Monitoring study of thrips populations (Insecta:Thysanoptarea) from mountainous meadows, in Romania

Liliana VASILIU-OROMULU

Abstract

The work presents the place and the role of the thrips associations in the praticolous biocoenosis from the Gârbova Massif, Southern Carpathians, Romania. The values of some structural indices of thrips populations (the specific presence, dominance, numerical abundance) were studied in relation with the abiotical factors, in researches of the monitoring type.

Keywords: Thysanoptera, structural indices, monitoring.

Introduction

OETTINGEN (1954) and KNECHTEL (1956, 1963) have done phenological studies on the thrips populations in Sweden and Romania, in the meadow ecosystems.

Materials and Methods

The thrips populations were studied during 3 years in 6 different sites, all secondary meadows, of 1 ha each, in the Gârbova Massif, differentiated altitudinally and through typical vegetal associations and soil.

Şetu site: 800 m altitude, S-W exhibition, the slope smally inclined, brown eubasic meadow soil, characterized by the association *Festuco rubrae-Agrostetum capillaris* Horv. 1951, in fir-beech zone.

The researches took place in the following sites on Bogdan Valley too:

Site 1: 900 m altitude, S exhibition, the slope 10°-15°, brown acid forest soil, *Festuco rubrae-Agrostetum capillaris* Horv. 1951 association, in beech underzone.

Site 2: 1050 m altitude, S-W exhibition, the slope 10°-15°, brown acid forest soil, the vegetal association of *Festuco rubrae-Agrostetum capillaris* Horv. 1951, in beech under zone.

Site 3: "Hut", 1200 m altitude, S-E exhibition, the slope 10°, brown acid meadow soil, *Festuco rubrae-Agrostetum capillaris* Horv. 1951 vegetal association, in beech under zone.

Site 4: 1400 m altitude, S exhibition, the slope 15°- 20°, podzol soil, the association *Scorzonero roseae-Festucetum nigricantis* (Puşcaru et all. 56) Coldea 87, in spruce-fir under zone.

Site 5: "Plateau" 1500 m altitude, W exhibition, the slope 25°-30°, podzol humico-silicatic meadow soil, *Violo declinatae-Nardetum* Simon 66. association, in spruce-fire under zone.

All the sites are unmoving and ungrazing meadows.

The working method was of the ecological stationary type, limited to a 1 ha surface.

In these sites, we have used two different methods, international recognized: the sweep net method and the shake of the blooming plants method; the thrips were collected twice a month, the number of samples was statistically determined.

The abiotical factors: The mechanical and physical factors have been investigated during 3 years on a row, at the Institute's meteorological station, from the Şetu site; the other climatic values were obtained from Cota 1500m meteorological station.

The monitoring researches show in the last 33 years a great deviation from the normal climatic parameters (figure no 1, 2), especially a long period of drought (about 12 years)

The aim of the biological monitoring is to evaluate the present state and to find the tendencies of the biocoenosis modifications on the whole and of its most important components: species with mass reproduction between phytophagous indicators.

Detailed quantitative studies on thrips populations are rare and have seldom lasted more than a few years, so the causes of long-term changes in

abundance are little understood (LEWIS, 1973).

Results and Discussions

The problem of the estimation of the effective has a special theoretical and practical importance, on this bases information on the respective coenosis's dimension and graduation being obtained.

A large number of exemplars were collected, on the whole 20629 exemplars belonging to 78 species in the consecutive three years of study and 4960 exemplars in the monitoring researchers between 1970-1998 (in July).

Thrips reaches on the mentioned criteria, for that, between 1970-1998 would present the particular structural aspects of thysanoptera from the same mountainous meadows. The collecting, every July during several years is added to the same period of the years 1967-1969.

The climatic data shows that between 1965-1998 there was a high deviation compared to the normal climatic parameters; that was represented by a continuous of draught ness (about 12 years), beginning in 1981 and ending in 1994 (figure no.1,2).The maximal observed deficit between the extremes, against the mean compensated curve, was of 300 mm. As average, this deficit represents about 200 mm precipitation/year. Contrary to the case of the precipitations, the average air temperature, increased, but the period of this rise, doesn't coincide with the rainfall deficit's one; it moves again to the right with three years, between 1985-1996. The differences between the extremities are of 0.9°C and the differences between the against the mean period expressed by the compensate curve is of 0.6°C/year.

