

Vulnerable and detected?

Assessing surveillance of wildlife diseases by determining mammal species vulnerability to climate change

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Introduction

The shifting climate is expected to become an important driver of species extinction and redistribution.

General wildlife health surveillance is based on the voluntary reporting/collection of dead wild animal specimens.

- Questionable whether this approach covers the whole of the Netherlands, all the relevant wildlife species, and all (potential) zoonotic agents.
- Trait-based vulnerability assessments (TVAs) could be used to refine conservation/surveillance strategies.

TVAs assume that the capability to deal with the impact of a threat is dependent on the level of exposure to the threat and on species' traits which allow them to cope with this exposure.

Objectives

- 1) To assess the vulnerability to climate change of 59 mammalian species native to the Netherlands using a TVA.
- 2) To link the outcomes of the TVA to the current number of mammals sampled for general wildlife health surveillance in the Netherlands.

Methodology

Objective I

1. **Exposure:** degree to which the spatial range of climate change overlaps with the geographical distribution of a species (presence-only distribution).
2. **Sensitivity:** the species' potential to persist *in situ* based on their traits.
3. **Adaptive capacity:** the species' ability to avoid, recover, or adjust to the impacts of climate change based on their traits.

Highly vulnerable = highly sensitive + low adaptive capacity + high exposure

Step 1. Selection climate metrics (exposure) and ecological traits (sensitivity, adaptive capacity)

Exposure

1. BIO01 – Mean temp.
2. BIO05 – Max temp. warmest month
3. BIO06 – Min temp. coldest month
4. BIO12 – Precipitation
5. BIO13 – Wettest month
6. BIO14 – Driest month

Sensitivity

1. Body mass
2. Fossorial
3. Diurnality
4. Habitat specialism

Adaptive capacity

1. Dispersal distance
2. Diet specialism
3. Reproductive capacity
4. Generation length

Figure 2. Overview included parameters to calculate vulnerability dimensions

Step 2. Categorization species into vulnerability categories

Dataset DWHC (January 2008 and August 2022).

