EFSA RISK ASSESSMENT ON HIGHLY PATHOGENIC AVIAN INFLUENZA: LAST OUTPUTS

Alessandro Broglia

EFSA

Biological Hazards & Animal Health and Welfare Unit

With contribution of

Istituto Zooprofilattico Sperimentale delle Venezie

ecdc EUROPEAN CENTRE FOR DISEASE PREVENTION AND CONTROL

efsa EUROPEAN FOOD SAFETY AUTHORITY

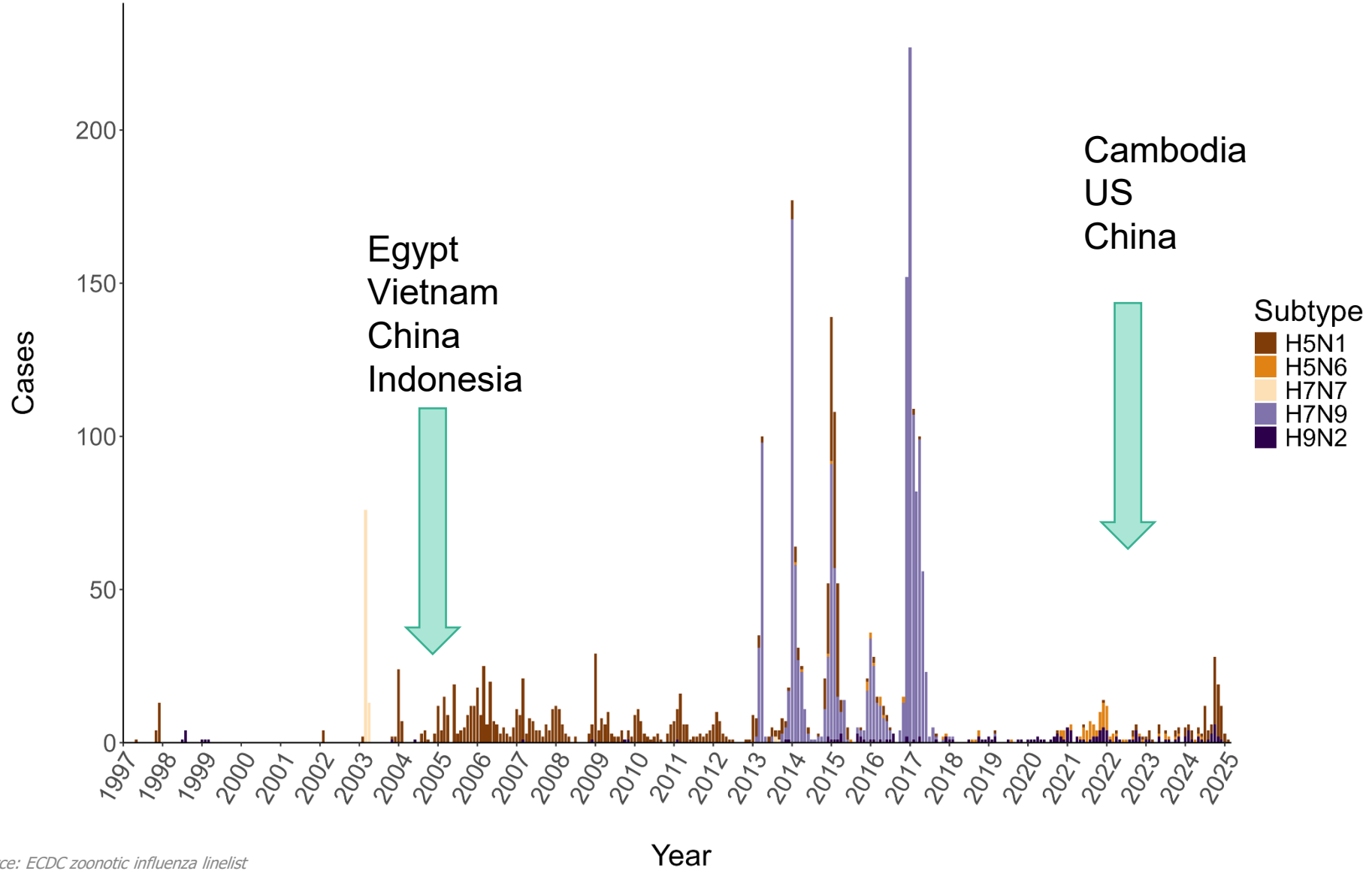
OUTLINE

- Contribution to **preparedness, prevention, and control** related to **zoonotic** avian influenza
- **Cattle infections in US** and possible pathways of **HPAI introduction** into EU
- **Wild bird surveillance** for early detection

- Mutations for mammals and human adaptation of AIV
- Surveillance, prevention and control



REPORTED HUMAN CASES OF AVIAN INFLUENZA 1997 – 13 FEB 2025



- A(H7N9)
- A(H5N1)
- A(H9N2)

*Human cases of A(H5) epidemiologically linked to A(H5N1) outbreaks in poultry and dairy cattle are included in the reported number of cases of A(H5N1).
**Includes detections of A(H5N1) due to suspected environmental contamination reported in 2022 (three detections) and 2023 (three detections, one inconclusive).

