

Diptera from Belgium : a survey

by P. GROOTAERT

Summary :

The history of dipterology in Belgium is briefly reviewed while the recent evolutions are dealt with in more detail. In 1981, a sampling campaign was started using Malaise traps, coloured water traps, pitfall traps etc. in order to get an idea of the faunal composition of the major zoogeographical provinces (atlantic and central European provinces with boreo-montane and submediterranean intrusions) and biotopes in Belgium. Since then, about 40 localities in semi-natural and cultivated biotopes have been sampled resulting in about 60 year cycles which are available for study. To cope with the serious identification problems, an informal workshop was founded in 1983. A number of Belgian and foreign specialists volunteered to study certain Diptera families and to exchange material and data so that more insight could be obtained in the taxonomy of the species, their distribution in Belgium, their phenology and other biological characteristics. This resulted in the publication of several annotated check lists and maps. Further, a catalogue of the Belgian Diptera fauna is in preparation. Nearly 4,000 species are actually known with certainty. In comparison to the British fauna, more than 6,000 species can be expected to occur in Belgium.

Key-words: Diptera, history, research, Belgium.

Résumé:

L'histoire de la diptérologie en Belgique est brièvement revue. Les recherches récentes sont détaillées. En 1981, une campagne de récoltes a commencé à l'aide de pièges Malaise, d'assiettes colorées et de pièges Barber, afin d'obtenir une idée sur la composition de la faune des principaux biotopes dans nos différentes provinces zoogéographiques (atlantique et Europe centrale avec des incursions boreo-montane et subméditerranéenne). Depuis lors, 60 cycles annuels ont été étudiés dans 40 sites différents.

Un groupe de travail a été fondé en 1983 avec pour but, l'échange de matériel et de données afin d'améliorer nos connaissances de la taxinomie, de la répartition géographique, de la phénologie et d'autres caractéristiques biologiques. Plusieurs catalogues et cartes ont été publiés. Un catalogue reprenant tous les diptères de Belgique est en préparation. En comparaison avec la faune britannique, le nombre d'espèces présentes en Belgique est estimé à 6,000 espèces.

Mots-clés: Diptères, histoire, recherches, Belgique.

Introduction

The order of the Diptera is the largest insect group occurring in Belgium. In comparison to the British fauna, we estimate that over 6,000 species belonging to no less than 105 families are present in our country. The Coleoptera, historically always considered as the most diverse group is only estimated at 4,500 - 5,000 species. This vast number of species to deal with, probably

discouraged many students in dipterology so that a lot remains to be done on taxonomy, faunistics and ecology. In this short note we want to give a survey of the research on Diptera in Belgium: its history, the recent approach and perspectives for the future.

History

J. MACQUART himself reported the first fly from our country. In 1836, he described from the surroundings of Liège a new genus and a new species that he called *Euthyneura myrtilli*. A year later, C. WESMAEL, a famous hymenopterist, published his observations on the quite rare *Xylophagus marginatus* Meigen. Further, a number of short notes were published by the brothers COUCKE between 1892 and 1896. In the mean time, J.Ch. JACOBS became very active. Probably incited by the "Nieuwe naamlijst van Nederlandsche Diptera" by F.M. VAN DER WULP and J.C.H. DE MEIJERE (1898), he made a catalogue of the Belgian Diptera. It took several years (1900-1906) to achieve it, listing finally about 1,450 species. In the beginning of the century, F. MEUNIER published a number of faunistical papers so that we can get an idea of the species occurring at that time. Unfortunately his collection is lost so that changes in nomenclature can not be checked. In 1907 A. LAMEERE published his "Manuel de la faune de Belgique" which was of great help to many entomologists. A. TONNOIR (1919-1921) was very active during a short period. He described many psychodids from our country but unfortunately he left Belgium for Australia. Already from 1908, M. GOETGHEBUER started to study Nematocera. He described a lot of new species of chironomids and ceratopogonids from Belgium. He also published several volumes on chironomids in the series "Faune de France". From 1908 till 1955, he published no less than 117 notes, papers and catalogues on Diptera. It should be mentioned that M. GOETGHEBUER and M. BEQUAERT built up the most representative and richest collections of flies from our country. Both collections are now preserved in the Koninklijk Belgisch Instituut voor Natuurwetenschappen.

