



Food and Agriculture  
Organization of the  
United Nations



World Health  
Organization



World Organisation  
for Animal Health  
Founded as OIE

# Integrated Surveillance and Available Tools and mechanisms

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**Prof. Yoshi Sakoda, DVM. PhD**

**Vice Dean, Faculty of Veterinary Medicine, Hokkaido University, Japan**



First, the **surveillance in birds** should be conducted **for avian influenza viruses**, and then accompanying **mammals** should be examined in the labs!!

An initiative of **the Ministry of Environment** is important, and **virus and information sharing** to the others

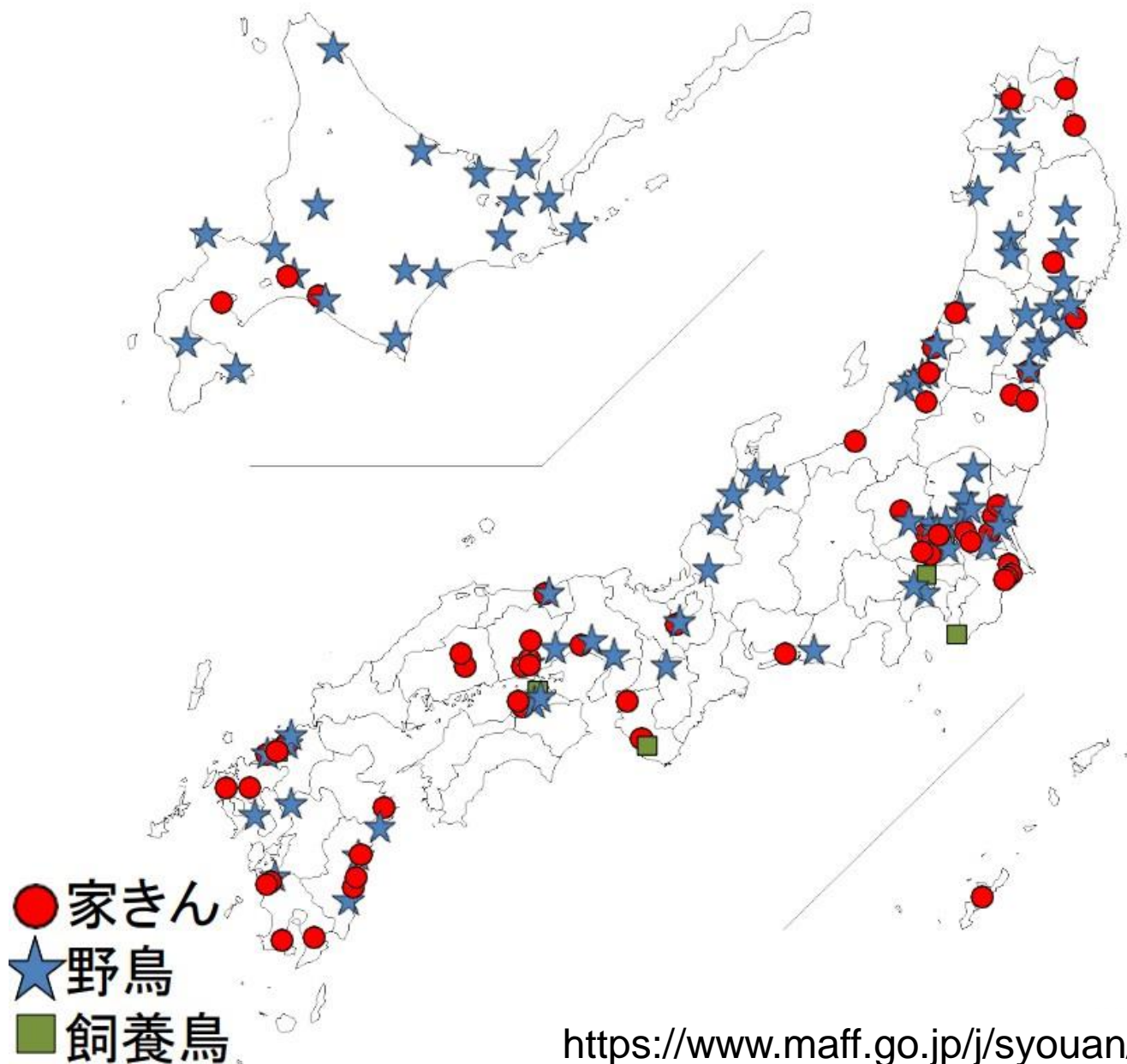
# Integrated Surveillance and Available Tools and mechanisms

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# Detection of H5N1 and H5N2 viruses in the 2022-2023 season



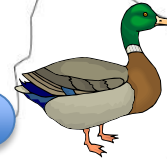
- Domestic:  
17 mil. of 84 outbreaks  
in 26 Prefecture
- ★ Wild birds and environment  
239 cases in 27 Prefecture
- Captive birds  
10 cases in 6 Pref.

