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The effects of nature restoration on the entomofauna in former arable land: restoration of brackish grasslands in the "Uitkerkse polder" (Blankenberge)

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Abstract

The effects of nature restoration on the entomofauna was never been studied thouroughly in brackish grasslands in Flanders. With this study several nature development measurements were looked at and their effect on several groups of insects and on spiders was studied. The project tried to estimate the natural value of recently converted arable land and arable land that was abandoned some time ago.

Here we look at one area in detail : the nature reserve "Uitkerkse polder" with 3 study sites (2 nature development sites and 1 reference area). The general conclusions are 1) that for each entomofauna group, different measurments are interesting and 2) that recently abandoned arable sites already have a high natural value (but this is different for each entomofauna group).

Samenvatting

De effecten van natuurontwikkeling in brakke graslanden op de entomofauna is nooit in detail onderzocht in Vlaanderen. Met deze studie werden verschillende beheersmaatregelingen en hun effect op insecten en spinnen bekeken. Tevens beoogt dit onderzoek de evaluatie van de natuurlijke waarde van zowel recent uit de landbouw genomen gebieden als gebieden die al geruime tijd verlaten werden.

Hier bekijken we de resultaten van één gebied in detail : het natuurreservaat "Uitkerkse polder" (met 3 sites: 2 natuurontwikkelingsgebieden en 1 referentiegebied). De algemene conclusies van dit project zijn o.a. : 1) voor verschillende insectengroepen zijn verschillende maatregelen interessant en 2) vele voormalige akkers hebben reeds een hoge natuurwaarde (maar dit is tevens verschillend voor de verschillende groepen).

Introduction

In cultivated areas and other habitats strongly influenced by human activity, biodiversity can be seen as an indicator of environmental quality (DUELLI & ORBIST, 1998). Counting and comparing species numbers in space and time as a method to quantify, evaluate and monitor biodiversity is a currently used method and especially endangered species (and Red lists) are used for this (DECLEER, 1989; MAELFAIT *et al.*, 1998; MAES & VAN DYCK, 1999; POLLET, 2001; GROOTAERT *et al.*, 2001; DESENDER *et al.*, 1995). A lot of taxonomic entomofauna groups show a high significant correlation of species numbers with specific species diversity. DUELLI *et al.* (1999) found that in general biodiversity is higher in less intensively cultivated habitats. In this paper we deal with the nature development in former arable land into salty grasslands with

observations at the Uitkerkse Polders Nature Reserve. We compared one so-called, reference site with two nature development sites. In order to determine the chances and key variables for nature development in areas with a former intensive agricultural use in Flanders towards salty grasslands some conclusions and statements were obtained using the results of a sampling campaign conducted in 2000.

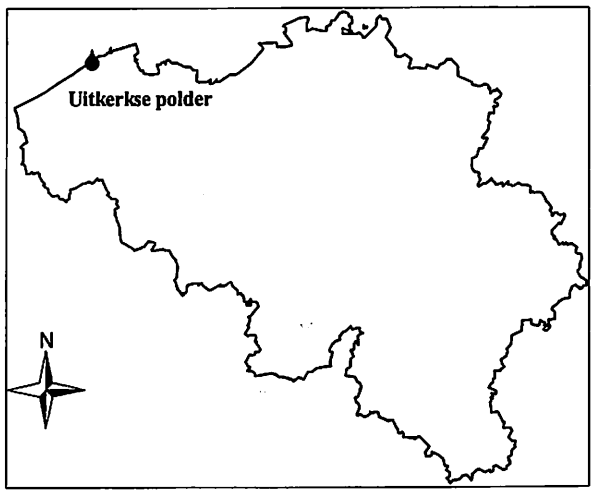

Fig. 1. The area of Uitkerkse polder (Blankenberge) in the northern part of Belgium.

Material and method

The Nature reserve Uitkerkse Polder was founded in 1991 and covers a surface of 1400 ha. The main reason for the enlargement of the reserve was to lower the detrimental influences of surrounding agricultural activities and thereby preserve the rare salty grasslands and their bird populations. In past decades agriculture was intensively practiced, this resulted in a high level of fertilization, ploughing of historical grasslands and so on. *Tringa totanus*, *Recurvirostra avosetta*, *Limosa limosa* (all brackish) are examples of the flora of these intensively managed grasslands. Between '91 and '95, 9 ha of the nature reserve were restored into their natural and historical situation : 2.5 ha were dig and in other areas the top soil level was removed or pools and ditches were laid-out (DEKONINCK *et al.*, 2002).