Translated into the De Martonne aridity index this climatic deviation is equal to a minus of 28 in the case of the extremities and with a minus of 33 in the case of the averages, that means the normal De Martonne index of the researched area, diminishes with about 60% (42%); 30 instead of 69 (70.8) like the normal values.

The deficitary value of the De Martonne index puts the investigated territory, in the beech forest plain at the interference with the oak, being known that the steppe begins at De Martonne index values smaller than 24.

The temporal analysis of the taxonomical structure of thrips reveals two distinct periods in its dynamics: the first is characteristic for the period 1967-1982 and the second for 1982-1998. In the year 1982, the thrips suffer a great reduction of the species, regardless the collecting methods or the investigated sites (with 57.10%) fact due to the impact of the ambiental modification (the beginning of highly draughty period) (figure no 2, 3).

The thrips diversity and numerical abundance of populations shows a time-back tendency of the first specific complexity only after the year 1995. The whole diversity analysis of thrips from investigated sites from Gârbova Massif, reveals a reach taxonomical spectrum organized on two trophic modules, of the phytophagous (65-82%) and of the zoophagous (18-35%) by both methods.

Table 1 shows characteristic for the spatial and temporal dynamics of the species and their individuals' numbers.

In order to justify, we have chosen as example, the shake method of whose results are less affected by the dryness.

In the Şeţu site the diminishing of the numerical abundance in 1982, comparatively with the maximum (obtained in 1968) had values of 10.93 times, in site 3 "Hut", 12.11 times, in the site 4, 19.48 times and at 1500 m, in the site 5 "Plateau" 8.75 times.

By the sweep net method, the ratio between that maximal values of the numerical abundance was reached in 1967 and the minimal values from 1982, is rather diminished comparing to those reached by shake method: in Şeţu site 3 times, in site 3 and 4, of 7.66 times and respectively 7.36 times are in the site 5, only 5 times.

The impact of those ambiental modifications can be reflected both in the taxonomical diversity and in the values of structural indices. The resistent species are: *Thrips tabaci, Aptinothrips stylifer, Chirothrips manicatus, Frankliniella intonsa, Odontothrips loti, Thrips validus, Haplothrips alpester, Haplothrips angusticornis, Haplothrips niger, Haplothrips reuteri*

By both methods of sampling, the highest number of exemplars were collected in the association ***Festuco rubrae-Agrostetum capillaris***; with the sweep net, in the site 3, and by shaking, in the Şeţu site, and the lowest number of exemplars, by both methods, generally, in the association ***Violo declinatae-Nardetum***, at 1500 m where the environmental conditions are less favourable to thrips populations.

The values of the effectives vary from a coenosis to another, depending on the vegetal association, the curve having oscillations with a constant character for the second year, a dry year in comparison with the third year. A certain reduction of the individual's sampling by sweep method is relevant, also reflecting the dry ness degree of the respective

Table 1.

Numerical and relative abundance of the thirps populations from the site 4 (sweep net method) and from the site 1 (shake method) July, 1967-1998