<https://www.maff.go.jp/j/syouan/douei/tori/>

# Laboratories for the diagnosis of HPAIV in Japan

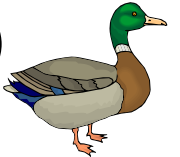


**Hokkaido Univ.  
(Prof. Sakoda)**

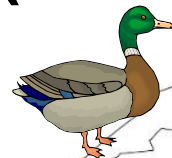


**National Institute  
of Animal Health**

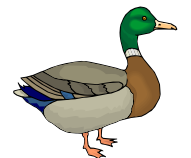
**(Dr. Uchida)**



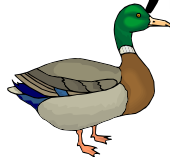
**Tottori Univ.  
(Prof. Yamaguchi)**



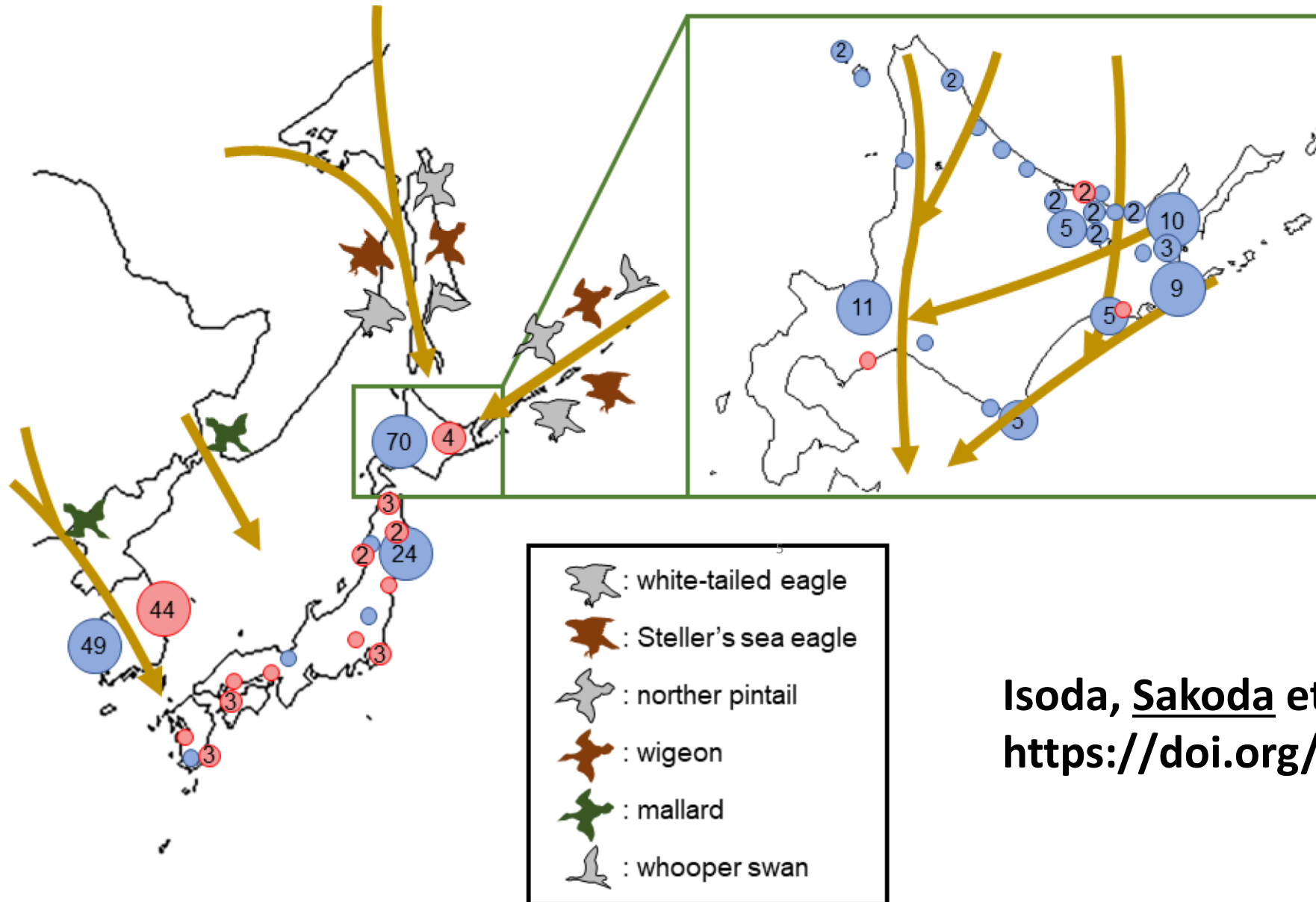
**National Institute  
for Environmental  
Studies (Dr. Onuma)**



