

# Modification of Groynes and Guide Dykes at Elbe Riverbanks



## Impact of Modified Groynes on Carabid Beetles

Meike Kleinwächter<sup>1</sup>, Otto Larink<sup>1</sup>, Thomas Ols Eggers<sup>1</sup> & Andreas Anlauf<sup>2</sup>

### Introduction

Carabid beetles were chosen as bioindicators to assess the impact of inclined and modified groynes at the river Elbe (Saxony-Anhalt, Germany, cf. poster Hentschel & Anlauf). Pre-Monitoring (2000) and post-monitoring (since 2001) was carried out to review performance of the changes induced by new groyne types built in 2000. The occurrence of highly specialised carabid species indicate different hydro-morphological processes. Therefore, the identification of a representative target species was one of the main aims of this study.

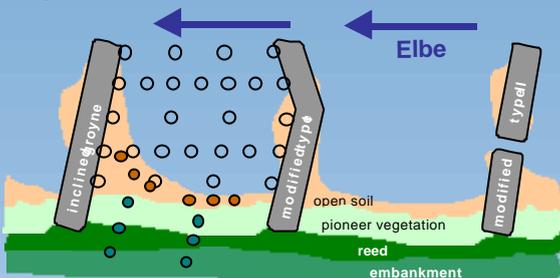


Fig. 1: Different groyne types and transect locations in groyne fields. Filled circles: pitfall trap transects, open circles: macrozoobenthos raster (cf. poster Eggers et al.).

### Conclusions

- *Bembidion velox* is a representative target species for hydro-morphological processes induced by different groyne types
- *B. velox* is strongly adapted to sandy open soil habitats and provides an umbrella effect for other rare riparian specialists
- Modified groynes may increase the hydro-morphological dynamics in the groyne fields and thus provide suitable habitat for specialised riparian beetles

### Sites and Methods

- 11 groyne fields separated by inclined or modified groynes (cf. poster Hentschel & Anlauf) at 2 study sites (Elbe-km 439 - 444)
- 102 pitfall traps (Ø = 9.5 cm, 2% formalin) in transects parallel and perpendicular to the water line (Fig. 1)
- weekly collections in early summer 2000 - 2003 (Fig. 2)
- survey of several environmental parameters to analyse the key factors governing the distribution of ground beetles

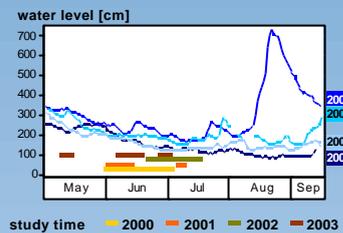
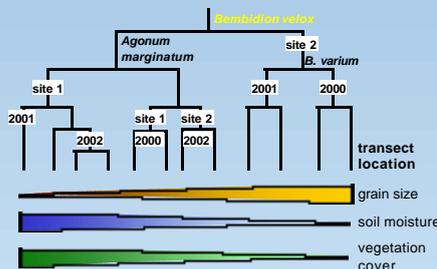


Fig. 2: Water levels (water level gauge Wittenberge) and study periods: 2000 before, 2001-2003 after new groyne types were built.

### Habitat Analysis

To analyse the riparian habitats in the groyne fields before and after the new groyne types were built a TWINSpan-analysis was performed. The transect locations were grouped by ground beetle data of three years (Fig. 3). The assemblages clearly reflected differences in grain size, soil moisture and vegetation cover. The end groups were primarily defined by study site location and year.

Fig. 3: TWINSpan - Dendrogram based on ground beetle data of riparian transects of three years (47 species, 13779 individuals).

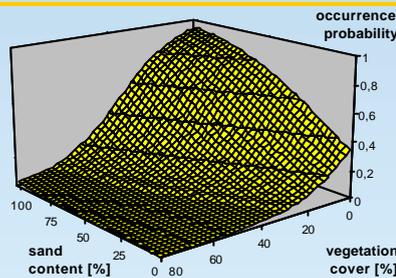


The sandy open soil habitats were characterised by the rare riparian species *Bembidion velox* (Fig. 3 and 4). This beetle is strongly adapted to high hydro-morphological dynamics. Therefore, the effects of different groyne types could be indicated by the occurrence of *B. velox* (cf. Tab. 2).

### Habitat Models

Habitat models by multiple logistic regressions are efficient tools for assessing the habitat suitability of species and make precise predictions of their occurrence probability. The occurrence probability of *Bembidion velox* rises with increasing content of sand and decreasing vegetation cover (Fig. 4).

Fig. 4: Response surface of bivariate habitat suitability model of *Bembidion velox*.



By model transfer the umbrella effect of a chosen target species can be measured. For this purpose, a model of *Bembidion velox* was transferred to a multi species group with similar distribution (Tab. 1).

Proportion of correct predictions = 89.0 %  
Nagelkerke R<sup>2</sup> = 0.64

### Habitat Suitability

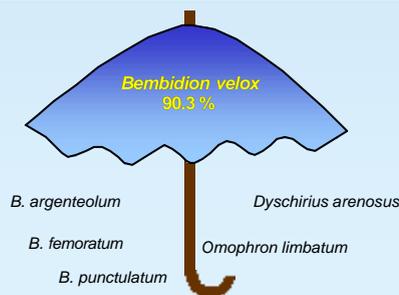


Fig. 5: Umbrella effect: Transfer of a *Bembidion velox*-habitat model to a TWINSpan species group.

Tab. 2: Impact of different groyne types on the occurrence of *Bembidion velox*. Proportion of individuals per trap [%] of three years.

	2000	2001	2002	trends
<b>site 1</b>				
inclined groyne	0	0	0	
modified type I	0	0.9	2.2	↗
modified type II	0.1	0	0	
<b>site 2</b>				
inclined groyne	2.7	1.8	0.2	↘
modified type II	5.4	5.2	4.9	
<b>S individuals</b>	389	247	41	

The occurrence of *Bembidion velox* indicates suitable habitats for other riparian species (Tab. 1). According to the distribution of *B. velox* in the study sites habitat suitability increases with modified groyne type I (Tab. 2).

### Addresses:

<sup>1</sup> Institute of Zoology, Technical University, D- 38092 Braunschweig, Germany  
meike.kleinwachter@tu-bs.de

<sup>2</sup> Federal Institute of Hydrology (BfG), P.O. Box 200253, D-56002 Koblenz, Germany