A Red Data Book of empidid flies of Flanders (northern Belgium) (Diptera, Empididae s.l.): Constraints and possible use in nature conservation

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Abstract

To enable use of Empididae s.l. (Diptera) as a tool in nature conservation, a Red Data Book of this taxonomical group was generated for Flanders, Belgium. All distribution data on species in Belgium between 1887 and 1999 were gathered from collections as well as personal sampling efforts by the first two authors. This resulted in about 21,000 records of Empididae, Hybotidae, Microphoridae and Atelestidae with 16,119 records for Flanders (northern Belgium) and 4776 for Wallony (southern Belgium). All species were assigned to Red Data Book categories which are based on a combination of a rarity and a trend criterion. Rarity is expressed as the proportion of the total number of UTM 5 km squares sampled in which the species have been found since 1981. The trend criterion is interpreted as the change of the species rarity between 1887–1980 and 1981–1999. A comparable number of UTM 5 km squares was investigated during the two time periods. A total of 259 species were recorded in Flanders. Twenty-seven or 10% of them are considered as 'extinct in Flanders', 10 (4%) as 'critically endangered', 12 (5%) as 'endangered', 11 (4%) as 'vulnerable', 99 species (38%) as 'susceptible' or 'rare', 65 species (25%) as 'safe' or 'at low risk' and 34 species (13%) are assigned to the category 'data deficient' due to taxonomic problems or a lack of ecological data. Only one of the common species shows a recent decrease of more than 50% and is classified as 'nearly threatened'. Current threats in most species are related to the alteration or destruction of their favoured habitats. The results are discussed in the light of recent criticism of the use of Red Data Books in nature conservation.

Introduction

Most Red Data Books deal with popular vertebrate and plant taxa and if invertebrates are involved, mostly large and conspicuous macro-invertebrates such as butterflies, grasshoppers and dragonflies are treated. Despite the fact that vertebrates and the above mentioned macro-invertebrates are traditionally used in site quality assessment studies, they are sometimes only present at low densities and/or low species richness, which restricts them for monitoring purposes. Little attention has thus far been paid to microbiota or cryptobiota which include the majority of the invertebrate species richness on earth.

Empididae s.l. comprises of small to medium-sized flies (2–20 mm) of the dipteran families Empididae, Hybotidae, Microphoridae and Atelestidae. As a taxonomic group they are very common and occupy nearly every (semi-)terrestrial habitat, from the seashore up to the mountains, sand-dunes, marshlands, forests and banks of different kinds of water bodies. High empidid species richness and abundances are observed particularly in dry or wooded habitats and up to 50 species have been encountered during one year

(Grootaert *et al*., 1988). They are present in fair numbers during almost all of their entire activity period (April–October). Empidid flies occupy a large variety of ecological niches and many species even require a multi-habitat landscape to complete their life-cycles (Delettre *et al*. 1992, 1998). In this respect they are potentially useful as indicators in, for example, site quality assessment studies.

Since the early 1980s considerable efforts have been made to inventorise the Belgian empidid fauna (Grootaert 1989). Recently, attention has also been paid to ecological aspects of the collected species, particularly to their habitat affinities. All major habitat types have now been investigated (e.g. Pollet & Grootaert 1994, 1996). In recognition of the importance of flies in nature conservation and to be able to incorporate selected families in environmental assessment studies, a project was initiated in 1997 by the Flemish Institute of Nature Conservation to produce a documented Red Data Book (RDB) for three dipteran families: long-legged flies (Dolichopodidae; Pollet 2000), dance flies (Empididae; Grootaert & Maes 2001) and hoverflies (Syrphidae; Meerhaeghe & Grootaert 1998). Although many of these fly species are currently quite common, information on their past and present distribution (rarity) is required to enable them to be placed in Red Data Book threat categories relevant to the assessment of the natural value of sites and areas.

The criteria used to define categories for Red Data Books have been a subject of considerable discussion, and the usefulness of Red Data Books has recently been severely criticised by a number of Dutch entomologists (Heijerman & Turin 1998; Ellis 1998; van Veen & Zeegers 1998; Barendregt *et al*. 1998). In the present contribution, results of the Red Data Book of Empididae s.l. of Flanders are presented and Red Data Books in general are discussed in the light of the above mentioned criticism of their relevance to nature conservation.

Materials and methods

Study area

Flanders, the northernmost part of Belgium, is situated in the middle of the European Atlantic province and forms a link between the northern (Scandinavia, The Netherlands) and the southern (France, North Spain) parts. The eastern and southeastern Flemish border is part of the Central European province, where central European and rare boreo-montane faunal elements enter the area. The distance from the sea to the easternmost border is about 250 km; the maximum distance between northern and southern border is about 120 km. The area is generally flat with only a few hills near the southern border where the elevation hardly exceeds 150 m. The climate is Atlantic, which implies a relatively humid atmosphere throughout the year with mild winters and moderately warm summers. The landscape is severely fragmented as a result of very dense human population, largely unstructured habitations and an extensive road infrastructure.

Data collection, storage and analysis

Specimens in the dry collections in the Museum of the Royal Belgian Institute of Natural Sciences (KBIN), containing formerly published data (e.g. Goetghebuer 1928, 1930, 1931, 1942, 1943) were individually checked, avoiding the need to include literature data in the dataset. Since 1980, further material has been collected using Malaise traps (Grootaert 1989) and later also coloured water traps (Pollet & Grootaert 1991, 1994). Both old and recent geographical distribution data were stored in a Microsoft Access@ database. Distribution records, defined as the collection of a particular species in a certain sampling site on a given date or during a certain time period are stored in table [EMPISDAT]. Detailed information and co-ordinates of sampling sites and all Belgian locations are present in [LOCDATA] and [UTM], while taxonomic information on the species as well as summarised data on their distribution and ecology is stored in resp. [SPECIES] and [ECOLDAT]. The primary key field [species code] is a code of nine alphanumeric characters composed of the first four characters of the genus name and of the species name, separated by a space. The database comprises 16,119 distribution records of 259 species with 303,657 identified specimens for Flanders (20,895 records of 344 species with 323,296 identified individuals for Belgium). A total of 263 or 40% of the UTM 5 km squares in Flanders has been sampled.

