DESSART, P. (sous presse). - Révision des *Dendrocerus* du groupe «*halidayi*» (Hym. Ceraphronoidea Megaspilidae). *Bull. Annls Soc. r. belge Ent.*

DESSART, P. & CANCEMI, P., 1986. - Tableau dichotomique des genres de Ceraphronoidea (Hymenoptera) avec commentaires et nouvelles espèces. *Frustula ent.*, 1984-1985, 7-8 (20-21): 307-372, 151 figs, 22 réfs.

DESSART, P. & GÄRDENFORS, U., 1985. - *Dendrocerus paradoxus* n. sp. et *D. ulmicola* n. sp. (Hym. Ceraphronoidea Megaspilidae), deux nouveaux hyperparasites paléarctiques de pucerons. *Bull. Annls Soc. r. belge Ent.*, 121/4-6: 197-211, 23 figs, 5 réfs.

DESSART, P. & MASNER, L., 1965. - Contibution à l'étude des Hyménoptères Proctotrupoidea (VII) Ecnomothorax, genre nouveau de Ceraphronidae). *Bull. Annls Soc. r. Ent. Belg.*, 101/15: 275-288, 25 figs, 14 réfs.

GAHAN, A.B. 1933. - The Serphoid and Chalcidoid parasites of the Hessian fly. *Misc. Publs U.S. Dep. Agric.*, 174: 147 pp., 32 figs.

GRAHAM, M.W.R DE V., 1984. - A new species of Conostigmus (Insecta: Hymenoptera, Ceraphronoidea) from Madeira. *Bocagiana*, 77: 1-5, 1 fig., 3 réfs.

HELLÉN, W., 1966. - Die Ceraphroniden Finlands (Hymenoptera: Proctotrupoidea). *Fauna fenn.*, 20: 45 pp., 1 fig., 1 carte.

HOWARD, L.O. 1930. - A History of applied Entomology (Somewhat Anecdotal). *Smithson. misc. Collns* 84, [1931], publ. 3065, 564 pp., figs, photos.

JANSSON, A., 1945. - Studier över svenska proctotrupider. 4. Ännu några för faunan nya släkten. *Opusc. ent.*, 10: 141-145.

MASNER, L. & DESSART, P. 1967. - La reclassification des catégories supérieures des Ceraphronoidea (Hymenoptera). *Bull. Inst. r. Sci. nat. Belg.*, 43/22: 1-33, 56 figs, 53 réfs.

SKUHRAVÁ, M., 1995. - A new gall midge species, *Etsuhoa thuriferae* sp.n. (Diptera: Cecidomyiidae), from galls on *Juniperus thurifera* L. (Cupressaceae) in Spain. *Zapateri, Rev. aragon. ent.*, 5: 135-146, 6 figs.

TAYLOR, C. [de Bernier] 1860. - Microscopic Views of the Insect World. VI. Representative Ichneumons or parasitic insects. *American Agriculturist*, N.Y., oct. 1860, pp. 300, 301, 8 figs.

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Dolichopodid communities (Diptera: Dolichopodidae) in "De Kempen" (eastern Belgium): biodiversity, faunistics and ecology*

by Dirk MAES[1] & Marc POLLET[2]

[1] Institute of Nature Conservation, Kliniekstraat 25, B-1070 Brussels, Belgium. Email: dirk.maes@instnat.be

[2] Department of Entomology, Royal Belgian Institute of Natural Sciences, Vautierstraat 29, B-1000 Brussels, Belgium. Email: mp@iwt.be

Summary

During a large scale inventory in "De Kempen" (eastern Belgium), 12 sites were sampled for dolichopodids by means of Malaise traps and/or pitfall and water traps or by sweepnet between 1991 and 1995. A total of 7,865 specimens of 73 named species were collected, 22 of which were known from ≤ 20 UTM 10 km-squares in Belgium. Dolichopus apicalis *is recorded for the first time in Belgium and* Medetera lorea *for the second time. Ecologically, several communities could be distinguished: species from humid wooded habitats, the eurytopic* Chrysotus gramineus, *eurytopic species from eastern Belgium and species from open and sunny habitats. All abundant species seemed to be univoltine and activity peaks are reached between May and July. Females were mostly collected in larger number than males and populations of* Dolichopus ungulatus *and* Chrysotus gramineus *showed different activity patterns in adjacent habitats. Finally, the suitability of the Malaise trap in site quality assessment studies is discussed.*

Key words: Diptera, Dolichopodidae, faunistics, ecology, biodiversity, De Kempen.

Samenvatting

Tijdens een grootschalige inventarisatie in De Kempen (Oost-België) werden tussen 1991 en 1995 12 plaatsen bemonsterd op slankpootvliegen

* Received: 5.II.1997.

(Dolichopodidae) *door middel van Malaisevallen, bodem- en watervallen of met een sleepnet. In totaal werden 7.865 exemplaren van 73 benoemde soorten verzameld, waarvan 22 soorten bekend zijn van 20 of minder UTM 10 km-hokken in België.* Dolichopus apicalis *werd voor het eerst waargenomen in België en* Medetera lorea *voor de tweede maal. Verscheidene ecologische gemeenschappen konden worden onderscheiden: soorten van vochtige en bosrijke habitats, de eurytope soort* Chrysotus gramineus, *eurytope soorten uit het oosten van België en soorten van open en zonnige habitats. Alle abundante soorten lijken slechts één generatie per jaar te hebben met activiteitspieken tussen mei en juli. Wijfjes waren meestal talrijker dan mannetjes en populaties van* Dolichopus ungulatus *en* Chrysotus gramineus *toonden verschillende activiteitspatronen in verschillende habitats. Tot slot wordt de geschiktheid van Malaisevallen voor het bepalen van de kwaliteit van gebieden besproken.*

Introduction

The region of "De Kempen" (provinces of Antwerp and Limburg) is probably one of the most interesting faunistic areas in Belgium. Its dipteran fauna, however, is poorly investigated. Maes & Decleer (1993) showed that a large number of interesting dipteran species occur in one particular Nature Reserve studied in the region, but these authors did not deal with dolichopodid flies. Only Pollet *et al.* (1988) and Pollet (1991) reported the results of recent inventories, and faunistic and ecological data on dolichopodid flies collected during recent inventories in "De Kempen". To obtain more information on their distribution and ecology in this region different sampling techniques were used (Malaise traps and/or white water traps, hand catches or net sweeping) at different sites between 1991 and 1995. The main purpose of the present contribution is to present the entire species list with a discussion of the species of special faunistic interest, the ecology of the most abundant species and the dolichopodid biodiversity in the investigated region.

Study area, material and methods

Study area and sampling sites

The predominantly sandy "De Kempen" is situated in the northern part of the provinces of Antwerp and Limburg (Belgium). Wet and dry heathland types, inland dunes, peatmoors and fens are readily encountered in this region but are quite rare elsewhere in our country. Figure 1 shows the location of "De Kempen" in Belgium with the sampled nature reserves (NR) and other sampling sites indicated.

The site codes used in Table 1 and Fig. 1 correspond with the following localities:

Site A: "De Rammelaars" NR (Oostham, Limburg, UTM: FS46) is a small Nature Reserve (26 ha) with moist grasslands and deciduous woodland (among which aldercarr). Dolichopodid flies were collected in different habitats by hand and sweepnet on 11.VII.1992 and 13.VII.1992.