Objective II

01 INCLUDED

Complete or partial necropsy

02 ANALYSIS

Classification per order. Spatial and Temporal analysis

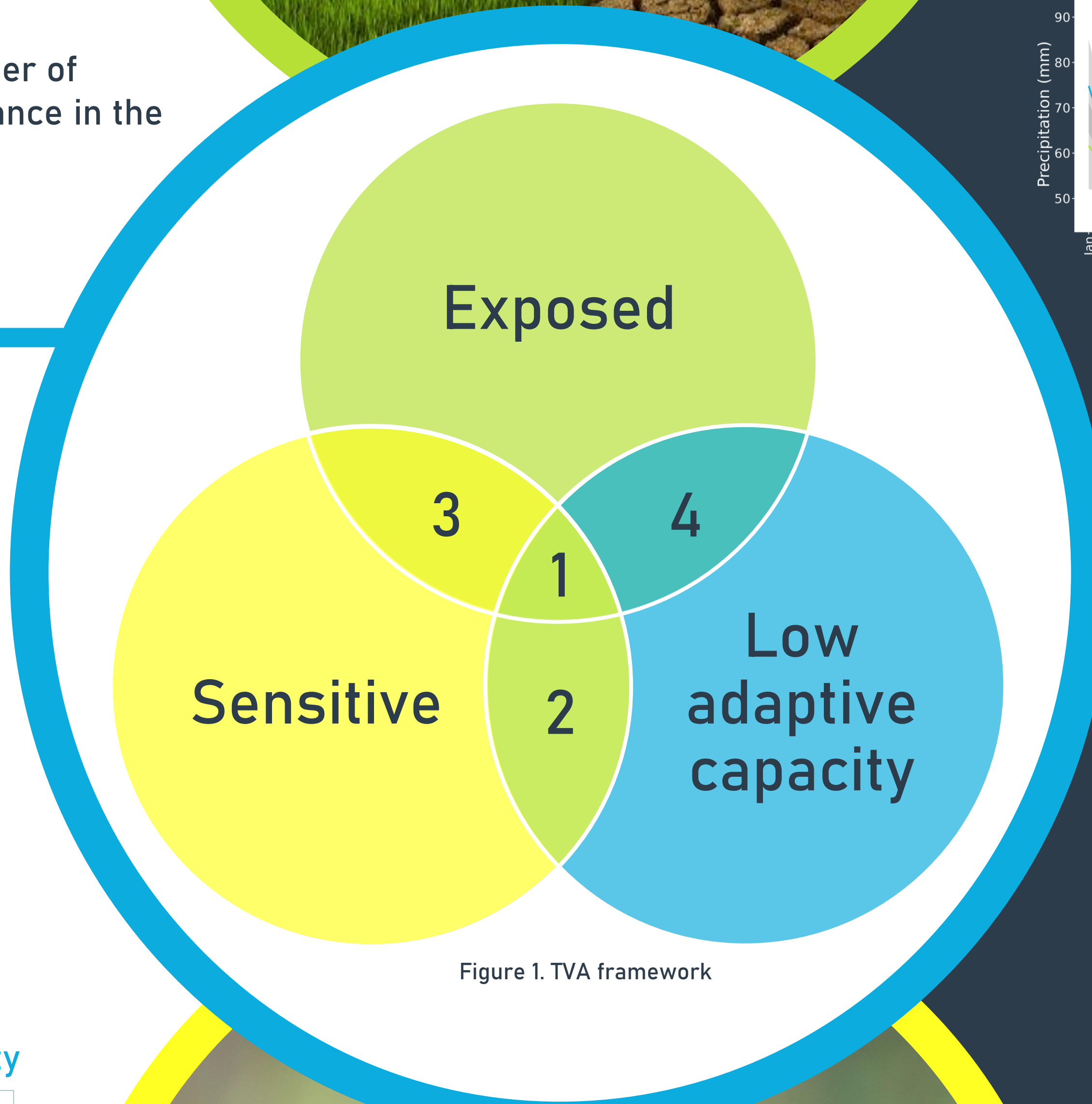


Figure 1. TVA framework



Take home message

Two species were highly vulnerable to climate change in the Netherlands (whiskered myotis, garden dormouse).

Species vulnerable to climate change are relatively poorly represented in the DWHC database.

The study suggests that TVAs can be adjusted to include additional drivers and species. Surveillance institutes should consider using these assessments to enhance wildlife-borne disease surveillance.

