

A survey of the hoverflies of northeastern Algeria (Diptera: Syrphidae)

Djellab S.^{1,2}, A. van Eck³ & B. Samraoui^{2,4} *

¹ Department of Biology, University of Tebessa, Tebessa, Algeria. djellabsihem@yahoo.fr

² Laboratoire de Recherche et de Conservation des Zones Humides, University of Guelma, Guelma, Algeria. bsamraoui@yahoo.fr

³ Korte Hoefstraat 30, NL 5046DB Tilburg, the Netherlands. eckvana@xs4all.nl

⁴ Center of Excellence for Research in Biodiversity, King Saud University, Riyadh, Saudi Arabia.

Abstract

A survey of the hoverfly fauna of northeastern Algeria was carried out in 1991 and 1992, and seventy-three species recorded. Four species are new for Algeria: *Dasysyrphus albostrigatus*, *Chamaesyrphus lusitanicus*, *Brachypalpus laphriformis* and *Spilomyia maroccana*. The genera *Dasysyrphus*, *Chamaesyrphus* and *Brachypalpus* are new for Algeria. Data on the distribution and the seasonal pattern of each species are provided. Species richness was found highest amongst wetlands (up to 38) and forested hills (up to 29). In contrast, degraded sites held the lowest numbers of hoverflies. Species such as *Episyrphus balteatus*, *Sphaerophoria scripta*, *Syrpitta pipiens* and *Eristalis tenax* were widespread and abundant, whereas others were rare (*Platycheirus albimanus*) or confined to forested hills, such as the North African endemic *Volucella liquida*. A good knowledge of the Syrphidae will pave the way to a close monitoring of global changes affecting the region and the conservation of an important but much neglected group in one of the foremost biodiversity hotspots of the Maghreb.

Keywords: Syrphids, distribution, biodiversity, conservation, Algeria.

Introduction

Insects are an important component of biodiversity (Resh & Cardé 2009) but, despite their number and the ecosystem services they deliver, they have so far in terms of conservation efforts been relatively neglected (New 2007, Berenbaum 2009, Scudder 2009). Detailed data on species status and distribution are essential for the assessment of the biodiversity of a region and insects are predominant in most ecosystems. Among the insects, Diptera are most diverse in species richness, habitat exploitation, life histories and interactions with humankind (Courtney *et al.* 2009). One family of Diptera, the hoverflies (Syrphidae), is chiefly known for the habits of adults to visit and hover above flowers and to exhibit numerous mimics of wasps, bees and bumblebees. Hoverflies exploit a wide spectrum of habitats and ecological niches, and are useful indicators of the ecological integrity of ecosystems (Gilbert 1993). Several species are of economic importance, e.g. as pests in bulbs (e.g. onions), biological control of aphids or as pollinators (Rizza *et al.* 1988, Rotheray 1993).

The Syrphidae of Algeria are poorly known and available data (specimens and literature) are widely disseminated and not easily accessible. Though in the past collecting efforts were numerous, no systematic survey of hoverflies has ever been conducted. Kassebeer (1999b) analysed the 'historic collection of hoverflies caught and published in 1849 with comments by Lucas'. This resulted in a list of 30 species collected in Algeria. Seguy (1961) compiled 28 species specified from Algeria while Peck (1988) listed 55 species. Both authors referred to more species (five in the case of Peck (1988) from « North Africa »). Dirickx (1994) put 69 species known from Algeria on distribution maps, and mentioned a couple more in the species accounts.

In contrast, the hoverfly faunas of neighbouring Morocco and Tunisia are much better known thanks to the recent efforts of several workers (Claussen 1989, Claussen & Hauser 1990, Kassebeer 1995a, b, 1998a, b, c, 1999a, c, d, 2000, 2001, Hauser & Kassebeer 1998, Reemer *et al.* 2004).

* Author for correspondence: email : bsamraoui@yahoo.fr

Materials & Methods

The study was carried out in 1991 and 1992 in Numidia, northeastern Algeria (also published in a short preliminary note: Djellab & Samraoui 1994). This region houses the El Kala wetland complex (78000 ha) and the Guerbes-Senhadja wetland complex (42000 ha), both identified as hotspots of biodiversity, and granted formal protection when various areas and wetlands were designated as Ramsar sites, National Parks or “Reserves intégrales”. Numidia is well known for hosting a great diversity of habitats of great ecological importance: forests of cork oak (*Quercus suber*) and of zeen oak (*Quercus canariensis*), pine plantations, maquis, marshes, shallow lakes and sand dunes. An overview of the wetlands of Numidia was provided by Samraoui & de Bélair (1997, 1998) and its importance for the flora and waterbirds of the Mediterranean Basin cannot be overstated (Véla & Benhouhou 2007, Samraoui & Samraoui 2008). Locality 18 (Tebessa), though found in a semi-arid region outside Numidia, was included in the present survey.