	Site 4 (sweep net method)																	
	1967		1968		1969		1970		1978		1982		1992		1995		1998	
species	no	%	no	%	no	%	no	%	no	%	no	%	no	%	no	%	no	%
Fam. Aeolothripidae																		
Aeolothrips fasciatus	1	0.45	1	1.37			1	0.77									1	1.15
Aeolothrips intermedius	6	2.70	3	4.11	8	5.56	6	4.62	3	5.26			2	2.50	5	3.88	5	5.75
Melanthrips fuscus							1	0.77					1	1.25	2	1.55		
Melanthrips pallidior					1	0.69			2	3.51							1	1.15
Fam. Thripidae																		
Anaphothrips obscurus													1	1.25				
Aptinothrips elegans			2	2.74	1	0.69											1	1.15
Aptinothrips rufus	4	1.80			5	3.47	2	1.54										
Aptinothrips stylifer	1	0.45	6	8.22	7	4.86	4	3.08	5	8.77	1	3.45	3	3.75	6	4.65	8	9.20
Chirothrips manicatus	5	2.25	15	20.55	11	7.64	10	7.69	6	10.53	4	13.79	8	10.00	6	4.65	12	13.79
Firmothrips firmus			1	1.37			1	0.77									1	1.15
Frankliniella intonsa					2	1.39	3	2.31			1	3.45	1	1.25	4	3.10	5	5.75
Odontothrips biuncus															1	0.78		
Odontothrips loti	3	1.35	10	13.70	5	3.47	3	2.31	2	3.51	3	10.34	4	5.00	1	0.78	2	2.30
Odontothrips phaleratus	1	0.45															3	3.45
Oxythrips bicolor			1	1.37			1	0.77										
Parafrankliniella verbasci			1	1.37											1	0.78		
Stenothrips graminum											1	3.45						
Taeniothrips picipes			1	1.37	1	0.69	2	1.54			1	3.45						
Tenothrips frici	1	0.45	1	1.37	3	2.08	2	1.54							1	0.78		
Thrips atratus	1	0.45			1	0.69	2	1.54	3	5.26			3	3.75	2	1.55		
Thrips flavus	1	0.45			4	2.78	2	1.54	1	1.75					1	0.78		
Thrips montanus	8	3.60			4	2.78	2	1.54	1	1.75								
Thrips montivagus							1	0.77										
Thrips nigropilosus							1	0.77							1	0.78		
Thrips pelikani					2	1.39												
Thrips physapus	1	0.45	1	1.37	3	2.08	3	2.31	2	3.51					2	1.55		
Thrips tabaci	1	0.45			1	0.69	3	2.31	2	3.51	8	27.59	2	2.50				
Thrips trehernei											1	3.45						
Thrips trybomi			1	1.37	1	0.69	1	0.77							1	0.78		
Thrips validus					1	0.69	1	0.77							2	1.55		
Thrips vulgatissimus	9	4.05	2	2.74	3	2.08	2	1.54	1	1.75					1	0.78	2	2.30

Fam. Phlaeothripidae																		
Haplothrips acanthoscelis															1	0.78	1	1.15
Haplothrips aculeatus	16	7.21	1	1.37	3	2.08	2	1.54	5	8.77	1	3.45	3	3.75	6	4.65	2	2.30
Haplothrips alpester	96	43.24			37	25.69	31	23.85	13	22,81	5	17.24	15	18.75	33	25.58	25	28.74
Haplothrips angusticornis	4	1.80	1	1.37	4	2.78	8	6.15	4	7.02	1	3.45	6	7.50	11	8.53	1	1.15
Haplothrips distinguendus	2	0.90	1	1.37			1	0.77					2	2.50	3	2.33		
Haplothrips leucanthemi	25	11.26	3	4.11	11	7.64	8	6.15	1	1.75	1	3.45	13	16.25	7	5.43	4	4.60
Haplothrips niger	34	15.32	18	24.66	24	16.67	20	15.38	4	7.02			12	15.00	23	17.83	7	8.05
Haplothrips reuteri	1	0,45	3	4.11	1	0.69	2	1.54	1	1.75			2	2.50	4	3.10		
Haplothrips subtilissimus													1	1.25				
Haplothrips tritici	1	0.45					3	2.31	1	1.75	1	3.45	1	1.25	3	2.33		
Kakothrips robustus							1	0.77									1	1.15
Limothrips denticornis															1	0.78		
Total	222	100	73	100	144	100	130	100	57	100	29	100	80	100	129	100	82	100

Site 1 (shake method)