Empidid taxonomy and nomenclature used here follow Collin (1961), Chvala (1975, 1983, 1994) and Grootaert & Chvala (1992).

Criteria for Red Data Book categories

All species were assigned to a particular Red Data Book category that is defined by the combination of a rarity and a trend criterion. Rarity is expressed

Table 1. Classification of Red Data Book species on the basis of a rarity and a trend criterion.

Trend (degree of decrease)	Rarity			
	Very rare <2%	Rare ≥2% and <5%	Fairly rare ≥5% and <10%	Common ≥10%
76–99%	Critically endangered	Endangered	Vulnerable threatened	Nearly threatened
51–75%	Endangered	Endangered	Vulnerable	Nearly threatened
26–50%	Vulnerable	Vulnerable	Vulnerable	Safe/Low risk
<25%	Susceptible	Susceptible	Susceptible	Safe/Low risk

Rarity expressed as the percentage of UTM 5 km squares where the species was observed since 1981 on the total of samples squares. Trend (degree of decrease) expressed as change of geographical distribution between the time period before and since 1981 (see also Pollet 2000).

as the proportion of the total number of UTM 5 km squares sampled in which the species has been found since 1981. The trend criterion is the change in rarity between the periods 1887–1980 and 1981–1999. The IUCN terminology is used, but standards used were as modified from Maes & van Swaay (1997). The criteria as indicated in Table 1 were adhered to except in those cases where the habitat of the species was extremely rare or when the species was only known from a population in a single or a few threatened sites. In these cases, the species were assigned to a category with a higher degree of vulnerability. For example *Syndyas nigripes* which was collected for the first time in Flanders in 1997 in a small peatbog habitat, is classified as 'critically endangered' as a reflection of the extreme vulnerability of its habitat and the scarcity of this habitat type in Flanders. A very rare species (known from <2% of the recently sampled UTM 5 km squares) with a decrease in geographical distribution of <25% since 1981 remains classified as 'susceptible' and thus does not belong to any of the categories RDB 0 to RDB 3. Also, rare species which have been discovered for the first time from 1981 onwards are at best assigned to the category 'susceptible'.

The Red Data Book categories are defined as follows.

Extinct
Species thought to have been reproducing in Flanders, but which seem to have disappeared recently.

Criterion: species not recorded in Flanders since 1981.

Critically endangered
Species which will disappear when no measures are taken to protect their habitat.

Criteria:
- species with a decrease of their geographical distribution by 76–99% and known from less than 2% of the sampled UTM 5 km squares since 1981;
- species known from a single or a few isolated populations;
- species from habitats threatened with extinction (i.e. the habitat may cease to exist) within Flanders.

Endangered
Rare species which run the risk of becoming 'critically endangered' if no measures are taken to protect their habitat.

Criteria:
- species with a decrease of their geographical distribution of at least 51% and known from less than 5% of the sampled UTM 5 km squares since 1981;
- species from threatened habitats.

Vulnerable
Species risking classification as 'endangered' if the stress on their habitats is not removed and no protection measures are taken.

Criterion: species with a decrease of their geographical distribution of at least 26% and known from less than 10% of the sampled UTM 5 km squares since 1981.

Susceptible
Species which are uncommon but for which no significant recent decrease in geographical distribution can be demonstrated.

Criteria:
- species without significant decrease in geographical distribution and known from less than 10% of the sampled UTM 5 km squares since 1981;
- species from rare habitats.

Nearly threatened
Common species which are not threatened but for which a significant decrease in geographical distribution since 1981 could be demonstrated.

Criterion: species known from more than 10% of the sampled UTM 5 km squares, but with a distinct decrease in geographical distribution since 1981.

Safe/Low risk
Species that are not threatened or even show a recent increase in geographical distribution.

Criterion: species known from more than 10% of the sampled UTM 5 km squares without a distinct decrease since 1981.

Data deficient
Species which cannot be classified in a category due to the lack of data and which need further study.

Criterion: species with uncertain taxonomical status (e.g. some *Drapetis*) or for which no sufficient ecological information is available (e.g. some *Hilara and Bicellaria*).

Results and discussion

To our knowledge, the present Red Data Book of Empididae s.l. is the first in Europe based on a thorough analysis of numerical data (cf. Shirt 1987; Falk 1991; Joost & Wagner 1997). The first records of empidids in Belgium date from 1887, whereas the most recent were gathered during the 1999 season. At the conclusion of the project (December 1999) about 21,000 distribution records of empidids in Belgium had been collected (16,119 records with 303,657 identified individuals in Flanders and 4776 records with 19,639 individuals in South-Belgium or Wallony). Although the number of UTM 5 km squares sampled before and after the pivot date (1980) is largely comparable at the specimen level, yields of sampling efforts after 1980 (14,546 records) were about nine times higher than those conducted in the preceeding time period (1713 records). This means that, species that were not rediscovered after 1980 can reliably be considered as extinct in Flanders, whereas the observed declines in other species may be underestimations. No valid conclusions can be drawn from observed increases in geographical distribution.

Analysis of the data reveal that a total of 259 species have been recorded in Flanders between 1887 and 1999 (and 345 in Belgium): 27 species (10.4%) are considered as 'extinct in Flanders', 10 species (3.8%) as 'critically endangered', 12 species (4.6%) as 'endangered', 11 species (4.2%) as 'vulnerable', 99 species (38.2%) as 'susceptible' or 'rare', 65 species (25.1%) as 'safe' or 'at low risk' and 34 species (13.1%) are assigned to the RDB category 'data deficient' due to taxonomical problems or a current lack of ecological data. Only one of the common species shows a decrease of > 50% since 1981 and is accordingly classified as 'nearly threatened' (Table 2). The full species list of Flanders is given in Appendix I. With 'susceptible' species included, 50.2% of the empidid fauna of Flanders is regarded as threatened, which closely matches the proportion cited for Great Britain (see Shirt 1987; Falk 1991).