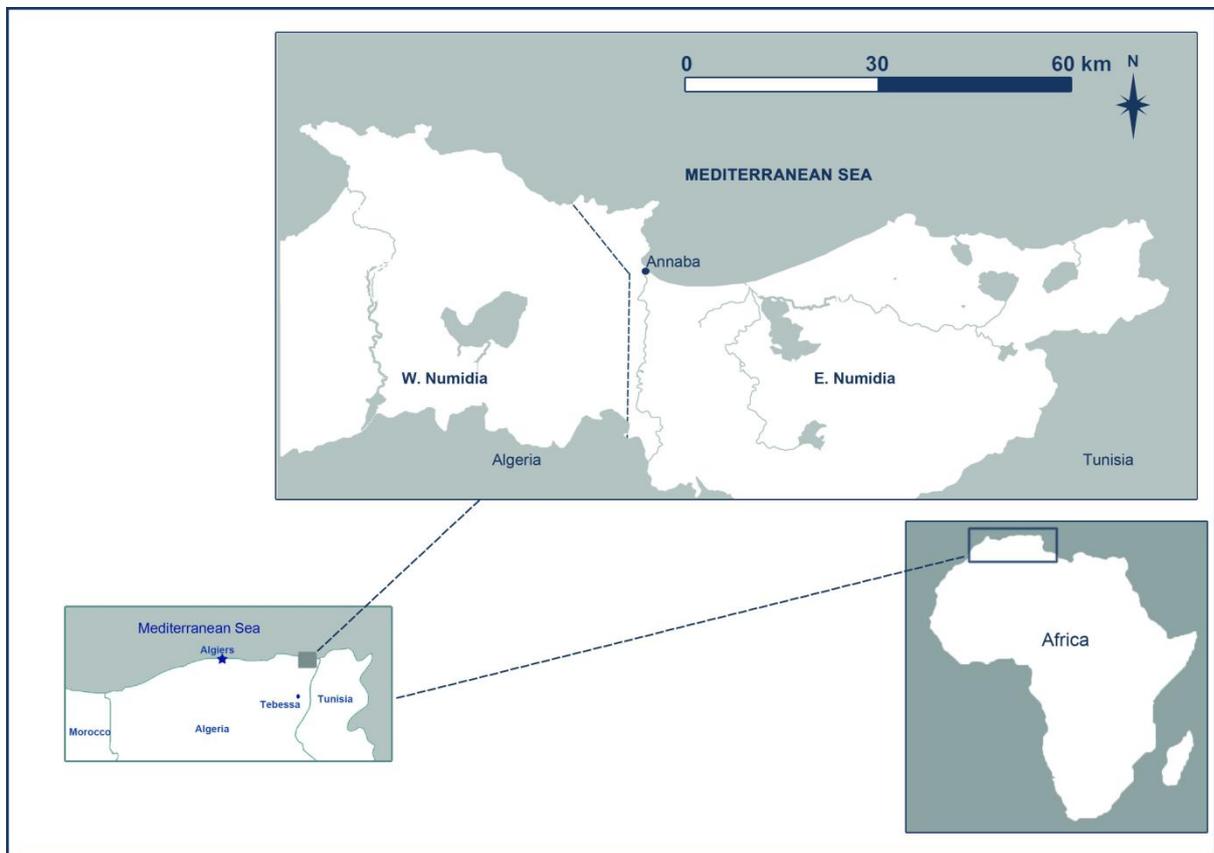


Figure 1: Map of northeastern Algeria showing the study area.

Sampling was carried out with the help of a butterfly net (four visits/site from January 1991 to July 1992). In addition Malaise traps were set up at eight sites (Ghora, Lac Bleu, Lac Tonga, Oubeïra/Cork Oak forest, Brabtia, Lac des Oiseaux, Séraïdi and Biological Station) from May 1992 to September 1992.

All the specimens were photographed and a reference collection built during the study period, stored at the University of Annaba, Algeria. Pending the availability of trained curators at local institutions, previous and current material will be hosted abroad at the Seckenberg Museum (Frankfurt, Germany) and the Natural History Museum (Leiden (Naturalis) Netherlands).

Identification keys used were provided by Seguy (1961), Verlinden (1991) and recent literature (Van Steenis 2000, Stubbs & Falk 2002, Van Veen 2010). This study complied with the Code for insect collecting (Samways *et al.* 2010).

The list of localities surveyed is as follows:

1. Lac Tonga (36° 52' N, 8° 31' E): a freshwater marsh of 2400 ha surrounded by a cork oak forest and alder carrs.
2. Lac Bleu (36° 52.104' N, 8° 19.621' E): a dune depression of 3 ha with *Nymphaea alba*.
3. Lac Oubeïra (36° 50' N, 8° 23' E): a shallow freshwater lake of 2200 ha surrounded by fields and *Pinus* plantations and a cork oak forest.
4. Lac des Oiseaux (36° 46.800' N, 8° 07.200' E): a freshwater pond of 75 ha.
5. Mellah marsh (36° 52.085' N, 8° 20.189' E): a brackish marsh south of Lake Mellah, a lagoon of 800 ha.
6. Mekhada marsh (36° 48' N, 8° 00' E): a vast brackish marsh of 10 000 ha dominated by *Scirpus maritimus*.
7. Bou Redim marsh (36° 45' N, 8° 15' E): a freshwater marsh dominated by *Salix cinerea*, *Nymphaea alba* and *Carex elata*.
8. Lac Oubeïra (Cork Oak forest; 36° 51.711' N, 8° 24.576' E): a fragmented and overgrazed Cork oak *Quercus suber* forest surrounding Lake Oubeïra.
9. Djebel Ghora (36° 36.239' N, 8° 22.033' E): a cork oak *Quercus suber* forest (alt. 750 m) on Mount Ghora in the Kroumirie area bordering neighbouring Tunisia.
10. Djebel Ghora (Zeen oak forest; 36° 36.141' N, 8° 23.023' E): a Zeen oak *Quercus faginea* forest (alt. 1100 m) in Mount Ghora.
11. Djebel Ghora (36° 36.229' N, 8° 22.245' E; ecotone, alt. 850 m): an open area located between the oak and zeen forests on Mount Ghora.
12. Seraïdi (36° 55' N, 7° 40' E, alt. 600-800 m): a cork oak forest on Mount Edough.
13. Mellah (*Pinus maritimus* plantation; 36° 52.465' N, 8° 21.219' E): a pine plantation sandwiched between Lake Mellah and Lake Oubeïra.
14. Reserve de Brabtia (36° 51.090' N, 8° 19.780' E): a protected area with a diversity of habitats (maquis, cork oak forest, wadi and freshwater pond).
15. Station Biologique (36° 51.090' N, 8° 20.189' E): compound of the Biological Station sandwiched between Brabtia Reserve and Lake Mellah.
16. El Frine (36° 50.395' N, 8° 25.636' E): a series of pools on the southern bank of Lake Oubeïra.
17. Lac Tonga (alder carr; 36° 52.725' N, 8° 30.724' E): a wet forest of *Alnus glutinosa* on the northern fringe of Lake Tonga.
18. Tebessa (35° 24.639' N, 8° 7.359' E): various habitats in a semi-arid climate.
19. Campus of the University of Annaba (36° 48.609' N, 7° 42.981' E): lawns and *Eucalyptus* plantation in the campus of the University of Annaba.
20. Oum Etboul (36° 52.875' N, 8° 32.064' E): a wetland west of Lake Tonga.
21. Nechaa Oum El Agareb (36° 49.356' N, 8° 11.983' E): an alder carr near wadi Bouglez.
22. Nechaa Righia (36° 49.996' N, 8° 2.547' E): an alder carr north of the Mekhada marsh.
23. Djebel Koursi (36° 52.561' N, 8° 16.438' E): a cork oak forest, west of Lake Mellah.
24. Mellah (Cork Oak forest; 36° 52.52', 8° 20.713'): a cork oak forest south-east of Lake Mellah.
25. Lac Oubeïra (*Eucalyptus* plantation; 36° 52.048' N, 8° 22.604' E): a *Eucalyptus* stand on the northern shore of Lake Oubeïra.
26. Guerbes (36° 51.774', 7° 15.957' E): a wetland complex in western Numidia.