species	1967		1968		1969		1970		1978		1982		1992		1995		1998	
	no	%	no	%	no	%	no	%	no	%	no	%	no	%	no	%	no	%
Fam. Aeolothripidae																		
Aeolothrips ericae																	1	2.08
Aeolothrips fasciatus			1	0.51	3	1.44	2	1.50	1	1.72	2	7.41			2	1.42	1	2.08
Aeolothrips intermedius			9	4.55	21	10.05	9	6.77	5	8.62	2	7.41	5	11.11	5	3.55	2	4.17
Melanthrips knechteli															1	0.71		
Fam. Thripidae																		
Aptinothrips stylifer			1	0.51														
Chirothrips manicatus	2	1.98			1	0.48	2	1.50							1	0.71		
Frankliniella intonsa	12	11.88	39	19.70	25	11.96	9	6.77	6	10.34	4	14.81	5	11.11	20	14.18	3	6.25
Kakothrips robustus	18	17.82													8	5.67		
Odontothrips biuncus			1	0.51														
Odontothrips loti	7	6.93	4	2.02	7	3.35	1	0.75	3	5.17			9	20.00	13	9.22	6	12.50
Taeniothrips picipes	5	4.95			5	2.39	3	2.26					1	2.22	1	0.71		
Tenothrips frici	1	0.99	1	0.51	2	0.96	1	0.75	1	1.72					2	1.42	2	4.17
Thrips atratus	1	0.99			7	3.35					1	3.70	1	2.22	3	2.13	2	4.17
Thrips minutissimus					1	0.48	1	0.75							1	0.71		
Thrips montanus			2	1.01	5	2.39	3	2.26					2	4.44	4	2.84	1	2.08
Thrips montivagus			15	7.58	9	4.31	7	5.26	4	6.90			2	4.44	4	2.84		
Thrips nigropilosus			8	4.04	4	1.91									3	2.13	1	2.08
Thrips pelikani			1	0.51	1	0.48	1	0.75									1	2.08
Thrips physapus			34	17.17	12	5.74	15	11.28			1	3.70	7	15.56	7	4.96	1	2.08
Thrips tabaci	7	6.93	32	16.16	12	5.74	8	6.02							15	10.64	7	14.58
Thrips trybomi			2	1.01			1	0.75							2	1.42		
Thrips validus			5	2.53	7	3.35	4	3.01	2	3.45			1	2.22	3	2.13	2	4.17
Thrips vulgatissimus	1	0.99	1	0.51	1	0.48							1	2.22	1	0.71		
Fam. Phlaeothripidae																		
Haplothrips acanthoscelis	6	5.94			1	0.48	2	1.50					1	2.22	1	0.71	1	2.08
Haplothrips aculeatus	2	1.98			3	1.44	2	1.50	1	1.72			1	2.22	3	2.13	1	2.08
Haplothrips alpester															1	0.71		
Haplothrips angusticornis	5	4.95	2	1.01	27	12.92	12	9.02	6	10.34	7	25.93	1	2.22	2	1.42	2	4.17
Haplothrips distinguendus			1	0.51	5	2.39	2	1.50	1	1.72			1	2.22	2	1.42	2	4.17
Haplothrips kurdjumovi			1	0.51														
Haplothrips leucanthemi	2	1.98			19	9.09	12	9.02	8	13.79	1	3.70	6	13.33	9	6.38	6	12.50
Haplothrips niger	31	30.69	35	17.68	25	11.96	32	24.06	18	31.03	9	33.33			22	15.60	5	10.42
Haplothrips reuteri			3	1.52	4	1.91	3	2.26	2	3.45			1	2.22	2	1.42	1	2.08
Haplothrips tritici					2	0.96	1	0.75							2	1.42		
Liothrips setinodis	1	0.99													1	0.71		
Total	101	100	198	100	209	100	133	100	58	100	27	100	45	100	141	100	48	100

