Prioritizing conservation and monitoring areas in the Danube River Basin: Insights from the DANUBE4all project

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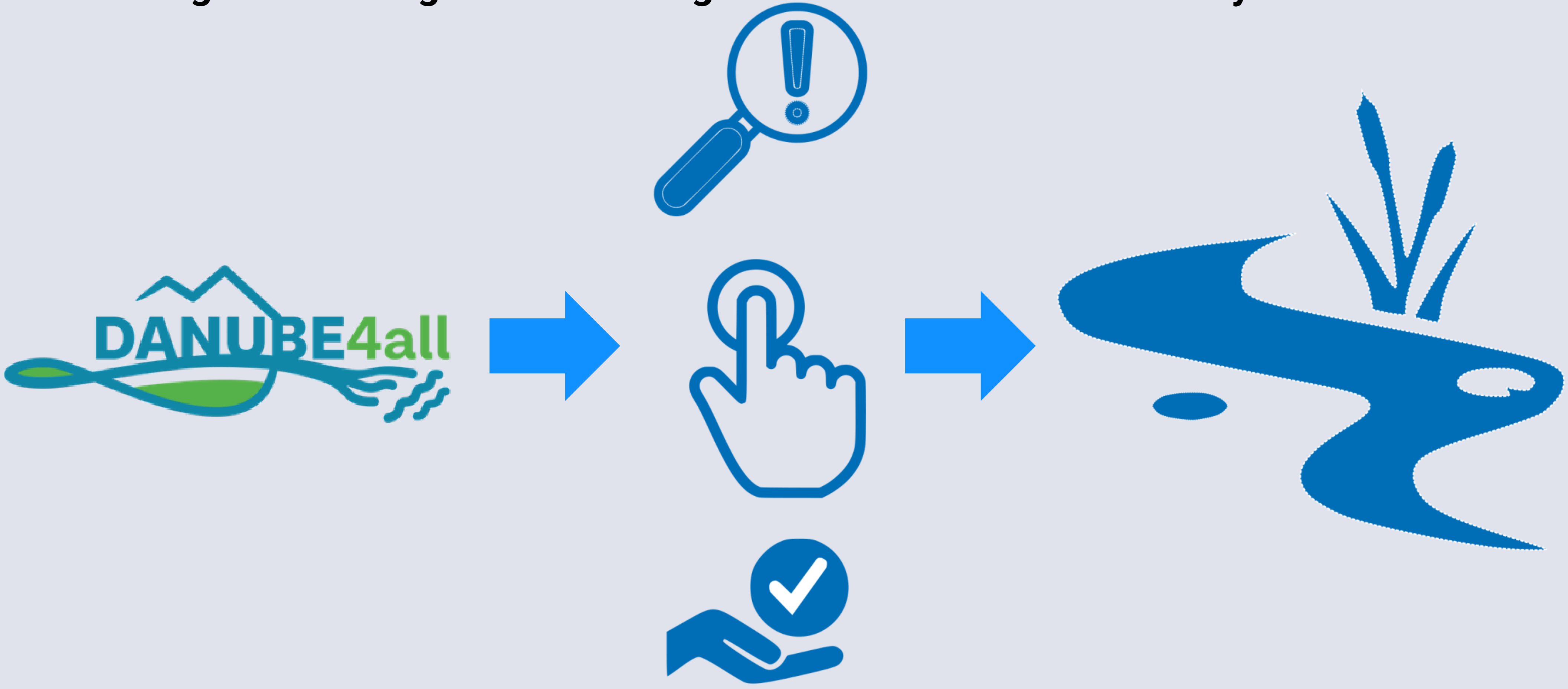
IGB Leibniz Institute of Freshwater Ecology and Inland Fisheries