Source: ECDC zoonotic influenza linelist

ANALYSIS OF AIV MUTATIONS TOWARDS ZOONOTIC AI

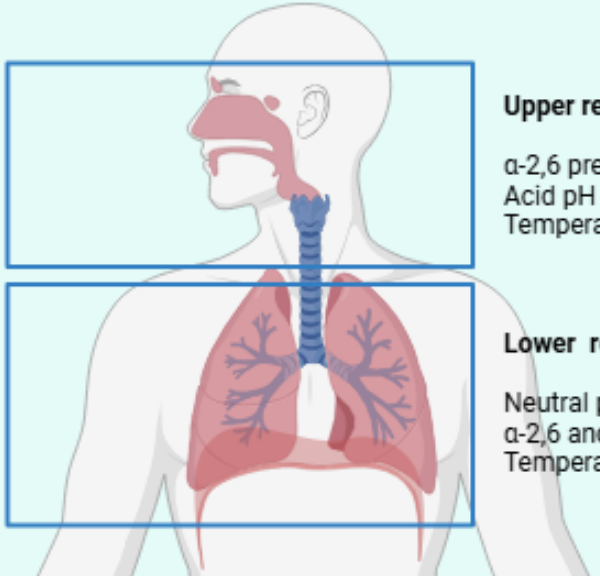
Avian influenza virus preferences

BINDING: AIV HAs bind α2-3-linked SA

pH STABILITY: Limited acid stability of the AIV HAs

Temperature: AIV polymerases more active at high temperatures (i.e. 37 and 42 °C)

Human host



Upper respiratory tract

α-2,6 predominant
Acid pH
Temperature: 32°C

Lower respiratory tract

Neutral pH
α-2,6 and α-2,3
Temperature: 37°C

Avian host

Both α-2,3 and α-2,6 receptors present in the respiratory and intestinal tracts

α-2,3 predominant

Temperature: 41 °C

ANALYSIS OF AIV MUTATIONS TOWARDS ZOONOTIC AI

- **Output**: 34 mutations linked with 5 relevant phenotypic traits for virus zoonotic potential

- **Sporadic viruses identified with multiple mutations** >>> combination of traits only in 144 viruses (over 27k sequences analysed) , mostly in **H9N2** subtype from Asia and Africa (2012 – 2023), others are A(H7N9), A(H3N8), A(H5N6)

  - In EU/EEA, 2021-2024, **H5Nx 2.3.4.4b** acquired highest number zoonotic traits, mainly due to wide spread;

  - Accumulation of **multiple phenotypic traits** leads to significantly increased zoonotic potential in a single host, but **uncommon and gradual process**

MUTATION ANALYSIS - RECOMMENDATIONS

- **To invest in bioinformatics tools:** characterisation of emerging viruses, on new mutations and traits and their combination >>
- **To ensure comparability of studies:** harmonisation in experimental characterisation studies
- To use **Whole Genome Sequencing** approaches (rather than partial sequences)
- comprehensive **metadata collection** needed (besides sequence data)
- List of **mutations of zoonotic traits to be continuously updated**: new studies >> new mutations
- To develop the **framework for assessing pandemic potential beyond the individual mutations**

ANIMAL HEALTH SURVEILLANCE

Objective: monitoring and **detection of AIV mutations** for mammal adaptation mutations

- **Risk-based passive surveillance** >> Target animals:
  - **Mammals with known exposure** to AIV infected birds or mammals
  - **Mammals found dead** in risk areas and periods
  - **Mammals with unexplained signs** in risk areas and periods

- Sampling all or sub sample of **sick or found dead animals per outbreak + WGS**
  - tissue from organs linked to clinical signs
  - Repeated sampling and sequencing over time if no culling applied

PREVENTION AND CONTROL MEASURES

At farm level

- **Biosecurity** to reduce the risk of HPAI introduction
- **Contingency plans** for facing outbreaks in new species
- **Farm location and type of breeding systems:** location close to wetlands, open breeding systems, high density of animals and farms >> risk factors

When detected:

- Isolation of infected animals, (culling), disposal of carcass, products
- Quarantine, movement restriction, contact tracing
- promptly apply control measures (from the outbreak start), to contain the spread

BIOSECURITY CAMPAIGN

efsa EUROPEAN FOOD SAFETY AUTHORITY

EN English Menu Search news, topics,

Home

No bird flu: protect your farm!

https://www.efsa.europa.eu/en/no-bird-flu#resources-to-share

PREVENTION AND CONTROL MEASURES

For the general public

Clear communication e.g. on:

- Avoid consumption of **raw dairy** products from areas with infected dairy cattle
- **Companion animals** roaming outdoor in infected areas/farms
- **Backyard farming**: hygiene, protective measures, report of any case or suspicion