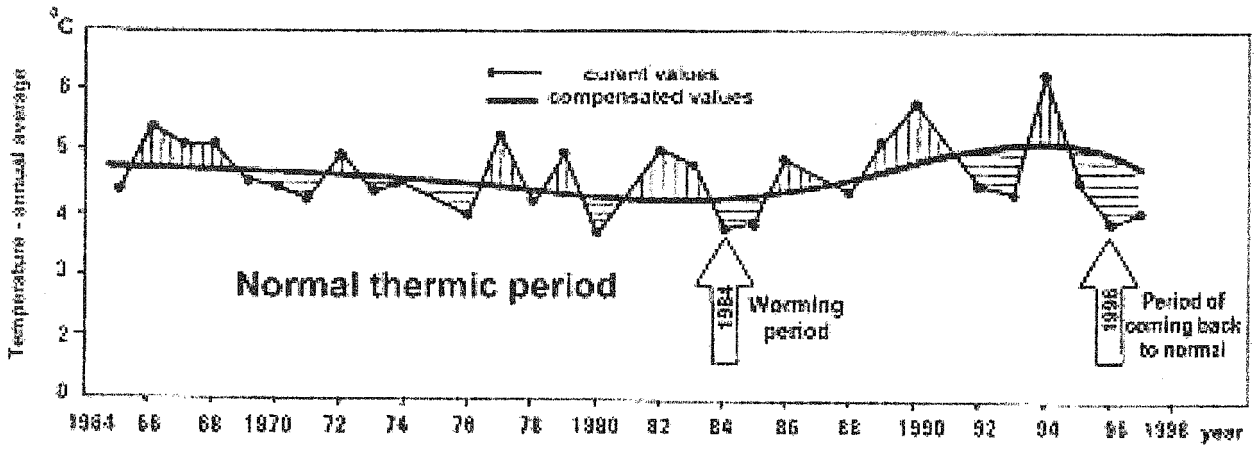

Fig. 1. The dynamics of the annual rainfall averages between 1965 – 1997

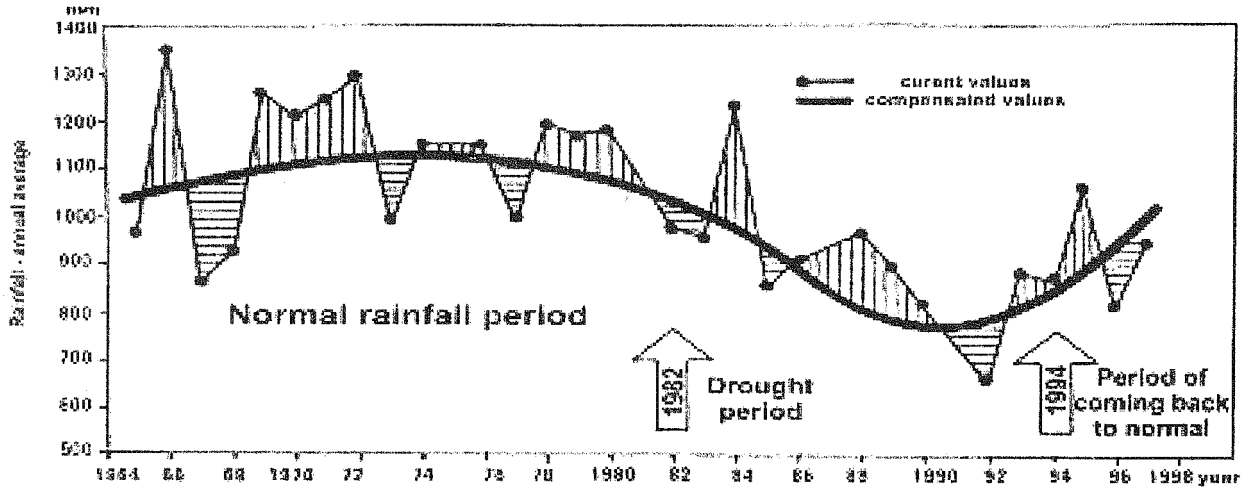

Fig. 2. The dynamics of the annual