Results

The following species were recorded during the survey:

Bacchini

1. *Melanostoma mellinum* (Linnaeus, 1758)
Localities: 1, 2, 4, 5, 7, 8, 10, 11, 12, 14, 15, 17, 18, 24. Flight period: January-December with a peak in June. Relatively widespread and abundant.
2. *Melanostoma scalare* (Fabricius, 1794)
Localities: 5, 10, 11, 12. Flight period: May-August, November with a peak in June. Locally abundant.
3. *Platycheirus albimanus* (Fabricius, 1781)
Localities: 2. Flight period: February-May; November. Rare.
4. *Xanthandrus comtus* (Harris, 1780)
Localities: 1, 2, 5, 12. Flight period: March-April, July. Uncommon.

Paragini

5. *Paragus bicolor* (Fabricius, 1794)
Localities: 5, 11, 12, 14, 15, 18. Flight period: June-August with a peak in the latter month. Local and rare.
6. *Paragus pecchiolii* Rondani, 1857
Localities: 2, 8, 11, 12, 18. Flight period: June-August with a peak in the latter month. Local and rare. This species has been published in recent literature under the name *P. majoranae* Rondani, 1857 (Van Eck 2011). Sommaggio (2002) showed that the name *majoranae* Rondani has been incorrectly applied, and that the correct name for *majoranae* is *pecchiolii* Rondani.
7. *Paragus strigatus* Meigen, 1822
Localities: 2, 4, 5, 11, 12, 14, 15, 16, 18, 24. Flight period: April-November with a peak in August. Widespread and abundant.
8. *Paragus tibialis* (Fallén, 1817)
Localities: 2, 5, 8, 10, 11, 12, 13, 14, 15, 18. Flight period: April-December with a peak in August. Relatively widespread and abundant.

Syrphini

9. *Chrysotoxum intermedium* Meigen, 1822
Localities: 1, 2, 3, 11, 12, 14, 18. Flight period: January, March-September with a peak in June. Not widespread but fairly abundant.
10. *Dasysyrphus albostriatus* (Fallén, 1817)
Localities: 14. Flight period: March. Local and rare. First records for Algeria.
11. *Dasysyrphus* sp.
Localities: 1, 14. Flight period: June and October. Rare.
12. *Epistrophe cf. flava* Doczkal & Schmid, 1994
Localities: 1, 11, 12. Flight period: May-July. Local and not abundant. Collected specimens were originally identified as *E. ochrostoma* (Zetterstedt 1849). *Epistrophe ochrostoma* auct. nec Zetterstedt, 1849, is a junior synonym of *E. flava*. In addition, note that Kassebeer (1998a) made a remark about records of *E. ochrostoma* from Morocco, which in his opinion probably concern the variety *trifasciata* of *E. eligans*.
13. *Epistrophe* sp. 1
Localities: 1, 2, 11, 12, 14, 24. Flight period: February-June with a peak of abundance in May. Found on the margin of cork oak forests. Not abundant but more frequent than the following species.