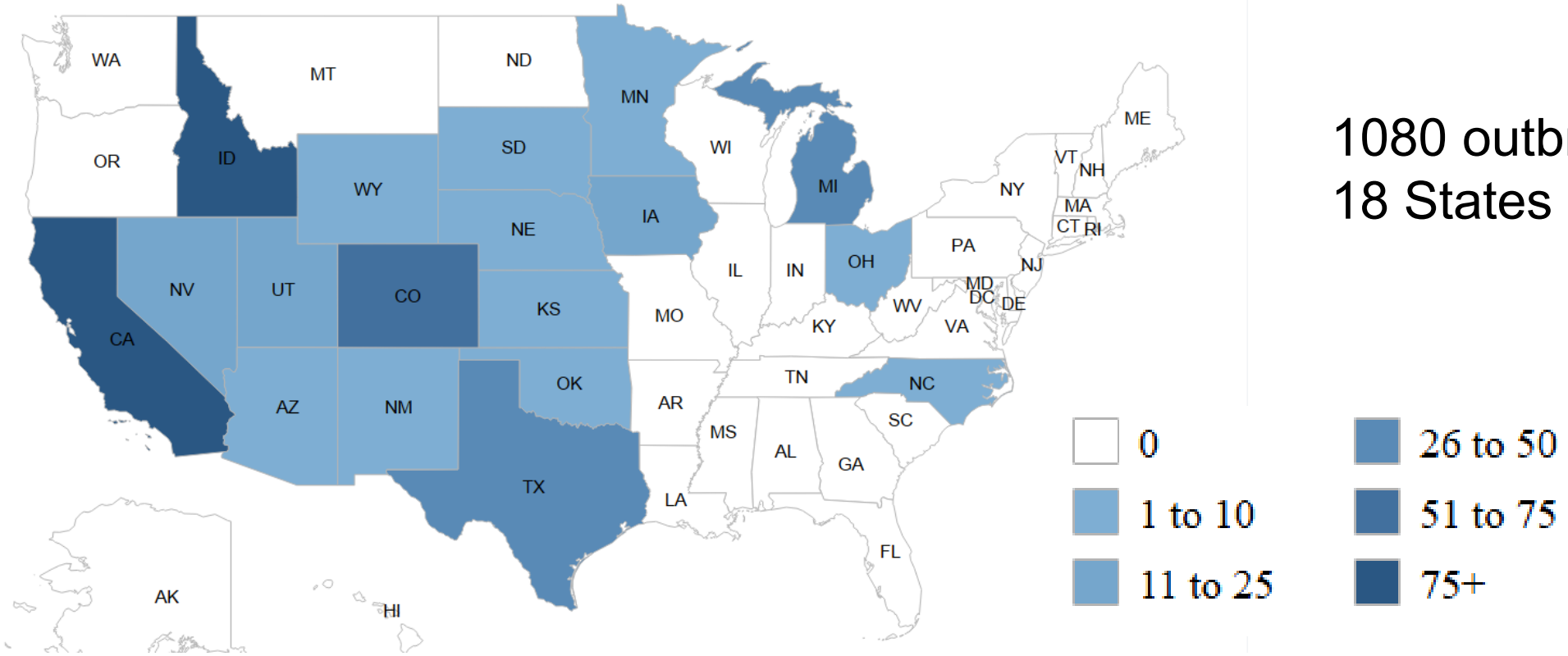
Wildlife management

- **Biosecurity** in handling animals/carcasses
- Removal of **carcass** and **waste** disposal
- strengthening wildlife-related **stakeholders' network**

- Cattle infections in US
- possible pathways of HPAI introduction into EU

OUTBREAK IN US DAIRY CATTLE

Cumulative number of HPAI H5N1 B3.13 reported cases in dairy farms per state in US (25/03/2024 – 15/09/2025)



1080 outbreaks in
18 States

- affected states >> 58% of U.S. dairy cattle population (tot 5,4 millions head)
- California: total 1,688,202 bovines in 1117 farms

PATHWAY OF HPAI INTRODUCTION INTO EU FROM US

TRADE of animal products:

- **Raw or insufficiently treated milk and dairy products** - uncertainty around the efficacy of non-thermal treatments and product labelling
- **Live bovine and bovine meat**, but limited virus detection in muscle tissue

Lack of knowledge regarding pathway:

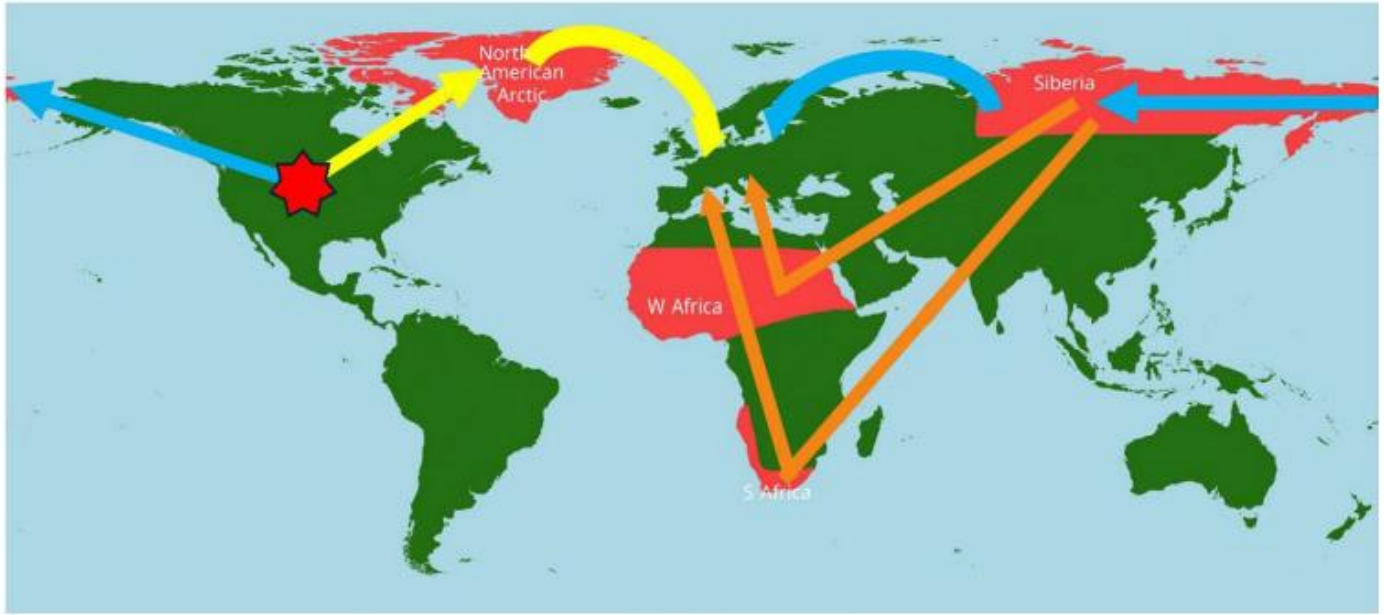
- No reports of investigations of bovine semen, embryos, oocytes or fetal calf serum