On other parts of the reserve all kinds of measurements were taken to restore the area into its natural condition; artificial accumulations were leveled, historical creeks were restored, pools were dug and the nutrient rich top layer of some areas was removed. An adequate management is necessary to maintain these salty grasslands! The current management is different for each site and consists of retarded mowing and grazing, limited levels of fertilization, extensive grazing and restoration management.

The study was conducted from April till October 2000 (DEKONINCK *et al*, 2002). On 18/04/2000 the trap types were installed on three different sampling sites (Table 1). The trap techniques used here were pitfall and white pan traps. Pitfall traps are glass vessels (10 cm of height and 9.5 cm of diameter) placed into the ground so that the top of the trap was on then same level of the ground surface. We also used 3 white water traps; plastic jars with 9.5cm of diameter. These traps were placed on the ground surface. Some problems occurred on sites where cows grazed, several white traps were lost.

Table 1: Description of the three sampled locations.

Sampling site	History	Present vegetation	Soil characteristics	Present Nature development	UTM-code
Nat.dev. site1 Uitk1	Heavily fertilized *Cynosurus cristatus* dominated grassland, excavated in 1992	Bare sand and *Juncus gerardi, Trifolium fragiferum, Alopecurus genicullatus Ranunculus sceleratus*	Clay soil coated with sand and on average 2 cm deep B-horizon	After bird breeding season, intensively grazing	ES0882
Nat.dev. site2 Uitk 2	Heavily fertilized rather salty *Lolium* grassland, excavated in 1992, recently regularly inundated by brackish water	Grassland with dominantly *Juncus gerardi, Bolboschoenus maritimus, Spergularia maritima, Puccinellia distans*	Clay soil and on average 8 cm deep B-horizon	After bird breeding season, intensively grazing	ES0981
Reference site Uitk3	Since 1990 yearly mowed and cleaned after bird-breeding season	brackish grassland with *Juncus gerardi, Trifolium fragiferum, Alopecurus genicullatus Ranunculus sceleratus*	Clay soil and on average 4 cm deep B-horizon	After bird breeding season, mowed and extensively grazing	ES0883

Results and discussion

Here we present the collected data of 10 different taxonomical entomofauna groups with additional conclusions and possible indicators and their significance for the aim of this study.

1. Ground beetles (Carabidae)

In total 1827 individuals belonging to 50 species were found in Uitkerkse polder (40, 29 and 23 species in respectively Uitk1, 2 and 3; Table 2). Only in Uitk 1 and 2, Red List species were found (resp. 7 and 4), whilst the number of indicator species for wet grassland and brackish grassland was respectively 11, 9 and 3 in Uitk 1, 2 and 3.

The "reference" site was less important for ground beetles, no red list species (DESENDER *et al.*, 1995) and only few stenotopic species (20 eurytopic species) were found. All data demonstrate that Uitk 3 is a more cultivated grassland than Uitk 1 and 2 where indicators for brackish grasslands were found. Some species found in the latter plots were: *Amara strenua*, *Bembidion bipunctatum* and *Bembidion fumigatum*. Especially the find of *A. strenua* was special, because this species was thought to be extinct since 1950 (VERSTEIRT *et al.*, 2002).

According to BLAKE *et al.* (1996), the presence of ground beetles is more related to the vegetation type and historical elements than to the effects of specific management measurements. Moreover GRIME (1973) and CONNELL (1978) state that the diversity is higher in areas with some level of disturbance; this is probably the case in wet areas with inundations and temporary drought as the main causes of disturbance. But this does not means that the quality of the fauna is higher when disturbance occurs. The pursuit of a 'high biodiversity' without using the knowledge on habitat preferences of the studied organisms, is rejected by many studies.

Important in the restoration and management of wetlands is the amount of relict situation available in the surroundings of the nature development site. Moreover it is important that in the area a high botanical diversity is pursued so the area can become a reservoir of ground beetle species (ASTERAKI, 1994). The use of different management techniques is necessary to maintain a diverse ground beetle population.

2. Empidids (Empididae)

In the nature reserve "Uitkerkse polder" only 13 species were found (a total of 418 specimens, Table 2). But of these 13 species, 9 can be found on the Red List of Flanders : *Clinocera (Hydrodromia) stagnalis* ("Extinct"), *Rhamphomyia (Parahamphomyia) simplex* (new to Flanders and has to get the status "Rare"). Because the species probably only occurs in brackish grasslands and this habitat is threatened, this species has to fall into the category "Critically endangered". Species listed as "Rare" are : *Crossopalpus flexuosus*, a species of wet grasslands; *Cr. setiger*, a species of salt marshes and dunes; *Hilara lundbecki*, a species of salt marshes, dunes and creeks; *H. subpollinosa*, a species of wet grasslands; *Platypalpus albocapillatus*, a species of salt marshes, dunes and banks of creeks; *P. infectus*, a species found especially on grasslands on clay; *P. kirtlingensis*, a species of grasslands and occasionally of cornfields.

