Flanders
State of the Art

Goose Monitoring in Belgium

Koen Devos

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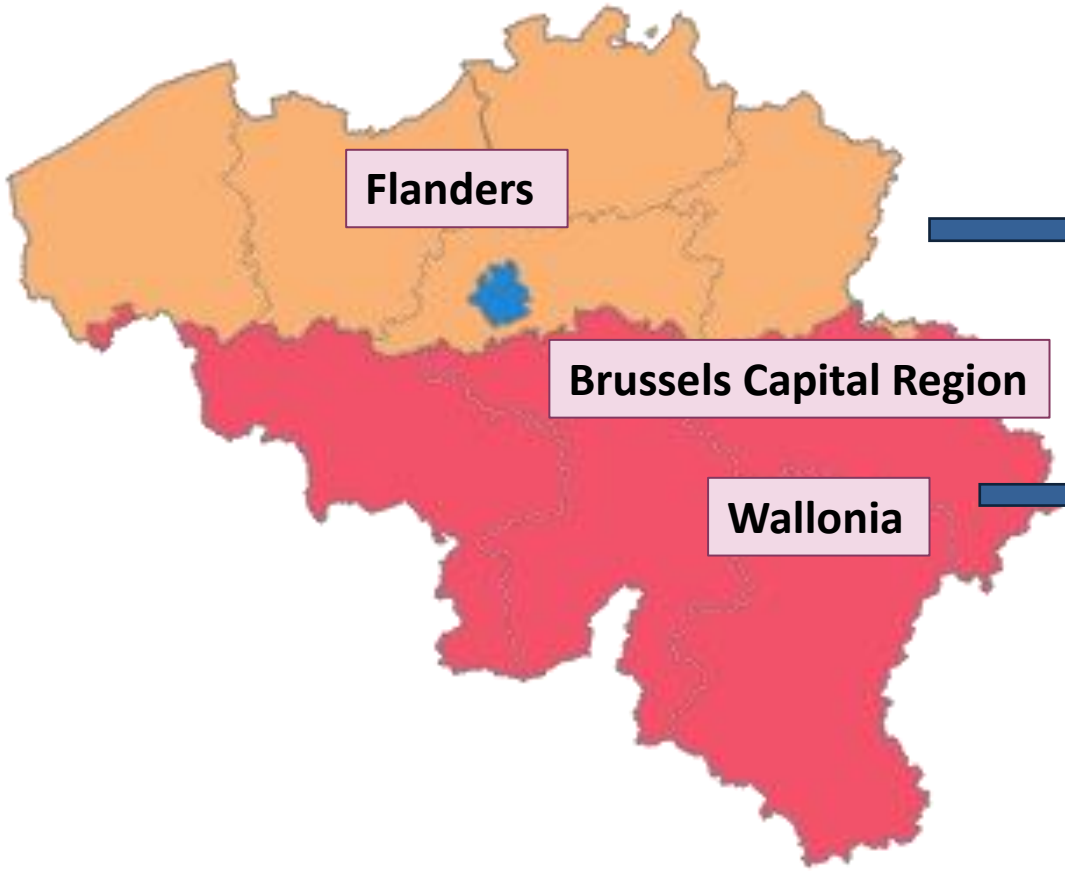
NATURE AND FOREST

Goose Monitoring Workshop Kopenhagen
22-24 November 2023

Context of monitoring

Belgium = federal state



Coördination of waterbird monitoring

Research Institute for Nature and Forest (INBO)
in coöperation with Natuurpunt (NGO)

Aves/Natagora (NGO)

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natuurpunt

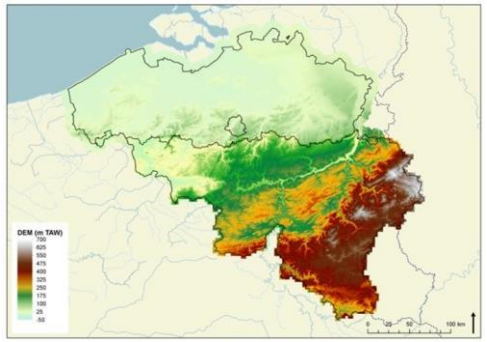
aves natagora

www.vlaanderen.be/inbo

Regional differences in occurance of geese

Total count January 2023

January 2023	Flanders	Wallonia/ Brussels
Tundra Bean Goose	2143	0
Pink-footed Goose	23202	1
White-fronted Goose	77235	2
Greylag Goose	18736	143
Canada Goose	8171	5188
Barnacle Goose	11321	310
Egyptian Goose	2117	681



