# Assessing exposure to avian influenza in seabirds in Canada

Dr. Jennifer Provencher

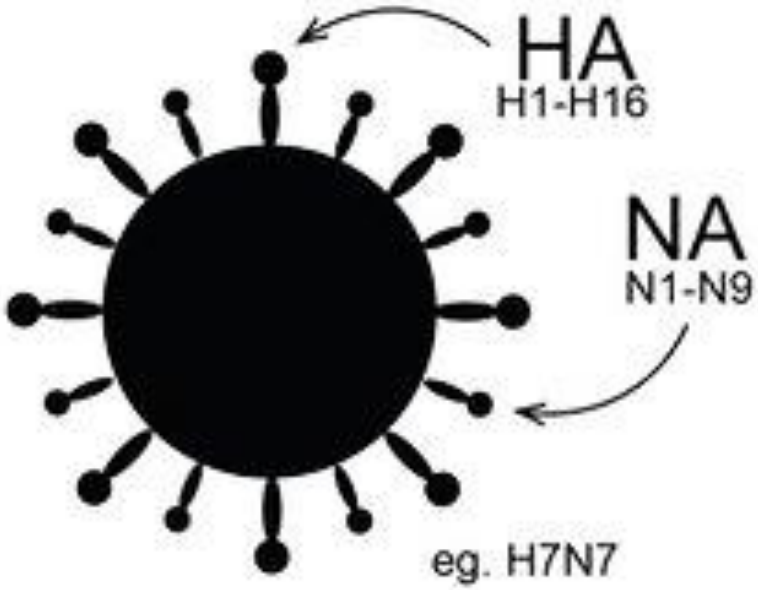
Research Scientist, Ecotoxicology and Wildlife Health

Environment and Climate Change Canada

# Different types of AIV

What's in the name?

**Avian influenza "subtype"**




**Low pathogenic**


- all HA subtypes (H1-H16)
- common in wild birds
- no disease in wild birds
- occasional, mild disease in poulty

Most previous cases in North America

**High pathogenic**

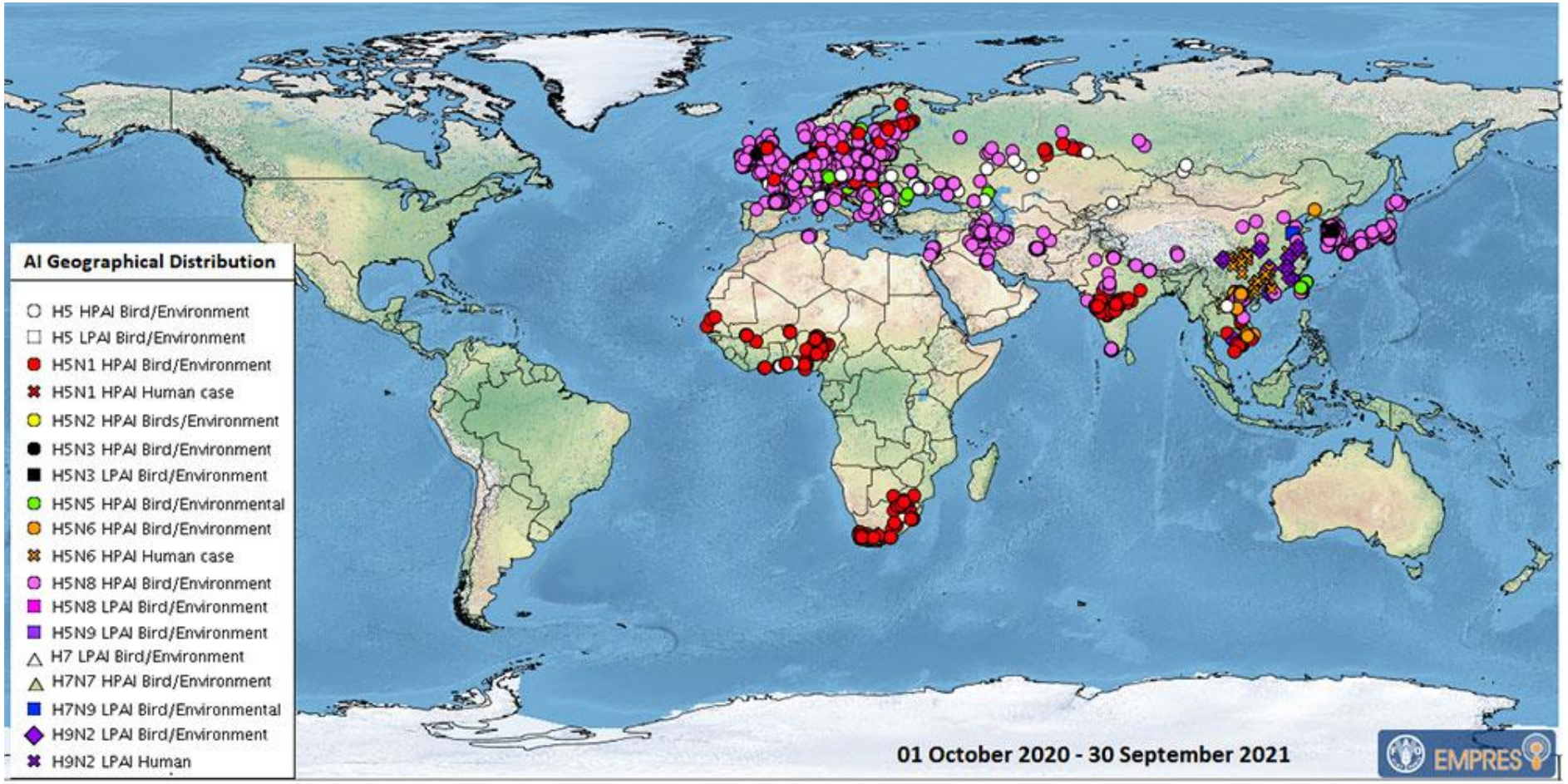

- "bird flu"
- only H5 and H7 subtypes
- causes outbreaks in poultry
- associated with disease and death in poultry and wild birds
- uncommon in wild birds

