

DEVELOPMENT OF A HABITAT SUITABILITY INDEX FOR THE NOBLE CRAYFISH *ASTACUS ASTACUS* USING FUZZY MODELLING



A Geographic Information System (GIS) and fuzzy modelling were used to develop a habitat suitability index for the noble crayfish, *Astacus astacus*. The model is based on crayfish distribution data for the federal state Hesse, Germany, which had been recorded between 1988 and 1996. It includes 185 sites with noble crayfish in 126 watercourses. Official data on the morphological quality of surface waters recorded between 1996 and 1998 by order of the Ministry of Hesse for Environment, Rural Areas and Consumers Protection was used to describe the habitat features. One third of the crayfish sites was selected by chance to determine habitat properties significantly associated with crayfish occurrence by means of the Kolmogorov-Smirnov test and frequency analysis. Meaningless associations were excluded based on expert knowledge. Five parameters related to the structure of the riverbed and the bankside were incorporated in the fuzzy model. The model was complemented by a number of parameters known to exclude the occurrence of the noble crayfish (e.g. pipes, concrete embankments). Finally, a habitat suitability index for every stretch of water in Hesse was calculated. The predictive power of the fuzzy model was tested on the remaining distribution data set for *Astacus*

astacus. The habitat suitability index differed slightly but significantly ($p < 0.001$) between sites with and sites without crayfish occurrence. Fuzzy modelling proved to be useful for assessing habitat suitability with respect to crayfish, though further improvements of the model appeared to be necessary for a more reliable prediction of noble crayfish sites.

Auteurs du document : S. ZUTHER, H. K. SCHULZ, A. LENTZEN-GODDING, R. SCHULZ

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