Site B: "De Liereman" NR (Oud-Turnhout, Antwerpen, UTM: FS38) (168 ha) consists of different habitats: *Erica* and *Calluna* heathland, fens, peatmoor, aldercarrs and other deciduous and coniferous woodland types. Dolichopodid flies were collected by means of a Malaise trap at the border of a fen between 9.VI.1992 and 4.VII.1992.

Site C: "De Vallei van de Grote Beek" NR (Leopoldsburg, Limburg, UTM: FS56) has a narrow and elongated shape (59 ha) and comprises meadows, dry heathland and coniferous and deciduous woodland (among which aldercarr). In these habitats dolichopodid flies were collected by hand and sweepnet between 9.VII.1992 and 12.VII.1992 and pitfall trapping (3 traps per habitat) from 28.II.1994 until 12.III.1995 in four different habitats: a dry heathland, a mixed forest, a moist hayfield and an abandoned railway track.

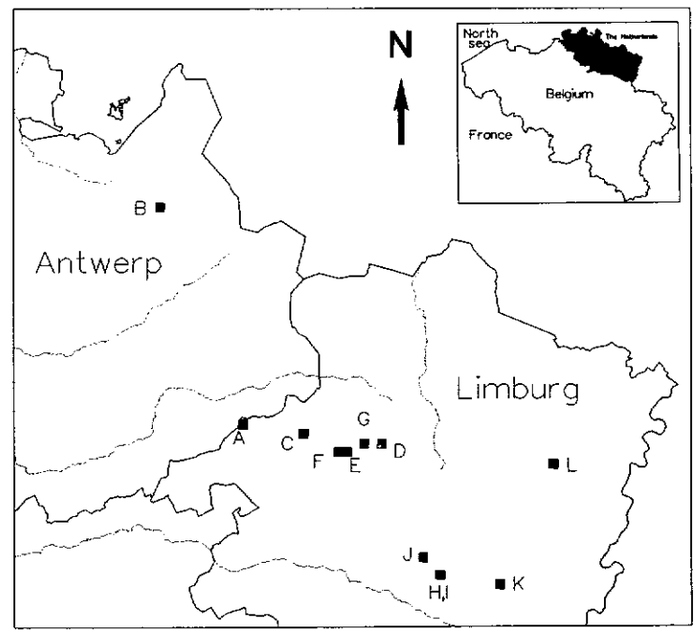

Fig. 1. Location of "De Kempen" in Belgium and of the sampling sites within this region. A, "De Rammelaars" NR (Oostham); B, "De Liereman" NR (Oud-Turnhout); C, "De Vallei van de Grote Beek" NR (Leopoldsburg); D-G, "De Vallei van de Zwarte Beek" NR (Beringen); H-I, "De Maten" NR (Genk); J, "Het Wik" NR (Genk); K, "Paependaal" (Zutendaal); L, "De Mieren" (Opoeteren).

Sites D, E, F and G: "De Vallei van de Zwarte Beek" NR (Beringen, Limburg, UTM: FS66) is one of the largest Nature Reserves in Belgium (ca. 1,000 ha) and includes a wide range of habitats: inland dunes, *Calluna* and *Erica* heathland with fens, peatmoors, coniferous and deciduous woodlands and dry grasslands and meadows. Three sites were sampled by means of Malaise traps: site D ("De Katershoeve") is a dry extensively grazed pasture bordered by *Calluna* and *Erica* heathland at one side and mixed woodland at the other side. Malaise trap sampling was carried out between 6.V.1992 and 10.X.1992. Site E ("De Kluut") is a clearing (with *Molinia caerulea, Lysimachia vulgaris, Salix* spec. and *Rubus* spec.) within a deciduous woodland area. Site F ("OCMW") is a humid oligotrophic grassland (with *Equisetum fluviatile, Comarum palustre, Carex* spec. and *Lychnis flos-cuculi*) within a woodland area and is mown once a year. In sites E and F a Malaise trap was in operation between 5.V.1992 and 10.X. 1992. Prior to the former sampling campaigns, white water traps had been used in a variety of habitats ("site G") between 6.VII.1991 and 21.VIII. 1991.

Sites H and I: "De Maten" NR (Genk, Limburg, UTM: FS74) (204 ha) comprises *Calluna* and *Erica* heathland as well as large oligotrophic ponds and shallow fens. One Malaise trap (site H) was put in *Erica* heathland (with *Molinia caerulea* and *Myrica gale*) and another (site I) on the banks of a pond (with *Myrica gale, Rubus* spec. and *Frangula alnus*) between 1.V.1993 and 30.IX.1993.

Site J: "Het Wik" NR (Genk, Limburg, UTM: FS74) is a small Nature Reserve (86 ha) with many ponds in a woodland area. One Malaise trap was in operation on the bank of an overgrown pond between 1.III.1992 and 3.X.1992. The dominant vegetation consisted of *Salix* spec., *Myrica gale, Molinia caerulea, Frangula alnus* and *Pinus sylvestris*.

Site K: a private garden ("Paependaal") (Zutendaal, Limburg, UTM: FS74) with a pond in a deciduous woodland area. Flies were sampled with 1 Malaise trap from 1.V.1993 to 30.X.1993.

Site L: "De Mieren" (Opoeteren, Limburg, UTM: FS86) is a derelict meadow of ± 40a (with *Urtica dioica, Salix* spec., *Heracleum sphondylium* and *Typha latifolia*) with a central pond. One Malaise trap sampled between 8.V.1992 and 30.VII.1992.

Sampling and identification

The collecting jars of the Malaise traps were for 1/2 filled with a 10% formaline solution and were emptied at more or less weekly (varying from four to ten days) or fortnightly intervals. Pitfall traps were emptied at fortnightly intervals.

Dolichopodid flies were sorted out in the laboratory and identified by means of Parent (1938), Negrobov & Stackelberg (1972, 1974a, 1974b, 1977), D'assis Fonseca (1978), Pollet (1990), Meuffels & Grootaert (1990) and some unpublished keys by Drs H. Meuffels (The Netherlands). Nomenclature is according to Meuffels *et al.* (1991). The specimens are preserved in part in the collections of the Department of Entomology (Royal Belgian Institute of Natural Sciences, Brussels) and in the private collections of the authors.

Data analyses

In order to investigate the dolichopodid community structures in the sampled sites, multivariate analysis techniques were applied: Detrended Correspondance Analysis (DCA in CANOCO program, Ter Braak, 1987) and Two-Way Indicator Species Analysis (TWINSPAN, Hill, 1979). In DCA, theoretical variables are constructed that best explain the variation in the species data. The first variable explains most of the variation, which is reflected by its highest eigenvalue. A second and further theoretical variables can be extracted from the data matrix but are subject to the constraint of being uncorrelated with the previous DCA variables. A further step in this analysis is the ordination of the species and site scores in an ordination diagram where the theoretical variables are represented by axes (Fig. 2). Sites are arranged along the axes on the basis of their species composition, and species on the basis of their distribution over the sites. The TWINSPAN clusters sites and species according to their species composition and occurrences resp. The combination of both methods allows the clustering of sites and species scores in the ordination diagram on a reliable basis.

