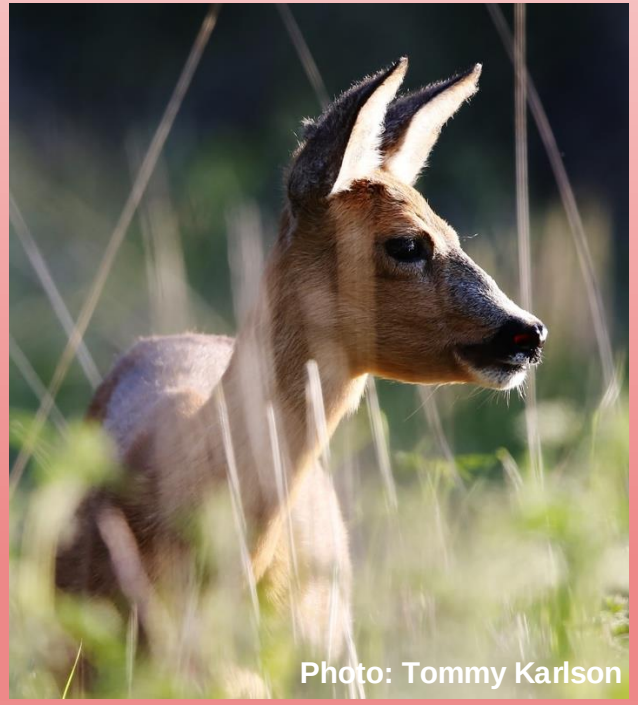
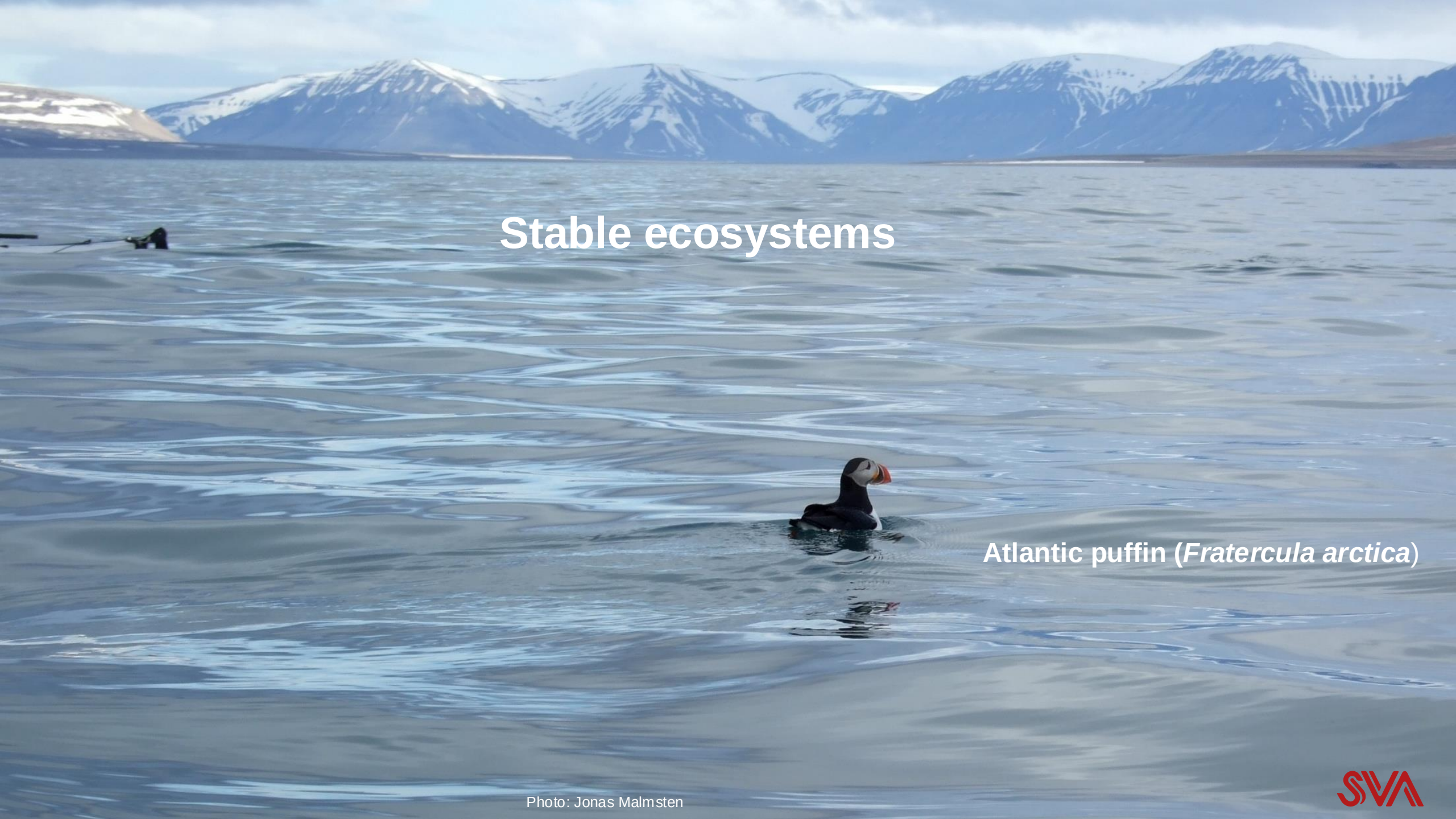
# Wildlife in focus: sources or victims of emerging diseases? The importance of wildlife disease surveillance

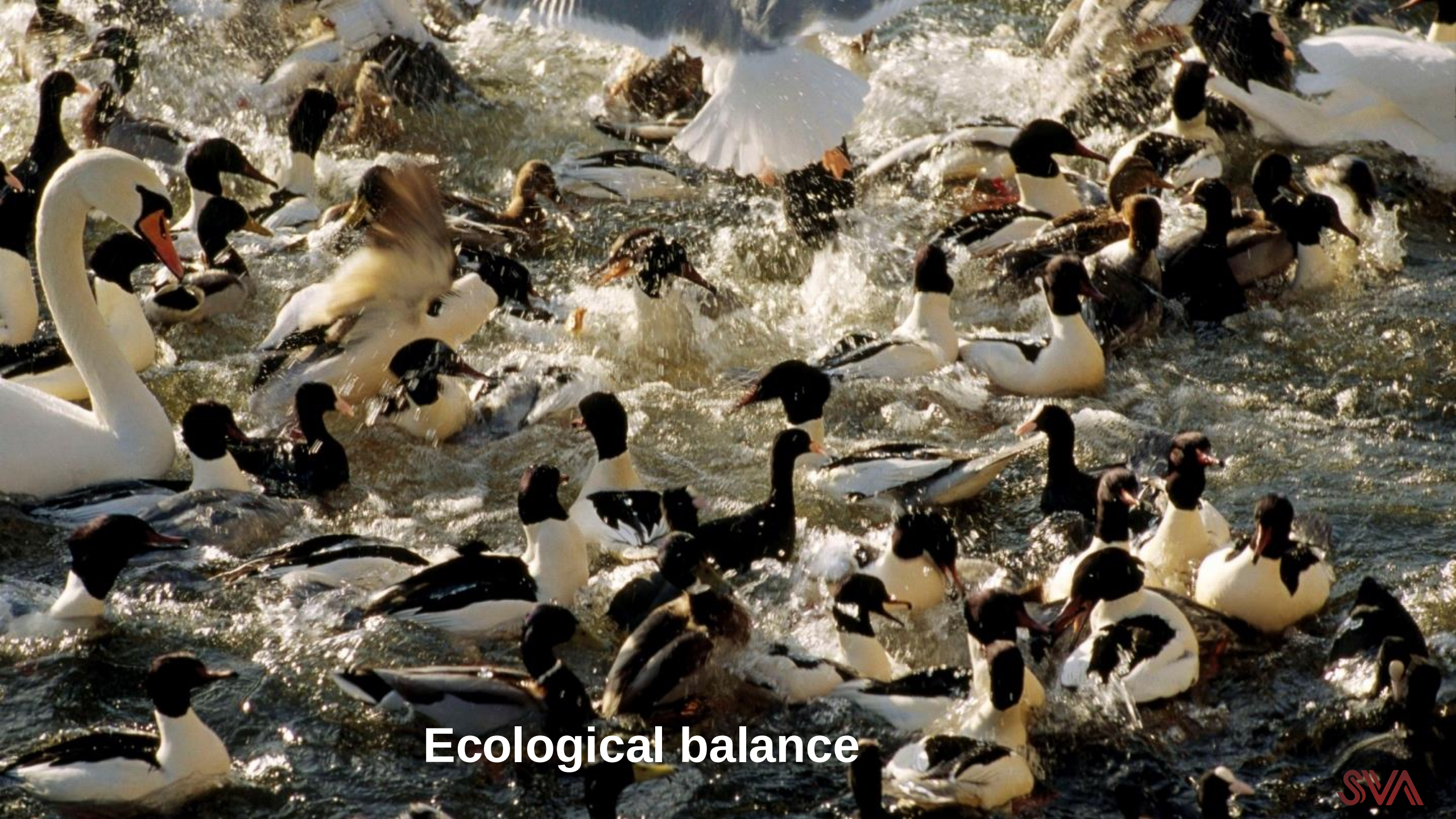


# Stable ecosystems



Atlantic puffin (*Fratercula arctica*)

