Entomological diversity in agro-ecosystems: not necessarily an ecological desert

Fr. FRANCIS, E. HAUBRUGE, P. COLIGNON, P. HASTIR & Ch. GASPAR

Introduction

Areas devoted to crop cultivation are generally suspected to present very low biodiversity due to the human action when compared to natural and semi-natural habitats such as woodlands. Here, two kinds of environment were investigated (several vegetable open fields and a nature reserve) to assess the Syrphidae diversity and abundance.

Material and methods

Observations on syrphid populations were realised using water yellow traps as described in FRANCIS *et al.* (2002). 72 and 9 yellow traps were used in 12 carrot (*Daucus carota* L.) fields (7, 3 and 2 plots next to fields, set-aside and nearby woodland habitats respectively) and in a natural reserve respectively. Sets of 3 traps placed in a 1 m side equilateral triangle were collected weekly. Vegetable open fields in Hesbaye (Wallonia, Belgium) were visited in 2000 while a natural reserve located at Viesville (next to Charleroi, Belgium) was investigated in 2001.

Results

Numbers and identifications of the collected hoverflies in different environments and closed habitats were reported in table 1. Similar numbers of species were observed whatever the studied environment.

In order to follow the evolution of syrphid diversity during the trapping period, an equitability index, according to Shannon, was calculated for each week and each considered habitat (fig. 1).

Conclusions

A similar Syrphidae diversity was observed whatever the visited habitat was (devoted to agriculture or not). All habitats were characterised by a high diversity in the beginning of June and from August onwards (E > 0.6-0.7, DAGUET 1976). Moreover, a higher diversity was observed in fields close to set-aside and woodlands than in fields only surrounded by other fields, suggesting the positive impact of semi-natural patches close to cultivated plots.

While nearly 70 % of the trapped individuals belonged to aphidophagous species and 52.1 % of hoverflies were *Episyrphus balteatus* in fields for all closed habitats, only 7.5 % of predatory syrphids and 1.1 % of *E. balteatus* were found in the natural reserve. 70 % of the individuals caught in the latter belonged to the *Eristalis* genus. Cultivated areas did not present and meet the needs of saprophagous hoverfly species living in water at larval stages. Predatory taxa were much more abundant in crops and can be related to the occurrence of high densities of aphid populations in vegetable fields.

Finally, biodiversity (in term of species number) was quite constant in Syrphidae populations whatever the agricultural practice intensity. Thus, even if yellow trap is more restrictive than Malaise trap for Syrphidae capture, agricultural lands are not necessarily entomological deserts.

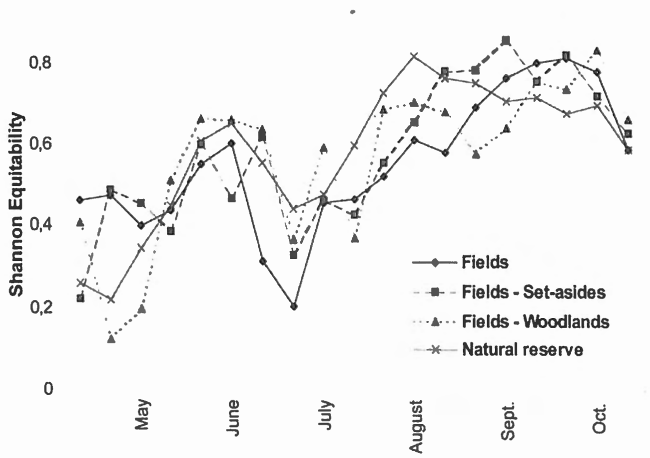

Fig. 1 — Evolution of the equitability index according to the Shannon diversity (DAGUET 1976) in a natural reserve and in carrot fields close to different habitats.

Table 1 — Hoverfly diversity and total individual numbers collected from May to October in a natural reserve (in 2001) and in carrot fields close to different habitats (in 2000).

Kind of habitat	Fields closed to			Natural
Hoverfly species	Woodlands	Fields	Set-asides	reserve
Chrysotoxum bicinctum L.	-	-	-	13
Dasysyrphus albostriatus Fallen	-	-	-	2
Epistrophe melanostoma Zetterstedt	-	-	-	1
Epistrophe nitidicollis Meigen	2	1	-	-
Episyrphus balteatus DeGeer	1359	4702	1502	18
Eristalis arbustorum L.	256	1219	223	251
Eristalis horticola DeGeer	-	-	1	2
Eristalis nemorum L.	5	25	6	39
Eristalis pertinax Scopoli	2	6	1	657
Eristalis sepulcralis L..	243	719	147	5
Eristalis tenax L.	167	454	237	163
Eumerus strigatus Fallen	2	61	13	6
Helophilus pendulus L.	55	237	67	129
Helophilus trivittatus F.	11	42	14	18
Melanostoma mellinum L.	1	2	2	-
Melonostoma scalare F.	71	234	88	8
Merodon equestris F.	1	-	-	-
Metasyrphus corollae F.	38	596	321	1
Metasyrphus nitens Zetterstedt	1	-	-	1
Myathropa florea L.	-	1	-	44
Neoascia podagrica F.	1	18	6	-
Pipizella varipes Meigen	-	-	-	1
Platycheirus albimanus F.	-	-	1	-
Platycheirus clypeatus Meigen	-	3	4	-
Platycheirus scutatus Meigen	-	3	2	-
Platycheirus peltatus Meigen	-	1	-	-
Platycheirus tarsalis Schummel	-	-	1	-
Rhingia campestris Meigen	1	7	3	15
Scaeva pyrasti L.	-	-	-	1
Sphaerophoria scripta L.	136	692	244	12
Syritta pipiens L.	6	37	8	3
Syrphus ribesii L.	9	34	12	50
Syrphus torvus	-	-	-	1
Syrphus vitripennis Meigen	5	15	5	17
Xanthogramma pedissequum Harris	-	-	-	5
Xylota segnis L.	56	60	24	131
Xylota sylvarum L.	24	-	2	1
Total	2452	9169	2933	1595
Number of species	23	24	25	28

References

DAGUET, J., 1976. Les modèles mathématiques en écologie. Masson, Paris.

FRANCIS, F., COLIGNON, P., HASTIR, P. & GASPAR C., 2002. Hoverfly diversity and abundance in vegetable agro-ecosystems: effect of the closed environment on beneficial species. *Agriculture, Ecosystems & Environment* (in press).

Frédéric FRANCIS
Eric HAUBRUGE
Pierre COLIGNON
Pierre HASTIR
Charles GASPAR
Pure and Applied Zoology Department
Gembloux Agricultural University
Passage des Déportés 2
B-5030 Gembloux