Some constraints were taken into consideration while constructing the matrix upon which the programs were run. First of all, only Malaise trap yields were included and thus sites A, C and G were left out. Secondly, only seasons from the beginning of May till the middle of October were considered, which meant that only part of the Malaise trap yields of J (March and April excluded) and K (second half of October excluded) were used and that the short seasons of B and L were not used. As a result, the geographic spread of the sites compared was restricted to two clusters of sites (D+E+F and H+I+J+K) in Limburg (Fig. 1). The longest distance between the sites analysed was between F and K, and was about 25 km. Because the sites analysed were reasonably close, climatic differences in any given year will be minimized, but it should be noted that sites D, E, F and J were studied in 1992, and H, I and K in 1993. Moreover, only species with a total yield of more than 20 specimens over all sites were used. As a result, a matrix of 7 sites and 23 species (5,784 individuals) was built. Finally, species which occurred in only one or two sites but, though, in sufficient numbers were downweighted in the DCA of the CANOCO program in order to decrease their impact on the overall analysis results.

For presenting the phenology of the most abundant species (≥ 100 specimens in at least 1 site) all sampling yields were converted to four equal yields per month between May 7th and October 1st, in order to enable comparison of the activity patterns between seasons and between traps.

Only data from D, E and F were considered, as Malaise traps were emptied at comparable intervals only at these sites which were all studied in 1992.

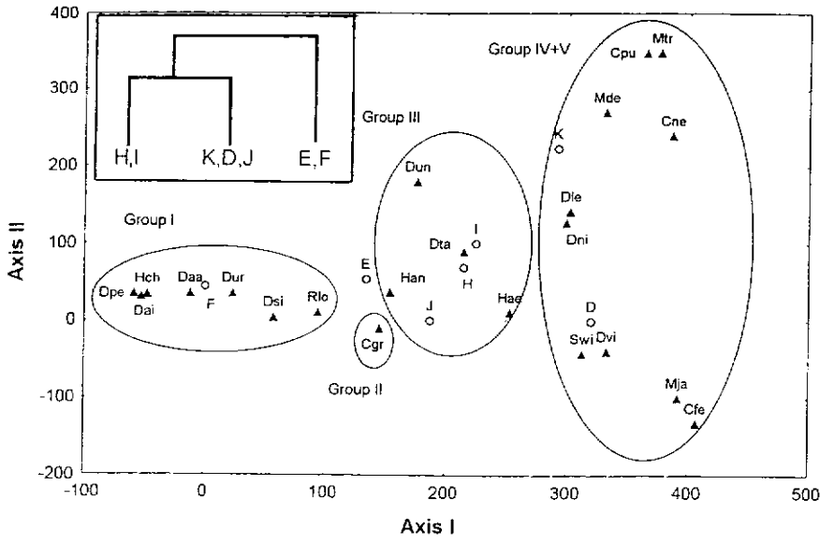

Fig. 2. DCA ordination diagram of the most numerous species (n > 20, ▲) and the sites sampled with Malaise traps (o). TWINSPAN dendrogram of the same sites in the upper left corner. Species and site codes are explained in Table 1 and Text.

Results and discussion

1.- In general

Table 1 presents all data on the dolichopodid flies per site. A total number of 7,865 specimens was collected, belonging to 73 named species. The females of the genera *Medetera* and *Chrysotus* could not always be identified to species level and are indicated as *Medetera* spec. and *Chrysotus* spec. respectively. Females of *Argyra argentina* and *A. perplexa* could not be separated and are thus mentioned as *A. argentina/perplexa*. Four species accounted together for more than 50% of the total yields: *Dolichopus ungulatus* (16.4%, n=1287), *Chrysotus gramineus* (14.6%, n=1151), *Dolichopus atripes* (14.0%, n=1101) and *Dolichopus tanythrix* (8.2%, n=641). Large numbers of species such as *D. lepidus, D. tanythrix, H. aerosus, H. angustifrons* and the presence of *R. longicorne* and 8 other species clearly reflects the oligotrophic acid character of the region.

2.- Faunistics

In this chapter, some comments are given on the distribution and the present status of some species of special faunistic interest in Belgium. Information on the dolichopodid distribution in Belgium was extracted from the ECODOL-database (POLLET, unpubl. data) and is based on the number of UTM 10 km-squares in which the species has been discovered prior to the present investigations. In the following discussion, only species with records from ≤ 20 UTM-squares are included (no. of squares indicated between brackets).

Campsicnemus armoricanus (7): POLLET (1991) reported five localities for this species in the eastern and southern parts of Belgium. It is mainly found in humid heathland, peatmoors and on riverbanks (POLLET *et al.*, 1988a).

Campsicnemus compeditus (3): this species is entirely restricted to oligotrophic peaty or sandy soils. It has been recorded as new to the Belgian fauna as late as 1986 (POLLET & GROOTAERT, 1986) and was thus far known from five localities (POLLET, 1991, 1992).

Dolichopus apicalis (0): this is the first record of this species in Belgium. It is considered as extremely rare everywhere in Europe and has recently been found in fair numbers in an inland saltmarsh habitat near Halle/S. (Germany) (STARK, pers.comm.).

Dolichopus campestris (15): this is a true marshland species, mainly occurring in reedmarshes and grasslands along the banks of mesotrophic waterbodies, which corresponds very well with the findings of EMEIS (1964) who recorded this species from beaches too.

Dolichopus lepidus (20): this is a typical species of wet oligotrophic habitats (heathlands, peatbogs). Consequently, it is most frequently collected in the large wet heathland areas in the eastern part of Flanders. Towards the west, it seems to be restricted to heathland relicts and has occasionally been encountered in reedmarsh habitats on peaty soils (POLLET, 1992).

Dolichopus longitarsis (12): POLLET (1992) reported the discovery of a large population of this species in a wooded reedmarsh in St.Laureins (northern part of Eastern Flanders). Apart from this record, this species seems to be rare in Belgium and has mainly been found in rather oligotrophic grasslands. A peat soil and tree canopy seem to be essential for its occurrence. EMEIS (1964) stated that this is a species of moist and shadowy places in woodlands as well as overgrown "Zwischenmoore".

Dolichopus nitidus (12): this species can be termed quite rare and is always collected in very low numbers. As a result, its ecological requirements could not yet be established. According to EMEIS (1964), it is hygrophilous and most often found on banks of waterbodies and in humid woodlands.

Table 1. Summary of dolichopodid species (males/females) collected in different nature reserves in "De Kempen" (Belgium). A, "De Rammelaars" NR (Oostham); B, "De Liereman" NR (Oud-Turnhout); C, "De Vallei van de Grote Beek" NR (Leopoldsburg); D, "De Katershoeve" NR (Hechtel); E, "De Kluut" NR (Beringen); F, "OCMW" (Beringen); G, water trap campaign in "De Vallei van de Zwarte Beek" NR (Beringen); H, *Erica* heathland and I, a pond within "De Maten" NR (Genk); J, "Het Wik" NR (Genk); K, "Paependaal" (Zutendaal); L, "De Mieren" (Opoeteren). Species codes are added to species used in the multivariate analyses (see Fig. 2).