Uitk 1 is, for Empididae, the best plot with 10 species of which 60% are target species. If we add to that the species typical for grasslands we get 90%. In this site we found 8 Red List species. So we can conclude that the digging 8 years ago has been very successful for the empidid fauna. Uitk2 has only 6 species but fits the prospective of the nature target type : wet, brackish grassland. The management technique used in this site 3 years ago (digging) is a success because the empidid fauna of the site already contains many target species. In Uitk 3 (originally chosen as reference site) 6 species and a lot more ruderal species than in Uitk 1 and 2 were found. Globally this site is of less 'value' than the two other, still 4 Red List species were caught here! The measurements taken in this site are mowing and grazing with cows.

The management techniques used in the nature development sites : digging respectively 8 and 3 years ago, already has positive effects on the empidid fauna of the area. The major question however for the nature development sites is if after a period of time the ruderal species are becoming again more abundant. Mowing seems to have no effect on the restoration of the brackish empidid fauna (this is probably due to the late point of time of mowing).

	Uitk 1	Uitk 2	Uitk 3	Total
Carabidae				
Acupalpus consputus		1		1
Acupalpus parvulus	3	4		7
Agonum marginatum	62	40	9	111
Agonum muelleri	4	1	1	6
Agonum viduum		1	1	2
Agonum viridicupreum		1		1
Amara aenea	1	1	1	3
Amara bifrons			1	1
Amara familiaris		1		1
Amara strenua	9	11		20
Anisodactylus binotatus			2	2
Bembidion bipunctatum	86	14		100
Bembidion dentellum	1		1	2
Bembidion gilvipes			1	1
Bembidion guttula	49	32		81
Bembidion harpaloides	1			1
Bembidion lunulatum	326	140	89	555
Bembidion minimum	232	104	33	369
Bembidion obtusum	1			1
Bembidion properans	65	33	7	105
Bembidion quadrimaculata	3			3
Bembidion semipuncatum	1			1
Bembidion varium	3	34		37
Carabus granulatus			1	1
Chlaenius nigricornis		1		1
Chlaenius vestitus	1			1
Clivina collaris	3	1		4
Clivina fossor	23	5	2	30
Dyschirius aeneus	2	7		9
Dyschirius globosus	7	2	63	72
Dyschirius luedersi	6			6
Dyschirius salinus	1			1
Elaphrus riparius	1	1		2
Harpalus affinis	2	1		3
Harpalus rufipes	3		12	15
Loricera pilicornis	14	11	4	29
Nebria brevicollis	1	3	6	10
Nebria salina		1		1
Notiophilus substriatus	6			6
Pterostichus cupreus	26	9	17	52
Pterostichus diligens	1		12	13
Pterostichus macer	1			1
Pterostichus melanarius	14	6	2	22
Pterostichus nigrita	1			1
Pterostichus strenuus	15	4	66	85
Pterostichus vernalis	6	4	34	44
Pterostichus versicolor	1		1	2
Stenolophus mixtus	2			2
Syntomus foveatus	1			1
Trechus obtusus	2			2
Number of individuals	***987***	***474***	***366***	***1827***
Number of species	***40***	***29***	***23***	***50***
Empididae				
Clinocera (Hydr.) stagnalis	1			1
Crossopalpus flexuosus	7	1		8
Crossopalpus setiger	16	4	8	28
Empis (E.) nigripes	3	2		5
Empis (E.) nuntia			1	1
Empis (Krit.) livida	14	2	29	45
Hilara lundbecki	2			2
Hilara subpollinosa	201	50	19	270
Platypalpus albocapillatus		2		2
Platypalpus infectus	7		2	9
Platypalpus kirtlingensis	1			1
Rhamphomyia (Pararh.) simplex	2	1	41	44
Rhamphomyia (Rh.) sulcata	1		1	2
Number of individuals	***255***	***62***	***101***	***418***
Number of species	***11***	***7***	***7***	***13***
Dolichopodidae				
Micromorphus spec.			2	7
Syntormon filiger	12	3	4	20
Dolichopus sabinus	1		1	4
Campsicnemus armatus	323	959	736	4543
Campsicnemus curvipes		7	2	16
Campsicnemus picticornis	3	3		9
Chrysotus cilipes			1	1
Chrysotus palustris			1	1
Chrysotus pulchellus	1			1
Dolichopus brevipennis	59	22	6	94
Dolichopus festivus	4			4
Dolichopus latilimbatus	19	11	8	46
Dolichopus nubilus	69	102	31	252
Dolichopus plumipes	244	360	220	1000
Dolichopus ungulatus	2			2
Medetera saxatilis	17	12		32
Medetera truncorum	42	5	3	66
Micromorphus albipes	28	14	27	89
Poecilobothrus nobilitatus		1		2
Rhaphium caliginosum		1		2
Rhaphium laticorne	1			1
Sympycnus desoutteri	5	47	36	116
Syntormon denticulatum	2			2
Syntormon pallipes	330	266	184	967
Syntormon pumilum	2			2
Argyra argyria		1		1
Argyra vestita	1			1
Dolichopus excisus		1		1
Dolichopus griseipennis		1		1
Hydrophorus praecox	3	1		6
Medetera micacea	10		1	21
Rhaphium antennatum	3			3
Schoenophilus versutus	1			1
Dolichopus diadema	2		4	6
Dolichopus signifer	13	27	6	61
Scellus notatus	11	1		39
Number of species	***27***	***21***	***18***	***36***
Number of specimens	***1208***	***1845***	***1273***	***7420***
Stratiomyiidae				
Chloromyia formosa	2			2
Nemotelus notatus	2		1	3
Nemotelus pantherinus	1			1

