-	0,003	Casual
Schendyla nemorensis	0,1		1,1	+	-	-	-	0,001	Casual
Geophilus electricus	0,1		1,1	+	-	-	-	0,001	Casual
Schendyla zonalis	0,06		0,5	+	-	-	-	0,0003	Casual

* F = frequency; Ac = casual species; A = accesories; C = constants; E = euconstants;

The **numerical domination** of species represents an ecological index, which reveals the extant rapports between the species of a certain biotope. Its calculation is usually made by taking into account the relative plenty. It is influenced by the number of the individuals and of extant species. Among the 18 species, present in this biotope, we meet one dominant species (Cryptops hortensis) and three accompanying species (Lithobius burzenlandicus, Clinopodes abbreviatus and Dicelophillus carniolensis).

Frequency is an index of the biocenosis level, which contributes together with other structural parameters to the characterization, and the description of the number, giving us a full image of the percentage in time or space – of every species in the overall picture of the relations established between these species. It is influenced by the richness and the spatial distribution of every species. Generally speaking the species with a relatively great abundance show high values of the frequency index, an observation also confirmed in our case. It can be noticed that the same species Cryptops hortensis registers the highest frequency – 83,3%. The rest of the species have frequencies with fluctuating values, which can reach the 0,5%, and this fact indicates only the presence of the species among the 180 units of testing (Table 3).

Constancy is an index, which depends on the frequency, and this index emphasized the percentage in time of the species as part of the relations they belong to. Depending on the Tischler frequency percentage (1955) the species can be grouped in casual species (F = 0,1-25%) accessories (F = 25,1-50%) constants (F=50,1-75%), euconstants (F=75,1-100%). On the basis of the presented dates in the table 3 it comes out that Cryptops hortensis belongs to the euconstant species Lithobius burtzenlandicus to the constant Clinopodes abbreviatus and Dicellophillus carniolensis belongs to the accesories and the remaining species belongs to the casual category (Table 3).

The index of ecological value (W) mirrors more precisely the position of the species in the biocenosi. It represents the relation between frequency (F) and abundance (A) and it is calculated with the following formula: W =FxA/100. Taking into account the value of this index the species can be grouped into the following categories: casual (W = under 0,1%), accesory (W = 0,1-5%), characteristic (W = over 5%). It can be noticed that two species are dominant: nine accesories and seven casual (Table 3).

The numerical evolution. The myriad populations are characterized by a permanent change of the numerical structures, determined on the one hand by the internal factors of the populations and on the other hand by the external factors. There is a close and permanent connection between those tow categories of factors and the force of the change of numerical relations. The numerical evolution of myriapods during a year is marked in general by the appearance of two periods of maximum plenty: spring and autumn. The début and the lenght of those periods vary sometimes very much depending on the area examined and on the change of climatic conditions in time (Weidemann, 1972). There are cases when the populations plenty vary very little during a year. In such cases the maximum values are reached during summer when new generations appear in the populations, and the minimum values during winter when the development of the populations stagnates (Albert, 1977). The estimation and thc interpretation of density fluctuations in the case of these organisms is much complicated by the vertical and horizontal migrations which some species do for wintering or for reproduction. The annual variation of the density curve is determined in general by the numerical evolution of the dominant group, and inside it by the dominant species. In our case the annual curve of evolution of the numerical abundence of the chilopods is determined by a great number of species – Cryptops hortensis, Lithobius burzenlandicus, Clinopodes abbreviatus, Brachyschendyla sp., Necrophloeophagus longicornis, Dicelophillus carniolensis all present here in great number. This specific variety causes the tow maximums to decrease. This one can see that the monthly numerical density in creases suddenly beginning in spring when it reaches maximum values in March (216 ind/m², the third year of study) and it keeps so with some variations at a high level until late autumn when it begins to decrease (Fig.1). When interpreting this kind of evolution we should take into account both the great variety of the present populations and the environmental conditions which here vary relatively little.

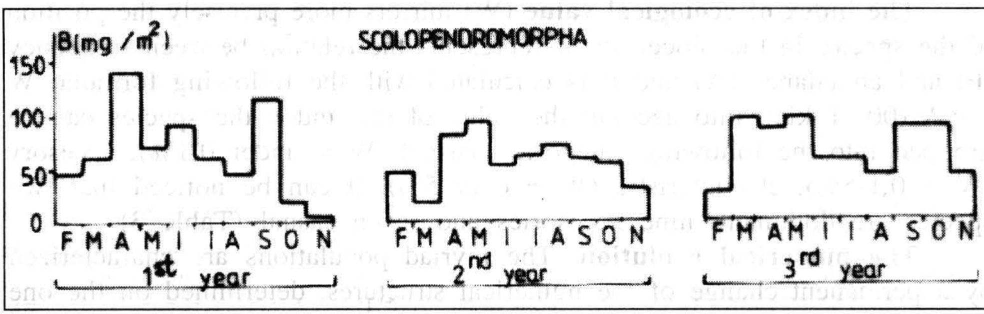

Fig.1 – The evolution of the monthly average density (ind/m²) of the Chilopods in Făget Forest