Dolichopodid species (Code)/Sites	A	B	C	D	E	F	G	H	I	J	K	L	mm/ff	Total
Argyra argentina/perplexa	-	-	-	-	-	-/1	-	-	-	-/5	-	-	-/6	6
Argyra diaphana	-	-	-	-	2/1	7/8	-	-	-	-	-	-/4	9/13	22
Argyra spec.	-	-	-	-	-	-	-	1/-	-	-	-	-	1/-	1
Campsicnemus armoricanus	-	-	-	-	-	-	-	-	-	-/1	-	-	-/1	1
Campsicnemus compeditus	-	-	-	-	-	-	1/-	-	-	-	-	-	1/-	1
Campsicnemus loripes	-	-/1	-	-	-	-	-	-	-	-/1	-	-/1	-/3	3
Campsicnemus scambus	1/-	1/1	4/5	-	-/2	-	1/-	-	-	-/2	-/1	-/1	7/12	19
Chrysotimus molliculus	-	-	-	1/4	-	-	-	-	-	1/5	1/2	-	3/11	14
Chrysotus cilipes	-	-	-/1	-/1	2/1	-	-	-/1	1/2	-/2	4/4	-	7/12	19
Chrysotus femoratus (Cfe)	-	-/1	1/17	86/340	-	-	1/-	-	-	-/1	2/-	-/1	90/360	450
Chrysotus gramineus (Cgr)	-	11/33	3/3	5/105	308/348	47/35	6/3	14/2	21/6	25/90	-/3	14/69	454/697	1151
Chrysotus laesus	-	-	-	1/-	-	-	-	-	-/1	-	-	-	1/1	2
Chrysotus neglectus (Cne)	-	-/2	1/13	4/115	1/8	-	-	-	1/-	1/6	13/23	3/5	24/172	182
Chrysotus pulchellus (Cpu)	-	1/7	1/-	-	-	-	-	-	-/3	-	5/16	1/-	8/26	34
Chrysotus suavis	-	-	-	-	-	-	-	-	-	-	-/1	-	-/1	1
Chrysotus spec.	-	-	-	-	-	-	-/1	-	-/2	-	-	-	-/3	3
Diaphorus nigricans (Dni)	-	-/3	-	-/1	-/1	-	-	-/2	10/13	-	-	-	10/20	30
Diaphorus oculatus	-	-	-	-	-	-/2	1/-	1/-	1/4	-	-/1	-	3/7	10
Dolichopus acuticornis	-	-	-	-	-	-	-	-	-	-	3/7	-	3/7	10
Dolichopus apicalis	-	1/-	-	-	-	-	-	-	-	-	-	-	1/-	1
Dolichopus atratus (Daa)	-	-	-	-	104/41	118/74	10/9	-	-	-	-	-	232/124	356
Dolichopus atripes (Dai)	1/-	-	2/-	-	25/17	399/456	73/105	-	-	5/15	-	2/1	507/594	1101
Dolichopus brevipennis	-	-	-	-	1/3	-	1/-	-	11/3	-	-	-	13/6	19
Dolichopus campestris	-	-	-	-	-	-/3	-	-	-	-	-	-	-/3	3
Dolichopus claviger	-	-	-	-	-/2	2/2	-	-	-	-	2/1	-	4/5	9
Dolichopus discifer	1/-	31/101	-	-	6/3	-/1	3/2	1/3	2/1	-	-	-	44/111	155
Dolichopus lepidus (Dle)	-	29/92	-/1	3/3	1/-	-/1	1/-	7/16	31/43	1/1	1/1	1/3	75/161	236
Dolichopus longicornis	-	-	-	1/-	-	-	-	-	-	-/1	1/1	1/-	3/2	5
Dolichopus longitarsis	-	-	-	-	-	9/9	-	-	-	-	-	-	9/9	18
Dolichopus nitidus	-	-/1	-/1	-	-	-	-	-	-	-/1	-	1/-	1/3	4
Dolichopus nubilis	-	-	-	-	-	-	-	-/1	-	-	-	-	-/1	1
Dolichopus pennatus (Dpe)	-	-	-	-	-/1	12/28	9/8	-	-	-	-	-/5	21/42	63
Dolichopus picipes	-	-/1	-	-	-	2/10	2/-	-	-	-	-	-	4/11	15
Dolichopus plumipes	-	2/2	3/5	-	-/2	-	-	-	-	1/-	-	1/1	7/10	17
Dolichopus popularis	-	-	36/29	-	-/2	2/2	1/-	-	-	-	-	-	39/33	72
Dolichopus rupestris	-	1/-	-	-	-	-	-	-	-	-	-	-	1/-	1
Dolichopus signatus (Dsi)	2/2	3/4	-/1	3/2	39/36	9/14	8/8	-/1	-	7/2	-	2/8	73/78	151
Dolichopus simplex	-	-	-/1	-	2/-	-	-	-/1	1/1	-/1	-	-	3/4	7
Dolichopus subpennatus	-	-/2	-	-	-	-	-	-	-	-	-	-	-/2	2
Dolichopus tanythrix (Dta)	-	85/156	-/2	-/3	37/38	4/13	2/15	6/45	44/165	7/9	1/-	2/7	188/453	641
Dolichopus ungulatus (Dun)	6/5	60/89	8/2	46/134	191/239	58/96	7/11	30/21	92/79	2/1	23/37	19/31	524/745	1287
Dolichopus urbanus (Dur)	1/-	-	-	-	42/31	10/18	4/3	-	-	-	-	1/-	58/52	110
Dolichopus vitripennis (Dvi)	-	2/14	-	9/9	-	-/1	1/-	12/17	3/6	-/1	-/1	-	27/49	76
Hercostomus aerosus (Hae)	-/2	3/63	7/13	2/42	17/47	6/17	10/8	5/40	36/106	1/8	-/2	-/12	87/360	447

Dolichopodid species (Code)/Sites	A	B	C	D	E	F	G	H	I	J	K	L	mm/ff	Total
Hercostomus angustifrons (Han)	-	2/12	-	1/4	54/104	1/1	-/2	4/12	7/18	-/4	1/-	-/2	70/159	229
Hercostomus brevicornis	-	-	4/2	-	1/6	-	-	-	1/-	2/-	2/4	-	10/12	22
Hercostomus celer	-	-	-/1	-	-/2	-	-	-	-/8	-/1	-/2	1/4	1/18	19
Hercostomus chalybeus(Hca)	-	-	-	-	-/1	19/37	4/1	-	2/1	-/2	-	-/1	25/43	68
Hercostomus chrysozygos	1/-	-	-	-	-	-	-	-	-/1	-	-	-	1/1	2
Hercostomus cupreus	-	-/2	1/-	1/4	1/6	-	-	-	-/7	-	-/1	-/4	3/24	27
Hercostomus metallicus	-	-/5	-/1	-	3/3	-/1	1/-	-	-	-/2	-	-	4/12	16
Hercostomus nigripennis	-	-	-	-	3/6	-	-	-	-	-	-	-	3/6	9
Hercostomus praeceps	-	-	-	-	-	-	-	-	-	-/1	-	-	-/1	1
Hercostomus silvestris	-	1/-	-	-	-	-	-	-	-	-	-	-	1/-	1
Hydrophorus bipunctatus	-	-	-	-	-	-	1/1	-	-	-	-	-	1/1	2
Medetera abstrusa	-	-	-	-	1/-	-	-	-	1/-	-	-	-	2/-	2
Medetera dendrobaena (Mde)	-	-	-	1/7	1/6	-	-	-/4	11/12	-	4/12	-/2	17/43	60
Medetera infumata	-	-	-	-	-	-	-	-	-	-	1/-	-	1/-	1
Medetera jacula (Mja)	1/-	7/6	-/1	33/38	-/1	-	-	-	1/1	1/6	-/2	-	43/55	98
Medetera lorea	-	-	-	-	-	-	-	-	1/-	-	-	-	1/-	1
Medetera micacea	-	-	-	2/4	-/1	-	-	-	-/1	-	-/1	-	2/7	9
Medetera pallipes	-	-	-	-	-/3	-	-	-	-	-	-	-	-/3	3
Medetera plumbella	-	-/1	-	8/5	-	-	-	-	-	-	-	-	8/6	14
Medetera saxatilis	-	-	-	4/-	-	-	-	-	-	-	-	-	4/-	4
Medetera spec.	-	6/13	1/6	-/5	-/9	-	-	-	-	-	-/1	-	7/34	41
Medetera truncorum (Mtr)	-	-	-	1/1	-	-	-	-	-	-	5/14	-	6/15	21
Poecilobothrus nobilitatus	12/10	-	1/5	-	3/1	-/1	3/-	-	-	-/1	-	-	19/18	37
Rhaphium elegantulum	-	-	-	-	1/-	-	-	-	1/-	-	-	-	2/-	2
Rhaphium longicorne (Rlo)	-	3/6	-	-	67/19	18/4	4/-	13/16	3/4	2/4	-	36/8	146/61	207
Sciapus contristans	-	-	-	-	-	-	-	1/-	6/1	-	-/1	-	7/2	9
Sciapus platypterus	-	-	2/18	-	-	-	-	-	-	-	2/3	-	4/21	25
Sciapus wiedemanni (Swi)	-	1/2	-	3/20	-	-	-	-/1	-/4	12/49	-/2	-/1	16/79	95
Sciapus zonatulus	-	-	16/13	14/3	-	-	-	-	-	-	-	-	30/16	46
Sympycnus pulicarius	-	-	1/-	-	-/1	1/-	-	-	-	1/3	-/9	-	3/13	16
Tachytrechus notatus	-	-	-	-	-	-	-	-	-	-	1/-	-	1/-	1
Thrypticus tarsalis	-	-	-	-	2/-	-/1	-	-	-	-	1/-	-	3/1	4
Xantochlorus tenellus	-	-	1/2	-	-	-	-	-	-	-	-	-	1/2	3
Total number of individuals	45	870	236	1079	1907	1560	332	278	781	295	226	256	3002/4863	7865
Total number of named species	10	28	26	24	38	27	26	18	30	31	32	25	73	