Table 3 compares the proportions of threatened species of different groups of organisms in Flanders for which a Red Data Book is available. A threatened status is given to more than half of the species from taxa that largely depend on freshwater habitats (amphibians to selected groups of insects), ground beetles and butterflies. Hoverflies have the lowest percentage of threatened species among the listed taxa. This might be explained by the fact that (i) larvae of a considerable number of species are detritivorous and survive in sites with a high organic enrichment or which are organically polluted, and (ii) most species are highly vagile (Verlinden 1991; Meerhaeghe & Grootaert 1998).

Table 2. Distribution of species of two dipteran families over Red Data Book categories.

Red Data Book categories	Taxonomic groups			
	Empididae s.l.		Dolichopodidae	
	No. of species	%	No. of species	%
RDB 0: Extinct	27	10.4	22	8.5
RDB 1: Critically endangered	10	3.8	10	3.8
RDB 2: Endangered	12	4.6	14	5.4
RDB 3: Vulnerable	11	4.2	16	6.2
RDB R: Susceptible	99	38.2	86	33.1
Near threatened	1	0.4	—	—
Safe/Low risk	65	25.1	73	28.1
Data deficient	34	13.1	39	15.0
Total	259		260	

Table 3. Proportions of threatened species in different taxonomic groups in Flanders.

Group	%	Authors
Plants	42	Cosyns *et al*. 1992
Mammals	44	Criel *et al*. 1994
Amphibians and reptiles	74	Bauwens & Claus 1996
Butterflies	66	Maes & Van Dijck 1996
Carabid beetles	57	Desender *et al*. 1995
Water bugs	58	Bosmans 1994
Water beetles	59	Bosmans 1994
Empididae s.l.	50	present study
Dolichopodidae	48	Pollet 2000
Syrphidae	36	Meerhaeghe & Grootaert 1998

Red Data Books are of limited use in space and time. The present empidid list can only be used in Flanders, and is not applicable to the empidid fauna of Wallony where the central European faunal component is much more strongly represented and an additional 100 species can be expected. Several boreomontane species such as *Syndyas nigripes*, a critically endangered species in Flanders, reach the northernmost limit of their distribution area in Flanders but are known to be (more) common in their preferred habitats near the centre of their distribution area. As a result, most of these species are not threatened or rare in the latter regions. It is, however, usefull to consider the geographical distribution on a larger geographical scale to find out how relevant the above mentioned diffferences are. *Syneches muscarius*, which is currently considered extinct in Flanders and recorded for the last time in 1949, is also very rare in the UK (Collin 1961). The species was last recorded in the Netherlands in 1953 (van der Goot 1990) and during recent times has not been observed in France (Daugeron in litt.). Van der Goot (1990) has suggested that drainage and soil enrichment of wet grasslands with manure and chemical fertilisers are the main reasons for the decline of this species. On the other hand, it is quite possible that this species may suddenly reappear and establish stable populations again. A striking example of this phenomenon is the virtual disappearance in Belgium of the hornet, *Vespa crabro* (Hymenoptera: Vespidae), and its spectacular re-establishment during the last 10 years (Asperges *et al.* 1993).

In finding an explanation for the observed rarity and vulnerability estimates, information on the ecological requirements of the separate species plays a crucial role. Unfortunately our knowledge on the autecology of most empidid species is still very poor and it is a challenge for the future to gather this information in a systematic way.

Despite its usefulness, the present Red Data Book of Empididae of Flanders has some important scientific shortcomings. Sixty percent of the Flemish region has not yet been explored for empidids and the sampling methods used in each of the time periods are rather different. Before 1981 empidids were caught mainly by sweepnet and not much attention was given to minute species (e.g. *Drapetis* spp.). However, the argument that old collections contain only large, conspicuous and/or rare species is not valid for empidids since most cannot be identified in the field and must be studied under a stereoscopic microscope. Since 1981 empidid flies have mainly been collected, and in large numbers, by coloured pan traps and Malaise traps which exclude the collector's bias. Thus common and small species are represented in the samples according to their activity and abundance in the field.

The debate about sampling methods continues. In northern Germany, emergence traps are mostly used for the assessment of empidoid diversity (Meyer and Heydemann 1990; Meyer *et al*. 1995). This technique indeed provides an accurate estimate of the fauna that emerges from the soil or vegetation. However, adults do not necessarily remain in the same habitat where they completed their larval development (Delettre *et al*. 1998; Morvan 1997). It is therefore recommended that both attractive and interception traps (e.g. coloured water traps and Malaise traps) in combination with emergence traps are used to obtain a reliable idea of the empidid diversity of a particular habitat. Information on the life histories is of great importance to the management of nature reserves: for example, larvae of wetland-inhabiting empidid flies do not live in wetlands but in adjacent drier sites, it is essential to consider both habitats in order to protect these species.

It remains unclear whether species that have not been recorded after 1980 are really extinct. They may still be present, but in such low numbers that the probability of being collected is extremely low. The terms 'critically endangered', 'endangered', 'vulnerable', 'susceptible' also remain relative descriptions of species rarity, but their link to threatened and rare habitats lends credibility to these Red Data Book categories. Indeed, certain saltmarsh, dune and shore-inhabiting species, and in the past also wetland species, are among the most threatened empidid species. *Chersodromia* species provide a good illustration. These flies occur on beaches, the sand of which is massively displaced by the wind during winter and replaced in spring by man to provide suitable space for summer tourism. This manipulation, together with the removal of drift material from the tide mark destroys the breeding areas of many of these species. Also, a number of species are at the limit of their distributions in Flanders. Stress on their habitats is likely to threaten such marginal populations that are already inhabiting suboptimal habitats. Ultimately, this causes shrinkage of the total area of distribution of these species (e.g. *Syneches muscarius*).