DANUBE4all

Introduction

Introduction

Addressing the challenges for restoring the Danube River Basin ecosystems



Objective

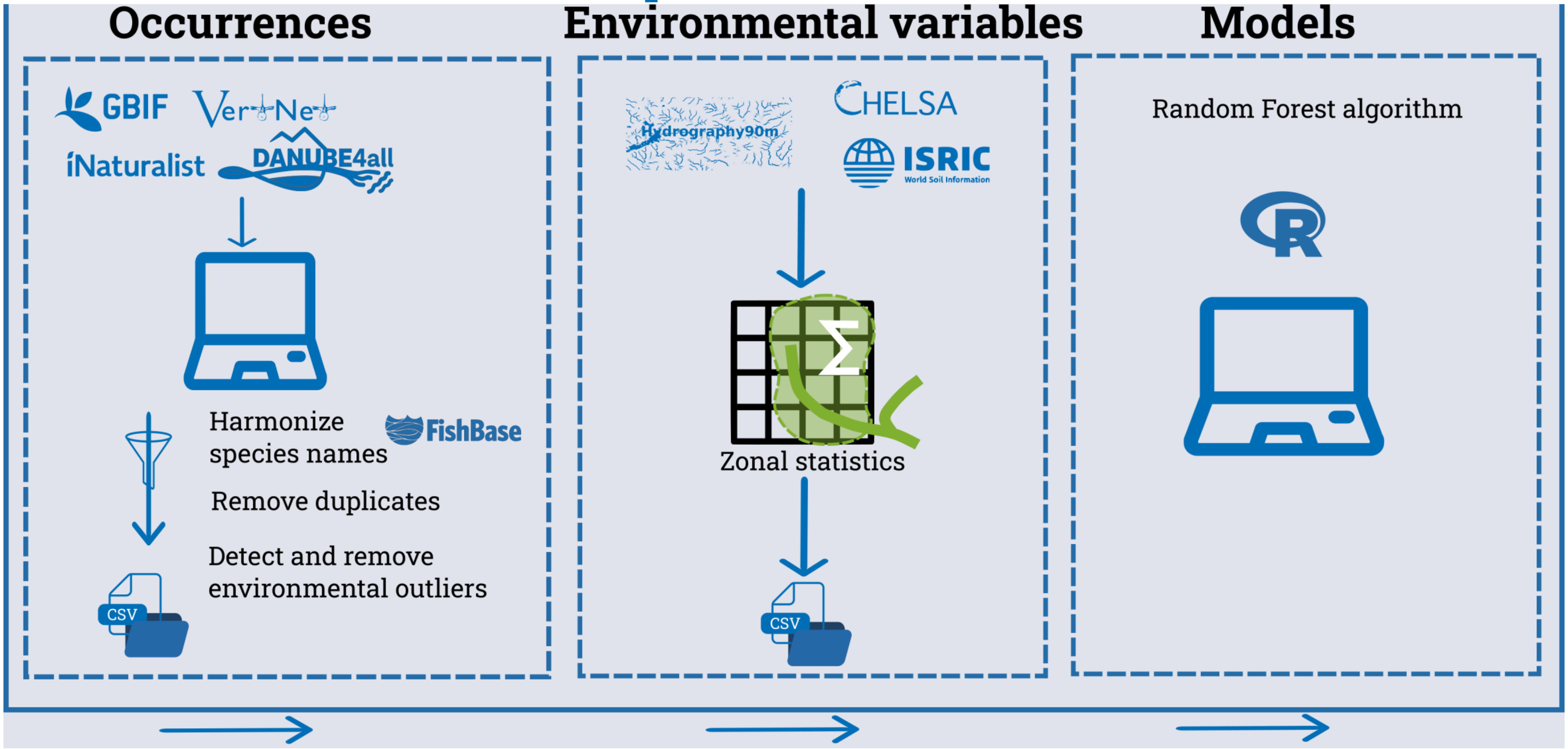
Identifying suitable habitats for both protected and invasive species, prioritizing conservation actions

Contents

1

Species distribution

Workflow followed to model species distribution



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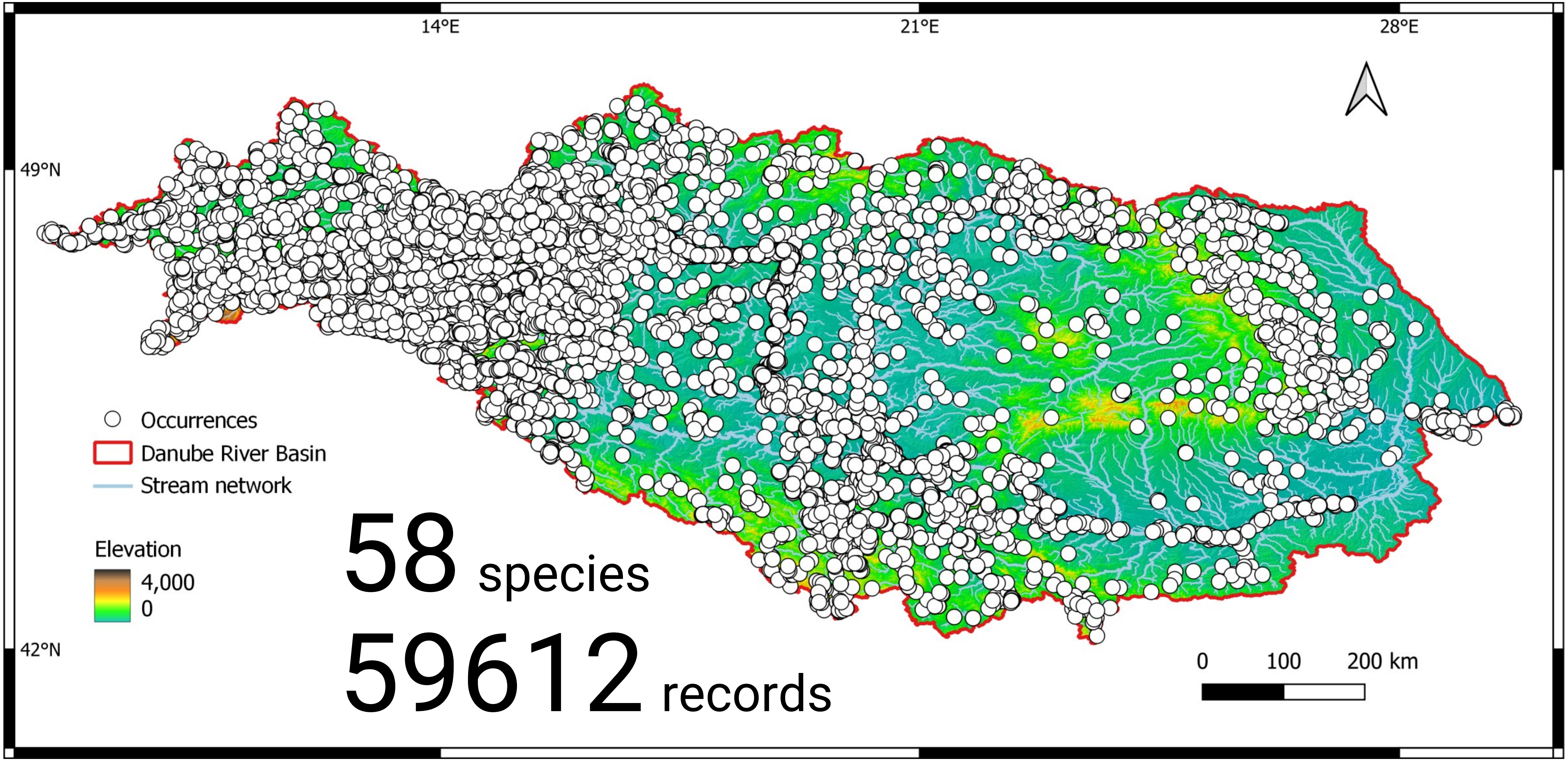
Occurrence records of a selection of fish species from the Danube River Basin