temperature averages between 1965 – 1997

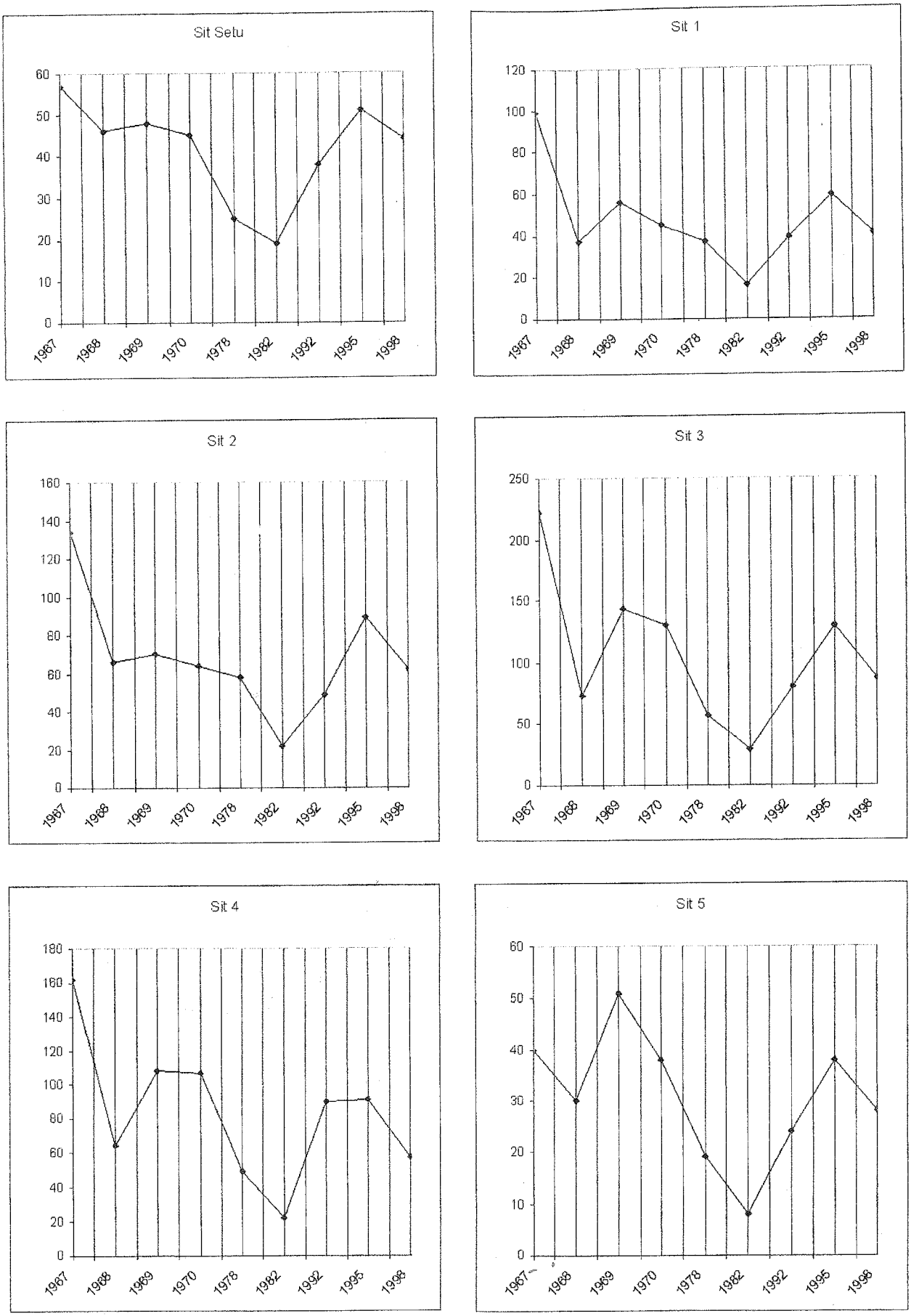

Fig. 3. The multiannual dynamics of the numerical abundance of thrips populations (sweep net method, July)