Results

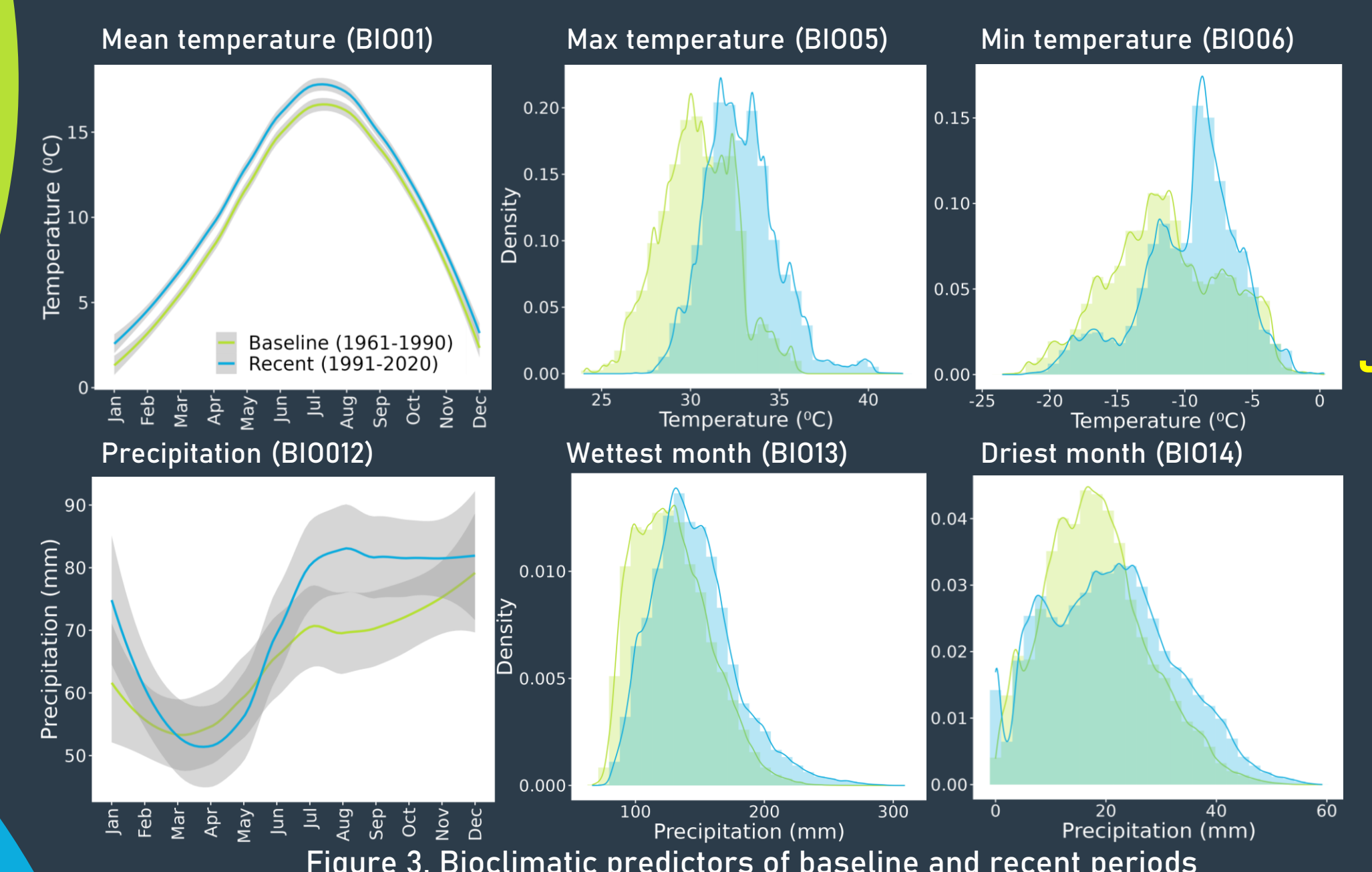


Figure 3. Bioclimatic predictors of baseline and recent periods

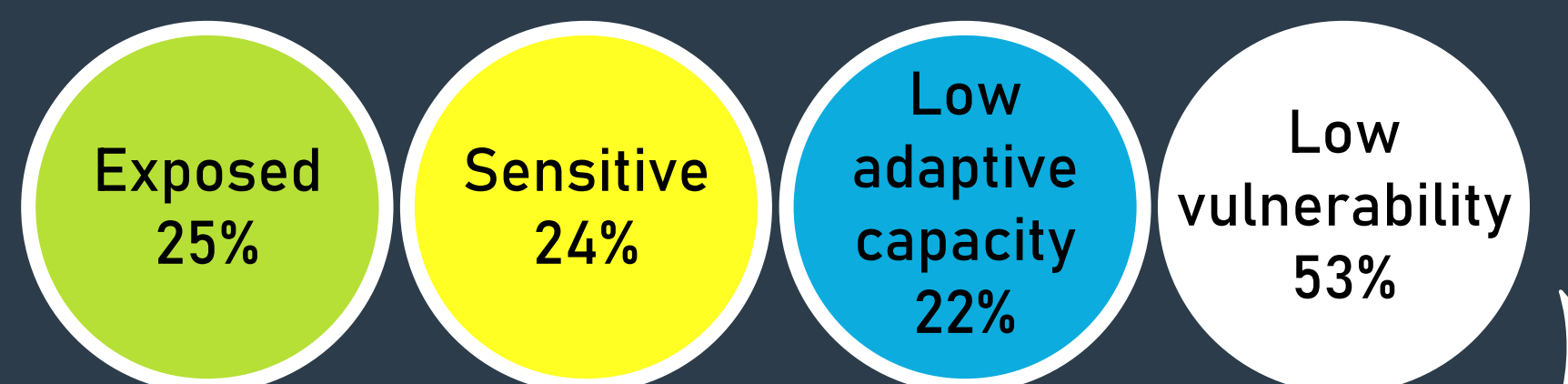


Table 1. Summary of vulnerability categories

Vulnerability type	Number of Species
Highly vulnerable (1)	2 (3.4%) Whiskered myotis Garden dormouse
High latent risk (2)	5 (8.5%)
Potential adapter (3)	3 (5.1%)
Potential persister (4)	2 (3.4%)
Sensitive only	4 (6.8%)
Low adaptive capacity only	4 (6.8%)
Exposed only	8 (13.6%)
Low vulnerability	31 (52.5%)

The DWHC received a total of 3560 dead mammals (36 host species), 69.2% (2463/3560) records were either completely or partially necropsied.

