

Explanation

This indicator evaluates the status of introduced flora and fauna in Belgium using time-series analysis to differentiate between newly arriving species and those actively spreading. While new species are flagged by checking new occurrences against a unified checklist, the status of emerging species is statistically assessed using Generalised Additive Models (GAMs). By analysing the sign of the first and second derivatives (the slope and acceleration) of the model curve over the previous three years, species are classified into specific categories:

- Emerging:** Both the first and second derivatives are positive, indicating a statistically significant and accelerating increase in observations or occupancy.
- Potentially emerging:** The first derivative is positive, but the acceleration is not strictly positive.
- Unclear:** Both derivatives are equal to zero, showing a flat or ambiguous trend.
- Not emerging:** The trend is negative or declining. (*Note: If a lack of data prevents the model from converging, a standardised decision tree is applied to assign a status. To prevent data lags from skewing the results, the current calendar year is excluded from the calculation.*)

Applicability for policy

This indicator is a key operational tool for rapid response and priority management under the EU Regulation (1143/2014).

Limitations

The indicator is highly sensitive to data availability on GBIF. For species with very few records, the GAM may fail to converge. Then, the classification is shifted to a simplified decision tree. Furthermore, because the indicator intentionally omits data from the current year to ensure completeness, it functions as a “recent historical assessment” (the past three complete years) rather than an instantaneous real-time alert system.

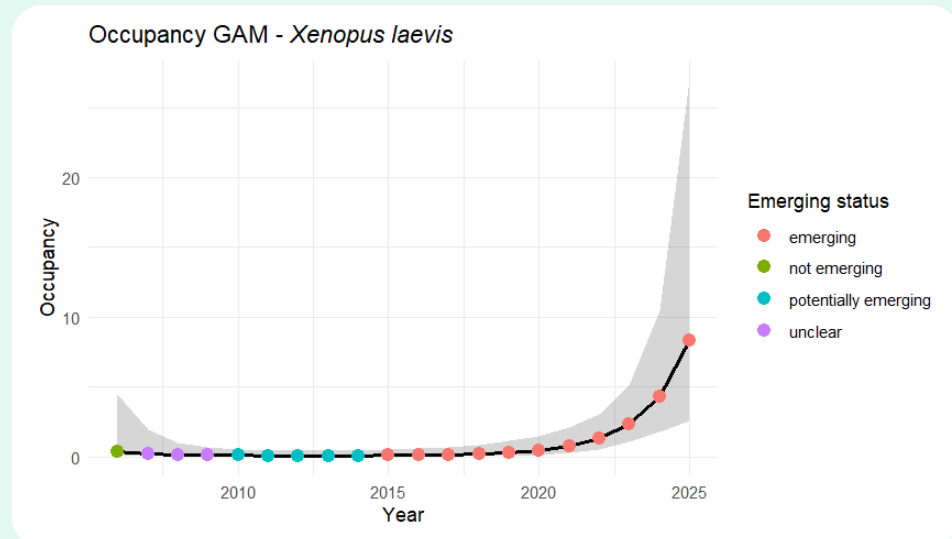
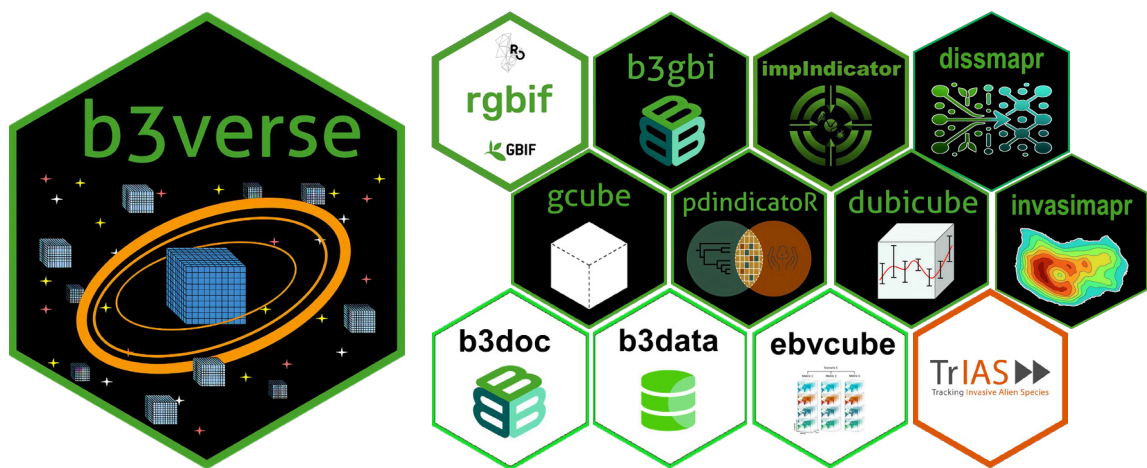
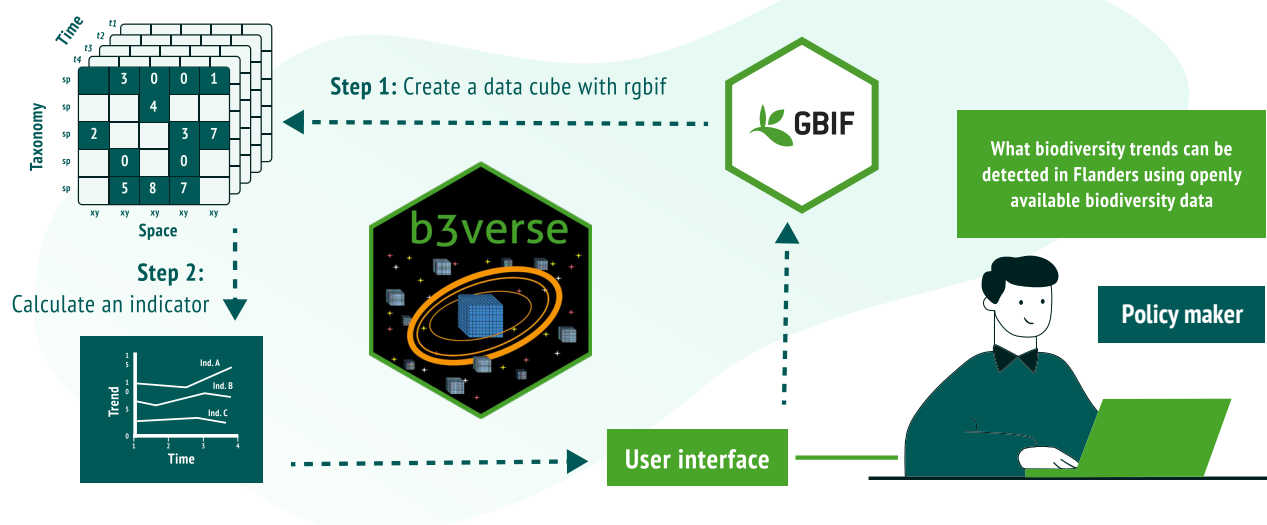