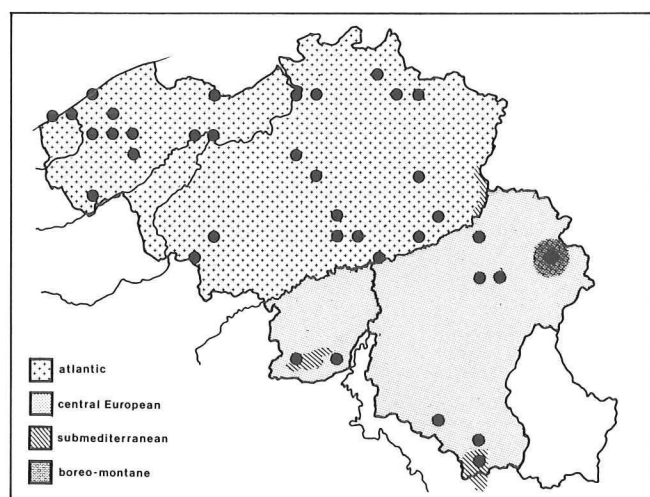


Fig. 1. Zoogeographical provinces in Belgium with the distribution of the Malaise traps.

From the thirties on, a number of professional dipterists were employed by the latter Institute. The emphasis of their research however was put on the central African fauna. A. COLLART (1933-1963) published about 50 papers mainly on faunistics and he paid special attention to the fauna of the "Hautes Fagnes". R. TOLLET (1943-1958) studied Mycetophilidae. F. FRANCOIS made a revision of the European Bombyliidae. P. VANSCHUYTBROECK published a few notes on Sphaeroceridae. Finally, J. VERBEKE (1944-1973) made some thorough studies on Tachinidae and Sciomyzidae. In alliance with the universities of Liège and Gembloux, M. LECLERCQ is since 1941 very active on Tabanidae and other parasitic groups. A list of papers on Belgian Diptera published since the early beginning till 1985, comprising some 400 references in all, has been compiled by GROOTAERT & VERBIST (1986).

Recent research

In the early eighties, there was a lot of interest in the zoogeographical distribution of invertebrates. This was coordinated in the "European Invertebrate Survey" program. Unfortunately, only very few collections of Belgian Diptera were available and there was an urgent need for recent material. In 1981, a vast sampling campaign was started in order to get an idea of the complex faunistical composition of the major zoogeographical provinces. In Belgium the atlantic and central European province meet each other roughly along the rivers "Sambre and Meuse" (Fig. 1). Further, there are boreo-montane elements on the plateau des Hautes Fagnes and some submediterranean intrusions on certain lime soils such as 1° the St. Pietersberg, 2° various hills in the region around Couvin and 3° a slope on a hill at Torgny in the extreme South of Belgium.

For this campaign several techniques were used and tested. The Malaise traps proved to be the best devices to obtain a global idea of the Diptera fauna (Table I; GROOTAERT & POLLET, in press). White, red and blue water traps were also tested and it appeared that the white water traps gave results that correspond with those of the Malaise traps. Fig. 2 shows the different attraction of two species of empidid flies, *Hilara cornicula*, a species in which the male hunts on the water surface and *Empis nigripes*, a nectar feeder. The combination of different kind of traps on the same site is of course the ideal situation to get an idea of the faunal composition but it is almost impossible to work through the enormous amounts of material (Table I).

