

A synthesis of the present knowledge of Pipunculidae (Diptera) in Belgium

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Abstract

The article briefly reviews the present knowledge of Pipunculidae in Belgium and the research done on this family during recent years in this country with regards to faunistics, ecology and systematics.

Key-words: Pipunculidae, Belgium, faunistics, phenology, review.

Introduction

The family Pipunculidae are situated in the Cyclorapha, Atriata; infraphalanx Syrphidea (GRIFFITHS, 1972). About hundred twenty species occur in the West Palaearctic region. They are usually small, dark inconspicuous flies except for the representatives of the genus *Nephrocerus* which are larger. All pipunculids can be readily recognized by the large compound eyes which are occupying most of the subhemispherical or hemispherical head. They can be differentiated from their close relatives the hoverflies or Syrphidae, by the differences in the wing venation: the lack of a vena spuria; the open cell R5 and no false wing margin (COE, 1966b).

The objective of this article is to give an account of the research that has been done on the family over the last years and to present a synopsis of the knowledge of these flies in Belgium.

Generic systematics

Pipunculidae are represented in 10 genera in Europe, all of which occur in Belgium. Although the phylogenetic relationship among the genera is still questionable for some groups, a preliminary tree can be constructed as in fig. 1. Three main sub-families can be recognized within the family. The most primitive being the Chalarinae with the genera *Chalarus* WALKER and *Verrallia* MIK (including *Jassidophagha* ENDERLEIN). As already mentioned by ACZÉL (1948) and further elaborated by RAFAEL (1986a), they show a number of plesiotypic character states like the presence of ocellar and/or frontal bristles, the well developed and sometimes bristly pilosity of mesonotum, scutellum and abdomen, the subhemispherical head, and the well developed abdominal terga vi and vii. Furthermore the

abdominal eight sternum does not envelop the genital structures and genitalia show some morphological resemblances with certain Platypezidae (see KESSEL & MAGGIONCALDO, 1968).

Nephrocerus ZETTERSTEDT species, belonging to the Nephrocerinae, still have a number of these plesiomorphies (like the structure of abdominal terga and sterna, and presence of scutellar and mesonotal bristles) but the head is hemispherical and the genitalia have a more apomorphic structure. *Nephrocerus* species are unlike most pipunculid flies because of their relatively large size, the elongated abdomen and legs and the indentation of the hind eye margin of the eyes.

The remaining genera belong to the third and largest group: Pipunculinae. By earlier authors (BECKER, 1897, 1900; KERTÉSZ, 1910; SACK, 1935; VERRALL, 1901), all species were placed in the single genus *Pipunculus* LATREILLE (or *Dorylas* MEIGEN) usually with the recognition of certain subgroup. Later on, most of these subgroups received generic or subgeneric status (ACZÉL, 1939a, 1940). At the moment we recognize 7 genera in Europe: *Pipunculus*, *Cephalops* FALLEN (including *Cephalosphaera* ENDERLEIN), *Beckerias* ACZÉL, *Eudorylas* ACZÉL, *Tomosvaryella* ACZÉL, *Dorylomorpha* ACZÉL and a newly erected genus (see DE MEYER, in press). These genera are mainly differentiated by the following character states: pilosity of mesonotum, absence or presence of propleural fan and coloured pterostigma (ACZÉL, 1948, COE, 1966b). Although the exact relationship is not completely clarified, it will probably appear to resemble the preliminary tree as shown in figure 1. The genus *Eudorylas* has recently been split up by RAFAEL (1986b, 1987a, b) in relation to the New World representatives. In as far as these new genera are also represented in Europe has not been studied yet. *Beckerias*, with the sole species *B. pannonicus* in Europe has been shown to be related to *Cephalops* (DE MEYER, 1989). Study of the Afrotropical species of *Beckerias* has confirmed this. At the moment an attempt is being made to reconstruct the phylogenetic systematics of all world genera of Pipunculidae.

