

# Predatory mites of the family Phytoseiidae (Acari, Mesostigmata) from South Sweden

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Thirty-three species of plants, mostly deciduous and coniferous trees, were examined for Phytoseiidae mites in South Sweden. Samples of leaves and twigs were submerged in a water-soap solution. The solution was filtered and the filtrate was examined for mites. Nineteen species of phytoseiid mites were identified, fifteen of which are new to Sweden. The four species with the highest densities were: *Typhlodromus pyri* (32.7% of the total phytoseiid material), *Euseius finlandicus* (28.4%) *Anthoseius bakeri* (10.4%) and *Dubininellus spoofi* (10.0%).

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## Introduction

Phytoseiid mites live in the foliage or on the bark of trees, bushes, and other plants all over the world, from alpine and Arctic tundras to tropical rain forests. Most species studied are predaceous on a variety of tetranychid mites and other small animals, but some forage more restrictively. In the absence of prey, many of them can survive and even reproduce by feeding on fungi, pollen and plant tissue (Evans et al. 1985, Dicke & Sabelis 1988). Plants also provide shelter for the mites in the form of domatia (i.e. pits, pouches, pockets and hair tufts formed by the plant but not induced by the mite), which can be regarded as an example of mutualism (O'Dowd & Willson 1991).

Phytoseiids are of approximately the same size as their main prey, the Tetranychidae mites. The mesostigmatic morphological structures of the Phytoseiidae are, however, quite different from the weakly sclerotized prostigmatic structures of the Tetranychidae. Thus, the phytoseiid dorsum is covered by a large dorsal sclerite with a number of setae, the number and arrangement of which are important taxonomic characters. The venter of the female mite is covered by a sternal, a genital and a ventrianal sclerite. Other taxonomically important characters are the number of setae on the legs and the shape of the female spermatheca.

Phytoseiid mites are important as control agents for phytophagous insects and mites (Helle & Sabelis 1985). The knowledge about these predators has increased since the early 1950s, and the number of named species has grown from ca 20 (Nesbitt 1951) to over 1 600 (Chant & Yoshida-Shaul 1991). An introduced species, *Phytoseiulus persimilis*, is being used as a control agent for tetranychid mites in greenhouses in many countries including Sweden. Many predatory mites are known to be highly sensitive to pesticides used to control phytophagous Tetranychidae mites (Hoy 1981). Applying acaricides to an orchard is thus an effective way to kill most of the natural enemies of the pest which is the target species of the treatment.

In most European countries large scale faunistic surveys of the natural phytoseiid mite fauna have been carried out. In Sweden, however, no such survey has been done so far. The main object to carry out such an investigation, is to establish if *Typhlodromus pyri* occurs naturally in Sweden. This species has been shown to effectively suppress populations of the European red spider mite *Panonychus ulmi* (McMurtry 1983). Strains of *T. pyri* (Fig. 1) resistant to pesticides have been used in integrated control programmes of orchards in Europe (Hoy 1992), and an intro-

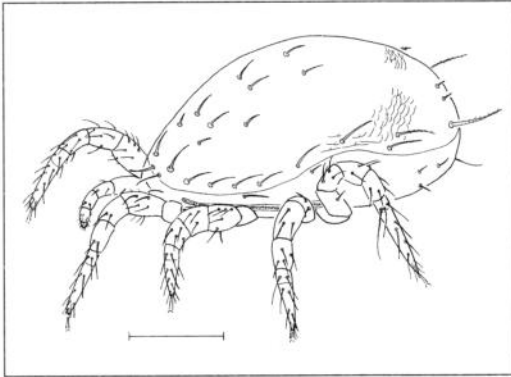


Fig. 1. *Typhlodromus pyri* is one of the most common and widely distributed phytoseiid mites in South Sweden. Strains of *T. pyri* has been genetically manipulated by artificial selection, which has resulted in pyrethroid resistance. Benefits and risks of using such strains in biological control was discussed by Hoy (1992). Scale bar indicates 100  $\mu\text{m}$ .

*T. pyri* är en av de vanligaste phytoseiid kvalsterna i Sverige. Internationellt pågår en debatt om för- och nackdelar med att använda genetiskt manipulerade stammar i integrerad bekämpning av skadedjur. Skälstreckat visar 100  $\mu\text{m}$ .

duction of such strains to Sweden has been proposed.