Nemotelus uliginosus	37	28	29	94
Number of species	***4***	***1***	***2***	***4***
Number of individuals	***42***	***28***	***30***	***100***
Formicidae				
Lasius flavus		1		1
Lasius fuliginosus			1	1
Lasius niger	8	5	4	17
Lasius umbratus	2	1	2	5
Myrmica rubra			1	1
Myrmica scabrinoides			1	1
Number of individuals	***10***	***7***	***9***	***26***
Number of species	***2***	***3***	***5***	***10***
Adrenidae				
Andrena angustior			1	1
Andrena flavipes	2	3	3	8
Andrena labiata	2			2
Number of species	***2***	***1***	***2***	***5***
Number of individuals	***4***	***3***	***4***	***11***
Halictidae				
Halictus confusus P.	1			1
Halictus tumulorum	4	2	3	9
Lasioglossum minutissimum			1	1
Number of species	***2***	***1***	***2***	***3***
Number of individuals	***5***	***2***	***4***	***11***
Lepidoptera				
Maniola jurtina			1	1
Cynthia cardui	1			1
Pieris napi			2	2
Pieris rapae	2			2
Number of species	***2***		***2***	***4***
Number of individuals	***3***		***3***	***6***
Orthoptera				
Chorthippus albomarginatus	3	1	9	13
Chorthippus parallelus			4	4
Tetrix ceperoi	23	6	2	31
Number of individuals	***26***	***7***	***15***	***48***
Number of species	***2***	***2***	***3***	***3***
Araneae				
Agyneta decora	29	4	346	379
Alopecosa pulverulenta		1	1	2
Antistea elegans			3	3
Arctosa leopardus	2			2
Argenna patula	18	2		20

Bathyphantes approximatus		1	1	2
Bathyphantes gracilis	46	64	183	293
Ceratinella scabrosa		1		1
Clubiona reclusa			1	1
Dicymbium nigrum			24	24
Diplostyla concolor	5	6	12	23
Erigone arctica	3			3
Erigone atra	746	724	264	1734
Erigone dentipalpis	118	78	5	201
Erigone longipalpis	302	790	320	1412
Gnathonarium dentatum	1	1		2
Gongylidiellum vivum		1		1
Hypomma bituberculatum	1		2	3
Lepthyphantes tenuis	5	6	33	44
Meioneta rurestris	3			3
Micrargus subaequalis	1			1
Milleriana inerrans	4	10	4	18
Oedothorax agrestis		1		1
Oedothorax apicatus	40	14	7	61
Oedothorax fuscus	1618	1960	1729	5307
Oedothorax retusus	987	1065	2339	4391
Ozyptila simplex			1	1
Ozyptila trux			1	1
Pachygnatha clercki	4	1	49	54
Pachygnatha degeeri	82	34	83	199
Pardosa amentata	16	19	24	59
Pardosa palustris	161	101	441	703
Pardosa proxima	21	12	31	64
Pardosa pullata	2	1	3	6
Pirata hygrophilus	1		2	3
Pirata piraticus	85	63	83	231
Porrhomma microphthalmum	1	1		2
Prinerigone vagans	427	282	10	719
Robertus arundineti		2	5	7
Robertus lividus	1			1
Saaristoa abnormis	1			1
Tiso vagans			5	5
Trochosa ruricola	3	3	51	57
Trochosa terricola		1		1
Xysticus cristatus	2	1		3
Number of individuals	***4736***	***5250***	***6063***	***16049***
Number of species	***32***	***31***	***31***	***45***

3. Dolichopodid flies (Dolichopodidae)

In total 36 species (Table 2) were found in the nature reserve "Uitkerkse polder"; 2 of those species were found exclusively in the pitfall traps (*Argyra vestita*, *Chrysotus cilipes*).