Faunistics

Pipunculid flies did not receive much attention before 1980 in Belgium. They were occasionally collected by general dipterists and mentioned in general faunistic articles, mainly by MARÉCHAL and GOETGHEBUER (for a detailed list of these publications see DE MEYER & DE BRUYN, 1985 and GROOTAERT & VERBIST, 1986). Most of these records were based on determination with Sack's work on the Pipunculidae of the Palaearctic Region (SACK, 1935). However since the publication of this work several new species have been described (ACZÉL, 1939 b, c; ALBRECHT, 1979 a, b; COE, 1966 a, b; COLLIN, 1937, 1956; KOZANEK, 1981 a, b) and the old records are therefore nowadays unreliable. In total 23 species were mentioned in this period (see DE MEYER & DE BRUYN, 1985).

In 1980 an extensive sampling program with different kinds of traps started in Belgium. This resulted in a considerable amount of new material from several regions of the country. This material has been systematically sorted and identified (DE MEYER, 1983, 1984, 1985, 1986). In addition, the old collections were revised and the old records checked as far as possible (DE MEYER & DE BRUYN, 1985). This resulted in a total of 73 species reported from Belgium. Two species are reported here for the first time for the Belgian fauna: *Cephalops perspicuus* (DE MEIJERE) and *Cephalops signatus* (BECKER). The results are summarized in table 1 and compared with some other European countries for which we have detailed information: Great Britain, Czechoslovakia, Poland, Finland, and Norway and Sweden (grouped as Scandinavia). The table is based on comparatively recent investigations regarding pipunculid faunistics (ALBRECHT, 1980; BANKOWSKA, 1973; COE, 1966b; COLLIN, 1956; DE MEYER & BACKELJAU, in press; DE MEYER, BACKELJAU & JANSSENS, 1989; KOZANEK & LAUTERER, 1987; STUBBS, 1980).

All these countries belong to either the atlantic, central-European or west-boreal biogeographical provinces, as outlined by FREITAG (1962). Records from the sub-mediterranean or mediterranean regions are very scarce and no material could be obtained from this region, hence the southern distribution of most species is unknown. There is also a lack of information for some genera in particular since they are currently under revision. This is the case for *Dorylomorpha* and *Chalarus* (see further).

In general it can be said that one third of the species, included in the table are occurring (or can be expected to occur) over all the regions. A number of species however, are present in atlantic or central-European provinces, but do not seem to occur in the boreal and arctic regions. This is for example the case with *Beckerias pannonicus*, *Cephalops ultimus*, *C. signatus*, *Eudorylas horridus*, *E. ruralis*, *Dorylomorpha clavifemora* and *Tomosvaryella kuthyi*. On the other hand,

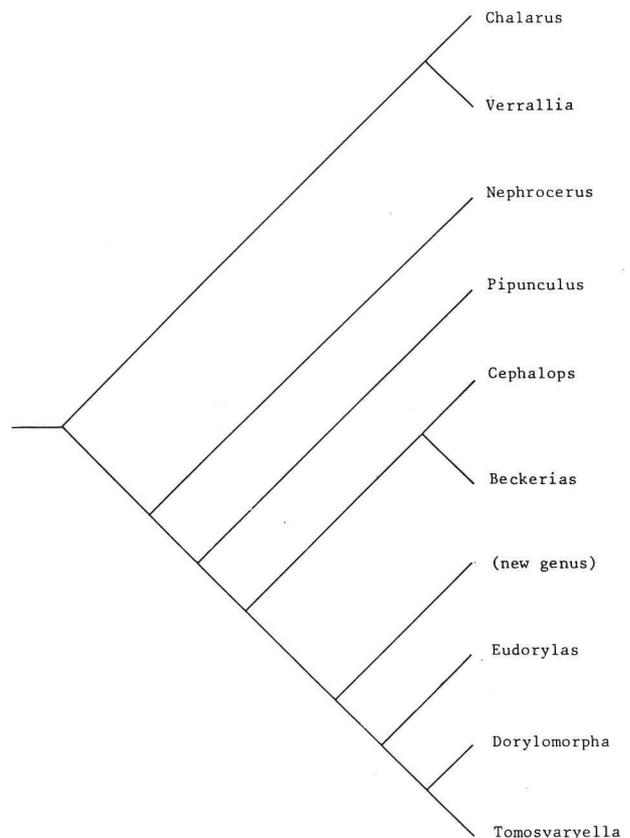


Fig. 1: Preliminary phylogenetic tree of European pipunculid genera.