Dolichopus picipes (5): this large dark-legged *Dolichopus* species can be found sometimes quite abundantly in rather oligotrophic and damp marshlands with a well developed herb vegetation in the central, eastern and southern parts of Belgium (Pollet *et al.*, 1988).

Dolichopus rupestris (5): Pollet *et al.* (1988) found this species in Rekem (Limburg) in humid woodland and *Erica* heathland. Its ecological status is not entirely clear as it is called a heathland species (Emeis, 1964), a riverbank species (Meyer & Heydemann, 1990) and a mountain and northern species (D'assis Fonseca, 1978; Meuffels, 1974). Its distribution

area extends from northern and central Europe down into France, where it seems to reach its southern limit (Lundbeck, 1912; Stackelberg, 1933; Parent, 1938; Meuffels, 1974).

Hercostomus angustifrons (19): Pollet (1991) and Pollet *et al.* (1992) dealt with the ecology and distribution of this species in detail. It can be concluded that this species is mainly distributed in the eastern parts of our country. It clearly prefers humid heathland, peatmoor and woodland habitats on exclusively sandy or peaty soils.

Hercostomus praeceps (13): recently, this relatively rare species was frequently encountered in reedmarshes on clayish and sandy loamy soils (POLLET, 1992). However, it is also known from a number of other mainly wooded habitats (gardens, woodlands, ...) (POLLET, unpubl.data).

Hercostomus silvestris (14): this species has been described as new as late as 1990 from two large populations discovered in Belgium namely De Mandelhoek NR at Ingelmunster and Wijnendalebos at Ichtegem (POLLET, 1990; POLLET *et al.*, 1992). POLLET *et al.* (1989) gave an account of the knowledge on its ecology and distribution. This species proved to be restricted to carr woodland types with shallow waterbodies.

Hydrophorus bipunctatus (12): as most of the *Hydrophorus* species, this species is restricted to shallow water bodies where it skates on the water surface (like *Gerris* sp., Heteroptera) in search for mating partners or food. *H. bipunctatus* is characteristic for heathland fens (see POLLET *et al.*, 1988; POLLET, 1991) but in southern Belgium occurs on river banks as well. It has been observed in the field as late as mid October.

Medetera spp.: due to their predominantly arboreal way of life, most *Medetera* species are not readily collected with traditional sampling techniques like Malaise or water traps and consequently the present knowledge on their distribution and ecology is considerably poorer than in other dolichopodids. *M. abstrusa* and *M. infumata* are known from only 12 and 7 squares resp. but are undoubtedly more common than these numbers might suggest. *Medetera lorea* has been added to the Belgian fauna on the basis of a male collected in a dune woodland at Nieuwpoort (POLLET & GROOTAERT, 1996). The record from "De Maten" (site I) is thus the second record for our country. *M. micacea* (17) and *M. plumbella* (15) differ from most of their congeners in that they demonstrate a soil-dwelling behaviour and, as a result, the knowledge on their distribution in Belgium is more reliable. As stated by POLLET & GROOTAERT (1996), both can be called lowland species, occurring mainly in the northern part of Belgium (Flanders), where they obviously prefer open and dry sandy habitats with short-grazed vegetations. Both are regularly found together both inland in dry heathlands and in the coastal dunes.

Rhaphium elegantulum (12): in contrast with the following species, *R. elegantulum* occurs mainly at the borders of mesotrophic ponds and lakes on sandy soils, where it can be found from May until September.

Rhaphium longicorne (14): this is another species typical for peatbogs (POLLET *et al.*, 1988a). In contrast to our findings this species is called xerophilous by MEYER & HEYDEMANN (1990).

Sciapus zonatulus (20): since its recognition by MEUFFELS & GROOTAERT in 1990, this species has proved to be fairly widespread. Besides the fact that it seems to be rather xerophilous and has been collected on tree-trunks, very little is known about its ecology.

Tachytrechus notatus (2): this species is only known from three localities in Belgium (POLLET, unpubl. data).

Thrypticus tarsalis (3): as most *Thrypticus* species, this species is not met with frequently. It is known from a few localities in Belgium, and has been found in sunny habitats such as woodland edges or paths in heathland areas.

The following species are more common but remain worth mentioning:

Chrysotus laesus: this relatively rare species is typical for the borders of oligotrophic ponds on sandy soils, although it has also been encountered in woodland habitats. Recently, it has been observed sun-basking on leaves of *Hedera helix* in a garden habitat (POLLET, unpubl. data). EMEIS (1964) calls it a species of dry habitats.

Chrysotus pulchellus: this species is a very typical grassland species of relatively humid open habitats on sandy or peaty soils. It is especially abundant in dune slacks (POLLET & GROOTAERT, 1994, 1996) and in inland heathlands (POLLET *et al.* 1989; POLLET, 1991).

Dolichopus acuticornis: POLLET & GROOTAERT (1994, 1996) call it a "lowland species" with its main distribution in the northern part of Belgium. Thus far, it has been collected in large numbers only in woodland habitats within the coastal dune region but obviously, populations occur in suitable sandy inland habitats as well as proved the record from Zutendaal (site K). According to EMEIS (1964) this species is mainly found in woodland habitats, but also in heathlands, moors and in the coastal region.

Dolichopus urbanus: this species is mainly collected in the central and southern parts of Belgium (POLLET *et al.*, 1988b) and seems to have a preference for damp wooded marshlands with a herb layer of *Filipendula ulmaria*.

