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Flower visitors to Saxifraga hirculus in Switzerland and Denmark, a comparative study

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Abstract

Warncke, E., Terndrup, U., Michelsen, V. and Erhardt, A. 1993. Flower visitors to *Saxifraga hirculus* in Switzerland and Denmark, a comparative study. Bot. Helv. 103: 141–147.

A list is given of 76 species of insects visiting Saxifraga hirculus at its only occurrence in Switzerland, Col du Marchairuz. Based on the number of flower visits, 4 species were the dominant visitors: Sphaerophoria scripta (Diptera: Syrphidae); Sepsis cynipsea (Diptera: Sepsidae); Neomyia viridescens (Diptera: Muscidae); Bellardia vulgaris (Diptera: Calliphoridae). The visitors to the population of S. hirculus at Col du Marchairuz are compared with the visitors to the Danish population of S. hirculus at Rosborg. The two populations share only two visiting insects, Melanostoma mellinum and Sphaerophoria menthastri (Diptera: Syrphidae).

Key words: Saxifraga hirculus, flower visitors, Switzerland, Denmark.

Introduction

Flat and bowl-shaped actinomorphic flowers as are found in e.g. the genus *Saxifraga* are known to be visited by a wide array of insects. Flies and beetles are among the most frequent visitors to such unspecialized flowers (Baker and Hurd 1968).

The pollination of individual populations of plants with unspecialized flowers may on the other hand depend on a restricted number of insect species varying between seasons (Olesen and Warncke 1989) and sites. However, detailed information about such variations is unknown.

Taxonomic differentiation in *Saxifraga hirculus* L. was studied by Hedberg (1992). Distribution maps of this circumpolar arctic-boreal species indicate that its recent distribution outside the northern territories is highly fragmented (Hedberg 1992).

In this study, we give a description of the insect fauna visiting *Saxifraga hirculus* in an alpine wetland at Col du Marchairuz, the southernmost European population of this plant and its only population in Switzerland.

The objective of this study was (1) to show the qualitative and quantitative composition of the insect fauna visiting the flowers of *S. hirculus* at Col du Marchairuz, and (2) to compare the visitor fauna at Col du Marchairuz with the known visitor fauna of *S. hirculus* at Rosborg, Denmark (Olesen and Warncke 1989).

Material and methods

Study site and population

From 27 July to 5 August 1992 studies were conducted on the Saxifraga hirculus population in western Switzerland by the second author of this paper in a NE-SW expanding valley 1 km W of Col du Marchairuz (46°33′N, 60′14′E) at 1326 m above sea level: a wetland overlayering and surrounded by dolomitic calcareous rocks of the Upper Jura.

A detailed description of the history of the vegetation for the region is given by Wegmüller (1966). Average mean temperatures for January and July are approx. -2° C and 12° C. Annual precipitation amounts to 1631 mm (Wegmüller 1966). The valley is subject to grazing by cows throughout the summer.

Weather conditions were sunny during the observation period. Temperatures increased from 23 °C on the first day to more than 25 °C the following days, and wind was modest during all observation days except for the first day with no wind and the second day with strong winds. It only rained once, on August 1st.

During the summer, a ramet of S. hirculus consists of an inclined rhizome with up to 5 runners. A minority of the ramets produce a flowering shoot. A flowering shoot consists of a stem of 10-30 cm seldom having more than one terminal flower and one lateral flower, the latter being often poorly developed or aborted. The flowers are protandrous with distinct staminate and pistillate phases. Duration of these phases depends on insect visitation and pollination. For a further description of the floral phenology and biology see Olesen and Warncke (1989).

In the lowlands of Denmark, S. hirculus is confined to a restricted number of spring areas as described by Warncke (1980).

The total number of flowers in the population at Col du Marcharuz during the whole season was estimated to be at least 10000. Until July 27, when the field observations begun, none of the flowers had reached the female phase, and none of the lateral flowers had opened yet.

