

## The Dynamics of the Sex Ratio Index of thrips populations from the mountainous meadows

Liliana VASILIU-OROMULU

### Abstract

In our researches, the main goal was to determine the sex ratio index of all the 78 thrips species from different meadows sites on the Gârbova Massive, three consecutive years and later in investigations of the monitoring type, during about 22 years, utilizing two collecting methods, shaking and sweeping. In the case of the dominant species we could notice a different sexual index, depending on the thrips sampling method. The year 1968, considered draughtier year than 1967 and 1969 produced a larger number of males. Also, in the draughtier time of the year 1982, the sex ratio index display lower values for some species, the values rose to 72.82% and 71.43% in 1968 and 1982 and to 94.87% in 1967 and 87.80% in 1998, years considered as „normal”.

**Keywords:** Dynamics, sex ratio, thrips populations

### Introduction

In all the ecological studies, the genetic structure was reduced only to the one of the main aspects of this parameter, represented by the sex structure.

The sex ratio index is very important in the knowledge of the biotic potential of the population.

Field populations of most species are bisexual, but females often predominate. In some species males are rare or unknown and reproduction is partly or wholly parthenogenetic.

Spurious ratios may also occur in species with flightless males, when plants other than the larval hosts are sampled, when one sex is more active than the other, or when sexes are attracted differentially to trap (LEWIS 1961).

In species in which only the females hibernate, the sex ratio changes in spring as new males are gradually produced. KOPPA (1969a) mentioned that the thrips species with flightless males, the sex ratio point out the suitability of different host plants.

Sex ratio can be influenced by the latitude (MORISON 1957 - in LEWIS 1973): *Thrips vulgatisimus* has males in equal number with females in Scotland (57°N) and rare or absent in southern England (52°N).

Males of *Aptinothrips rufus* are rare, but in Scotland the ratio is 1♂: 150♀♀ (MORISON 1957) and 1♂: 3,000♀♀ in central France (PUSARD & RADULESCO 1930 - in LEWIS 1973).

Arrhenotoky or thelitoky are present on the thrips species. In Netherlands (VIERBERGEN 2000) *Thrips tabaci* is normally telytokous, but the female

(male ratio observed on leek was 26: 1 during three research years.

KIRK (1985) has recorded the male-biased adult sex ratio at flowers, suggest that blossoms represent mating sites analogous to leeks.

Few data interpretable in terms of sex ratio adaptation are available for fully-winged thrips on grasses and crops. The sex ratio of *Chirothrips manicatus* (SHULL, 1914) vary erratically during the breeding season.

Adult sex ration for some Australian gall thrips (CRESPI B.J. 1993) varies between 0.05-0.52, depending on the type of galls.

### Materials and Methods

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

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

We have done the researches and in the following sites on Bogdan Valley:

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

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

Sex ratio index values of thrips species from Garbova Massif

species	Sweep net method						Shake method					
	sex ratio			f/m			sex ratio			f/m		
	1 <sup>st</sup> year	2 <sup>nd</sup> year	3 <sup>rd</sup> year	1 <sup>st</sup> year	2 <sup>nd</sup> year	3 <sup>rd</sup> year	1 <sup>st</sup> year	2 <sup>nd</sup> year	3 <sup>rd</sup> year	1 <sup>st</sup> year	2 <sup>nd</sup> year	3 <sup>rd</sup> year
<b>Fam. Aeolothripidae</b>												
<i>Aeolothrips albicinctus</i>	80.00	66.67	80.00	4.00	2.00	4.00						
<i>Aeolothrips ericae</i>	66.67	100.00	100.00	2.00	2/0	1/0	66.67	100.00	100.00	2.00	5/0	6/0
<i>Aeolothrips fasciatus</i>	96.15	100.00	100.00	25.00	19/0	13/0	90.91	91.18	100.00	10.00	10.33	24/0
<i>Aeolothrips intermedius</i>	81.08	85.37	80.41	4.29	5.83	4.10	77.24	74.30	81.02	3.39	2.89	4.27
<i>Melanthrips fuscus</i>	80.95	66.67	85.71	4.25	2.00	6.00	50.00	73.33	78.26	1.00	2.75	3.60
<i>Melanthrips knechteli</i>							100.00			1/0		
<i>Melanthrips pallidior</i>	74.34	65.38	78.21	2.90	1.89	3.59	63.78	68.57	75.68	1.76	2.18	3.11
<i>Rhipidothrips gratiosus</i>	100.00											
<b>Fam. Thripidae</b>												
<i>Anaphothrips euphorbiae</i>	100.00			1/0			84.62	100.00		5.50	8/0	
<i>Anaphothrips obscurus</i>	100.00	100.00	100.00	4/0	9/0	7/0		100.00			2/0	
<i>Apterothrips secticornis</i>							100.00			1/0		
<i>Aptinothrips elegans</i>	100.00	100.00	100.00	14/0	23/0	17/0	100.00			11/0		14/0
<i>Aptinothrips rufus</i>	100.00	100.00	100.00	53/0	59/0	61/0	100.00		100.00	33/0	5/0	8/0
<i>Aptinothrips stylifer</i>	100.00	100.00	100.00	183/0	192/0	190/0	100.00	100.00	100.00			
<i>Chirothrips aculeatus</i>	91.67			11.00								
<i>Chirothrips manicatus</i>	21.71	72.38	45.15	0.28	2.62	0.82	89.29	100.00	100.00	8.33	10/0	24/0
<i>Firmothrips firmus</i>	24.24	85.71	82.35	0.32	6.00	4.67					0.00	
<i>Frankliniella intonsa</i>	92.16	90.70	94.44	11.75	9.75	17.00	81.14	86.69	81.89	4.30	6.51	4.52
<i>Frankliniella pallida</i>							100.00	100.00		1/0	1/0	
<i>Frankliniella tenuicornis</i>	100.00			1/0								
<i>Kakothrips dentatus</i>							100.00			1/0		
<i>Kakothrips robustus</i>	75.00	50.00	100.00	3.00	1.00	3/0	93.94	97.06	100.00	15.50	33.00	4/0
<i>Limothrips denticornis</i>	100.00	100.00	100.00	14/0	2/0	6/0						
<i>Limothrips schmutzi</i>	100.00	100.00	100.00	3/0	1/0	1/0	100.00			1/0		
<i>Mycterothrips annulicornis</i>		100.00										
<i>Neohydatothrips abnormis</i>	100.00	100.00			2/0							
<i>Odontothrips biuncus</i>	100.00	100.00	100.00	4/0	4/0	2/0	100.00	50.00	81.82		1.00	4.50
<i>Odontothrips confusus</i>	100.00		100.00	1/0		1/0		100.00				
<i>Odontothrips loti</i>	84.00	88.31	88.06	5.25	7.56	7.38	71.11	75.73	75.32	2.46	3.12	3.05
<i>Odontothrips phaleratus</i>	66.67	66.67	85.71	2.00	2.00	6.00						
<i>Oxythrips bicolor</i>	100.00	100.00	100.00	4/0	1/0	1/0						

species	Sweep net method						Shake method						
	sex ratio			f/m			sex ratio			f/m			
	1 <sup>nd</sup> year	2 <sup>nd</sup> year	3 <sup>rd</sup> year	1 <sup>nd</sup> year	2 <sup>nd</sup> year	3 <sup>rd</sup> year	1 <sup>nd</sup> year	2 <sup>nd</sup> year	3 <sup>rd</sup> year	1 <sup>nd</sup> year	2 <sup>nd</sup> year	3 <sup>rd</sup> year	
<i>Parafrankliniella verbasci</i>		100.00			1/0			100.00			4/0		
<i>Prosopothrips vej dovski</i>		100.00	100.00		2/0	1/0							
<i>Sericothrips bicornis</i>	100.00	100.00	100.00	8/0	1/0	1/0							
<i>Sminythrips biuncatus</i>		100.00			1/0								
<i>Stenothrips graminum</i>								100.00			2/0		
<i>Taeniothrips inconsequens</i>	75.00			3.00									
<i>Taeniothrips picipes</i>	85.09	95.00	100.00	5.71	19.00	56/0		67.73	91.85	93.42	2.10	11.27	14.20
<i>Tenothrips discolor</i>								100.00			1/0		