Dolichopus vitripennis: as shown by POLLET *et al.* (1989), this species is characteristic for humid *Erica* heathland with open fens. EMEIS (1964) too calls this species typical for open peatmoors and *Erica* heathlands. It has been found on several occasions with other dark-legged *Dolichopus* species e.g. *D. atratus, D. lepidus, D. tanythrix* and *D. atripes*. All these species are most abundantly found in open oligotrophic situations.

Hercostomus chalybeus: together with *H. plagiatus* and *H. assimilis*, this species can be considered a typical reedmarsh *Hercostomus* species (POLLET, 1992) although it has been found in extremely large numbers in a wooded marshland habitat as well (POLLET *et al.*, 1992).

Summarising, during the present inventory of some habitats in "De Kempen", 22 rare species were discovered (9 known from ≤ 10 UTM-squares, 13 known from 10-20 UTM-squares). Seven of these species were encountered in sufficient numbers to assume the presence of a population in at least one site. *D. lepidus* occurred quite abundantly even in 3 sites and *R. longicorne* in 4 sites. Furthermore, another 6 species (*C. pulchel-*

lus, *D. nigricans*, *D. atratus*, *D. atripes*, *D. tanythrix*, *D. vitripennis*) which are typical for oligotrophic habitats and 2 species of more mesotrophic sites (*D. urbanus*, *H. chalybeus*) were collected. As a result, the investigated region of "De Kempen" can be considered very valuable in respect of its dolichopodid fauna.

3.- Ecology

Sites were clustered by the Two Way Indicator Analysis (TWINSPAN) as indicated in Fig. 2. Two of the three sampling sites of the "Vallei van de Zwarte Beek" were separated first and the two sites of "De Maten" were grouped together as well. On species level, 5 groups (I-V) were distinguished in TWINSPAN, which correspond well with the DCA results:

- group I consists of species which were, in the present inventory, either restricted to or occurred in the highest numbers in the open habitat types amid woodland of "De Vallei van de Zwarte Beek". It is a mixture of typical oligotrophic species (*R. longicorne*, *D. atratus*, *D. atripes*) and woodland species of more mesotropic or eutrophic situations (*D. signatus*, *D. chalybeus*, *D. pennatus*). *D. urbanus* is almost always found in well developed herb vegetations in damp wooded habitats. All species are clearly hygrophilous.
- *Chrysotus gramineus* (group II) is somewhat separated from the former group due to its eurytopic behaviour. Indeed, although the species (group) prefers sunny places, it is not restricted to open habitats and can be found in large numbers in well-lit woodland habitats as well.
- group III represents the "regional eurytopic" species. All appeared to occur in lower or higher numbers at the 7 sites considered in this analysis. Although *D. ungulatus* is among the most common species in Europe, *D. tanythrix* and *H. angustifrons* are only fairly common in the eastern parts of our country and become much rarer towards the west. *H. aerosus* can be termed a eurytopic heathland species.
- the clustering of the species belonging to groups IV and V differs between the TWINSPAN and DCA approach. Nevertheless, all members are known to prefer open sandy habitats but occur in both dry and rather humid conditions. A number of them, *C. pulchellus*, *M. truncorum* and *M. jacula*, are recorded from large coastal dune populations (Pollet & Grootaert, 1996) but the latter two species can be found in numbers on tree trunks as well.

On the basis of their habitat preferences, axis I (eigenvalue = 0.648) might represent light intensity (with woodland species at the left-hand side of the ordination diagram and the xerophilous species of more open habitats at the right-hand side). The eigenvalue of axis II proved to very low (0.092) and according, no unequivocal environmental factor could be linked with it.

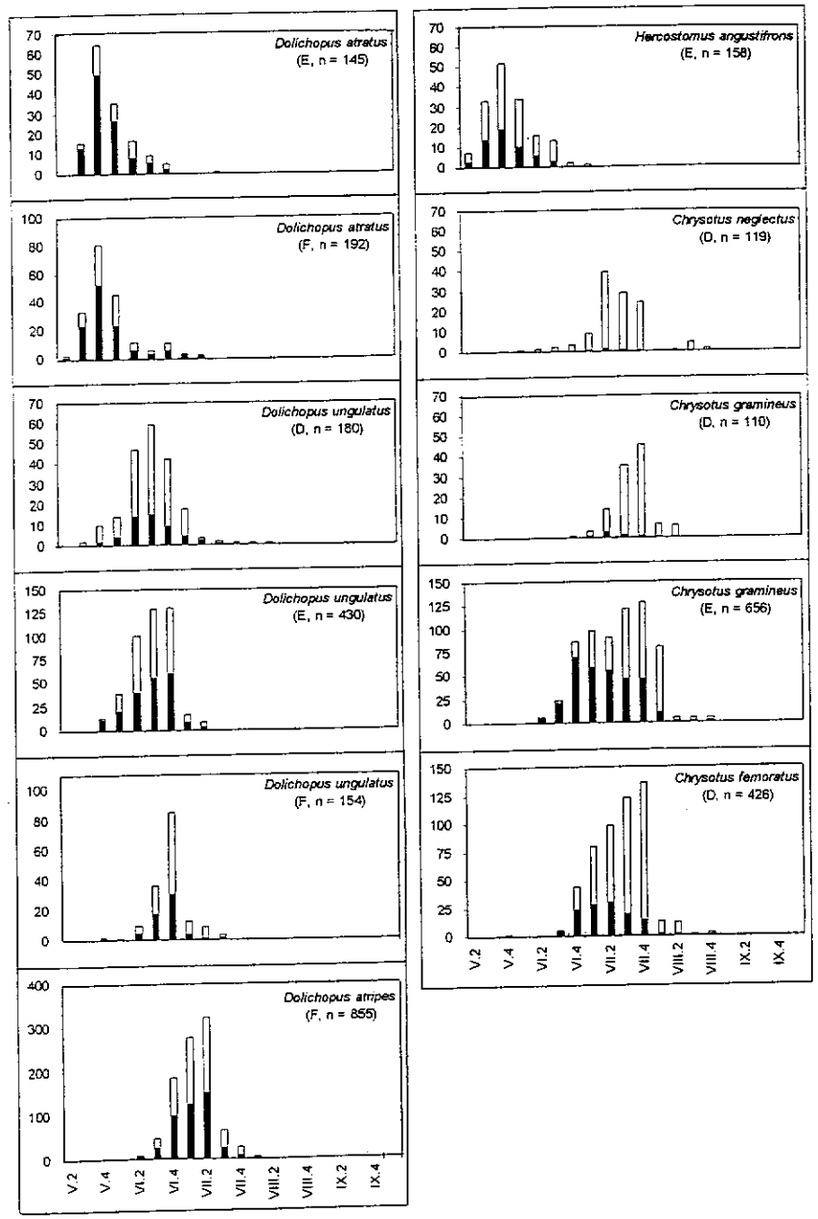

Fig. 3. Seasonal activity patterns of the most abundant dolichopodid species (n ≥ 100), collected with Malaise traps in sites D, E and F of "De Vallei van de Zwarte Beek" (black columns: males, white columns: females).

Table 2. Summary of phenology data on the most abundant dolichopodid species from sites D, E and F.