Another threat to the empidid fauna is the perturbation of vegetation layers resulting in altered light intensities reaching the soil. Even in countryside gardens, species richness and abundances can be very low. Since most species have multi-habitat requirements, even small changes in the environment can dramatically

interrupt their life cycles. There are indications that rapid cycles in land use change, e.g. from forest to pasture, from pasture to cornfield, from abandoned cornfield again to pasture or forest, results in a very slow restoration of the original empidid fauna. The impact of such alterations on the different species should be given sufficient attention in future research as this information is of major importance in providing guidelines for 'nature restoration' and nature development.

Red Data Books are supposed to be a signal to decision makers and the public about the qualitative condition of nature in their country and are thus an important tool for nature management (Hoogeveen 1998). Most RDBs consist of merely a list of species grouped per RDB category. In the German as well as the British versions, these categories are solely based on the geographical distribution of the species and must be considered as estimates of rarity alone, without any information on the degree of recent decline (vulnerability). As has been demonstrated, the Flemish RDB concept encompasses both rarity and vulnerability.

One of the main criticisms of Red Data Books is that sampling efforts are never sufficient, that they do not reflect the exact condition of the population and that the results are, therefore, arbitrary (Heijerman and Turin 1998). These arguments are valid but it must also be recognised that there is an urgent need for properly processed data, and that such data, even if incomplete, may reveal real patterns.

Site quality assessment is preferably based on a combination of species' richness, abundance, rarity and vulnerability estimates of as many biota as possible. As reliable data on rarity and vulnerability are almost entirely restricted to Red Data Books, it seems evident that only organisms which have been investigated in this respect can be used in these assessment studies (see Pollet and Grootaert 1999; Pollet, in press). It has been suggested that there is no need to consider natural target types, target species or RDB species in situations of spontaneous development of natural areas (Heijerman and Turin 1998). It is our conviction that this is too simplistic a view of reality; decision makers need to know their goal – what the natural situation is, what kind of measures should be taken to reach that goal (e.g. replace former fields or exotic tree stands with semi-natural habitats) and which organisms can be used to monitor the on-going processes. As many Empidoidea (including Dolichopodidae) show strict habitat requirements, they may be considered as promising bio-indicators in this direction, in combination with other organisms.

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Appendix 1. List of Empididae s.l. recorded in Flanders with rarity and trend values.

Species	Rarity				current rarity*	Trend (degree of decrease)
	1887–1980		1981–1999			
	No. of UTM 5 km squares	%	No. of UTM 5 km squares	%		
Extinct						
Chelifera stigmatica (Schiner, 1860)	1	0.7	—	—	U	−100
Chersodromia arenaria Haliday, 1833	1	0.7	—	—	U	−100
Chersodromia speculifera Walker, 1851	1	0.7	—	—	U	−100
Clinocera (Hydrodromia) stagnalis (Haliday, 1833)	5	3.6	—	—	U	−100
Dolichocephala engeli Niesiolowski, 1992	1	0.7	—	—	U	−100
Empis (Empis) pusio Egger, 1860	1	0.7	—	—	U	−100
Empis (Leptempis) variegata Meigen, 1804	2	1.4	—	—	U	−100
Empis (Pachymeria) femorata Fabricius, 1798	1	0.7	—	—	U	−100
Hemerodromia unilineata Zetterstedt, 1842	2	1.4	—	—	U	−100
Hilara bistriata Zetterstedt, 1842	2	1.4	—	—	U	−100
Hilara brevivittata Macquart, 1827	3	2.2	—	—	U	−100
Hilara griseola Zetterstedt, 1838	1	0.7	—	—	U	−100
Hilara intermedia (Fallén, 1816)	3	2.2	—	—	U	−100
Hilara primula Collin, 1927	9	6.5	—	—	U	−100
Hilara tenella (Fallén, 1816)	2	1.4	—	—	U	−100
Platypalpus albifacies (Collin, 1926)	2	1.4	—	—	U	−100
Platypalpus analis (Meigen, 1830)	4	2.9	—	—	U	−100
Platypalpus fuscicornis (Zetterstedt, 1842)	1	0.7	—	—	U	−100
Platypalpus pseudorapidus Kovalev, 1971	1	0.7	—	—	U	−100
Platypalpus sylvicola (Collin, 1926)	1	0.7	—	—	U	−100
Ragas unica Walker, 1836	2	1.4	—	—	U	−100
Rhamphomyia (Holoclera) variabilis (Fallén, 1815)	2	1.4	—	—	U	−100
Rhamphomyia (Megacyttarus) maculipennis Zetterstedt, 1842	3	2.2	—	—	U	−100
Syneches muscarius (Fabricius, 1794)	6	4.3	—	—	U	−100
Tachydromia connexa Meigen, 1822	4	2.9	—	—	U	−100
Tachydromia woodi (Collin, 1926)	1	0.7	—	—	U	−100
Trichina bilobata Collin, 1926	1	0.7	—	—	U	−100
Critically endangered						
Chelifera precatoria Fallén, 1815	6	4.3	1	0.7	zZ	−84.2
Chersodromia incana Walker, 1851	6	4.3	1	0.7	zZ	−84.2
Hilara canescens Zetterstedt, 1849	7	5.1	1	0.7	zZ	−86.5
Hilara pilosa Zetterstedt, 1842	6	4.3	1	0.7	zZ	−84.2
Hilara sturmii Meigen, 1822	12	8.7	2	1.4	zZ	−84.2
Microphor crassipes Macquart, 1827	5	3.6	1	0.7	zZ	−81.1
Rhamphomyia (Pararhamphomyia) marginata (Fabricius, 1787)	0	—	1	0.7	zZ	—
Rhamphomyia (Pararhamphomyia) physoprocta Frey, 1913	0	—	1	0.7	zZ	—
Syndyas nigripes (Zetterstedt, 1842)	0	—	1	0.7	zZ	—
Tachydromia sabulosa Meigen, 1830	7	5.1	1	0.7	zZ	−86.5
Endangered						
Bicellaria nigra (Meigen, 1824)	4	2.9	2	1.4	zZ	−52.7
Empis (Empis) serotina Loew, 1867	8	5.8	4	2.7	Z	−52.7
Empis (Platyptera) borealis Linnaeus, 1758	3	2.2	1	0.7	zZ	−68.5
Empis (Xanthempis) digramma Meigen, 1835	2	1.4	1	0.7	zZ	−52.7
Hilara beckeri Strobl, 1892	2	1.4	1	0.7	zZ	−52.7
Hilara gallica (Meigen, 1804)	3	2.2	1	0.7	zZ	−68.5
Hilara litorea (Fallén, 1816)	8	5.8	4	2.7	Z	−52.7
Hilara lurida (Fallén, 1816)	4	2.9	2	1.4	zZ	−52.7
Hybos grossipes (Linnaeus, 1767)	4	2.9	2	1.4	zZ	−52.7