H5N1 cases currently in North America

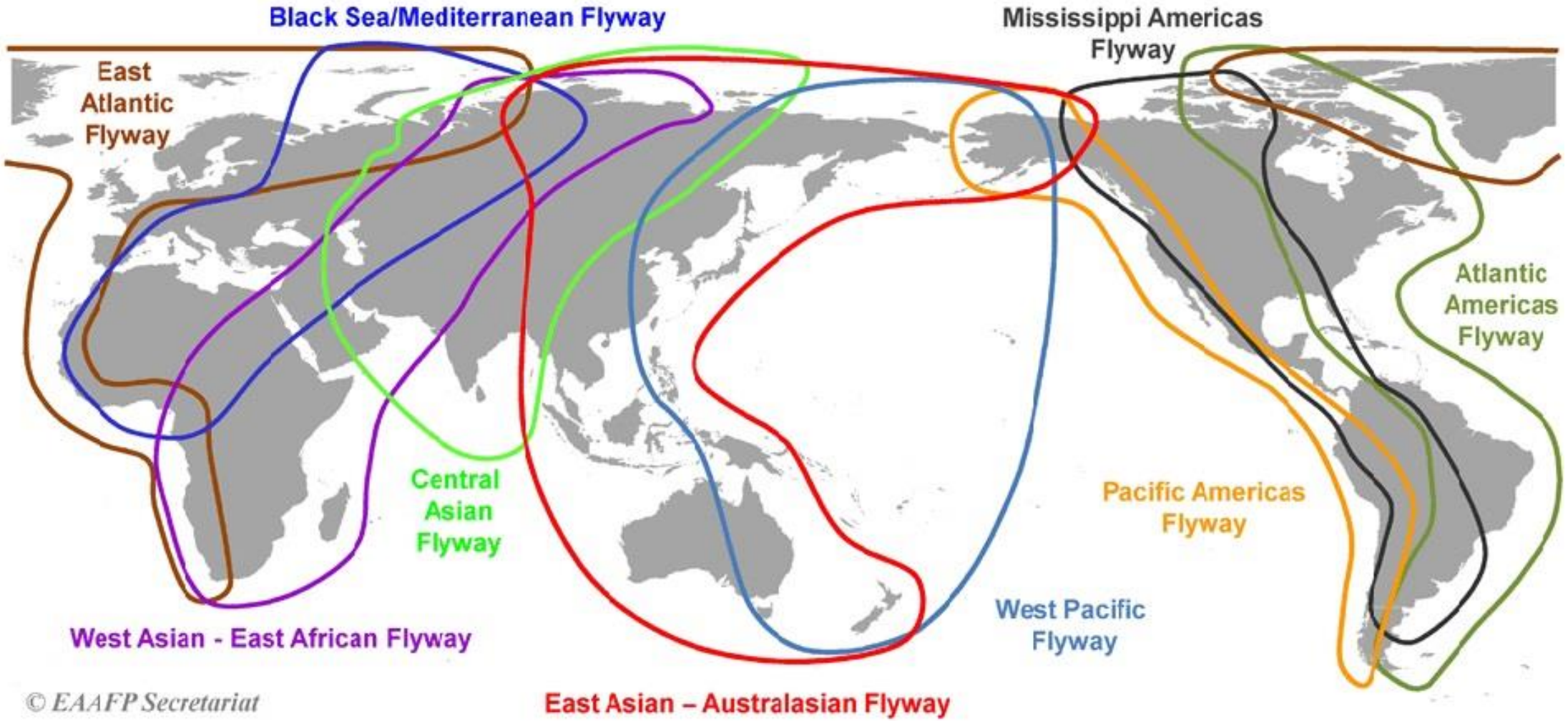
Wille and Lynch 2020

# AIV Globally in 2020/2021

- H5 highly pathogenic was first detected in the UK in 2020
- Map shows detections since **October 2020 to September 2021**
- This includes both low path and high path strains
- *Notice that the Americas have no detections during this time period*

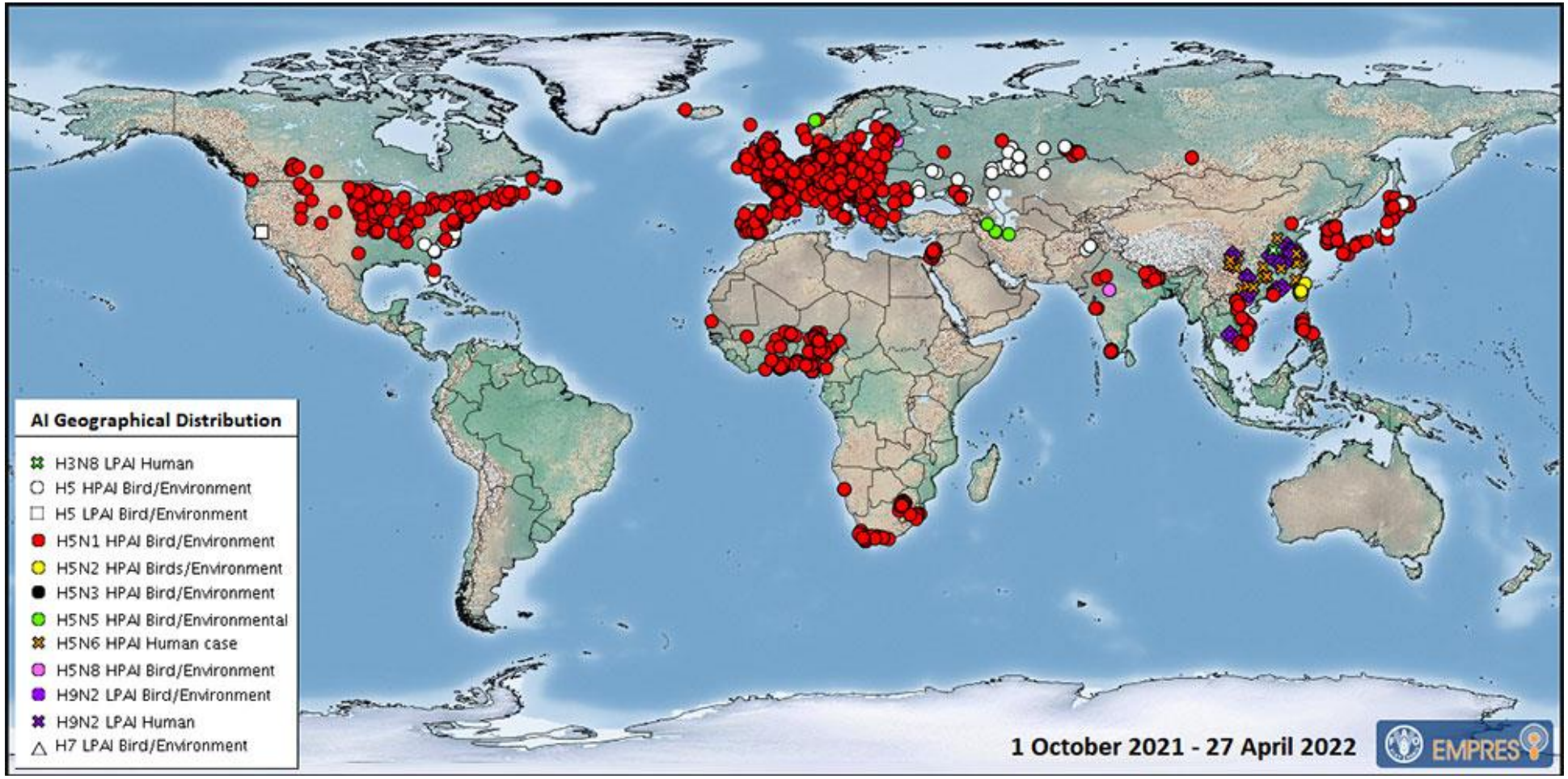


# Global flyways



# AIV Globally in 2022

- H5 highly pathogenic was first detected in the UK in 2021
- There have been ongoing waves of infection since that time
- Notice the detections in Iceland and North America



# Northern gannet colonies in a normal year

# Colony, dead gannets and no dead COMU – JF Rail (ECCC)

# Population level effects

Northern Gannet

Common eider

Common murre

Has the population (the number of individuals declined) due to HPAIV?

# Issue: Population-level impacts to priority wild bird species

Population level impact assessments are critical for informing: harvest management (Canada and internationally), species status assessments (COSEWIC), concerns of rights holders and stakeholders

## Northern Gannet

- Globally, **mass mortality** events were reported at **75%** of breeding colonies.
- In Canada, we estimate as much as a **30% of the breeding population may have died** in 2022.
- Very limited reported mortality in 2023 but **impacted populations have not recovered**.
- Information was presented to COSEWIC's Bird Specialist Subcommittee and will be provided to support IUCN assessments upon request.