**Kagoshima Univ.  
(Prof. Ozawa)**



# Flyways of migratory birds and HPAI cases in 2021-2022



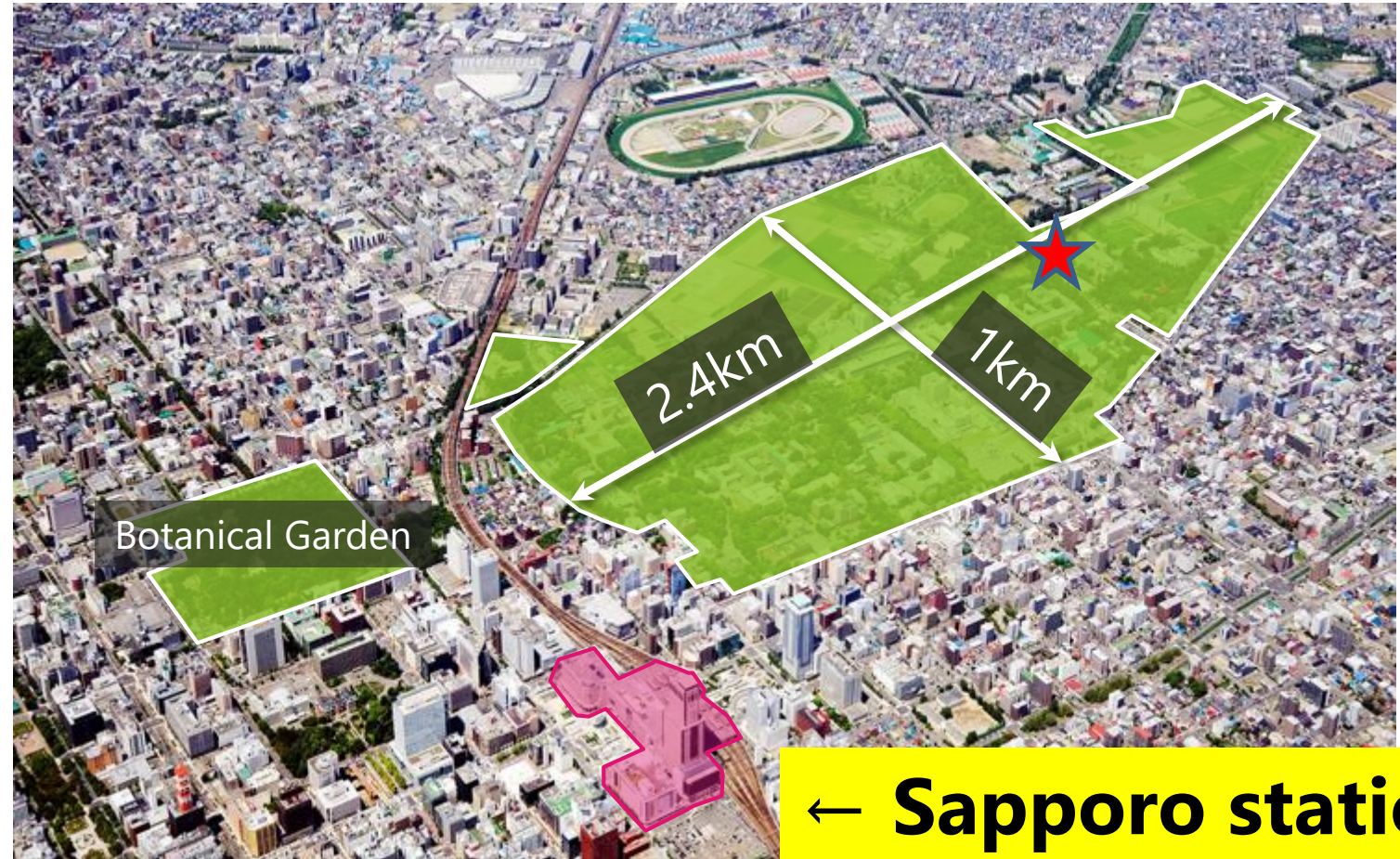
Isoda, Sakoda et al., *Viruses*, 2022  
<https://doi.org/10.3390/v14102168>