14. *Epistrophe* sp. 2
Localities: 5, 9. Flight period: March and May. A relatively rare species.
15. *Episyrphus auricollis* (Meigen, 1822)
Localities: 1, 5, 8, 11, 12, 13, 14, 15, 18, 20, 24. Flight period: January-June, September-December with a peak in May. Widespread and fairly abundant.
16. *Episyrphus balteatus* (De Geer, 1776)
Localities: 1, 2, 3, 5, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 20, 23, 24, 25. Flight period: January-December with a peak in May. Widespread and abundant; the commonest species.
17. *Eupeodes bucculatus* (Rondani, 1857)
Localities: 2, 5, 8, 9, 14, 24. Flight period: April-June. Relatively rare, inhabiting cork oak forests.
18. *Eupeodes corollae* (Fabricius, 1794)
Localities: 1, 2, 3, 4, 5, 8, 10, 11, 12, 13, 14, 16, 18, 23, 24. Flight period: January, March-December with a peak of abundance in June. Found in dune slacks covered with holm oak formations.
19. *Eupeodes latifasciatus* (Macquart, 1829)
Localities: 1, 2, 4, 11, 12, 13, 15, 19, 23. Flight period: March, May-August, December with a peak in June. Relatively uncommon, found in pine plantations.
20. *Eupeodes luniger* (Meigen, 1822)
Localities: 5, 15, 24. Flight period: January; March; May; November; December. Relatively uncommon, found on herbaceous plants.
21. *Scaeva albomaculata* (Macquart, 1842)
Localities: 2, 18. Flight period: April. Confined to a few sites and relatively rare.
22. *Scaeva pyrastris* (Linnaeus, 1758)
Localities: 2, 11, 12, 14. Flight period: March, May-July, September with a peak in June. Relatively uncommon, found on ferns, between bushes.
23. *Scaeva selenitica* (Meigen, 1822)
Localities: 12, 24. Flight period: May-June. Relatively rare.
24. *Sphaerophoria scripta* (Linnaeus, 1758)
Localities: 1, 2, 3, 4, 5, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 24, 25. Flight period: January, April-December with a peak in June. Widespread and abundant.
25. Syrphini sp.
Localities: 5. Flight period: March. One specimen caught.
26. *Xanthogramma marginale* (Loew, 1854)
Localities: 2, 11, 12, 14, 15. Flight period: February, May-August. Restricted in distribution and uncommon.
27. *Xanthogramma cf. pedissequum* (Harris, 1776)
Localities: 2, 5, 14, 15, 24. Flight period: February-June. Relatively restricted but fairly abundant locally. New insights into this genus suggest it could be a species complex (Van Eck 2011).

Ceriodini

28. *Ceriana vespiformis* (Latreille, 1804)
Localities: 1, 2, 14, 18. Flight period: May-July, September with a peak in June. Fairly restricted, never abundant.

Cheilosini

29. *Cheilosia paralobi* Malski, 1962
Localities: 12, 14. Flight period: January, July. Relatively uncommon. *Ch. paralobi* has in the past been confused with *Ch. laticornis* Rondani, 1857 (Kassebeer 1998c, Marcos-García 1987) (as *latifacies*). Except for the male genitalia, both species are very similar

(Marcos-García 1987). *Ch. paralobi* has been described from specimens found in Algeria. It can be found all year round.

30. *Cheilosia scutellata* (Fallén, 1817)
Localities: 14. Flight period: October-November. Rare.
31. *Cheilosia* sp.
Localities: 14. Flight period: September. Rare.
32. *Ferdinandea* sp.1
Localities : 5, 14. Flight period: January-February. Relatively uncommon.
33. *Ferdinandea* sp. 2
Localities: 1. Flight period: October. One specimen caught.

Chrysogastrini

34. *Chrysogaster solstitialis* (Fallén, 1817)
Localities: 1. Flight period: April. Rare, one single specimen caught.
35. *Myolepta difformis* (Strobl, 1909)
Localities: 1, 10, 14. Flight period: March, May-June. Restricted and rare.
36. *Neoascia* sp.
Localities: 1, 14, 17. Flight period: March, May, October-December. Relatively uncommon.
37. *Orthonevra brevicornis* (Loew, 1843)
Localities: 1, 2. Flight period: April. Restricted and rare.
38. *Orthonevra onytes* (Séguy, 1961)
Localities: 1. Flight period: April, June. Rare and restricted to one site.
39. *Orthonevra* sp.
Localities: 1, 2, 5, 14, 16. Flight period: April, June. Relatively uncommon.
40. *Riponnensia longicornis* (Loew, 1843)
Localities: 1. Flight period: April-May. Rare and restricted to one site.

Eristalini

41. *Eristalinus (Lathyrophthalmus) aeneus* (Scopoli, 1763)
Localities: 2, 3, 4, 5, 6, 14, 18, 24. Flight period: June-August, October and November. Fairly widespread but not abundant.
42. *Eristalinus (Eristalodes) megacephalus* (Rossi, 1794)
Localities: 1, 2, 5, 14, 15, 16, 24, 27. Flight period: May to October with a peak in June-July. Fairly widespread but not abundant.
43. *Eristalinus sepulchralis* (Linnaeus, 1758)
Localities: 1, 2, 5, 13, 14, 15, 17, 24, 26. Flight period: March to October with a peak in July. Fairly widespread and abundant.
44. *Eristalinus (Eristalodes) taeniops* Weidemann, 1818
Localities: 1, 2, 3, 5, 8, 13, 14, 15, 24. Flight period: January-June, August, October-December, with a peak in April. Fairly widespread but not abundant.
45. *Eristalis (Eoseristalis) abusiva* Collin, 1931
Localities: 5, 8, 13, 14, 15, 24. Flight period: June-November with a peak in October. Fairly widespread but not abundant.
46. *Eristalis (Eoseristalis) arbustorum* (Linnaeus, 1758)
Localities: 2, 3, 5, 6, 10, 11, 12, 14, 16, 18. Flight period: February, May-December. Widespread but not abundant.
47. *Eristalis (Eoseristalis) similis* (Fallén, 1817)
Localities: 1, 2, 3, 5, 8, 12, 13, 14. Flight period: January-June, August-September, November-December, with a peak in November. Fairly widespread and abundant.