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Maps of habitat suitability

Common bream (*Abramis brama*)

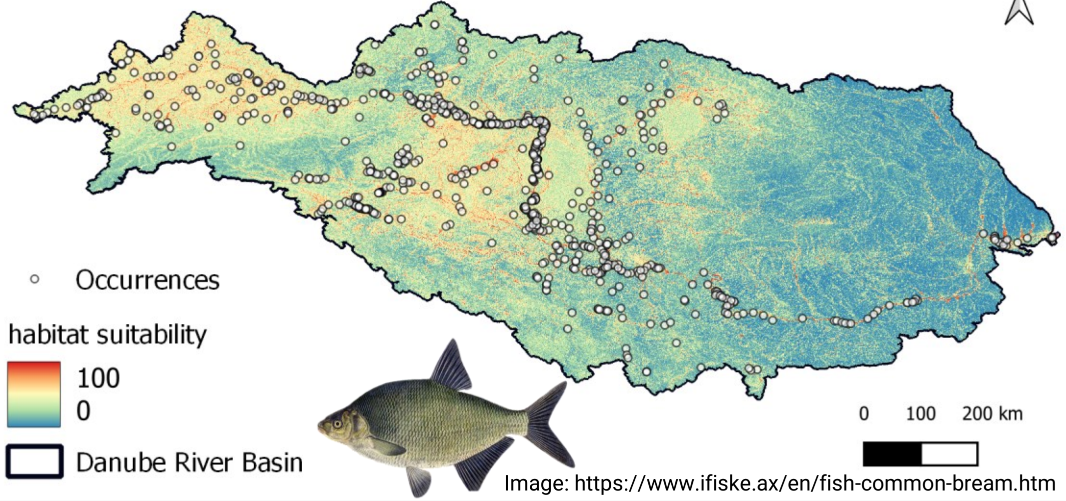


Image: https://www.ifiske.ax/en/fish-common-bream.htm

Schneider (*Alburnoides bipunctatus*)

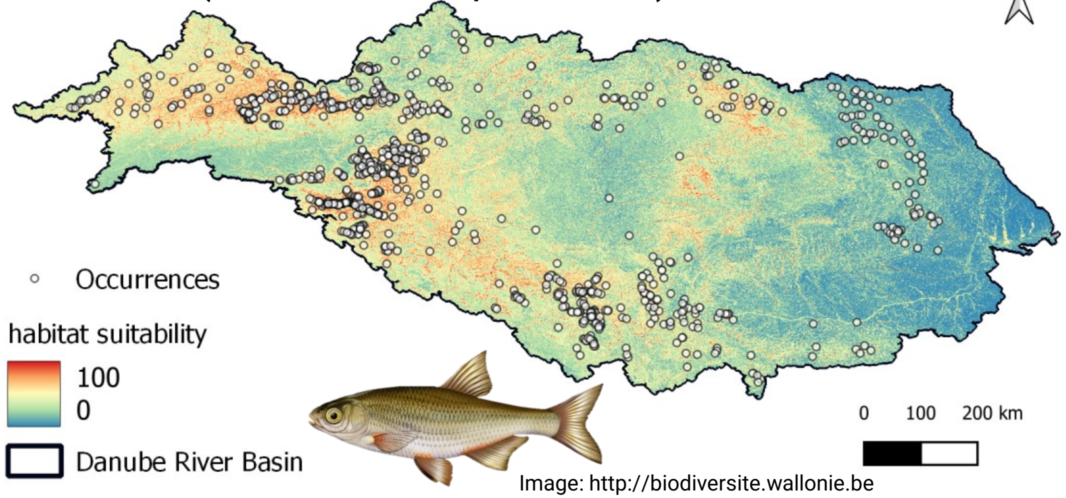


Image: http://biodiversite.wallonie.be

European eel (*Anguilla anguilla*)

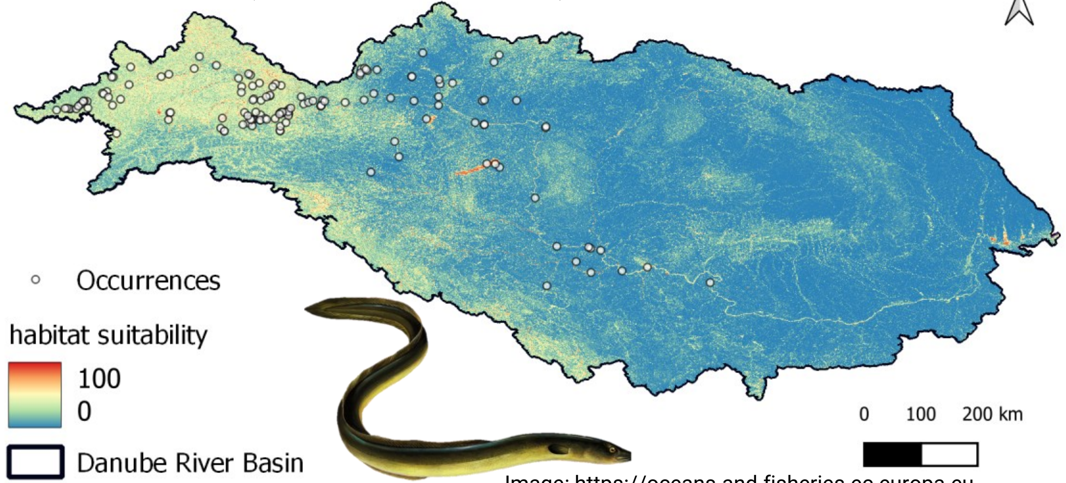


Image: https://oceans-and-fisheries.ec.europa.eu

Barbel (*Barbus barbus*)