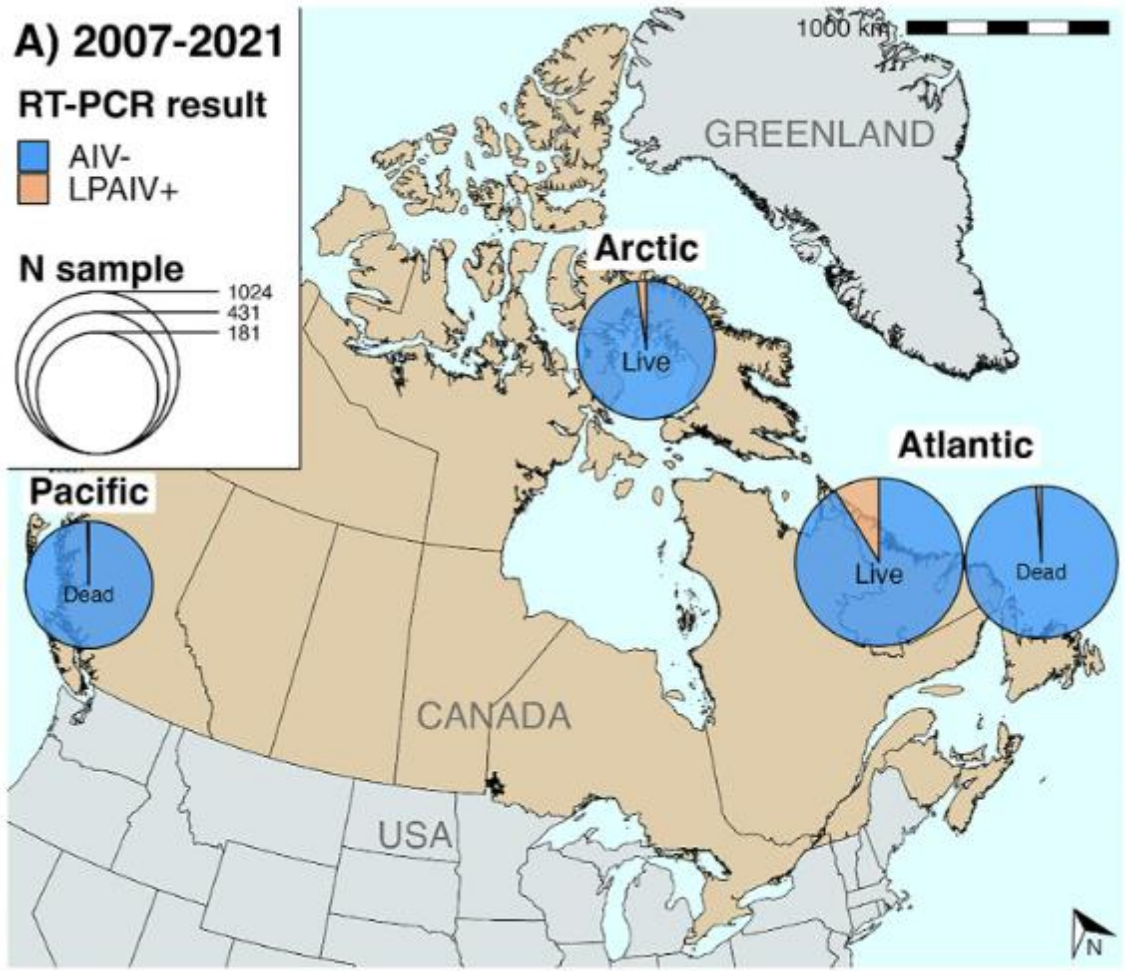
## American Common Eider

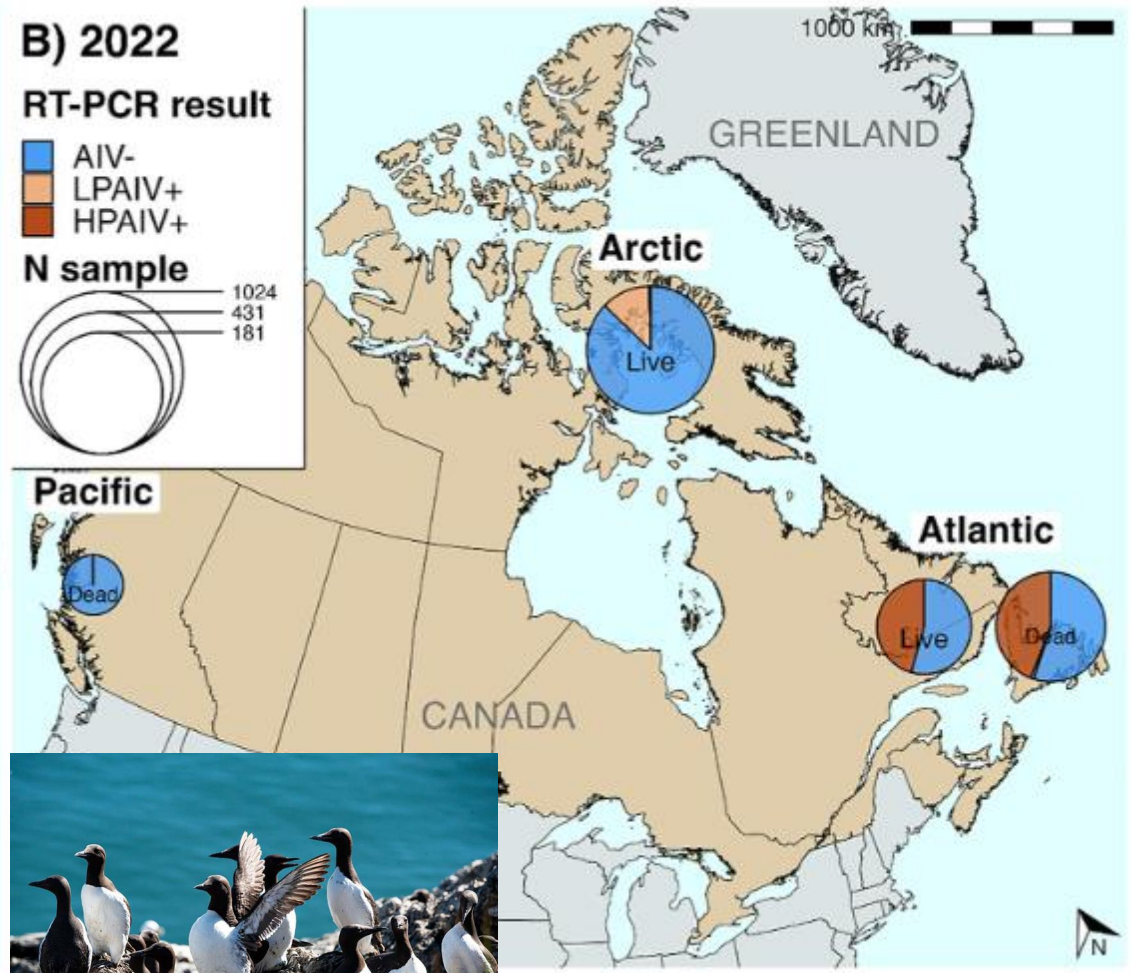
- In 2022, we estimated **losses of 5-15%** of this breeding population.
- Accordingly, authorities in Canada & the USA recommended that hunters voluntarily reduced harvest in 2022.
- No colony mortalities in 2023, and **populations have recovered to pre-HPAI levels.**

