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## Evaluation of the effects of recent nature development measures in the Yser Estuary on ground beetle and spider assemblages

Konjev Desender<sup>1</sup>, Léon Baert<sup>1</sup> and Jean-Pierre Maelfait<sup>2,3</sup>

<sup>1</sup> Entomology Department, Royal Belgian Institute of Natural Sciences  
Vautierstraat 29, B-1000 Brussels, Belgium  
E-mail: Konjev.Desender@naturalsciences.be

<sup>2</sup> Institute for Nature Conservation  
Kliniekstraat 25, B-1070 Brussels, Belgium

<sup>3</sup> Terrestrial Ecology Unit, Ghent University,  
Ledeganckstraat 35, B-9000 Ghent, Belgium

### Abstract

Since 1990, populations of ground beetles and spiders are continuously monitored in the coastal dune and saltmarsh habitats of the Yser Estuary (Nieuwpoort), within the context of a long-term study on invertebrate diversity, population dynamics and ecological and genetic effects of habitat fragmentation. By now, we know in detail the faunal composition of practically all available habitats in the study area. This is an ideal framework to monitor the effects of the nature development activities that started in 2001 in the area. Results of five large sampling campaigns in 2001-2003 (more than 25.000 carabid beetles and spiders, 218 species) show a number of new ground beetle and spider species and assemblages, but warrant that many of these could be rapidly lost again.

Keywords: Long-term monitoring; Dunes; Saltmarsh; Ground beetles; Spiders.

### Introduction and methods

As a part of this study, pitfall trap sampling is being performed without interruption for more than 14 years along a transect from seaside marram dunes to inland moss dunes and dune grassland. Faunal assemblages are compared with those from surrounding habitats and microhabitats in the same study area. The studied invertebrates belong to the most appropriate bio-indicators for saltmarshes and different coastal dune habitats. Amongst other characteristics, these animal groups show a high biodiversity and/or abundance and productivity, a lot of highly specialized and stenotopic species and a high variation in their dispersal power. They offer unmatched possibilities as model organisms for studies on differing spatial and temporal scales. Our long-term study is an ideal framework to monitor the effects of the nature development activities that started in 2001 in the area (*cf.* project 'MONAY'), in order to evaluate, understand, and possibly even predict changes in faunal assemblage structure and population dynamics. We started sampling newly created habitats immediately after nature development

management activities were finished. Our long-term sampling has been continued on a number of reference sites from the main habitats in the area ('old' dune habitats, 'old' saltmarsh). Besides, intensive short-term sampling is also performed on a large number of sites (Fig. 1) along transects in the entire nature development area, by simultaneous monitoring of target invertebrate species and abiotic as well as vegetation characteristics.

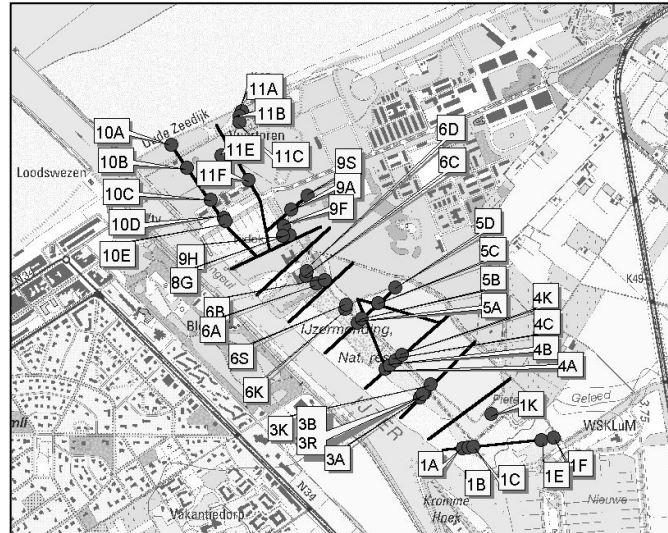


Fig. 1. Sampling sites of ground beetles and spiders in the Yser Estuary nature development area.

## Results and conclusions

Results of five large sampling campaigns in 2001-2003 (more than 25.000 carabid beetles and spiders, 218 species) show a number of new beetle and spider species and assemblages for the study area, including intermediate assemblages between those from 'old' marram dune, dune grassland and transitions to saltmarsh habitat. Some completely new habitat types were created such as a brackish dune pond, dikes, and marshy areas associated with freshwater seeping at the base of newly constructed dikes. Assemblages of ground beetles and spiders have quickly colonized all of these habitats, although the speed of colonization is habitat-specific and differs between beetles and spiders. Among these arthropods, we observe not only ruderal species but also a number of species with high conservation interest. Our preliminary results however seem to indicate that such species could be lost again in short time, unless natural dynamic processes are kept ongoing. Such processes generate special assemblages typical for first stages of succession in saltmarshes and dune slacks. It is, however, still unclear whether the newly created saltmarsh habitats will evolve as hoped for, because of the observation that the newly deposited sediments in the saltmarsh are relatively coarse-grained (sand instead of silt). Further invertebrate monitoring is therefore imperative not only for a better understanding of the patterns and processes generated by the nature restoration measures, but also as a possible early warning system for the need of additional management measures in the future.