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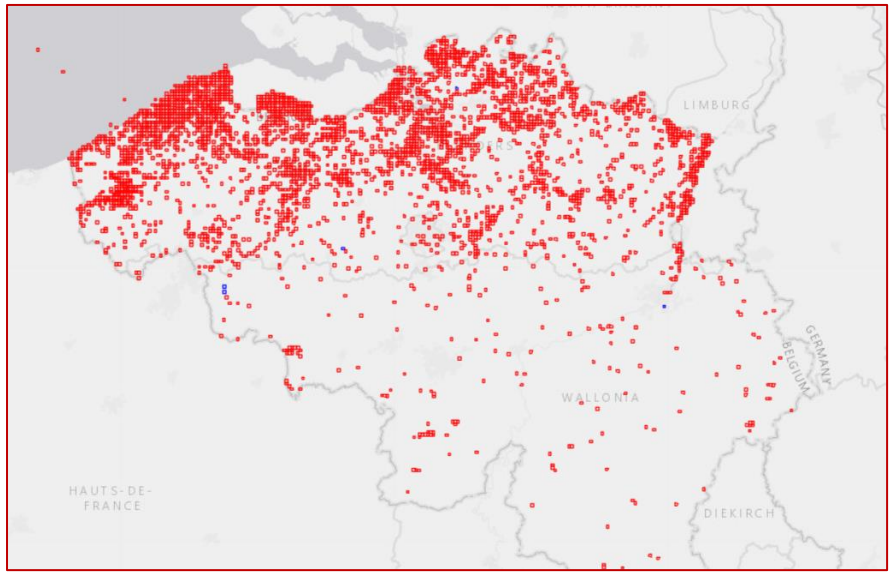
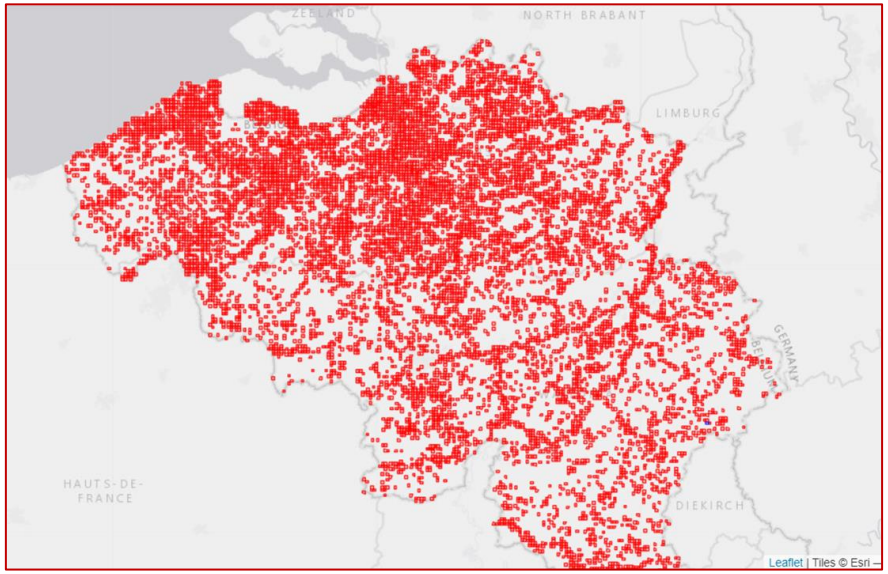
White-fronted Goose 2000-2023