Cephalops chlorionae, *Dorylomorpha haemorrhoidalis*, and probably some other *Dorylomorpha* spp. as well, are typical boreal species. *Tomosvaryella littoralis* and *Pipunculus phaeon* might be atlantic species but the information is still too scarce.

The large pipunculid fauna of Belgium can be due to the geographic richness of this country, being partly atlantic and partly central-European with the presence of boreomontane and submediterranean inclusions. Comparison with Czechoslovakia and Great Britain however, shows that an additional 10 species can be expected in our country.

Phenology

Pipunculidae are parasitoids of Auchenorrhyncha (Homoptera) during their larval stage. Rearing experiments have shown that most species have a distinct host specificity (JERVIS, 1980 a, b; WALOFF, 1975; WALOFF & JERVIS, 1987). Therefore, the occurrence of a particular pipunculid fly has to be related to its specific homopteran host or hosts, not only with regard to the habitat but also the flight period. Although, no research has been done in Belgium concerning host specificity, the data obtained from the sampling program with different types of traps (mainly Malaise

Table 1: comparison of pipunculid fauna in Belgium (B), Great Britain (GB), Czechoslovakia (CZ), Poland (P), Scandinavia (SC) and Finland (SF) (see text for sources of occurrence).

	B	GB	CZ	P	SC	SF		B	GB	CZ	P	SC	SF
Chalarus argenteus Coe	*						Pipunculus oldenbergi Collin	*	*		*		
Chalarus basalis Loew	*	*	*	*			Pipunculus omissinervis Becker			*			
Chalarus fimbriatus Coe	*	*	*	*			Pipunculus phaeton Coe	*	*				
Chalarus griseus Coe	*						Pipunculus spinipes Meigen	*	*	*	*	*	*
Chalarus latifrons Hardy	*	*	*	*	*		Pipunculus tenuirostris Kozanek	*	*	*	*	*	*
Chalarus parmenteri Coe	*						Pipunculus thomsoni Becker	*	*	*	*	*	*?
Chalarus pughi Coe	*	*	*				Pipunculus varipes Meigen	*	*	*	*	*	*
Chalarus spurius (Fallén)	*	*	*	*	*	*	Pipunculus zugmayeriae Kowarz	*	*	*	*	*	*
Verrallia aucta (Fallén)	*	*	*	*	*	*	Cephalops aeneus Fallén	*	*	*	*	*	*
Verrallia beatricis Coe	*	*	*				Cephalops carinatus (Verrall)	*	*	*		*	*
Verrallia pilosa (Zetterstedt)	*	*	*	*	*	*	Cephalops chlorionae (Frey)	*	*	*	*	*	*
Verrallia setosa Verrall	*	*	*	*	*	*	Cephalops furcatus (Egger)	*	*	*	*	*	*
Verrallia villosa (von Roser)	*	*	*	*	*	*	Cephalops germanicus (Aczél)	*	*	*	*	*	*
Nephrocerus flavicornis Zetterstedt	*	*	*	*	*	*	Cephalops obtusinervis (Zett.)	*	*	*	*	*	*
Nephrocerus lapponicus Zetterstedt	*	*	*	*	*	*?	Cephalops perspicuus (de Meijere)	*	*	*	*	*	*
Nephrocerus scutellatus (Macquart)	*	*	*	*	*	*	Cephalops semifumosus (Kowarz)	*	*	*	*	*	*
Dorylomorpha albitarsis (Zett.)	*	*	*	*	*	*	Cephalops signatus (Becker)	*	*	*	*	*	*
Dorylomorpha anderssoni Albrecht	*	*	*	*	*	*	Cephalops subultimus Collin	*	*	*	*	*	*
Dorylomorpha beckeri (Aczél)	*	*	*	*	*	*	Cephalops ultimus (Becker)	*	*	*	*	*	*