The biomass accumulated by a species or by a group of species at a certain moment expresses more precisely their ecological role and their importance in the activity of transfer of the substance and energy as part of an ecosystem. Both the estimation of the quantity of biomass and its evaluation in time were done only for the order scolopendromorphs and for lithobiomorphs, starting from the knowledge of the numerical density of each species. As the post-embryonic development of most of the species is not very well known, and so the classification of the individuals according to the development stages, can not be made, we grouped same species into many classes, according to their size. For each class, we established an average individual weight, which was multiplied by the number of the individuals belonging to that class and in this way we found out the biomass at a certain moment. I expressed the biomass through mg dry substance on m^2. Druing was made in the thermostat-boiler at 95^0 C for 72 hours. The weighing was done with an electronic weight indicator, its precision being 1/10 mg. We found out that the annual average biomass of the scolopendromorphs is 62.33/mg dry substance per m^2, and that of the lithobiomorphs is 18.11/mg dry substance per m^2.

Following **the monthly evolution of the biomass** of the scolopendromorphs over a year, we can notice that in spring and in autumn, the values are higher, and in summers they are lower. The values in the spring are higher thn those in the autumn. In the last year of study, in the spring months, the biomass was over $90mg/m^2$, it lowered in the first part of the summer to 55 mg/m^2, reaching the minimal value in August (38.2 mg/m^2), and it grew again in the autumn to 86 mg/m^2 (Fig. 2).

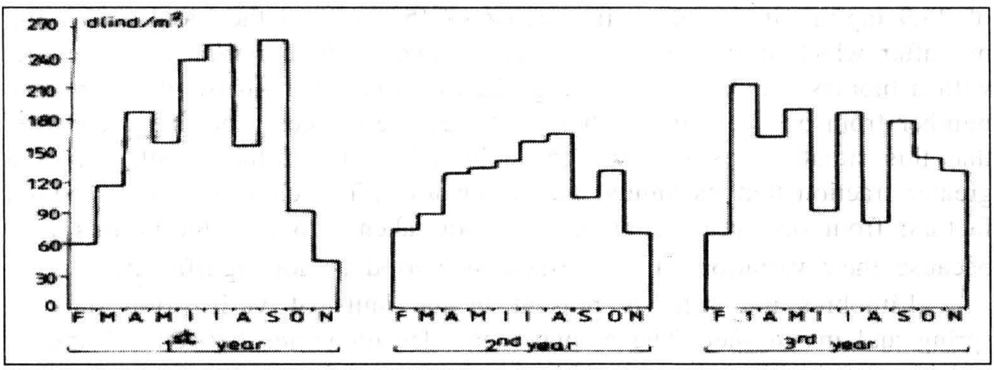

Fig.2 – The evolution of the monthly average biomass (mg. dry substance / m2) of the scolopendromorphs.

The evolution of the numerical density and of the biomass is characteristic for every species.

The lithobiomorphs are represented by three species: Lithobius mutabilis, Lithobius muticus, and Lithobius burzenlandicus. The researches regarding the postembryonic development of the Lithobiidae (Andersen, 1976, 1978, Jolly, 1966) emphasized the idea that their biological cycle takes place in thirtees stages and the period of development from the egg to the reproductive adult is variable depending on the species and even on the geographic area. Thus, in the temperate zones it lasts three years (Lewis, 1965) and sometimes it reaches 5-6 years (Wignarajah and Phillipson, 1977 quoted after Geoffroy, 1979). The researches have also proved that the period of reproduction and depositing of the eggs takes place during the whole year. In such conditions we find a large number of generations in the biothop, which grow simultaneously, therefore in each unit of verification we find individuals of various ages, the most numerous being the immature individuls.

Lithobius (M) burzenlandicus is present in the survey every month. In the case of this species one also notices a lowering of the annual mean density in the three years of study. Thus, from 37.8 ind/m^2 in the first year it decreases to 17.8 ind/m^2 in the second year and it reaches 13.6 ind/m^2 in the third year, and the mean biomass decreases from 18.8 mg/m^2, in the first year, to 5.9 mg/m^2 in the third year. The maximum density is reached at the end of the spring and the beginning of the summer. Then, a lowering follows at the end of the summer and a new increasing value in autumn. For instance, in the first year of studies the numerical density increases in spring and it reaches maximum value in June (64 ind/m^2), with a biomass of 33,9 mg/m^2, it decreases in August to 45,3/m^2 and the biomass 39 mg/m^2, after which it increases again and it reaches 66,6 ind/m^2 in September with a biomass of 35,7 mg/m^2 (Fig. 3). In conection with the decreasing in number from one year to another as it the case of these specis we consider that this situation results from the subtracting out of the population of a greater fraction that its annual increasing level. The change of the medium factors, from one year to another, is not taken into account in this case because their variation in the respective period is not significant.