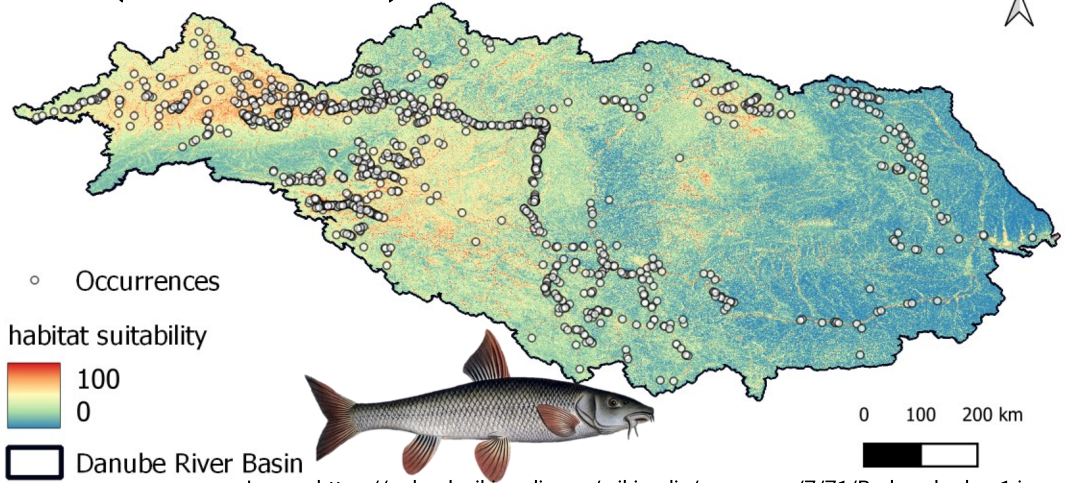
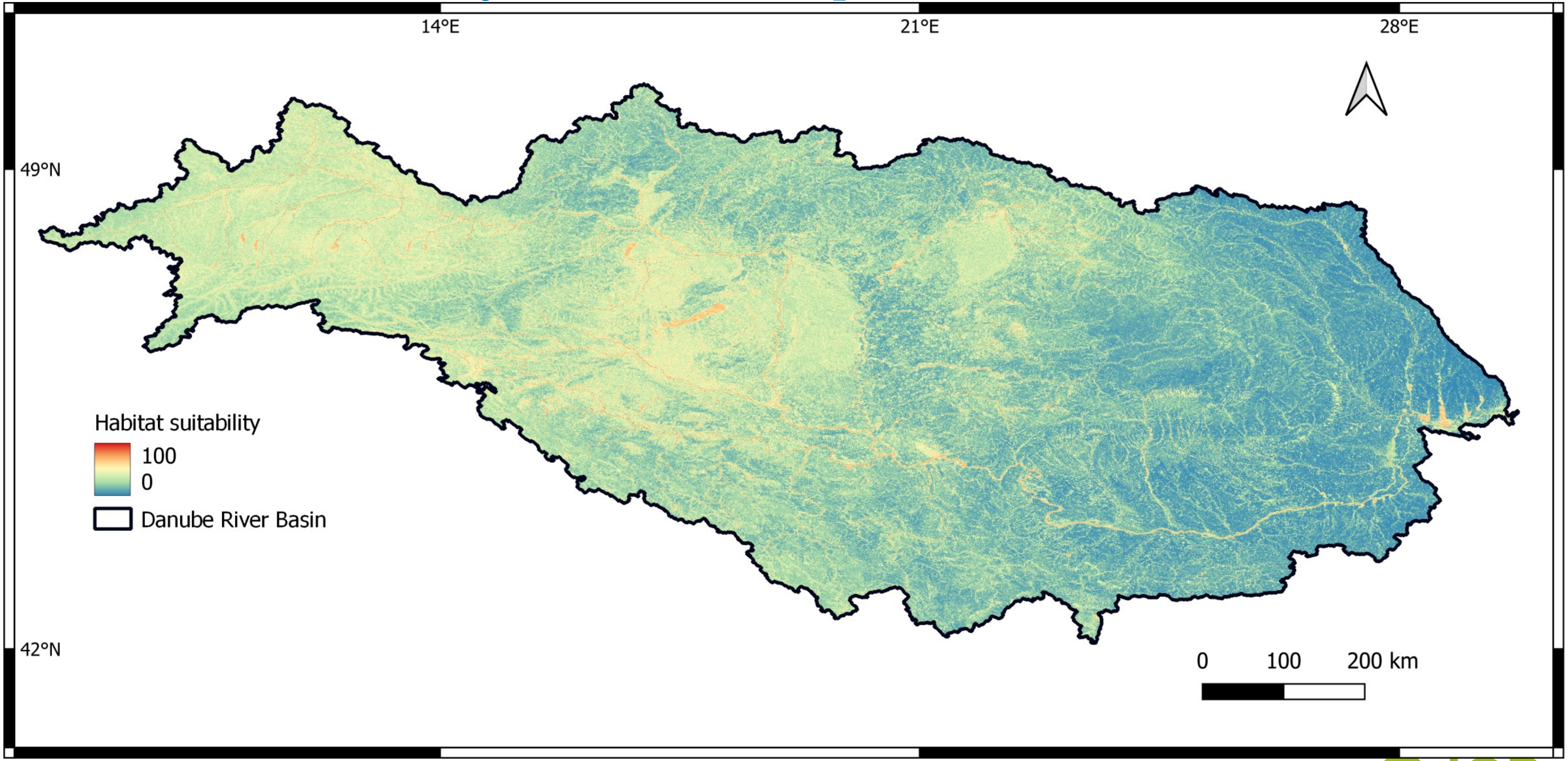