**Taxonomic considerations**

The classification of the family is in a state of flux, and there are widely differing concepts of its genera. Thus Hirschman (1962) regarded the entire family as one single genus, *Typhlodromus* in the family Gamasidae. On the other hand, Muma and Denmark (quoted by Chant 1985) and others, recognize up to 50 or more genera. Despite the small number of acarologists studying the classification of the Phytoseiidae, no less than 15 to 20 major revisions have been published during the last 25 years and the lack of agreement in taxonomic nomenclature and generic concept is almost total.

In this publication we will largely follow Karg (1991) on the generic level.

The nomenclature of the plants follows mainly Tutin et al. (1964-1980), but also Krüssmann (1972, 1977).

**Material and methods**

Samples of twigs with 50 to 200 leaves from trees and bushes, or 20 to 50 leaves from herbaceous plants were taken from cultivated, ornamental

and wild growing plants, mostly in the surroundings of Alnarp, South Scania (Tab. 2). Other samples were taken from the western parts of Scania and Halland, Blekinge, Småland, the two Baltic islands of Öland and Gotland and the island of Tjörn, Bohuslän (Tab. 1, Fig. 2). Collections were made at irregular intervals from July to October, 1980 - 1988.

Samples were submerged in a warm (45°) water-soap solution according to a widely used standard method (T. Edland pers. comm.). After one hour the solution was filtered through a net (mesh size 100  $\mu\text{m}$ ) in a funnel. The filtrate was then stored in alcohol (70%), and examined for mites under a binocular dissecting microscope (20 - 40x).

Mites were put in Nesbitt's solution for one hour to macerate internal tissues (Krantz 1978), transferred to a microscopic slide, and embedded in a gum-chloral solution (Hoyer's medium).

All sampling from orchards (Tab. 4) reported here were made from unsprayed ones. In addition, five sprayed apple orchards were investigated, but no phytoseiid mites were found in those samples.

We define the density of a mite species as the percentage of the total number of mites found (1154), and the abundance as the percentage of samples in which the species was found.

Tab. 1. Plant species examined from localities 2-24 in South Sweden. Plant material from locality 1, SK Alnarp, is presented in Tab. 2. Abbreviations of Swedish provinces as follows. SK: Skåne, BL: Blekinge, SM: Småland, ÖL: Öland, GO: Gotland, BO: Bohuslän.

Växter som undersökts med avseende på phytoseider från lokalerna 2-24, sydsverige. Materialet från lokal 1, SK Alnarp, presenteras i tabell 2.

Loc. no.	Locality	Plant species examined
2	SK Akarp	<i>Malus domestica</i>
3	SK Lund	<i>Malus domestica</i>
4	SK Södra Sandby	<i>Malus domestica</i>
5	SK Bjärred	<i>Pinus silvestris</i>
6	SK Saxtorp	<i>Pinus silvestris</i>
7	SK Asmundtorp	<i>Malus domestica</i>
8	SK Dagstorp	<i>Malus domestica</i>
9	SK Eneskogen	<i>Juniperus communis</i> , <i>Larix decidua</i> , <i>Picea abies</i>
10	SK Konga	<i>Picea abies</i>
11	SK Skaralid	<i>Picea abies</i>
12	SK Fleninge	<i>Cucumis sativus</i>
13	SK Strövelstorp	<i>Cucumis sativus</i>
14	SK Ramsjöstrand	<i>Malus sylvestris</i>
15	SK Kattvik	<i>Malus domestica</i>
16	SK Borrbby	<i>Malus domestica</i>
17	SK Villands Vånga	<i>Malus domestica</i>
18	BL Istaby	<i>Cucumis sativus</i>
19	BL Fågelmara	<i>Cucumis sativus</i>
20	ÖL Skogsby	<i>Malus domestica</i>
21	GO Halla	<i>Malus domestica</i>
22	SM Ryd	<i>Juniperus communis</i> , <i>Picea abies</i>
23	SM Eksjö	<i>Fragaria X ananassa</i>
24	BO Tjörn	<i>Fragaria X ananassa</i>

Mites were identified using the following keys: Chant (1959), Karg (1971, 1983), Moraes et al. (1986), Chant & Yoshida-Shaul (1987), Evans & Momen (1987), Miedema (1987), Denmark & Muma (1989) and Evans (unpublished).

