



USING SPECIES DISTRIBUTION MODELS (SDMs) TO PREDICT HABITAT SUITABILITY OF BENTHIC MACROINVERTEBRATES ACROSS THE ATLANTIC FOREST

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Understanding the spatial distribution of benthic macroinvertebrates in freshwater ecosystems is essential for evaluating ecological patterns and environmental gradients that influence their habitat occupancy. This study applied Species Distribution Models (SDMs) within the Atlantic Forest, considering bioclimatic, land cover, topographic, and topological variables. Using the *faunaBR* package, we selected 19 orders from the Atlantic Forest in the Brazilian Fauna Taxonomic Catalog, resulting in 3,053 species. Occurrence records for these species were obtained from the Global Biodiversity Information Facility (GBIF) using the *rgbif* package, restricted to the biome polygon, and filtered according to record type (e.g., material citation, material sample, preserved specimen, human observation, and occurrence). Records derived from machine observation and fossil specimens were excluded. Only records from scientific institutions, such as universities and museums, from 1980 onward were considered, totaling 3,465 records. Using the *hydrographr* R-package, each record was associated with its corresponding sub-catchment. Bioclimatic, land cover, topographic, and topological variables were extracted from the *Environment90m* dataset. For SDMs, only species with more than five records were included, while using randomly sampled pseudo-absences from background data, balanced to match the number of presences for each species. We calibrated Random Forest models with ten repetitions and evaluated the models using AUC, F1, Kappa, TSS, and deviance metrics. Sensitive species, mainly Ephemeroptera, Plecoptera, and Trichoptera (EPT), showed high predictive performance, indicating consistent responses to environmental gradients and enabling the detection of ecological patterns across species with different tolerance levels. We will show spatial patterns of habitat suitability across subcatchments, revealing contrasts between sensitive (EPT) and tolerant species. These results highlight



spatial gradients and ecological differences that improve our understanding of macroinvertebrate biodiversity patterns across the Atlantic Forest.

Keywords: *Spatial distribution; occurrence records; random forest; bioassessment; conservation.*