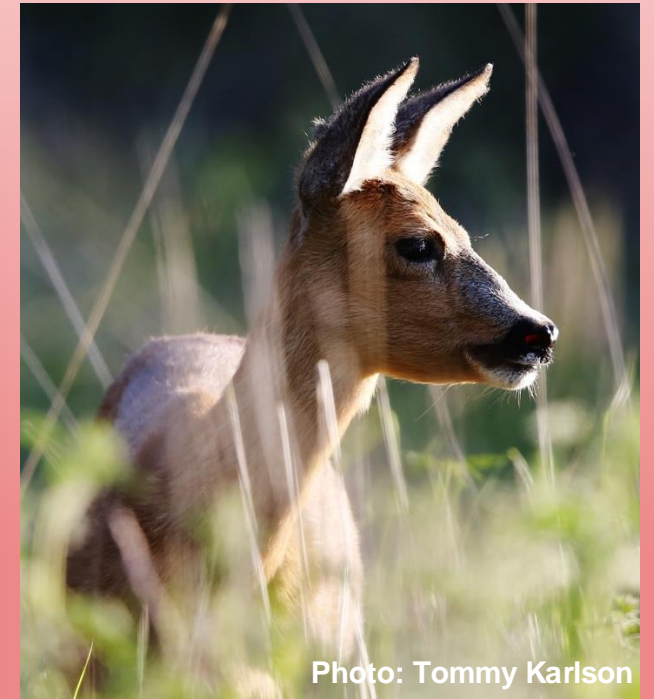
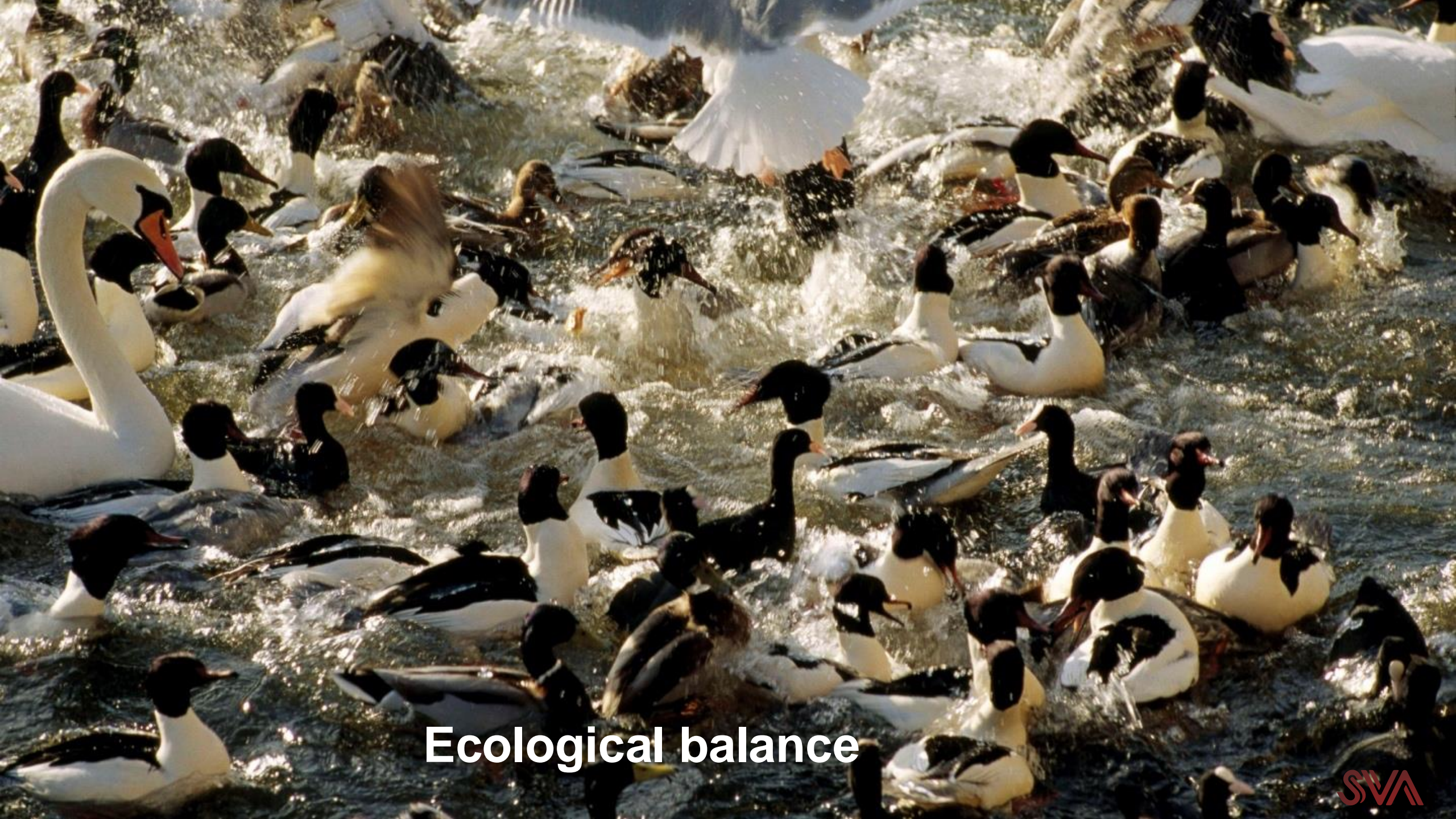


Wildlife in focus: sources or victims of emerging diseases? The importance of wildlife disease surveillance



Stable ecosystems

Atlantic puffin (*Fratercula arctica*)

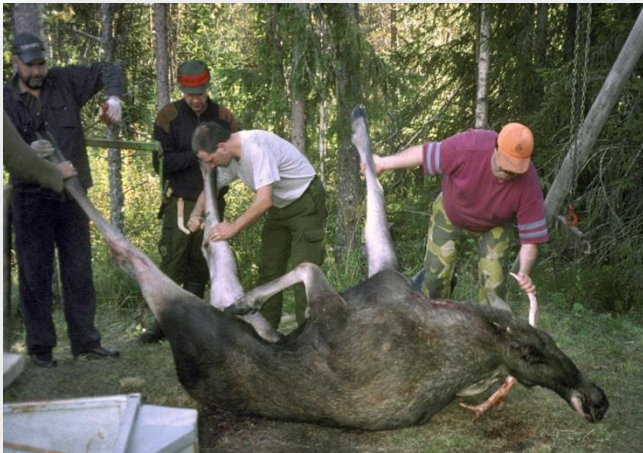


Ecological balance

Healthy ecosystems-healthy wildlife-healthy people

- Wildlife provides **ecosystem services** -
Contribute to human well-being, survival and
quality of life
- The value of wildlife: social, cultural, economic
and ecologic values

Game meat:
ecological, climate
friendly, renewable
resource



What's the
Problem?