48. *Eristalis* sp. 1
Localities: 1, 2, 3, 6, 8, 13, 14, 15, 16, 24, 27. Flight period: February. Widespread and abundant.
49. *Eristalis* sp. 2
Localities: 5. Flight period: June, August, October-November. Rare and restricted to one site.
50. *Eristalis tenax* (Linnaeus, 1758)
Localities: 1, 2, 3, 5, 8, 9, 10, 11, 12, 13, 14, 15, 17, 18, 24. Flight period: February to September, December, with a peak in June. Widespread and abundant.
51. *Helophilus pendulus* (Linnaeus, 1758)
Localities: 1, 2, 3, 10, 12, 14. Flight period: March to November. Fairly widespread but not abundant.
52. *Helophilus* sp.
Localities: 1, 2, 14, 27. Flight period: April, June to October. Restricted and not abundant.
53. *Helophilus trivittatus* (Fabricius, 1805)
Localities: 1, 2, 3, 4, 6, 12, 15, 21. Flight period: May-August with a peak in June. Fairly widespread but never abundant.
54. *Myathropa florea* (Linnaeus, 1758)
Localities: 1, 2, 3, 5, 8, 12, 14. Flight period: March-November with a peak in June. Fairly widespread but not abundant.
55. *Parhelophilus frutetorum* (Fabricius, 1775)
Localities: 1, 2, 5, 14, 17, 25. Flight period: April-August with a peak in April. Fairly widespread and abundant.
56. *Parhelophilus* sp.
Localities: 22. Flight period: July. Rare and restricted to one site.
57. *Parhelophilus versicolor* (Fabricius, 1794)
Localities: 25. Flight period: May. Rare and restricted to one site.

Merodontini

58. *Eumerus emarginatus* Loew, 1848
Localities: 1, 2, 3, 4, 5, 8, 11, 12, 14, 15, 16, 18. Flight period: February-August, November with a peak in June. Widespread and fairly abundant. The status of this species is in need of confirmation.
59. *Eumerus nudus* Loew, 1848
Localities: 1, 2, 3, 4, 5, 8, 11, 14, 15, 18. Flight period: May-September with a peak in June. Fairly widespread but not abundant.
60. *Eumerus pulchellus* Loew, 1848
Localities: 5, 14, 24. Flight period: May-August. Relatively restricted and not abundant.
61. *Merodon avidus* (Rossi, 1790)
Localities: 2, 11, 14. Flight period: April, June, September. Restricted and rare.
62. *Merodon* sp. 1
Localities: 10. Flight period: June. Rare and restricted to one site.
63. *Merodon* sp. 2
Localities: 11. Flight period: June and August. Rare and restricted to one site.
64. *Merodon* sp. 3
Localities: 14. Flight period: October. Rare and restricted to one site.
65. *Merodon trochantericus* Costa, 1884
Localities: 11, 14. Flight period: May-June. Local and rare.

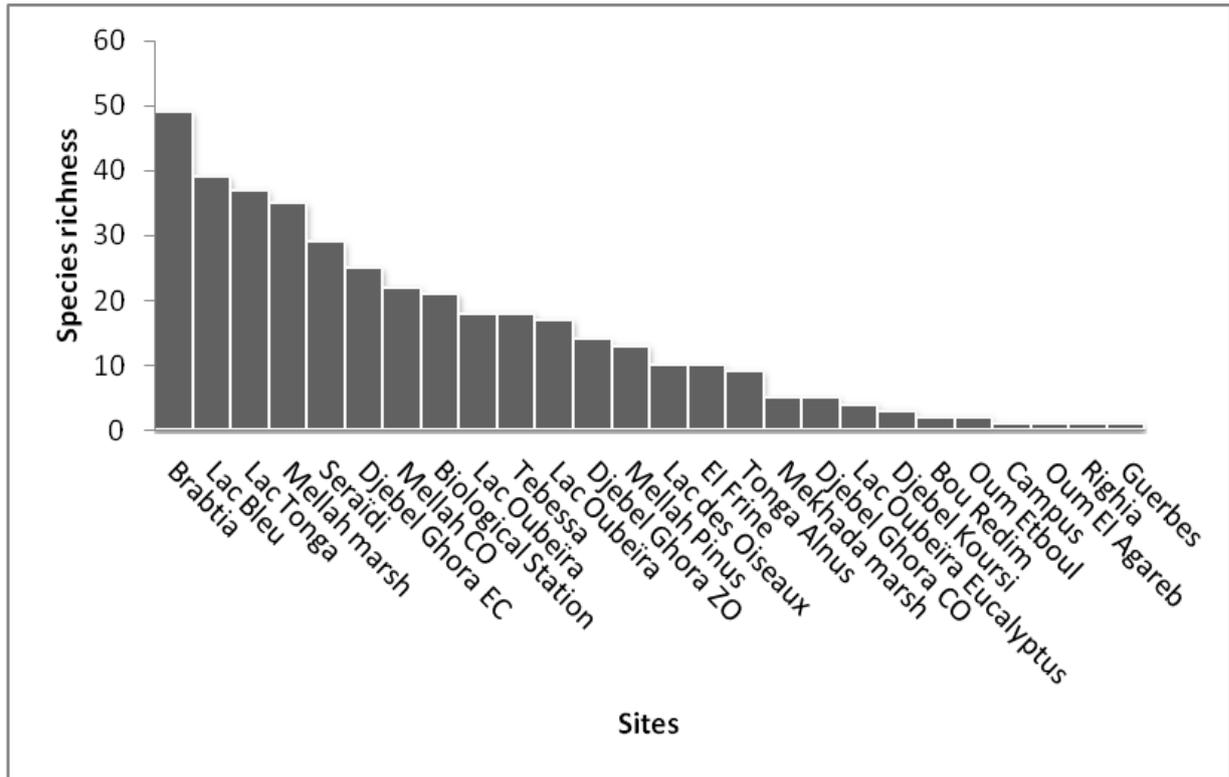


Figure 2: Species richness of the sampled sites

Milesini

- 66. *Spilomyia maroccana* Kuznetsov, 1997.
Localities: 10, 11, 12. Flight period: July-August. Restricted in its distribution and rare. According to Kassebeer (1999b) all previously published *S. digitata* (Rondani 1865) from the Maghreb, belong in fact to *S. maroccana* Kuznetsov 1997.

