VERHANDELINGEN VAN HET SYMPOSIUM "INVERTEBRATEN VAN BELGIE", 1989, p. 363-371
COMPTES RENDUS DU SYMPOSIUM "INVERTEBRES DE BELGIQUE", 1989, p. 363-371

Relationship between habitat preference and distribution of dolichopodid flies in Flanders (Dipt., Dolichopodidae)

by M. POLLET, P. GROOTAERT & H. MEUFFELS

Summary

Within the scope of a larger sampling campaign, conducted by the Royal Belgian Institute of Natural Sciences (Brussels), some years ago, dolichopodid flies were initially collected by means of sweeping, pitfall traps and Malaise traps. By using the latter method in particular, large amounts of these flies were gathered. However, POLLET & GROOTAERT (1987) proved that white water traps were at least as effective as Malaise traps for most of the species. As a result, during the further progress of our inventory, sampling was focused on the former technique, in combination with net sweeping. In this way, a large part of the province of West Flanders (Belgium) has been studied. Moreover, several sites have been investigated in great detail, applying different sampling techniques.
Analysis of the data revealed that the majority of the species appeared to show specific ecological requirements and thus demonstrated a distinct habitat preference. Other species, however, were found to be pronouncedly eurytopic. The observed distributions of many species are thought to be closely related to these features, although other factors seem to play an important role too. Finally, some remarks are given concerning the characteristics of the different sampling techniques as well as an evaluation of the concept of rarity versus commonness.
Key-words: Dolichopodidae, habitat preference, geographical distribution, Flanders.

Samenvatting

In het kader van een grootschalige bemonsteringscampagne, uitgaande van het Koninklijk Belgisch Instituut voor Natuurwetenschappen (Brussel), werden langpootvliegen enkele jaren geleden aanvankelijk verzameld door middel van sleepnetten, bodemvallen en Malaisevallen. Vooral met deze laatste techniek werden grote aantallen van deze vliegen gevangen. Nochtans toonden POLLET & GROOTAERT (1987) aan dat witte watervallen minstens even efficiënt zijn als Malaisevallen voor het verzamelen van de meeste soorten. Bijgevolg werd in het verdere verloop van onze inventarisatie vooral de nadruk gelegd op het gebruik van watervallen, aangevuld met sleepnet-vangsten. Op deze manier werd reeds een aanzienlijk deel van West-Vlaanderen (België) onderzocht. Bovendien werden een aantal gebieden zeer intensief bestudeerd, waarbij verschillende bemonsteringsmethodes werden toegepast.
Uit onze gegevens blijkt dat het merendeel van de soorten specifieke ecologische eisen stelt aan hun biotoop en dus een duidelijke habitatpreferentie vertonen. Daarnaast komen ook soorten voor, die als sterk eurytoop kunnen gekarakteriseerd worden. De waargenomen verspreiding van diverse soorten lijkt in verband te staan met deze eigenschappen, alhoewel ongetwijfeld andere faktoren eveneens een rol spelen. Tenslotte worden enkele opmerkingen gegeven betreffende (i) de eigenschappen van de verschillende bemonsteringstechnieken (ii) het concept zeldzaamheid.
Sleutelwoorden : Dolichopodidae, habitatpreferentie, geografische verspreiding, Vlaanderen.

Introduction

In the early '80s, a large scale sampling campaign was started in order to gather information on the distribution of flying insects in Belgium. This was conducted by the Royal Belgian Institute for Natural Sciences and carried out by Malaise traps all over the country. Particularly in the Flemish part of Belgium, pitfall traps were also used. At that time, the use of Malaise traps and pitfall traps could be considered as a considerable improvement on the traditional way of collecting by net sweeping. In order to compare the capture efficiency of various sampling techniques for the collection of dolichopodid flies, a field experiment was set up during 1986 in a woodland habitat of Wijnendalebos at Torhout (POLLET & GROOTAERT, 1987). From this study, the following general conclusions could be drawn: (i) white water traps are as effective as Malaise traps in collecting dolichopodid flies; (ii) water traps at soil surface level yield almost fourfold the number of individuals caught in those on wooden supports at a height of 60 cm; (iii) the species composition differs greatly between these two vertical distribution levels; (iv) distinctly soil surface active species are either strongly underestimated or not collected by Malaise traps. Therefore, we selected white water traps as the sampling method for a large scale investigation on the habitat preference of dolichopodid species. In this paper, the observed habitat selection and distribution patterns of some species in West Flanders (Belgium) are compared and the usefullness of the different sampling methods is discussed.