Global human population growth!



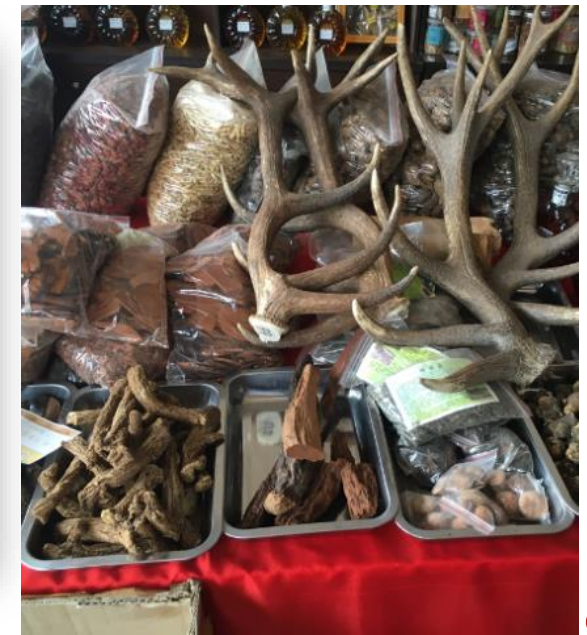
~7,8 billion today
~8,5 billion by 2030
~9 billion by 2050

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



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
- Transport of pathogens or vectors
- Climate change
- Land use change

Human behaviour



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

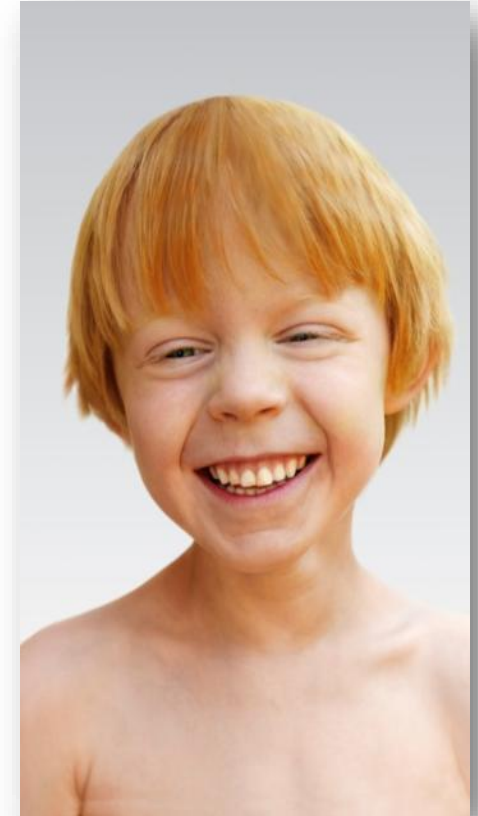


Emerging infectious diseases (EID)-in humans

- 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



SARS-CoV-2 coronavirus



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



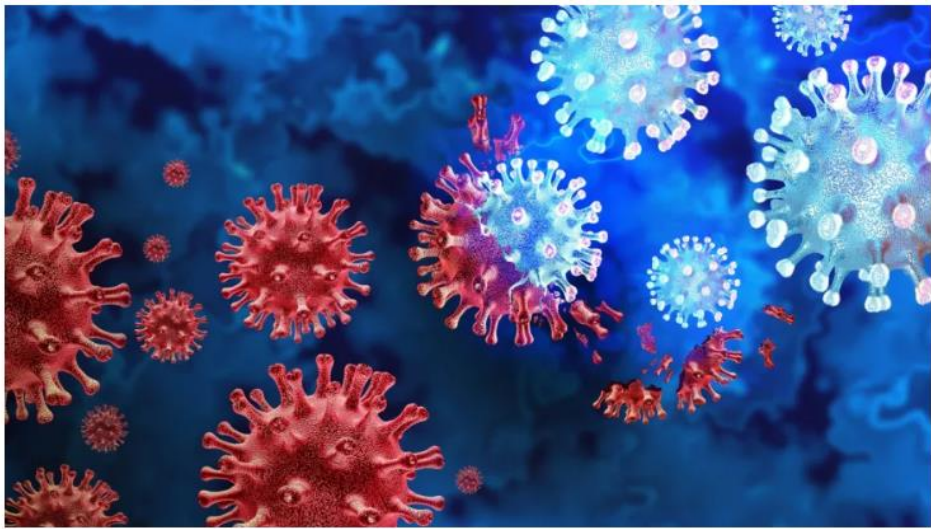
Intermediate horseshoe bat (*Rhinolophus affinis*)

PHOTO: MINDEN PICTURES, IN [HTTPS://WWW.WSJ.COM/ARTICLES/THE-BATS-BEHIND-THE-PANDEMIC-11586440959](https://www.wsj.com/articles/the-bats-behind-the-pandemic-11586440959)

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

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



111 viral families have been discovered globally to date.



Of these 111 viral families, the GVP will target **25** containing viruses known to infect (or to have substantial risk of infecting) people.



In these 25 families, an estimated **1.67 million** unknown viruses exist in mammals and birds—hosts that represent 99% of the risk for viral emergence.



Of these 1.67 million viruses, an estimated **631,00 to 827,000** likely have the capacity to infect people.

