

**On a Migration of Hover-flies (Dipt., Syrphidae)
and Sawflies (Hym., Tenthredinidae)
observed in Denmark, August 1967.**

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A large number of insects are migratory, and observations from abroad show that also hover-flies (Syrphidae) and some sawfly species (Tenthredinidae) migrate. Williams (1958, p. 97) and Southwood (1962, p. 194) present a number of records indicating that hover-flies often migrate, while information on migrating sawflies is more rare.

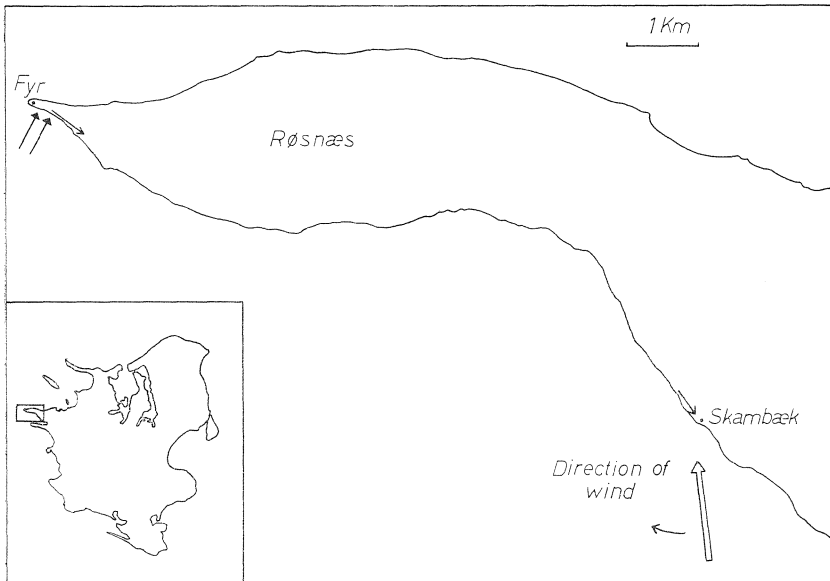


Fig. 1. Map of Røsnæs, Zealand.

While migrating hover-flies and sawflies have been recorded abroad, we had hitherto no information on the migration of these insects in Denmark. However, on August 2nd, 1967, a migration of hover-flies with sawflies among them was observed at Skambæk, about 6 km NW of Kalundborg, Zealand, Denmark, and on the same day a pure hover-fly migration was later seen at Røsnæs lighthouse (Fyr), at the Point of Røsnæs, about 11 km from Skambæk (Fig. 1).

On August 2nd, 1967, at 11.40 a.m., swarms of migrating insects, chiefly syrphids, were observed on the top of the coast-slopes at Skambæk. The insects passed 2—2.5 metres above the shrubbery growing on the top of the slopes. All individuals moved in the same direction flying parallel to the beach, following the top of the coast-slopes, which are about 12 metres high. During the period 11.40 to 14.20 the migration was studied at Skambæk. The composition of species in the migration was established by standardized sweeping during periods of 20 minutes. In this way three samples were collected, viz. 11.40 — 12.00, 12.10 — 12.30, and 14.00 — 14.20. Table 1 presents the results of the sampling, indicating that the hover-flies *Syrphus balteatus* D.G. and *S. corollae* F. together with the sawfly *Athalia cordata* Lep. formed the majority, i.e. about 90 % of the migrating insects. As for these three species, a certain fluctuation in percentage was observed, thus during the period 11.40 to 14.20 the number of *S. balteatus* declined and that of *S. corollae* increased, while the activity of *A. cordata* ceased about 13.00 p.m., and no specimens were sampled during the third period (14.00 — 14.20), (Table 1).

The number of other syrphids collected is very constant in the three samples, which possibly indicates that these species were not migrating, but represented the local fauna of the site.

During the period 11.40 — 14.20, fluctuations in the migration activity were observed (Table 2) indicating that the migrating insects passed in waves. The estimated numbers of migrating insects/minute are based on counts of individuals passing the observation post during periods of 5 minutes, thus the estimates for each period (Table 2) are average values based on these counting periods of 5 minutes. In all probability the values are minimum values, as it was rather difficult to count all the fast-moving individuals passing, especially when the activity was very high. Based on the values given in Table 2 about 20.000 migrating

Table 1. Three samples of migrating insects collected at Skambæk, by standardized sweeping in periods of 20 min. between 11.40 a.m. and 14.20 p.m.