Overall: **low quantities of these commodities traded from the US to the EU**

PATHWAY OF HPAI INTRODUCTION INTO EU FROM US

Migratory waterbirds

- migration seasons (April–May) and non-breeding season (September–April)
- North American Arctic route most likely
- US birds may come into contact with European birds

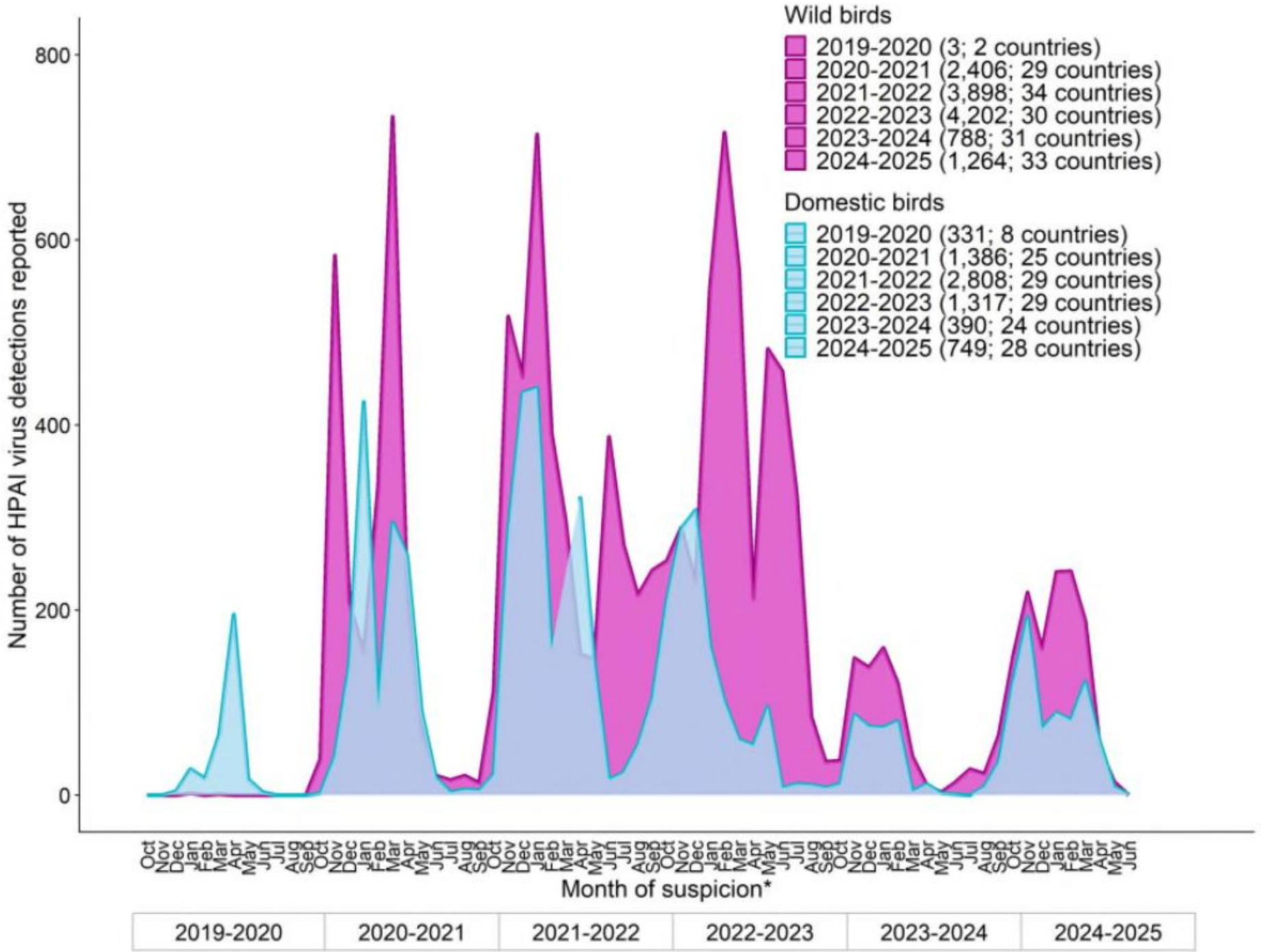


yellow arrows = intercontinental transmission via the North American Arctic
blue arrows = intercontinental transmission via Siberia
orange arrows = secondary transmission in West or South Africa

Likely key entry points to EU:

- Iceland, Ireland, western Scandinavia
- large wetlands like the Wadden Sea

Wild birds surveillance for early detection


Wild birds
2019-2020 (3; 2 countries)
2020-2021 (2,406; 29 countries)
2021-2022 (3,898; 34 countries)
2022-2023 (4,202; 30 countries)
2023-2024 (788; 31 countries)
2024-2025 (1,264; 33 countries)
Domestic birds
2019-2020 (331; 8 countries)
2020-2021 (1,386; 25 countries)
2021-2022 (2,808; 29 countries)
2022-2023 (1,317; 29 countries)
2023-2024 (390; 24 countries)
2024-2025 (749; 28 countries)
Number of HPAI virus detections reported
800
600
400
200
0
Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep
Month of suspicion*
2019-2020
2020-2021
2021-2022
2022-2023
2023-2024
2024-2025

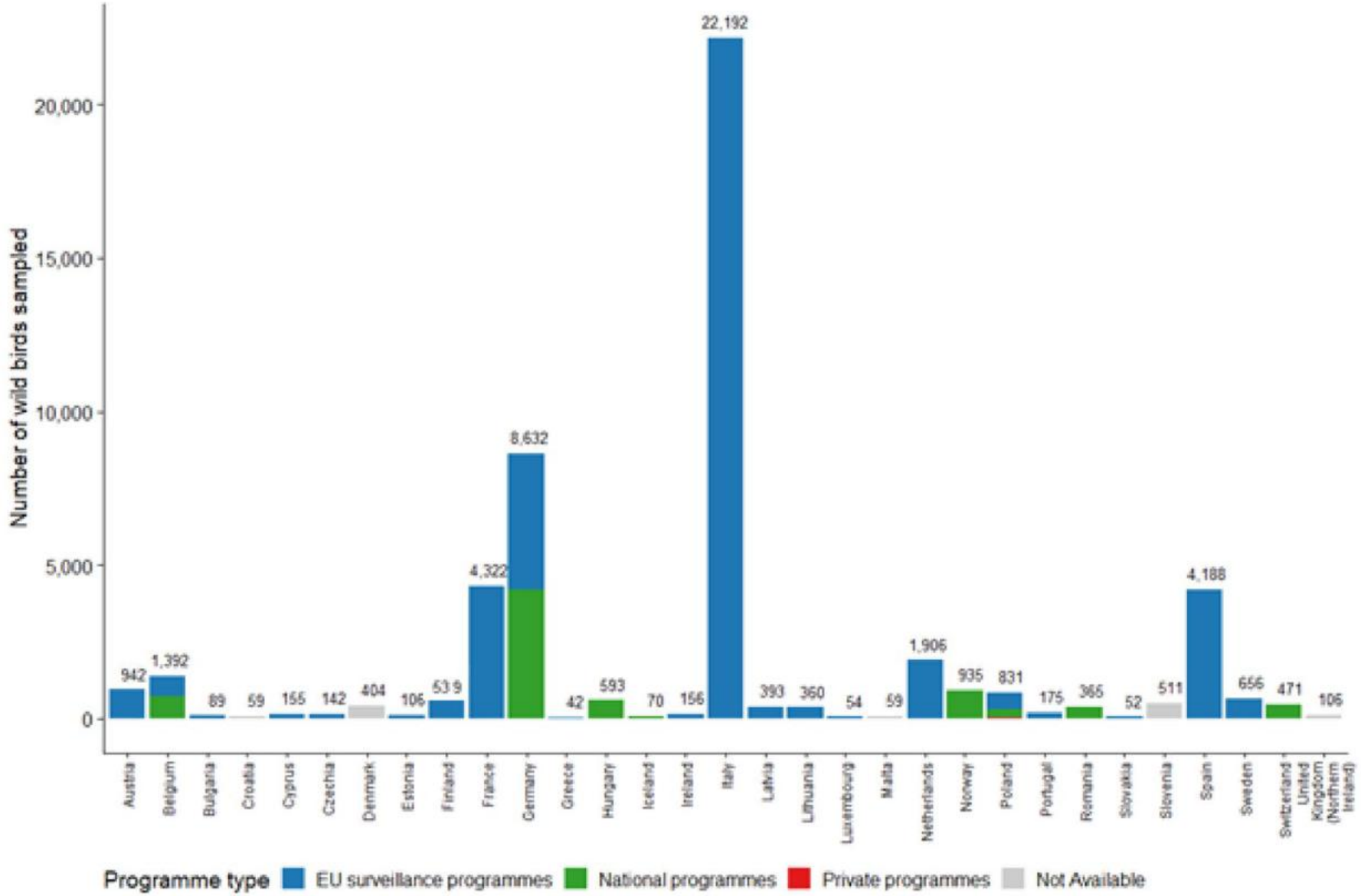
AVIAN INFLUENZA ANNUAL REPORT ON SURVEILLANCE IN POULTRY AND WILD BIRDS

Data from 31 EU/EEA countries from previous year (2023)