Species	Rarity 1887–1980 No. of UTM 5 km squares	%	1981–1999 No. of UTM 5 km squares	%	current rarity*	Trend (degree of decrease)
Platypalpus praecinctus (Collin, 1926)	2	1.4	1	0.7	zZ	−52.7
Platypalpus rapidus (Meigen, 1822)	2	1.4	1	0.7	zZ	−52.7
Tachydromia costalis (von Roser, 1840)	3	2.2	1	0.7	zZ	−68.5
Vulnerable						
Empis (Xanthempis) aemula Loew, 1873	1	0.7	1	0.7	zZ	−5.5
Chersodromia cursitans Zetterstedt, 1819	3	2.2	2	1.4	zZ	−37
Crossopalpus curvipes (Meigen, 1822)	3	2.2	2	1.4	zZ	−37
Trichopeza longicornis (Meigen, 1822)	3	2.2	2	1.4	zZ	−37
Hilara brevistyla Collin, 1927	4	2.9	3	2.1	Z	−29.1
Platypalpus verralli (Collin, 1926)	4	2.9	3	2.1	Z	−29.1
Platypalpus excisus (Becker, 1907)	4	2.9	4	2.7	Z	−5.5
Platypalpus strigifrons (Zetterstedt, 1849)	10	7.2	6	4.1	Z	−43.3
Hilara fuscipes (Fabricius, 1794)	11	8.0	7	4.8	Z	−39.9
Hybos femoratus (Müller, 1776)	20	14.5	11	7.5	vZ	−48
Rhamphomyia (Megacyttarus) crassirostris (Fallén, 1816)	19	13.8	14	9.6	vZ	−30.4
Susceptible						
Bicellaria pilosa Lundbeck, 1910	2	1.4	8	5.5	vZ	278.1
Bicellaria simplicipes (Zetterstedt, 1842)	0	—	7	4.8	Z	—
Bicellaria spuria (Fallén, 1816)	0	—	7	4.8	Z	—
Bicellaria sulcata (Zetterstedt, 1842)	2	1.4	7	4.8	Z	230.8
Chelifera precabunda Collin, 1961	1	0.7	1	0.7	zZ	−5.5
Chelipoda albiseta (Zetterstedt, 1838)	1	0.7	5	3.4	Z	372.6
Chersodromia hirta Walker, 1835	2	1.4	2	1.4	zZ	−5.5
Crossopalpus abditus Kovalev, 1972	0	—	4	2.7	Z	—
Crossopalpus flexuosus (Loew, 1840)	3	2.2	12	8.2	vZ	278.1
Crossopalpus setiger (Loew, 1859)	3	2.2	8	5.5	vZ	152.1
Dolichocephala guttata (Haliday, 1833)	4	2.9	12	8.2	vZ	183.6
Drapetis assimilis (Fallén, 1815)	0	—	13	8.9	vZ	—
Empis (Anacrostichus) nitida Meigen, 1804	1	0.7	5	3.4	Z	372.6
Empis (Empis) acinerea Chvala, 1985	0	—	6	4.1	Z	—
Empis (Empis) albopilosa de Meijere, 1935	0	—	7	4.8	Z	—
Empis (Empis) bicuspidata Collin, 1927	2	1.4	10	6.8	vZ	372.6
Empis (Empis) caudatula Loew, 1867	4	2.9	10	6.8	vZ	136.3
Empis (Empis) pennipes Linnaeus, 1758	3	2.2	6	4.1	Z	89
Empis (Empis) rufiventris Meigen, 1838	0	—	3	2.1	Z	—
Empis (Empis) woodi Collin, 1927	0	—	4	2.7	Z	—
Empis (Euempis) ciliata Fabricius, 1787	5	3.6	12	8.2	vZ	126.8
Empis (Leptempis) grisea Fallén, 1816	2	1.4	6	4.1	Z	183.6
Empis (Leptempis) nigricans Meigen, 1804	3	2.2	3	2.1	Z	−5.5
Empis (Xanthempis) lutea Meigen, 1804	0	—	2	1.4	zZ	—
Empis (Xanthempis) punctata Meigen, 1804	5	3.6	12	8.2	vZ	126.8
Euthyneura gyllenhali (Zetterstedt, 1838)	1	0.7	2	1.4	zZ	89
Gloma fuscipennis Meigen, 1822	0	—	2	1.4	zZ	—
Hilara albipennis von Roser, 1840	0	—	6	4.1	Z	—
Hilara clypeata Meigen, 1822	7	5.1	7	4.8	Z	−5.5
Hilara discoidalis Lundbeck, 1910	4	2.9	4	2.7	Z	−5.5
Hilara griseifrons Collin, 1927	0	—	5	3.4	Z	—
Hilara interstincta (Fallén, 1816)	11	8.0	10	6.8	vZ	−14.1
Hilara lugubris (Zetterstedt, 1819)	0	—	3	2.1	Z	—
Hilara lundbecki Frey, 1913	7	5.1	11	7.5	vZ	48.5
Hilara manicata Meigen, 1822	4	2.9	14	9.6	vZ	230.8
Hilara medeteriformis Collin, 1961	0	—	2	1.4	zZ	—
Hilara nigrina (Fallén, 1816)	3	2.2	8	5.5	vZ	152.1