Image: https://upload.wikimedia.org/wikipedia/commons/7/71/Barbus_barbus1.jpg

Mean habitat suitability across 58 fish species



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2

Connectivity

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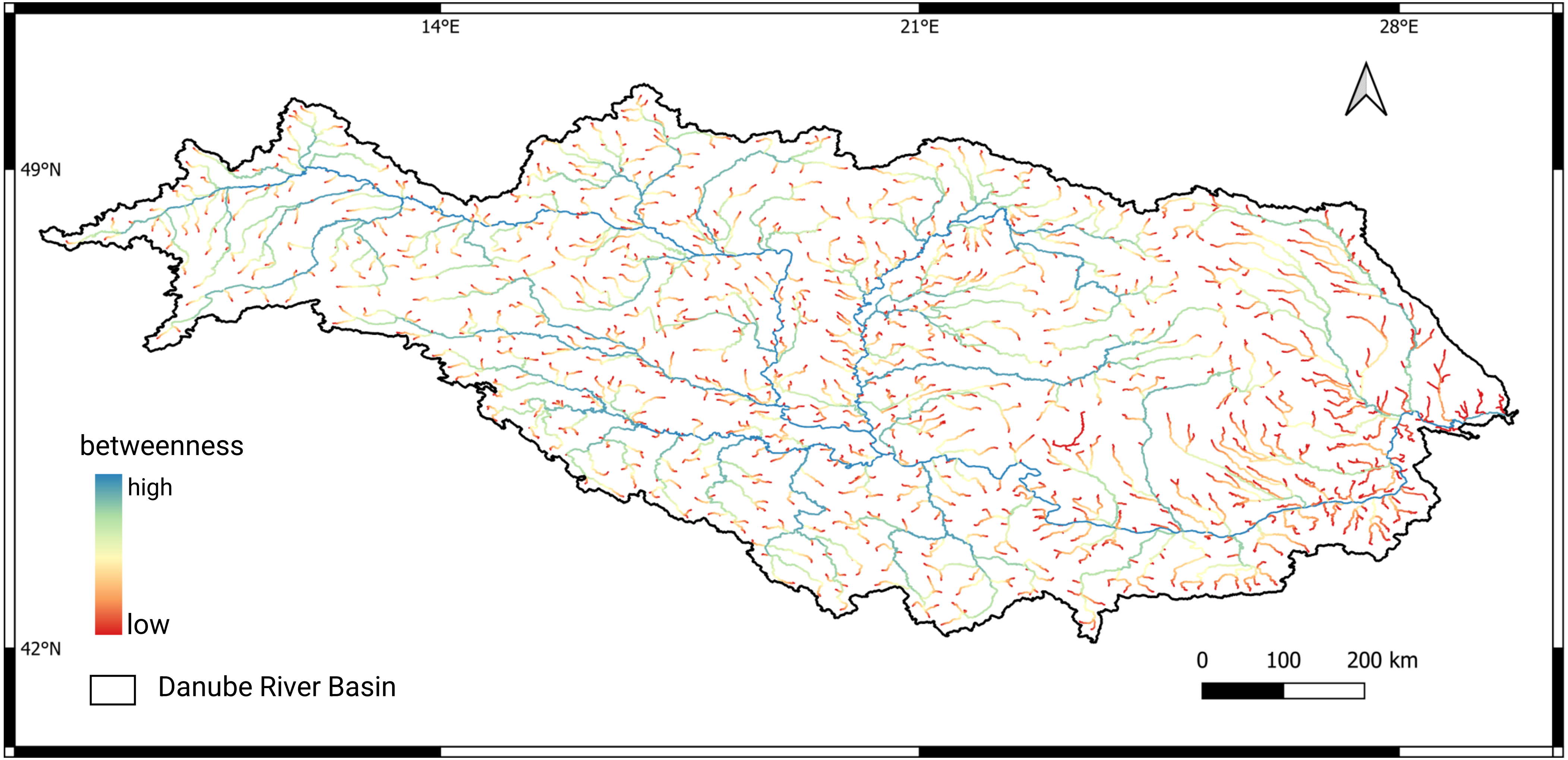
Centrality index (betweenness) **across Hydrography90m stream network** (Strahler order > 5)



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Spatial conservation prioritization