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

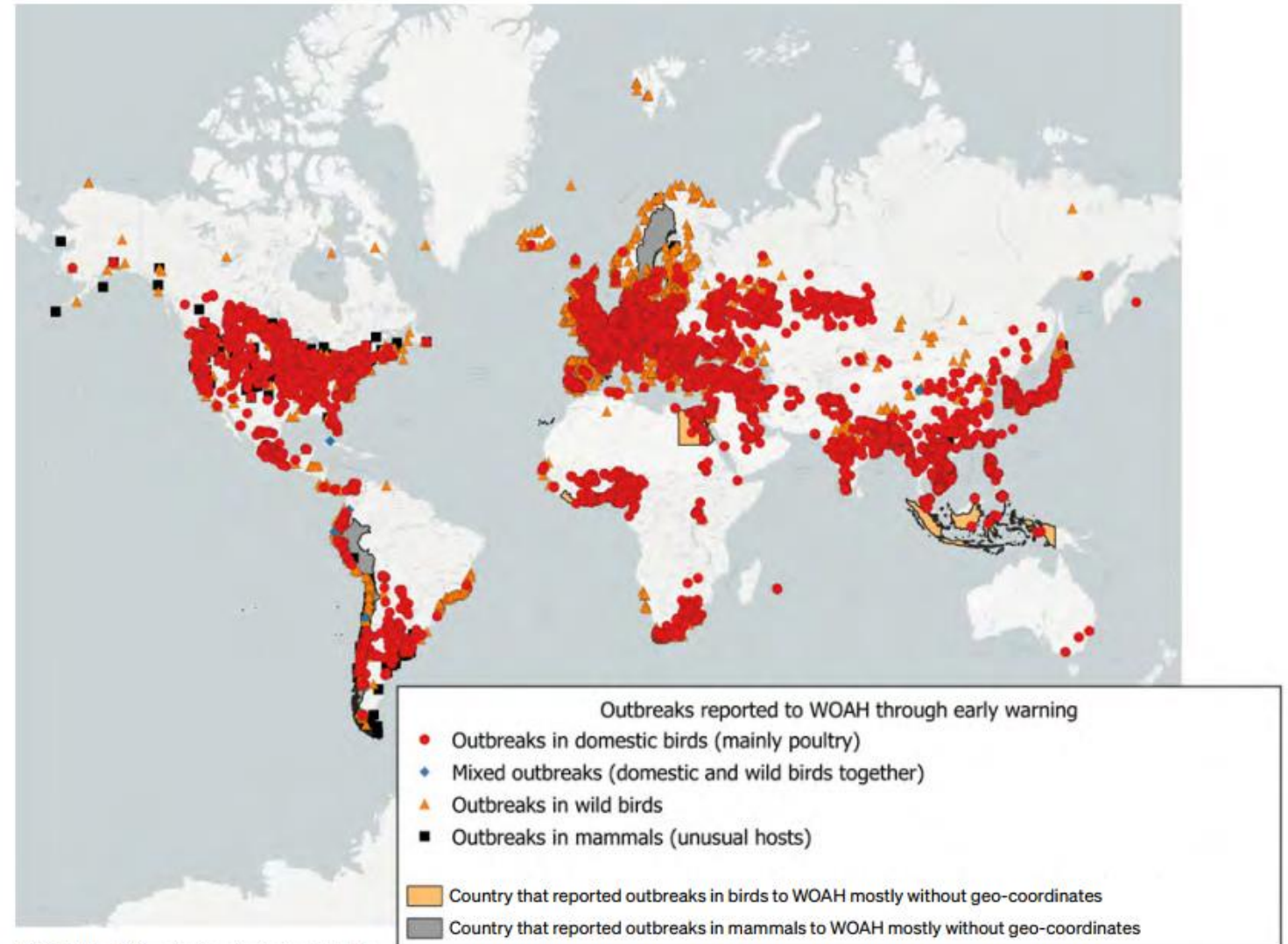


<https://www.dailynewsegypt.com/2022/01/27/highly-pathogenic-avian-influenza-outbreak-confirmed-in-namibia/>

The impact of HPAI-H5N1 2.3.4.4b

- Panzootic
- Global spread, 6 continents

Requires One Health approaches to disease control and prevention



WOAH: World Organisation for Animal Health

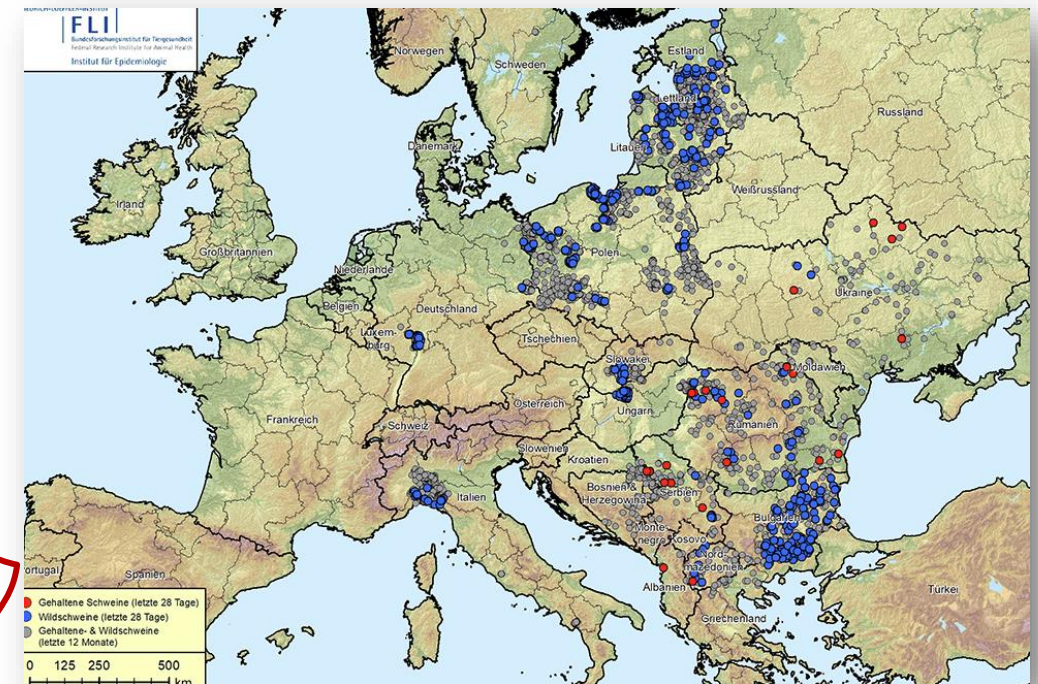
Figure 1

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

Source: WOA Scientific and Technical Review, Special Edition 2024

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

- 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

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



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.