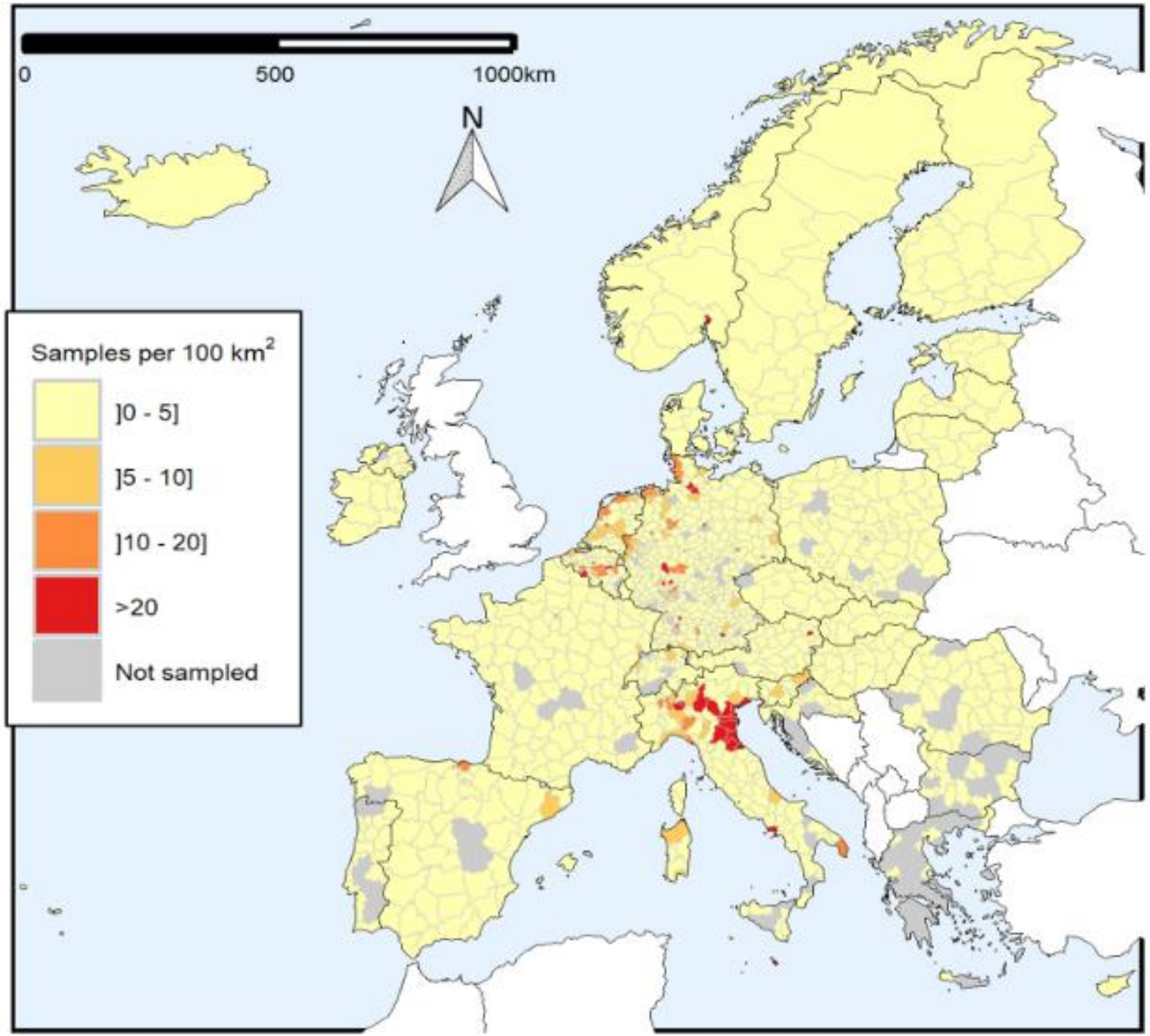
Wild birds: Early detection of AIVs in wild birds through virological surveys on

- Passive surveillance:
  - found dead
  - alive with clinical signs
- Active surveillance:
  - hunted with clinical signs
  - hunted without clinical signs
  - alive without clinical signs