Pelecocerini

- 67. *Chamaesyrrhus lusitanicus* Mik, 1898
Localities: 1, 5, 14, 24. Flight period: May, October-December. Restricted and not abundant. First records for Algeria.

Volucellini

- 68. *Volucella liquida* Erichson in Wagner, 1841
Localities: 9, 10, 12. Flight period: June, July. Restricted and rare.

Xylotini

- 69. *Brachypalpus laphriformis* (Fallén, 1816)
Localities: 5, 14, 24. Flight period: March. Restricted and rare. First records for Algeria.
- 70. *Chalcosyrphus nemorum* (Fabricius, 1805)
Localities: 1, 2, 14, 17. Flight period: March-June, September-October. Restricted and not abundant.
- 71. *Syritta flaviventris* Macquart, 1842
Localities: 1, 2, 3, 5, 8, 14. Flight period: July-October with a peak in September. Fairly widespread but not abundant.

72. *Syrirta pipiens* (Linnaeus, 1758)

Localities: 1, 2, 3, 4, 5, 6, 8, 10, 11, 12, 13, 14, 15, 16, 17, 18, 24. Flight period: February-December with a peak in July. Ubiquitous and abundant.

73. *Xylota segnis* (Linnaeus, 1758)

Localities: 14, 15. Flight period: May, September. Relatively uncommon.

Discussion

A total of 73 species of hoverflies were recorded during the study within the confines of the El Kala National Park with four species new for Algeria: *Dasysyrphus albostriatus*, *Chamaesyrphus lusitanicus*, *Brachypalpus laphriformis* and *Spilomyia maroccana*. The first three genera are recorded for the first time in Algeria. In view of the previous sparse effort invested in this group, these additions should come as no surprise and there is no doubt that further taxonomic progress (Hurkmans 1993, Marcos-García *et al.* 2007) will considerably improve our knowledge of the hoverfly fauna of North Africa. Morocco and Tunisia share with northeastern Algeria 40 and 16 species, respectively, but these numbers are likely to change and a detailed comparison has to await a systematic sampling of the whole region.



Figure 3: Preserved specimens of *Volucella liquida*, a North African endemic hoverfly (upper) and *Spilomyia maroccana* (lower).

Wetlands exhibited the highest species richness with 37 and 38 species for Lac Bleu and Lake Tonga, respectively. The hill habitats held also a high number of species, with Séraïdi (Mount Edough) and El Ghora hosting 29 and 27 hoverflies. Localities displaying greater heterogeneity of habitats (wadi, cork oak forest and maquis) such as the Brabtia reserve also housed a high number of species (37). In contrast, degraded oak forests or pine or *Eucalyptus* plantations were rather species-poor. Our study has shown that some species such as *Episyrphus balteatus* or *Eristalis tenax* are widespread and abundant, whereas others such as *Platycheirus albimanus* are rare and confined to small areas. Some species were only recorded

at relatively high altitude, like *Volucella liquida*, a North African endemic associated with mountain forests.

For some species (*Episyrphus balteatus*, *Syrirta pipiens*), the flight period was short whereas for many (*Brachypalpus laphriformis*, *Myolepta difformis*) it was spread over many months. Other factors (abundance, ecological determinants) need further research before hoverflies can fulfil their reputation as useful bioindicators of global changes.

Despite their sheer numbers, biomass and the spectrum of ecosystem services they provide, knowledge and conservation of insects in North Africa, as elsewhere (New 2007), has lagged far behind those of popular taxa such as waterbirds. Recent trends (Riservato *et al.* 2009, Samraoui *et al.* 2011, Clausnitzer *et al.* 2012), however, prompted in part by leading conservation bodies such as the IUCN, are encouraging inasmuch as they provide a more balanced view of biodiversity. Over the last few decades, the study area has been undergoing rapid changes in land use that has left many of its natural habitats heavily impacted and degraded, posing a tough challenge to the sustainable use of its natural resources. Adult hoverflies and their larvae exploit a wide variety of habitats and microhabitats (Rotheray 1993, Van Veen 2010) and their distribution and abundance inform us about the state of ecosystems they occupy (Stubbs 1982, Whiteley 1987, Speight 1989). This study, aimed at assessing the hoverfly species richness and species composition of habitats across northeast Algeria, is a prelude to future detailed studies focused on using hoverflies as indicators, thus hoping to contribute to the conservation of an important biodiversity hotspot in the Maghreb (Véla & Benhouhou 2007, Samraoui & Samraoui 2008).

Acknowledgements

This work benefitted from the enthusiasm and encouragement of F. Gilbert, A.H. Alfarhan and K.A.S. Al-Rasheid. We are most grateful to R. Dahmri and K. Atafi for help in fieldwork. Jeroen van Steenis (Amersfoort, the Netherlands) kindly confirmed the identity of *S. maroccana*. This research was supported by the Algerian Ministère de l'Enseignement Supérieur et de la Recherche Scientifique (DGRSTD/MESRS) and DSFP, King Saud University, Saudi Arabia.