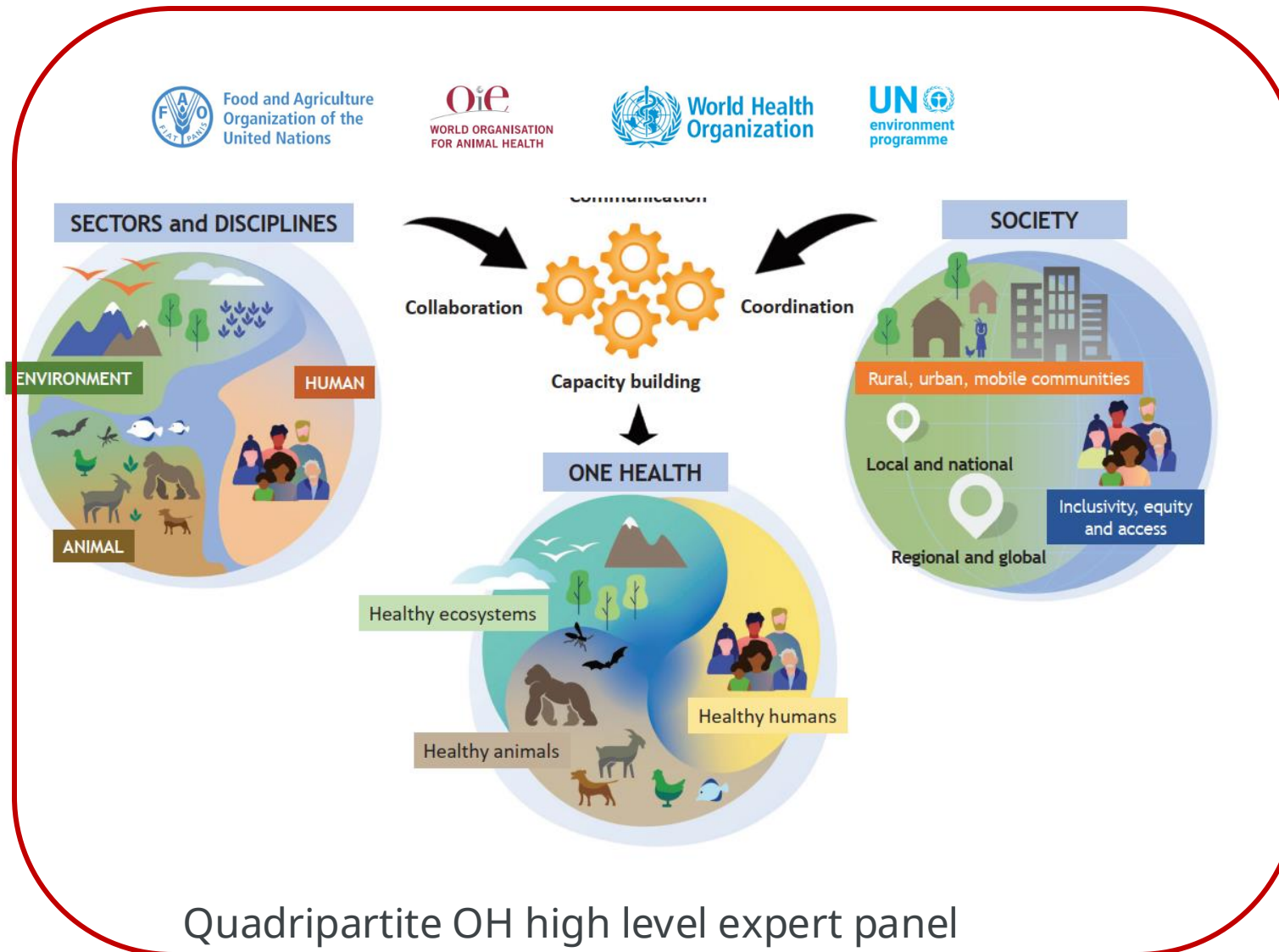
Stone marten (*Martes foina*), invasive sp.

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



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

OIE MANDATE

The World Organisation for Animal Health aims to improve animal health worldwide

OVERALL GOAL OF WILDLIFE HEALTH FRAMEWORK

Protect wildlife health worldwide to achieve One Health

OBJECTIVE 1

OIE Members improve their ability to manage the risk of pathogen emergence in wildlife and transmission at the human-animal-ecosystem interface, whilst taking into account the protection of wildlife

OBJECTIVE 2

OIE Members improve surveillance systems, early detection, notification and management of wildlife diseases

OUTCOME 1

One Health, multisectoral collaboration and capacity for wildlife health management, monitoring and surveillance systems Strengthened

OUTCOME 2

A political, policy and scientific environment that allows Veterinary Services to implement effective wildlife health monitoring and management promoted

OUTCOME 3

Awareness and knowledge of risks pathways and best practices in wildlife health and One Health management increased



Output 1
Multisectoral coordination and collaboration promoted



Output 2
Capacity in wildlife health management strengthened



Output 3
Quality data collection, reporting, analysis and use improved



Output 4
Guidelines, standards, risk reduction strategies updated & developed



Output 5
Scientific knowledge developed and disseminated



Output 6
Awareness and advocacy tools produced and disseminated

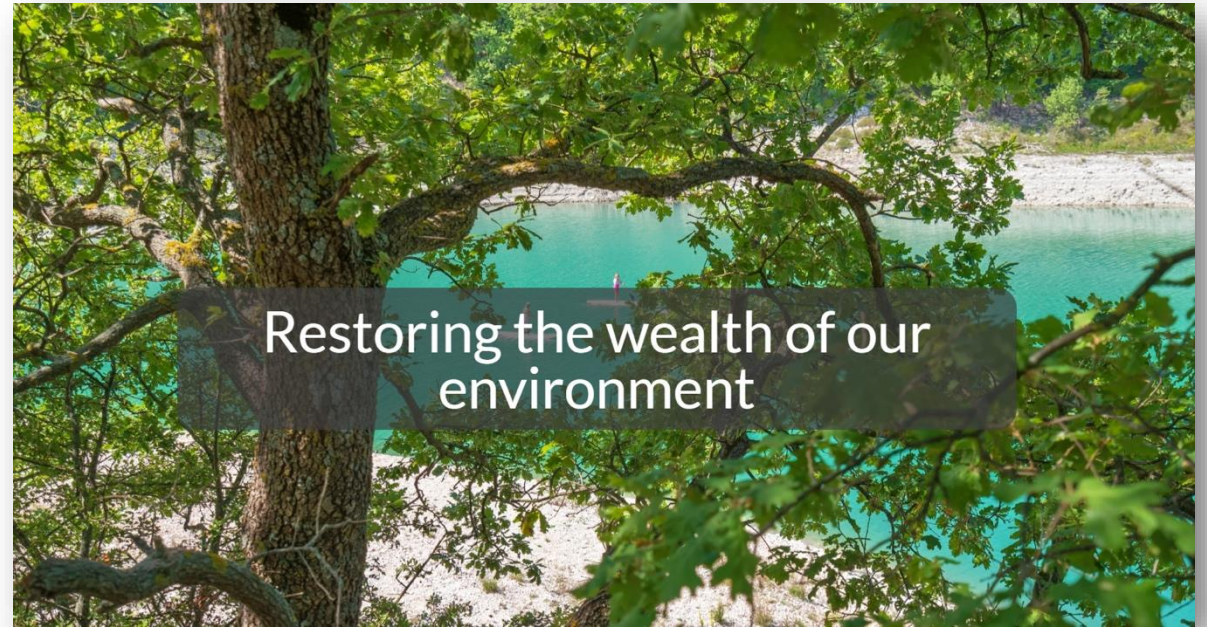
The WOA (OIE) Wildlife Health Framework

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*”