# Beautiful campus in the heart of Sapporo and **important surveillance spot for avian influenza**



北海道大学  
HOKKAIDO UNIVERSITY





# Veterinary School in Hokkaido University



**April 29, 2023**



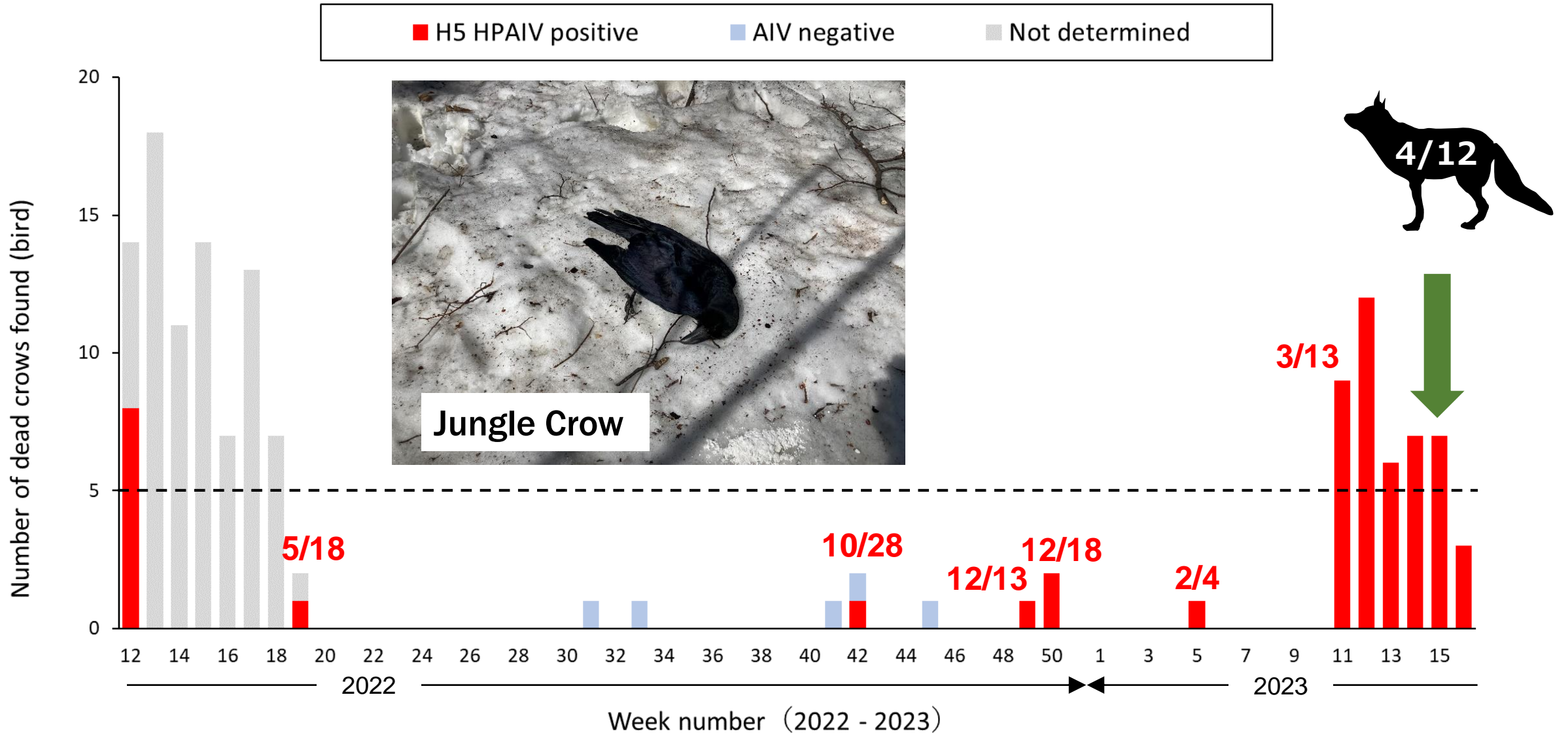


2022年12月24日 PM4: from my office





# Dead crows found in Hokkaido University in Sapporo



As of 27<sup>th</sup> April, 2023

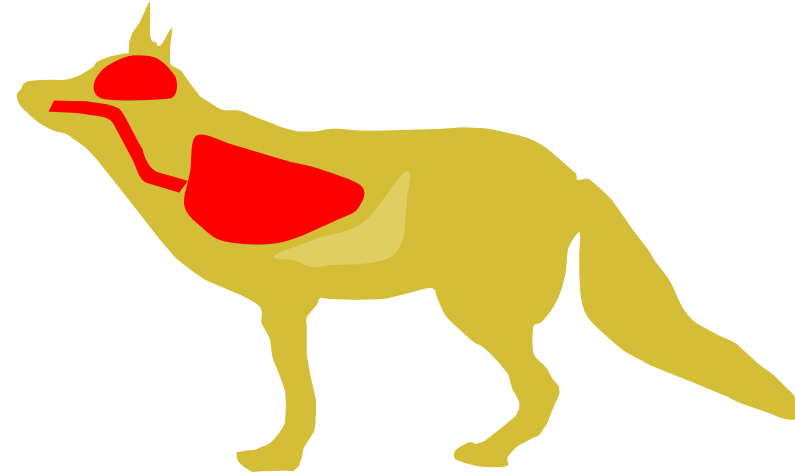
# HPAIV cases in an Ezo red fox and a tanuki