The fauna is dominated by *C. armatus*, *Syntormon pallipes* en *Dolichopus plumipes* who represent together resp. 74.3% (Uitk 1), 85.9% (Uitk 2) and 89.6% (Uitk 3) of the fauna.

Of the 36 species, 13 were listed in de Red List of Flanders, 2 as threatened and 11 as rare. The "Critically Endangered" species *Syntormon filiger*, the "Rare" *Dolichopus signifer* (up to now only one locality in the Netherlands!) and *Scellus notatus* are abundant in this area. The halophilous species *Dolichopus diadema* and *D. sabinus* appear less frequent, but are present in small local populations. This is confirmed by the fact that juveniles of *D. diadema*, *D. signifer* and *Hydrophorus praecox* were found in the traps.

In each site of the area, eurytopic species are most abundant (10 species in total); marshland species on the other hand are represented by more species in Uitk 1 (7 species). This is the reason why the highest species richness is found in the latter site (Uitk 1 showed also the lowest abundance of species).

Looking only at the number of individuals, the

halophilous fauna is most abundant.

Three species are represented in high numbers in Uitkerkse polder: *C. armatus*, *S. pallipes*, *D. plumipes*, with *S. pallipes* as most abundant species in Uitk 1, and *C. armatus* in Uitk 2 and Uitk 3.

The reference site (Uitk 3) is very interesting for dolichopodid flies and can not be considered as a less valuable brackish grassland (even though it is for other groups of low value and has the lowest diversity). Not only *S. notatus* and *H. praecox* (both halophilous species) are found here, but also *D. diadema* en *D. sabinus* were caught here in highest numbers and this is the only site where *Micromorphus* sp. was caught (probably this species is the same as one found in northern Germany where it is a permanent fauna-element of marshlands). On the other hand *S. notatus*, *H. praecox*, *Rhaphium antennatum* and *S. versutus* were only found in the nature development sites, but probably this is due to the availability of bare sand and short vegetation. Other species found in Uitk 1 and 2 are eurytopic, hygrophilous species.

The reference site has not the highest diversity, in spite of the fact that its fauna includes all halophilous species. The high species richness in the nature development sites is explained by the 'enrichment' of a number of species with a preference for humid sandy soils and other hygrophilous species (less typical for marshlands).

4. Stratiomyiidae

During this study 100 specimens belonging to 4 species were caught (Table 2). Two species are true halophilous species : *Nemotelus notatus* and *Nemotelus uliginosus*. The latter species is also the most abundant (94 out of 100 specimens belonged to that species!).

Nemotelus notatus is a typical halophilous species and can locally be very abundant. This species can be found on salt marshes and drier areas where open sandy soils appear. The larva lives in the litter layer and the top layer of the soil and can survive temporary flooding. In Belgium, the species is only known from 4 localities (BRUGGE, 1987).

Nemotelus uliginosus is again a halophilous species, known from 6 localities in Belgium (BRUGGE, 1987), especially in Antwerp and the Belgian coast. This species can be found together with *N. notatus*, but the first species inhabits the lower areas of the salt marshes whilst the latter species occurs on the higher parts. The larva lives between plants or on the surface of standing, brackish water.

Although these Stratiomyiidea are characteristic for brackish grasslands they can not be used as indicators for differential land use in adjacent sites because the adults wander from one area to another. The dynamics of the area in Uitkerkse polder seems to be reason why some very interesting populations occur in this nature reserve. During the study some typical halophilous and some important pioneers species/populations were found. The current management (especially aimed on bird populations) seems to do no harm to the Stratiomyiidae population; only intensively grazing would have negative effects on the entomofauna.

5. Ants (Formicidae)

Little is known on the influence of the different management techniques (mowing, grazing, top soil removing, digging) on the ant fauna of wet habitats. Moreover, little information is available on the colonization of former arable land by ants and on the negative or positive influences of different management measurements on this colonization.