Material and methods

The habitat affinity was determined by means of small (diameter: ± 9 cm, depth: 4.5-6.5 cm) and large (diameter: 11 cm, depth: 8 cm), white water traps, which simply consist of recycled cottage cheese cups. These traps were installed upon the soil surface or slightly dug into the soil, depending on the (expected) level of the neighbouring water surface. They were fixed to the soil with metal pins and filled to 2/3 with 25 % formalin solution in order to preserve the captured organisms even during periods of heavy precipitation. In most cases, 3 or 4 replicates were in operation at each site investigated. Occasionally, some or all traps appeared to be removed or destroyed and in these cases, our data were based on fewer sample units. The traps were emptied at fortnightly or three monthly intervals. It must be mentioned that a three month period is the absolute maximum to preserve the flies properly and is thus not recommendable. In general, the whole sampling period included the months May till October. This period varied between the sites; however, it was considered that this variability would not invalidate an overall comparison since the sampling period at each site comprised at least the months June till September. Once collected, the yields were placed in plastic jars and sorted in the laboratory. They were sexed and identified by means of D'ASSIS FONSECA (1978), PARENT (1938) and some unpublished keys by the first (*Hercostomus,* subgenus *Gymnopternus*) and the third author (*Argyra,*

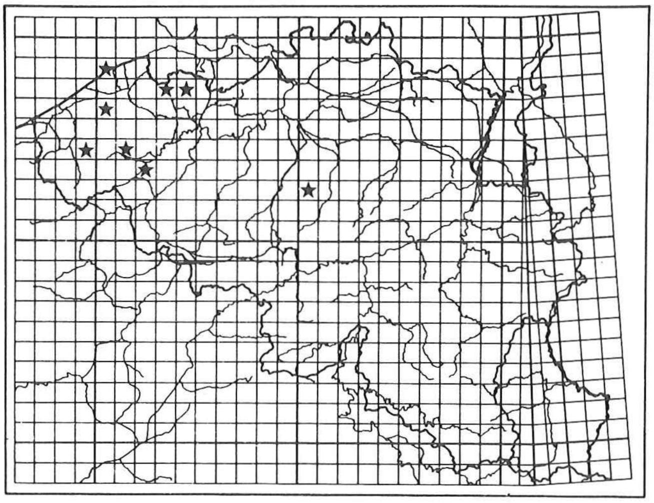
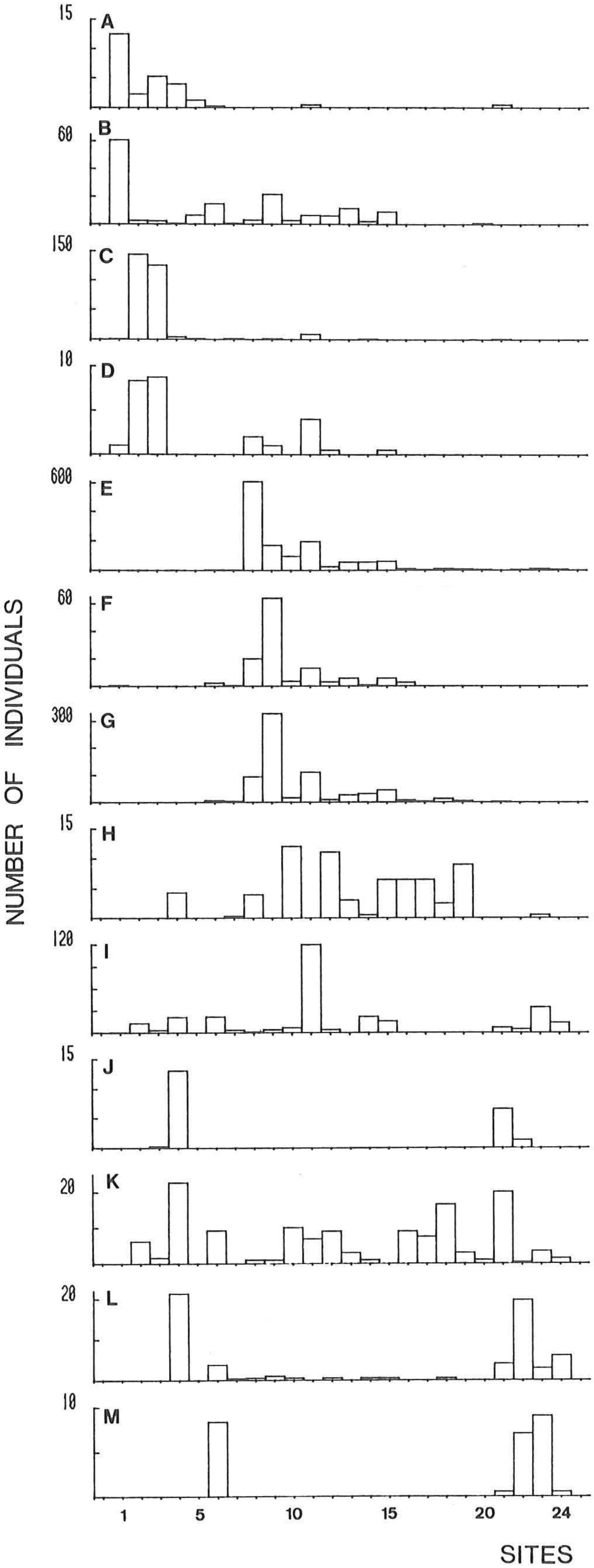


