The use of monitoring systems in nature reserves, an example : "De Vallei van de Zwarte Beek" at Koersel-Beringen (Limburg, Belgium)

by Dirk MAES

Summary

Although several surveys on invertebrates have been performed during the last couple of years in most of the Belgian nature reserves, the results of such surveys rarely seem to be used when reserve management schemes are discussed.

In order to have a tool to evaluate different management practices, a monitoring system has been started in "De Vallei van de Zwarte Beek" (Koersel-Beringen). On four monitor routes with different management practices butterflies are counted weekly to detect if changes in abundance are due to management or not.

Finally, the incorporation of different invertebrate groups in management schemes is highly recommended together with their use in evaluating nature management.

Key-words : monitoring scheme, butterflies, invertebrates, nature management.

Samenvatting

Ondanks het feit dat er recent vele inventarisaties van invertebraten gebeurd zijn in verscheidene Belgische natuurreservaten worden de resultaten ervan slechts zelden gebruikt bij het opmaken van een beheersplan voor het reservaat.

Om de verschillende beheersmaatregelen te kunnen evalueren is er in "De Vallei van de Zwarte Beek" (Koersel-Beringen) gestart met een monitoring-project : op vier monitor-routes, elk met een verschillend beheer, worden de dagvlinders wekelijks geteld om na te gaan of veranderingen in abundantie te wijten zijn aan het gevoerde beheer of niet.

Ten slotte wordt er aangeraden om rekening te houden met ongewervelden bij het opstellen van beheersplannen en wordt er op gewezen dat ongewervelden uitermate bruikbaar zijn bij het evalueren van natuurbeheer.

Trefwoorden : monitor-project, dagvlinders, ongewervelden, natuurbeheer.

Introduction

In several nature reserves in Belgium invertebrate surveys were done over the years but very exceptionally the results of these surveys are used when a management scheme is discussed for the reserve. Invertebrates though are good ecological indicators (MAELFAIT & BAERT,1987; MAELFAIT et al., 1989; RUSHTON, 1987; SIEPEL, 1989; SPEIGHT, 1986) and should therefore play a role in managing nature reserves. In most nature reserves flora and avifauna are used to evaluate management and the reason for doing so is obvious : their ecology is well known and they are easy to detect and to identify. Invertebrates, however, react remarkably faster to changes in the local environment. The most important obstacle for not using invertebrate animals in a management scheme is probably the lack of ecological knowledge of many invertebrate groups; therefore it is difficult to estimate the impact of management practices on the invertebrate group in question. Of some invertebrate groups (spiders, carabid beetles, butterflies) however enough knowledge is present to use them in management schemes. A second reason for not taking invertebrates into account is the lack of

research on the impacts of management practices on invertebrates, although recently some studies were done on this subject (BLAB & KUDRNA, 1982; MAES, 1989; VELTHUIS, 1986).

This paper tries to give an example of how some invertebrate groups can fit into a global management scheme for the nature reserve "De Vallei van de Zwarte Beek" at Koersel-Beringen (Limburg, Belgium).

Study area

"De Vallei van de Zwarte Beek" (Fig. 1) is one of the biggest nature reserves in Belgium (about 800 ha) and consists of a wide variety of habitats (heathland, deciduous forest, meadows, sand dunes, ...). It is one of the best preserved lowland brooks in Western Europe, because of the very low human impact on the ecosystem. "De Vallei van de Zwarte Beek" is owned by "Natuurreservaten v.z.w." (former B.N.V.R.) and is managed by BERO, a local nature organization. Over the years several invertebrate surveys (spiders, butterflies, grasshoppers, dragon flies, carabid beetles, hoverflies, ...) were done in "De Vallei van de Zwarte Beek" and today more than 1,100 invertebrate species are known for the reserve. The long list of invertebrates has been collected mostly by (amateur) entomologists on occasional visits to the reserve and by a couple of members of the local management group; up until now there has been no professional or well organized invertebrate survey by any research institute. In 1991 a first attempt is made to incorporate an invertebrate group into the management scheme by monitoring butterflies in different habitats.