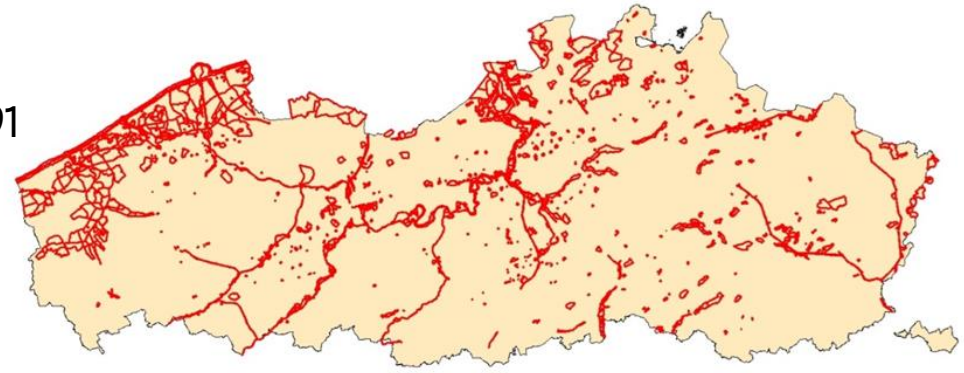
Greater Canada Goose 2000-2023

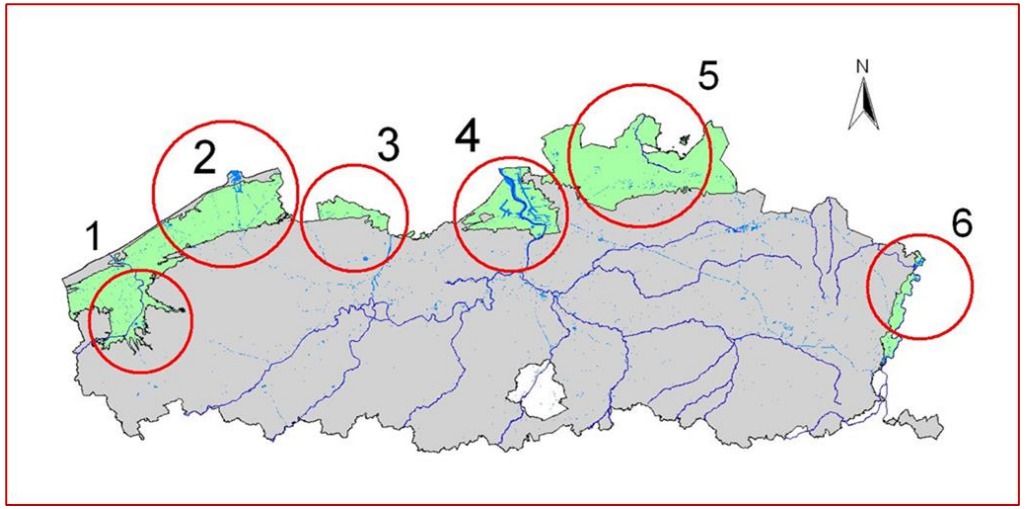


Census scheme wintering geese

Part of broader monitoring programm for wintering waterbirds

- Flanders: mid-monthly waterbird counts October-March
  - → First counts in 1967, standardised monthly counts since 1991
  - → Coastal Polders: extra goose count end of December
- 750-800 sites (or count units) counted
- Counts by +300 volunteers (and some professionals from INBO)
  - → Local organisation by regional coördinators
- Daytime counts
  - → Roost site counts for some species (but not for geese)





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Other data

- Reading of neck bands: long tradition en quite popular

- Counts of age-ratios: occasional, mainly for White-fronted Goose

Data analysis

- Coverage wintering areas (wild) geese is quite complete
- Total counted numbers are close to actual numbers present
- Imputing for sites that were not counted

Data handling: imputation of missing values

J Ornithol
DOI 10.1007/s10336-016-1404-9

ORIGINAL ARTICLE

Working with population totals in the presence of missing data comparing imputation methods in terms of bias and precision

Thierry Onkelinx[1] · Koen Devos[1] · Paul Quataert[1]

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Abstract Missing observations in water bird censuses are commonly handled using the Underhill index or the birdSTATs tool which enables the use of TRIM under the hood. Multiple imputation is a standard technique for handling missing data that is rarely used in the field of ecology, but is a well known statistical technique in the fields of medical and social sciences. The purpose of this paper is to compare these three methods in terms of bias and variance. The bias in the Underhill method depends on the algorithm and starting values. birdSTATs and multiple imputation are unbiased in the case of missing values that are missing completely at random; more missing values implies less information, and so wider confidence intervals are expected as the missingness increases. The Underhill method and birdSTATs tool underestimate the variance; omitting data from a complete dataset and applying the Underhill index or birdSTATs tool

Keywords Missing data · Multiple imputation · Monitoring of biodiversity · Survey design and analysis