References

- Berenbaum M (2009) Insect biodiversity - millions and millions. pp. 575-582 in Footitt RG & Adler PH (eds.) *Insect biodiversity: science and society*. Oxford: Blackwell Publishing.
- Clausnitzer V, Dijkstra K-DB, Koch R, Boudot J-P, Darwall WRT, Kipping J, Samraoui B, Samways MJ, Simaika JP & Suhling F (2012) Focus on African freshwaters: hotspots of dragonfly diversity and conservation concerns. *Frontiers in Ecology & the Environment* 10: 129-134.
- Claussen C (1989) Syrphiden aus Marokko. *Entomofauna* 10: 357-375.
- Claussen C & Hauser M (1990) Neue Syrphiden vorkommen aus Marokko und Tunesien. *Entomofauna* 11: 433-8.
- Courtney GW, Pape T, Skevington JH & Sinclair BJ (2009) Biodiversity of Diptera. pp. 185-222 in Footitt RG & Adler PH (eds.) *Insect biodiversity: science and society*. Oxford: Blackwell Publishing.
- Dirickx HG (1994) Atlas des Diptères syrphides de la région méditerranéenne. *Studiedocumenten van het K.B.I.N., Brussels*: 75: 1-314.
- Djellab S & Samraoui B (1994) The hoverflies of north-east Algeria: a preliminary account. *Hoverfly Newsletter* 8: 6-8.
- Eck A van (2011) A checklist of the hoverflies of Portugal (Diptera, Syrphidae). *Boletín de la Sociedad Entomológica Aragonesa (S.E.A.)* 49: 127-144.
- Gilbert F (1993) *Hoverflies*. Slough: Naturalists Handbooks, Richmond Press.
- Hauser M & Kassebeer CF (1998) Beiträge zur Schwebfliegenfauna Marokkos VI. *Neoascia claussoni* spec nov. aus Nordafrika (Diptera, Syrphidae). *Dipteron* 1: 37-44.
- Hurkmans W (1993) A monograph of *Merodon* (Diptera: Syrphidae). Part 1. *Tijdschrift voor Entomologie* 136: 147-234.
- Kassebeer CF (1995a) Beiträge zur Schwebfliegenfauna Marokkos, I. *Pipizella thapsiana* n. sp. aus dem Hohen Atlas (Diptera: Syrphidae). *Entomologische Zeitschrift* 105: 260-264.
- Kassebeer CF (1995b) Beiträge zur Schwebfliegenfauna Marokkos, II. Zur Kenntnis der nordafrikanischen Arten der Gattung *Psilota* Meigen 1822 (Diptera: Syrphidae). *Entomologische Zeitschrift* 105: 395-404.
- Kassebeer CF (1998a) Beiträge zur Schwebfliegenfauna Marokkos III. Ergänzende Nachweise von Schwebfliegen aus Marokko (Diptera: Syrphidae). *Dipteron* 1: 21-24.

- Kassebeer CF (1998b) Beiträge zur Schwebfliegenfauna Marokkos V. Die marokkanischen Arten der Gattung *Platycheirus* Lepeletier & Serville, 1828 (Diptera, Syrphidae). *Dipteron* 1: 25-36.
- Kassebeer CF (1998c) Beiträge zur Schwebfliegenfauna Marokkos VII. Die marokkanischen Arten der Gattung *Cheilosia* Meigen, 1822 (Diptera, Syrphidae). *Dipteron* 1: 57-68.
- Kassebeer CF (1999a) Beiträge zur Schwebfliegenfauna Marokkos VIII. Eine neue Gattung der Brachyopini (Diptera, Syrphidae) aus dem Mittleren Atlas. *Dipteron* 2: 11-24.
- Kassebeer CF (1999b) Zur Identität der 1849 von Lucas aus Algerien nachgewiesenen Schwebfliegen (Diptera, Syrphidae). *Dipteron* 2: 143-152.
- Kassebeer CF (1999c) Beiträge zur Schwebfliegenfauna Marokkos IX. Eine neue Art der Gattung *Ferdinandea* Rondani, 1844 (Diptera, Syrphidae) aus Nordafrika. *Dipteron* 2: 153-162.
- Kassebeer CF (1999d) Beiträge zur Schwebfliegenfauna Marokkos, IV. Zur Kenntnis einiger Gattungen der Chrysogastrini in Marokko (Diptera: Syrphidae). *Entomologische Zeitschrift* 109: 155-164.
- Kassebeer CF (2000) Beiträge zur Schwebfliegenfauna Marokkos X. Eine neue *Brachyopa* Meigen, 1822 (Diptera, Syrphidae) aus dem Atlas. *Dipteron* 3: 141-148.
- Kassebeer CF (2001) Über eine ungewöhnliche *Brachyopa* Meigen, 1822 (Diptera, Syrphidae) aus Tunesien. *Dipteron* 4: 37-42.
- Marcos-García MA (1987) Sobre la presencia de *Cheilosia paralobi* Malski, 1962 y *C. latifacies* Loew, 1857 en la península Iberica (Diptera, Syrphidae). *Anales de Biología* 11 (Biología Animal 3): 99-101.
- Marcos-García MA, Vujic A & Mengual X (2007) Revision of Iberian species of the genus *Merodon* (Diptera: Syrphidae). *European Journal of Entomology* 104: 531-572.
- New TR (2007) Broadening benefits to insects from wider conservation agendas. pp. 301-321 in Stewart AJA, New TR & Lewis OT (eds). *Insect conservation biology*. Wallingford: CABI Publishing..
- Peck L (1988) Syrphidae – Conopidae. In Soos A & Papp L (eds.). *Catalogue of Palaearctic Diptera*. Amsterdam: Elsevier. Vol. 8, 230 pp
- Reemer M, Hauser M & Speight MCD (2004) The genus *Myolepta* Newman in the West-Palaearctic region (Diptera, Syrphidae). *Studia Dipterologica* 11: 553-580.
- Resh VH & Cardé RT (2009) *Encyclopedia of insects*. Burlington: Academic Press.
- Riservato E, Boudot J-P, Ferreira S, Jovic M, Kalkman VJ, Schneider W & Samraoui B (2009) *The status and distribution of dragonflies of the Mediterranean Basin*. Gland, Switzerland & Malaga, Spain: IUCN.
- Rizza A, Campobasso G, Dunn PH & Stazi M (1988) *Cheilosa corydon* (Dipt.: Syrphidae), a candidate for the biological control of musk thistle in North America. *Annals Entomological Society of America* 81: 225-232.
- Rotheray GE (1993) Colour guide to hoverfly larvae (Diptera, Syrphidae). *Dipterist Digest* 9. Sheffield: Derek Whiteley.
- Samraoui B & Bélair de G (1997) The Guerbes-Senhadja wetlands: Part I. An overview. *Ecologie* 28: 233-250.
- Samraoui B & Belair de G (1998) Les zones humides de la Numidie orientale : bilan des connaissances et perspectives de gestion. *Synthèse (Numéro spécial)* 4: 1-90.
- Samraoui B & Samraoui F (2008) An ornithological survey of Algerian wetlands: Important Bird Areas, Ramsar sites and threatened species. *Wildfowl* 58: 71-96.
- Samraoui B, Boudot J-P, Ferreira S, Riservato E, Jovic M, Kalkman VJ & Schneider W (2011) The status and distribution of dragonflies. pp. 51-70 in Garcia N, Cuttelod A & Abdul Malak D (eds). *The status and distribution of freshwater biodiversity in northern Africa*. Gland, Switzerland, Cambridge, UK & Malaga, Spain: IUCN.
- Samways MJ, McGeoch MA & New TR (2010) *Insect Conservation. A handbook of approaches and methods*. Oxford: Oxford University Press.
- Scudder GGE (2009) The importance of insects. pp. 7-32 in Footitt RG & Adler PH (eds.). *Insect biodiversity: science and society*. Oxford: Blackwell Publishing..
- Seguy E (1961) Diptères Syrphidés de l'Europe Occidentale. *Mémoires du Muséum National d'Histoire Naturelle, Paris* 23: 1-248.
- Sommaggio D (2002) *Paragus gorgus* Vujić & Radenkovic, 1999: a junior synonym of *P. majoranae* Rondani, 1857 and reinstatement of *P. pecchiolii* Rondani, 1857 (Diptera, Syrphidae). *Volucella* 6: 53-56.
- Speight MCD (1989) Saproxylic invertebrates and their conservation. Strasbourg: *Nature & Environment Series*, n°42. Council of Europe.
- Stenis Van J (2000) The West-Palaearctic species of *Spilomyia* Meigen (Diptera, Syrphidae). *Mitteilungen der Schweizerischen Entomologischen Gesellschaft* 73: 143-168.
- Stubbs AE (1982) Hoverflies as primary woodland indicators with reference to Wharnecliffe Wood. *Sorby Record* 20: 62-67.
- Stubbs AE & Falk SJ (2002) *British Hoverflies*. London: British Entomological & Natural History Society.
- Veen Van MP (2010) *Hoverflies of Northwest Europe*. Utrecht: KNNV Publishing.
- Véla E & Benhouhou S (2007) Evaluation d'un nouveau point chaud de biodiversité végétale dans le Bassin méditerranéen (Afrique du Nord). *Comptes Rendus Biologies* 330: 589-605.