## Common Murre

- In 2022, reported mortality was ***not*** a significant fraction of the region's breeding population.
- However, CWS colony surveys indicated a **10% reduction in a key breeding colony**.
- One of North America's two regulated harvested seabird species.
- **Currently no changes to murre harvest.**

# Changes in HPAIV and LPAIV in recent years

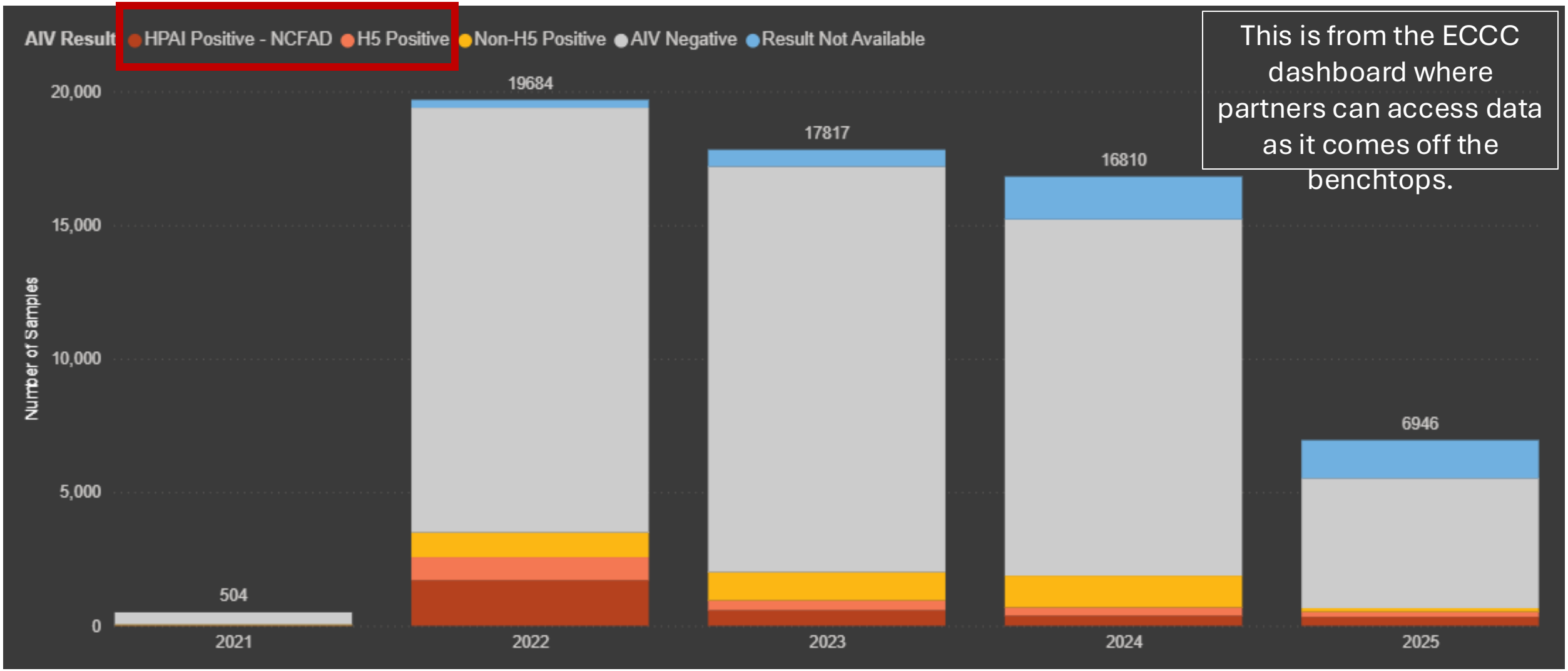