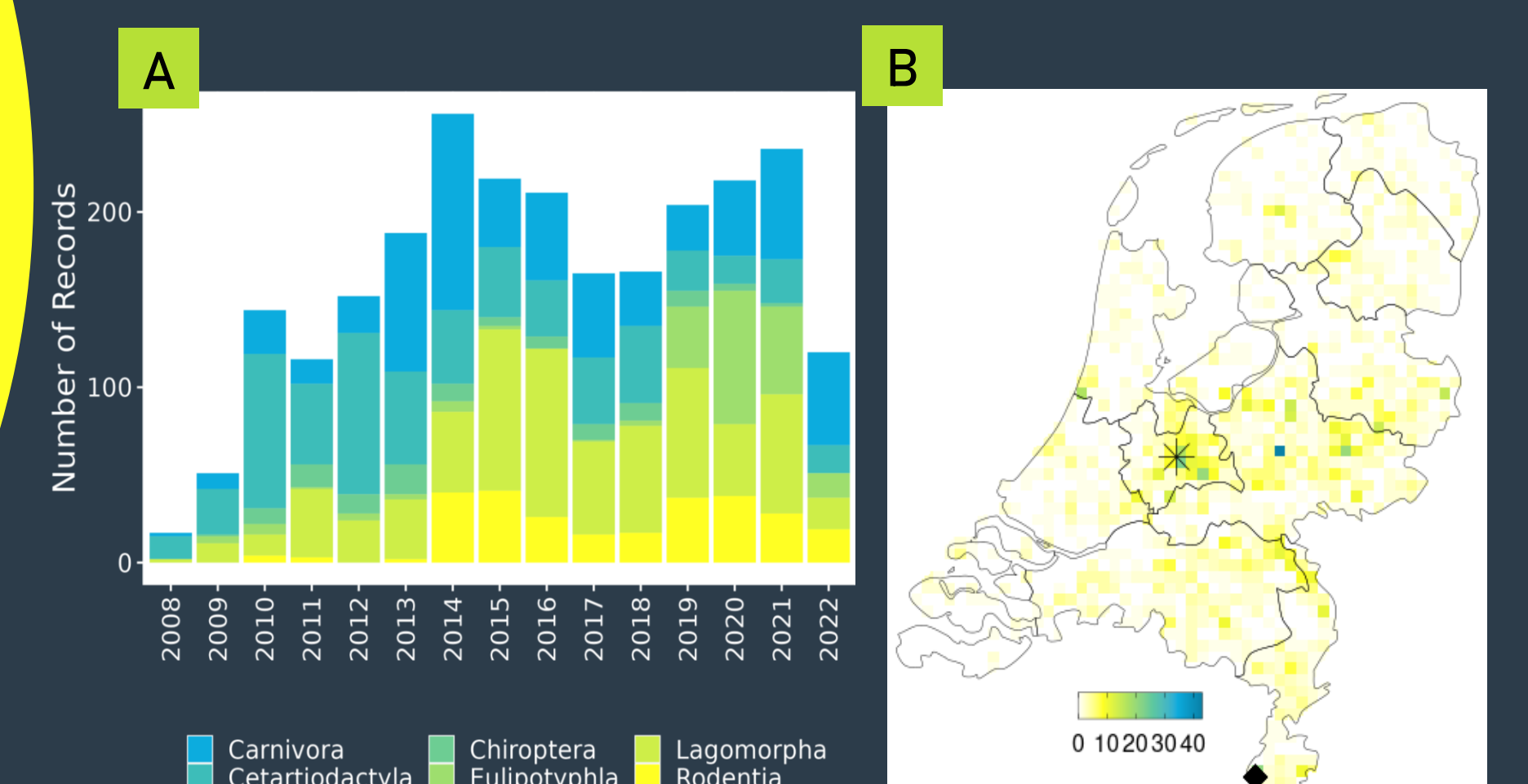


Figure 4. Number of mammalian carcasses per year per order (Figure 4A), and per location (Figure 4B).