Photo: Jonas Malmsten

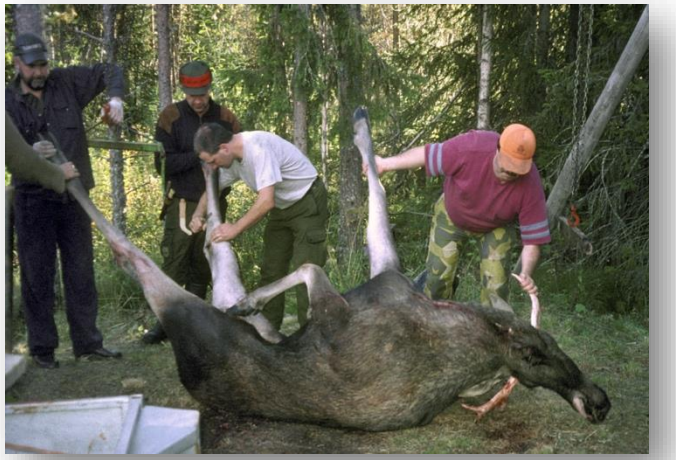

Ecological balance

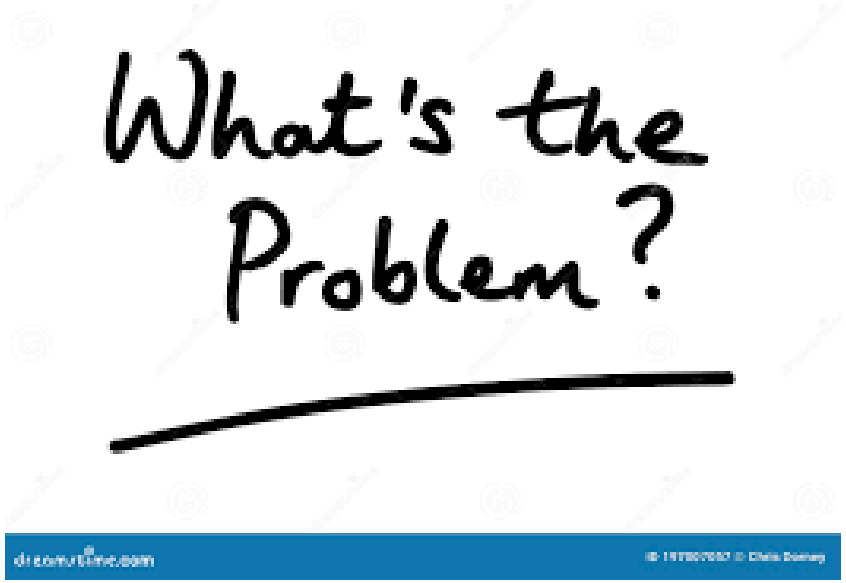
# Healthy ecosystems-healthy wildlife-healthy people

- Wildlife provides **ecosystem services** - Contribute to human well-being, survival and quality of life

- The value of wildife: social, cultural, economic and ecologic values

**Game meat**: ecological, climate friendly, renewable resource




What's the
Problem?

# Global human population growth!

~7,8 billion today
~8,5 billion by 2030
~9 billion by 2050

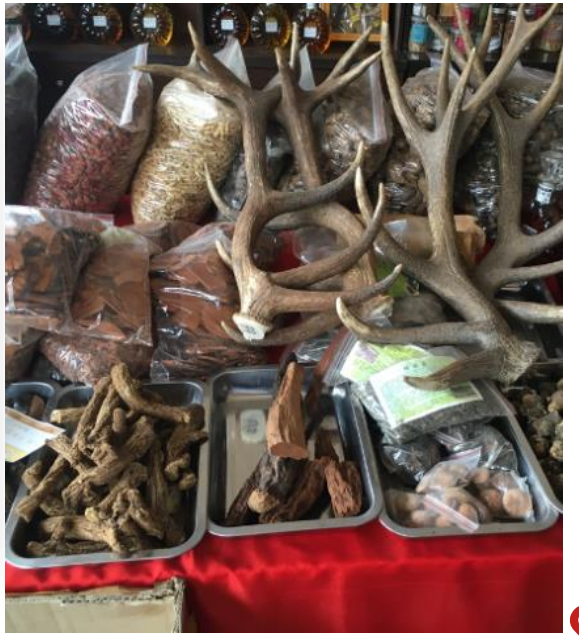
https://emagazine.com/still-surging-human-population-numbers-worry-environmentalists/

# Drivers of disease emergence

- Disruption of habitats, deforestation
- Fencing, roads, barriers
- Wildlife depopulation (cull of bats, rodents, wild ungulates, etc)
- Wildlife markets and trade
- Wildlife trafficking and movements, invasive alien species
- Transport of pathogens or vectors (‘pathogen pollution’)
- Climate change
- Land use change

https://penntoday.upenn.edu/news/climate-change-and-atmospheric-dynamics-unveil-future-weather-extremes

https://www.nature.org/en-us/newsroom/european-union-deforestation-free-ratified



https://www.ecohealthalliance.org/2018/02/heres-how-wildlife-trade-and-disease-spread-are-linked

# Drivers of disease emergence

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- Wildlife markets and trade
- Wildlife trafficking and movements
- Transport of pathogens or vectors
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**Human behaviour**

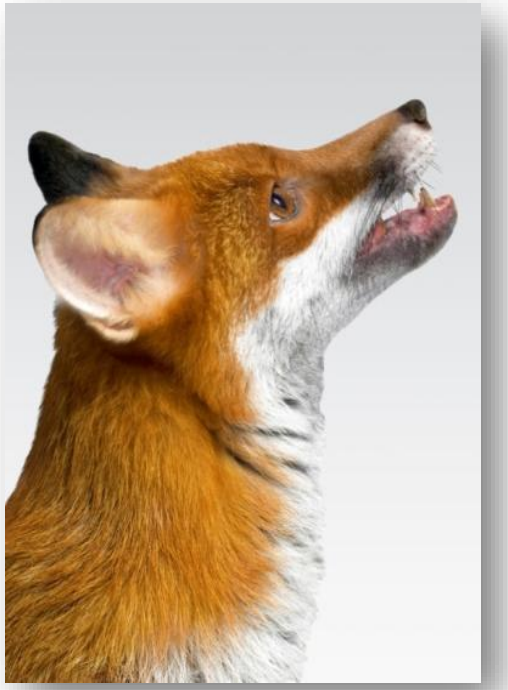
https://www.nature.org/en-us/newsroom/european-union-deforestation-free-ratified

https://penntoday.upenn.edu/news/climate-change-and-atmospheric-dynamics-unveil-future-weather-extremes

https://www.ecohealthalliance.org/2018/02/heres-how-wildlife-trade-and-disease-spread-are-linked

# Emerging infectious diseases (EID)-in humans

- Dominated by zoonoses (60%)
- 71.8% of EID zoonoses are caused by pathogens with a wildlife origin



Zoonoses from wildlife represent the most significant, growing threat to global health of all EID

(K.E. Jones et al, Nature 451, 2008)

# Covid-19 pandemic


https://www.nycclc.org/news/2020-08/covid-19-pandemic-resources

SARS-CoV-2 coronavirus

https://www.niussp.org/health-and-mortality/covid-19-pandemic-demographic-highlights/

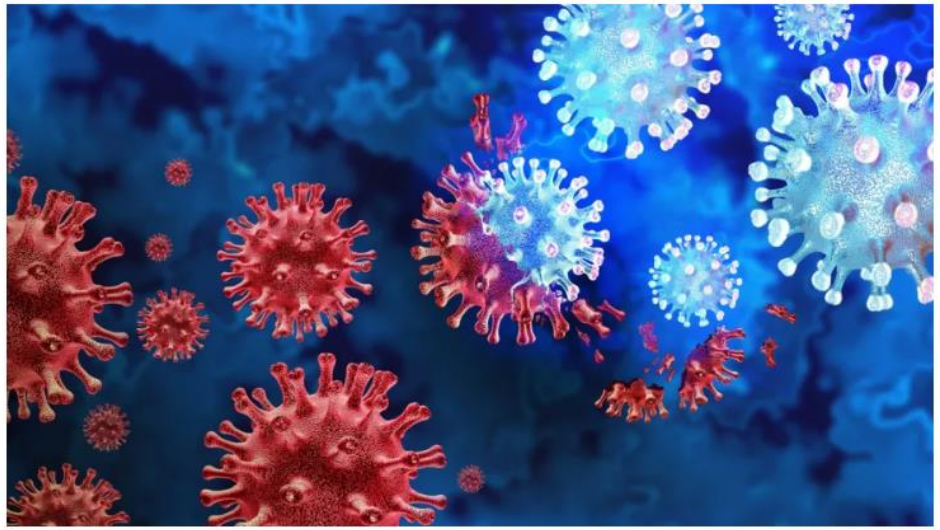
PHOTO: MINDEN PICTURES, IN HTTPS://WWW.WSJ.COM/ARTICLES/THE-BATS-BEHIND-THE-PANDEMIC-11586440959

Intermediate horseshoe bat (*Rhinolophus affinis*)

# Disease X (unknown pathogen, ”next pandemic”)

## World health leaders warn of pandemic 20 times worse than COVID

- Disease X refers to a hypothetical unknown pathogen
- Such a virus could already be circulating in animals but not yet in humans
- Scientists say without preparation, next pandemic could be worse than COVID



*The virus is evolving through a "continual game of cat and mouse between the virus and our immune systems," an epidemiologist explained. (Getty Images)*

Steph Whiteside
Updated: JAN 23, 2024 / 08:45 AM CST

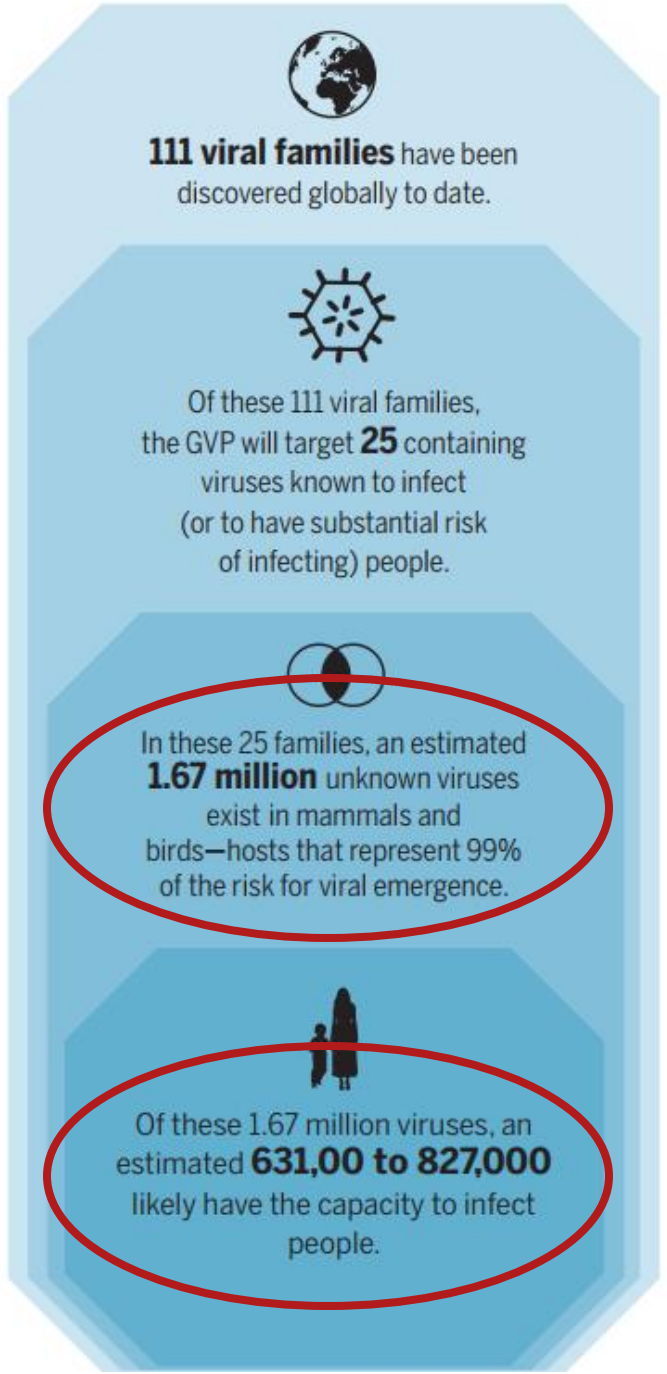
/www.newsnationnow.com/health/world-health-leaders-warn-pandemic-worse-covid/

Most likely a:

- Zoonotic, multi-host, widely distributed
- RNA virus
- Respiratory virus
- Emerging from high risk area
- Possibly already circulating in animals and has not yet made the jump to humans.