The study area contained several co-blooming entomophilous species such as e.g. Swertia perennis L., Gentianella campestris L., Gentiana lutea L., Parnassia palustris L., Lychnis flos-cuculi L., Epilobium palustre L., Euphrasia spp., Pinguicula spp., Ranunculus acris L., Lotus ulignosus Schkuhr and Dianthus superbus L.

Flower visitors

Specimens of insects visiting the flowers of S. hirculus were caught with a net at different times of the day on every second day during the observation period.

Results and discussion

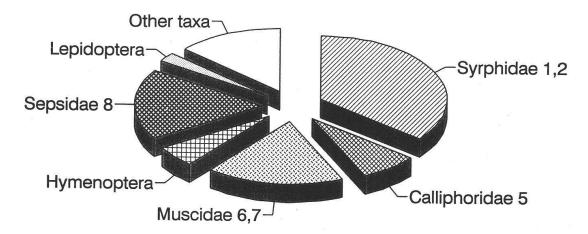
Four orders of insects visited the flowers of *S. hirculus* at Col du Marchairuz (Tab. 1). Diptera and Coleoptera were especially numerous. The most frequent visitors were Diptera: *Sphaerophoria scripta* 97 (Syrphidae in total 35.1%); *Sepsis cynipsea* 80 (Sepsidae in total 17.3%); *Neomyia viridescens* 32; *Spilogona dispar* 18 and *Neomyia cornicina* 11 (Muscidae in total 17.4%); *Bellardia vulgaris* 31 (Calliphoridae in total 7.2%).

Among 25 specimens of Hymenoptera (or in total 5.2%) the superfamily Apoidea was represented by 13 specimens, and Lepidoptera with 11 specimens only (or in total 2.3%).

The most frequently observed visitors to the large population of *S. hirculus* at Col du Marchairuz are plotted in Fig. 1. and compared with the visitors to the much smaller population at Rosborg. This population produced only 1525 flowers during the whole season from 9 July to 13 Aug. in 1984 (Olesen and Warncke 1989).

Numbers behind insect taxa in Fig. 1 refer to the most frequently observed species among these taxa. These species are briefly discussed in the following section.

COL DU MARCHAIRUZ



ROSBORG

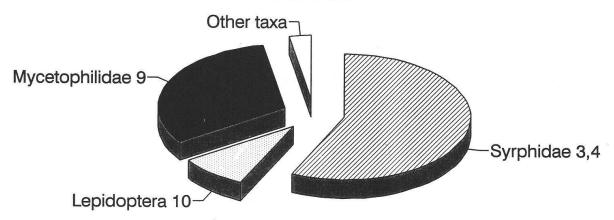


Fig. 1. Insects visiting Saxifraga hirculus at Col du Marchairuz, Switzerland, compared with visitors at Rosborg, Denmark. For further explanations see text.

Tab. 1. Flower visitors to Saxifraga hirculus at Col du Marchairuz, Switzerland 27 July - 5 August 1992.