Lithobius mutabilis is present in the units of verification only in spring and in summer. The annual mean density varies betwen 7.2 ind/m^2

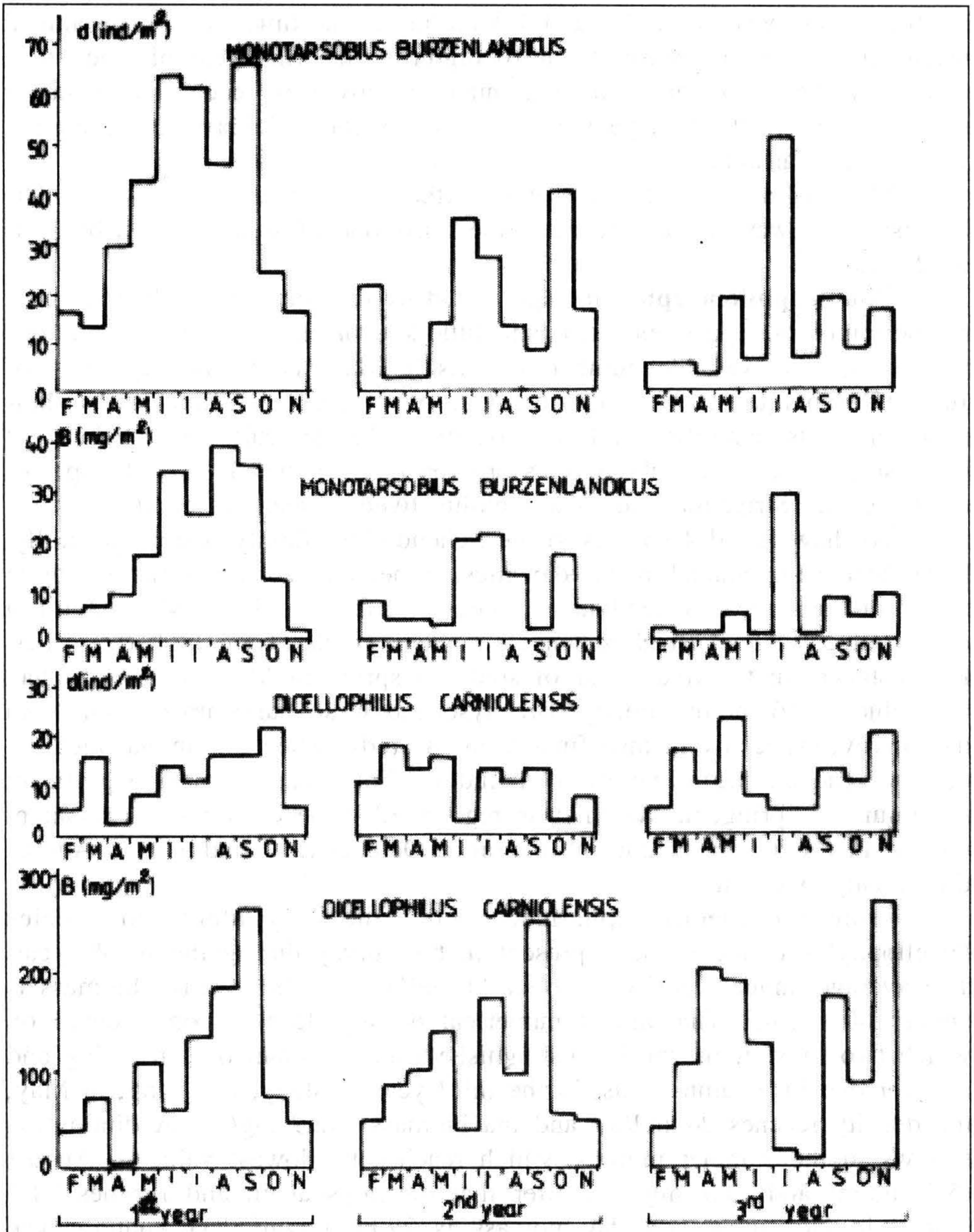

Fig. 3 – The evolution of the monthly numerical density (ind/m²) and of the biomass (mg. dry substance/m²) of some species of chilopods in Făget forest

(in the second year of study) and 1.3 ind/m^2 (in the third year). The annual mean biomas also decreases from 10 mg/m^2 in the first year of study to 2 mg/m^2 in the third year. The maximum density was reached in summer (13.3 ind/m^2), in the first year of study. The highest biomass, 20.12 mg/m^2, was reached in June.