## Results

Twenty-four localities in South Sweden (Fig. 2) were sampled and 33 species of plants (Tab. 2) were examined for Phytoseiidae mites. 1154 specimens were found and 19 species of 8 genera were identified (Tabs 2, 3 & 4).

Eight species had a density of more than 1% on other plant species than *Malus domestica* (Tab. 2). Ten species were considered to be rare, i.e. had a density of less than 1% on other plant species than *Malus domestica* (Tab. 3). On *Malus domestica* totally twelve species were found. One species (*Paraseiulus soleiger*) was found on *M. domestica* only (Tab. 4).

Four dominating species constituted together 81.5% of the total material (including mites found on *Malus domestica*). These were: *Typhlodromus pyri* (density 32.7%), *Euseius finlandicus* (28.4%), *Anthoseius bakeri* (10.4%), and *Dubininellus spoofi* (10.0%). The four most abundant species were *T. pyri* (found in 33.3% of all samples), *A. bakeri* and *E. finlandicus* (both 31.8%) and *Typhlodromus ernesti* (21.2%) (Tab. 2).

No species was found in all localities, or on all host plant species, which may be due to the fact that the size of the samples varied between localities and host plants.

Three distribution patterns of mites on *Malus domestica* were discernible: i) accidental mite species were found in low numbers, and in only one or two samples (about 10%), ii) occasional species were found in moderate numbers (10-25) in three to four samples (about 20%), and iii) regular species were abundant (> 90 individuals) in six or more (> 35%) samples (Tab. 4).

## Species list

Numbers in brackets refer to localities on map (Fig. 2).

Genus *Amblyseius* Berlese, 1914

Type species: *Zercon obtusus* Koch, 1839

### 1) *andersoni* (Chant)

*Typhlodromus* (*Amblyseius*) *andersoni* Chant, 1957.

Found in low numbers (Tab. 2) at Alnarp (1) and Eneskogen (9), mostly on coniferous trees, but also on the hairy leaves of *Rubus plicatus* and

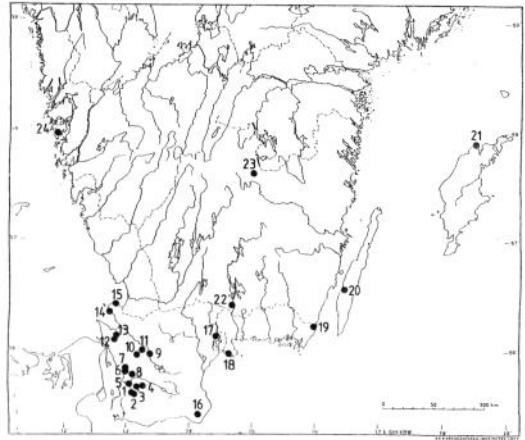


Fig. 2. Localities 1 - 24 in South Sweden, where one or more samples of plants have been investigated for phyto-seiid mites.

Lokalerna 1-24 i södra Sverige, där en eller flera växtprover har undersökts med avseende på phytoseiidfaunan.

### *Sorbus intermedia*.

### 2) (*Neoseiulus*) *barkeri* (Hughes)

*Neoseiulus barkeri* Hughes, 1948.

*Amblyseius mckenziei* Schuster & Pritchard, 1963.

Spontaneous on cucumber (*Cucumis sativus*) in greenhouses at Fleninge (12) and Strövelstorp (13) and on open-air cultivated *Fragaria X ananassa* at Eksjö (23) (Tab. 3).

### 3) *masseei* (Nesbitt)

*Typhlodromus masseei* Nesbitt, 1951.

Only one female on *Salix purpurea* at Alnarp (1) (Tab. 3).

### 4) *zwoelferi* (Dosse)

*Typhlodromus zwoelferi* Dosse, 1957.

One male and five females from field gherkin (*Cucumis sativus*) at Fågelmara (19), one female on *Fragaria X ananassa* at Alnarp (1) (Tab. 3).

Genus *Anthoseius* De Leon, 1959

Type species: *Anthoseius bebetis* De Leon, 1959

### 5) *bakeri* (Garman)

*Seiulus bakeri* Garman, 1948.

Found mostly on coniferous trees (Tab. 2), but accidentally on *Malus domestica* (Tab. 4), *Prunus avium* and *Sorbus aucuparia* (Tab. 2).