Fam. Thripidae

<i>Tenothrips frici</i>	77.27	100.00	100.00	3.40	2/0	20/0		83.33	100.00	100.00	5.00	6/0	6/0
<i>Thrips atratus</i>	79.25	100.00	85.71	3.82	3/0	6.00		97.96	95.35	96.61	48.00	20.50	28.50
<i>Thrips crassicornis</i>		100.00	100.00		1/0	1/0							
<i>Thrips dilatatus</i>		100.00			1/0								
<i>Thrips euphorbiae</i>								100.00	100.00	100.00	3/0	6/0	4/0
<i>Thrips flavus</i>	100.00	100.00	100.00	2/0	10/0	23/0		100.00	88.89	85.00		8.00	5.67
<i>Thrips incognitus</i>									100.00			1/0	
<i>Thrips major</i>	100.00	100.00	100.00	2/0	1/0	4/0		50.00	100.00	100.00	1.00	3/0	3/0
<i>Thrips minutissimus</i>	100.00	100.00	100.00	2/0	1/0	1/0			100.00	100.00	0/1	3/0	1/0
<i>Thrips montanus</i>	77.89	93.33	94.12	3.52	14.00	16.00		88.89	88.24	91.14	8.00	7.50	10.29
<i>Thrips montivagus</i>	50.00	100.00	100.00	1.0	5/0	3/0			85.37	90.00		5.83	9.00
<i>Thrips nigropilosus</i>		100.00			1/0				96.30	80.00		26.00	4.00
<i>Thrips pelikani</i>	86.67	83.33	90.91	6.50	5.00	10.00		76.02	82.00	82.24	3.17	4.56	4.63
<i>Thrips physapus</i>	95.59	93.48	98.68	21.67	14.33	75.00		77.14	79.22	87.20	3.38	3.81	6.81
<i>Thrips pillichii</i>								100.00	100.00	100.00	9/0	4/0	5/0
<i>Thrips tabaci</i>	100.00	86.67	100.00	48/0	6.50	37/0		94.61	90.44	99.06	17.56	9.46	105.00
<i>Thrips trehermei</i>	70.59	100.00	75.00	2.40		3.00		62.86	87.50	86.96	1.69	7.00	6.67
<i>Thrips trybomi</i>	100.00	100.00	100.00	1/0	2/0	2/0		100.00	90.00	100.00	3/0	9.00	4/0
<i>Thrips validus</i>	94.12	100.00	100.00	16.00	6/0	11/0		37.50	80.00	81.88	0.60	4.00	4.52
<i>Thrips vulgatissimus</i>	86.67	100.00	100.00	6.50	20/0	18/0		100.00	82.61	79.17	27/0	4.75	3.80

Fam. Phlaeothripidae

<i>Bolothrips bicolor</i>	0.00	0.00		0/1	0/1								
<i>Haplothrips acanthoscelis</i>	85.71	75.00	92.31	6.00	3.00	12.00		82.61	100.00	100.00	4.75	6/0	19/0
<i>Haplothrips aculeatus</i>	93.62	92.31	89.19	14.67	12.00	8.25		90.00	100.00	100.00	9.00	2/0	11/0
<i>Haplothrips alpester</i>	92.02	87.88	88.61	11.54	7.25	7.78		92.31	86.11	84.35	12.00	6.20	5.39
<i>Haplothrips angusticornis</i>	83.91	50.24	71.11	5.21	1.01	2.46		88.65	61.47	93.37	7.81	1.60	14.09
<i>Haplothrips distinguendus</i>	93.33	100.00	94.74	14.00	7/0	18.00		72.73	91.30	80.00	2.67	10.50	4.00

species	Sweep net method						Shake method					
	sex ratio			f/m			sex ratio			f/m		
	1 <sup>nd</sup> year	2 <sup>nd</sup> year	3 <sup>rd</sup> year	1 <sup>nd</sup> year	2 <sup>nd</sup> year	3 <sup>rd</sup> year	1 <sup>nd</sup> year	2 <sup>nd</sup> year	3 <sup>rd</sup> year	1 <sup>nd</sup> year	2 <sup>nd</sup> year	3 <sup>rd</sup> year
<i>Haplothrips kurdjumovi</i>	100.00		100.00	2/0		2/0		0.00				0/1
<i>Haplothrips leucanthemi</i>	95.35	81.25	100.00	20.50	4.33	27/0	88.58	82.71	78.91	7.76	4.78	3.74
<i>Haplothrips niger</i>	93.06	90.32	82.98	13.40	9.33	4.88	98.59	96.19	95.68	70.13	25.26	22.13
<i>Haplothrips phyllophilus</i>								100.00				1/0
<i>Haplothrips reuteri</i>	91.67	66.67	84.21	11.00	2.00	5.33	75.00	60.34	69.01	3.00	1.52	2.23
<i>Haplothrips setiger</i>	100.00	100.00	100.00	5/0	3/0	5/0	100.00			2/0		
<i>Haplothrips subtilissimus</i>			66.67	100.00	2.00	2/0	100.00			1/0		
<i>Haplothrips tritici</i>	96.77	100.00	100.00	30.00	4/0	23/0	100.00	100.00	100.00	7/0	5/0	5/0
<i>Hoplandrothrips bidens</i>	0.00	66.67	0.00	0/1	2.00	0/1						
<i>Liothrips austriacus</i>	100.00		100.00	1/0		1/0						
<i>Liothrips setinodis</i>		100.00			2/0		100.00			1/0		
<i>Phlaeothrips coriaceus</i>	100.00		100.00	1/0		1/0						
<i>Phlaeothrips pillichianus</i>	0.00	66.67	50.00	0/1	2.00	1.00						

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* (PUȘCARU 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.