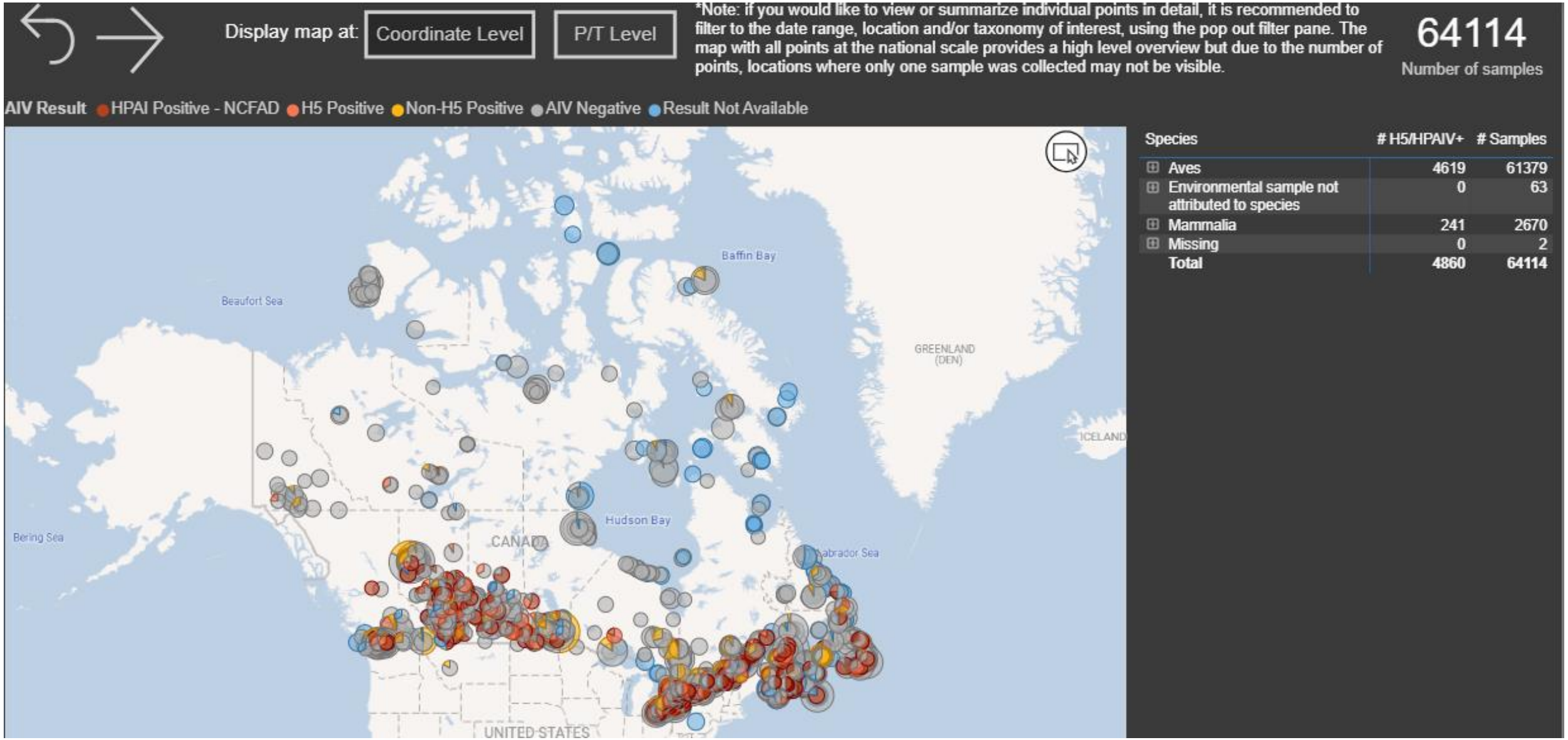

MacLaughlin et al. 2024

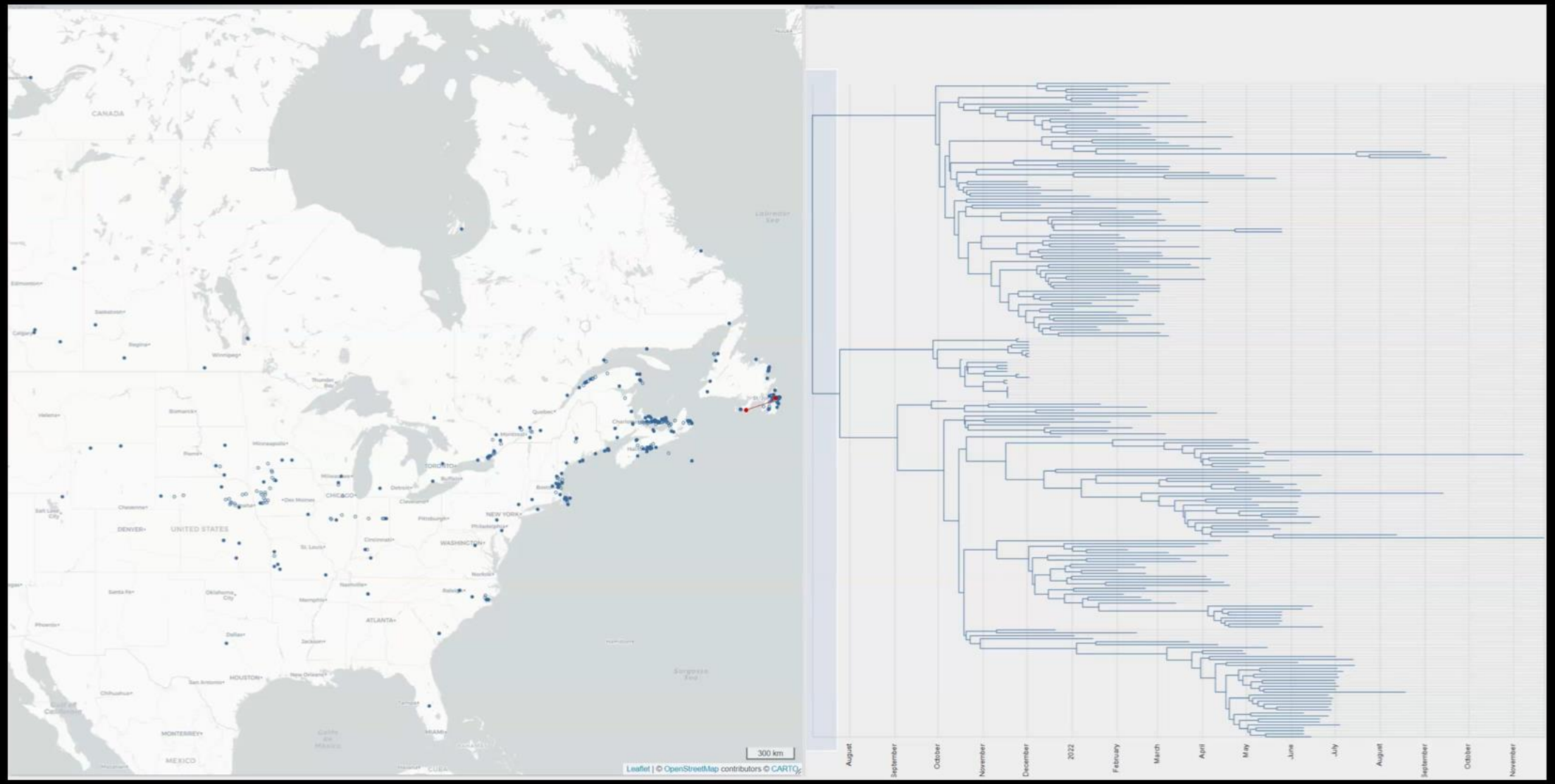
# Testing of wild birds since across Canada since 2021 – data visualization

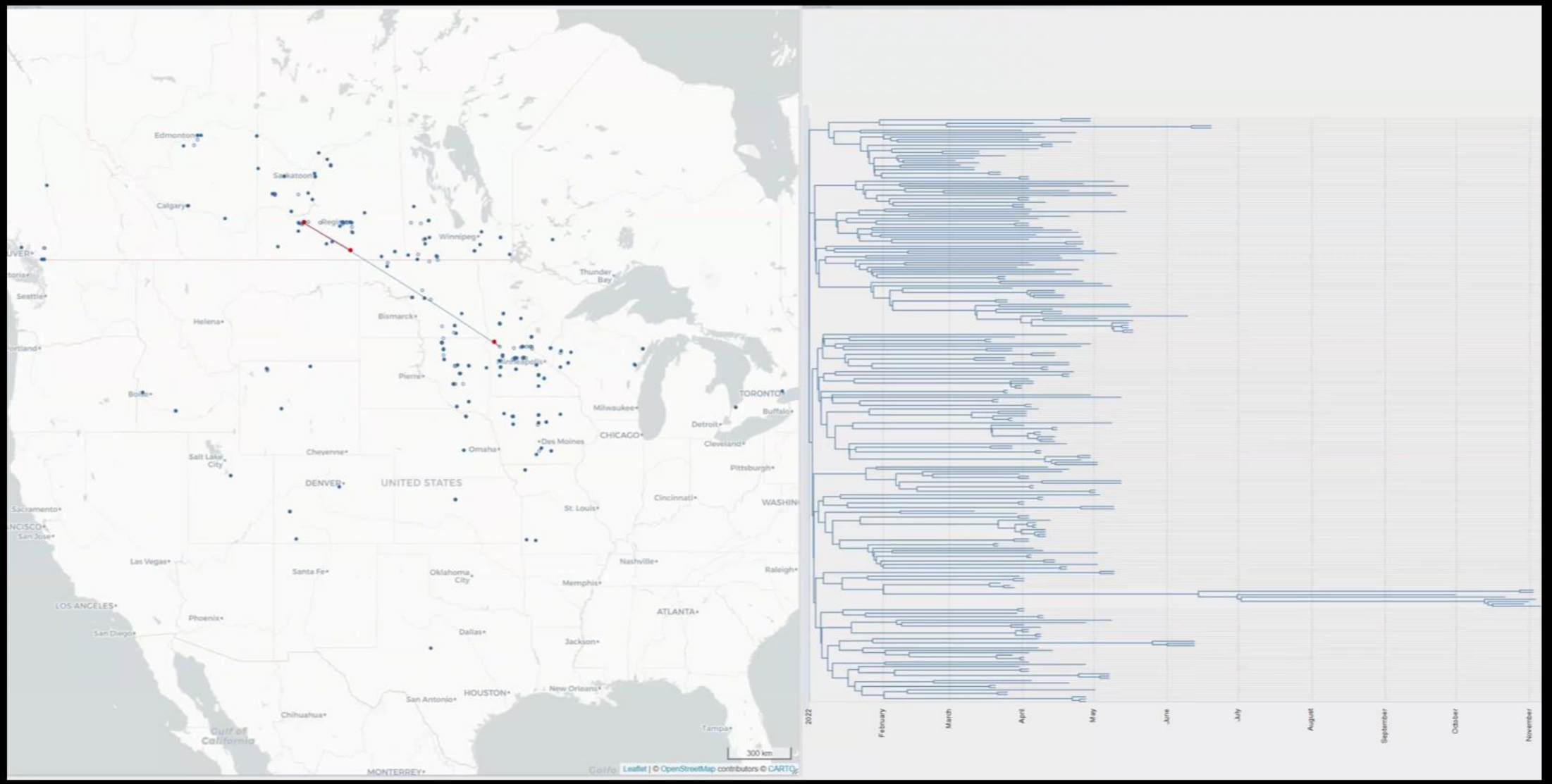



This is from the ECCC dashboard where partners can access data as it comes off the benchtops.