Tab. 2. Number of mites of eight phytoseiid species with population densities of more than 1% on non-*Malus* host species. Plant species indicated with <sup>1)</sup> have been collected from locality 1, SK Alnarp. For further details on *M. domestica* (16) see Tab. 4.

Antal kvalster av de åtta vanligaste arterna på andra växtarter än äpple. Växter som är markerade med <sup>1)</sup> har samlats från lokal 1. SK Alnarp. För ytterligare detaljer vad gäller äpple, se tabell 4.

Plant sp. no.	Plant species	No. of samples	A. andersoni	A. bakeri	A. rhenanus	D. spoofi	E. finlandicus	T. ernesti	T. laurae	T. pyri	Total
1	<i>Abies koreana</i> <sup>1)</sup>	1	4								4
2	<i>Aesculus hippocastanum</i> <sup>1)</sup>	1					5			1	6
3	<i>Alnus glutinosa</i> <sup>1)</sup>	1					1				1
4	<i>A. incana</i> <sup>1)</sup>	1					2				2
5	<i>Carpinus betulus</i> <sup>1)</sup>	1					1			1	2
6	<i>Chamaecyparis pisifera</i> <sup>1)</sup>	1			12			12			24
7	<i>Corylus avelana</i> <sup>1)</sup>	1					11			21	32
8	<i>Crataegus monogyna</i> <sup>1)</sup>	1					6				6
9	<i>Cucumis sativus</i>	4		8							8
10	<i>Fagus sylvatica</i> <sup>1)</sup>	2					47			3	50
11	<i>Fragaria X ananassa</i> <sup>1)</sup>	4			2		11				13
12	<i>Fraxinus excelsior</i> <sup>1)</sup>	1					38	1		4	43
13	<i>Humulus lupulus</i> <sup>1)</sup>	1					2				2
14	<i>Juniperus communis</i>	2		31				9			40
15	<i>Larix decidua</i> <sup>1)</sup>	2	1	11				1		1	14
16	<i>Malus domestica</i> <sup>1)</sup>	17	1	1	2	96	95			266	461
17	<i>M. floribunda</i> <sup>1)</sup>	1					6			2	8
18	<i>M. sylvestris</i>	1					9			29	38
19	<i>Picea abies</i>	4		24	1			34	1		60
20	<i>Pinus sylvestris</i> <sup>1)</sup>	4		49	2	1	2	9	20	1	84
21	<i>Populus balsamifera</i> <sup>1)</sup>	1		1							1
22	<i>P. canescens</i> <sup>1)</sup>	1						1			1
23	<i>Prunus avium</i> <sup>1)</sup>	1		1	1		26	1		9	38
24	<i>P. domestica</i> <sup>1)</sup>	1					10				10
25	<i>Quercus robur</i> <sup>1)</sup>	1					8				8
26	<i>Rubus plicatus</i> <sup>1)</sup>	1	4								4
27	<i>Salix purpurea</i> <sup>1)</sup>	1									0
28	<i>Sorbus aucuparia</i> <sup>1)</sup>	2		1			1			1	3
29	<i>S. intermedia</i> <sup>1)</sup>	1	2		1	18				5	26
30	<i>Taxus baccata</i> <sup>1)</sup>	1	4					3		5	12
31	<i>Thuja plicata</i> <sup>1)</sup>	1	2				5				7
32	<i>Tilia cordata</i> <sup>1)</sup>	3					24			16	40
33	<i>Ulmus glabra</i> <sup>1)</sup>	2					16			11	27
	<b>Sum:</b>	<b>68</b>	<b>18</b>	<b>127</b>	<b>21</b>	<b>115</b>	<b>326</b>	<b>71</b>	<b>21</b>	<b>376</b>	<b>1075</b>
	<b>found in no. of samples</b>		<b>7</b>	<b>17</b>	<b>8</b>	<b>8</b>	<b>33</b>	<b>15</b>	<b>4</b>	<b>23</b>	

6) *caucasicus* (Abbasova)  
*Mumaseius caucasicus* Abbasova, 1970.  
*Anthoseius toruli* Karg & Edland, 1987. syn.nov.  
 (Edland, pers. comm.).  
 A rare species (Tab. 3) probably with East European distribution. Found in Norway on coniferous trees, in orchards and on shrub species (Karg & Edland, 1987). We have found it at Alnarp (1).