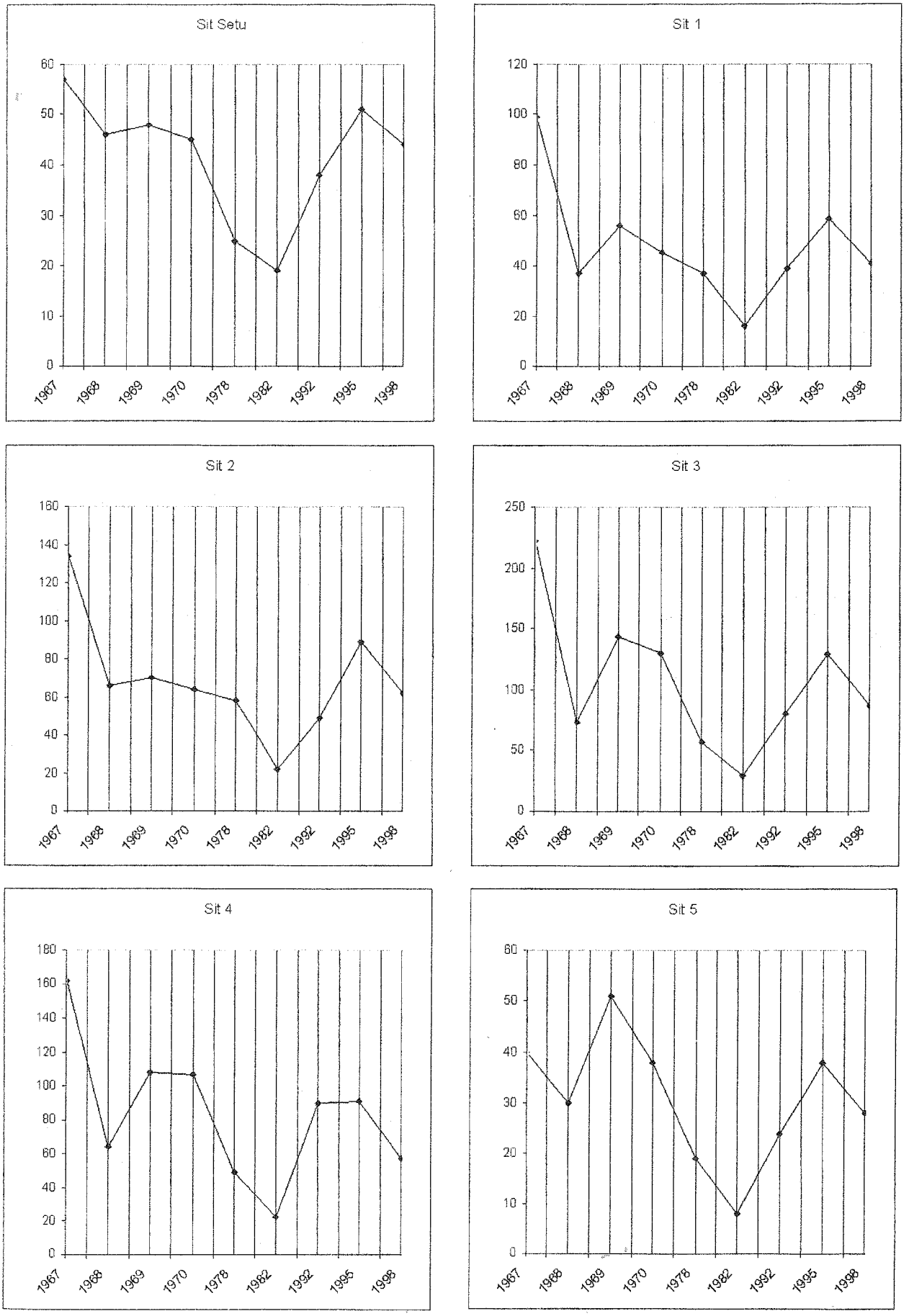

Fig. 4. The multiannual dynamics of the numerical abundance of thrips populations (shake method, July)

vegetation (fig.no.3, 4).

The shake method reveals the degree of the thrips aggregation on the blooming plants; they can change numerous hosts, because of their polyphagy.

We consider both methods very useful, the sweeping taking an important contribution of species, and the shaking of exemplars, both realizing a complete sampling of the thrips fauna from the mountainous meadows.

Conclusions

• The ecological study of the thrips associations structure was conducted in 6 sites of secondary meadows, differentiated by the vegetal associations and by altitudes between 800 m – 1500 m in the Gârbova Massif, Southern Carpathians, Romania;

• The general analysis of the thysanoptera diversity showed a large number of species: namely 78; by the sweep net method - 68 species, by the shake method - 58 species ;

• The temporal and spatial dynamics of the thrips populations show the richest structural net in the vegetal association ***Festuco rubrae-Agrostetum capillaris;***

• A species and individual decreasee was observed in all sites, in the draughty 1982 year, with the tendency to came back, to the 1967-1970 normal values, towards 1995.

References

KNECHTEL W. K. 1956. Ökologisch-phaenologische Forschungen über Thysanopteren, X Intern. Kongress of Ent. Montreal, **2**: 689-695.

KNECHTEL W. K. 1963. Ökologisch-phaenologische Forschungen über Thysanopteren. Zur Kenntnis der Thysanopterenfauna der Karpathen, Beiträge zur Ent.,13(3/4): 369-377.

OETTINGEN VON H. 1954. Beitrag zur Thysanopterenfauna Schweden, Entomol. Ts. Arg., **75** (2-4):: 134-150

PELIKÁN J. 1996. Vertical distribution of alpine Thysanoptera, Folia Ent. Hung., **LVII**: 121-125

VASILIU-OROMULU L. 1995. Population Diversity of Thysanoptera in Romanian Meadows, in, "Thrips Biology and Management", B. L. Parker et al. (eds.), Plenum Press, New York, NATO ASI Series, Series A: Life Sciences, **276**: 469-477.

VASILIU-OROMULU L. 1998. Lista revizuită a speciilor de thysanoptere din România, St. Cerc. Biol. S. Zool. **2**: 77-83.

Liliana VASILIU-OROMULU
Institute of Biology,
Spl. Independentei 296, Po Box 56-53,
79651 Bucharest-6, Romania

Received: 10.05.2002
Accepted: 10.06.2002
Printed: 24.06.2002