Species	Sample No. 1 11.40 — 12.00				Sample No. 2 12.10 — 12.30				Sample No. 3 14.00 — 14.20				Total	%	
	♂♂	♀♀	Total	%	♂♂	♀♀	Total	%	♂♂	♀♀	Total	%			
Syrphidae:															
<i>Syrphus balteatus</i> D.G.	53	34	87	53.7	51	51	102	51.3	4	4	8	17.8	197	48.5	
<i>Syrphus corollae</i> F.	26	1	27	16.7	34	3	37	18.6	20	1	21	46.7	85	20.9	
<i>Syrphus vitripennis</i> Mg.	1		1										1		
<i>Syrphus cinctellus</i> Zett.									1		1		1		
<i>Lasiophthicus pyrastris</i> L.		1	1										1		
<i>Syrpitta pipiens</i> L.	1	1	2		1	1	2						4		
<i>Eristalis arbustorum</i> L.									1		1		1		
<i>Sphaerophoria menthastri</i> L.	1	2	3	6.8		2	2			4	4		9		
<i>Sphaerophoria scripta</i> L.					1		1	6.5	1		1	35.5	2	9.8	
<i>Platychirus clypeatus</i> Mg.		1	1			3	3		2	2	4		8		
<i>Platychirus albimanus</i> F.		2	2			4	4		1	3	4		10		
<i>Platychirus scutatus</i> Mg.		1	1										1		
<i>Melanostoma mellinum</i> L.						1	1						1		
<i>Baccha obscuripennis</i> Mg.										1	1		1		
Tenthredinidae:															
<i>Athalia cordata</i> Lep.	8	29	37	22.8	10	37	47	23.6					84	20.7	
			162				199				45		406		

Table 2. Activity of migrating insects at Skambæk.

Hour	Activity of migrators Nos./min.	Comments
11.40 — 12.00	175	Activity very low just before 12.00
12.00 — 12.40	300	Abrupt increase 12.00—12.05, strong activity 12.05—12.30, decrease 12.30—12.40.
12.40 — 13.00	100	Slight decrease 12.40—12.45, increase 12.45—12.50, decrease 12.50—13.00.
13.00 — 13.30	10	Activity very low; 13.15—13.30 no migration.
13.30 — 14.00	0	No migration.
14.00 — 14.20	150	Sudden increase about 14.00; 14.15—14.20 no migration.
14.20 — ?	0	No migration.
17.30		Slight activity.

insects passed the locality during the period 11.40 — 14.20, or by using the percentages given in Table 1, about 16.000 hover-flies and 4000 sawflies.

The speed of the migrating insects could not be timed accurately. Based on a series of rather rough observations by means of a measured distance and a wrist-watch, the average speed was estimated at 18 km per hour, direction of wind as in Fig. 1. The steadiness of the flight was noteworthy. During the migration the weather was hot and sunny with a slight haze over the sea and a few small clouds. At 12.35 air temperature and RH was 27.2°C and 67 % respectively, and at 13.40, 25.8°C, and 74 %. The wind was SSE to S (on-shore wind), force 1—3m/sec. (at 12.00), and 0—2 m/sec. (at 13.40). All measurements were carried out 2 metres above the ground.

In order to get information on the route and the origin of the migration, I went at 15.00 to Røsnæs lighthouse at the Point of Røsnæs (Fig. 1). In this locality huge numbers of hover-flies were observed in a small grove, on the herbs of the coast-slopes, and on the beach. A number of individuals were collected by sweeping

Table 3. Samples of hover-flies collected at Røsnæs light-house. Sample No. 1 from the vegetation, sample No. 2 from the migration coming from over the sea.

Species	Sample No. 1				Sample No. 2
	♂♂	♀♀	Total	%	Total
Syrphidae:					
<i>Syrphus balteatus</i> D.G.	2	1	3	1.3	9
<i>Syrphus corollae</i> F.	53	61	114	48.5	about 1480
<i>Syrphus ribesii</i> L.		1	1		2
<i>Syrphus vitripennis</i> Mg.					1
<i>Lasiophthicus pyrastrii</i> L.	2	3	5		8
<i>Syritta pipiens</i> L.	1		1		
<i>Sphaerophoria menthastrii</i> L.		5	5		
<i>Platychirus</i> spp.			93		
<i>Melanostoma mellinum</i> L.		13	13		
			235		

in the vegetation on the slopes, Table 3. In this material *S. corollae* was clearly dominant, while *S. balteatus* was rare.

