BIODIVERSITY BUILDING BLOCKS FOR POLICY

OCCUPANCY TURNOVER

Indicator type

Trend / Pressure Indicator

Explanation

Occupancy turnover measures changes in species composition over time, reflecting the rate at which species appear or disappear from a given area between two time steps in the data cube. The metric is calculated using the Jaccard dissimilarity index (Jaccard, 1901), which compares the species present in two time steps and quantifies their dissimilarity on a scale from 0 to 1.

- **High values (closer to 1):** Indicate a complete turnover in species composition between the two time periods.
- **Low values (closer to 0):** Indicate little or no change in species composition between the two time periods.

This indicator is available only as a time series.

Applicability for policy

- Ecosystem stability: This is a vital tool for assessing how ecosystems have responded to large-scale pressures like climate change, habitat fragmentation, land use change or nitrogen deposition.
- Evaluating effectiveness of management strategies: It allows managers to evaluate whether restoration policies are actually working. For example, if a province creates a new wetland, a controlled increase in turnover might indicate that the targeted wetland species are successfully moving in.
- Invasive species: Biological invasions can result in high turnover rates.

Limitations

This measure is largely affected by survey effort. Further, it must always be combined with rarity or taxonomic indices to understand the true nature of the turnover shift (positive or negative for local biodiversity). Turnover timescales also differ across organism types. Mobile, short-lived species such as birds and insects exhibit faster turnover than sessile, long-lived tree species.

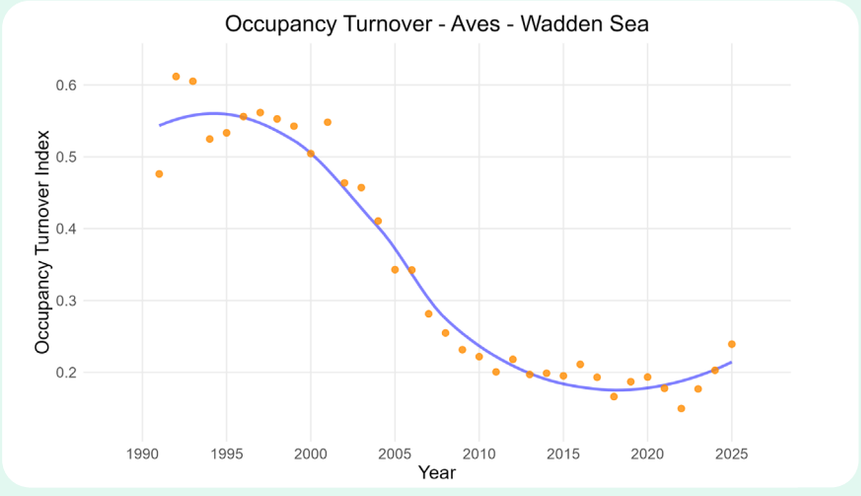


Figure 1: This figure shows occupancy turnover of species present in the Wadden Sea, a Ramsar site in the Netherlands. This indicator is strongly influenced by the number of occurrence records (see Figure 2). When survey effort is low, recorded species may vary substantially between years, resulting in artificially high turnover values. This highlights the need to consider survey effort metrics alongside turnover to support proper interpretation.