Dorylomorpha borealis (Wahlgren)	*	*	*	*	*	*	Cephalops vestitus (Becker)	*	*	*	*	*	*
Dorylomorpha canadensis Hardy	*	*	*	*	*	*	Cephalops vittipes (Zetterstedt)	*	*	*	*	*	*
Dorylomorpha clavata Albrecht	*	*	*	*	*	*	Beckerias pannonicus Aczél	*	*	*	*	*	*
Dorylomorpha clavifemora Coe	*	*	*	*	*	*	Eudorylas arcanus Coe	*	*	*	*	*	*
Dorylomorpha confusa (Verrall)	*	*	*	*	*	*	Eudorylas dissimilis Coe	*	*	*	*	*	*
Dorylomorpha extricata (Collin)	*	*	*	*	*	*	Eudorylas elephas (Becker)	*	*	*	*	*	*
Dorylomorpha fennica Albrecht	*	*	*	*	*	*	Eudorylas fascipes (Zetterstedt)	*	*	*	*	*	*
Dorylomorpha hackmani Albrecht	*	*	*	*	*	*	Eudorylas furvulus Collin	*	*	*	*	*	*
Dorylomorpha haemorrhoidalis (Zett.)	*	*	*	*	*	*	Eudorylas fuscipes (Zetterstedt)	*	*	*	*	*	*
Dorylomorpha hungarica (Aczél)	*	*?	*	*?	*	*	Eudorylas fusculus (Zetterstedt)	*	*	*	*	*	*
Dorylomorpha imparata (Collin)	*	*	*	*	*	*	Eudorylas halteratus (Meigen)	*	*	*	*	*	*?
Dorylomorpha incognita (Verrall)	*	*	*	*	*	*	Eudorylas holosericeus (Becker)	*	*	*	*	*	*
Dorylomorpha infirmata (Collin)	*	*	*	*	*	*	Eudorylas horridus (Becker)	*	*	*	*	*	*
Dorylomorpha maculata (Walker)	*	*	*	*	*	*	Eudorylas inferus Collin	*	*	*	*	*	*
Dorylomorpha occidens (Hardy)	*	*	*	*	*	*	Eudorylas jenkinsoni Coe	*	*	*	*	*	*
Dorylomorpha platystylis Albrecht	*	*	*	*	*	*	Eudorylas kowarzi (Becker)	*	*	*	*	*	*
Dorylomorpha praetermissa Albrecht	*	*	*	*	*	*	Eudorylas longifrons Coe	*	*	*	*	*	*
Dorylomorpha rufipes (Meigen)	*	*	*	*	*	*	Eudorylas melanostolus (Becker)	*	*	*	*	*	*
Dorylomorpha spinosa Albrecht	*	*	*	*	*	*	Eudorylas montium (Becker)	*	*	*	*	*	*
Dorylomorpha xanthocera (Kowarz)	*	*	*	*	*	*	Eudorylas obliquus Coe	*	*	*	*	*	*
Dorylomorpha xanthoceroideus (Aczél)	*	*	*	*	*	*	Eudorylas obscurus Coe	*	*	*	*	*	*
Dorylomorpha xanthopus (Thomson)	*	*	*	*	*	*	Eudorylas opacus (Fallén)	*	*	*	*	*	*
Tomosvaryella cilitarsis (Strobl)	*	*	*	*	*	*	Eudorylas pannonicus (Becker)	*	*	*	*	*	*
Tomosvaryella coquilletti (Kertész)	*	*	*	*	*	*	Eudorylas restrictus Coe	*	*	*	*	*	*
Tomosvaryella geniculata (Meigen)	*	*	*	*	*	*?	Eudorylas roseri (Becker)	*	*	*	*	*	*
Tomosvaryella kuthyi Aczél	*	*	*	*	*	*	Eudorylas ruralis (Meigen)	*	*	*	*	*	*
Tomosvaryella littoralis (Becker)	*	*	*	*	*	*	Eudorylas subfascipes Collin	*	*	*	*	*	*
Tomosvaryella minima (Becker)	*	*	*	*	*	*	Eudorylas subterminalis Collin	*	*	*	*	*	*
Tomosvaryella miniscula (Collin)	*	*	*	*	*	*	Eudorylas sulcatus (Becker)	*	*	*	*	*	*
Tomosvaryella palliditarsis (Collin)	*	*	*	*	*	*	Eudorylas terminalis (Thomson)	*	*	*	*	*	*
Tomosvaryella sylvatica (Meigen)	*	*	*	*	*	*	Eudorylas trochanterus (Becker)	*	*	*	*	*	*?
Pipunculus calceatus von Roser	*	*	*	*	*	*	Eudorylas unicolor (Zetterstedt)	*	*	*	*	*	*?
Pipunculus campestris Latreille	*	*	*	*	*	*	Eudorylas zermattensis (Becker)	*	*	*	*	*	*
Pipunculus fonsecai Coe	*	*	*	*	*	*	Eudorylas zonatus (Zetterstedt)	*	*	*	*	*	*
Pipunculus lichtwardti Kozanek	*	*	*	*	*	*	Eudorylas zonellus Collin	*	*	*	*	*	*