7) *rhenanus* (Oudemans)  
*Seiulus rhenanus* Oudemans, 1905.  
*Typhlodromus foenilis* Oudemans, 1930 *Typhlodro-*

*mella rhenanus* (Oudemans); Evans & Momen (1988).  
 Found on eight plant species (Tabs 2 & 4) at Scania (1, 5, 6, 10) and at Gotland (21) and Tjörn (24), most often in low numbers, but 12 females were found in one sample of *Chamaecyparis pisifera* at Alnarp (1).

8) *richteri* (Karg)  
*Typhlodromus richteri* Karg, 1970.  
 Sampled at Alnarp (1) on *Chamaecyparis pisifera* (Tab. 3) and accidentally on *Malus domestica* (Tab. 4), at Eneskogen (9) on *Picea abies* and at

Tab. 3. Number of phytoseiid mites of species with low (< 1%) population densities on non-*Malus* host plant species.

Antal kvalster med låg (< 1%) populationstäthet på andra växtarter än äpple.

Mite Species	No. of mites		Host plant species
	total	on each plant species	
<i>Amblyseius barkeri</i>	9	8	<i>Cucumis sativus</i> <i>Fragaria X ananassa</i>
<i>A. massei</i>	1	1	<i>Salix purpurea</i>
<i>A. zwoelferi</i>	7	6	<i>Cucumis sativus</i> <i>Fragaria X ananassa</i>
<i>Anthoseius caucasicus</i>	8	1	<i>Fagus silvatica</i> 2 <i>Larix decidua</i> 1 <i>Sorbus aucuparia</i> 3 <i>Taxus baccata</i> 1 <i>Thuja plicata</i>
<i>A. richteri</i>	7	1	<i>Chamaecyparis pisifera</i> 1 <i>Malus domestica</i> 2 <i>Picea abies</i> 3 <i>Pinus silvestris</i>
<i>Paraseiulus triporus</i>	15	1	<i>Fagus silvatica</i> 11 <i>Malus domestica</i> 1 <i>M. floribunda</i> 1 <i>Sorbus aucuparia</i> 1 <i>Tilia cordata</i>
<i>P. talbii</i>	2	1	<i>Malus domestica</i> 1 <i>Sorbus intermedia</i>
<i>Propioseiopsis okanagensis</i>	1	1	<i>Fragaria X ananassa</i>
<i>Seiulus aceri</i>	3	3	<i>Alnus incana</i>
<i>S. tiliarum</i>	24	23	<i>Malus domestica</i> 1 <i>Ulmus glabra</i>
<b>Sum</b>	<b>77</b>		

Ryd (22) on *Pinus silvestris*.

Genus *Dubininellus* Wainstein, 1959.

Type species: *Phytoseius (Dubininellus) corniger* Wainstein, 1959.

9) *spoofti* (Oudemans)

*Seiulus spoofti* Oudemans, 1915.

*Phytoseius spoofti* (Oudemans); Sellnick (1958)

In our material *D. spoofti* (Fig. 3) was one of the regular phytoseiid species in orchards (Tab. 4). Besides on *M. domestica* it was found in two other samples only (Tab. 2) viz. at Alnarp (1) 18 females on *Sorbus intermedia*, and at Bjärred (5), 1 female on *Pinus silvestris*.

Taxonomic remark: This species has often been synonymized with the North American species *D. macropilis* (Banks) (Miedema 1987), but can be distinguished by the following character (Fig. 4): macroseta on genu IV subequal to the macroseta on basitarsus IV: *D. spoofti*; Macroseta on genu IV clearly shorter than macroseta on basitarsus IV: *D. macropilis* (Edland, pers. comm., Karg 1991).

Genus *Euseius* Wainstein, 1962.

Type species: *Seiulus finlandicus* Oudemans, 1915.

10) *finlandicus* (Oudemans)

*Typhlodromus finlandicus* (Oudemans); Sellnick (1958)

The most abundant species and with the second

Tab. 4. Number of phytoseiid mites found on 17 samples of *Malus domestica* from South Sweden. The specimens are accounted for also in Tabs 2 and 3 respectively when applicable. Numbers in brackets refer to map (Fig. 2).