Figure 1. Location of the sampled sites in Belgium.

Table 1. List of the investigated sites with habitat type and the number of suitable trap units indicated.

Locality	10 km U.T.M. square	habitat characterization	number of traps
1. Ooigem	ES23	poplar woodland	4
2. Harelbeke	ES23	poplar woodland (centre)	3
3. Harelbeke	ES23	cf. 2 (nearby ditch)	3
4. Harelbeke	ES23	poplar woodland	3
5. Harelbeke	ES23	poplar woodland	3
6. Ingelmunster	ES14	mixed deciduous woodland	3
7. Torhout	ES06	water-meadow forest	3
8. Houthulst	DS94	birch woodland	2
9. Houthulst	DS94	birch woodland	2
10. Houthulst	DS94	birch woodland	2
11. Houthulst	DS94	alder woodland	2
12. Houthulst	DS94	woodland path (birch)	2
13. Houthulst	DS94	birch woodland	2
14. Houthulst	DS94	border of forest pond	2
15. Houthulst	DS94	birch woodland	2
16. Houthulst	DS94	*Erica* heathland	2
17. Houthulst	DS94	*Erica* heathland	2
18. Houthulst	DS94	*Erica* heathland	2
19. Houthulst	DS94	heathlike grassland	2
20. Houthulst	DS94	meadow	2
21. Ingelmunster	ES14	small pond	2
22. Harelbeke	ES23	cattle pond	3
23. St. Laureins	ES37	creek (Blokkreek)	2
24. St. Jan-in-Eremo	ES47	creek (Oostpolderkreek)	2



Dolichopus, Sciapus). They were deposited in a 75% alcohol solution either at the Museum of the R.B.I.N.S. at Brussels or in the first author's collection.

In this way, a total of 31 sites was investigated, using 104 water traps, distributed over 8 10x10 km U.T.M.-squares (Fig. 1). Thus far, the yields of 84 traps (28 sites) have been studied, of which 55 (small type, 24 sites) proved to be suitable for a further analysis. More information about the latter sites is given in Table I.

Data on the distribution of dolichopodid flies in West Flanders (Belgium) are mainly based on (i) a preliminary inventory by C. Verbeke from the mid '80s and (ii) an intensive sampling campaign by the first author from 1985 onwards. Apart from these, additonal information was gathered from literature data (which are extremely scarce) and occasional collections by several cooperators.