WILD AND CAPTIVE BIRDS SAMPLED



SAMPLING DENSITY



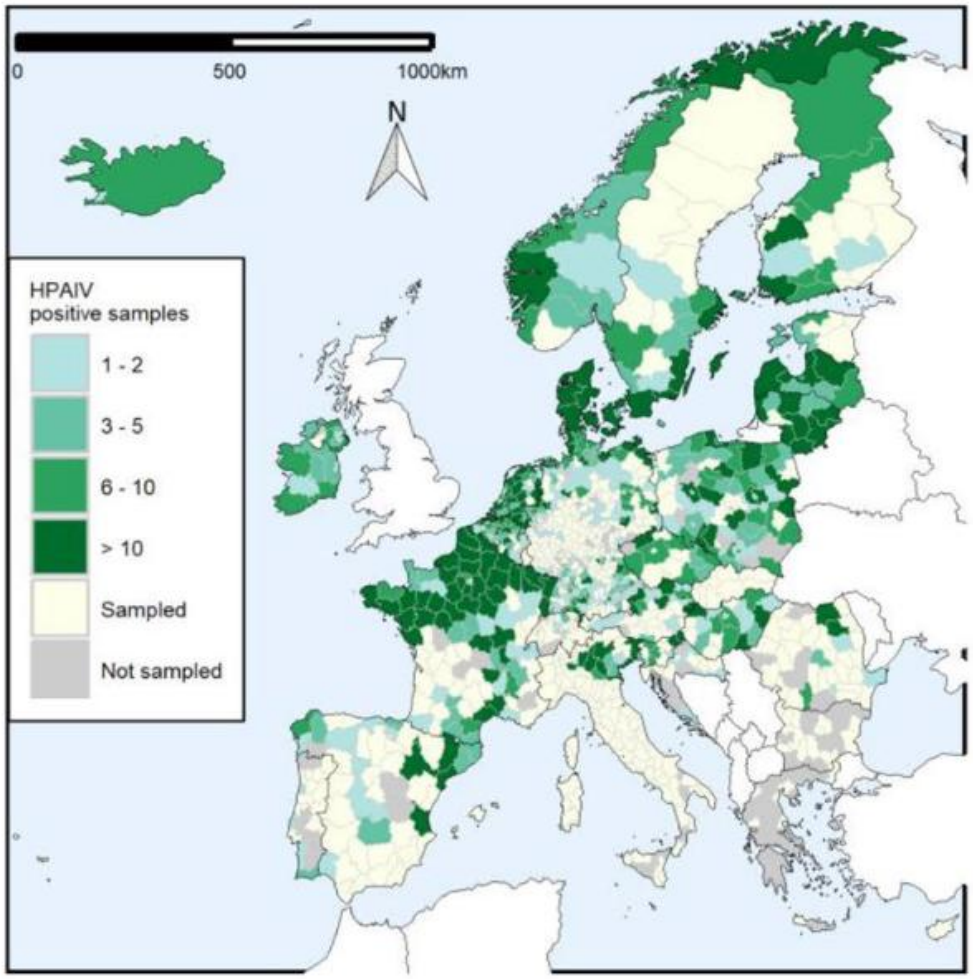
ACTIVE VS. PASSIVE SURVEILLANCE

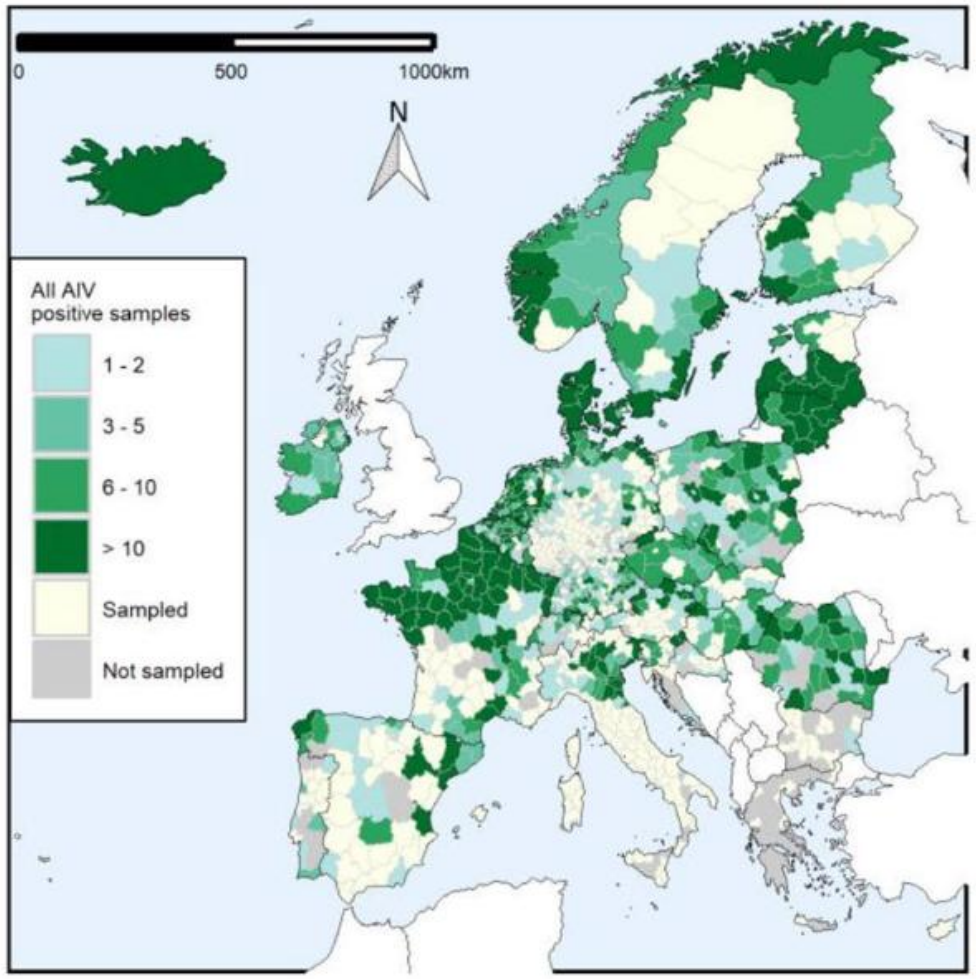
The choice of surveillance type is according to the virus pathogenicity:

- ✓ LPAI viruses >> active surveillance more effective
- ✓ HPAI >> passive surveillance more effective

Wild bird status		No. of wild birds sampled	No. of AIV-positive wild birds		
Bird status			Positive by PCR or VI	HPAIV	LPAIV
Active	Hunted without clinical signs	2041	141 (7%)	11	130
	Live without clinical signs	15,135	330 (2.2%)	49	281
	Subtotal	**17,176**	**471 (2.7%)**	**60**	**411**
Passive	Found dead	32,756	8010 (24.4%)	6523	1487
	Live with clinical signs	1387	136 (9.8%)	103	33
	Subtotal	**34,235**	**8186 (23.9%)**	**6657**	**1529**
Total		**51,411**	**8657 (16.8%)**	**6717**	**1940**