Antal kvalster funna i de 17 proverna av äpple. Djuren är också upptagna i tabellerna 2 och 3 där så är tillämpligt. Siffror inom parantes anger lokalnummer på kartan (Fig. 2).

Locality (No.)	No. of samples	A. andersoni	A. barkeri	A. rhenanus	A. richteri	D. spoofti	E. finlandicus	P. soleiger	P. triporus	P. talbii	S. tiliarum	T. pyri	Sum
Alnarp (1)	6		1		1		22	2	1	1		50	78
Åsmundtorp (7)	1						1		9			155	165
Borby (16)	1	1				15							16
Dagstorp (8)	1										3		3
Halla (21)	1			2		5	2						9
Kattvik (15)	2					1	19				3		23
Lund (3)	1						16		1			18	35
S. Sandby (4)	1						3						3
Villands Vånga (17)	1					27							27
Åkarp (2)	1					23	1				6	14	44
Ölands Skogsby (20)	1					25	31				11	29	96
<b>Sum:</b>	<b>17</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>1</b>	<b>96</b>	<b>95</b>	<b>2</b>	<b>11</b>	<b>1</b>	<b>23</b>	<b>266</b>	<b>499</b>
found in no. of samples		1	1	1	1	6	13	1	3	1	4	8	
No. of mites not accounted for in Tabs 2 or 3								2					2

highest density in our material, found on most plant species studied (Tab. 2), regularly in orchards (Tab. 4), in Scania and at the islands Öland and Gotland.

Genus *Paraseiulus* Muma, 1961.

Type species *Seiulus soleiger* Ribaga, 1902.

11) *soleiger* (Ribaga)

*Seiulus soleiger* Ribaga, 1902.

Only two individuals at Alnarp (1) on *Malus domestica* (Tab. 4) in 1980.

12) *triporus* (Chant & Shaul)

? *Neoseiulus soleiger* (Ribaga) sensu Sellnick (1958); Miedema (1987) *Typhlodromus triporus* Chant & Shaul, 1982.

Found on deciduous trees in South Scania (Tab. 3), *Fagus silvatica*, *Malus floribunda*, *Sorbus aucuparia* and *Tilia cordata* at Alnarp (1), and occasionally on *Malus domestica* (Tab. 4).

13) *talbii* (Athias-Henriot)

*Typhlodromus talbii* Athias-Henriot, 1960.

One female on *Malus domestica* (Tab. 4), and one male on *Sorbus intermedia*, at Alnarp (1) (Tab. 3).

Genus *Proprioseiopsis* Muma, 1961.

Type species: *Typhlodromus terrestris* Chant, 1959.

14) *okanagensis* (Chant)

*Typhlodromus (Amblyseius) okanagensis* Chant, 1957.

*Amblyseius alpinus* (Schweizer) sensu Sellnick (1958); Miedema (1987)

On *Fragaria X ananassa* at Alnarp (1). Only one female appeared in our material (Tab. 3), but Sellnick (1958) reports it as '...recht zahlreiche Art...' in Central Sweden.

Genus *Seiulus* Berlese, 1887.

Type species: *Seiulus hirsutigenus* Berlese, 1887.

15) *aceri* (Collyer)

*Typhlodromus aceri* Collyer, 1957.

On *Alnus incana* at Alnarp (1) (Tab. 3).

16) *tiliarum* (Oudemans)

*Typhlodromus tiliarum* Oudemans, 1930.

Occasionally on *Malus domestica* (Tab. 4). Only one female on *Ulmus glabra* at Alnarp (1) (Tab. 3).

Genus *Typhlodromus* Scheuten, 1857.

Type species *Typhlodromus pyri* Scheuten, 1857.

17) *ernesti* Ragusa & Swirski, 1978.

Although found in low density (6.2%), this was the fourth most abundant species. On deciduous and coniferous trees in Scania (1, 6, 9) and at Ryd (22) (Tab. 2).

18) *laurae* Arutunjan, 1974.

On coniferous trees, *Picea abies* at Konga (10) and in three of four samples of *Pinus silvestris*, in Scania (1, 5, 6). It was not found at the coniferous site at Ryd (22).

Taxonomic remark: Chant & Yoshida-Shaul (1987) noted a 'small macroseta' on tibia IV, in opposition to the original description (not seen by us) by Arutunjan. The macroseta is present in the Swedish material and on specimens from Norway.

19) *pyri* Scheuten, 1857.