Results

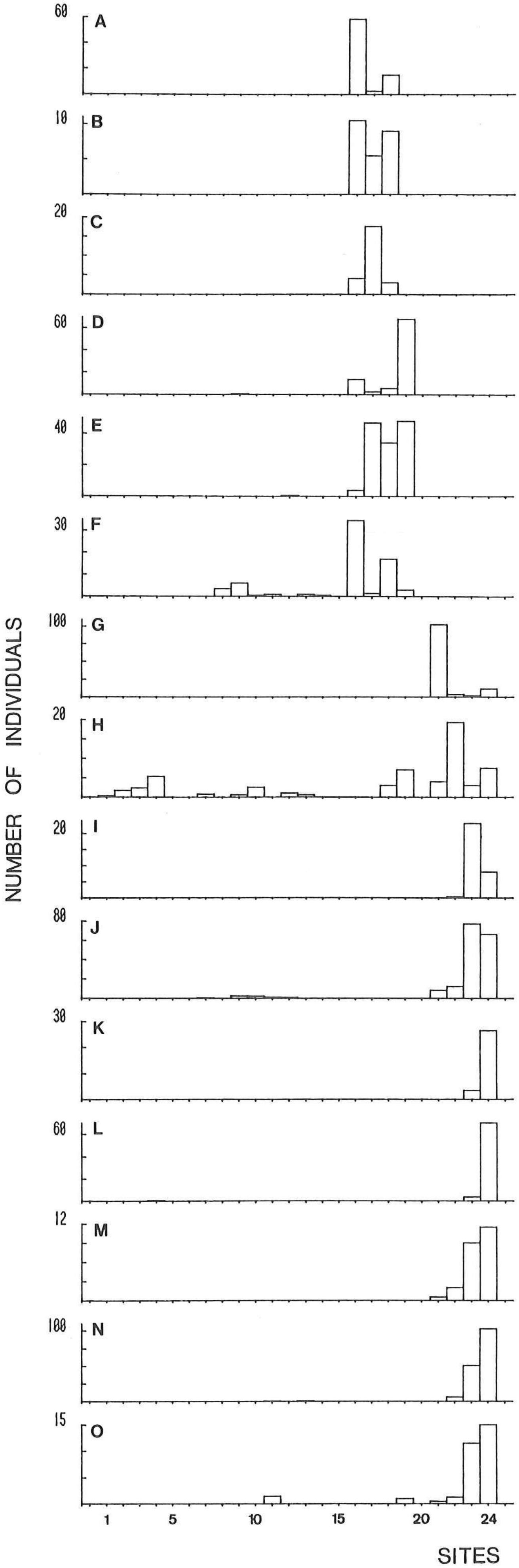
1. Habitat selection

Since the identification of some *Chrysotus* (males, females) and *Medetera* species (females) remains doubtful and a thorough revision of both genera would be very worthwhile, the exact number of species found could not be determined yet. However, at least 109 species were collected in 84 trap units, comprising 38.8 % of the total Belgian dolichopodid fauna known thus far. In the following text, only the most abundant species from the sampling campaign mentioned above are taken into consideration. Figures 2 and 3 show the distribution of these species over the different sites. The habitats investigated ranged from woodland on loamy (sites 1-6) and sandy soil (7-15) through heathland (16-18) and grassland (19-20) to borders of ponds (21-22) and creeks (23-24).

In general, the species can be pooled in groups, each of which prefers a particular habitat type. A first group (I) consists of *Dolichopus claviger, D. popularis, Sciapus platypterus* and *D. wahlbergi,* which were most abundantly found in woodland types on loamy soil. In contrast to the first two species, *S. platypterus* and *D. wahlbergi* seem to be somewhat more eurytopic, as they were regularly found in sandy woodland habitats too (Fig. 2). All these species seem to prefer dark microhabitats within woodland areas (Pollet & Grootaert, 1987).

Group II is characteristic for woodland on sandy soil: *Campsicnemus scambus, Hercostomus metallicus* and *H. cupreus. Chrysotus neglectus* and *C. curvipes* are also caught in largest numbers in these habitats, but appear to be rather abundant at other sites too (Fig. 2). A third group (III) comprises species which show a

Figure 2. Abundance (mean number of specimens caught per trap unit) of the most abundant dolichopodid species at the sampled sites (A: Dolichopus claviger, *B:* Sciapus platypterus, *C:* Dolichopus popularis, *D:* Dolichopus wahlbergi, *E:* Campsicnemus scambus, *F:* Hercostomus metallicus, *G:* Hercostomus cupreus, *H:* Chrysotus neglectus, *I:* Campsicnemus curvipes, *J:* Dolichopus pennatus, *K:* Dolichopus ungulatus, *L:* Sympycnus pulicarius, *M:* Hercostomus plagiatus*).*



so-called bimodal habitat preference: *D. pennatus, D. ungulatus, Sympycnus pulicarius* and *Hercostomus plagiatus*. They were found in high numbers both in one or more woodland and non-woodland sites. Contrary to the last mentioned species, *D. ungulatus* and *S. pulicarius* are known from literature to be extremely eurytopic (e.g. EMEIS, 1964; POLLET *et al.*, 1987b).

The following species are members of the typical fauna of *Erica* heathland and the borders of oligotrophic fens (group IV): *D. tanythrix, C. alpinus, Rhaphium fascipes, D. vitripennis, Chrysotus pulchellus* and *H. aerosus*. *H. aerosus* appears to be more eurytopic than the other species, as it occurs in fair numbers also in woodland habitats on sandy soil. Within the remaining species, distinct preferences for a particular site are apparent (Fig. 3).