# The still unknown viruses of mammals and birds


10.1126/science.aap7463, 2018



# The impact of HPAI-H5N1 2.3.4.4b

- Numerous (”new”) species, ~489 bird species and ~48 **mammal** species!
- Threat to biodiversity, livestock, food security
- Risk to humans

17,000 elephant seal pups (*Mirounga leonina*) died, Punta Delgada, Argentina.© Valeria Falabella

Terns (*Sterna hirundinacea*), Punta Leon in Argentina,© Marcela Uhart, UC Davis

https://www.dailynewsegypt.com/2022/01/27/highly-pathogenic-avian-influenza-outbreak-confirmed-in-namibia/

# The impact of HPAI-H5N1 2.3.4.4b

- Panzootic
- Global spread, 6 continents

**Requires One Health approaches to disease control and prevention**

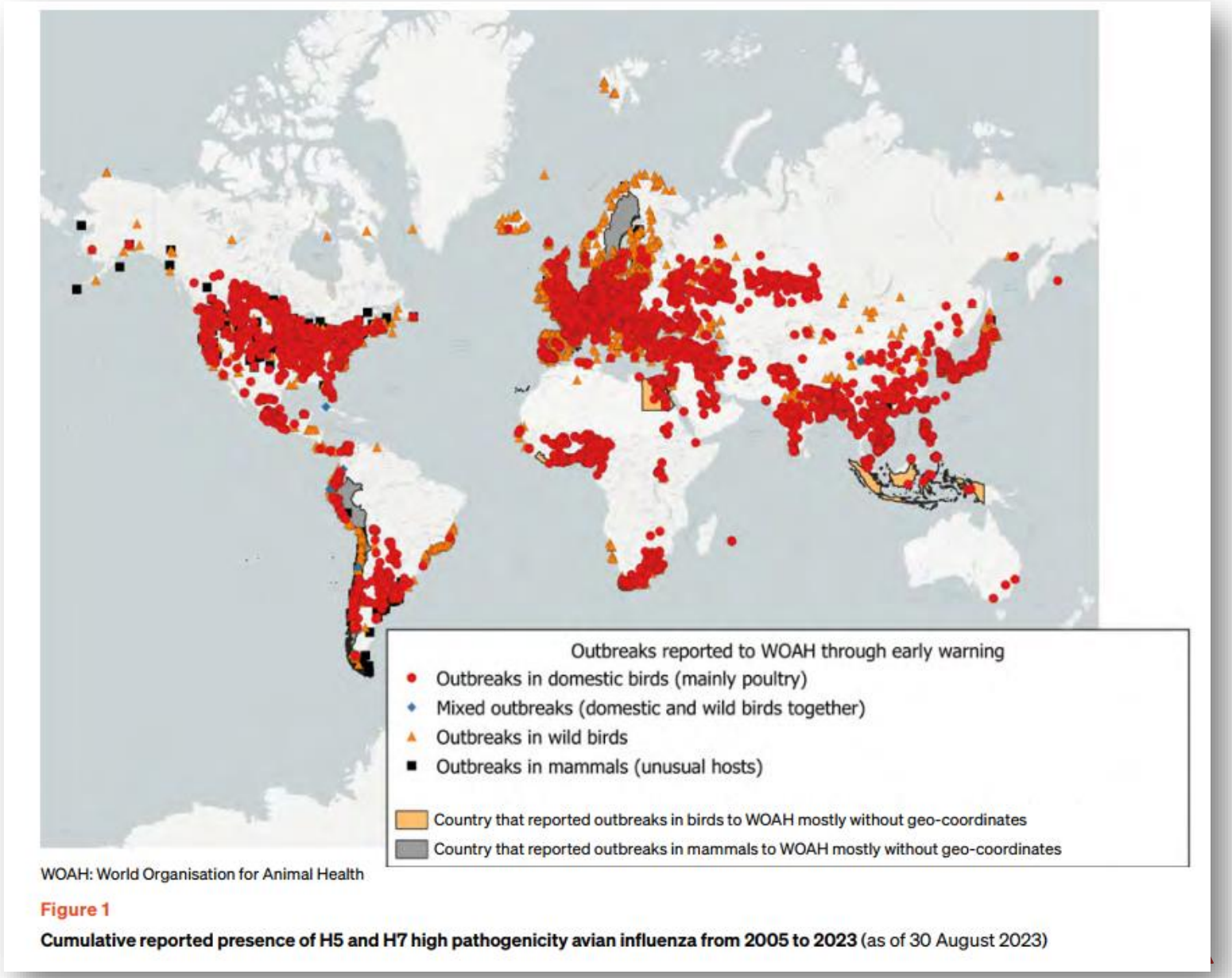



Figure 1

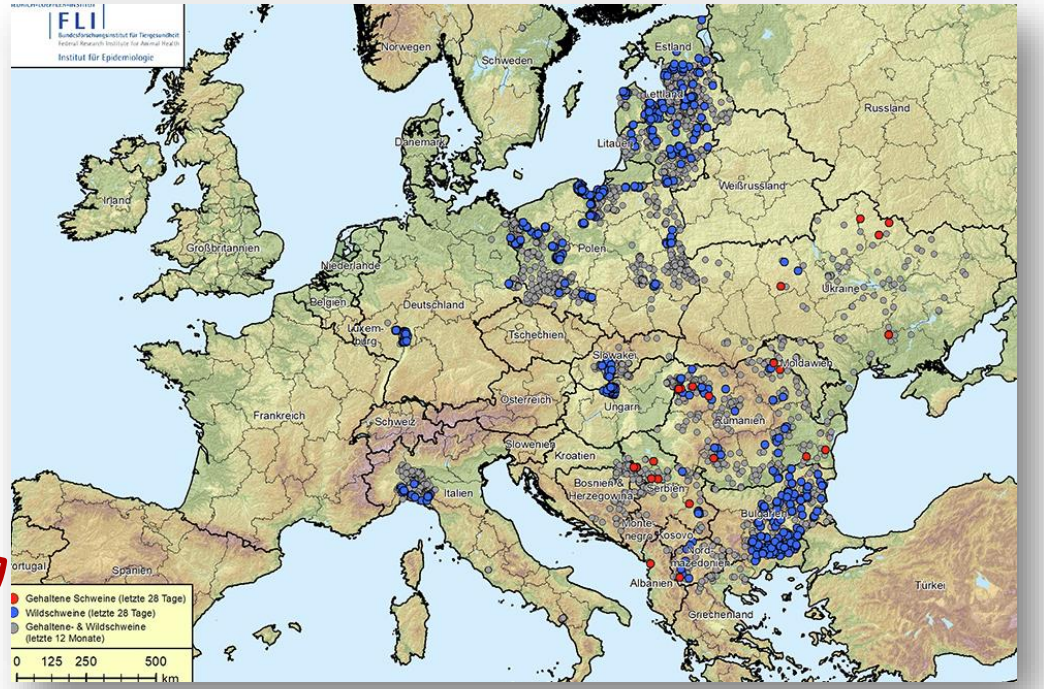
**Cumulative reported presence of H5 and H7 high pathogenicity avian influenza from 2005 to 2023** (as of 30 August 2023)

*Source: WOAH Scientific and Technical Review, Special Edition* 2024

# African swine fever: a socio-economic burden and a threat to food security and biodiversity


Wild boar=wildlife reservoir

- Introduced into Georgia from Africa via food leftovers from a boat, taken over by local pigs
- Spread to wild boar and domestic pigs
- Into EU 2014, Asia 2018….>70 countries, 5 continents




FLI, 7th Jan 2025

# Wildlife a victim of:

- Disease emergence
- Misinformation, wrong perceptions
- Depopulation, culling
- Habitat loss, climate change
- Trafficking, alien species
- Poor wildlife management
- Human activities

Pelican, oil spill

https://leesbird.com/2010/06/22/louisiana-oh-louisiana

Red squirrel *(Sciurus vulgaris*), pox virus

*Stone marten* (Martes foina) *culled in southern Sweden. The bright white throat patch and visible paw pads distinguishes it from the pine marten* (Martes martes). *Photo: Invasive species task force.*