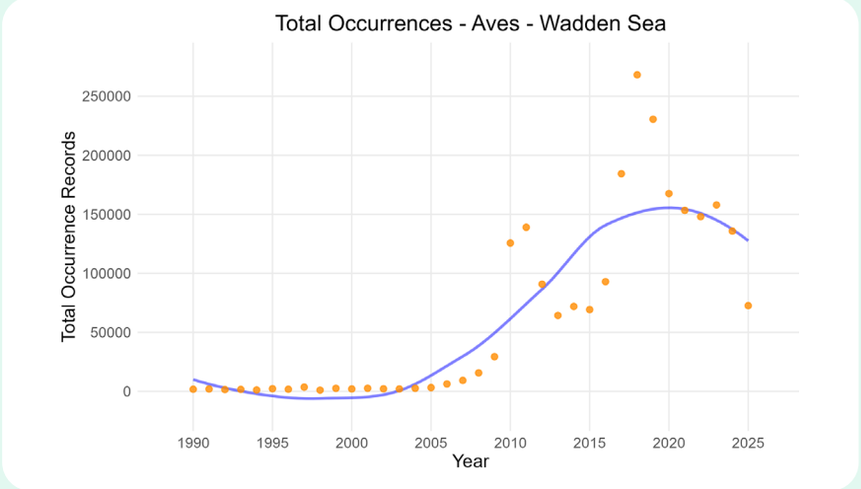
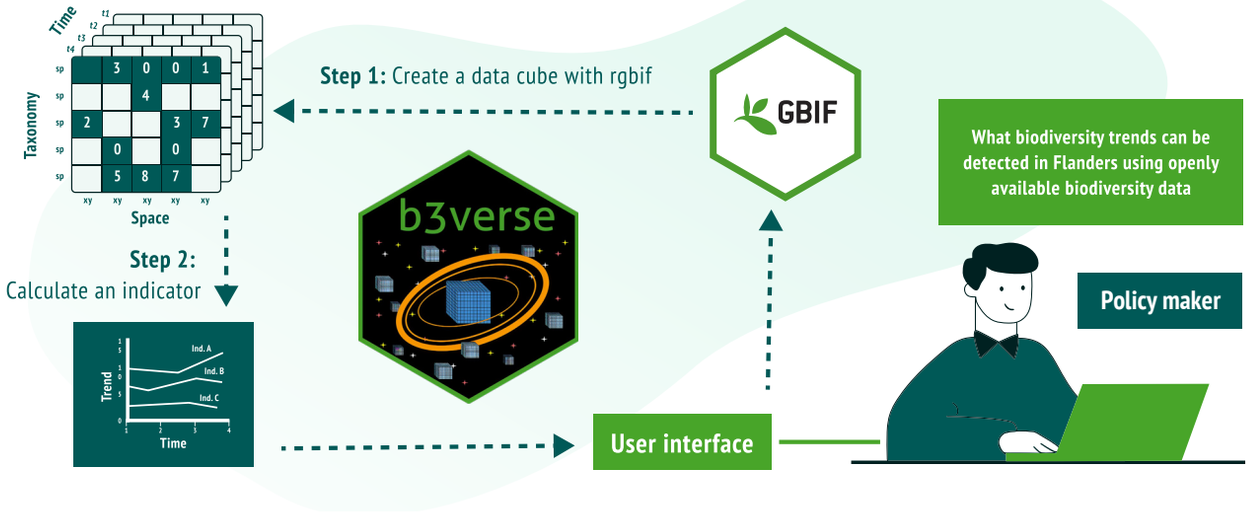


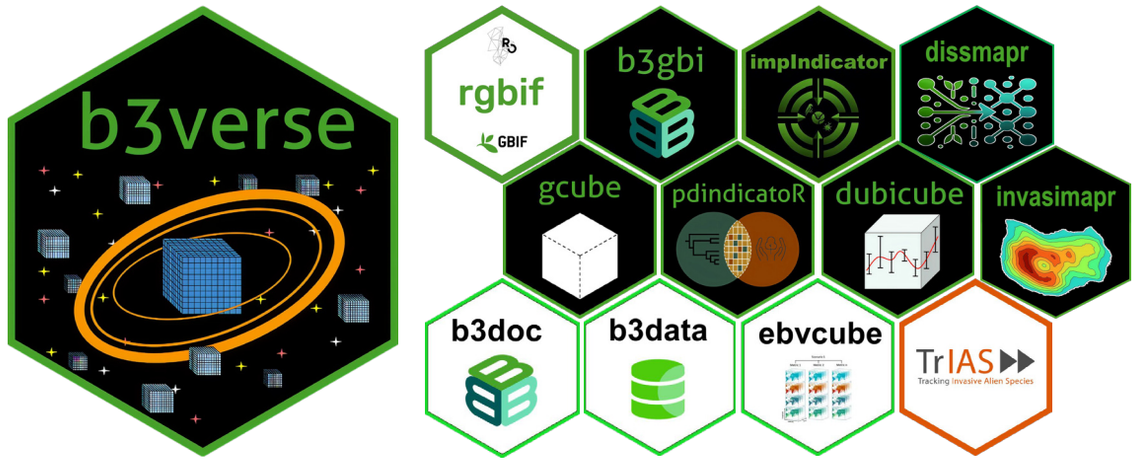
Figure 2: This figure shows the annual number of occurrence records (all species included) reported in the Wadden Sea.

References

Jaccard, Paul (1901). "Étude comparative de la distribution florale dans une portion des Alpes et des Jura". *Bulletin de la Société vaudoise des sciences naturelles* (in French). 37 (142): 547–579.

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.eu

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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