Figure 1: Overview of the annual emerging status of *Xenopus laevis* since 2005 based on Generalised Additive Models (GAMs) following the TRIAS methodology.

References

Tracking Invasive Alien Species (TrIAS): Building a data-driven framework to inform policy. Contract - BR/165/A1/TrIAS. Final Report. (2022) Quentin John Groom, Sonia Vanderhoeven, Hilde Eggermont, Maxime Coupremagne, Tim Adriaens, Peter Desmet, Lien Reyserhove, Damiano Oldoni, Diederik Strubbe, Thierry Backeljau, Yvan Barbier, Dimitri Brosens, Amy Davis, Luc Lens, Arnaud Monty, Grégory Mahy, Anne-Laure Jacquemart, Thomas Verleye, Gert Van Hoey, Ruben Van De Kerchove, Thierry Backeljau, Marc Dispas, Aline Vilain, Rozemien De Troch, Bert Van Schaeybroeck, Piet Termonia.

The B-Cubed workflow supports the creation and analysis of a data cube based on GBIF data. Further documentation is available at <https://docs.b-cubed.eu/>. Overview of all available packages at <https://b-cubed-eu.r-universe.dev/builds>.



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B-Cubed aimed to standardise access to biodiversity data, helping transform fragmented biodiversity records into timely, policy-relevant indicators. This was achieved by developing a service to create “species occurrence cubes”, which then served as the basis for models and indicator of past, current and future biodiversity. To ensure its results can be reused, the project created exemplary workflows for modelling and indicator calculation, as well as a suite of guides, tutorials and hands-on training sessions. The application and usefulness of B-Cubed’s algorithms and software are demonstrated through the project’s four case studies.

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