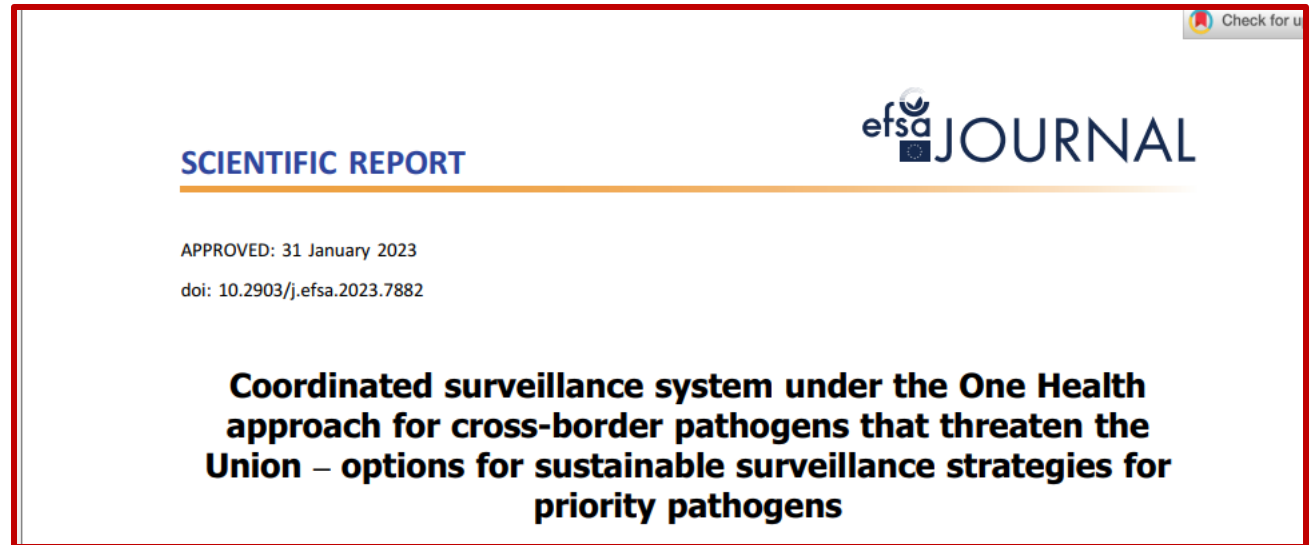
EU4Health: response to COVID-19 pandemic



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**



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

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
<i>E. granulosus</i>	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



Enhancing European Capacity for Wildlife Pathogen Risk Assessment

Accurate risk assessment of pathogens with implications for both human and animal health requires knowledge of the presence and abundance of wild species, which often serve as reservoirs for pathogens.

In Europe, various countries and organizations diligently collect spatial data on wildlife. However, differences exist in the methodologies employed, the types of data acquired, and the data management systems used.



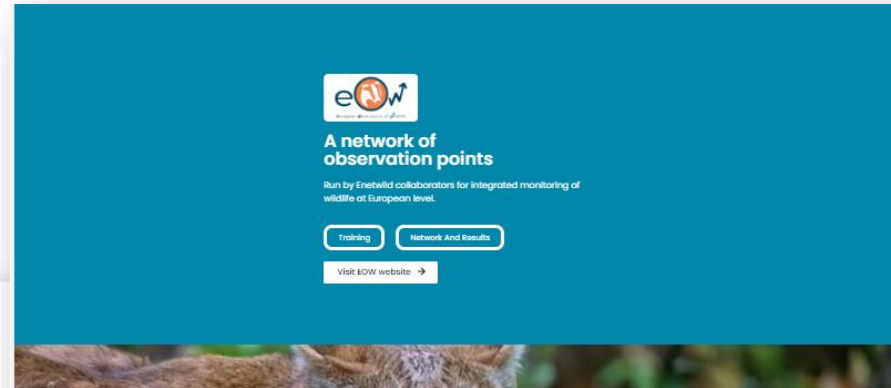
The European Food Safety Authority (EFSA) is

The European Food Safety Authority (EFSA) is championing a project to enhance European capacity for wildlife pathogen risk assessment. This project aims to improve the understanding of disease risks shared between wildlife and humans, which only serve critical needs for effective conservation and management of wildlife.

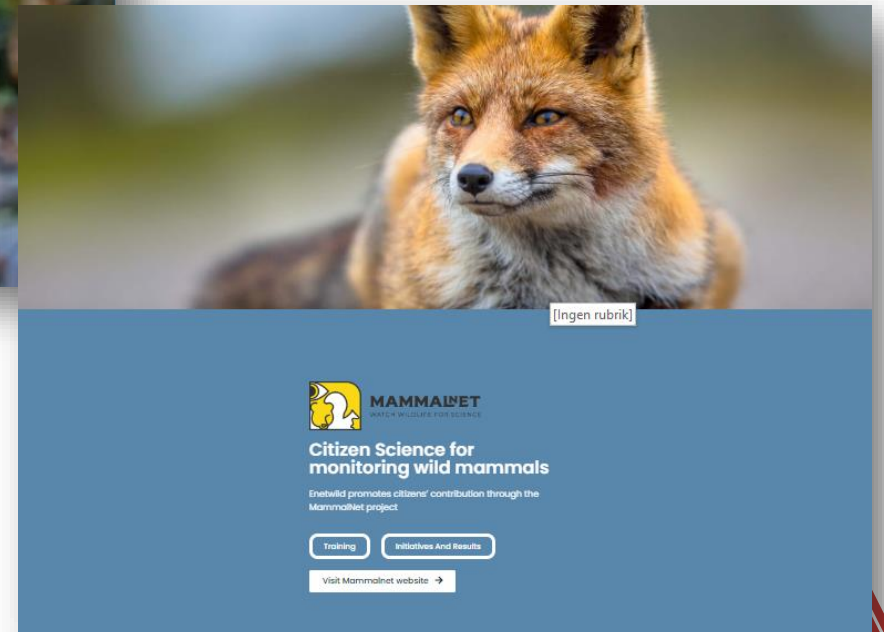
ENETWILD seeks to enhance wildlife populations by developing and validating monitoring and assessment tools.