In total 26 individuals belonging to 10 species were found during this study (Table 2); but all these species are immigrants, passing by (e.g. ants looking for new habitats to colonize, or ants drifted away during storm). In general, the area is too wet for ants on one hand to colonize and on the other hand to maintain the colony.

6. Hymenoptera

Two subfamilies were found in Uitkerkse polder : Andrenidae and Halictidae, but in very low numbers of species and individuals so it is not possible to conclude anything on the conservation of these subfamilies.

Andrenidae

This subfamily is especially known from open, sandy areas. The 3 species (only 11 individuals) found in Uitkerkse polder are all common; they have no/little bio-indicator value.

Halictidae

Again it is difficult to conclude anything about the data on Halictidae gathered during this study. Only 3 species were found, one species (*H. confusus P*) is rare but only one specimen was found. Little is known on the ecology and distribution of Halictidae in Belgium; on some species more information is available. *Lasioglossum minutissimum*, found once in Uitkerke 3, is an indicator species for dry grasslands.

Most species of Hymenoptera found during the project in Uitkerkse polder are accidental "tourists" and are not characteristic for the sampled wet grasslands and marshes. Due to the low number of species found, it is difficult to

make statements on the effects of nature development on former arable land on Hymenoptera.

7. Butterflies (Lepidoptera)

Only 4 species were found in Uitkerkse polder and only in plot 1 and 3 (Table 2). Those species are all common; no indicator species were caught during this study. This is not surprising because target species for wet grasslands and marshes have become very rare in Flanders (most are critically endangered).

Restoration of the butterfly fauna will be very hard to execute. The aim for butterfly friendly management of oligotrophic wet grasslands and marshes will have to be at creating a small-scale variation in time and space. Phased mowing (the presence of host plants is assured) on small areas and extensive grazing (creation of variation) for large areas is probably the best management.

8. Locusts and crickets (Orthoptera)

In Uitkerkse polder, a total of 48 individuals and 8 juveniles belonging to 3 species were identified (Table 2). Of the 3 species, 2 are indicator species for wet habitats and are listed on the Red List of Flanders (DECLEER *et al.*, 2000); *Chorthippus albomarginatus* and *Tetrix ceperoi*. The latter is at the same time a characteristic species for dune and brackish habitats.

Most nature development techniques have negative effects on the orthoptera fauna of the area (e.g. mowing at the time when most locusts eggs are still on the grass, etc.). It is therefore not easy to take the needs of orthopthera into account in management strategies of the nature development sites.

9. Spiders (Aranaea)

Different publications show that spiders are good indicators for estimating changes into the habitat caused by stress conditions (CLAUSEN, 1986 ; KREMEN, 1992 ; MAELFAIT, 1997 ; MAELFAIT & BAERT, 1987, 1988 ; MAELFAIT *et al.*, 1989 ; MAELFAIT & HENDRICKX, 1997 ; MURPHY *et al.*, 1994 ; MALT, 1995). A list of expected species characteristic of good quality wet grasslands is available (MAELFAIT *et al.*, 1998).

In total 16049 individuals belonging to 45 species were found. All three plots have a comparable number of individuals and species (Table 2) and four Red List species were found : *Arctosa leopardus* (Vulnerable, Gow with tussocks), *Argenna patula* (Critical, Salt marsh), *Pardosa proxima* (Rare geographically restricted species, at the northern limit of its geographical range) and *Robertus arundineti* (Endangered, Gow with rough vegetation). The most abundant species are typical for disturbance and pioneer situations (*Prinerigone vagans*, *Oedothorax apicatus*, *O. retusus* and *Erigone longipalpis*). Specific species for brackish grasslands were only found in negligible numbers. Indicator species for the area "Uitkerkse polder" are all species of open habitats (eg. *Dicymbium nigrum* typical for grasslands) and the above-mentioned ruderal species. Most species found in Uitk 3 (the "reference" site) were common grassland species (especially for wet grasslands), whilst species found in Uitk 1 and Uitk 2 were species typical for pioneer situations (e.g. *Argenna patula* and *Erigone longipalpis*).

In general, the spider fauna of the nature development sites takes a long time to recover from former agricultural use. These young nature development sites have more pioneer and ruderal species than the older reference sites (here grassland species can be found).

Conclusions

* Only a few entomofauna groups have sufficient possible indicator species to evaluate nature development in the brackish grasslands in the Uitkerkse Polder. For Empididae, Dolichopodidae, Carabidae and Araneae indicator species of this habitat are known. Their occurrence and numbers can be a measure for the improvement of the natural value.