# Interactive data dashboard with partners

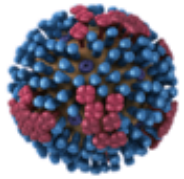



CANADA
UNITED STATES
MEXICO
CHICAGO
TORONTO
NEW YORK
WASHINGTON
ATLANTA
DENVER
HOUSTON
MIAMI
MONTERREY
300 km
Leaflet | © OpenStreetMap contributors © CARTO
August
September
October
November
December
2022
February
March
April
May
June
July
August
September
October
November


Edmonton
Saskatoon
Calgary
Winnipeg
Thunder Bay
Seattle
Helena
Bismarck
Pierre
Boise
Milwaukee
TORONTO
Buffalo
Detroit
CHICAGO
Cleveland
Des Moines
Omaha
Cheyenne
Salt Lake City
DENVER
UNITED STATES
Pittsburgh
Cincinnati
St. Louis
Sacramento
San Jose
Las Vegas
Santa Fe
Oklahoma City
Nashville
Raleigh
Memphis
LOS ANGELES
Phoenix
ATLANTA
San Diego
Dallas
Jackson
HOUSTON
New Orleans
San Antonio
Chihuahua
Gulf of California
Tampa
MONTERREY
300 km
Leaflet | © OpenStreetMap contributors © CARTO
2022
February
March
April
May
June
July
August
September
October
November

# Antibody testing can be complimentary to viral testing

First Infection

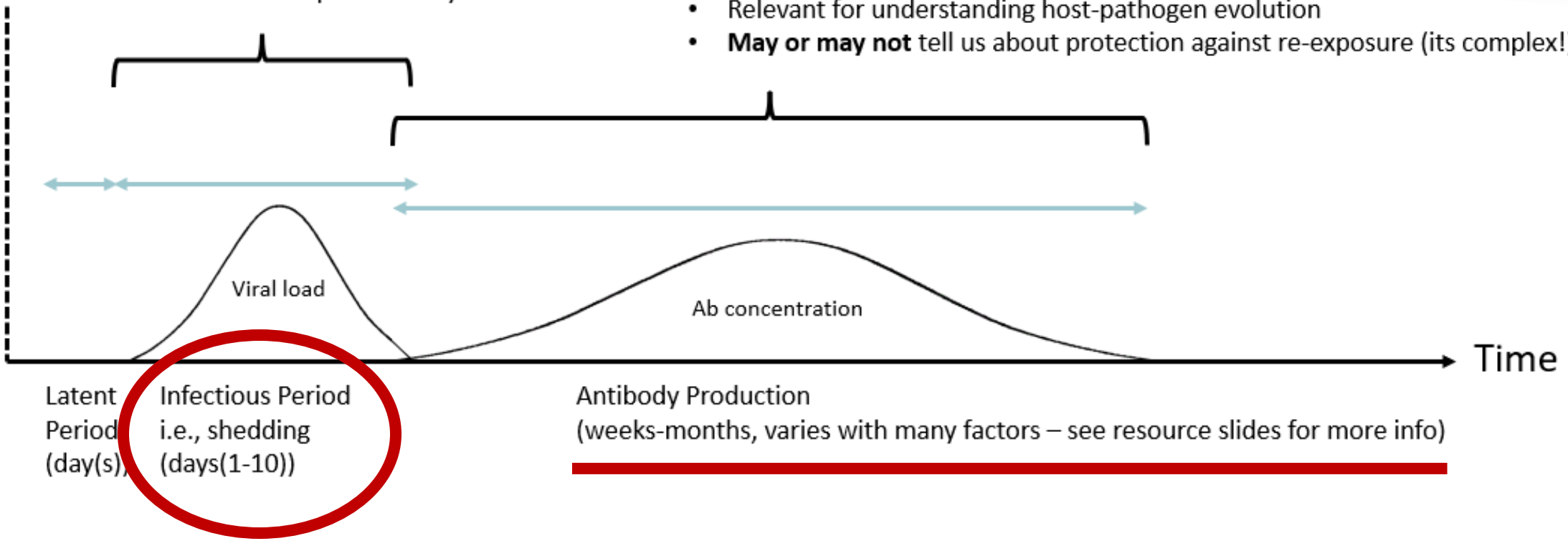


Swabs can detect infection
(i.e., virus)

- Short window
- Pinpoints timing of infection
- Needed for sequence analysis

Blood samples can detect exposure
(i.e., Abs circulating in blood)