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

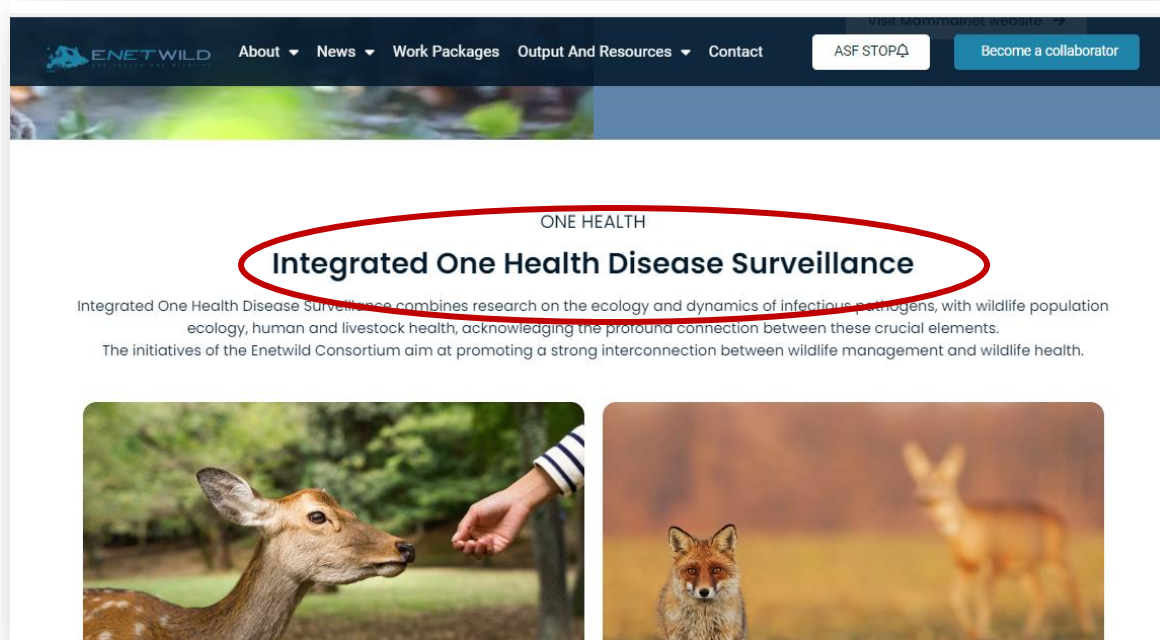
<https://wildlifeobservatory.org/>



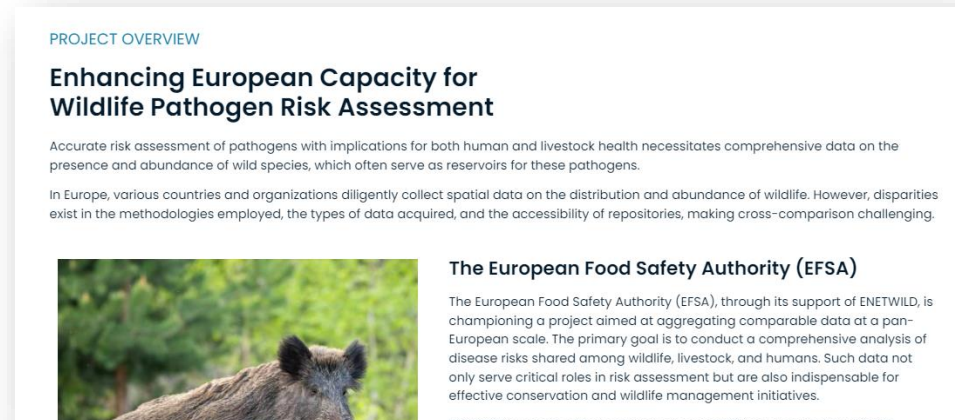
Mammalnet - Citizen Science



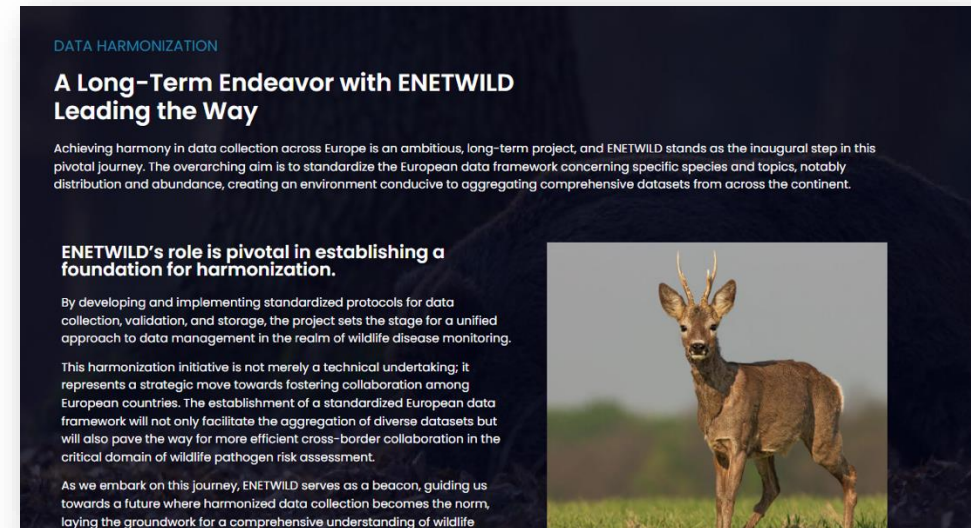
ENETWILD 2.0 (2024-2029): distribution, abundance and structure of selected wildlife species populations



The screenshot shows the ENETWILD website header with navigation links: About, News, Work Packages, Output And Resources, Contact, ASF STOP, and Become a collaborator. Below the header, the 'ONE HEALTH' section is highlighted with a red oval, featuring the title 'Integrated One Health Disease Surveillance'. The text below explains that this surveillance combines research on infectious pathogens, wildlife population ecology, human and livestock health, and acknowledges the connection between these elements. It also mentions the initiatives of the Enetwild Consortium. Two images are shown: a deer being fed by a person and a fox in a field.



The screenshot shows the 'PROJECT OVERVIEW' section of the ENETWILD website. It features the title 'Enhancing European Capacity for Wildlife Pathogen Risk Assessment'. The text explains that accurate risk assessment of pathogens with implications for both human and livestock health necessitates comprehensive data on the presence and abundance of wild species, which often serve as reservoirs for these pathogens. It also mentions that in Europe, various countries and organizations diligently collect spatial data on the distribution and abundance of wildlife, but disparities exist in the methodologies employed, the types of data acquired, and the accessibility of repositories, making cross-comparison challenging. An image of a bison is shown at the bottom left.



The screenshot shows the 'DATA HARMONIZATION' section of the ENETWILD website. It features the title 'A Long-Term Endeavor with ENETWILD Leading the Way'. The text explains that achieving harmony in data collection across Europe is an ambitious, long-term project, and ENETWILD stands as the inaugural step in this pivotal journey. The overarching aim is to standardize the European data framework concerning specific species and topics, notably distribution and abundance, creating an environment conducive to aggregating comprehensive datasets from across the continent. It also mentions that ENETWILD's role is pivotal in establishing a foundation for harmonization. The text further explains that by developing and implementing standardized protocols for data collection, validation, and storage, the project sets the stage for a unified approach to data management in the realm of wildlife disease monitoring. It also mentions that this harmonization initiative is not merely a technical undertaking; it represents a strategic move towards fostering collaboration among European countries. The establishment of a standardized European data framework will not only facilitate the aggregation of diverse datasets but will also pave the way for more efficient cross-border collaboration in the critical domain of wildlife pathogen risk assessment. Finally, it mentions that as we embark on this journey, ENETWILD serves as a beacon, guiding us towards a future where harmonized data collection becomes the norm, laying the groundwork for a comprehensive understanding of wildlife. An image of a deer is shown on the right.