The monitoring of butterflies started in april 1991 with four routes and if the results are satisfying they will be used in future management schemes. The reason for taking butterflies as ecological indicators is fivefold :
-       their ecology is very well known (TAX, 1989),
-       they are easy to identify (WYNHOFF *et al.*, 1990),
-       they can be counted with a standardized technique (POLLARD, 1977; VAN SWAAY & VELING, 1991),
-       they react quickly to changes in the ecosystems (SIEPEL, 1989; VAN SWAAY & VELING, 1991),
-       if a site is rich in butterflies it is thought to be beneficial for other invertebrates as well.

Method

The technique used for counting butterflies is the transect method (POLLARD, 1977), adapted by VAN SWAAY & VELING (1991). A given route is walked weekly from april to september and all butterflies within 5 meters are counted (Fig. 2). The route is divided into sections of 50 meters each and may only be walked under certain climatic circumstances :
-       counting must take place between 11.30 a.m. and 4.30 p.m.,
-       when temperatures are between 13 and 17°C the route may only be walked when cloud coverage is less than 40%,
-       counting is not allowed when wind speed exceeds 6 beaufort, when it is raining or when mist is present.
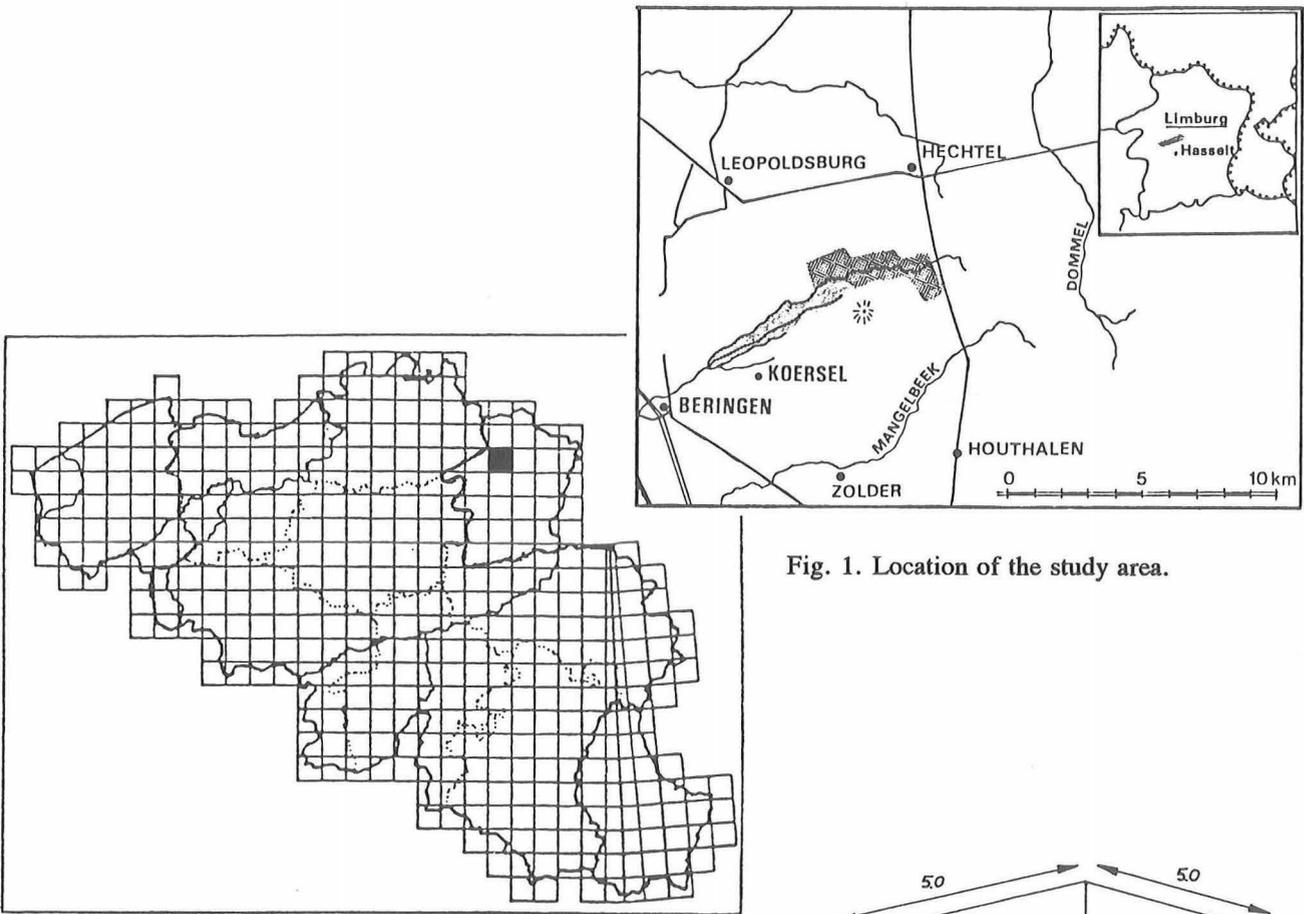
Fig. 1. Location of the study area.
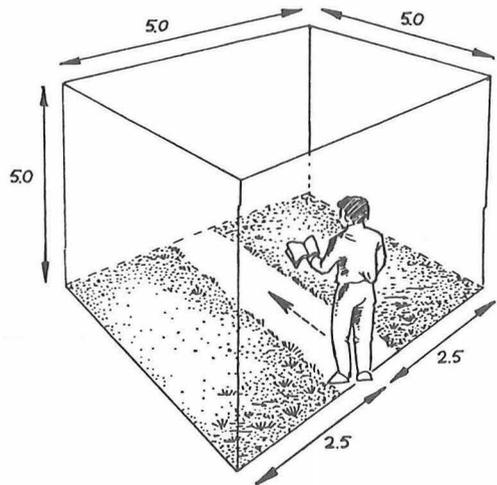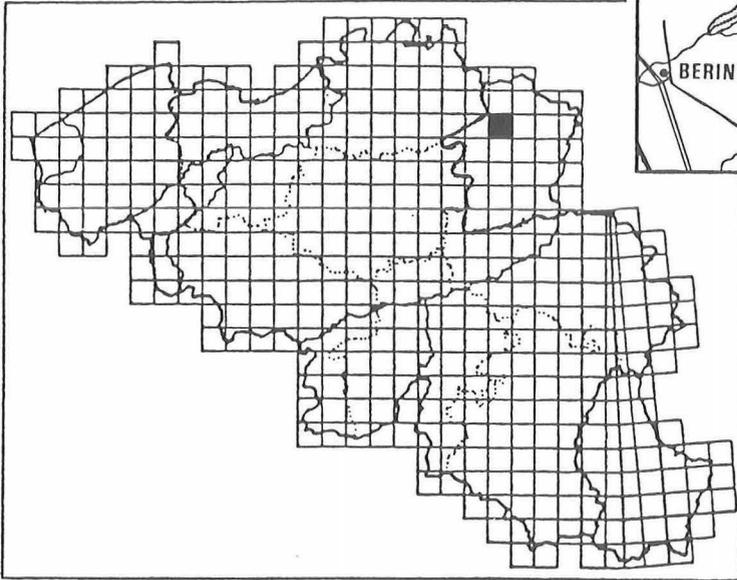
Fig. 2. Imaginary cage in which butterflies are counted during monitoring (from VAN SWAAY & VELING, 1991).

