ARPHA Conference Abstracts 9: e202850
doi: 10.3897/aca.9.e202850

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Conference Abstract

Freshwater systems as invasion hotspots: a global synthesis of alien species distributions, pathways, impacts, and temporal dynamics

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Received: 05 Jun 2026 | Published: 05 Jun 2026

Citation: Medina A, Sevilla-Navarro A, Rossetto F, Gallardo B (2026) Freshwater systems as invasion hotspots: a global synthesis of alien species distributions, pathways, impacts, and temporal dynamics. ARPHA Conference Abstracts 9: e202850. https://doi.org/10.3897/aca.9.e202850

Abstract

Freshwater ecosystems are disproportionately affected by biological invasions (Gallardo et al. 2015; Moorhouse and Macdonald 2014), yet knowledge of freshwater alien species and their potential impacts remains limited (Thomsen et al. 2014) and scattered across databases, many of which only cover certain taxa or geographic regions. To address this gap, we developed FRIAS, a reproducible workflow to generate the first global dataset dedicated to freshwater alien species.

We showed that freshwater ecosystems contain a disproportionately high richness of alien species relative to their global surface area. Of all 3,576 recorded species, approximately 75% were animals (47% vertebrates and 28% invertebrates), while 16% were vascular plants (Fig. 1).

Vertebrates and vascular plants were predominantly introduced as commodities through intentional pathways, whereas invertebrates were mainly introduced unintentionally via ship transport. Most introduced species originated from North America and Asia, and the Americas and Western Europe represented the primary recipient regions. The countries sharing the greatest number of species were those in North America (the United States, Canada, and Mexico). The global accumulation of alien species over time followed an exponential trend, with notable increases in introduction rates occurring in the early and

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late 19th century, as well as in the mid-20th century. Interestingly, the annual rate of new introductions at the country level declined notably at the beginning of this century, likely due to reporting lags, and the saturation of the species pool and their potential range. Of the 458 species with documented impacts, 315 (69%) were classified as invasive based on their impact severity. Among assessed taxa, vascular plants had the strongest impacts, whereas amphibians showed the weakest.

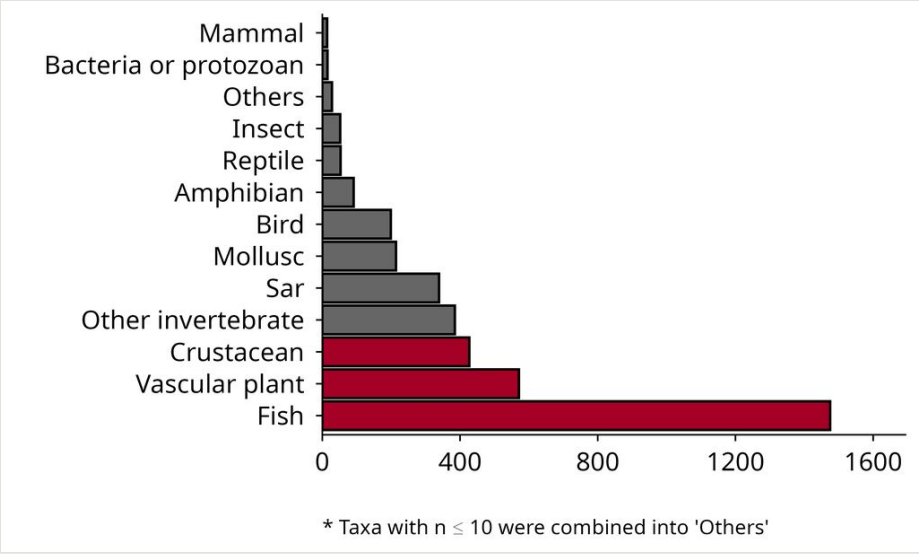

Figure 1.

Representation of the major taxonomic groups of alien species in the FRIAS database. The “Others” category groups non-animal taxa with 10 or less species (i.e., algae, fungi, and bryophytes). "Sar" group includes Stramenopiles, Alveolates, and Rhizarians.

Overall, this work provides the first integrated global assessment of spatiotemporal patterns and impacts of freshwater alien species, establishing a baseline for further exploration of large-scale patterns in freshwater invasions.

Keywords

EICAT, introduction pathways, exotic species, freshwater habitat, biological invasions

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Albert Medina

Presented at

Neobiota 2026, the 14th International Conference on Biological Invasions

Funding program

Proyectos de generación de conocimiento y formación de investigadores predoctorales (Ref: PID2023-152037OB-I00)

Grant title

GLOBAL STATUS AND TRENDS OF FRESHWATER INVASIVE ALIEN SPECIES (FRIAS)

Hosting institution

Instituto Pirenaico de Ecología (IPE-CSIC)

Conflicts of interest

The authors have declared that no competing interests exist.

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