RESULTS



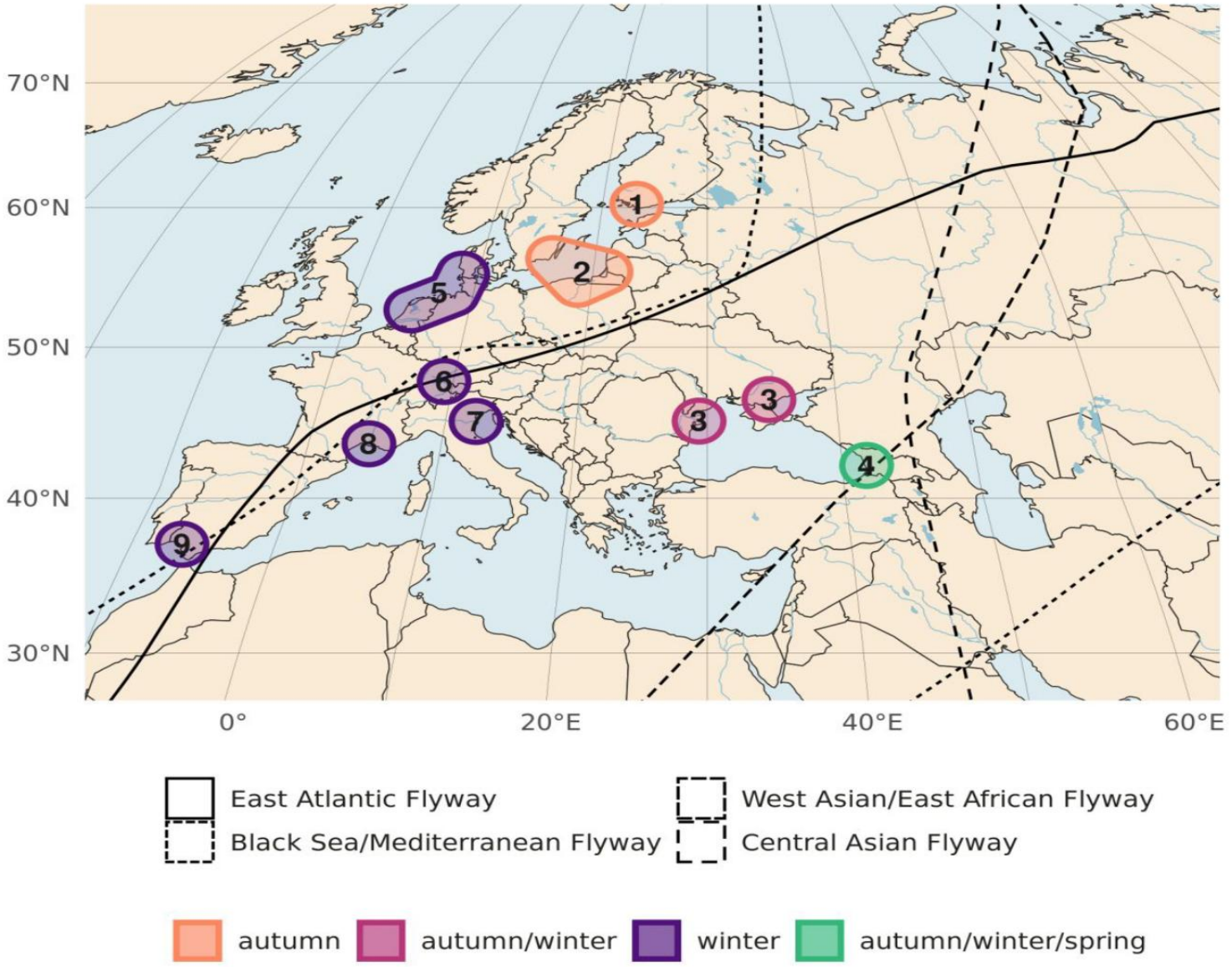


AIV-positive wild birds (left) and HPAIV-positive wild birds (right) by administrative unit

IMPROVING ACTIVE SURVEILLANCE IN WILD BIRDS

- Establishment of a coordinated **network of active surveillance nodes** across Europe
- Testing the **added value** of active wild bird surveillance to other surveillance efforts
- Increasing the **pool of genomic sequences**
- **Preparedness** and **early warning**

- **9 surveillance nodes** (geographic locations)



TASKS OF THE NETWORK

- **Establishment** and **maintenance** of:
  - **infrastructure** (e.g. wild bird traps, transport vehicles)
  - **capacities** (e.g. manpower, laboratory benches, IT systems)
- **Participation** in the **network** (e.g. training, annual meetings)
- Harmonised **sampling plan** and **data collection/sharing** framework
- Sampling and testing
  - **Field work** (i.e. trapping/hunting and sampling)
  - **Screening** for HPAI viruses by rapid diagnostic methods (e.g. PCR)
  - **Whole genome sequencing**
- Real-time **data collection**, **collation** and **submission** to the coordination team
- Preparation of a communication plan to keep national authorities involved and/or informed

PUBLICATIONS

- Scientific opinion: **Preparedness, prevention and control related to zoonotic avian influenza** https://www.efsa.europa.eu/en/efsajournal/pub/9191

- Scientific report: **Risk posed by the HPAI currently circulating in the US** https://efsa.onlinelibrary.wiley.com/doi/epdf/10.2903/j.efsa.2025.9508

- **Avian influenza annual report on surveillance** https://efsa.onlinelibrary.wiley.com/doi/epdf/10.2903/j.efsa.2025.9197

THANK YOU FOR YOUR ATTENTION!

EFSA topic page on avian flu:

https://www.efsa.europa.eu/en/topics/topic/avian-influenza

LinkedIn

Bluesky