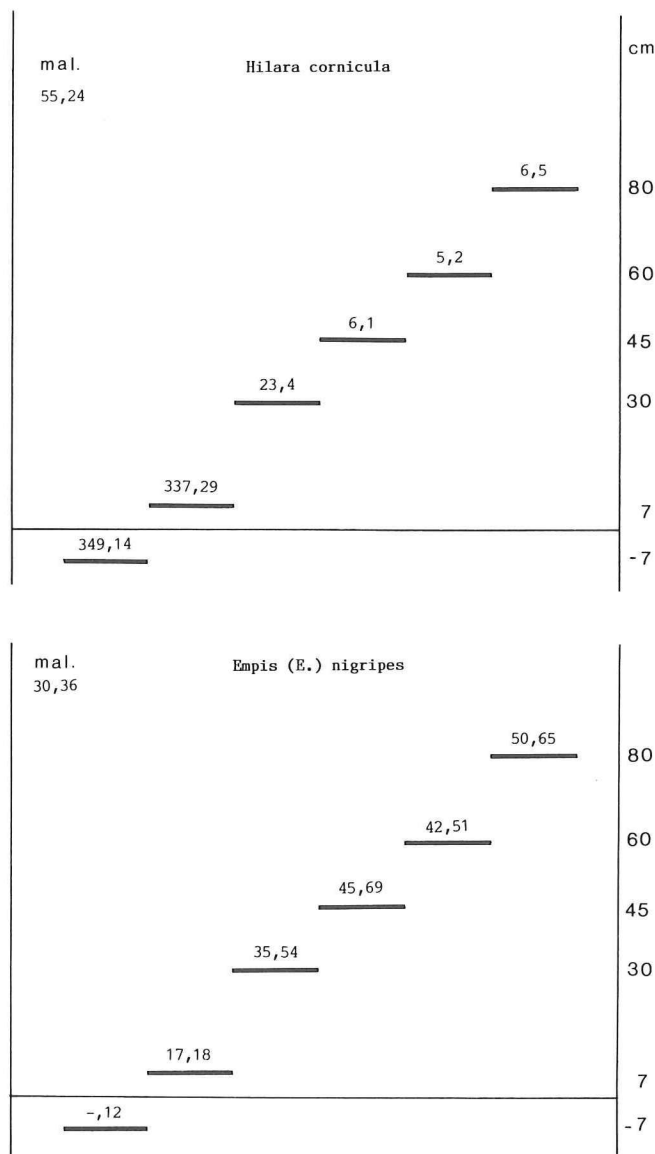


Fig. 2. The different attraction of the empidid flies to white water traps placed at different heights. *Hilara cornicula* males hunt above water surfaces and are more attracted to traps on the soil; *Empis nigripes*, a nectar feeder, is more attracted to higher placed white water traps. (GROOTAERT & POLLET, in prep.)

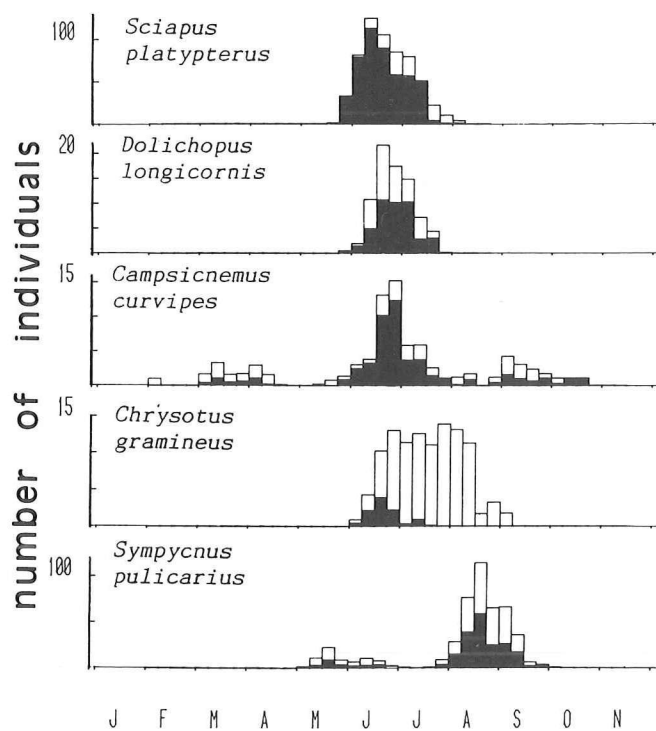


Fig. 3. Phenology of some Dolichopodids: males black, females white. *Sciapus platypterus*: activity of males higher than females; *Dolichopus longicornis*: activity of males and females more or less equal; *Campsicnemus curvipes*: three peaks of activity but probably only two generations, one hibernating; *Chrysotus gramineus*: very high activity of females; *Sympycnus pulicarius*: two generations. (MEUFFELS, POLLET & GROOTAERT, 1989).

At the moment about 40 localities (Fig. 1) distributed over the major zoogeographical regions have been sampled and about 60 annual cycles are available for study now. A provisional list of these localities can be found in DE MEYER & DE BRUYN (1989). Thanks to these samples a far better idea is obtained of the 1° diversity, 2° the phenology and generations, 3° different activity of male / female. Such data can hardly be gathered with hand catches. Fig. 3 illustrates the phenology and the different activity of males and females of some dolichopodids.

To cope with the serious identification problems, an informal workshop was founded in 1983. It was called: "Werkgroep dipterologie van België". A number of Belgian and foreign specialists volunteered to study the Belgian fauna by exchanging collections and information. Following steps seemed likely to improve our knowledge of the Belgian Diptera: 1° annotated check lists as a preparation for further studies; 2° taxonomical revisions leading to identification handbooks; 3° faunistic studies leading to typology of biotopes; 4° ecological studies.