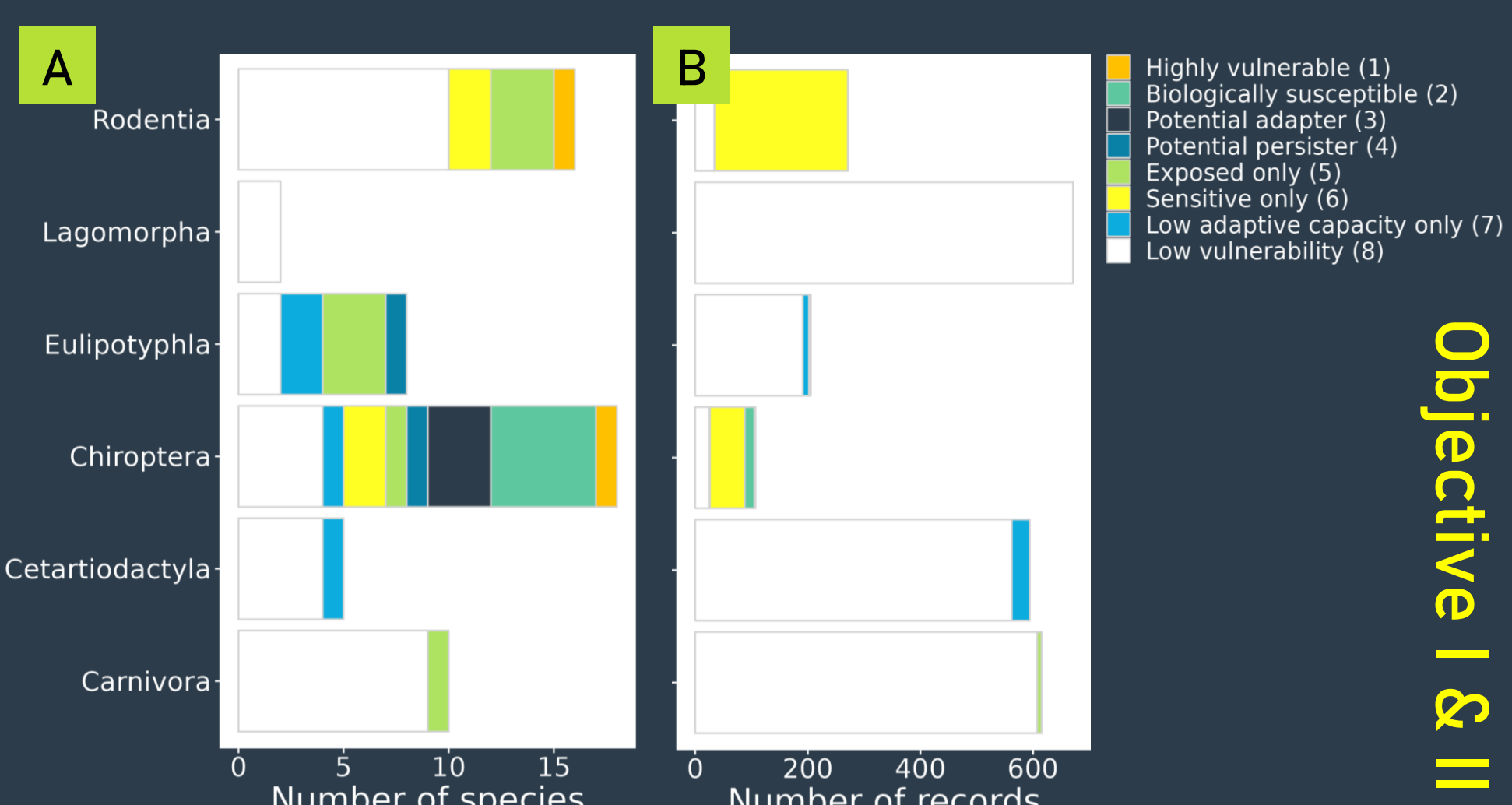


Figure 5. The number of species per order per vulnerability category (Figure 5A), and the cumulative number of records per order within the DWHC database (Figure 5B)

Objective I

Objective II

Objective I & II

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