* Other groups (Lepidoptera, Orthoptera, Formicidae and other Hymenoptera) are never abundant on and lack indicator species for brackish grassland. Species of these groups found during the project are immigrants and have a eurytopic habitat preference.

* The management techniques used in the nature development sites : digging respectively 8 and 3 years ago, already has positive effects on the empidid and dolichopodid fauna of the area. The major question for nature development however is: what will the influence on the fauna be after a period of time; will the ruderal species become again more abundant?

* Even though the reference site has not (yet) the highest species richness nor shows the highest diversity for some groups, it contains however the most halophilous species of these groups. The high species richness in the nature development sites is explained by the 'enrichment' of a number of species with a preference of humid sandy soils and other hygrophilous species (less typical for marshlands).

* The reference site (Uitk 3) is proven to be a

good site especially for some groups whilst for others this site hosts mostly ruderal grassland species. The management measurements taken in the nature development sites already show good results; many "special" species (e.g. target species) were only caught in these sites.

* As suggested by DUELLI *et al.* (1999) in general organism biodiversity is higher in less intensively cultivated habitats. So normally biodiversity should have been more interesting in the reference site. Variation in species diversity often depends on the biodiversity of the surroundings (mosaic landscape) rather than on differing management regimes. This means that recovery of the fauna in nature developments sites also depends on source populations in nearby areas.

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References

ASTERAKI E., 1994. - The carabid fauna of sown conservation margins around arable fields. In: Desender *et al.*, 1994. Carabid Beetles: Ecology and Evolution : 229-233.

BLAKE S., FOSTER G.N., FISHER G.E.J. & LIGERTWOOD G.L., 1996. - Effects of management practices on the carabid faunas of newly established wildflowermeadows in southern Scotland. *Annales Zoologici Fennici*, 33 : 139-147.

BRUGGE B., 1987. - Wapenvliegentabel. Jeugdbondsuitgeverij - Utrecht : 76 pp.

CLAUSEN I. H. S., 1986. - The use of spiders (Aranaea) as ecological indicators. *Bulletin of the British Arachnological Society*, 7(3) : 83-6.

CONNELL J.H., 1978. - Diversity in tropical rain forest and coral reefs. *Science*, 199 : 1302-1310.

DECLEER K., 1989. - Kansen voor ongewervelden in het huidig natuurbeheer. *Verhandelingen van het symposium "Invertebraten van België"* : 447-453.

DECLEER K., DEVRIES, H., HOFMANS, K., LOCK K., BARENBRUG B. & MAES D., 2000. - Voorlopige atlas en "Rode Lijst" van de sprinkhanen en krekels van België (Insecta, Orthoptera). Rapport I.N. 2000/10, Instituut voor Natuurbehoud Brussel : 74 pp.

DEKONINCK W., VERSTEIRT V. & GROOTAERT P., 2002. - Praktijkgericht onderzoek naar kansen en belangrijke stuurvariabelen voor natuur-ontwikkeling op gronden met voormalig intensief landbouwgebruik. Deel IV: Invertebraten. Studie uitgevoerd voor rekening van de Vlaamse Gemeenschap binnen het kader van het Vlaams Impulsprogramma voor natuurontwikkeling in opdracht van de Vlaamse minister bevoegd voor Natuurbehoud. Rapport ENT.2002.01: 254 pp.

DESENDER K., MAES D., MAELFAIT J.-P. & VAN KERCKVOORDE M., 1995. - Een gedocumenteerde Rode Lijst van de zandloopkevers en loopkevers van Vlaanderen-Brussel : 208 pp.

DUELLI P. & ORBIST M.K., 1998. - In search of the best correlates for local organismal biodiversity in cultivated areas. *Biodiversity and Conservation* 7 : 297-309.

DUELLI P., ORBIST M.K. & SCHMATZ D.R., 1999. - Biodiversity evaluation in agricultural landscapes: above-ground insects. *Agriculture, Ecosystems and Environment* 74 : 33-64.

GRIME J.P., 1973. - Control of species density in herbaceous vegetation. *Journal of Environmental Management*, 1: 151-167.

GROOTAERT P., POLLET M.& MAES D., 2001. - A Red Data Book of empidid flies of Flanders (northern Belgium) (Diptera, Empididae s.l.): constraints and possible use in nature conservation. *Journal of Insect Conservation*, 5 (2) : 117-129.

KREMEN C., 1992. - Assessing the indicator properties of species assemblages for natural areas monitoring. *Ecological Applications*, 2(2) : 203-217.

MAELFAIT J.-P. & BAERT L., 1987. - Het gebruik van spinnen bij ecologische indicatie. *Nieuwsbrief van de Belgische Arachnologische Vereniging*, 6 : 24-27.