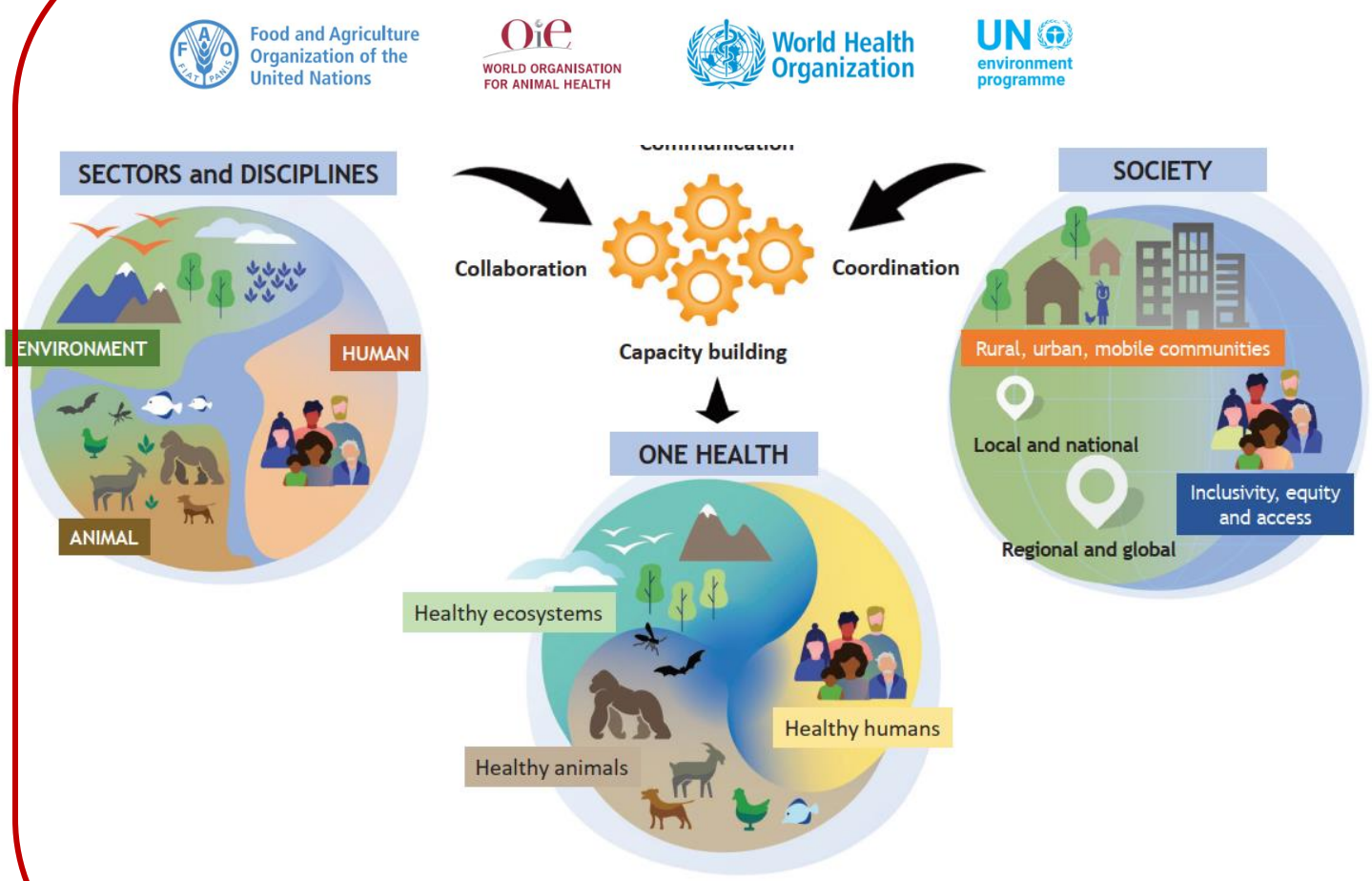
Stone marten (*Martes foina*), invasive sp.

https://westmorlandredsquirrels.org.uk/squirrels/threats-to-reds/

# What is being done about it ?

# One Health

- Global need to better manage risks from emerging diseases at the human-animal ecosystems interface, whilst protecting wildlife
- Animal (wild and domestic) health, balanced ecosystems, and biodiversity contribute to achieving One Health

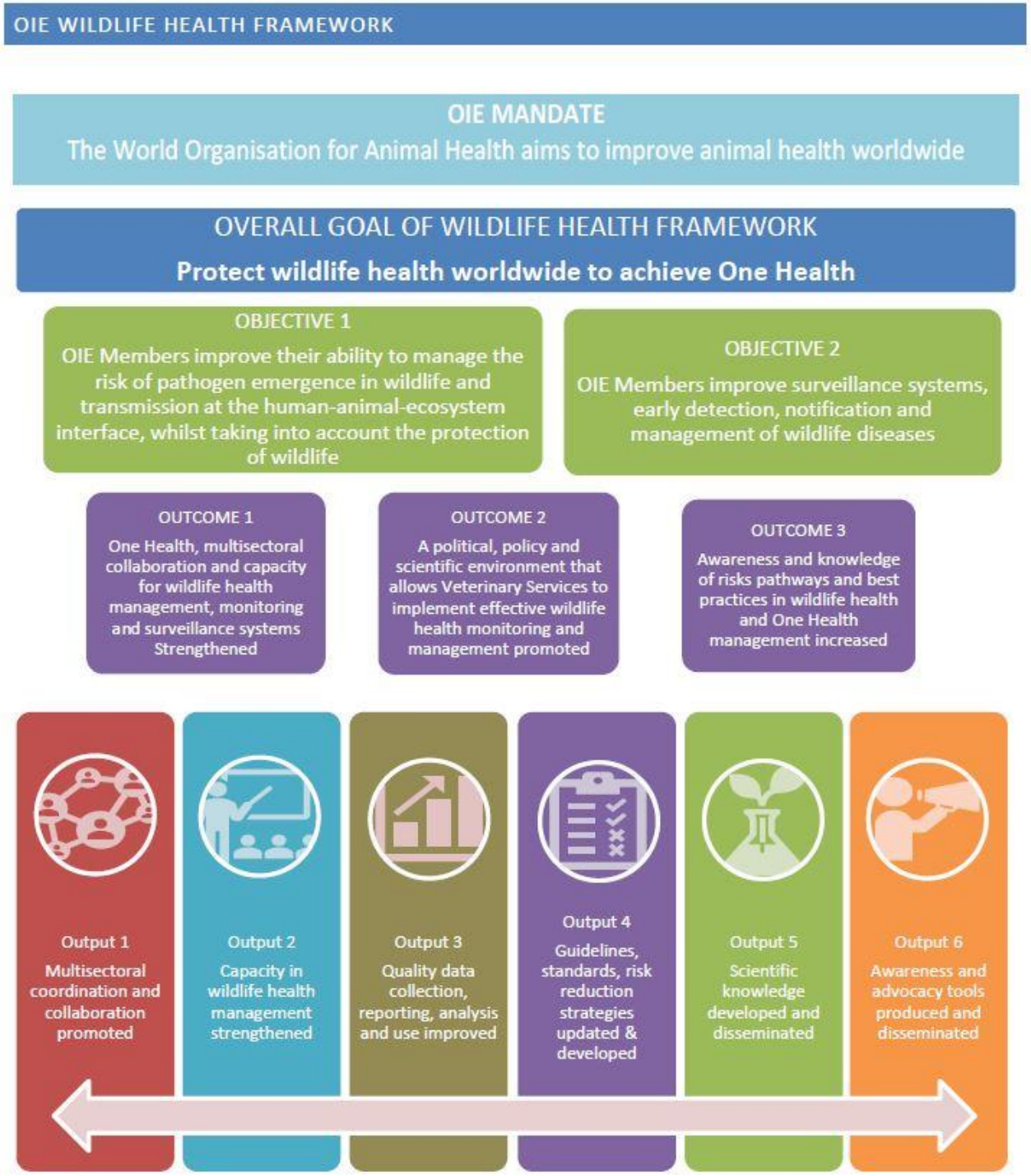



Quadripartite OH high level expert panel

## WOAH

**"In response to global trends in disease emergence and biodiversity loss there is recognition of an urgent need to strengthen the wildlife component of One Health"**

OIE WILDLIFE HEALTH FRAMEWORK (WHF). PROTECTING WILDLIFE HEALTH TO ACHIEVE ONE HEALTH. 2021



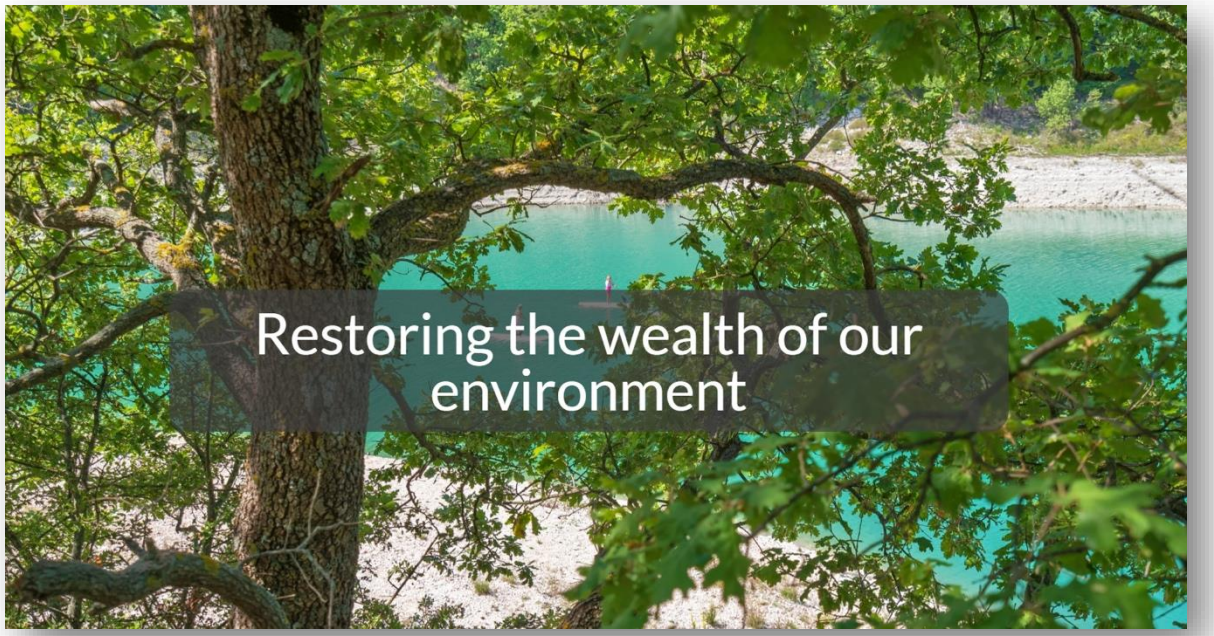

# The WOAH (OIE) Wildlife Health Framework

Support OIE Members in improving:

- ability to reduce, anticipate and manage the risk of pathogen emergence and transmission at the human–animal–ecosystem interface;
- early detection, notification and management of wildlife diseases.