Species	Rarity					Trend (degree of decrease)
	1887–1980		1981–1999		current rarity*	
	No. of UTM 5 km squares	%	No. of UTM 5 km squares	%		
Hilara nigrocincta de Meijere, 1935	2	1.4	3	2.1	Z	41.8
Hilara quadrivittata Meigen, 1822	4	2.9	7	4.8	Z	65.4
Hilara rejecta Collin, 1927	0	—	3	2.1	Z	—
Hilara subpollinosa Collin, 1927	3	2.2	9	6.2	vZ	183.6
Hilara thoracica Macquart, 1827	1	0.7	1	0.7	zZ	−5.5
Leptopeza flavipes (Meigen, 1820)	5	3.6	10	6.8	vZ	89
Microphor anomalus (Meigen, 1824)	1	0.7	11	7.5	vZ	939.7
Microphor holosericeus (Meigen, 1804)	3	2.2	14	9.6	vZ	341.1
Oedalea hybotina (Fallén, 1816)	1	0.7	10	6.8	vZ	845.2
Oedalea stigmatella Zetterstedt, 1842	0	—	4	2.7	Z	—
Oedalea zetterstedti Collin, 1926	0	—	10	6.8	vZ	—
Platypalpus aeneus (Macquart, 1823)	1	0.7	1	0.7	zZ	−5.5
Platypalpus albicornis (Zetterstedt, 1842)	5	3.6	8	5.5	vZ	51.2
Platypalpus albiseta (Panzer, 1806)	5	3.6	5	3.4	Z	−5.5
Platypalpus albocapillatus (Fallén, 1815)	2	1.4	3	2.1	Z	41.8
Platypalpus aristatus (Collin, 1926)	0	—	10	6.8	vZ	—
Platypalpus candicans (Fallén, 1815)	12	8.7	11	7.5	vZ	−13.4
Platypalpus caroli Grootaert, 1987	0	—	5	3.4	Z	—
Platypalpus cothurnatus Macquart, 1827	2	1.4	11	7.5	vZ	419.9
Platypalpus coxatus (Zetterstedt, 1842)	0	—	8	5.5	vZ	—
Platypalpus dessarti Grootaert, 1983	0	—	9	6.2	vZ	—
Platypalpus exilis (Meigen, 1822)	1	0.7	5	3.4	Z	372.6
Platypalpus flavicornis (Meigen, 1822)	4	2.9	11	7.5	vZ	159.9
Platypalpus infectus (Collin, 1926)	1	0.7	9	6.2	vZ	750.7
Platypalpus kirtlingensis Grootaert, 1986	0	—	10	6.8	vZ	—
Platypalpus laticinctus Walker, 1851	1	0.7	1	0.7	zZ	−5.5
Platypalpus leucocephalus (von Roser, 1840)	1	0.7	2	1.4	zZ	89
Platypalpus leucothrix (Strobl, 1910)	0	—	1	0.7	zZ	—
Platypalpus luteipes Zuskova 1966	0	—	2	1.4	zZ	—
Platypalpus luteoloides Grootaert, 1983	0	—	4	2.7	Z	—
Platypalpus luteolus (Collin, 1926)	1	0.7	1	0.7	zZ	−5.5
Platypalpus luteus (Meigen, 1804)	6	4.3	8	5.5	vZ	26
Platypalpus maculimana (Zetterstedt, 1842)	0	—	9	6.2	vZ	—
Platypalpus major (Zetterstedt, 1842)	0	—	3	2.1	Z	—
Platypalpus nanus (Oldenberg, 1924)	5	3.6	6	4.1	Z	13.4
Platypalpus niveiseta (Zetterstedt, 1842)	2	1.4	2	1.4	zZ	−5.5
Platypalpus optivus (Collin, 1926)	0	—	1	0.7	zZ	—
Platypalpus pallipes (Fallén, 1815)	1	0.7	14	9.6	vZ	1223.3
Platypalpus pictitarsis (Becker, 1902)	0	—	1	0.7	zZ	—
Platypalpus politus (Collin, 1926)	0	—	4	2.7	Z	—
Platypalpus pseudofulvipes Frey, 1909	8	5.8	13	8.9	vZ	53.6
Platypalpus pygialis Chvala, 1973	0	—	8	5.5	vZ	—
Platypalpus stabilis (Collin, 1961)	0	—	7	4.8	Z	—
Rhamphomyia (Amydroneura) erythrophthalma Meigen, 1830	3	2.2	14	9.6	vZ	341.1
Rhamphomyia (Amydroneura) gibba (Fallén, 1816)	7	5.1	11	7.5	vZ	48.5
Rhamphomyia (Holoclera) flava (Fallén, 1816)	0	—	5	3.4	Z	—
Rhamphomyia (Pararhamphomyia) atra Meigen, 1822	0	—	5	3.4	Z	—
Rhamphomyia (Pararhamphomyia) barbata (Macquart, 1823)	0	—	14	9.6	vZ	—
Rhamphomyia (Pararhamphomyia) geniculata Meigen, 1830	0	—	5	3.4	Z	—
Rhamphomyia (Pararhamphomyia) nitidicollis Frey, 1913	0	—	3	2.1	Z	—

