GBIF-Extinct, A Tool for Exploring Global Biodiversity Information Facility (GBIF) Data with Enhanced Filtering Capabilities

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Abstract

The current accelerated loss of biodiversity is a major concern, with extinction rates far exceeding historical norms. Since research and conservation efforts are often biased towards more prominent or recognizable animals and plants, it poses a challenge to understand which organisms are underrepresented or have not been observed for an extended period of time. This paper introduces GBIF-Extinct, a web-based tool designed to enhance the exploration of the Global Biodiversity Information Facility (GBIF) data by offering advanced filtering capabilities not available on the official GBIF website. Users can search for the latest observations of specific taxa across different countries and refine their searches by taxon name, taxonomic rank, and country. GBIF-Extinct aims to identify "forgotten taxa," or species that have not been recently recorded, thus guiding researchers and conservationists towards understudied species. The tool's user-friendly interface ensures accessibility for researchers, students, and citizen scientists, promoting broader participation in biodiversity research. Despite certain limitations, such as data quality issues and the non-exhaustive nature of the searches, GBIF-Extinct represents a significant advancement in the exploration of biodiversity data and has the potential to lead to more targeted conservation efforts.

Introduction

The loss of undiscovered biodiversity is a pressing concern in contemporary ecology, with extinction rates currently estimated to be 100-1000 times higher than historical background rates (Singh 2012). The impact of these extinctions on ecosystem function and stability is still debated, yet there is a consensus that biodiversity loss is a major consequence of environmental change (Wilson 1989). Determining the exact yearly loss of undiscovered biodiversity is challenging due to uncertainties in the total number of species and their respective extinction rates (May 2011). Additionally new species are described at varying rates across different taxonomic groups and geographic regions. In marine biodiversity, an average of 2,332 new species are described annually (Bouchet et al. 2023). Europe sees the description of over 770 new species of terrestrial and freshwater animals annually, with more than 60% identified by non-professional taxonomists (Fontaine et al. 2012).

Yet, predictions of future animal extinction rates vary, suggesting a range from less than 5% to over 25% of all animal species, depending on habitat loss rates (Magin et al. 1994). While some researchers propose that most species could be described within this century due to ongoing conservation efforts (Costello, May, and Stork 2013), the exact number of species on Earth and true extinction rates remain uncertain.

The Global Biodiversity Information Facility (GBIF) has significantly advanced the digitization and standardisation of biodiversity data, providing access to over 377 million records (Edwards, Lane, and Nielsen 2000). Despite these strides, concerns about data quality and usability persist (Barve 2023). Proposals for peer review of GBIF datasets aim to enhance data credibility and reliability, while efforts are also underway to improve the discoverability and usability of natural history collections within GBIF (Barve 2023; Robertson et al. 2019).

In response to the need for improved data exploration tools, GBIF-Extinct was developed to enhance the functionality of the GBIF database. This tool introduces unique filtering capabilities that are not available on the official GBIF website, facilitating the search for the latest occurrences of taxa across different countries. Users can refine their searches using filters based on taxon name, taxonomic rank, and country, offering a more tailored approach to data exploration.

Advantages of GBIF-Extinct

Identification of "Forgotten Taxa"

One of the significant advantages of GBIF-Extinct is its potential to identify "forgotten taxa." By focusing on the latest observation data, the tool can highlight taxa that have not been recently recorded in specific countries. This feature is particularly valuable in guiding researchers and conservationists towards understudied species and areas, thus promoting targeted biodiversity research and conservation efforts. The ability to uncover these "forgotten taxa" can be crucial in understanding and mitigating the impacts of biodiversity loss.

Enhanced Filtering Capabilities

GBIF-Extinct offers enhanced filtering capabilities that allow users to explore data at different levels of the taxonomic hierarchy. This flexibility caters to a broader range of research interests, enabling detailed and specific searches that can assist in various biodiversity studies. For instance, researchers focusing on a particular taxonomic rank can filter data accordingly, making it easier to access relevant information.

Accessibility and User-Friendliness

The user-friendly interface of GBIF-Extinct, with its intuitive filtering options, empowers researchers, students, and citizen scientists to explore and analyse GBIF data efficiently. The readily accessible homepage interface ensures that users can navigate and utilise the tool with ease, enhancing the overall user experience. This accessibility is crucial in democratising data access, allowing a wider audience to engage with and benefit from GBIF data.

Caveats and Considerations

While GBIF-Extinct provides several advantages, it is important to also acknowledge its caveats:

Data Quality: GBIF data is not perfect and contains errors and biases. Users should be aware that the data might include errors, misidentifications, and outdated records.
Completeness: The tool does not perform an exhaustive search for all occurrences and relies on a backbone taxonomy from GBIF which may be outdated.
Data Fetching: Data fetching occurs at random intervals via a cron job, meaning the data on GBIF-Extinct could be outdated by over a year

Conclusion

GBIF-Extinct represents a significant advancement in the exploration of biodiversity data by offering enhanced filtering capabilities and a user-friendly interface. This easy access to biodiversity data, may be a first step to support professional and non-professional taxonomists alike (Fontaine et al. 2012). By facilitating the identification of "forgotten taxa" and providing a versatile tool for biodiversity research, GBIF-Extinct has the potential to promote a deeper understanding of global biodiversity patterns and support targeted conservation efforts. However, users must remain mindful of the limitations regarding data quality and completeness to maximise the tool's efficacy in biodiversity research.

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