Special forms (Fig. 3) are designed by the "Vlinderstichting" to facilitate the counting. The first form describes the route and deals with all kinds of biotic factors (flowering plants, management, habitat, etc.); the second form has to be used to fill in the weekly counting of the butterflies on the route. Drastic changes (mowing or any other form of management practice) can be noted on the second form as well, but should only be noted once (although the influences of the change can be long lasting).

DE VLINDERSTICHTING   Vlinder - monitoringproject
                                             telformulier

Route-nr. 034   Datum (dag, mnd., jaar) 04 05 91   Tijd begin 13 15 eind 13 40

Temperatuur (°C) 21   Bewolking (-achtste) 1   Windkracht (Beaufort) 2

Waarnemersnummer 893   Naam route: Regulieren

Gegevens over de teller(s)

Naam: P. van Dam
Adres: Rudolfstraat 8
Postcode: 4102 HJ
Woonplaats: CULEMBORG
Telefoon: 03450 - 17822
Medewaarnemer: /

Opmerkingen

Tussen sectie 1 en 2:   1 Bruin blauwtje
Tussen sectie 3 en 4:   1 ♂ Oranjetipje

11 Soortenlijst

Soortsnaam	Afkorting	Nummer	1	2	3	4	5	6	7	8	9	10
Zwartsprietdikkopje	THYMLINE	430 040										
Groot dikkopje	OCHLVENA	430 070										
Citroenvlinder	GONERHAM	450 070										
Groot koolwitje	PIERBRAS	450 090										
Klein koolwitje	PIERRAPA	450 100										
Klein geaderd witje	PIERNAPI	450 110	4			2						
Kleine vuurvlinder	LYCAPHLA	460 070										
Bruine vuurvlinder	HEODTITY	460 100										
			1	2	3	4	5	6	7	8	9	10
Heideblauwtje	PLEBARGU	460 150										
Icarusblauwtje	POLYICAR	460 190										
Boomblauwtje	CELAARGI	460 220										
Atalanta	VANEATAL	470 050										
Distelvlinder	CYNTCARD	470 060										
Kleine vos	AGLAURTI	470 070										
Dagpauwoog	INACIO	470 100										
Gehakkelde aurelia	POLYCALB	470 110										
			1	2	3	4	5	6	7	8	9	10
Landkaartje	ARASLEVA	470 120		1								
Bont zandoogje	PARAAEGE	480 010										
Argusvlinder	LASIMEGE	480 020										
Koevinkje	APHAHYPE	480 050										
Hooibeestje	COENPAMP	480 080										
Bruin zandoogje	MANIJURT	480 110										
			1	2	3	4	5	6	7	8	9	10
Oranjetipje	ANTHCARD	450 130	3	1								

Fig. 3. Counting form (Vlinderstichting/CBS).

This technique has already proved to be useful in the Netherlands and in Great-Britain where a lot of routes are walked all over the country. A widespread monitoring net is necessary for distinguishing local (due to nature management) from national changes (due to climatic factors); together with the extensiveness of the monitoring net, it is very important that the monitoring is maintained for 10 years or more to detect changes in abundances of butterflies.

Using the monitoring scheme in nature management

How can the results of this monitoring be used in nature management? For each butterfly species, an index of abundance is calculated (POLLARD, 1977) and if, after a couple of years of monitoring, a change in the index of abundance is noticed (for examples, Fig. 4), an explanation for the change has to be found: is the change only local or is it national? If the change is a local phenomenon, is it possible that it is caused by management or is it due to changes in other factors (changes in waterlevel, the eutrofication of the site,...)? If the change is caused by the management practice an adaptation of the management scheme should be considered, especially on sites where rare and endangered species show a decreasing index of abundance. The monitoring system that is presented here has its limitations (only butterflies are counted) and should be extended. Therefore a monitoring system, using monitor species from different invertebrate groups for the different habitats is worked on and will eventually replace the butterfly monitoring project in the future.
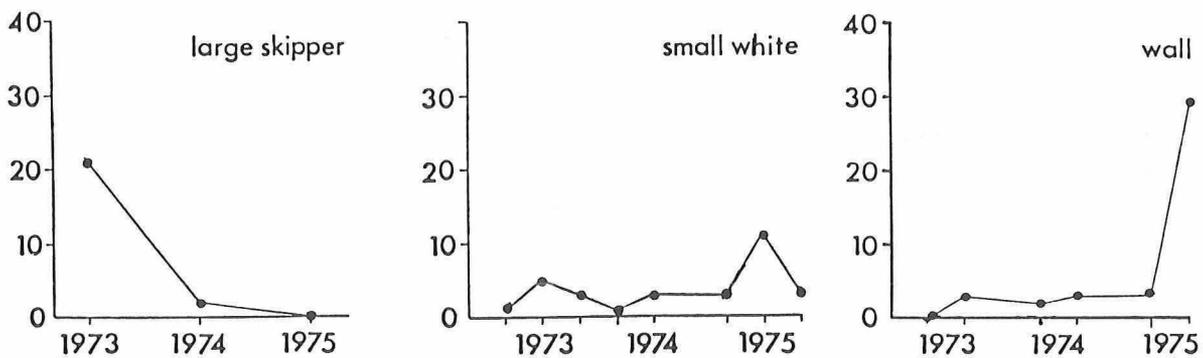
Fig. 4. Examples of changes in the index of abundance; left, decrease: Large skipper (*Ochlodes venatus*; middle, status quo: Small white (*Pieris rapae*); right, increase: Wall (*Lasiommata megera*) (from POLLARD, 1977).