Several annotated checklists, some of them with distribution maps and faunistic information, have been published since, e.i. on Syrphidae (VERLINDEN & DECLEER, 1986), Pipunculidae (DE MEYER & DE

BRUYN, 1985), Dolichopodidae (MEUFFELS & GROOTAERT, 1987), Simuliidae (VAN DEN NEUCKER, 1987), Chloropidae (DE BRUYN, 1983, 1985). Finally, a catalogue of the Belgian Diptera is in preparation.

Meanwhile a number of taxonomical revisions were started: on Pipunculidae (DE MEYER, 1989), Dolichopodidae (MEUFFELS & GROOTAERT, 1989; POLLET, in prep.) and other Empidoidea (GROOTAERT, 1983, 1986, 1987, 1989). The publication of an identification handbook on Syrphidae is now in its final phase.

The many faunistic studies must be seen as preliminary ecological studies (e.g. DE MEYER & DE BRUYN, 1989; POLLET & GROOTAERT, 1987). At the moment, thorough ecological studies are in progress only in a limited number of groups such as the Chironomidae (GODDEERIS, 1987) and Chloropidae (DE BRUYN, 1989).

Perspectives for the future

There remains an urgent need for revisions and identification keys for Diptera in general and that for the whole Palaearctic region. This is partly because the species concept and the techniques of observation alter continuously. This is also well illustrated by the number of new species that are continuously described from western Europe and even from Belgium. As in most disciplines, the morpho-species concept is still used here. While in the beginning of the century simple optical techniques and the study of the external morphological characters sufficed to discriminate between species, the use of genitalia as identification characters became more and more important during the fifties. At that moment the key-lock hypothesis was formulated suggesting that species recognize each other when the male genitalia fit to the female genitalia. So specimens with different genitalia are considered to be different species. This concept is interesting as a tool in systematics whether you accept or not this mechanism of species recognition or speciation (EBERHARDT, 1985). Diptera and more precisely mosquito's were the first animals in which sibling or cryptic species were discovered. The recent description of *Platypalpus australominutus*, a sister species hidden in the very common *P. minutus* in Belgium is another example. Externally there is no difference and the specimens almost need to be dissected to be sure about the identification (Fig. 4). A further example can be found in Cecidomyiidae in which all parts of the body have to be prepared, mounted and measured. Identification of certain species is only possible through a morphometric analysis of a population.

At the moment it seems utopic to test the bio-species concept in all groups. Even in the future, it will be limited to groups of special economic or scientific interest. Further chromosome structure, recombinant DNA, electrophoresis are hardly used yet in Diptera taxonomy in Belgium.

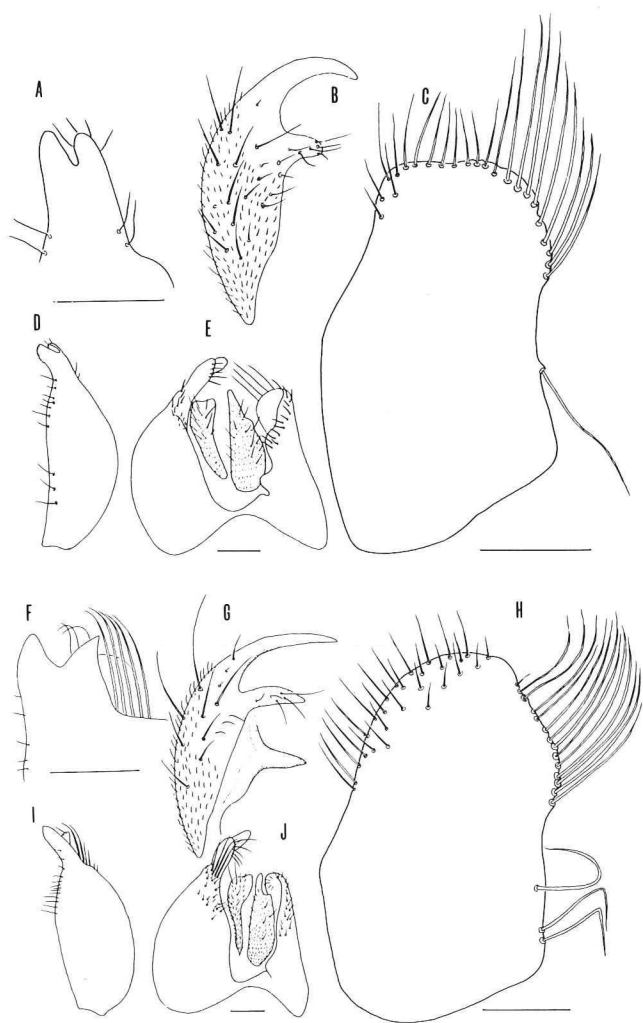


Fig. 4. Difference in structure of the genitalia of two sisterspecies *P. minutus* (MEIGEN) and *P. australominutus* GROOTAERT (F-J): A, F: tip of right periandrial lamella; B, G: left cercus; C, H: left periandrial lamella.