Species	Site code	Peak activity [a]	Activity period [a]	Activity period according to D'ASSIS FONSECA (1978)
H. angustifrons	E	May (4)	May (1)-July (2)	May,June-July [b], September
D. atratus	E F	May (4) May (4)	May (3)-July (3) May (1)-July (2)	June-July
D. ungulatus	D E F	June (3) June (3) June (4)	May (3)-August (2) May (4)-July (2) May (4)-July (3)	May-August
D. atripes	F	July (2)	June (1)-August (1)	June-August
C. neglectus	D	July (2)	May (3)-August (3)	June-August
C. gramineus	D E	July (4) July (4)	June (3)-August (2) June (2)-August (4)	June-September
C. femoratus	D	July (4)	May (4)-August (4)	June-August

[a] May (4) means 4th period of May (≈ 23-30 May); [b] according to DRAKE (1991) and CROSSLEY (1993).

4.- Phenology

Table 2 summarises information on the seasonal activity of the seven most abundant species (n ≥ 100) collected during this inventory; in Figure 3 the activity patterns of these species are displayed. On the basis of this information, the following conclusions can be drawn: (i) our phenology data correspond quite well with the D'ASSIS FONSECA (1978) dates for most species. Nevertheless, activity periods mentioned by this author are generally shorter which can be explained by the fact that they were based on (probably limited) museum material only; (ii) no evidence can be found for more than one brood a year for the species shown in Figure 3, except maybe for *C. neglectus* (small peak in September); activity peaks vary from the end of May (*H. angustifrons*) until the end of July (*C. femoratus*); D'ASSIS FONSECA mentions captures *of H. angustifrons* and *C. gramineus* in September, indicating a possible second brood in these species; (iii) in all but one of the seven species, females outnumbered the males in the trap yields. The deviated sex ratio in *D. atratus* (the only *Dolichopus* species with a significantly higher proportion of males to females) is comparable to the excess of males found in traps at soil surface level in previous studies (*D. popularis* in POLLET *et al.*, 1986; *D. claviger*, *D. latilimbatus*, *D. nubilus*, *D. pennatus*, *D. plumipes*, *D. ungulatus* in POLLET & GROOTAERT, 1987). It is peculiar, though, that males of *D. popularis* considerably outnumbered females in pitfall traps (POLLET *et al.*, 1986) whereas, despite relatively low numbers, no clear difference between both sexes was found in white water traps on the soil (POLLET & GROOTAERT, 1987). In all other abundant *Dolichopus* species, the opposite phenomenon was observed during these studies. So pitfall and coloured water traps possibly attract different parts of the species populations or at least specimens exhibiting a different activity. In *Chrysotus*, males generally appear first (in rather low numbers) but numbers drop when females become abundant. In site E, however, *C. gramineus* exhibits an unusual strong male activity; (iv) within both genera considered here, activity patterns are spread in time: *D. atratus* reaches it peak activity at the end of May, followed by *D. ungulatus* about three to four weeks later and *D. atripes* during mid July. All abundant *Chrysotus* species reach their activity peaks during mid summer and activity can last up to 4 months (*C. femoratus*); (v) within one species, activity peaks are reached simultaneously in the different sites, but patterns show a different peak length and unequal sex ratios. In both D and E, activity of *D. ungulatus* continued at a high level for three weeks, whereas this was restricted to only one week in F. In *C. gramineus*, the considerably higher proportion of males in E explains the highly different activity patterns in the dry pasture (D) and woodland site (E). As *C. neglectus* and *C. femoratus* also showed a dramatic decrease in numbers at the beginning of August, most probably unfavourable (micro)climatological conditions such as drought and/or high temperatures are responsible for this phenomenon. In site E, the decline of *C. gramineus* is evident one week later but it cannot be proved whether this longer high activity is a reflection of a higher longevity of the present population or the result of a migration of specimens from the drier habitats.

5.- Site quality assessment and dolichopodid biodiversity

Table 3 summarises data on the rarity, abundance and biodiversity of the dolichopodids per investigated site. Only sites analysed by TWINSPAN and DCA were used in this approach. All sites appear to house between 3 (site H) and 7 (site I) rare species i.e., species with records in ≤ 20 UTM 10 km-squares. When only considering populations of these rare species (it is assumed here that a population is present in a particular site if 10 or more specimens were collected there during our sampling campaign), however, not more than 3 rare species were found at a single site. In the assessment of the dolichopodid biodiversity, only species with ≥ 10 specimens were taken into consideration, again, to exclude occasional migrants. The most interesting site in this respect proved to be the humid oligotrophic grassland in "De Vallei van de Zwarte Beek" (site F) with 14 spe-

Table 3. Species rarity versus biodiversity in dolichopids.

Species/sites	D	E	F	H	I	J	K
Rare species: no. of species known from							
- ≤ 10 UTM-squares	-	-	1	-	1	1	3
- 10 < UTM-squares ≤ 20	5	6	5	3	6	5	3
- > 20 UTM-squares	19	32	21	15	23	25	26
Biodiversity and abundance: no. of species with							
- ≥ 20 specimens	7	10	10	6	8	3	3
- 10 ≤ specimens < 20	3	-	4	2	1	1	3
- < 10 specimens	14	28	13	10	21	27	26
Abundance of rare species (no. of species with ≤ 20 UTM-squares and ≥ 10 specimens collected per site)	2	2	2	3	2	-	-
Total number of species	**24**	**38**	**27**	**18**	**30**	**31**	**32**

cies. The overgrown pond in "Het Wik" (site J) and the garden habitat at Zutendaal (site K) showed the lowest dolichopodid biodiversity (resp. 4 and 6 abundant species). Although no clear correlation between the number of abundant rare species (site quality) and the total number of abundant species (biodiversity) was evident, not a single rare species seemed to have a real population in the low biodiversity sites (J, K).

The former conclusions must be considered highly preliminary and should be interpreted with great caution due to the restrictions of the present set-up. With the present data-set it is, indeed, nearly impossible to draw general conclusions about the usefulness of biodiversity estimates or rare species to determine the site quality or even the natural value of nature reserves versus disturbed habitats (e.g. gardens). Malaise traps are not the ideal collecting devices for that kind of investigations for the following reasons:

- the effectiveness of Malaise traps depends largely on the optimal orientation of the trap and the collecting jar in particular. The side with the collecting jar must be directed to the south as the potentially captured insects tend to fly to the most sunny spot on the top wall of the trap, especially in dark habitats. If the trap is not installed as such, then the yields will always be low. That is probably also the explanation for the rather low numbers collected in site J which not necessarily equals local dolichopodid scarcity;
- most dolichopodids live near the soil surface and do not fly regularly over large distances. Former investigations (Pollet & Grootaert, 1987) indeed showed that the abundance of soil-dwelling species such as *Campsicnemus* spp. and a large number of *Dolichopus* spp. is undoubtedly underestimated when only using Malaise traps;
- with only 1 Malaise trap per site, no information about the heterogeneity of the habitat and the present fauna can be determined.

However, the usefulness of Malaise traps in large scale inventories stands beyond any doubt but one should be aware of its restrictions in gathering quantitative data in more ecological and applied research.

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References

Crossley, R., 1993. - *Hercostomus angustifrons* (Staeger) (Dipt., Dolichopodidae) in Yorkshire. *Entomologist's mon. Mag.*, 129: 204.

D'Assis Fonseca, E.C.M., 1978. - Diptera Orthorrhapha Brachycera Dolichopodidae. *Handbk Ident. Br. Insects*, 9 (5): 90 pp.

Drake, C.M., 1991. - Recent records of *Hercostomus angustifrons* Staeger (Dipt., Dolichopodidae) in Cumbria and Shropshire. *Entomologist's mon. Mag.*, 127: 121.

Emeis, W., 1964. - Untersuchungen über die ökologische Verbreitung der Dolichopodiden (Ins. Dipt.) in Schleswig-Holstein. *Schr. Naturw. Ver. Schlesw.-Hols.*, 35: 61-75.