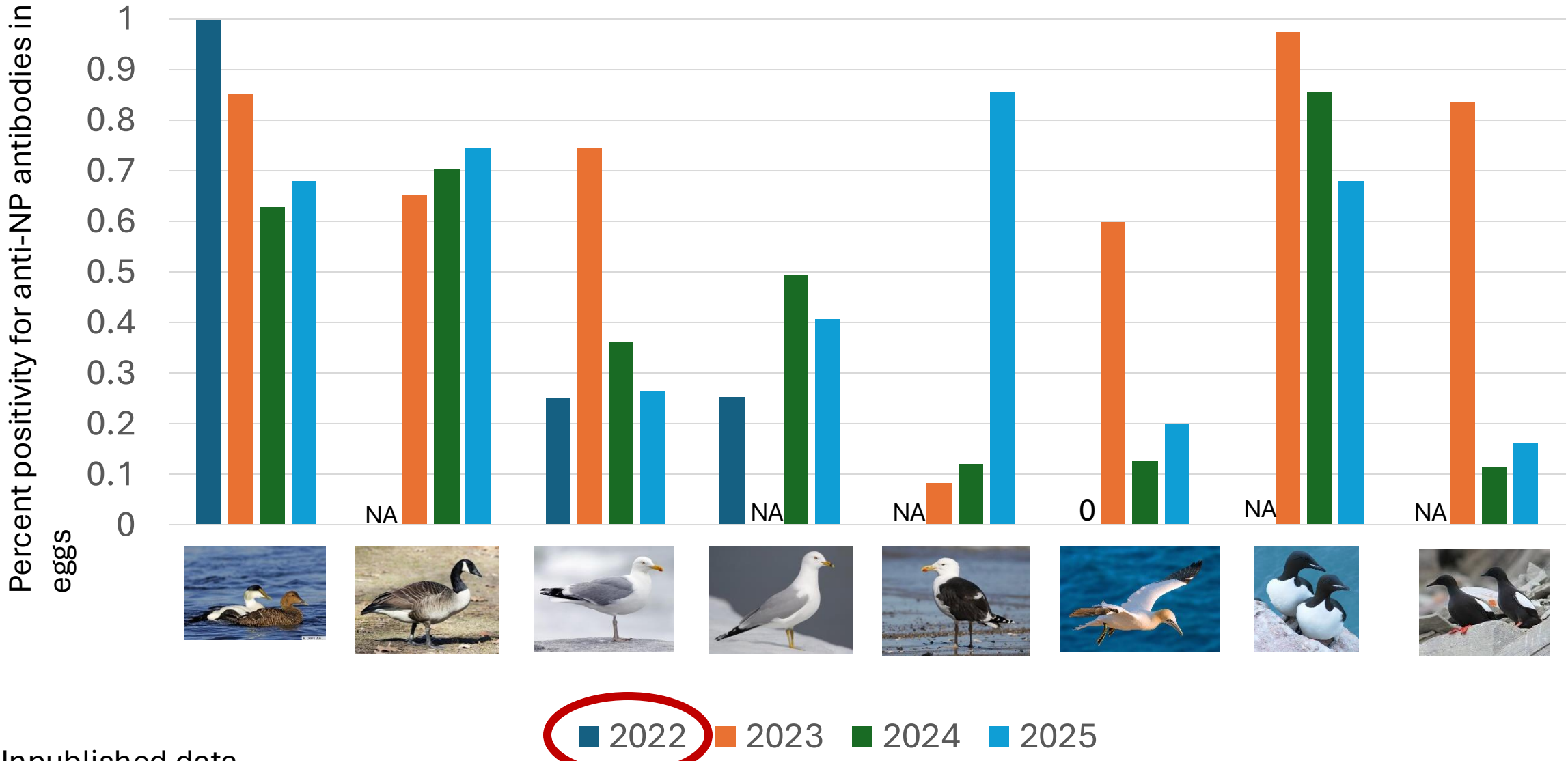
- Longer window (vs. swabs)
- Helps to determine level of exposure, immune dynamics and survival
- Relevant for understanding host-pathogen evolution
- **May or may not** tell us about protection against re-exposure (its complex!)




JPro13·2024
15 ARTE Eggs
Nasurvalik/Tern Is.,NU
Na-ARTE-01 → Na-ARTE-15
Rec'd 2024-07-08.SS
☑Washed ☐Morphology


JPRO13
JPRO13

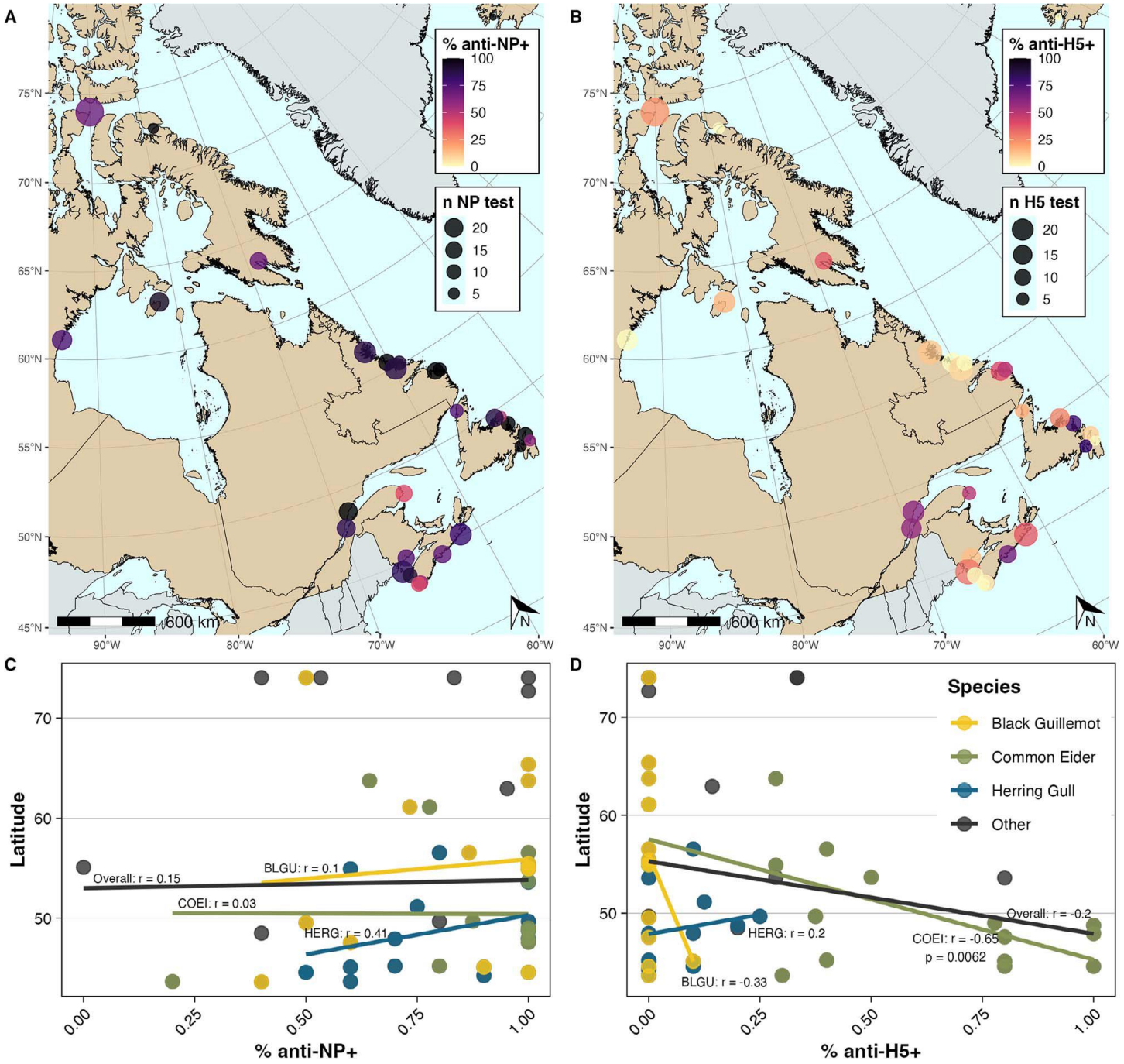
# How AIV antibodies changes across years