Spatial conservation prioritization analysis

Features

Habitat suitability

Target

30%

Convention on Biological Diversity

GUROBI OPTIMIZATION

Solution

Cost

1/betweenness

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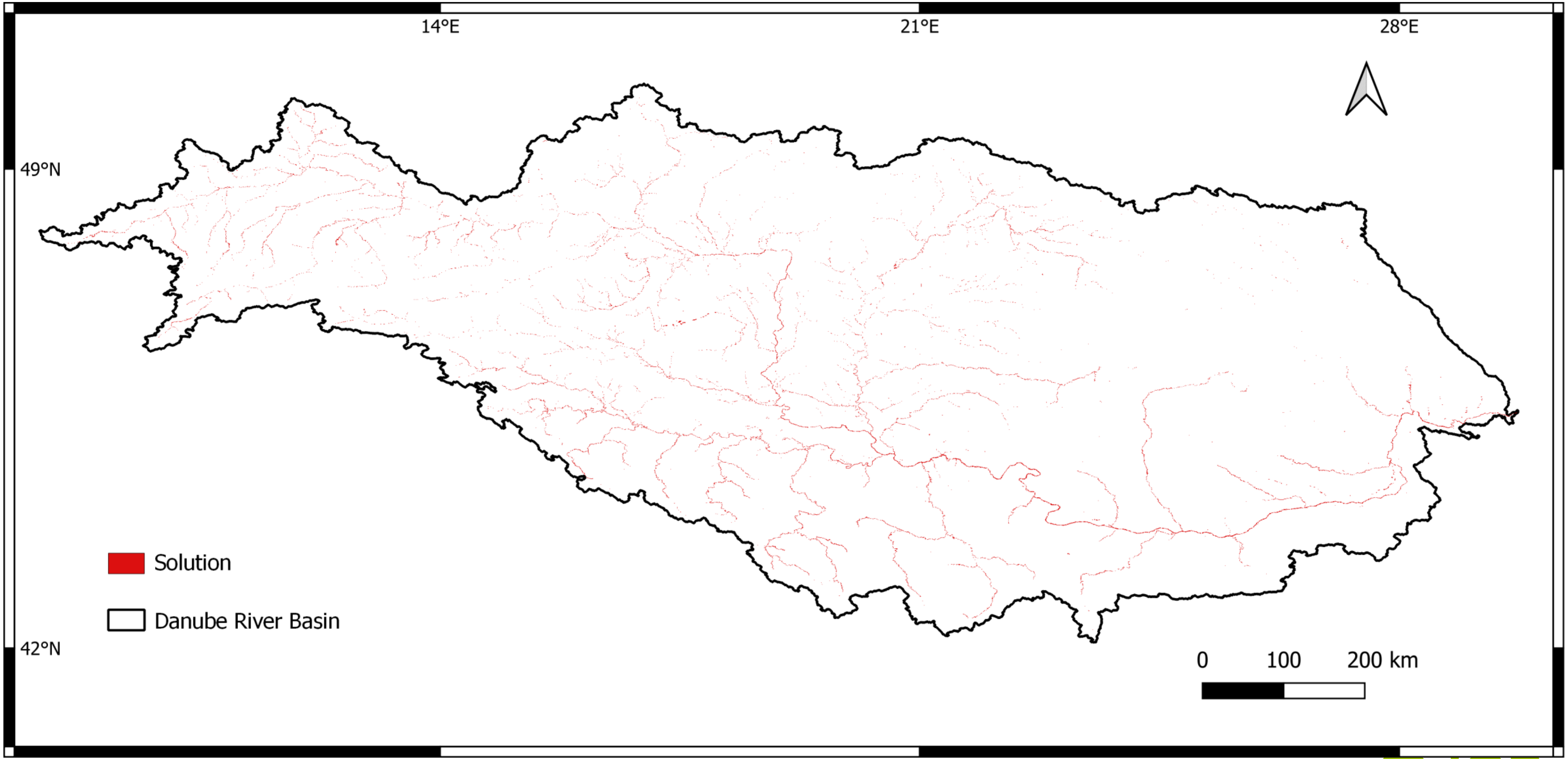
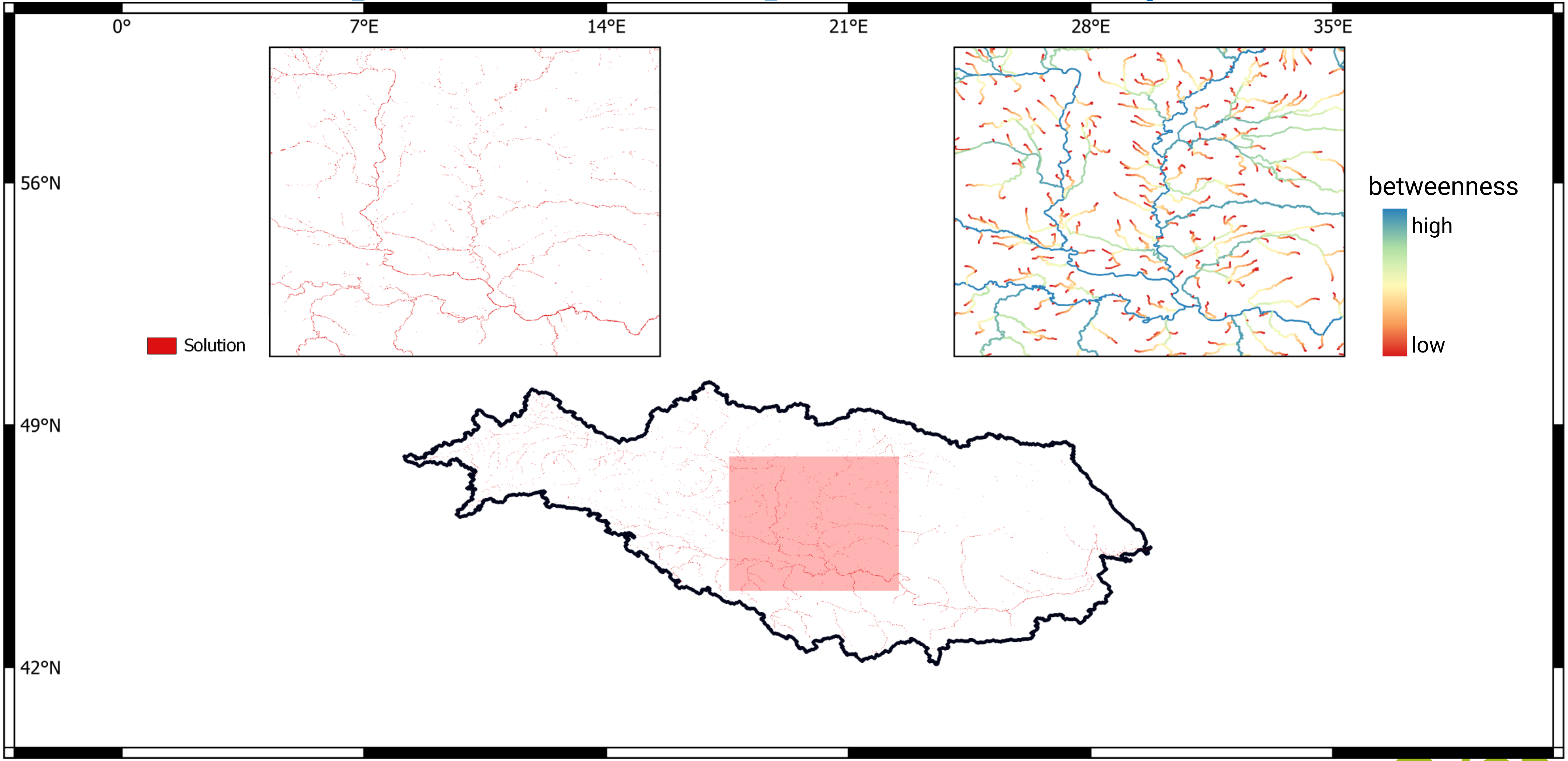
Solution of the spatial conservation prioritization analysis