Zusammenfassung

Gesamtbestandszahlen trotz fehlender Daten – ein Vergleich von Imputationsmethoden hinsichtlich systematischer Abweichungen und Genauigkeit

Fehlende Beobachtungen bei Wasservogelzählungen werden üblicherweise gehandhabt, indem der Underhill-Index oder birdSTATs angewendet werden. Letzteres nutzt TRIM. Multiple Imputation ist eine Standardmethode für die Handhabung fehlender Daten, die in der Medizin und in den Sozialwissenschaften wohlbekannt ist, in der Ökologie jedoch kaum angewendet wird. Das Ziel dieses Artikels ist

Downloads available on www.inbo.be

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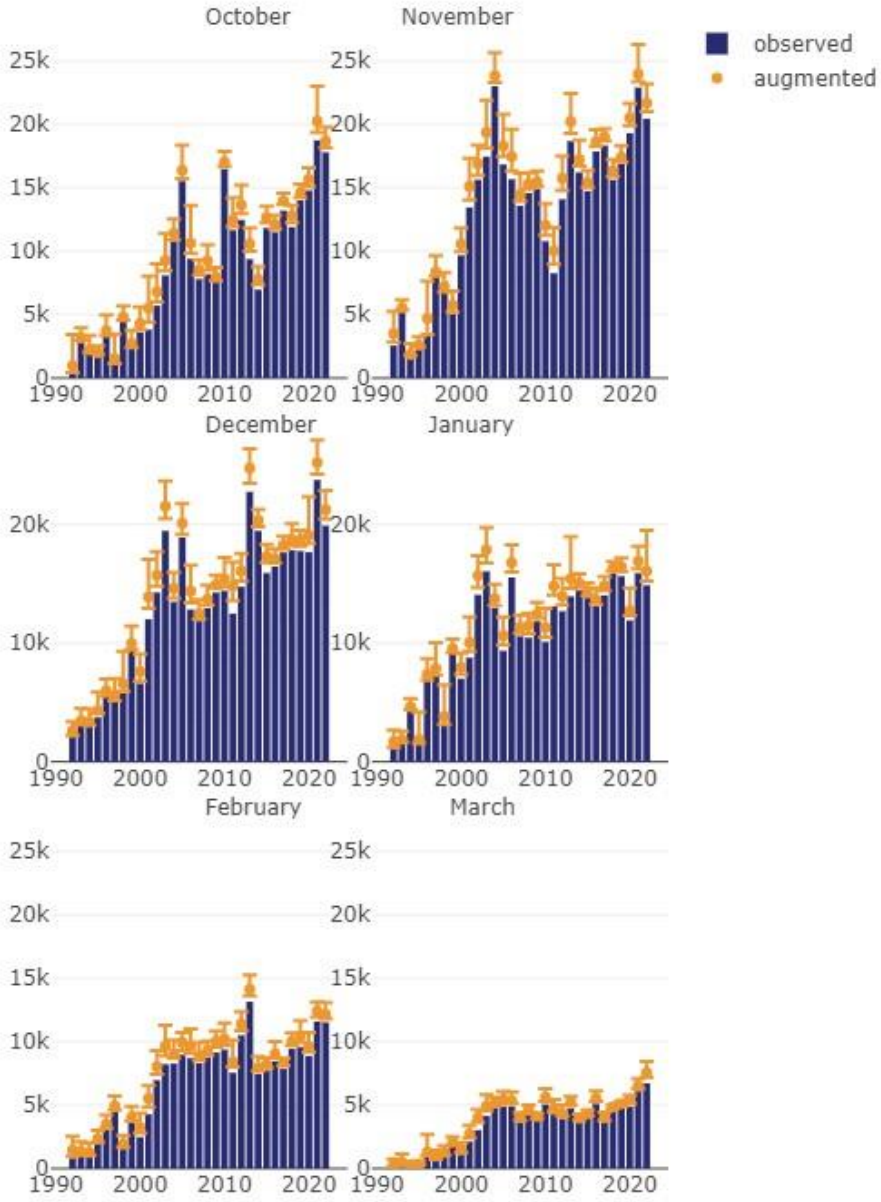
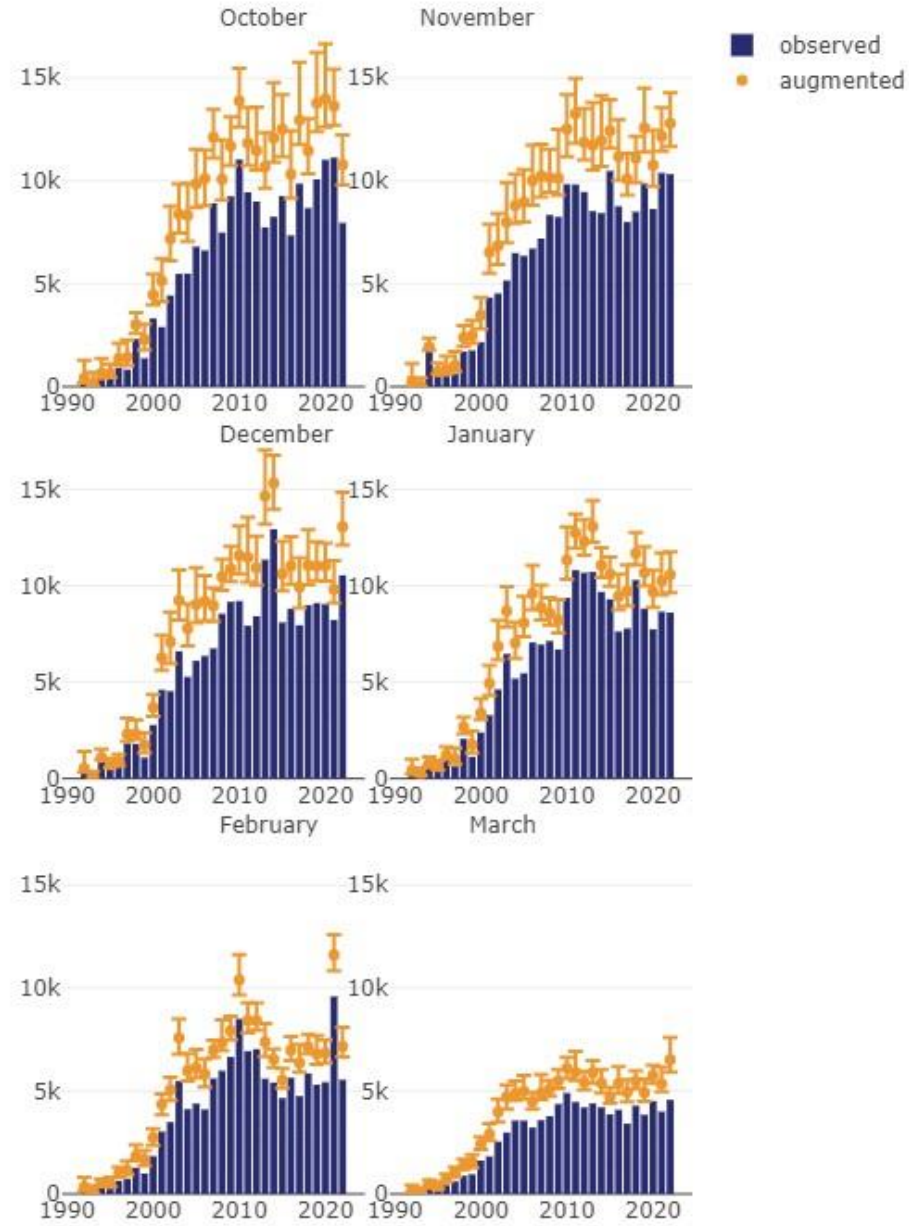
Greylag Goose