As can be seen above, faunistical studies combined with ecological studies are still needed. Again the large number of species in a single biotope is a difficult and time consuming problem e.g. in a wet grassland at Virelles in the South of Belgium, GROOTAERT et al. (1988) found 345 species and only 11 families of the 50 present during that period, were studied. As it is a problem in other insect groups, quantitative studies of fly populations are very difficult. For each group specific sampling techniques have to be invented and tested. Finally it must be ascertained that the larva which is perhaps the most important stage in the life cycle of the fly is complete terra incognita in most species.

Acknowledgements

The author wishes to thank all his colleagues from the workshop dipterology. In alphabetical order: B. BRUGGE, L. DE BRUYN, N. DE BUCK, K. DECLEER, M. DE MEYER, H. DIRICKX, Ch. FASSOTTE, B. GODDEERIS, K. HOFMANS, M. LECLERCQ, H. MEUFFELS, A. MICHIELS, M. POLLET, A. RYCKAERT, L. VALCKE, D. VAN DEN NEUCKER, V. VAN DER GOOT, M. VAN VEEN, Ch. VERBEKE, L. VERLINDEN.

Table I: Diversity and number of specimens caught with different kind of traps in a wet woodland (GROOTAERT & POLLET, in prep.)

	no. of species	no. of specimens	dominant species
Malaise trap	51	1.213	<i>Empis nigripes</i>
White water trap 60 cm	35	750	<i>Empis aestiva</i>
White water trap 0 cm	30	1.447	<i>Hilara cornicula</i>
Red water trap 60 cm	21	105	<i>Phyllodromia melanocephala</i>
Blue water trap 60 cm	26	223	<i>Rhamphomyia nigripennis</i>
Pitfall	9	35	<i>Hilara cornicula</i>
Total	62	3.773	