**Ensuring that wildlife health is adequately monitored and managed with the same diligence as domestic animal health is vital for taking a One Health management approach by Veterinary Services**

# Political will, ambitions and trends in the EU

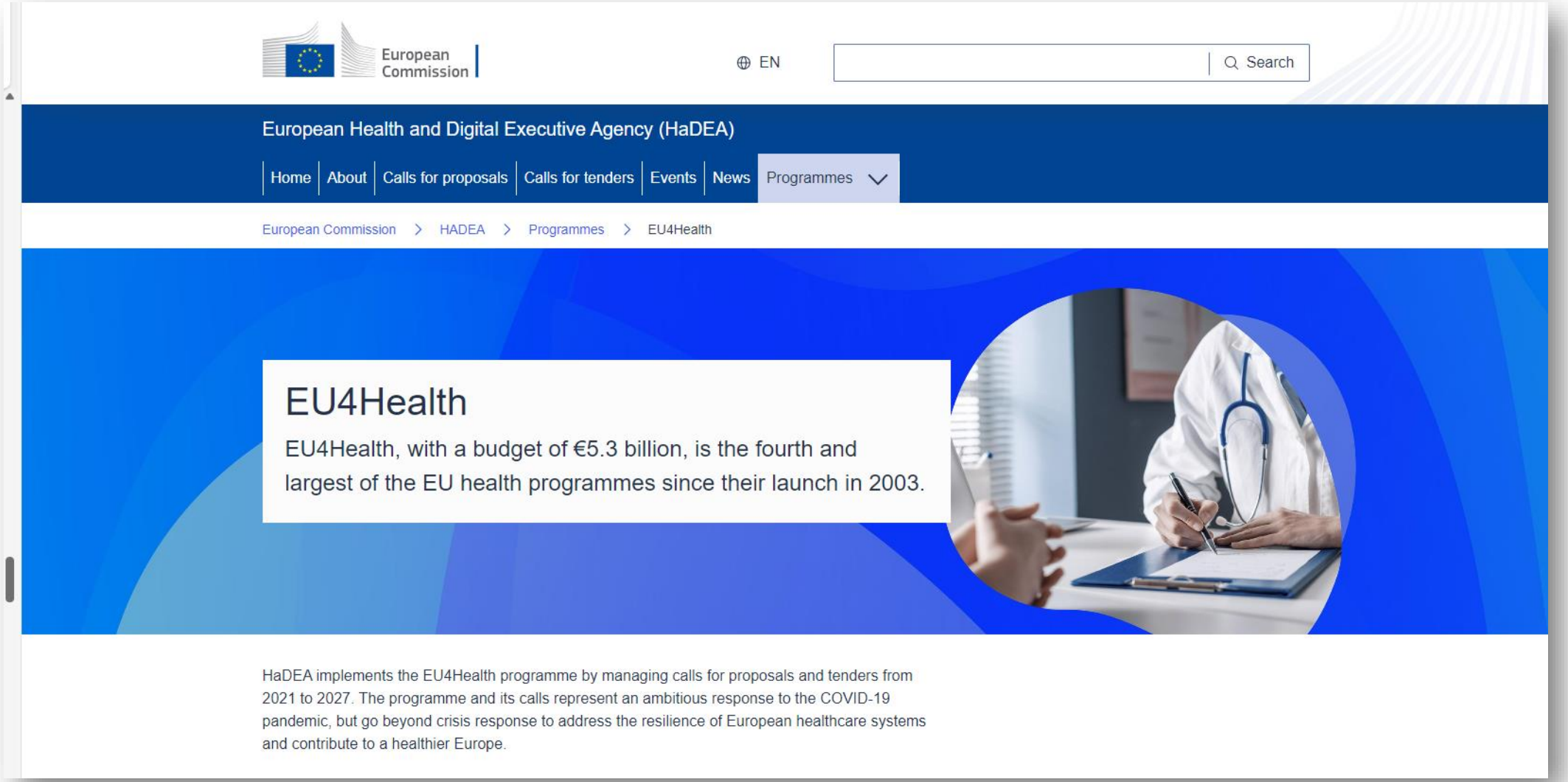




https://ec.europa.eu/stories/european-green-deal/

In EU, ~ €40 trillion depends on nature and its resources

**Green Deal "*Making the EU climate neutral by 2050*"**

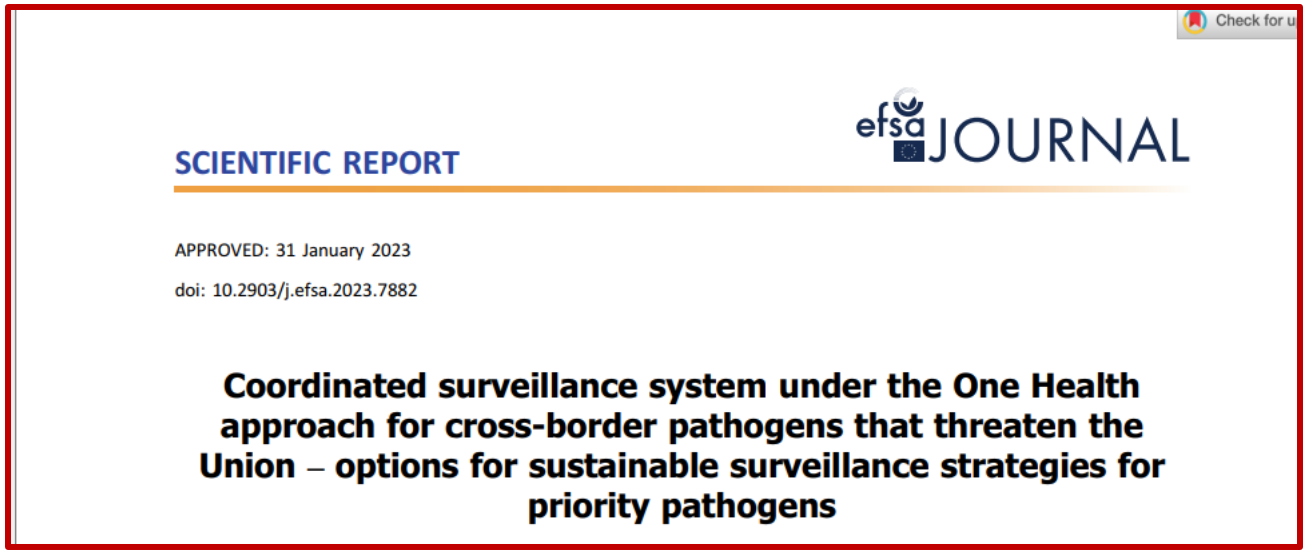
# EU4Health: response to COVID-19 pandemic



# EU: setting up a coordinated surveillance system under the OH approach for cross-border pathogens that threaten the Union

2022. EU-Commission allocated resources for MS (EU4Health program's **direct grant opportunity** CP-g-22-04.01) for setting up coordinated **surveillance systems** under the One Health approach for cross-border pathogens that threaten the Union

On-going WDS in EU under **EU4Health**




efsa + ENETWILD

# Prioritisation of 10 pathogens for OH surveillance grants

- 50 pathogens pre-selected (risk assessment) by OH working group of EFSA
- Prioritisation done by EFSA with Member States and ECDC

efsa JOURNAL

SCIENTIFIC REPORT

ADOPTED: 31 January 2023

doi: 10.2903/j.efsa.2023.7853

**Prioritisation of zoonotic diseases for coordinated surveillance systems under the One Health approach for cross-border pathogens that threaten the Union**

European Food Safety Authority (EFSA),
John Berezowski, Katinka de Balogh, Fernanda C Dórea, Simon Rüegg, Alessandro Broglia, Andrea Gervelmeyer and Lisa Kohnle

| Priority diseases/pathogens | |
|---|---|
| CCHF | TBE |
| *E. granulosus* | WNF |
| Hepatitis E | RVF |
| HPAI | Lyme dis. |
| Influenza in swine | Q fever |

+

**Dis X (dis Y in animals)**: possible future, still unknown, emerging zoonotic disease

**SURVEILLANCE CARD_Disease Y_Detection of new infectious agent causing disease in Wildlife**

| | Characteristics | Description |
|---|---|---|
| 1 | Surveillance component name | Detection of new infectious agent causing disease (Disease Y) in wildlife |
| 2 | Surveillance aim | Early detection of new, disease-causing pathogens in wildlife |
| 3 | Target species and group | All wildlife |
| 4 | Target sector / production type | Not applicable |
| 5 | Geographical area covered | Whole country |
| 6 | Age group | All |
| 7 | Sampling point and strategy | Found dead by the public, hunters, farmers and others, road killed, wildlife centres, veterinary practices |
| 8 | Sampling time period | Year-round / not limited |
| 9 | Sampling matrix | Carcasses |
| 10 | Type of disease indicators | Dead animals |
| 11 | Sampling unit | Individual animal |
| 12 | Allocation of animal groups /animals to sampling | No risk factors |
| 13 | Testing protocol / Diagnostic test | Following exclusion of known pathogens, additional diagnostic investigations using metagenomics, whole genome sequencing, etc. |
| 14 | Design prevalence (only relevant for probability-based sampling) | Not applicable |

# OH surveillance grants: 2023-2026

Applications for direct grants:

- 23 MS applied
- 9 applications
- 7 mono-beneficiary grants
- 2 multi-beneficiary
- OH4Surveillance (11 MS) and one with 5 MS


- Coordinated by Statens Serum Institut (SSI)

Results collected by EFSA = risk assessment to identify OH zoonotic risks for the EU