Greater Canada Goose



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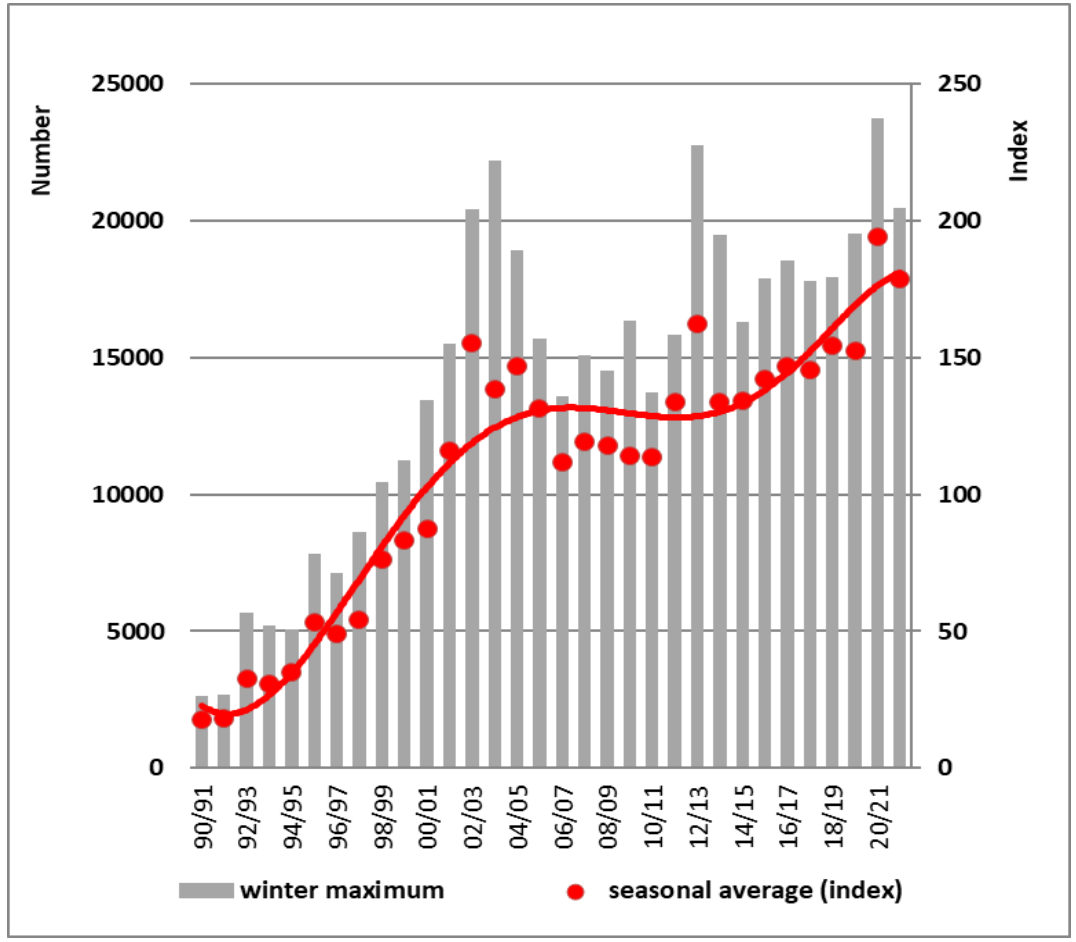
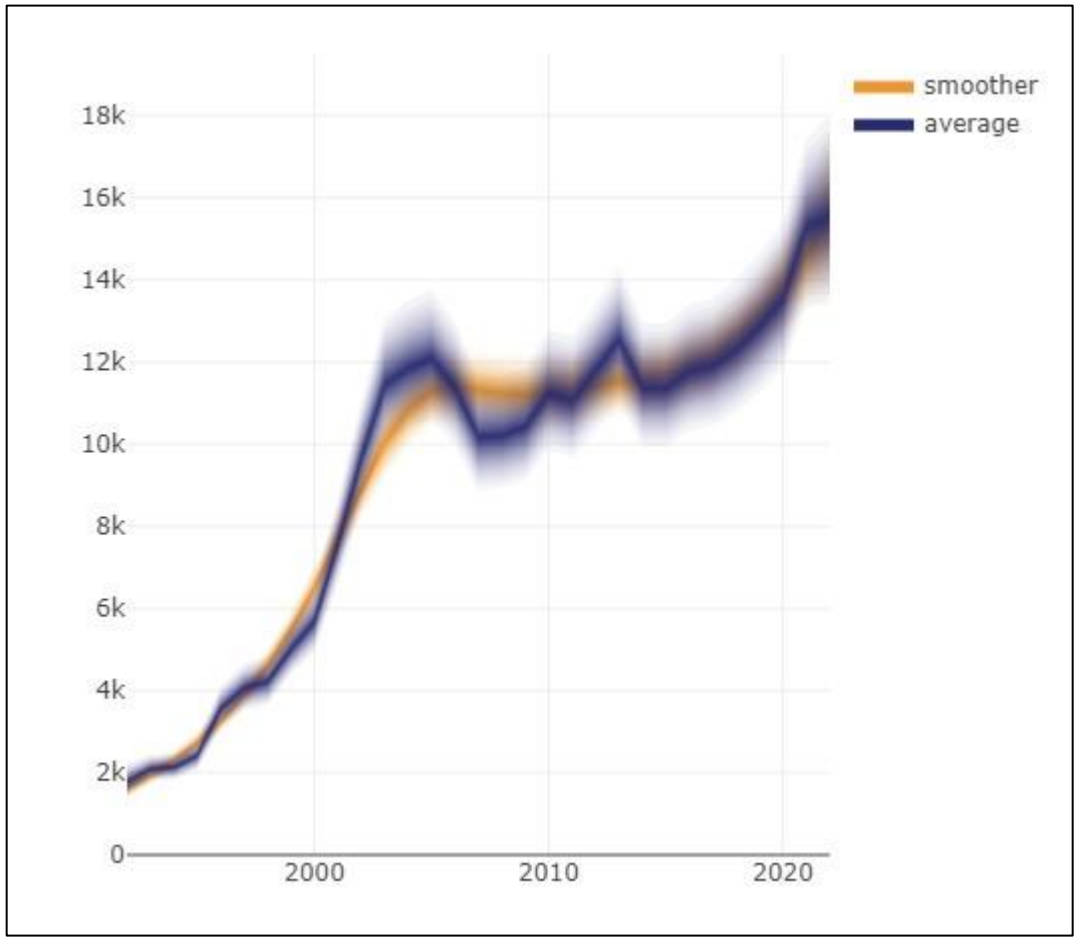
Trend Greylag Goose