The species with the highest density and the second highest abundance in our material (Tab. 2) occurring on 15 out of 33 plant species. Regularly, often in large numbers on *Malus domestica* (Tab. 4), but present in less than half of the samples from orchards, 8 of 17.

## Discussion

This is the first report that concentrates on Phytoseiidae mites in Sweden. The only previous mentioning of these mites from the country that we are aware of, is Sellnick's (1958) work. He reports on eight species of the family, of which we have found four. The dominating species in our study are very much the same as found by Edland (pers.comm.), who carried out an extensive sampling programme of phytoseiid mites in Norway. One interesting exception should be noted. We found only two specimens of *Paraseiulus soleiger*, a species that is abundant in Norway and in orchards in Finland (Kropczynska & Tuovinen 1988, Tuovinen & Rokx 1991). The species occurs accidentally in Denmark (Hansen & Johnsen 1986). *Anthoseius bakeri* was the second most abundant species in our material, but was found in only few samples and in low densities in South Finland (Tuovinen & Rokx 1991). The differences may be explained by differences in latitudes.

We found *Typhlodromus pyri* to be a common and widely distributed species in Sweden. However, we do not know whether this fact weighs in favour of introducing foreign strains of the species to the country or not (Tuovinen & Rokx 1991, Hoy 1992).

*Amblyseius barkeri* is commercially supplied as a predator, mainly on thrips larvae in greenhouse production of cucumber. It was found, however, spontaneously in green-houses in South Sweden already in the late seventies, before the commercial introduction of the species. The species is known to occur spontaneously on strawberries in areas where it has not been previously released (Wyskoi, 1985). In our opinion the species nowadays reproduces in Sweden, and should be considered, although introduced, as a local species.

It seems as if the number of phytoseiid species reported in an investigation is a function of the number of identified mites. Thus Hansen & Johnsen (1986) reported at least 17 species of hundred identified mites. We found 19 species of about 1150 identified and Edland (1986) reported 30-40 species out of ca. 2100 mites. Kropczynska and Tuovinen (1988) found nine species, but they did

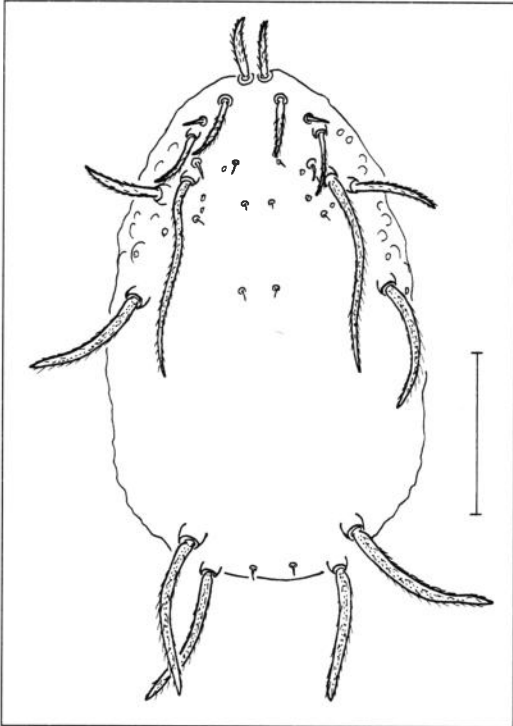


Fig. 3. Dorsal shield of *Dubininellus spoofi*. This is one of the most spectacular-looking mites of the Swedish mesostigmatic fauna. Scale bar indicates 100  $\mu\text{m}$ .

Ryggskölden av *D. spoofi*, en av de mest spektakulära mesostigmat-arterna i den svenska faunan. Skälstrecket visar 100  $\mu\text{m}$ .

not report the total number of identified mites, and their investigation emphasized orchards more than similar investigations from other Scandinavian countries have done. Thus, to know the complete local phytoseiid fauna, there seems to be a need of an extensive sampling programme.

Finally it can be noted that in the Scandinavian investigations, very few phytoseiid mites have been found in orchards where pesticides or fungicides have been used (Tuovinen & Rokx 1991), especially those containing sulphur (Edland 1986).