Review surveillance priorities and methodologies

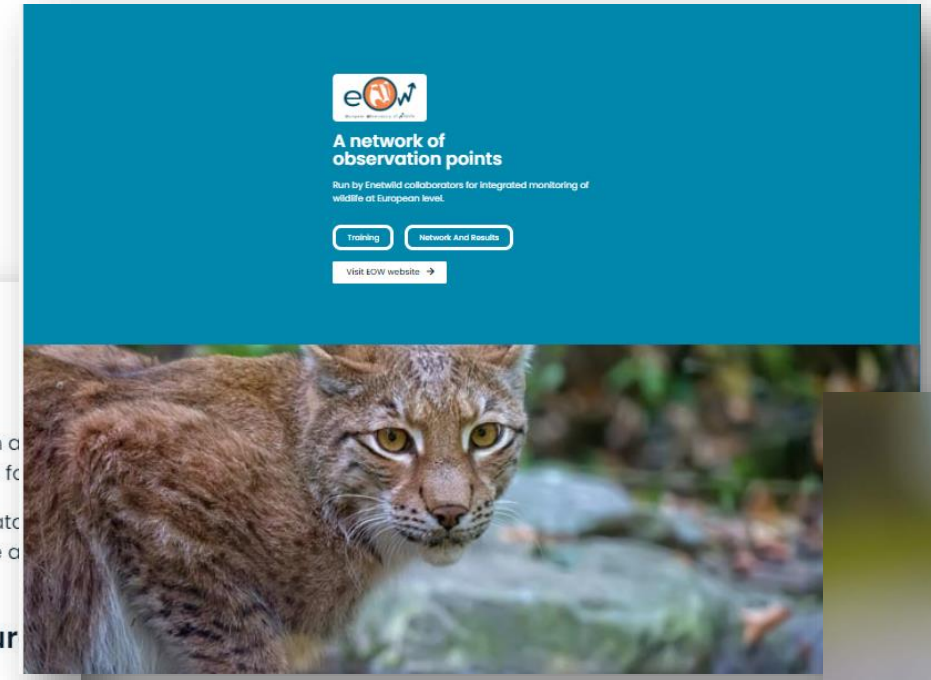
**Towards an EU coordinated surveillance system under the OH approach**