- Verlinden L (1991) *Fauna van België: Zweevliegen (Syrphidae)*. Brussels: Institut Royal des Sciences Naturelles de Belgique.
- Whiteley D (1987) Hoverflies of the Sheffield area and North Derbyshire. *Sorby Record, Special Series*, n°6. Sheffield: Sorby Natural History Society.

الملخص العربي

حصر لذباب السرفيس في شمال شرق الجزائر (رتبة ثنائية الأجنحة - فصيلة ذباب السرفيس) دجلاب س¹، 2 - أ. فان إيك³ - ب. سامراوى^{2،4}

- 1- قسم البيولوجي - جامعة تيببسا - الجزائر
- 2- معمل الأبحاث وحماية المناطق الرطبة - جامعة جولما - الجزائر
- 3- كورتى هوفسترات - تيلبيرج - هولندا
- 4- مركز بحوث التنوع الفطري - جامعة الملك سعود - الرياض - المملكة العربية السعودية

تناول البحث الحالي دراسة تصنيفية لأنواع ذباب السرفيس (hoverfly - رتبة ثنائية الأجنحة) في شمال شرق الجزائر للفترة الممتدة من سنة 1991 الى سنة 1992، تم تسجيل ثلاثة وسبعين نوعاً، أربعة أنواع هي جديدة بالنسبة للجزائر: *Dasysyrphus albostriatus*، *Chamaesyrphus lusitanicus*، *Brachypalpus laphriformis* و *Spilomyia maroccana*، وكانت الأجناس التالية: *Dasysyrphus*، *Chamaesyrphus* و *Brachypalpus* جديدة بالنسبة للجزائر.

أيضاً تم تسجيل معلومات هامة عن التوزيع والنمط الموسمي لكل نوع من الأنواع المسجلة. أما بالنسبة للثراء النوعي، فقد كانت أكثر المناطق ثراء هي الأراضي الرطبة (38 نوعاً) تليها التلال التي تغطيها الغابات (29 نوعاً).

في المقابل سجلت المناطق المتدهورة بيئياً أقل الأعداد. وكانت الأنواع مثل *Episyrphus balteatus*، *Sphaerophoria scripta*، *Syrpitta pipiens*، *Eristalis tenax*، متوزعة على نطاق واسع وبأعداد وفيرة، في حين كانت هناك أنواع أخرى نادرة مثل *Platycheirus albimanus* أو محدودة التواجد حيث اقتصر تواجدها على التلال التي تغطيها الغابات، مثل النوع الشمال أفريقي *Volucella liquida*. ان المعرفة الجيدة لذباب السرفيس تمهد الطريق لتنفيذ مراقبة دقيقة للتغيرات البيئية التي تؤثر على المنطقة، ولذا يجب الحفاظ على هذه المجموعة الهامة، والتي لم تلق العناية الكافية من الدراسة بالرغم من انتشارها في واحدة من أكثر المناطق اهمية للتنوع البيولوجي في شمال أفريقيا.