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**

EUROPEAN PARTNERSHIPS FOR THE GREEN TRANSITION

Public and private sectors **mobilise research and innovation funding** to address **global challenges** that matter to EU citizens

European Green Deal – climate neutral by 2050, green technology, sustainable industry and transport, cut greenhouse gas emissions and pollution, put biodiversity on path to recovery by 2030

67% of **HORIZON EUROPE** Partnership R&I funding is expected to contribute to a greener, sustainable future

CONTRIBUTION TO THE UN SUSTAINABLE DEVELOPMENT GOALS

2	3	6	7	8	9	11	12	13	14	15
CLIMATE ACTION	ZERO HUNGER	CLEAN WATER AND SANITATION	AFRICANA AND CLIMATE ACTION	DECENT WORK AND ECONOMIC GROWTH	INDUSTRY, INNOVATION AND INFRASTRUCTURE	CLIMATE ACTION	CONSUMPTION AND PRODUCTION	CLIMATE ACTION	CLIMATE ACTION	CLIMATE ACTION

19 Partnerships for the green transition

Started 2024



European Partnership on
Animal Health and Welfare



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



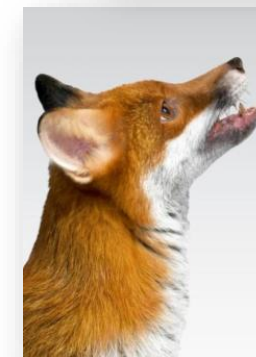
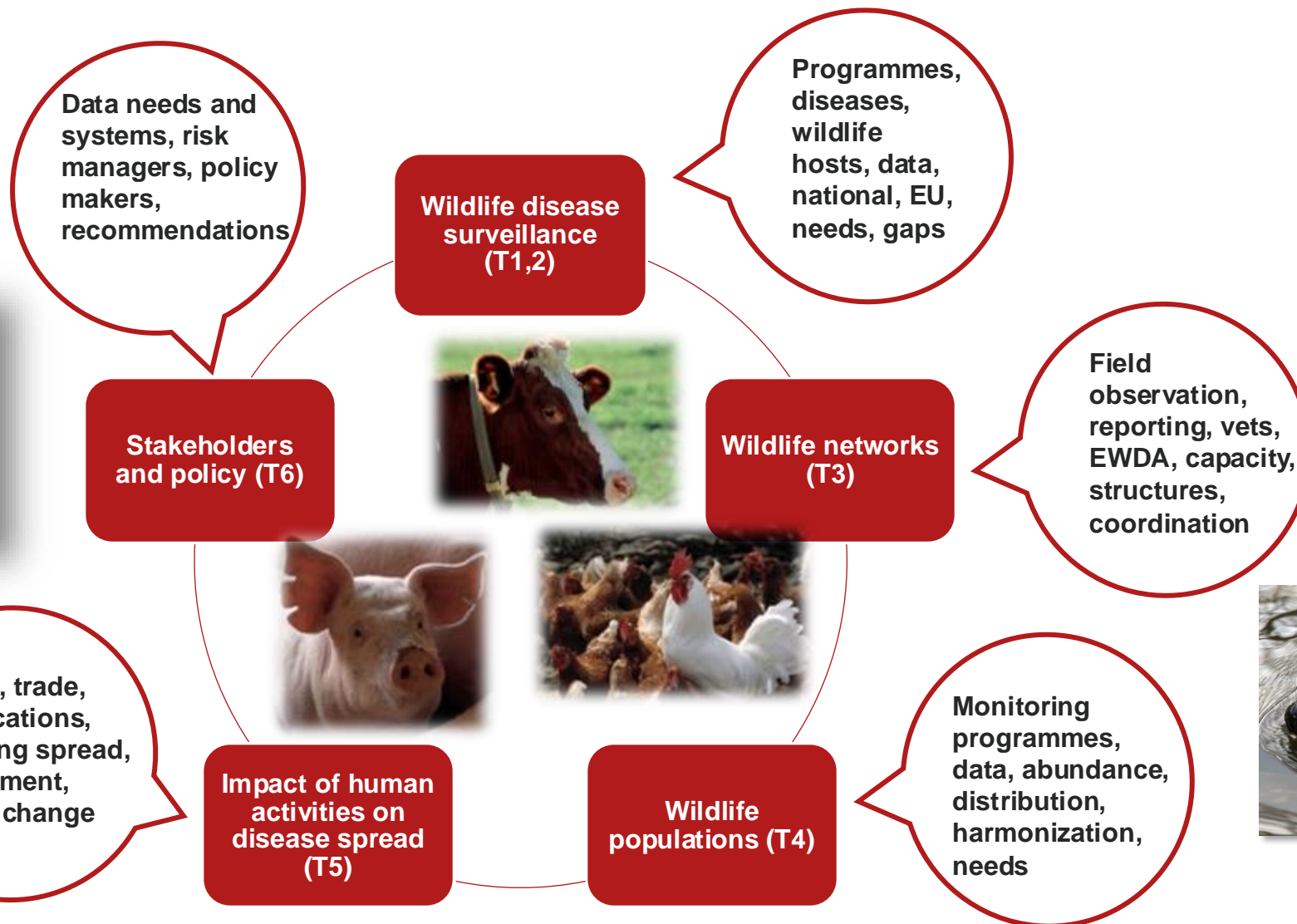
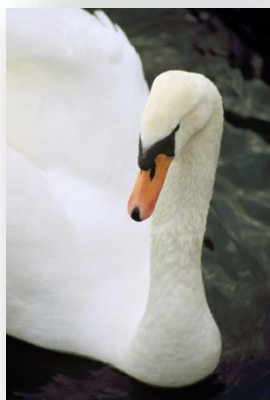
Co-funded by
the European Union



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



Animal Health Surveillance



”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



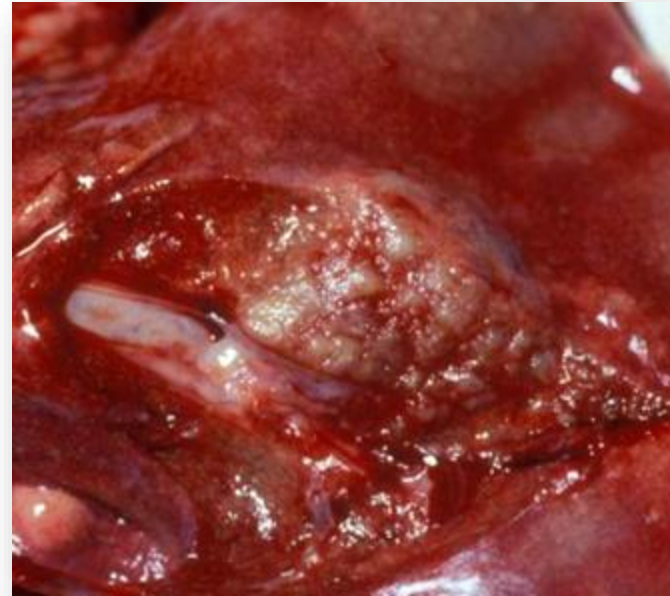
Targeted surveillance
("active"): testing
animals for the presence
of specific pathogens