# Wildlife population monitoring: the denominator data
## (”susceptible population”)-2018-2023 and 2024-2029

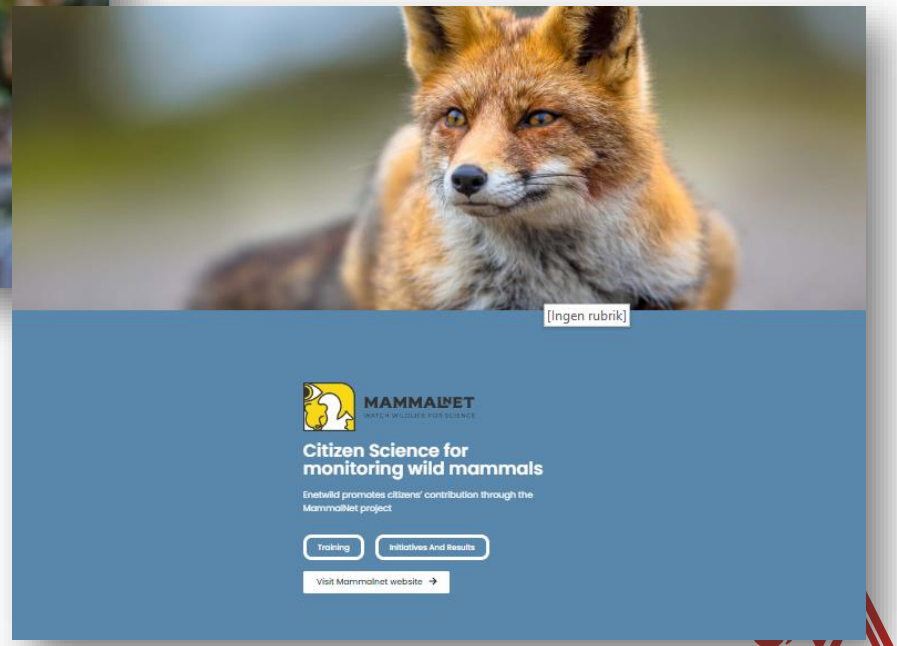
EUROPEAN FOOD SAFETY AUTHORITY

ENETWILD

https://wildlifeobservatory.org/



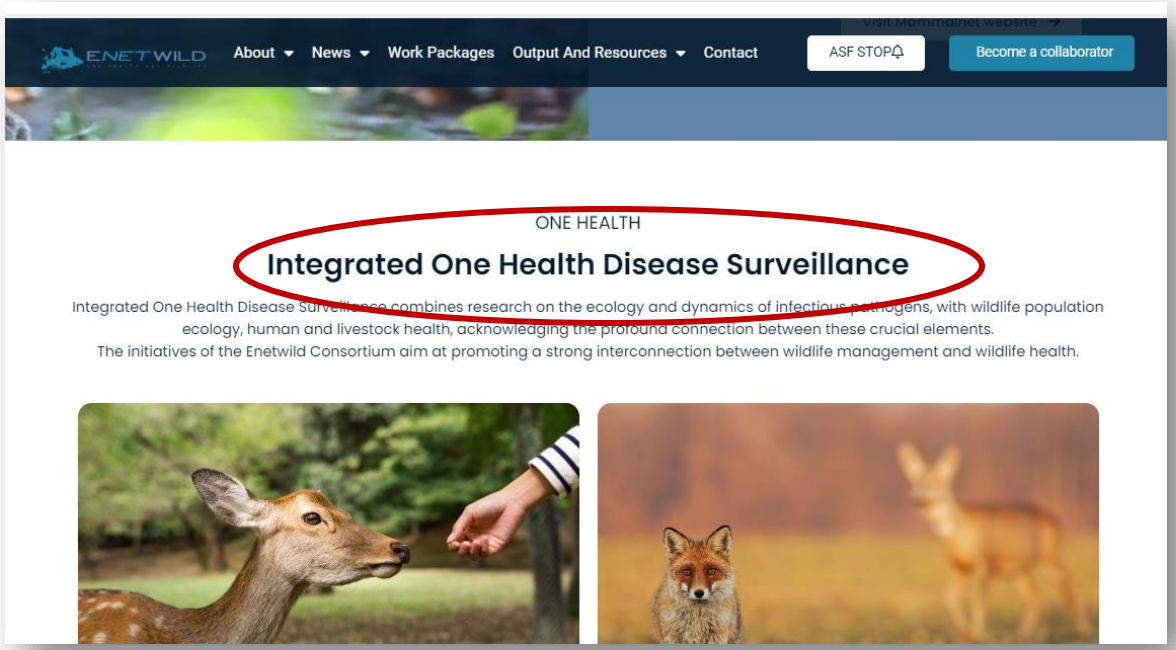

Mammalnet - Citizen Science



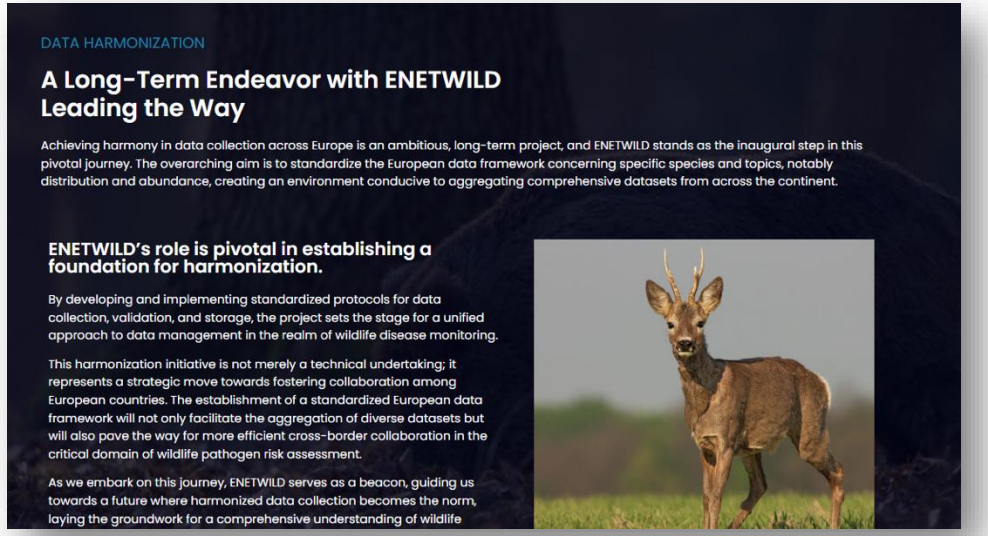


https://enetwild.com/the-project/

# ENETWILD 2.0 (2024-2029 ): distribution, abundance and structure of selected wildlife species populations




Integrated surveillance

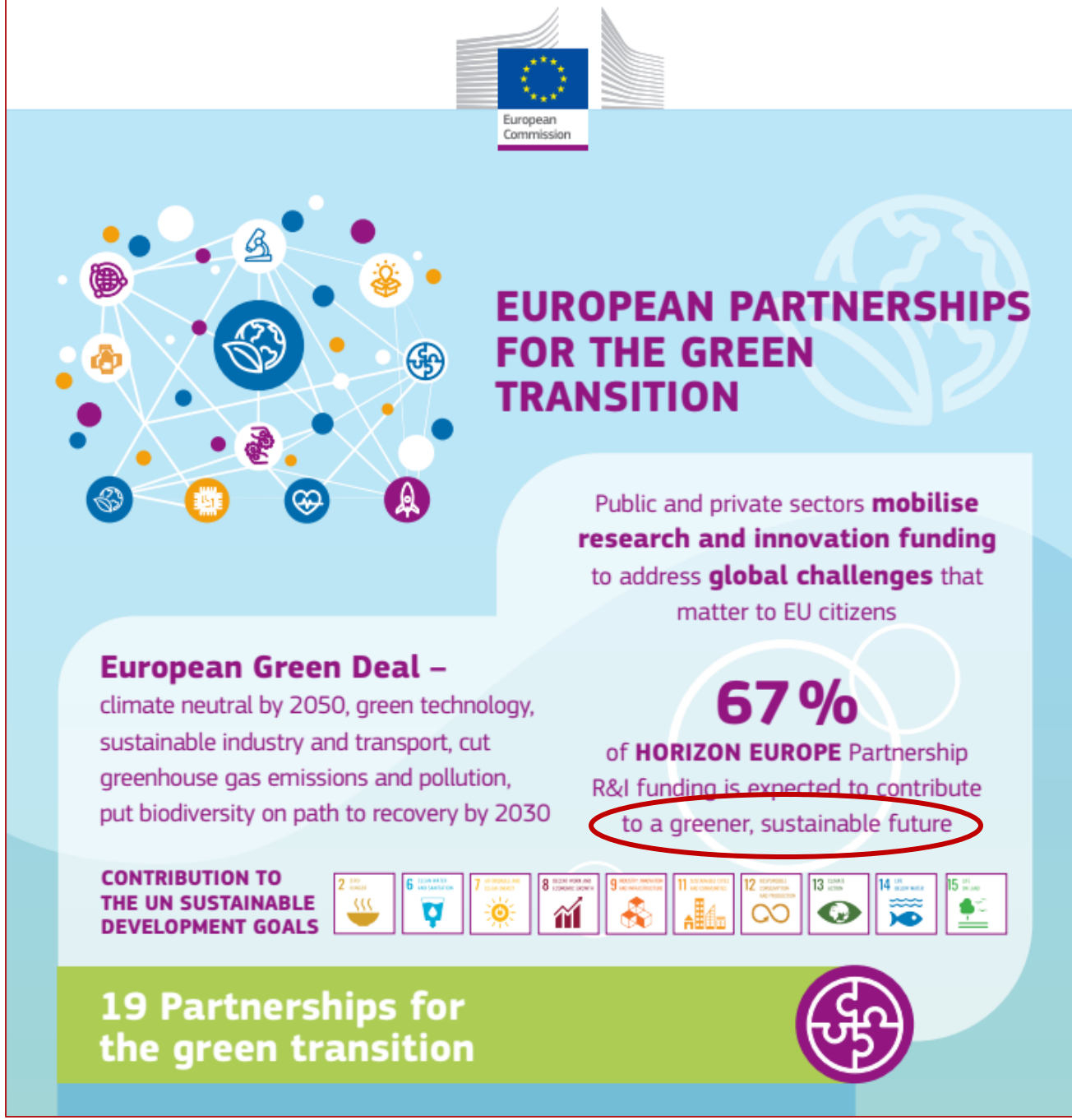



Data harmonization

# Horizon Europe's (HE) partnerships

- Key R&I implementation tool of HE
- EU's political priorities, transitions towards a **green, climate neutral**, and digital Europe, strengthening the resilience and competitiveness of European industry
- Bring **private and public** partners together
- **Avoid the duplication** of investments
- **Reduce the fragmentation** of the R&I
- Address complex challenges, integrated approach, **broad range of actors** across the value chain and countries

**One Health**



Started 2024

EUP AH&W European Partnership on Animal Health and Welfare

One HEALTH EJP

## EUROPEAN PARTNERSHIP on Animal Health & Welfare

- 90 partners
- 56 Research Performing Organizations (RPO)
- 30 Funding Organizations (FO)
- Some other entities EFSA, EMA, Authorities
- From 24 EU and non-EU countries
- Duration 7 years (+3)
- Expected total budget: 360 MEUR
- Coordinated by GHENT UNIVERSITY

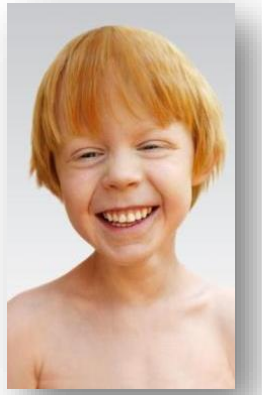

Co-funded by the European Union

SVA

# SOA6 (OO1-2). European network for wild mammals and birds

Co-chairs, Dolores Gavier-Widén, Aleksija Neimanis, Swedish Veterinary Agency (SVA)

**29 partners, 14 countries, >100 scientists**



Data needs and systems, risk managers, policy makers, recommendations

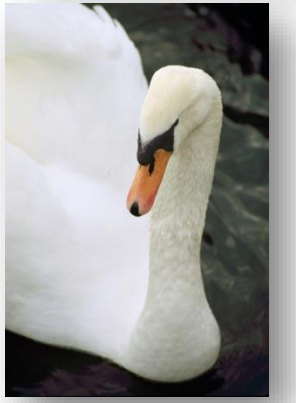
Programmes, diseases, wildlife hosts, data, national, EU, needs, gaps

Wildlife disease surveillance (T1,2)

Stakeholders and policy (T6)

Wildlife networks (T3)

Field observation, reporting, vets, EWDA, capacity, structures, coordination



Captive, trade, translocations, modelling spread, environment, climate change

Impact of human activities on disease spread (T5)

Wildlife populations (T4)

Monitoring programmes, data, abundance, distribution, harmonization, needs

# Animal Health Surveillance

World Organisation for Animal Health
Founded in 1924

”Systematic ongoing collection and analysis of information related to wildlife health and timely **dissemination of information** so that **action** can be taken” (WHO-WOAH)

**Objectives:**

- Early detection of diseases
- Determine presence and distribution of a disease or demonstrate absence
- Monitor trends
- Data for risk analysis
- Facilitate control

# Wildlife Health/disease Surveillance

General surveillance (”passive”): pathological examination of animals found dead or moribund

Targeted surveillance (”active”): testing animals for the presence of specific pathogens

# General (passive) wildlife disease surveillance

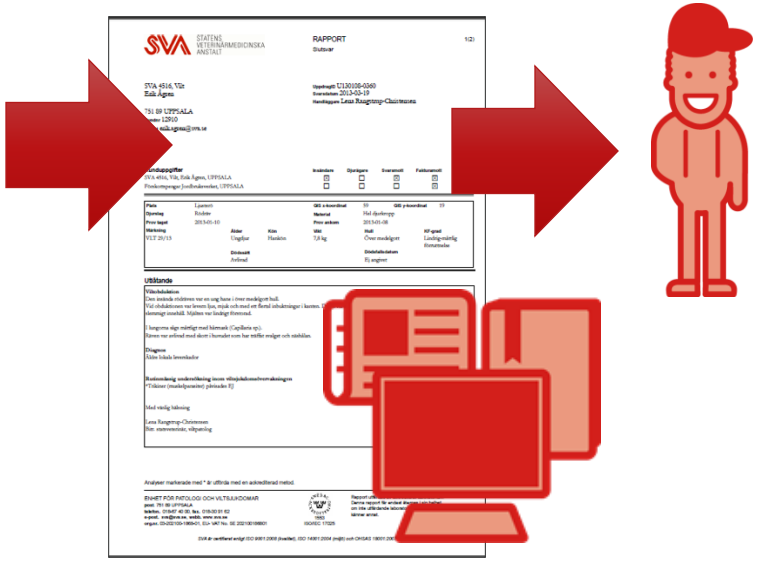
## Objectives

- Early detection
- Higher chance of detecting positive animals than in targeted surveillance
- Correct sampling
- Characterise diseases
- Interpretation of lab analyses: cause of disease? Cause of mortality?
- (Wildlife forensics)

Bovine tuberculosis, lung, E. badger (*Meles meles*)

Sarcoptic mange, red fox (*Vulpes vulpes*)

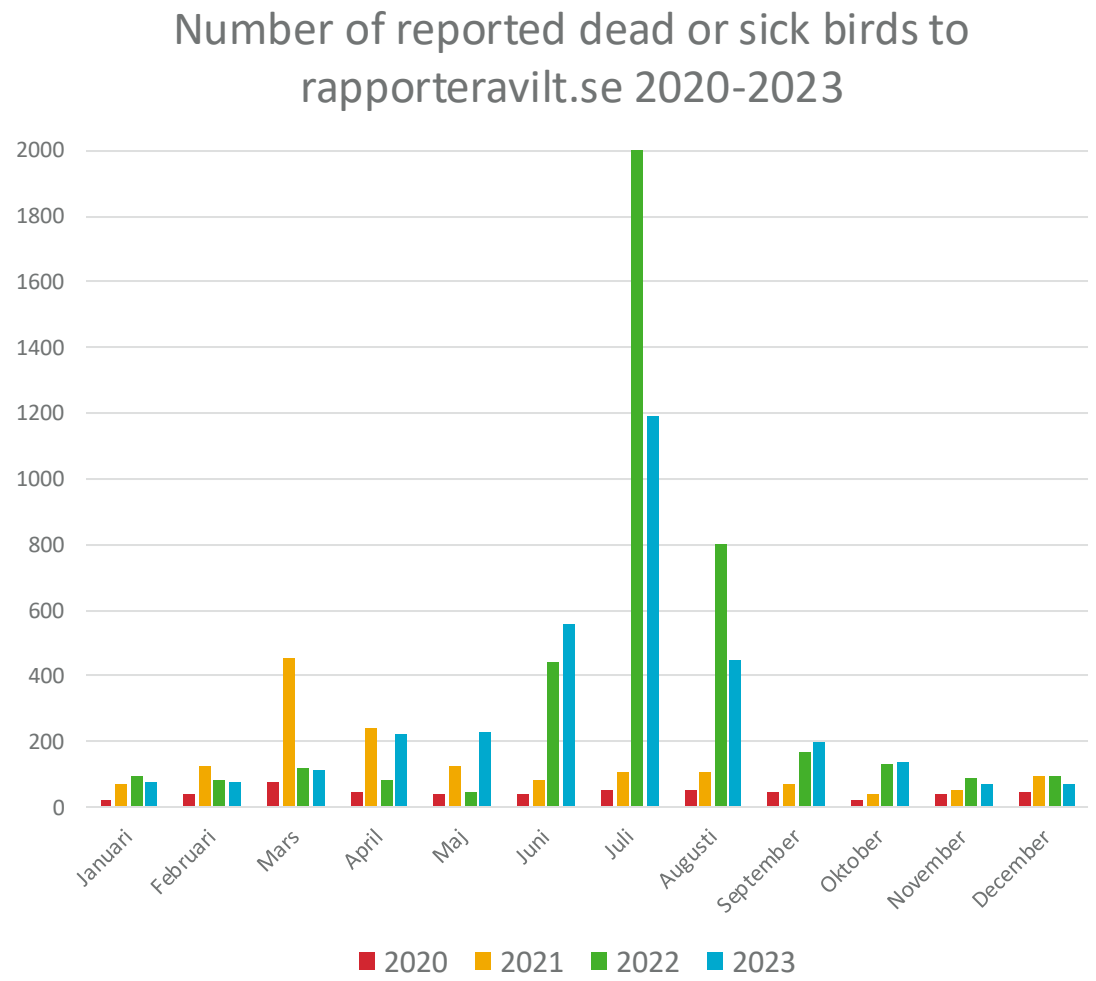
# General (passive) wildlife disease surveillance

