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Distribution of *Magelona* species (Polychaeta: Magelonidae) in the German Bight (North Sea): a modeling approach

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Abstract

The aim of the present study was the development of species-habitat models for four *Magelona* species (Polychaeta: Magelonidae) found in the German Bight in the SE North Sea. Analyses were based on field data and data obtained from reexamination of material deposited in museum collections. In addition, data on environmental variables were retrieved from the sediment map by Figge (1981) and from long-term monitoring data sets. The statistical modeling technique applied was multivariate adaptive regression splines (MARS). Predictive accuracy measures were calculated for each model. The candidate model with highest discriminatory power was selected for predictive mapping.

Models with excellent predictive performance were developed for *Magelona johnstoni*, *M. filiformis* and *M. alleni* based on the analyzed set of environmental predictors. In each of the developed habitat models the most important predictor was a sediment parameter, either median grain size diameter (*M. johnstoni*) or mud content (*M. alleni, M. filiformis*). Salinity and water depth were also of importance. Model predictions were aimed to allow evaluation of habitat suitability for the investigated species in the German Bight. According to our results suitable habitats for *M. johnstoni* are numerous and a wide distribution of this species could be expected. Habitat suitability for *M. filiformis* in the German Bight was suggested to be high in areas with mud contents below 10 % at water depths between 25 and 35 m. The *M. alleni* habitat model indicated the presence of suitable habitats where sands with elevated mud contents are present and where water depths exceed 30 m.

Key words: benthos ecology, ecological modeling, habitat model, *Magelona alleni*, *Magelona filiformis*, *Magelona johnstoni*, *Magelona mirabilis*, MARS, mapping, multivariate adaptive regression splines, species distribution

Introduction

The environmental factors that influence species occurrence have always been a major focus for ecologists (e.g., Kirkegard 1969; Wolff 1971; Rachor 1982; Miron & Desrosiers 1990). A modern approach to this question is ecological modeling. Essentially, a model is a hypothesis about the behavior of a system. In ecology, a model may serve as a quantitative description of species response to environmental conditions, or the quantitative formulation of the species-habitat relationship.

Ecological modeling opens up completely new opportunities in ecological research. For example, a species-response model developed from a data set consisting of the response variable (species occurrence) and a set of predictor variables (e.g., environmental parameters) can be used to

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