MAELFAIT J.-P. & BAERT L., 1988. - Les araignées sont-elles de bons indicateurs écologiques. *Bulletin de la Société Scientifique de Bretagne*, 59 : 155-160.

MAELFAIT J.-P., 1997. - Spinnen als bio-indicatoren ten behoeve van het natuurbehoud in Vlaanderen. *De Levende Natuur*, 98(5) : 174-183.

MAELFAIT J-P & HENDRICKX F., 1997. - Spiders as bio-indicators of athropogenetic stress in natural and semi-natural habitatten in Flanders (Belgium): some recent developments. Selden PA, ed. Proceedings of the 17th European Colloquium of Arachnology, 1997; Edinburgh. Edinburgh : 1997.

MAELFAIT J-P, DESENDER K., BAERT L., 1989. - Some example of the practical use of spiders and carabid beetles as ecological indicators. *Verhandelingen van het symposium invertebraten van België* 1989 : 437-442.

MAELFAIT J.-P., BAERT L., JANSSENS M. & ALDERWEIRELDT M., 1998. - A Red list for the spiders of Flanders. *Bulletin de L'institut royal des sciences naturelles de Belgique, Entomologie* 68 : 131-142.

MAES D. & VAN DYCK H., 1999. - Dagvlinders in Vlaanderen. Ecologie , verspreiding en behoud. Stichting Leefmilieu/Antwerpen i.s.m. Instituut voor Natuurbehoud en Vlaamse vlinderwerkgroep/ Brussel : 480 pp.

MAES D. & VAN DYCK H., 2001. - Butterfly diversity loss in Flanders (north Belgium): Europa's worst case scenario? *Biological conservation* 99: 263-

276.
MALT S., 1995. - Epigeic spiders as an indicator system to evaluate biotope quality of riversides and floodplain grasslands on the river Ilm (Thuringia). Proceedings of the 15th Colloquium of Arachnology : 136-46.
MURPHY K.J., CASTELLA E., CLÉMENT B., HILLS J.M., OBRDLIK P., PULFORD, I.D., 1994. - Biotic indicators of riverine wetland ecosystems functioning. Mitsch WJ, ed. Global wetlands: Old world and new. Elsevier Science B.V., 1994 : 659-682.
POLLET M., 2000. - Een gedocumenteerde Rode Lijst-van slankpootvliegen van Vlaanderen. *Mededelingen van het Instituut voor Natuurbehoud* 8. Brussel : 190 pp.

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Cryptostemma alienum HERRICH-SCHAEFFER, 1835 (Heteroptera Dipsocoridae) in België

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Abstract

Cryptostemma alienum Herrich-Schaeffer was rediscovered in Belgium after more than a century. Literature data about biology and distribution are summarized.

Keywords : Heteroptera, faunistics, Belgium.

Samenvatting

Cryptostemma alienum Herrich-Schaeffer werd na meer dan een eeuw weer in België waargenomen. Literatuurgegevens over biologie en verspreiding worden samengevat.

Résumé

Cryptostemma alienum Herrich-Schaeffer a été retrouvé en Belgique plus d'un siècle après sa première découverte. Les données de la littérature sur sa biologie et sa répartition sont résumées ici.

De familie Dipsocoridae telt slechts één genus, dat kosmopolitisch verspreid is: *Cryptostemma*. Talrijke vertegenwoordigers, met name in de tropen, zijn nog onbeschreven.

Veel soorten leven op oevers van stromend water op nat zand onder stenen. De beide Europese vertegenwoordigers van het subgenus *Pachycoleus* leven echter in nat mos, met name in veenmos (*Sphagnum* sp.).

In België komt van deze familie alleen de in rivierbeddingen levende *Cryptostemma (Cryptostemma) alienum* Herrich-Schaeffer, 1835 (Fig. 1) voor. Uit het aangrenzend gebied is de mosbe-wonende *Cryptostemma waltli* (Fieber, 1860) bekend.

ŠTYS (1990) geeft een overzicht van de West-Palaearctische Dipsocoridae met speciale aandacht voor de biologie van de verschillende soorten. Determinatietabellen zijn te vinden in SOUTHWOOD & LESTON (1959) en WAGNER (1967).

Algemene informatie over Dipsocoridae is te vinden in SCHUH & SLATER (1995). De catalogus van het Palaearctische gebied (KERZHNER, 1995) geeft onder andere informatie over de nomenclatuur en de verspreiding van de

Fig. 1. *Cryptostemma alienum*, mannetje (Foto E. Wachmann, Berlin).