Based on counted numbers alone



With imputation of missing values



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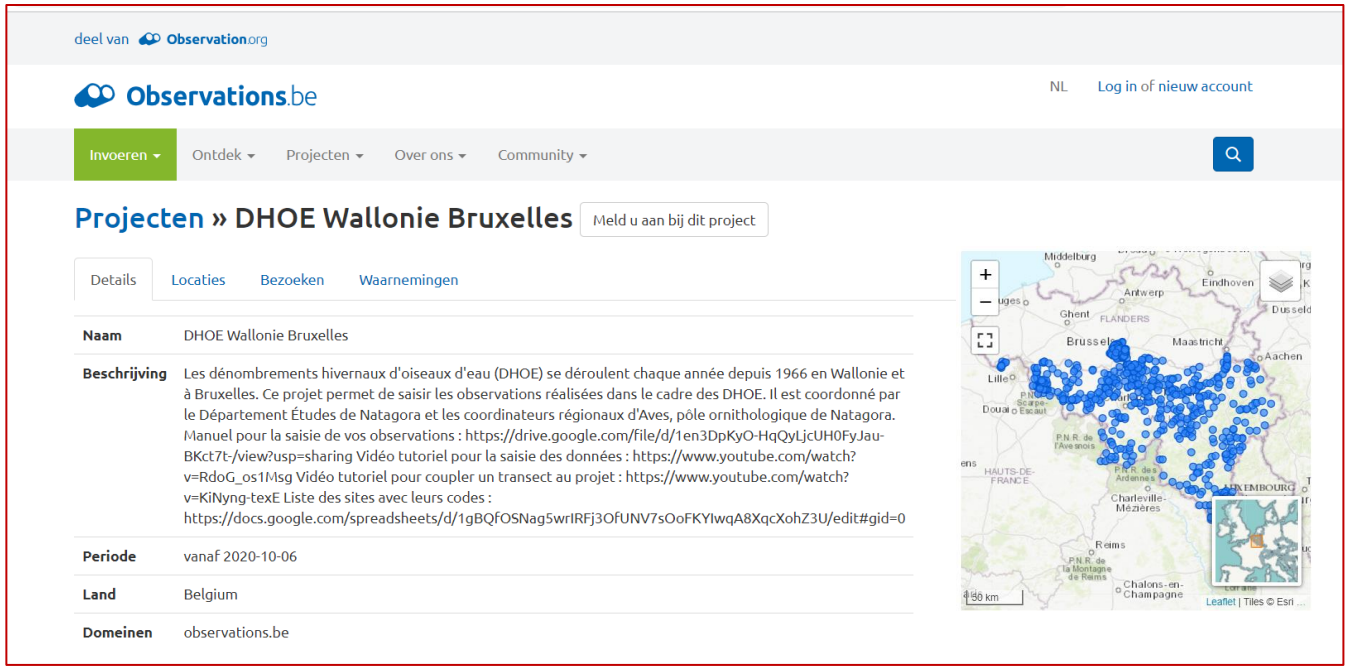
Data flow