traps) has resulted in some information regarding flight periods and modality of the more common Pipunculidae species. Concluding from the rearing experiments done abroad (HUQ, 1985; WALOFF, 1975; WALOFF & JERVIS, 1987) the modality also seems to reflect the voltinism of the species concerned, although this could not be supported by rearing experiments of our own. The results of this phenological research is dealt with in detail in DE MEYER & DE BRUYN (1984; 1989) and GROOTAERT & DE MEYER (1986).

Most species seem to be uni- or bivoltine. Some are occasional trivoltine like *Pipunculus campestris*, *Eudorylas subterminalis* and *Dorylomorpha hungarica*. For some species an intraspecific variety could be shown. The best example is *Pipunculus campestris* for which uni-, bi- or trimodal graphs were found. This

variation is most likely the result of meteorological differences between the successive years and/or differences in climatological conditions at the sites where the traps were placed.

Also a seasonal variation in the species composition could be detected. Most adult pipunculid flies occur between June and September/October. The first species occurring may be uni- or bivoltine. Later on in the season however we find a distinct occurrence of bivoltine species of which the first generation was present. These become gradually replaced by univoltine species. Finally, they are replaced by the second generation of the above mentioned bivoltine species. Still, data are few and further research is needed to comprehend the full phenomenon of seasonal variation.

Revisionary systematics

During recent years the European representatives of some genera have been the scope of a systematic revision. After an ecological study, Jervis (Cardiff, U.K.) discovered that most of the *Chalarus* species are in fact species complexes (JERVIS, 1980 a, b) and he is working on revision of this group. Albrecht (Helsinki, Finland) is working on a world revision of the genus *Dorylomorpha* and found some new species for Europe (ALBRECHT, 1979 a, b). KOZANEK (1981 a, b) and KOZANEK & LAUTERER (1987) have studied the czechoslovak species of respectively *Pipunculus* and *Cephalops* and reported some new synonyms and new species.

The European representatives of the Genus *Cephalops* have been studied more in detail by the author, in the scope of a world revision of this and adjacent genera (DE MEYER, 1989; DE MEYER & BACKELJAU, in press). At the moment 14 *Cephalops* species are recognized in the West Palaearctic region. The genus *Beckerias*, with one representative in Europe (*Beckerias pannonicus*), has found to be closely related to *Cepha-*

lops. A number of species groups could be differentiated. A study of the Nearctic species of *Cephalops* (DE MEYER, in press) has shown that both faunas are closely related and that a number of vicariants could be detected, especially within the *aeneus*-group.

Although progress has been made during the last years regarding systematics of European Pipunculidae, some groups still need a thorough revision. This is especially the case for *Eudorylas* species, and to a lesser extent also for *Tomosvaryella*. Also, a clear and unambiguous identification key for the European fauna is still lacking, and would be a considerable help for further reserach on this group.

Acknowledgements

The author is much indebted to Dr. P. GROOTAERT of the Koninklijk Belgisch Instituut voor Natuurwetenschappen, and Prof. Dr. W.N. VERHEYEN of the Laboratorium voor Algemene Dierkunde, Rijksuniversitair Centrum Antwerpen, for providing working facilities and assistance at specific stages of this research during the last years.

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