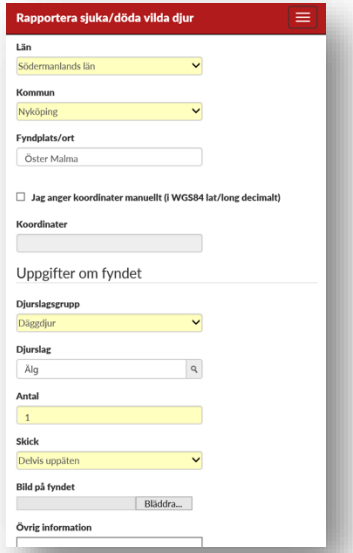



DATA-
& BIO-
BANK

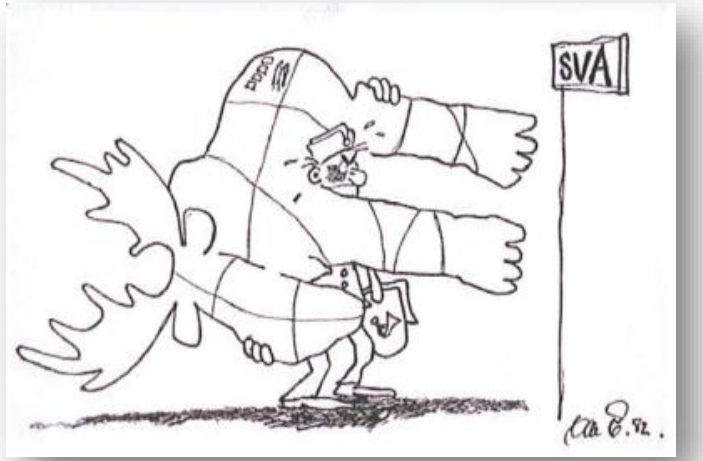
# General (passive) wildlife disease surveillance: reports from the general public and early detection

## Wild birds reported to rapporteravilt.se (Sweden)




rapporteravilt.sva.se



# General (passive) wildlife disease surveillance in the field

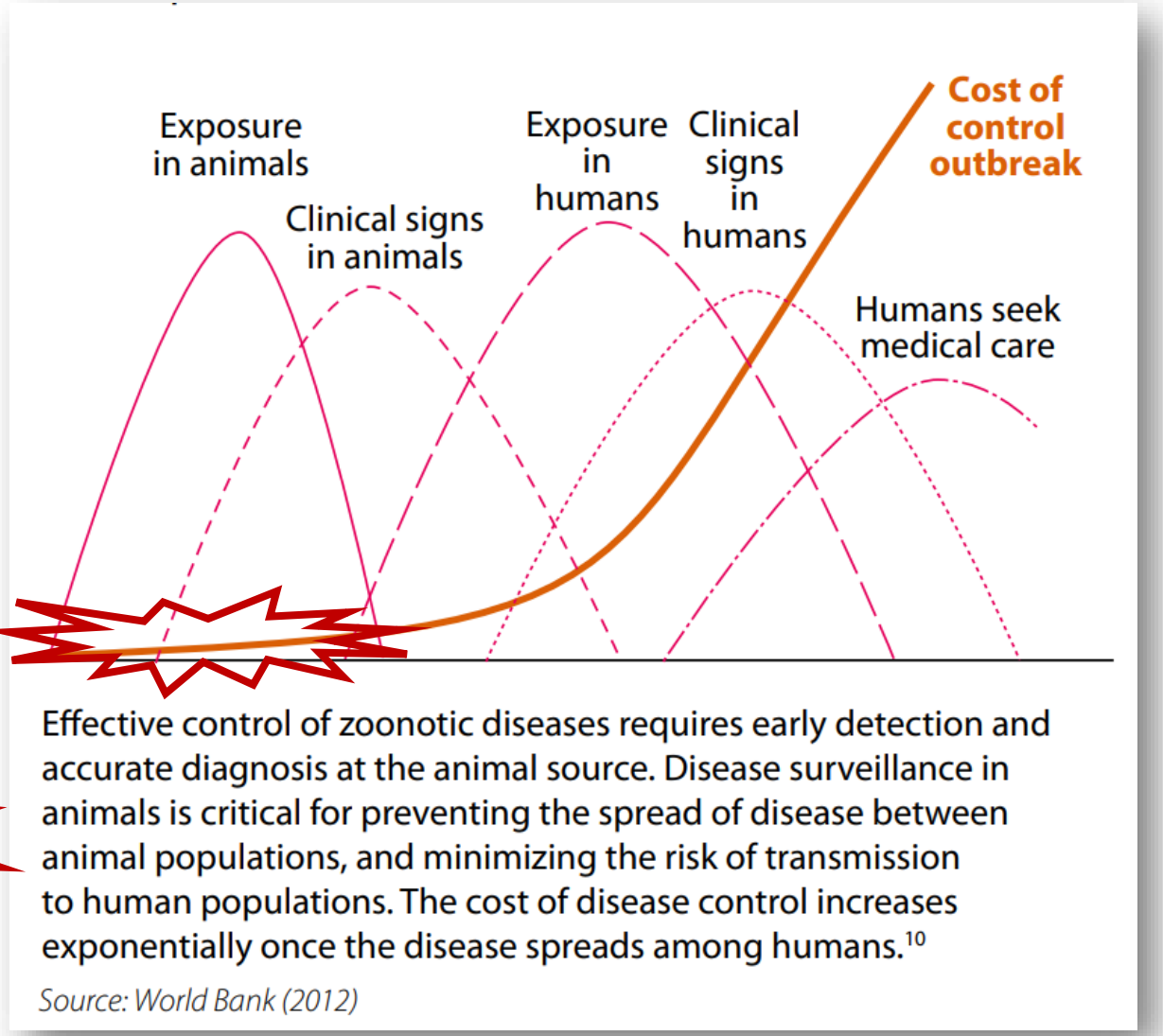
Field sampling of wild boar (*Sus scrofa*)

Field necropsy, killer whale (*Orcinus orca*)


OHEJP-Strategic-Research-and-Innovation-Agenda

**WDS**

**Early detection**

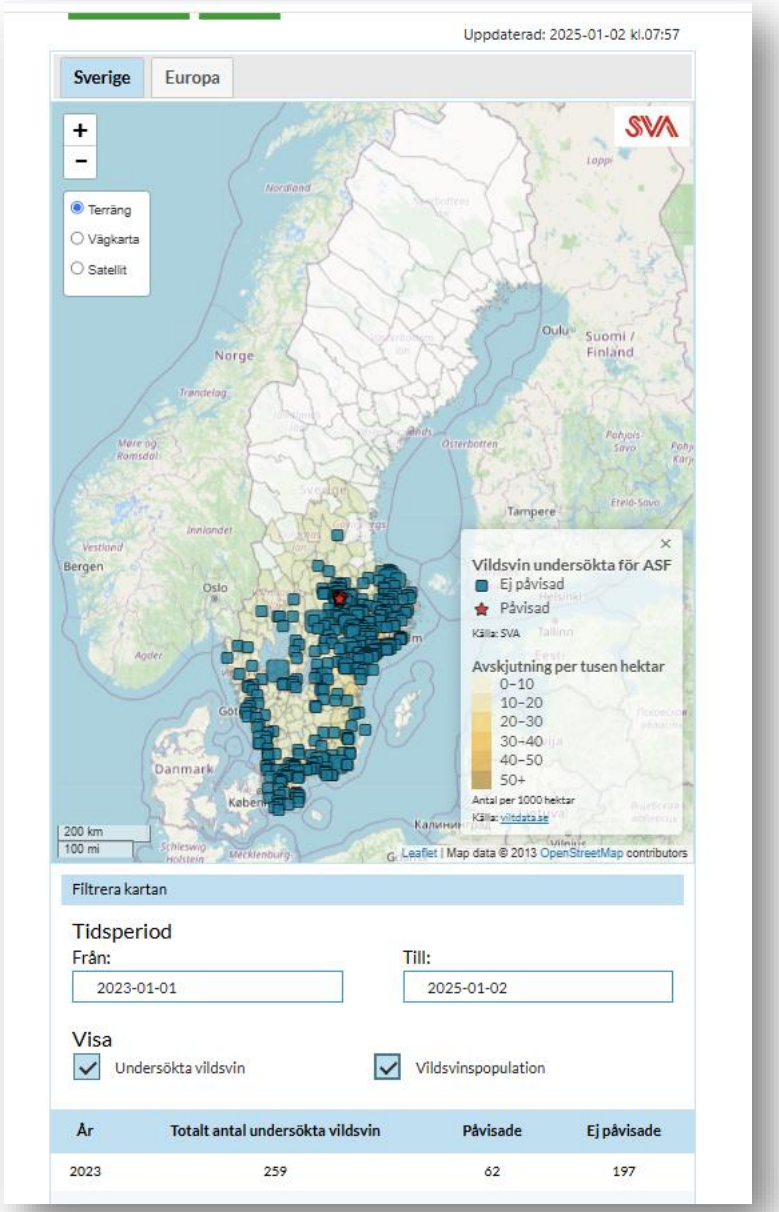



Effective control of zoonotic diseases requires early detection and accurate diagnosis at the animal source. Disease surveillance in animals is critical for preventing the spread of disease between animal populations, and minimizing the risk of transmission to human populations. The cost of disease control increases exponentially once the disease spreads among humans.[10]

*Source: World Bank (2012)*

***"The cost of prevention is 100 times less than the cost of responding to pandemics" (WHO)***

# Communication of results and data sharing




Sveriges dataportal
DIGG – Agency for Digital Government

www.dataportal.se

Government and public sector, Environment

## Open data, examinations of cetaceans in Swedish waters, 2020-2022

Health status, diseases and cause of stranding or death of cetaceans examined at SVA from 2020-2022. Cetaceans were examined together with the Swedish Museum of Natural History (NRM). These data support the annual reports from the health- and disease...

**Statens veterinärmedicinska anstalt**

SPREADSHEET CSV

Government and public sector, Environment

## Open data, examinations of phocids in Swedish waters, 2020-2022

Health status, diseases and cause of stranding or death of seals examined at SVA from 2020-2022. These data support the annual reports from the health- and disease surveillance program for marine mammals set up by the National Veterinary Institute (S...

**Statens veterinärmedicinska anstalt**

SPREADSHEET CSV

# Take home messages

- Anthropogenic activities are the main causes of biodiversity loss and emergence of diseases
- Wildlife is a victim of human behaviour and should be protected
- One Health management of diseases needs wildlife disease surveillance
- Wildlife health management needs broad, multi-sectoral integrated approaches and sustainable solutions

https://www.imperial.ac.uk/school-public-health/epidemiology-and-biostatistics/research/global-health/

# Acknowledgements


Belgian One Health

ENETWILD

efsa

FALLVILTSUNDERSÖKNINGEN SVA 75 ÅR 1948 - 2023

SVAs wildlife team (www.SVA.se)

EUP AH&W European Partnership on Animal Health and Welfare

EWDA European Wildlife Disease Association

WDA Wildlife Disease Association Founded in 1951

One HEALTH EJP