**2022 and 2023**



**2022**

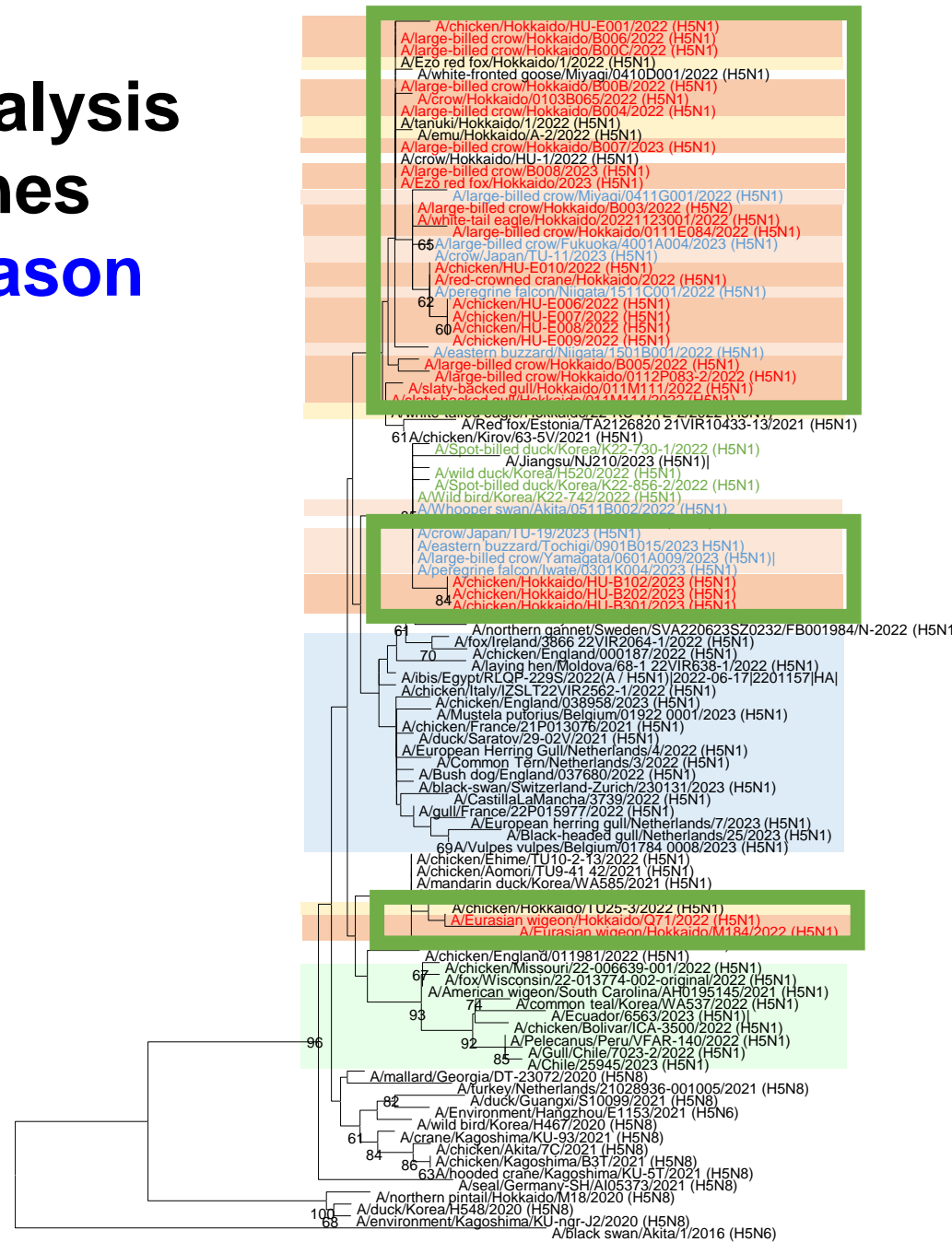


**髄膜脳炎: meningoencephalitis**

Hiono, Sakoda et al., *Virology* 2023 Jan;578:35-44.  
doi: 10.1016/j.virol.2022.11.008.



# Phylogenetic analysis of the H5 HA genes in 2022–2023 season HPAIVs in Japan



2022–2023  
Hokkaido

2022–2023  
Japan

2021–2022  
Hokkaido

2022–2023  
South Korea

2021–2023  
Europe

2022–2023  
North and South America

G2d:  
Hokkaido isolates  
in 2021–2023

G2c:  
Southern Japan  
isolates in 2022–2023

G2e:  
Europe isolates  
2021–2023





G2b:  
Southern Japan  
isolates 2021–2022

G2a: Southern Japan  
Isolates 2020–2021

G1: Southern Japan  
Isolates in 2020

2.3.4.4b

# No mammalian adaptations for the Fox and tanuki isolates

Proteins	Mutations	Viruses				References
						
PB2	E 627 K	E	E	E	E	Hatta et al., Science, 2001
	D 701 N	D	D	D	D	Li et al., J Virol, 2005
HA	Q 226 L	Q	Q	Q	Q	Rogers and Paulson, Virology, 1983
	G 228 S	G	G	G	G	Rogers and Paulson, Virology, 1983

**Blue:** avian type. **Red:** human type

Accession numbers

Fox: EPI2021929–36; Tanuki: EPI2109940–7; Crow: EPI2021937–44; White-tailed eagle: EPI2109932–9

illustration <https://www.irasutoya.com/>

Hiono, Sakoda et al., Virology 2023 Jan;578:35-44.  
doi: 10.1016/j.virol.2022.11.008.



# However, viral passages in wildlife is problematic....



左：<https://blog.goo.ne.jp/katchgoo/e/tda9715>  
中央：<https://blog.goo.ne.jp/namikazetateo/m/20>  
右： 演者 2022年6月12日





## Sample collection



## Virus isolation and preservation

**HA test positive**

	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11	H12	H13	H14	H15	H16
N1	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
N2	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
N3	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
N4	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
N5	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
N6	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
N7	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
N8	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
N9	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

● Isolation in field (81 strains) ● Made in lab. (63 strains)

**All isolates**

**Registration**

## Whole genome sequence

**Next generation sequencer**

**Whole genome sequence in all eight segments**

PB2  
PB1  
PA  
HA  
NP  
NA  
M  
NS

**Registration**

## Release in database

**All isolates were registered and shared on Hokkaido University Influenza Virus Database System or public database (DDBJ/GenBank/EMBL).**

## Research and development



# Acknowledgements

- Wildlife Division, Nature Conservation Bureau, Ministry of the Environment
- Ishikari Subprefectural Bureau of Hokkaido Government, Hokkaido Government
- Dr. Keisuke Saito, Institute for Raptor Biomedicine Japan

Laboratory of Microbiology,  
Faculty of Veterinary Medicine, Hokkaido University