Species	1887–1980		1981–1999		current rarity*	of decrease)
	No. of UTM 5 km squares	%	No. of UTM 5 km squares	%		
Rhamphomyia (Pararhamphomyia) tarsata Meigen, 1822	0	—	6	4.1	Z	—
Rhamphomyia (Pararhamphomyia) tibiella Zetterstedt, 1842	0	—	8	5.5	vZ	—
Symballophthalmus fuscitarsis (Zetterstedt, 1859)	1	0.7	1	0.7	zZ	−5.5
Tachydromia aemula (Loew, 1864)	7	5.1	9	6.2	vZ	21.5
Tachydromia smithi Chvala, 1966	6	4.3	10	6.8	vZ	57.5
Tachydromia terricola Zetterstedt, 1819	1	0.7	14	9.6	vZ	1223.3
Tachydromia umbrarum Haliday, 1833	8	5.8	12	8.2	vZ	41.8
Tachypeza fuscipennis (Fallén, 1815)	2	1.4	2	1.4	zZ	−5.5
Trichina clavipes Meigen, 1830	3	2.2	10	6.8	vZ	215.1
Trichina elongata Haliday, 1833	2	1.4	9	6.2	vZ	325.3
Trichina pallipes (Zetterstedt, 1830)	5	3.6	5	3.4	Z	−5.5
Trichinomyia flavipes (Meigen, 1830)	0	—	1	0.7	zZ	—
Near threatened						
Hybos culiciformis (Fabricius, 1775)	43	31.2	23	15.8	vA	−49.4
Safe/Low risk						
Bicellaria vana Collin, 1926	1	0.7	16	11.0	vA	1412.3
Chelipoda vocatoria (Fallén, 1815)	4	2.9	21	14.4	vA	396.2
Crossopalpus humilis (Frey, 1913)	3	2.2	16	11.0	vA	404.1
Crossopalpus minimus (Meigen, 1838)	0	—	23	15.8	vA	—
Crossopalpus nigritellus (Zetterstedt, 1842)	1	0.7	40	27.4	A	3680.8
Dolichocephala irrorata (Fallén, 1815)	21	15.2	28	19.2	vA	26
Drapetis parilis Collin, 1926	0	—	56	38.4	A	—
Drapetis pusilla Loew, 1859	0	—	37	25.3	A	—
Drapetis simulans Collin, 1961	0	—	45	30.8	A	—
Elaphropeza ephippiata (Fallén, 1815)	2	1.4	40	27.4	A	1790.4
Empis (Coptophlebia) albinervis Meigen, 1822	7	5.1	61	41.8	A	723.7
Empis (Coptophlebia) vitripennis Meigen, 1822	7	5.1	27	18.5	vA	264.6
Empis (Empis) aestiva Loew, 1867	5	3.6	78	53.4	zA	1374.5
Empis (Empis) chioptera Meigen, 1804	1	0.7	66	45.2	A	6138.4
Empis (Empis) nigripes Fabricius, 1794	2	1.4	86	58.9	zA	3964.4
Empis (Empis) nuntia Meigen, 1938	0	—	28	19.2	vA	—
Empis (Empis) planetica Collin, 1927	0	—	24	16.4	vA	—
Empis (Empis) praevia Collin, 1927	0	—	71	48.6	A	—
Empis (Empis) prodromus Loew, 1867	3	2.2	30	20.5	vA	845.2
Empis (Euempis) tessellata (Fabricius, 1794)	24	17.4	56	38.4	A	120.5
Empis (Kritempis) livida Linnaeus, 1758	14	10.1	78	53.4	zA	426.6
Empis (Polyblepharis) opaca Meigen, 1804	6	4.3	44	30.1	A	593.2
Empis (Xanthempis) stercorea Linnaeus, 1761	7	5.1	31	21.2	vA	318.6
Empis (Xanthempis) trigramma Wiedemann, 1822	3	2.2	25	17.1	vA	687.7
Euthyneura myrtilli Macquart, 1836	0	—	35	24.0	vA	—
Heleodromia immaculata Haliday, 1833	5	3.6	15	10.3	vA	183.6
Hilara chorica (Fallén, 1816)	24	17.4	22	15.1	vA	−13.4
Hilara cornicula Loew, 1873	5	3.6	18	12.3	vA	240.3
Hilara flavipes Meigen, 1822	22	15.9	19	13.0	vA	−18.4
Hilara maura (Fabricius, 1776)	29	21.0	24	16.4	vA	−21.8
Hilara monedula Collin, 1927	11	8.0	23	15.8	vA	97.6
Ocydromia glabricula (Fallén, 1816)	3	2.2	40	27.4	A	1160.3
Oedalea flavipes Zetterstedt, 1842	0	—	16	11.0	vA	—
Oedalea holmgreni Zetterstedt, 1852	0	—	15	10.3	vA	—
Oedalea tibialis Macquart, 1827	0	—	16	11.0	vA	—