Solution of the spatial conservation prioritization analysis



Next steps

Spatial conservation prioritization

Include information on barriers

Article

More than one million barriers fragment Europe's rivers

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Rivers support some of Earth's richest biodiversity[1] and provide essential ecosystem services to society[2], but they are often fragmented by barriers to free flow[3]. In Europe, attempts to quantify river connectivity have been hampered by the absence of a harmonized barrier database. Here we show that there are at least 1.2 million instream barriers in 36 European countries (with a mean density of 0.74 barriers per kilometre), 68 per cent of which are structures less than two metres in height that are often overlooked. Standardized walkover surveys along 2,715 kilometres of stream length for 147 rivers indicate that existing records underestimate barrier numbers by about 61 per cent. The highest barrier densities occur in the heavily modified rivers of central Europe and the lowest barrier densities occur in the most remote, sparsely populated alpine areas. Across Europe, the main predictors of barrier density are agricultural pressure, density of river-road crossings, extent of surface water and elevation. Relatively unfragmented rivers are still found in the Balkans, the Baltic states and parts of Scandinavia and southern Europe, but these require urgent protection from proposed dam developments. Our findings could inform the implementation of the EU Biodiversity Strategy, which aims to reconnect 25,000 kilometres of Europe's rivers by 2030, but achieving this will require a paradigm shift in river restoration that recognizes the widespread impacts caused by small barriers.

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Introducing 'riverconn': an R package to assess river connectivity indices

Damiano Baldan[a,b], David Cunillera-Montcusí[c,d,e,f], Andrea Funk[a,b], Thomas Hein[a,b,*]

Which type of actions

DOI: 10.1111/2041-210X.14220

Methods in Ecology and Evolution

APPLICATION

Innovations in Practice

prioriactions: Multi-action management planning in R

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Abstract

1. Designing effective conservation strategies requires deciding not only where to locate conservation actions (i.e. which territorial units should be priortized), but also which type actions should be deployed. For most of conservation planning contexts, deciding where and what to do usually yields a complex and computationally challenging decision-making setting. Although the resulting optimization problems have typically been tackled using heuristic approaches, recent advances in mixed integer programming (MIP) solver technology have turned MIP-based approaches into a practical alternative for solving complex conservation planning problems.
2. We introduce the R package prioriactions, which allows solving complex conservation planning problems comprising prioritization and action deployment decisions. prioriactions features a MIP approach that allows formulating and solving optimally (or nearly optimally) a wide class of conservation planning problems

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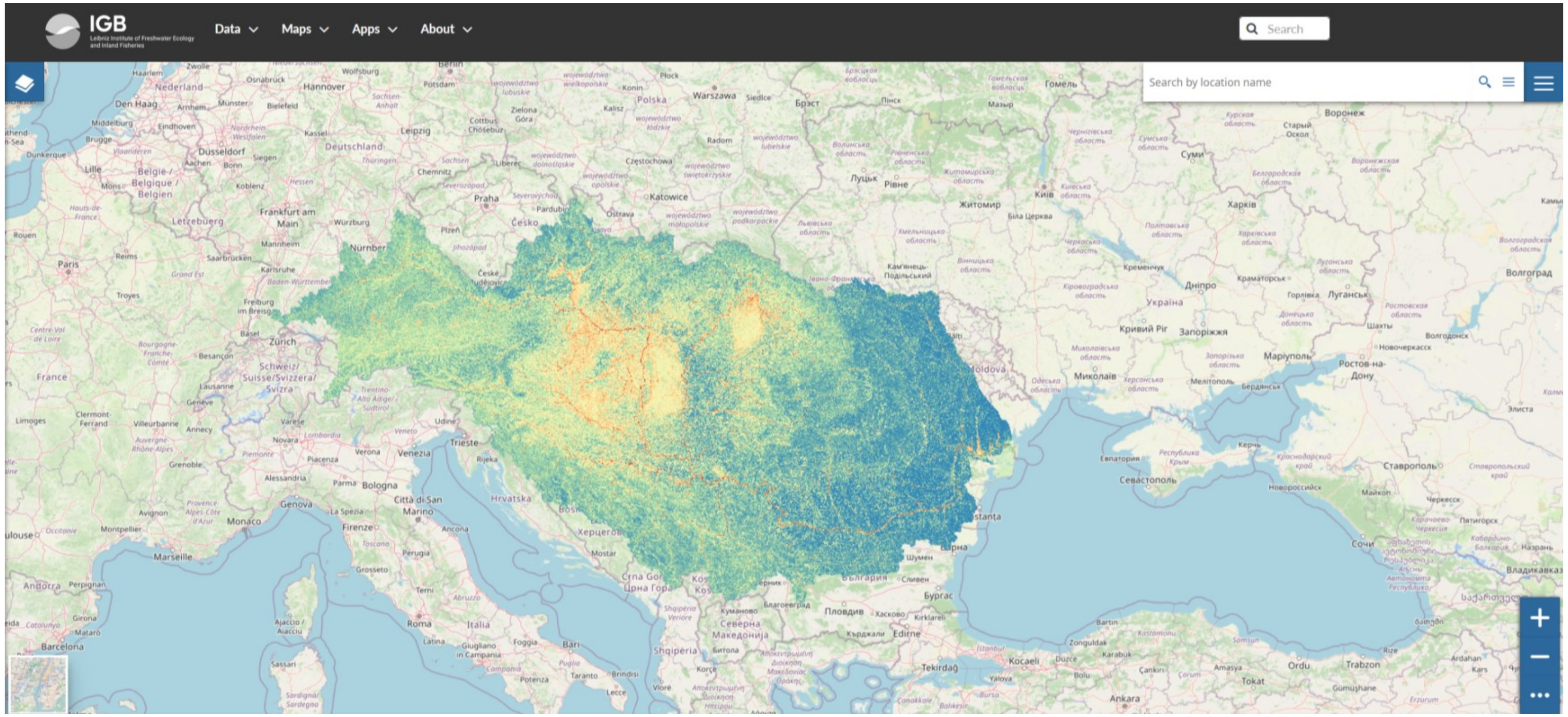
Models validation