In the Șețu site there had been functioning a meteorological station, during 3 years.

The working method was of the ecological stationary, delimited on the surface of 1 ha.

In these sites, we have utilised two established methods, recognized on international level: sweep net method and shake of blooming plants method; the thrips were collected twice every month, the number of samples were statistically determined.

The sex ratio was calculated, after standard formula:

$$Sr = \frac{f}{m + f} \times 100$$

#### Resultats and Discussions

The main purpose in our researches was the point out the sex ratio of all 78 thrips species, in 3 consecutive years, in vegetal association.

The sex ratio, and the female/male ratio were shown in the tables 1. The ratio female-male number for each for the first three consecutive years, on the dominant thrips species was: 274 females : 988 males; 393 females : 150 males and 298 females : 362 males, by sweeping method and 25 females : 3 males; 10 females : 0 males and 24 females : 0 males by shake method, on *Chirothrips manicatus* (VASILIU-OROMULU 1986).

In order to the sweep net method, the distributions of males wingless are more homogenous, especially between July and October, more abundant in September, in all sites, indifferently on the altitude, or vegetal association.

On the *Aeolothrips intermedius*, the maximal numbers of males were sampled, opposite, by shake method: 112 females : 33 males, 133 females : 46 males and respectively 222 females : 52 males and by sweeping: 120 females : 28 males, 70 females : 12 males and 119 females to 29 males (Tabel.no.1).

On the *Frankliniella intonsa* the same shake method must be utilized for obtain the must abundant males number for the three years: 499 females : 116 males, 267 females : 41 males, 194 females : 44 males and for sweep net method the result are scarcer and equally for years: 47 females: 4 males, 39 females : 4 males, 34 females : 2 males; the same results were registered and for *Thrips physapus*, by shake method: 378 females : 112 males, 611 females : 176 males, 436 females : 64 males, the males being present in all the researches month.

*Thrips vulgaticornis*, in Romania, at 45°N, has a higher number of males as in England. The mean ratio, for 3 years, is 14,83 females : 1 males by sweeping and 11.85 females : 1 males by shake method.

From the Phlaeothripidae Family, *Haplothrips angusticornis* has a high individuals collection, for the three years: 250 females : 32 males, 268 females : 168 males, 324 females : 23 males by shake method

and 73 females : 14 males, 210 females : 208 males and 192 females : 78 males, this species having more males number in the second year, draughtlier. The maximal male number characterized the site 4, from 1300 m, with *Scorzonero roseae - Festucetum nigricantis* association, in the second part of July. The same situation, was in the first year, in the same site, and month, but fewer males.

#### Conclusions

The sex ratio index of the thrips species depending on the collecting method and sites, points out characteristic values for each species. For *Aptinothrips stylifer*, *Aptinothrips rufus* and *Aptinothrips elegans*, have never been found males, for *Taeniothrips inconsequens* and for *Firmothrips firmus* the ratio 1 males : 3 females is very rare.

#### REFERENCES

- CRESPI L. 1993. Sex Ratio Selection In Thysanoptera, 6, In Wrench D.L. & Ebbert M. (Eds.) Pp: 214-234, Chapman & Hall, New York.
- KENDALL D. M. & CAPINER J. L. 1990. Geographic And Temporal Variation In The Sex Ratio Of Onion Thrips. Southwestern Entomologist, 15: 80-88.
- KIRK W. D. J. 1985. Aggregation And Mating Of Thrips Flowers Of Calistegia Sepium. Ecological Entomology, 10: 433-440.
- KOPPA P. 1969. The sex index of some species of thrips living on cereals plants. Ann. Ent. Fenn., 35: 65-72.
- LEWIS T. 1961. Records of Thysanoptera at Silwood

- Park with notes on their biology. Proc. R.ent. Soc. Lond. (A), **36**: 89-95.
- LEWIS T 1973. Thrips, their biology ecology and economic importance, Acad. Press London, New York.
- MOUND L. 1991. Patterns of sexuality in Thysanoptera, in the 1991 conference on thrips (Thysanoptera): Insect and disease considerations in sugar Maple Management: 2-15.
- SHULL A.F. 1914. Biology of the Thysanoptera. American Naturalist, **48**: 161-176; 236-247.
- VIERBERGEN G. & ESTER A. 2000. Natural enemies and sex ratio of *Thrips tabaci* (Thysanoptera: Thripidae), a major pest of *Allium porrum* in the Netherlands. Med. Fac. Landbouww. Univ. Gent, **65**(2a): 335-342.
- VASILIU-OROMULU L. 1986. Studiul unor indici ecologici populaționali ai cenzelor de tisanoptere din Masivul Gârbova, Lucr. III Conf. Ent. Iași: 179-187

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