At 16.00 a huge hover-fly migration coming from over the sea was observed about 200 metres E of Røsnæs lighthouse. The hover-flies were flying 1—1.5 metres above the water, and the beach was invaded for a distance of 2—300 metres. At 16.15 the air temperature was 22.5°C, and force of the on-shore wind 1 m/sec. The migration from over the sea continued until about 17.00, and reached a peak at 16.30. When the migrating hover-flies reached the beach, they settled at once, and the sand, stones, and wrack teemed with these insects. During the period 16.20—16.40 I collected a great number of the migrating hover-flies by means of a sweep-net, and during this sampling my clothes and net were covered with hover-flies. About 1500 specimens and 5 species of syrphids were collected.

Based on a rough estimate about 30.000 hover-flies invaded Røsnæs during the period from 16.00 to 17.00. At 16.50 an eastward migration started when a great number of hover-flies (the majority being *S. corollae*) left the area of the lighthouse, flying along the coast-slopes, (Fig. 1). No doubt this eastward migration

indicates a connection between the observations at Skambæk and at Røsnæs light-house, thus the syrphids, which arrived at the latter locality, migrated further on, and following the coast-slopes they passed Skambæk. Of course it is unknown whether invasions also occurred between the lighthouse and Skambæk so the size and composition of the eastward migrations might have changed on the way.

Comparing the insect material from Skambæk (Table 1) with that collected at Røsnæs lighthouse, in the vegetation as well as on the beach (Table 3), we notice that no sawflies were caught at the lighthouse, and that while *S. corollae* dominates in the material from the latter locality, *S. balteatus* is first on the whole in the material from Skambæk, although *S. corollae* increased in number and is dominating in the third sample.

As for the sawflies, no migration from over the sea was observed at the lighthouse, thus it is unknown whether the sawflies migrating at Skambæk invaded the beach on the very same day, somewhere between the lighthouse and Skambæk, or whether they arrived previously, e.g. on the day before at the lighthouse or at another landing-place. Of course, it is possible that the sawfly migration was more local, i.e. that these insects derived from the Røsnæs area and joined the migrating hover-flies there.

The differences in ratio between *S. balteatus* and *S. corollae* in the two localities could be explained in a similar way to that above by presuming that migrating *S. balteatus*, or at least swarms of hover-flies dominated by this species, have invaded the beach between the lighthouse or Skambæk. Another possibility is that these swarms containing *S. balteatus* had arrived previously at the area of the lighthouse, e.g. even on the day before. Gradually these flies left the area and migrated eastward along the coast-slopes. Meanwhile new swarms dominated by *S. corollae* arrived, occupying the lighthouse area for some time, thus the eastward migration of the next few days should be characterized by the preponderance of this species.

The period of July 31st, August 1st, and August 3rd I partly spent in the area around Skambæk, and during the whole time the hover-fly activity was exceptionally great, thus the migration is most likely to have covered several days.

The origin of the migrating hover-flies coming from over the sea is unknown. Provided that the course observed at the light-

house had been held unchanged over the sea, the outbreak of the migration might have been somewhere on the North coast of Funen. In fact, an exceptionally great hover-fly activity was observed during the period August 1st—4th on the North coast of Funen, i. e. on the beach at Baardesø, Jørgensø, Kristiansminde, and Hasmark, where the "babybees" were very annoying to the holliday-makers, who had to stay indoors (verbal information). Presumably this was also a migration, but of course the connection between the Røsnæs migration and that on the coast of Funen is uncertain.

In another case the information available possibly indicates a migration. On August 16th Mr. G. Løwe, Silkeborg, observed a great number of hover-flies (*Syrphus vitripennis* Mg.) near Overgaard at Mariager Fjord, Jutland. He found syrphids crawling halfdead and indolent everywhere, and many more lay dead on the beach (information from Mr. Løwe, *in lit.*)

In connection with the hover-fly migration mentioned above, it should be pointed out that the summer of 1967 was extremely favourable to the aphidophagous syrphids, thus the abundance of many species has been remarkable in many localities, and, as pointed out by Nielsen (1964, p. 165), the sudden appearance of an insect is no valid evidence of migration.