Species	Rarity					Trend (degree of decrease)
	1887–1980		1981–1999		current rarity*	
	No. of UTM 5 km squares	%	No. of UTM 5 km squares	%		
Phyllodromia melanocephala (Fabricius, 1794)	0	—	35	24.0	vA	—
Platypalpus agilis (Meigen, 1822)	13	9.4	55	37.7	A	299.9
Platypalpus annulatus (Fallén, 1815)	17	12.3	40	27.4	A	122.4
Platypalpus annulipes (Meigen, 1822)	3	2.2	18	12.3	vA	467.1
Platypalpus articulatoides (Frey, 1918)	4	2.9	28	19.2	vA	561.6
Platypalpus articulatus Macquart, 1827	3	2.2	17	11.6	vA	435.6
Platypalpus australominutus Grootaert, 1989	1	0.7	27	18.5	vA	2452.1
Platypalpus calceatus (Meigen, 1822)	6	4.3	20	13.7	vA	215.1
Platypalpus ciliaris (Fallén, 1816)	4	2.9	51	34.9	A	1105.1
Platypalpus clarandus (Collin, 1926)	10	7.2	29	19.9	vA	174.1
Platypalpus cursitans (Fabricius, 1775)	9	6.5	43	29.5	A	351.6
Platypalpus interstinctus (Collin, 1926)	10	7.2	32	21.9	vA	202.5
Platypalpus longicornis (Meigen, 1822)	28	20.3	68	46.6	A	129.5
Platypalpus longiseta (Zetterstedt, 1842)	9	6.5	56	38.4	A	488.1
Platypalpus maculipes (Meigen, 1822)	14	10.1	15	10.3	vA	1.3
Platypalpus minutus (Meigen, 1804)	35	25.4	62	42.5	A	67.4
Platypalpus niger (Meigen, 1804)	19	13.8	38	26.0	A	89
Platypalpus nigritarsis (Fallén, 1816)	0	—	17	11.6	vA	—
Platypalpus notatus (Meigen, 1822)	12	8.7	20	13.7	vA	57.5
Platypalpus pallidicornis (Collin, 1926)	3	2.2	15	10.3	vA	372.6
Platypalpus pallidiventris (Meigen, 1822)	33	23.9	102	69.9	zA	192.2
Platypalpus pectoralis (Fallén, 1815)	11	8.0	35	24.0	vA	200.7
Rhamphomyia (Aclonempis) longipes (Meigen, 1804)	1	0.7	47	32.2	A	4342.5
Rhamphomyia (Holoclera) nigripennis (Fabricius, 1794)	2	1.4	40	27.4	A	1790.4
Rhamphomyia (Rhamphomyia) subcinerascens Collin, 1926	0	—	16	11.0	vA	—
Rhamphomyia (Rhamphomyia) sulcata (Meigen, 1804)	0	—	33	22.6	vA	—
Stilpon graminum (Fallén, 1815)	0	—	15	10.3	vA	—
Tachydromia annulimana Meigen, 1822	21	15.2	26	17.8	vA	17
Tachydromia arrogans (Linnaeus, 1761)	10	7.2	35	24.0	vA	230.8
Tachypeza nubila (Meigen, 1804)	7	5.1	43	29.5	A	480.6
Data deficient						
Bicellaria mera Collin, 1961	0	—	1	0.7	zZ	—
Bicellaria subpilosa Collin, 1926	0	—	1	0.7	zZ	—
Drapetis arcuata Loew, 1859	0	—	2	1.4	zZ	—
Drapetis exilis Meigen, 1822	0	—	2	1.4	zZ	—
Empis (Empis) decora Meigen, 1822	0	—	2	1.4	zZ	—
Empis (Empis) near *acinerea*	0	—	1	0.7	zZ	—
Hilara anglodanica Lundbeck, 1913	0	—	1	0.7	zZ	—
Hilara curtisi Collin, 1927	0	—	1	0.7	zZ	—
Hilara hirtipes Collin, 1927	0	—	2	1.4	zZ	—
Hilara obscura Meigen, 1822	0	—	2	1.4	zZ	—
Hilara woodi Collin, 1927	0	—	1	0.7	zZ	—
Platypalpus latemi Grootaert, 1983	0	—	1	0.7	zZ	—
Platypalpus ochrocerus (Collin, 1961)	0	—	1	0.7	zZ	—
Platypalpus pulicarius (Meigen, 1830)	0	—	2	1.4	zZ	—
Platypalpus ruficornis (von Roser, 1840)	0	—	1	0.7	zZ	—
Platypalpus stigma (Collin, 1926)	0	—	1	0.7	zZ	—
Platypalpus villeneuvi Becker, 1910	0	—	1	0.7	zZ	—
Platypalpus vividus Meigen, 1838	0	—	1	0.7	zZ	—
Rhamphomyia (Aclonempis) albohirta Collin, 1926	0	—	2	1.4	zZ	—
Rhamphomyia (Holoclera) caliginosa Collin, 1926	0	—	2	1.4	zZ	—

Species	1887–1980		1981–1999		current rarity*	of decrease)
	No. of UTM 5 km squares	%	No. of UTM 5 km squares	%		
Rhamphomyia (Holoclera) lamellata Collin, 1926	0	—	2	1.4	zZ	—
Rhamphomyia (Holoclera) umbripennis Meigen, 1822	0	—	2	1.4	zZ	—
Rhamphomyia (Megacyttarus) anomalipennis Meigen, 1822	0	—	1	0.7	zZ	—
Rhamphomyia (Pararhamphomyia) albipennis (Fallén, 1816)	0	—	1	0.7	zZ	—
Rhamphomyia (Pararhamphomyia) curvula Frey, 1913	0	—	2	1.4	zZ	—
Rhamphomyia (Pararhamphomyia) dentipes (Zetterstedt, 1842)	0	—	1	0.7	zZ	—
Rhamphomyia (Rhamphomyia) laevipes (Fallén, 1816)	0	—	1	0.7	zZ	—
Rhamphomyia (Rhamphomyia) spinipes (Fallén, 1816)	0	—	1	0.7	zZ	—
Rhamphomyia (Rhamphomyia) stigmosa Macquart, 1827	0	—	1	0.7	zZ	—
Rhamphomyia (Rhamphomyia) sulcatella Collin, 1926	0	—	2	1.4	zZ	—
Stilpon lunatus (Haliday, 1851)	0	—	1	0.7	zZ	—
Stilpon nubilus Collin, 1926	0	—	2	1.4	zZ	—
Stilpon sublunatus Collin, 1961	0	—	1	0.7	zZ	—
Symballophthalmus dissimilis (Fallén, 1815)	0	—	1	0.7	zZ	—

*A: common; U: extinct; vA: fairly common; zA: very common; vZ: fairly rare; Z: rare; zZ: very rare.