Species, which form the fifth group (V) , were most numerously encountered at eutrophic sites neighbouring open water: *Syntormon pumilus* was most abundant at the borders of a small pond, whereas *D. plumipes* obviously prefers larger waterbodies with a rather sparse vegetation. Nevertheless, it has been found in a great variety of habitat types (cf. Fig. 3). The following species seem to be almost confined to the creek sites in this study: *H. chalybeus, C. picticornis, C. armatus, S. pallipes, Teuchophorus spinigerellus, D. nubilus* and *D. latilimbatus*. Among these, only the first species was caught more abundantly at the first creek site.

2. Geographical distribution

Figure 4 shows the geographical distribution of some selected species from groups I, II, IV and V. Unlike most other similar studies, no distinction is made between data from before and after 1950, since information on dolichopodid flies caught before 1950 is very scarce.

D. wahlbergi (Fig. 4a) is obviously confined to inland woodland areas. It seems to occur only in rathermature woodland as it has not been found in any of the young forest sites sampled. It shows a distinct preference for dark spots within woodland areas (POLLET *et al.*, 1986).

H. cupreus (Fig. 4b) is clearly more widely distributed than the former species. However, it also prefers rather old woodland or at least extensively canopied sites within or neighbouring on mature woodland. In contrast to *D. wahlbergi*, it is most abundantly found at

Figure 3. Abundance (mean number of specimens caught per trap unit) of the most abundant dolichopodid species at the sampled sites (A: Dolichopus tanythrix, *B:* Campsicnemus alpinus, *C:* Rhaphium fascipes, *D:* Dolichopus vitripennis, *E:* Chrysotus pulchellus, *F:* Hercostomus aerosus, *G:* Syntormon pumilus, *H:* Dolichopus plumipes, *I:* Hercostomus chalybeus, *J:* Campsicnemus picticornis, *K:* Campsicnemus armatus, *L:* Syntormon pallipes, *M:* Teuchophorus spinigerellus, *N:* Dolichopus nubilus, *O:* Dolichopus latilimbatus).