Species:	Remarks	Z	Sex ratio of insects Individuals	Individuals	Species:	Remarks	z	Sex ratio of insects Individuals	Individuals
	below		caught (3/9)	observed		below		caught (♂/♀)	observed
Coleoptera					Tabanidae				
Galeruca pomonae	•	2	2/	> 500	Glaucops hirsutus	□	7	/2	<10
Cyphon kongsbergensis	•	~	_	> 1000					
Otior hynchus lugdunensis	sis♦△	-	-	>10	Tachinidae	,		:	(
Plateumaris consimilis	•	-	_	<10	Eriothrix rufomaculata	•	-	1	<10
Plateumaris rustica	•	5	-	<10	Estheria bohemani	•	ო .	(3	<10
					Tachina magnicornis	•	_	1/	< 20
Diptera					Tephritidae				
3					Terellia serratulae	*		1/	<10
Anthomyiidae									
Anthomyia liturata	•	_	1/	<10	o o o o o o o o o o o o o o o o o o o				
Botanophila varicolor	•	_	1/	<10	Syrpmidae Choileais memalia	4	7	2/5	< 20
Hydrophoria lancifer	*	-	1/	<10	Cilcilosia Veriralia		٠.) =	07.7
Pegoplata aestiva	40	9	4/2	>100	Eosenstalls interrupta	• •	- 0	- 67	< 20
					Episylphius Daireatus	• •	۱ -	1 5	000
Calliphoridae					Eristalis tenax	•	- 0	_ 5	720
Bellardia vulgaris	√ 0	31		>400	Melanostoma mellinum		o c	5 5	10
Pollenia amentaria	•	4	3/1	< 20	Metasymbile corollae	•	o (1)	ν <u>κ</u>	< 20 < 50
					Neoascia sp	•	,	-	<10
Chloropidae	į	,	87. 4	,	Parasyrphus annulatus	•	_	1/	<10
Chlorops sp.	•	- ,	-	×10	Platycheirus clypeatus	₩	1	3/8	< 50
Meromyza sp.	•	-	_	01>	Platycheirus cyaneus	*	က	2/1	< 20
9					Pyrophaena granditarsa	*	က	/3	< 20
Conopidae	4	,	•	,	Scaeva pyrastri	*	7	/2	< 20
Tecophora fulvipes	•		_	0 >	Sphaerophoria sp. 9	*	16	/16	<100
					Sphaerophoria menthastri 3\$	iri 🕉	12	12/	
Dolichopodidae	•	c	F/ F	\ 	Sphaerophoria scripta 3	\$	97	{ 8/68	> 1000
Dollchopus longitarsus	•	٧	1/1	2	Sphaerophoria taeniata 👌	\$ ♦ 50	4	/4	

Muscidae									
Coenosia pedella		-	/1	<10	Hymenoptera				
Drymeia brumalis	Q	ဇ	/3	< 20					
Drymeia hamata	\$	ø	2/6	> 100	Apoidea				
Graphomya minor	•	7	/2	<10	Andrena bicolor	•	-	11	< 20
Hebecnema umbratica	•	_	1/	<10	Andrena coitana	*	-	1/	< 20
Helina obscurata	•	_	1/	<10	Halictus rubicundus	*	ო	/3	< 50
Helina reversio	•	-	1/	<10	Hylaeus confusus	•	_	1/	< 20
Hydrotaea albipuncta	•	-	7	<10	Lasioglossum fratellum	•	9	2/4	< 20
Hydrotaea irritans	•	2	1/	<10					
Musca autumnalis	•	-	1/	<10					
Neomyia cornicina	₩	7	9/9		Chalcididae sp.	*	-	-	<10
			^	> 500					
Neomyia viridescens	\$ ◆	32	20/12		Eumenidae				
Phaonia serva	*	-	7	<10	Odynerus spinipes	*	_	1/	< 20
Pseudocoenosia solitaria	•	-	7	<10					
Spilogona dispar	\$ ◆	18	5/13	>400	Ichneumonidae				
					Diplazon sp.	•	4	4/	< 20
Rhagionidae					Lissonota sp.	•	ဇ	2/1	< 20
Rhagio tringarius	•	_	1/	<10					
					Tenthredinidae				
Sarcophagidae					Tenthredo schaefferi	•	2	2	<10
Discachaeta pumila	•	7	/2	< 20	Nematus myosotidis	•	-	_	<10
Sarcophaga sp. 🌣	•	-	7	<10					
Sarcotachinella sinuata	*	7	1/1	< 20					
2 2 2					Lepidoptera				
Scathophagidae	3								
Scathophaga stercoraria	•	7	/2	<10	Nymphalidae				
					Brenthis ino	*	4	/4	< 20
Sciomyzidae					Erebia pronoe vergy	D		1/	<10
Tetanocera fuscinervis	*	ო	1/2	<10					
Pherbellia cinerella	•	_	-	<10	Lycaenidae				
					Cyaniris semiargus	•	2	/2	<10
Sepsidae					Lysandra coridon	D	7	2/	< 20
Saltella sphondylii	*	4	4						
Sepsis cynipsea	₩	80	80 }	> 5000	Gelechiidae				
Sepsis orthocnemis	•	-	-		Aristoliinae sp.	•	2	1/1	< 20

Substitutes Meligethes aeneus at Rosborg in the Danish population.