Grootaert, P., De Bruyn, L. & De Meyer, M., 1991. - Catalogue of the Diptera of Belgium. *Docums Trav. Inst. r. Sci. nat. Belg.*, 70: 338 pp.

Hill, M., 1979. - TWINSPAN-FORTRAN Program for Arranging Multivariate Data in an Ordered Two-way Table by Classification of Individuals and Attributes (Cornell University Ithaca: NY). 90pp.

Lundbeck, W., 1912. - *Diptera Danica.* Part IV. Dolichopodidae. G.E.C. Gad, Copenhagen. 407 pp.

Maes, D. & Decleer, K., 1993. - Vliegenonderzoek (Diptera) in "De Vallei van de Zwarte Beek" (Koersel-Beringen). *Limburgs Jaarboek voor Natuurstudie*, 2 (1992): 41-47.

Meuffels, H., 1974. - Nederlandse Dolichopodidae (Dipt.). *Ent. Ber., Amst.*, 34: 32-35.

Meuffels, H. & Grootaert, P., 1990. - The identity of *Sciapus contristans* (Wiedemann, 1817) (Diptera: Dolichopodidae), and a revision of the species group of its relatives. *Bull. Inst. r. Sci. nat. Belg., Ent.*, 60: 161-178.

Meuffels, H., Pollet, M. & Grootaert, P., 1989. - The dolichopodid fauna (Dolichopodidae, Diptera) of a garden habitat: faunistics, habitat preference, phenology and distribution. *Bull. Inst. r. Sci. nat. Belg., Ent.*, 58: 83-94.

Meyer, H. & Heydemann, B., 1990. - Faunistisch-ökologische Untersuchungen an Dolichopodiden und Empididen (Diptera - Dolichopodidae u. Empididae, Hybotidae) in Küsten- und Binnenlandbiotopen Schleswig-Holsteins. *Faun.-Ökol. Mitt.*, 6: 147-172.

Negrobov, O. & von Stackelberg, A., 1972. - 29, Dolichopodidae. *In*: E. Lindner (Ed.), *Die Fliegen der Palaearktischen Region* (Stuttgart: Nägele & Obermiller) 289: 257-302.

Negrobov, O. & von Stackelberg, A., 1974a. - 29, Dolichopodidae. *In*: E. Lindner (Ed.), *Die Fliegen der Palaearktischen Region* (Stuttgart: Nägele & Obermiller) 302: 303-324.

Negrobov, O. & von Stackelberg , A., 1974b. - 29, Dolichopodidae. *In*: E. Lindner (Ed.), *Die Fliegen der Palaearktischen Region* (Stuttgart: Nägele & Obermiller) 303: 325-346.

Negrobov, O. & von Stackelberg, A., 1977. - 29, Dolichopodidae. *In*: E. Lindner (Ed.), *Die Fliegen der Palaearktischen Region* (Stuttgart: Nägele & Obermiller) 316: 347-354.

PARENT, O., 1938. - Diptères Dolichopodidae. *Faune Fr.* 35: 720 pp.

POLLET, M., 1990. - Phenetic and ecological relationships between species of the subgenus *Hercostomus* (*Gymnopterus*) in western Europe with the description of two new species (Diptera: Dolichopodidae). *Syst. Ent.*, 15: 359-383.

POLLET, M., 1991. - Contributions to the knowledge of Dolichopodid flies in Belgium: IV. Ecology and faunistics of dolichopodid flies collected in some nature reserves (Diptera: Dolichopodidae). *Phegea*, 19 (2): 75-85.

POLLET, M., 1992. - Impact of environmental variables on the occurrence of dolichopodid flies in marshland habitats in Belgium (Diptera: Dolichopodidae). *J. nat. Hist.*, 26: 621-636.

POLLET, M. & DE BRUYN, L., 1987. - A contribution to the knowledge of dolichopodid flies (Dolichopodidae, Diptera) in Belgium. I. The Dolichopodidae fauna of a garden at Schoten (Prov. Antwerpen). *Bull. Annls Soc. r. belge Ent.*, 123: 371-377.

POLLET, M. & GROOTAERT, P., 1986. - Two Dolichopodid species new for the Belgian Fauna (Dolichopodidae, Diptera). *Bull. Annls Soc. r. belge Ent.*, 122: 300.

POLLET, M. & GROOTAERT, P., 1994. - The dolichopodid fauna of coastal habitats in Belgium (Dolichopodidae, Diptera). *Bull. Annls Soc. r. belge Ent.*, 130: 331-344.

POLLET, M. & GROOTAERT, P., 1996. - An estimation of the natural value of dune habitats using Empidoidea (Diptera). *Biodivers. Conserv.*, 5: 859-880.

POLLET, M., GROOTAERT, P. & MEUFFELS, H., 1989. - Relationship between habitat preference and distribution of dolichopodid flies in Flanders (Dipt., Dolichopodidae). *Proceedings of the Symposium 'Invertebrates in Belgium'*, Brussels, 25-26 November 1988: 363-371.

POLLET, M., VERBEKE, C. & GROOTAERT, P., 1986. - Verspreiding en fenologie van Dolichopodidae in een bosbiotoop te Wijnendale (West-Vlaanderen). *Bull. Annls Soc. r. belge Ent.*, 122: 285-292.

POLLET, M., MERCKEN, L. & DESENDER, K., 1988. - Contributions to the knowledge of Dolichopodid flies in Belgium: II. Faunistic data on the Dolichopodid fauna of some nature reserves in the Campines (Prov. Limburg, Antwerpen, Belgium) (Diptera: Dolichopodidae). *Phegea*, 16 (4): 135-143.

POLLET, M., MEUFFELS, H. & GROOTAERT, P., 1992. - Dolichopodid flies at the Mandelhoek Nature Reserve (Belgium): an example of the importance of small Nature Reserves to Invertebrates. *Bull. Annls Soc. r. belge Ent.*, 128: 213-227.

TER BRAAK, C., 1987. - CANOCO - A FORTRAN Program for Canonical Community Ordination by [Partial] [Detrended] [Canonical] Correspondance Analysis, Principal Components Analysis and Redundancy Analysis (Version 2.1), ITI-TNO, Wageningen. 95 pp.

VON STACKELBERG, A., 1933. - 29, Dolichopodidae. *In*: E. LINDNER (Ed.), *Die Fliegen der Palaearktischen Region* (Stuttgart: Nägele & Obermiller) 71: 65-128.

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Dans le texte, les références aux autres auteurs se feront selon les modèles suivants: SMITH (1969), (SMITH, 1969), SMITH (1969, 1985), (SMITH, 1969; BROWN, 1971), SMITH (1969) et BROWN (1976), BLACK & WHITE (1945), et, pour plus de deux auteurs: SMITH *et al.* (1979).

Dans les données de capture, il convient de citer les mois en chiffres romains (11.IV.1928); ailleurs, il est recommandé de les écrire en toutes lettres (le 11 avril 1928).

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FAIN, A. & LUKOSCHUS, F. S., 1971. - Parasitic Mites of Surinam; XV. Nasal Ereynetid Mites of Bats with a key of the known species. *Bull. Annls Soc. r. belge Ent.* 107: 284-297.

HENNIG, W., 1966. - *Phylogenetic Systematics*. University of Illinois Press, Urbana, 263 pp.

On fournira les légendes des illustrations et des tableaux sur une page séparée.

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