Maps of habitat suitability at https://geo.igb-berlin.de/maps/898/view



SCAN ME

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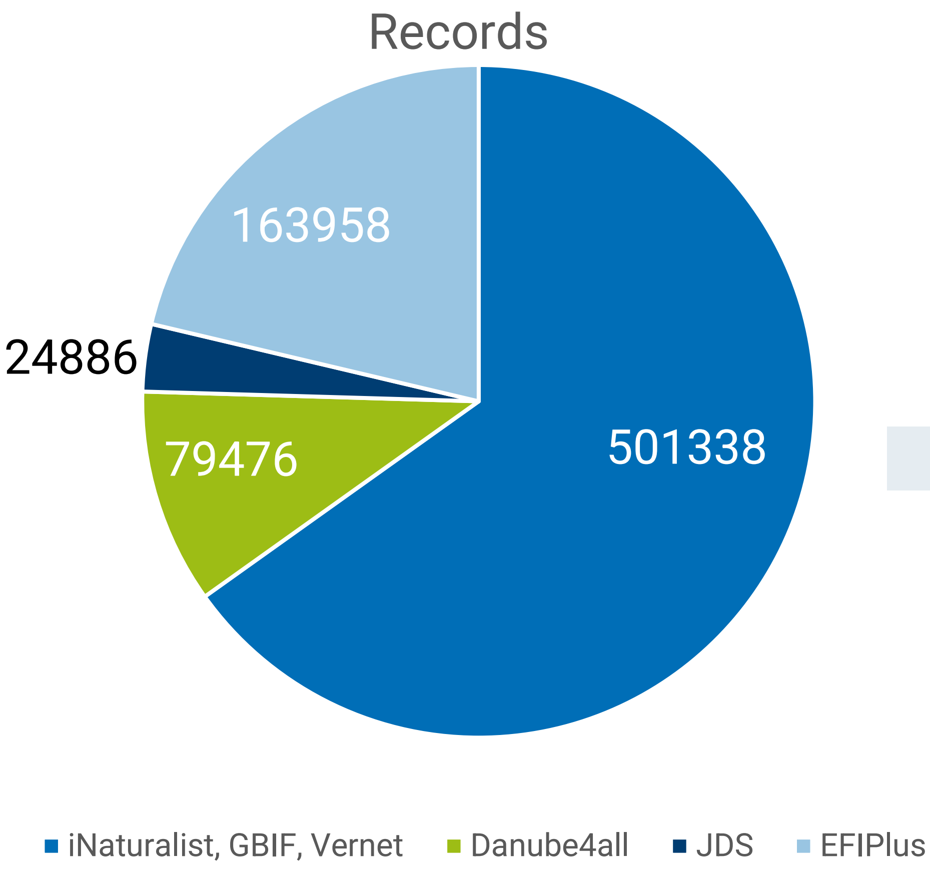
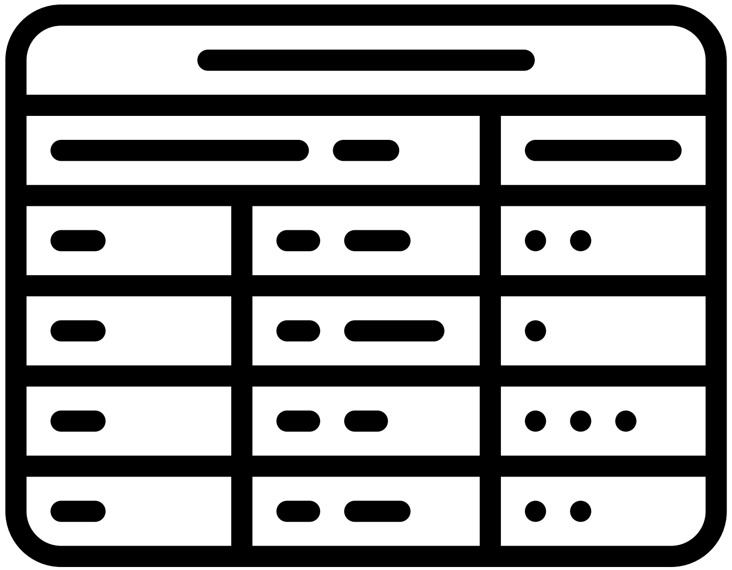
Data paper



scientific **data**

https://www.nature.com/sdata/



Thank you very much for your attention!

If you have any questions, please contact:
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