Unpublished data

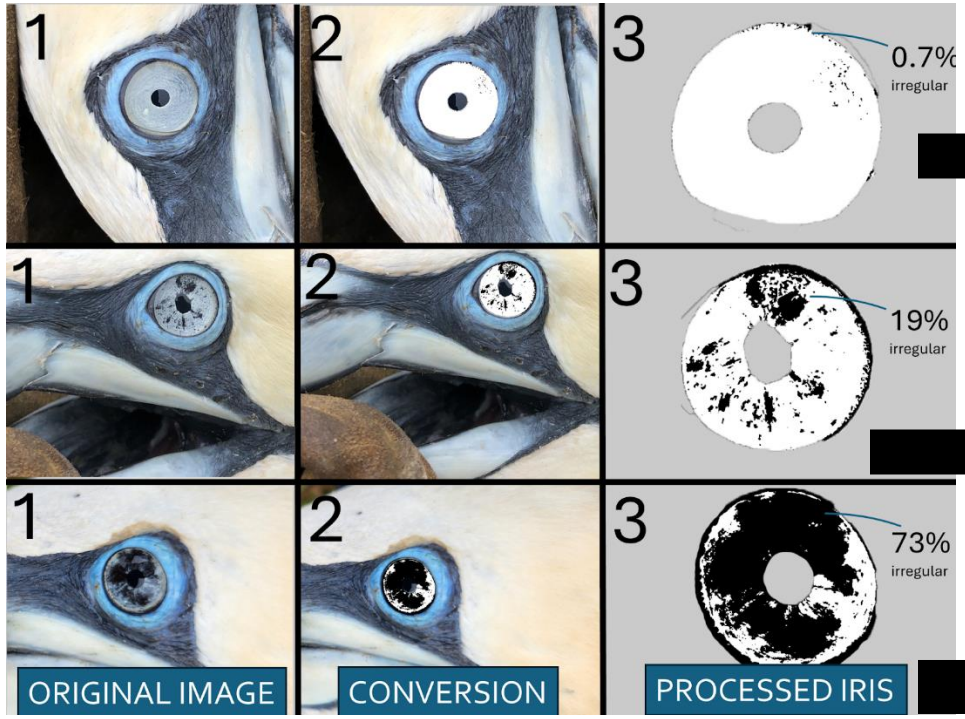
# Latitudinal gradient

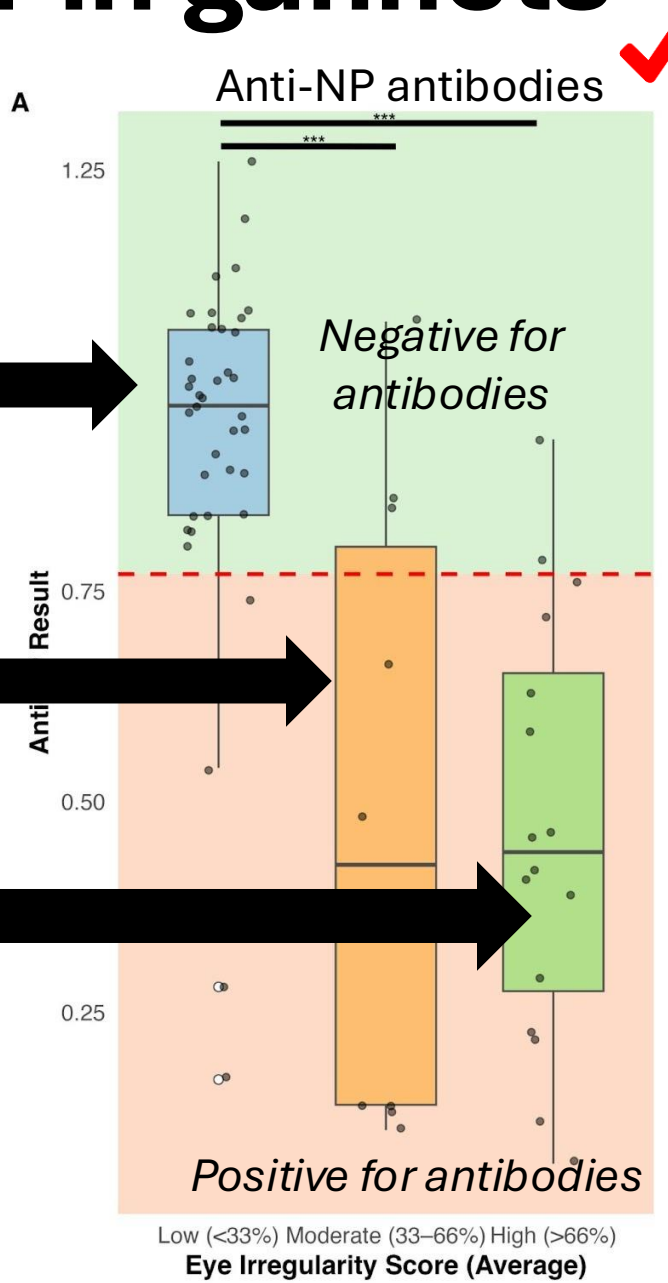
- Widespread detections of NP antibodies
  - Detections of antibodies, even when no viral detections
- Some species in the south were more likely to be exposed to H5 antibodies
  - Strongest relationship for the species we have the largest geographic spread (common eiders)

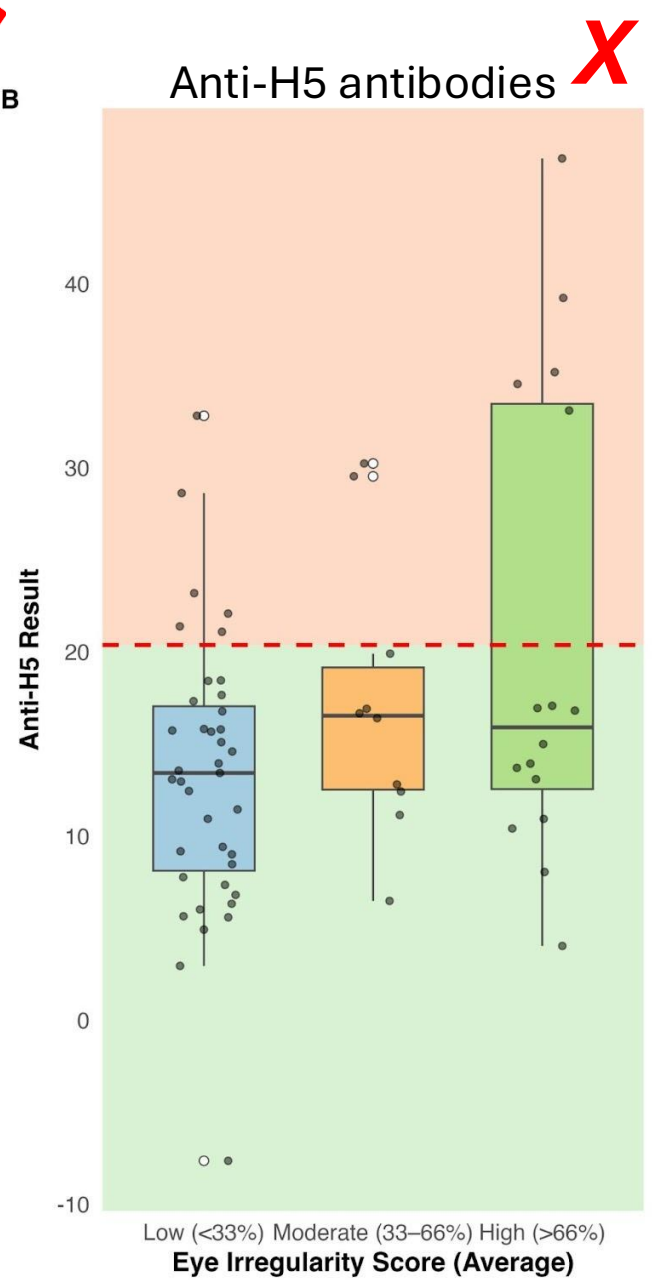



MacLaughlin et al. 2025

# Changes in Iris colour in gannets




Lane et al. 2024
Petalas et al. In review

# Summary

- Outbreak in 2022
- Increased species affected
- Increased mortality
- Seabirds widely affected at colonies
- Both individual and population level effects
- Ongoing circulation of both LPAIV and HPAIV

# Questions welcome!