♦ Not observed in Denmark visiting Saxifraga hirculus.

[#] Substitutes Clossiana selene at Rosborg in the Danish population. * Identification of females is uncertain. N = Collected specimens.

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Syrphidae

(1) Sphaerophoria scripta. The dominant syrphid at Col du Marchairuz. In central Europe it is one of the obligate migrants. In Switzerland it flies from elevations of 300 m to 2700 m. Although common and widely distributed in Denmark (Torp 1984), it was not observed at Rosborg during the flowering period of S. hirculus in 1984. Suitable habitats of this species include fields, meadows and moors. The larva is aphidophagous.

(2) Sphaerophoria menthastri and S. taeniata. Both species were rather common at Col du Marchairuz. S. menthastri is common and distributed all over Denmark (Torp 1984), but was only observed with few individuals at Rosborg. S. taeniata is rare in Denmark (Torp 1984) and was not observed at Rosborg. The larvae are aphidophagous.

(3) Eurimyia lineata. The dominant syrphid at Rosborg. Common and widely distributed in Denmark (Torp 1984). Not observed at Col du Marchairuz. Habitats include

moors and damp meadows often near ponds. The larva is saprophagous.

(4) Neoascia tenur. Common and widely distributed in Denmark (Torp 1984). Not observed at Col du Marchairuz. Habitats include borders of ponds, lakes, streams and drainage ditches, damp meadows and moors. The larva is saprophagous.

Calliphoridae

(5) Bellardia vulgaris. Rather common at Col du Marchairuz. Common and widespread in Europe. Not observed at Rosborg. The larva is an obligatory predator of earthworms.

Muscidae

- (6) Neomyia viridescens and Neomyia cornicina. These shiny, metallic green Muscidae with a widespread distribution were rather common at Col du Marchairuz. N. viridescens is palaearctic and N. cornicina is cosmopolitan. N. cornicina is a species of the lowlands of Europe whereas N. viridescens is more common in the mountains. In Denmark, N. viridescens is seldom seen. Larvae of both species are coprophagous.
- (7) Spilogona dispar. Rather common at Col du Marchairuz. Common and widespread in Middle- and Northern Europe. Belongs to a large genus of Muscidae, which strongly dominates in the subarctic-boreal part of the Holarctic. Not observed at Rosborg. Many species of this genus are important pollinators. The larva of S. dispar lives in wet soil, is carnivorous and feeds on other arthropods.

Sepsidae

(8) Sepsis cynipsea. Very common at Col du Marchairuz. Belongs to a common and widespread family in Middle- and Northern Europe represented with at least three species at Col du Marchairuz. The larva is coprophagous.

Mycetophilidae

(9) Asindulum nigrum. Common at Rosborg. Common and widespread elsewhere in Denmark. Only few individuals observed at Col du Marchairuz. The larva is saprophagous and is found in mushrooms. Not much is known about its biology.

Lepidoptera

(10) Zygaena trifolii. Common at Rosborg. Common and widespread in Denmark. Not seen at Col du Marchairuz. In Denmark this moth frequently visits also the flowers of Lychnis flos-cuculi. The caterpillar feeds on Lotus corniculatus, L. uliginosus and on other Leguminosae such as clover (Trifolium repens).

Visitors belonging to the order Hymenoptera were not observed at Rosborg.

In conclusion, this study shows 1) that the investigated Swiss population of S. hirculus shares only two species with the Danish population at Rosborg, namely the Diptera (Syrphidae): Melanostoma mellinum and Sphaerophoria menthastri; 2) the Swiss population as well as the Danish population of Saxifraga hirculus is visited by a large spectrum of insect species.

We are grateful to E. Torp and V. Mahler for identification of the Syrphidae and Coleoptera respectively, to Andreas Müller and to Peter Müller for the determination of Hymenoptera, and to Dr A. J. Richards for improvements on the manuscript. The work was carried out in collaboration with WWF-Denmark.

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