As for the hover-flies observed in the present migration, the dominant species *S. balteatus* and *S. corollae* are well-known migrators, thus *S. balteatus* has been observed migrating through passes in the Pyrenees (Lack and Lack, 1951, Williams *et al.*, 1956) through the Brünig Pass, Switzerland (Prell, 1925), and further in Nepal (Williams, 1958, p. 98). Migrating *S. corollae* were also observed in the Pyrenees (Williams *et al.*, 1956), and further Johnson (1960) treats a migration of this species on the Norfolk coast. By means of insect material trapped on two light-vessels in the Baltic and on one in the North Sea, Heydemann (1967) demonstrates that many hover-fly species actively fly at least 15—35 km over the sea. The dominant species in his material were also *S. balteatus* and *S. corollae* (*op. cit.*, p. 188—189, Tab. 1), and furthermore all syrphid species collected from the migration at Skambæk (Table 1) are also represented in Heydemann's material from the light-vessels (*op. cit.*, p. 188—189, Tab. 1) with the exception of *S. cinctellus*, *P. scutatus* and *B. obscuripennis*.

Heydemann (*op. cit.*, p. 208) points out that in his syrphid material from the light-vessels the sex ratio of *S. balteatus* is almost equal, while there is a preponderance of females among *S. corollae*. In the samples from Skambæk (Table 1) there is a slight preponderance of males in *S. balteatus* (55 % ♂♂ : 45 % ♀♀), while the sex ratio in *S. corollae* is very skew (94 % ♂♂ : 6 % ♀♀). In the vegetation at Røsnæs lighthouse the sex ratio of *S. corollae* was almost equal (47 % ♂♂ : 53 % ♀♀) and in the swarms coming from over the sea there was a preponderance of males (63 % ♂♂ : 37 % ♀♀). These differences in the sex ratio of *S. corollae* are possibly valid, and could be explained in various ways, e. g. by assuming that most of the females arriving at the lighthouse from over the sea settled, say, for foraging in the area around the lighthouse, while the males and a few females left the area and migrated eastward along the coast-slopes; however, the comparison is based on very few samples, thus the differences observed might quite as well be accidental.

As for the feeding habits of the larvae of the species observed in the migration, Lundbeck (1916) and Coe (1953) state that within the genera *Syrphus*, *Lasiophthicus*, *Sphaerophoria*, *Platychirus*, and *Baccha* the larvae are aphidophagous, the larvae of *Melanostoma* sp. are seemingly at least partly aphidophagous, whereas the larvae of *Eristalis arbustorum* are found in decaying organic matter or stagnant water, and that of *Syritta pipiens* is an inhabitant of dung and decaying vegetable refuse.

Examples of migration among sawflies are given by Benson (1950, p. 82), Williams (1958, p. 97) and Southwood (1962, p. 197), but information on the migration of sawflies is rather scarce, however, mass flights of the turnip-sawfly *Athalia rosae* L. and of *Athalia cordata* Lep. have been observed in England (Marshall, 1783, Tutt, 1902, Benson, 1935 and 1946). The larva of *A. cordata* feeds on *Ajuga reptans*, *Antirrhinum* sp., and *Plantago* sp. (Benson, 1952, p. 83). According to Nielsen and Henriksen (1915, p. 144), *A. cordata* (= *A. lineolata* Lep. in part) is common in Denmark during May and June, and again in August (2 generations). Benson (1952, p. 80) points out that *Athalia* species (larvae as well as adults) tend to be gregarious, and that they are potentially many-brooded in a favourable season, thus rapid local increase of numbers is possible.

During the afternoon huge migrations of ladybirds (Coccinelli-

dae) were observed at Røsnæs lighthouse; apparently they migrated alone, at least the swarms were not mixed with hover-flies.

Summary

This paper reports on a migration of hover-flies (Syrphidae) and sawflies (Tenthredinidae) observed on the point of Røsnæs, Zealand, Denmark. Notes on the composition of species in the migration, quantitative aspects, and weather conditions are given. *Syrphus balteatus* D.G., *Syrphus corollae* F. (Dipt., Syrphidae), and *Athalia cordata* Lep. (Hym. Tenthredinidae) were the dominant species in the migration.

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*) quoted after Benson (1950, p. 82).

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*) quoted after Benson (1950, p. 82)