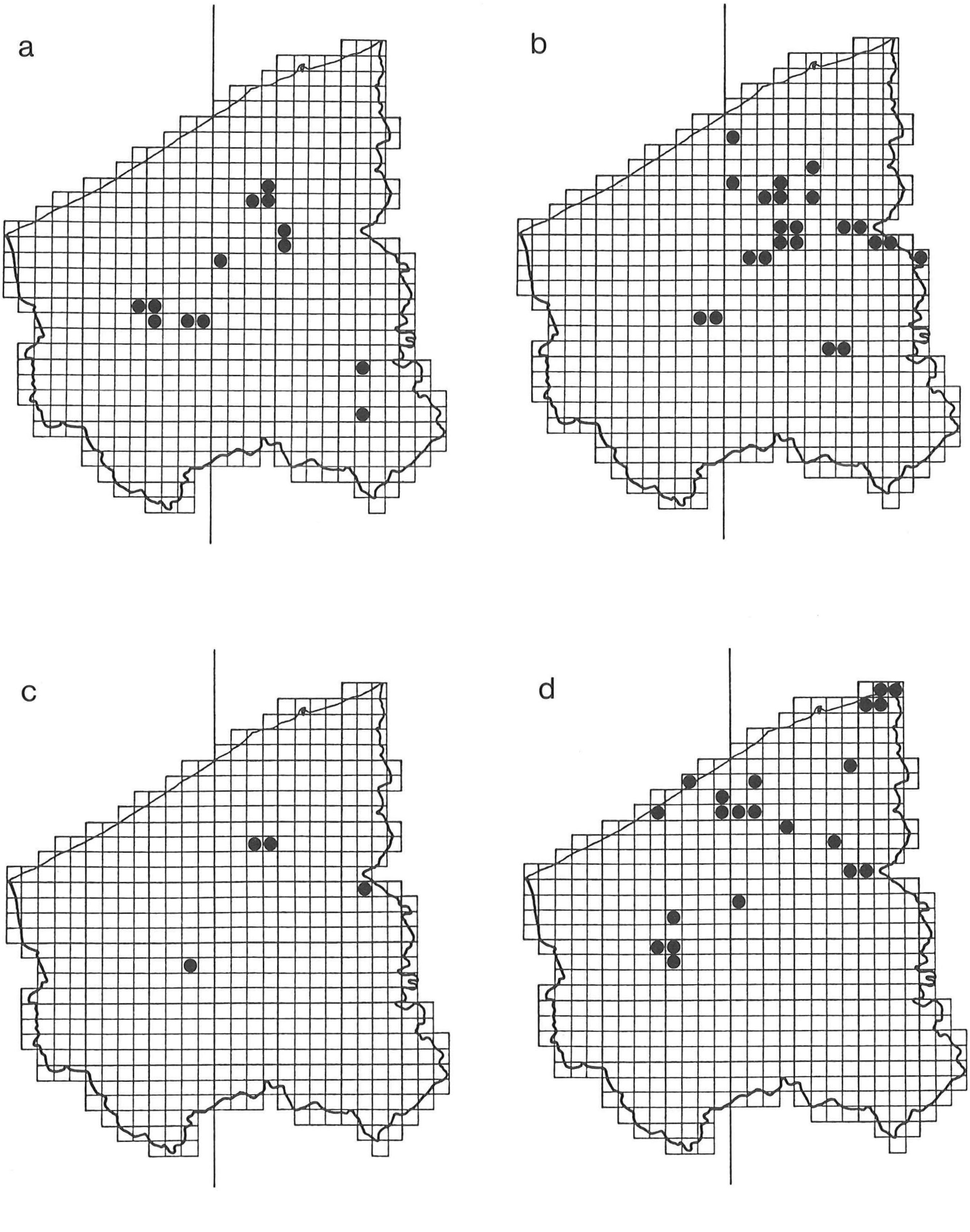


Figure 4. Geographical distribution of (a) Dolichopus wahlbergi, *(b)* Hercostomus cupreus, *(c)* Campsicnemus alpinus and *(d)* Campsicnemus armatus *in Western Flanders (Belgium).*

Table 2. Summary of data on abundance, habitat preference and geographical distribution of the most abundant dolichopodid species, caught during the sampling campaign of 1988 (A : total number of specimens caught during this sampling campaign ; B : number of sites, at which the species was found ; C : habitat width calculated according to LEVINS *(1968) ; D : number of 2.5 km U.T.M.-squares in Western Flanders in which the species has been recorded).*

Dolichopodid species	A	B	C	D
Group I				
Dolichopus claviger	27	8	0.1429	35
Sciapus platypterus	150	16	0.1976	25
Dolichopus popularis	285	10	0.0927	27
Dolichopus wahlbergi	26	8	0.1686	13
Group II				
Campsicnemus scambus	1305	20	0.1558	30
Hercostomus metallicus	121	12	0.1273	29
Hercostomus cupreus	397	15	0.2507	24
Chrysotus neglectus	67	13	0.3533	34
Campsicnemus curvipes	300	17	0.2122	50
Group III				
Dolichopus pennatus	21	4	0.0871	16
Dolichopus ungulatus	134	20	0.4368	63
Sympycnus pulicarius	62	14	0.1743	60
Hercostomus plagiatus	25	5	0.1338	3
Group IV				
Dolichopus tanythrix	76	3	0.0659	9
Campsicnemus alpinus	25	3	0.1176	4
Rhaphium fascipes	25	3	0.0755	3
Dolichopus vitripennis	90	5	0.0697	3
Chrysotus pulchellus	134	5	0.1306	10
Hercostomus aerosus	69	10	0.1269	25
Group V				
Syntormon pumilus	119	4	0.0551	23
Dolichopus plumipes	59	15	0.2572	60
Hercostomus chalybeus	31	3	0.0688	10
Campsicnemus picticornis	169	9	0.1137	33
Campsicnemus armatus	30	2	0.0525	22
Syntormon pallipes	75	3	0.0473	39
Teuchophorus spinigerellus	23	4	0.1013	18
Dolichopus nubilus	160	5	0.0815	42
Dolichopus latilimbatus	31	6	0.1091	26

more humid sites on a sandy soil (cf. POLLET & GROOTAERT, 1987).
C. alpinus (Fig. 4c) can be termed very rare in Western Flanders; this can be explained by its pronounced affinity to humid *Erica* heathland. These sites are very scarce and endangered in this part of the country. In this respect, this species is thought to be more common in the eastern part of Belgium, where large heathland areas are still present (POLLET *et al.*, 1988). At its favoured sites, *C. alpinus* can often be encountered in rather large numbers.
Completely opposed to its congener, *C. armatus* (Fig. 4d) is more or less restricted to the coastal and polder region; this corresponds with the findings of EMEIS (1964). In this area, it shows a distinct preference for meadows, reed marshes and marshland bordering open water. More inland, it has nearly always been caught as single specimens or in very small numbers.

