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Conference Abstract

Generating a reproducible workflow to compile a global dataset of freshwater invasive and alien species (FRIAS)

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Abstract

Freshwater ecosystems are disproportionately affected by biological invasions, yet global databases of invasive and alien species often underrepresent freshwater taxa. Global alien species databases often lack information on freshwater species. Existing efforts are fragmented, focusing on continental scales (e.g., the European Alien Species Information Network, EASIN), national scales (e.g., the United States Geological Survey), or on specific groups such as the Global Naturalized Alien Flora database GLONAF (van Kleunen et al. 2018), global avian invasions atlas GAVIA (Dyer et al. 2017), and the

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World Register of Introduced Marine Species WRiMS (Costello et al. 2021). Although valuable for policy research, databases such as GRIIS (Pagad et al. 2022) are not freshwater-specific, and are difficult to update dynamically. Also, they often lack additional essential information for a comprehensive study of biological invasion patterns and dynamics, such as introduction pathways, native range, functional group, year of introduction, or level of impact, hindering global assessments of freshwater invasions and their ecological consequences. In this study, we developed a traceable, transparent, standardized, and replicable workflow in R that compiles a global registry of freshwater alien species (Fig. 1. 1).

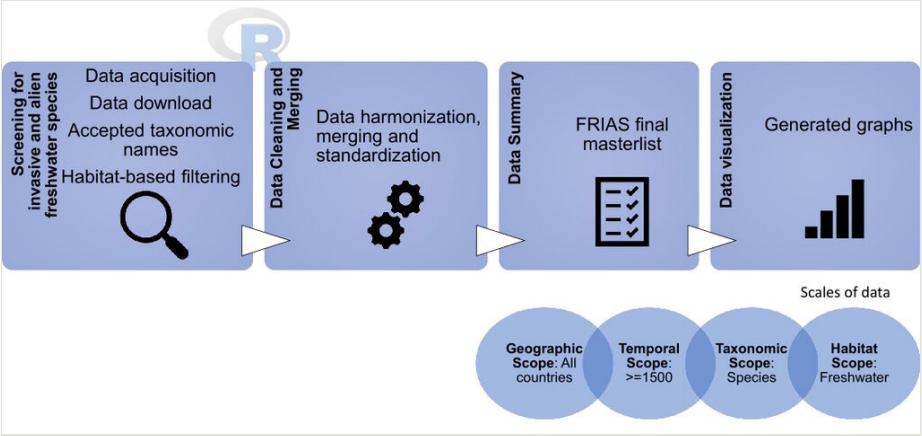

Figure 1.

Four main steps of the FRIAS workflow.

First, we screened databases and the scientific literature to compile information about the presence of freshwater invasive species worldwide, covering all taxonomic groups. We standardized scientific names and filtered freshwater species. Second, we harmonized variables in each individual database under a common framework. Third, we added additional information to support risk assessments, such as higher taxonomy levels, functional feeding group, native and recipient ranges, establishment means, introduction pathways, impact type and severity, affected taxa, first introduction dates in each country, habitats and data sources used. This workflow, available through GitHub, can be used as reference to develop other taxa or region-specific workflows. We used the workflow to compile a comprehensive global dataset of FReshwater Invasive and Alien Species (FRIAS) with over 3,800 species drawn from 94 online sources and the literature. The FRIAS masterlist provides the most comprehensive checklist of freshwater invasive and alien species worldwide that can be easily corrected and updated periodically. By compiling, harmonizing and standardising this information, the FRIAS workflow will facilitate the monitoring of invasion patterns and macroecological trends, and support comparative studies aimed at understanding and mitigating the impacts of invasive and alien species on freshwater ecosystems.

Keywords

GBIF, exotic species, EICAT, freshwater habitat, biological invasions

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Conflicts of interest

The authors have declared that no competing interests exist.

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