- Online data portal (Flanders)

Database INBO

- Observation.org (Wallonia/Brussels)

Database Aves-Natagora



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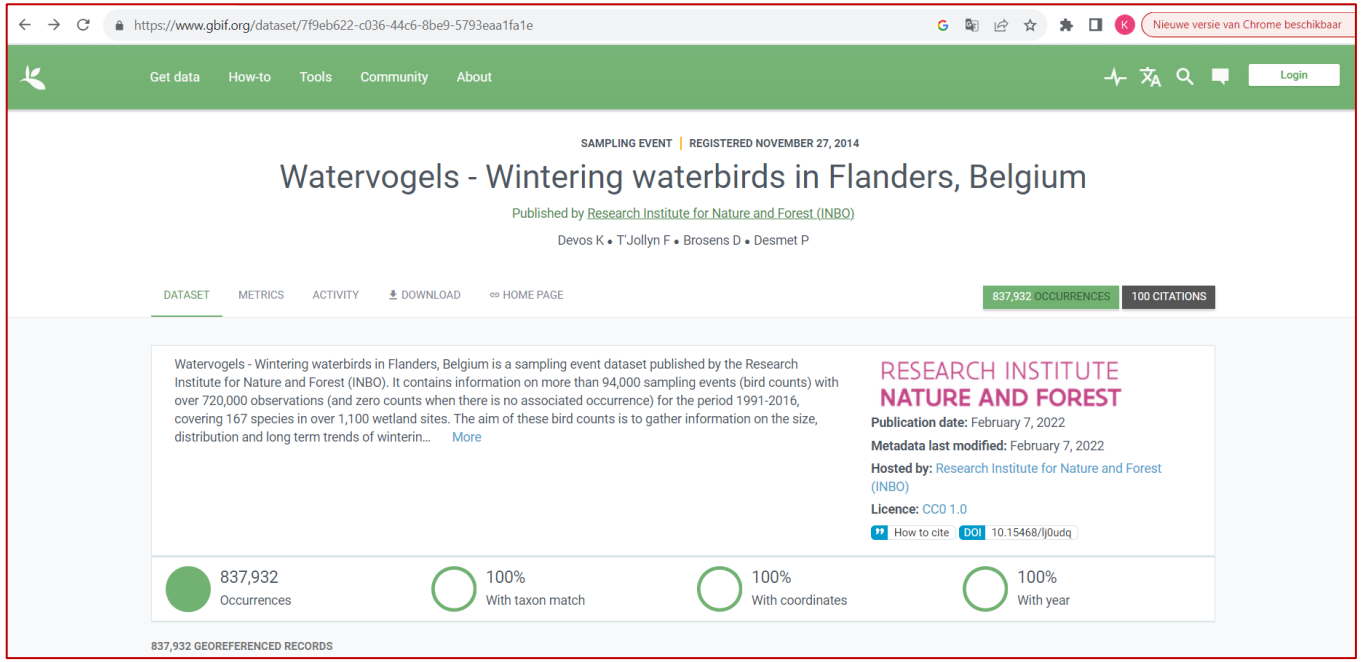
Data flow

Every six years: Flemish and Wallon data are put together to allow trend analysis and population estimates at a Belgian level for the EU Bird Directive reporting

Transfer to database Wetlands International: on a yearly basis, only midwinter count, target for delivery is the beginning of the upcoming season (October)

Flemish data: open access on GBIF



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Census scheme breeding population (Flanders)

- Common Bird Monitoring (point counts)
  - → OK for widespread species as Greater Canada Goose
  - → Problems with localised and/or semicolonial species as Greylag Goose

- Rare Bird Monitoring (complete covering)
  - → Most goose species too abundant for yearly covering in whole of Flanders

- Breeding bird atlas
  - → Population estimates / distribution 2000-2002 versus 2020-2024

Summer count

- One count around mid July
- Count data availabe for 2010-2018 and 2021-2023.

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