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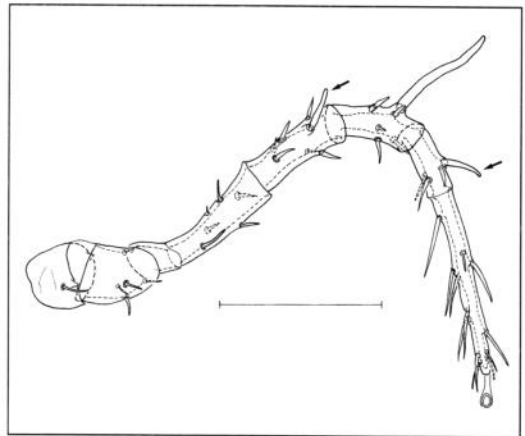


Fig. 4. Leg IV of *Dubininellus spoofi*. The macrosetae on genu and basitarsus are indicated by arrows. Scale bar indicates 100  $\mu\text{m}$ .

Fjärde benet av *D. spoofi*. De macrosetae på respektive genu och tars som omnämns i texten som viktiga artkarakteristika, är markerade med pilar. Skälstrecket visar 100  $\mu\text{m}$ .

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### Sammanfattning

Kvalster av familjen Phytoseiidae lever huvudsakligen i bladverket på vedartade växter över hela världen. Deras samspel med växterna har ibland nämnts som exempel på mutualism; växterna får ett slags livvakter (Dicke & Sabelis 1988), och kvalstren får mat i form av spinnkvalster, men också svamp, pollen och växtvävnad. Vissa växter tillhandahåller rent av gömslen, s k domatia, för rovkvalstren (O'Dowd & Willson 1991).

I vår undersökning, som är den första som koncentrerar sig på phytoseiid kvalster från Sverige, ingår 33 växtarter (Tabell 2) från Skåne, Blekinge, Småland, Halland, Öland, Gotland, och ett prov från Tjörn i Bohuslän (Tabell 1, Figur 2). Insamlingarna har skett oregelbundet på sensom-

rarna från 1980 till 1988. För att extrahera kvalstren användes en floteringsmetod där blad och kvistar från växten sänktes ner i ca 45° såpvatten. Efter en timme filtrerades vattnet genom en silduk som därefter granskades under ett preparermikroskop. Kvalstren preparerades enligt en standardmetod (Krantz 1978).

Totalt hittades 1 154 kvalster av familjen Phytoseiidae. Nitton arter (varav femton är nya för Sverige) identifierades, fördelade på 8 släkten (Tabellerna 2, 3, och 4). De fyra vanligaste arterna var *Typhlodromus pyri* (Fig. 1) (32,7% av det totala phytoseiid-materialet), *Euseius finlandicus* (28,4%), *Anthoseius bakeri* (10,4%) och *Dubininellus spoofi* (Fig. 3) (10,0%).

Våra resultat stämmer tämligen väl överens med vad man funnit i liknande undersökningar i övriga Skandinavien, med några undantag: vi hittade bara två individer av *Paraseiulus soleiger*, en art som är ganska vanlig i Norge (Edland, muntligt) och i Finland (Kropczynska & Tuovinen 1988). I Danmark är arten emellertid tämligen sparsamt förekommande (Hansen & Johnsen 1986). Å andra sidan är *Anthoseius bakeri* tämligen allmänt förekommande i södra Sverige, till skillnad mot i södra Finland, där den är sällsynt.

## Upphävande av fridlysning av dårgräsfjäril

Länsstyrelsen i Gotlands län beslutade 1993-01-11 att upphäva det av länsstyrelsen den 8 december 1950 meddelade förbudet att inom Gotlands län avsiktligt skada eller insamla exemplar av dårgräsfjäril, *Lopinga achine*.

### Motivering

Under två veckor i juli 1991 utfördes en inventering av dårgräsfjärilens förekomst på Gotland. Det visade sig därvid att arten är mycket talrika och förekommer inom en betydligt större del av Gotland än vad som tidigare har varit känt.

Av de 110 lokaler som besöktes under inventeringen, påträffades dårgräsfjärilar på hela 33 lokaler. På 23 av dessa flög arten rikligt.

Eftersom dessa nya resultat visar att dårgräsfjärilens vanlighet på Gotland tidigare troligen har underskattats, och att insamling knappast utgör ett hot mot artens fortlevnad på ön, föreligger det inte någon anledning att bibehålla det meddelade insamlingsförbudet.

Länsstyrelsen i Gotlands län, Naturvårdsenheten