3. Relationship between habitat selection and geographical distribution

Table 2 summarizes data on habitat width and geographical distribution of the species from Fig. 2 and 3. Table 3 gives the results of the comparison between both features.
A clear overall relationship is evident between the geographical distribution of the species considered and respectively the number of individuals caught, the number of sites and the habitat width (Table 3). Moreover, even within the separate groups, the more eurytopic species are in general most widely distributed (cf. *D. ungulatus, C. curvipes, H. aerosus* and *D. plumipes*). The highly significant correlation between habitat width and geographical distribution is rather surprising, since the first is calculated on a data set, in which all habitat types are not equally represented.
However, the geographical distribution of some species cannot be explained completely by the occurrence of distinct habitat preferences as mentioned before. For example, in our study, *D. claviger* and *D. popularis* proved to be characteristic species of dark woodland sites on a loamy soil. In contrast to their rather restricted occurrence in these habitat types, these species seem to be remarkably common in West Flanders. This is mainly due to the fact that they are also found in other similar sites. They are even very abundant in the coastal dunes (purely sandy!), where they occur mainly within the shrub layer of the dune ponds.
Another striking phenomenon is the fact that, contrary to most other species, almost all species of group IV are known from only a few localities. Except for *H. aerosus*, they seem to be completely restricted to humid heathland, which is extremely rare in this province. Indeed *C. alpinus, R. fascipes* and *D. vitripennis* are found nearly exclusively at such sites. *D. tanythrix* and *H. aerosus* seem to be more common: besides heathland, they occur also in well-lit humid woodland sites on a sandy soil. *C. pulchellus* can be considered as a characteristic species of humid heathland and grassland on a purely sandy soil.

Discussion

Apart from EMEIS (1964), VAN DER VELDE (1985), POLLET *et al.* (1986, 1987a,b, 1988), POLLET & GROOTAERT (1986, 1987) and POLLET & DE BRUYN (1987), data on the ecology and habitat preferences of dolichopodid species are remarkably scarce in the literature. To determine habitat affinity, an adequate and quantitative sampling technique has to be used. In contrast to e.g. pitfall traps, which are, in this respect, excellent collecting devices for soil surface active invertebrates, no equivalent method had thus far been developed to sample a large number of different sites simultaneously for dolichopodid flies. Therefore, we considered the assumptions for the most suitable sampling device and compared the different features of three widely used sampling techniques. Table 4 gives a summary of this comparison.
From this Table, it is evident that Malaise traps are very useful only in the cases, when (i) one is interested in the phenology and the faunistics of the fauna of a

*Table 3. Overall relationship of abundance, occurrence and habitat preference with geographical distribution (A : Spearman rank correlation coefficients, significance level : ** : $p<0.05$, *** : $p<0.01$; n : number of species).*

Relationship	A	n
(1) total abundance - geographical distribution (cf. columns A and D, Table 2)	+0.437 **	28
(2) occurrence at the investigated sites - geographical distribution (cf. B and D)	+0.639 ***	28
(3) habitat width - geographical distribution (cf. C and D)	+0.456 **	28

particular habitat and/or (ii) the trap can be installed within a protected area. For large scale investigations on the distribution and habitat preference of dipteran species, however, these do not seem to be the most suitable sampling method. This is mainly due to the fact that, in practice, it is nearly impossible to sample most habitat types with several trap units. Nevertheless, the latter seems to be necessary to minimize the variability of the trap catches due to microclimatological heterogeneity. Indeed, many dolichopodid species react very pronouncedly to different abiotic (and biotic) factors (see above). Consequently, they might be very useful as bio-indicators. Pitfall traps on the other hand are in general not as effective as Malaise traps and water traps (cf. POLLET & GROOTAERT, 1987). Thus water traps appear to be the most appropriate sampling method for large scale investigations of the present kind. Preferably, these should be installed at soil surface.

Undoubtedly, some species will be underestimated when applying this method. For example, many *Medetera* species are more attracted to a blue colour than to red or white (POLLET & GROOTAERT, 1987). In contrast to *Medetera* species, species of *Sciapus* appear to be caught in large numbers, although, in common with the former, these are also distinctly tree-trunk dwelling.

The terms "rarity" or "rare" are used far too often. Most authors dealing with zoogeography do so, even when the investigation of the study area is very preliminary. In most cases a species is called "rare" when it shows a very limited geographical distribution. At the sites of its occurrence, however, it might be very abundant (cf. *C. alpinus*). On the other hand, species which are widely distributed but are mostly found in very low numbers can also be termed rare. In most cases it is very difficult to make a distinction between true rarity and "rarity" as a result of inefficient sampling. Therefore, it is an absolute necessity to gather as many ecological data as possible on the organisms considered, since this is the only way in which an appropriate sampling campaign can be constructed. Moreover, knowledge of the exact ecological demands of the studied species enables the investigator to select areas for sampling, in which a particular species might occur. For example, net sweeping of herbage and shrubs yields only very occasional specimens of *C. alpinus*, even at sites where it is abundant. This is mainly due to its pronounced soil surface activity - its wings are clearly reduced - and its cryptic way of life within *Erica* heath or on bare soil spots in humid heathland. Once the investigator is aware of this behaviour, *C. alpinus* can easily be found in fair numbers at these sites by using e.g. water traps. According to our current knowledge on the ecology of dolichopodid flies, the previously mentioned water trap technique is a step in the right direction.