Conclusion

Because of the ecological importance of invertebrates they should play a role in management schemes, but up until now very few nature organizations take them into account. Several groups of invertebrates can be used as ecological indicators (carabid beetles, spiders, butterflies, ...) because their ecology is well known. A monitoring scheme for butterflies, as proposed in this poster, is easy to do (even by laymen !) and gives a lot of information about the possible effects of management practices on the abundance of butterflies. It surely is not right to manage only butterflies, management schemes for nature reserves are supposed to approach the reserve as a global entity with difficult and unknown relationships. Management practices should have beneficial effects on plants as well as on animals (including invertebrate animals) that are becoming rare outside nature reserves. The installation of a management commission is therefore recommended for all bigger nature reserves inable to discuss the proper management scheme. Hopefully henceforth invertebrates are going to be taken into account when management schemes for nature reserves are to be discussed. Professional entomologists should therefore provide adequate and handy monitoring schemes that can be used by amateur entomologists as well.

Acknowledgements

References

BLAB & KUDRNA, 1982. Hilfsprogramm für Schmetterlinge. *Naturschutz aktuell*, 135 pp. Kilda Verlag, Greven.

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

MAELFAIT, J.-P., DESENDER, K. & BAERT, L., 1989. Some examples of the practical use of spiders and carabid beetles as ecological indicators. Proceedings of the Symposium "Invertebrates of Belgium", pp. 437-442, K.B.I.N., Brussel.

MAES D., 1989. Faunistisch-ekologische studie van de loopkevers (Coleoptera, Carabidae) van het natuurreservaat "De Blankaart" (Woumen, West-Vlaanderen) ten behoeve van het natuurbeheer. *Licentiaatsverhandeling RUG.*, 2 delen.

POLLARD, E., 1977. A method for assessing changes in the abundance of butterflies. *Biological Conservation*, 12: 115-134.

RUSHTON, S.P., 1987. A multivariate approach to assessment of terrestrial sites for conservation. *In*: LUFF, M.L.(Editor). The use of invertebrates in site assessment for conservation. University of Newcastle upon Tyne, Newcastle upon Tyne, pp. 62-79.

SIEPEL, H., 1989. Objective selection of indicator species for nature management. Verhandelingen van het Symposium "Invertebraten van België", pp. 443-446, K.B.I.N., Brussel.

SPEIGHT, M.C.D., 1986. Criteria for the selection of insects to be used as bio-indicators in nature conservation research. Proceedings of the third European Congress of Entomology, pp. 485-488, Nederlandse Entomologische Vereniging, Amsterdam.

SWAAY, C.A.M. VAN & VELING, K., 1991. Handleiding dagvlindermonitoring. Vlinderstichting/Centraal bureau voor de statistiek. Wageningen/Voorburg.

TAX, M.H., 1989. Atlas van de Nederlandse Dagvlinders. Vereniging tot behoud van Natuurmonumenten in Nederland/Vlinderstichting, 's Graveland/Wageningen, pp. 1-248.

VELTHUIS, H.H.W. 1986. Insect protection: theory and practice. Proceedings of the 3rd European Congress of Entomology part 3. pp. 343-345. Nederlandse Entomologische Vereniging, Amsterdam.

WYNHOFF, I., VAN DER MADE, J.G. & VAN SWAAY, C.A.M., 1990. Dagvlinders van de Benelux. Stichting Uitgeverij Koninklijke Nederlandse Natuurhistorische Vereniging, Utrecht, Vlinderstichting Wageningen.

Dirk MAES
Laboratorium voor Ekologie der Dieren,
Zoögeografie en Natuurbehoud,
Universiteit Gent
Ledeganckstraat 35
B-9000 GENT