References

- DE BRUYN, L. 1983. Een systematische en ecologische studie van de Chloropidae (Diptera). Licentiaatsverhandeling U.I.A. 198 pp.
- DE BRUYN, L., 1989. Habitatselectie en levenscyclusstrategieën in het genus *Lipara* (Diptera; Chloropidae). - Doctoraatsverhandeling Antwerpen, U.I.A., 244 pp.
- DE BRUYN, L. & M. DE MEYER, 1985. New and noteworthy Chloropidae (Diptera) from the Belgian fauna. *Bulletin et Annales de la Société royale belge d'Entomologie*, 121: 269-275.
- DE MEYER, M., 1989. The West-Palaearctic species of the pipunculid genera *Cephalops* and *Beckerias* (Diptera): classification, phylogeny and geographical distribution. *Journal of Natural History*, 23: 725-765.
- DE MEYER, M. & DE BRUYN, L., 1985. On the occurrence of Pipunculidae (Diptera) in Belgium. *Studiedocumenten K.B.I.N.* n° 24, 52 pp.
- DE MEYER, M. & DE BRUYN, L., 1989. Seasonal occurrence and voltinism of Pipunculidae (Diptera) in Belgium. *Bulletin de l'Institut royal des Sciences Naturelles de Belgique, Entomologie*, 58: 71-81.
- EBERHARD, W.G., 1985. Sexual selection and animal genitalia. Harvard University Press, Massachusetts, London, 244 pp.
- GODDEERIS, B., 1987. The time factor in the niche space of *Tanytarsus*-species in two ponds in the Belgian Ardennes (Diptera: Chironomidae). *Entomologica Scandinavica Supplementa* 29: 281-288.
- GROOTAERT, P., 1983. Description of three new *Platypalpus* species (Diptera Empididae) from Belgium. *Bulletin et Annales de la Société royale belge d'Entomologie*, 119: 123-137, 4 Figs.
- GROOTAERT, P., 1986. A new *Platypalpus* species related to *P. pictitarsis* (Becker, 1902) (Diptera Empidoidea Hybotidae) from western Europe. *Bulletin et Annales de la Société royale belge d'Entomologie*, 122: 187-193, 13 Figs.
- GROOTAERT, P. 1987- Description of a new *Platypalpus* species from the *P. albiseta* group (Diptera Empidoidea, Hybotidae) from Belgium. *Bulletin et Annales de la Société royale belge d'Entomologie*, 123: 277-282, 17 Figs.
- GROOTAERT, P., 1989. Description of a new *Platypalpus* species, closely allied to *P. minutus* Meigen (Diptera Empidoidea Hybotidae). *Bulletin et Annales de la Société royale belge d'Entomologie*, 125, 243-250, 10 figs.
- GROOTAERT, P. & POLLET, M., (in prep.). Ecological data on Empididae (Diptera) from a woodland ecosystem in Wijnendalebos (Belgium). *Bulletin de l'Institut Royal des Sciences Naturelles de Belgique, Entomologie*.
- GROOTAERT, P. & VERBIST, P., 1986. Bibliografie van de Diptera (Insecta) van België. *Studiedocumenten K.B.I.N.*, 44 pp.
- GROOTAERT, P., L. VERLINDEN, H. MEUFFELS, G. HAGHEBAERT, M. POLLET, M. LECLERCQ, M. DE MEYER et N. MAGIS, 1988. Diptères de la réserve naturelle de Virelles en Belgique. *Bulletin et Annales de la Société royale belge d'Entomologie*, 124, 320-324.
- JACOBS, J.C., 1900. Diptères de la Belgique. I. Muscidae. *Annales de la Société entomologique de Belgique*, 44: 192-212.
- JACOBS, J.C., 1901. Diptères de la Belgique. XXIX. Syrphidae. *Annales de la Société entomologique de Belgique*, 45: 324-333.
- JACOBS, J.C., 1906. Diptères de la Belgique. IVe suite. *Mémoires de la Société entomologique de Belgique*, 12: 21-76.
- LAMEERE, A., 1907. Manuel de la faune de Belgique. Bruxelles, Lamertin, 869 pp.
- MACQUART, M.J., 1836. Description d'un nouveau genre d'insectes Diptères de la Famille des Tanystomes. *Annales de la Société entomologique de Belgique*, 5: 517-520.
- MEUFFELS, H.J.G. & GROOTAERT, P., 1987. Preliminary check list of the Dolichopodidae (Diptera) from Belgium. - *Bulletin et Annales de la Société royale belge d'Entomologie*, 123: 29-41.
- MEUFFELS, H.J.G. & GROOTAERT, P., 1989. The relatives of *Dolichopus plumipes* (Scopoli, 1763), with the description of a new species from Belgium (Diptera Dolichopodidae). *Bulletin et Annales de la Société royale belge d'Entomologie*, 125: 83-98, 34 figs.
- MEUFFELS, H.J.G., POLLET, M. & GROOTAERT, P., 1989. The Dolichopodid fauna (Dolichopodidae, Diptera) of a garden habitat: faunistics, habitat preference, phenology and distribution. *Bulletin de l'Institut Royal des Sciences Naturelles de Belgique Entomologie*, 58: 83-94.
- POLLET, M. & GROOTAERT, P., 1987. Ecological data on Dolichopodidae (Diptera) from a woodland ecosystem: I. Colour preference, detailed distribution and comparison of different sampling techniques. *Bulletin de l'Institut Royal des Sciences Naturelles de Belgique Entomologie*, 57: 173-186, 8 Figs.
- VAN DEN NEUCKER, D., 1987. De Simuliiden-fauna van België (Diptera, Simuliidae). *Bulletin et Annales de la Société royale belge d'Entomologie*, 123: 131-136.
- VAN DER WULP, F.M. & J.C.H. DE MEIJERE, 1898. Nieuwe naamlijst van Nederlandsche Diptera. Tijdschrift voor Entomologie 41, bijvoegsel, 149 pp.
- VERLINDEN, L. & DECLEER, K., 1987. The Hoverflies (Diptera, Syrphidae) of Belgium and their faunistics: Frequency, distribution, phenology. *Studiedocumenten K.B.I.N.* n° 39, 170 pp.
- WESMAEL, C., 1837. Sur les métamorphoses d'un Xylophage. *Bulletin de l'Académie royale des Sciences, des Lettres et des Beaux-Arts de Belgique, Bruxelles*, 4: 320-323.

Afdeling entomologie
Koninklijk Belgisch Instituut
voor Natuurwetenschappen
Vautierstraat 29
B-1040 Brussel