The medium annual densities of Lithobius muticus are very law. The highest value was of 0,8 ind/m^2, in the third year of study, with a biomass of 2.5 mg/m^2.

The geophilomorphs are represented by thirteen species. In their case the postembryonic development is still little known. In our country conditions females spawn variable number of eggs in May and at the beginning of June (Dărăbanțu 1973). The nestlings are formed in June-July. Their development is epimorfic, the larva looks, just like the adult. The development cycle some species lasts three years or even more (Lewis 1971). The species of the genus Strigamia and Dicellophilus lived 7 years in captivity.

We haw found 4 species in the Schendylidae family which, generally, have decreasing annual mean densities. Schendyla zonalis turns up quite rarely in the surrey. Schendyla nemorensis turns up only in May having a density of 2,6 ind/m^2. Brachyschendyla montana reaches some higher densities. For instance, in the final Year of study in spring in May the density had the value of 16 ind/m^2. Finaly, Brachyschendyla sp. turns up constantly in the survey, especially in thea final Year of study, when the annual medium density reached the value of 14,1 ind/m^2. This year, a more significant maximum in spring, in March, was registered in the density's development (40 ind/m^2) and a lower one in autumn in October (21.3 ind/m^2). In August the density was null.

From the Mecistocephalidae family the only identified species Dicellophylus carniolensis, is present in the survey during the whole year. The average annual density is about 11 ind/m^2 and the average biomass is about 100 mg/m^2. Tha annual numerical density develops on a curve on which two maximums can be distinguished, an important one in spring and a lower one in autumn. Thus, in the third year of study, in spring, in May, the density reaches 24 ind/m^2 and tha biomass 192.9 mg/m^2. A diminution follows in the summer months, which reaches the lowest value in August (5.3 ind/m^2 and 11.7 mg/m^2), after that develops again and reaches 21.3 ind/m^2 in November and the biomass is 270.6 mg/m^2. The mature type appeared in the survey only in spring and autumn (Fig.3).

The species of the Geophilidae family are the largest group. The Clinopodes genus is represented by three species. Clinopodes flavidus is present in the test units only in certain months. The average annual density does not exceed 0.5 ind/m² in any of the years of study. Clinopodes abbreviatus appears in the survey month. Tha average annual density is about 12 ind/m². In the monthly variation of the numerical density, in a year time, three maximums can be distinguished, two of them being important, one in spring and the other in summer and a lowest one in autumn, in November. Referring to the first year of study, the density rose in spring, reaching in April 18.6 ind/m², diminished in May to 8 ind/m². It rose in summer and reached in July the highest annual value of 37.3 ind/m², a diminishing to 2.6 ind/m² followed in autumn, in October, and a new rising to 10.6 ind/m² in November. *Clinopodes linearis* appears in all the three years of study but only in spring and autumn. The average medium densities are 2.1 ind/m².

Necrophloeophagus longicornis, is another geophilidius, which appears in surreys only in certain months. The monthly densities do not exceed 16 ind/m². *Geophilus electricus* appears sporadically only in certain months ans it has monthly densities under 2,6 ind/m². *Geophilus insculptus* appears especially in spring months and in autumn with densities, which do not exceed 8 ind/m².

The last two species of *Geophilidae* belong to the *Strigamia* genus.

Strigamia engadina appears in surreys only in some months of the year. The monthly densities in the first two years do not excced 8 ind/m². In the last in summer in July they get to 24 ind/m².

Strigamia transsylvanica is in the testing units only in some months with densities, which do not exceed 8 ind/m². As in the case of the preceding species their number is greater in the last of the last part of the third year of study. The maximal values (10,6 ind/m²) were reached also in July. It is possible for the hatching of the eggs to take in this month too.

Scolopendromorphs are to be found in two species. Their post-embryonic development is less known. If for the tropical species there are some data regarding their post-embryonic development which seems to be annual (Lewis, 1969), for the European species these data are missing.

Cryptops parisi appears by accident only in two testing units.

Cryptops croaticus gest to very big densities. The annual average densities varied between 60 ind/m² (the second year of study) and 70 ind/m² (the last year of study), and the biomass between 55.5 and 65.5 mg/m² in the same period. The monthly numerical denssity ,developes a maximum in springin April and May and one in autumn, in september.

For example, in the last year of study, the maximum value (117.3 ind/m²) was reached in March and was maintained at such a high value (over 85