Acknowledgments

We are very grateful to Mr. C. VERBEKE, who may be regarded as the pioneer of this study in the province of West Flanders. We are also much indebted to Mr. I. BAPTISTE, conservator of the nature reserve "De Gavers" (Harelbeke) and Mr. W. LAFAIRE, commander of the military depot "Houthulstbos" (Houthulst) for allowing us to sample different sites respectively in the environment of Harelbeke and within Houthulstbos. Finally, many thanks are due to Dr. K. ROCHE for improving the English.

Table 4. Comparison of some trapping adequacy assumptions between different sampling techniques.

Assumptions	Malaise traps	Pitfall traps	Water traps
(1) effective in collecting large numbers of species and individuals	+	-(*)	+
(2) not very time-consuming	-	+	+
(3) simultaneous application at different sites within a large area	-	+	+
(4) not very conspicuous	-	+	+
(5) possibility of replicates in the same habitat	-	+	+
(6) yield of quantitative data	+	+	+

* pitfall traps are very efficient in some habitat types such as water-meadow forests and reed marshes; however, large amounts of soil material and captured mammals and amphibians can cause decomposition of the collected insects.

References

D'ASSIS FONSECA, E.C.M., 1978. Diptera Orthorrhapha Brachycera Dolichopodidae. *Handbooks for the Identification of British Insects.* Vol. IX, Part 5: 1-90.

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

LEVINS, R., 1968. *Evolution in changing Environments: some theoretical explorations.* In: WHITTACKER, R.N. and LEVIN, S.A. (Editors). Niche theory and application. Benchmark papers in Ecology, pp. 241-258.

PARENT, O., 1938. Diptères Dolichopodidae. *Faune de France,* 35: 1-720.

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). *Bulletin & Annales de la Société royale belge d'Entomologie,* 123: 371-377.

POLLET, M. & GROOTAERT, P., 1986. Two Dolichopodid species, new for the Belgian Fauna (Dolichopodidae, Diptera). *Bulletin & Annales de la Société royale belge d'Entomologie,* 122: 300.

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 royale des Sciences Naturelles de Belgique, Entomologie,* 57: 173-186.

POLLET, M., GROOTAERT, P. & MEUFFELS, H., 1987a. Dolichopodid species new to the Belgian fauna with notes on their habitat (Diptera: Dolichopodidae). *Entomologische Berichten,* Amsterdam, 48(3): 44-46.

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 reverves in the Campines (Prov. Limburg, Antwerpen, Belgium) (Diptera, Dolichopodidae). *Phegea,* 16(4): 135-143.

POLLET, M., VERBEKE, C. & GROOTAERT, P., 1986. Verspreiding en fenologie van Dolichopodidae in een bosbiotoop te Wijnendale (West-Vlaanderen). *Bulletin & Annales de la Société royale belge d'Entomologie,* 122: 285-292.

POLLET, M., VERBEKE, C. & GROOTAERT, P., 1987b. Preliminary results of the investigations on the distribution of dolichopodid flies (Diptera: Dolichopodidae) in Western Flanders (Belgium). *Bulletin & Annales de la Société royale belge d'Entomologie,* 123: 338-345.

VAN DER VELDE, G., MEUFFELS, H.J.G., HEINE, M. & PEETERS, P.M.P.M., 1985. Dolichopodidae (Diptera) of a Nymphaeid-Dominated System in The Netherlands: Species composition, Diversity, Spatial and Temporal Distribution. *Aquatic Insects,* 7(4): 189-207.

MARC POLLET
Laboratory of Animal Ecology,
Zoogeography and
Nature Conservation,
State University,
K.L. Ledeganckstraat 35
B-9000 Ghent (Belgium)

PATRICK GROOTAERT
Department of Entomology,
Royal Belgian Institute of
Natural Sciences,
Vautierstraat 29
B-1040 Brussels (Belgium)

HENK MEUFFELS
Meesweg 16
6325 BG Vilt (The Netherlands)