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)

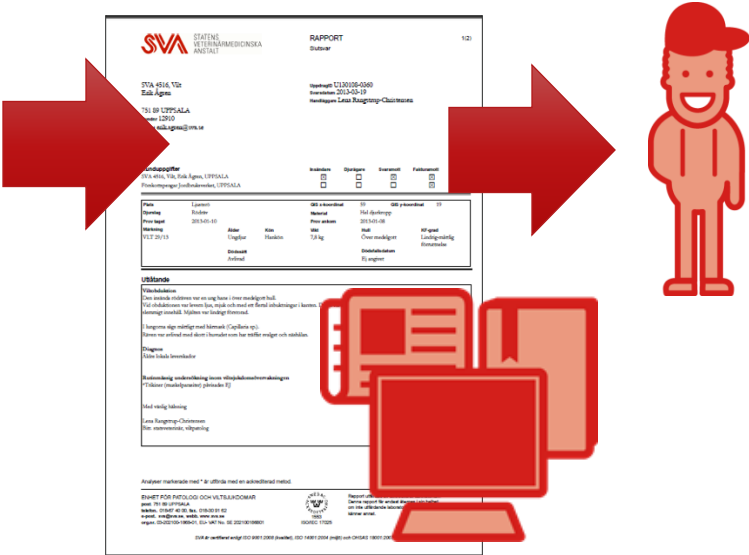
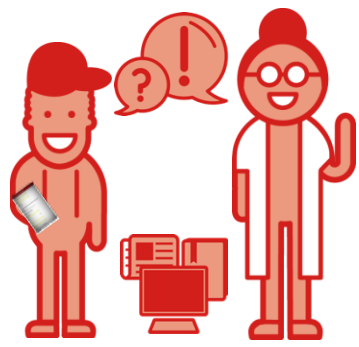


Bovine tuberculosis, lung, E. badger (*Meles meles*)



Sarcoptic mange, red fox (*Vulpes vulpes*)

General (passive) wildlife disease surveillance



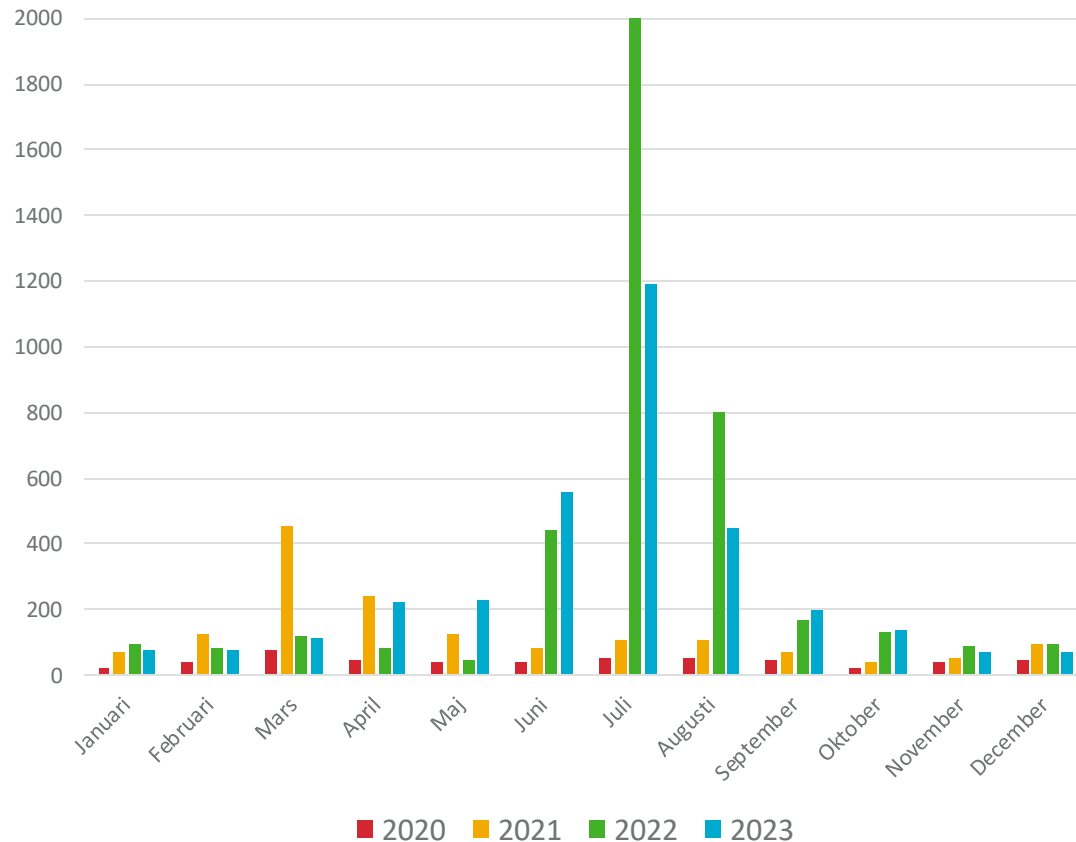
**DATA-
& BIO-
BANK**



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

Wild birds reported to rapportervilt.se (Sweden)

Number of reported dead or sick birds to
rapportervilt.se 2020-2023



Rapportera sjuka/döda vilda djur

Län: Södermanlands län

Kommun: Nyköping

Fyndplats/ort: Öster Malma

☐ Jag anger koordinater manuellt (i WGS84 lat/long decimalt)

Koordinater:

Uppgifter om fyndet

Djurslagsgrupp: Däggdjur

Djurslag: Alg

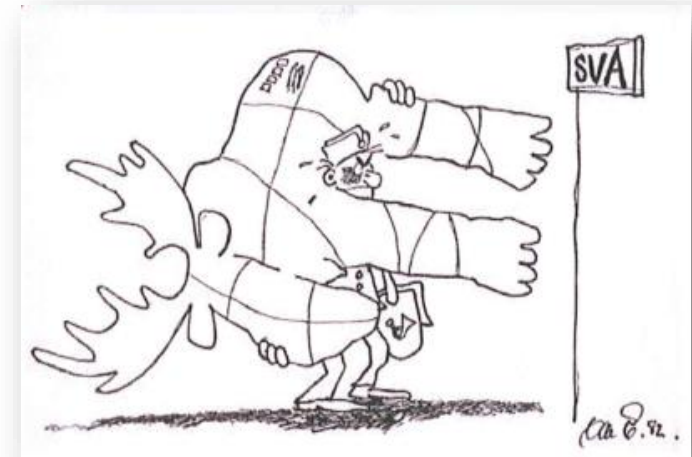
Antal: 1

Skick: Delvis upplåten

Bild på fyndet: Bläddra...

Övrig information:

rapportervilt.sva.se



General (passive) wildlife disease surveillance in the field



Field sampling of wild boar (*Sus scrofa*)



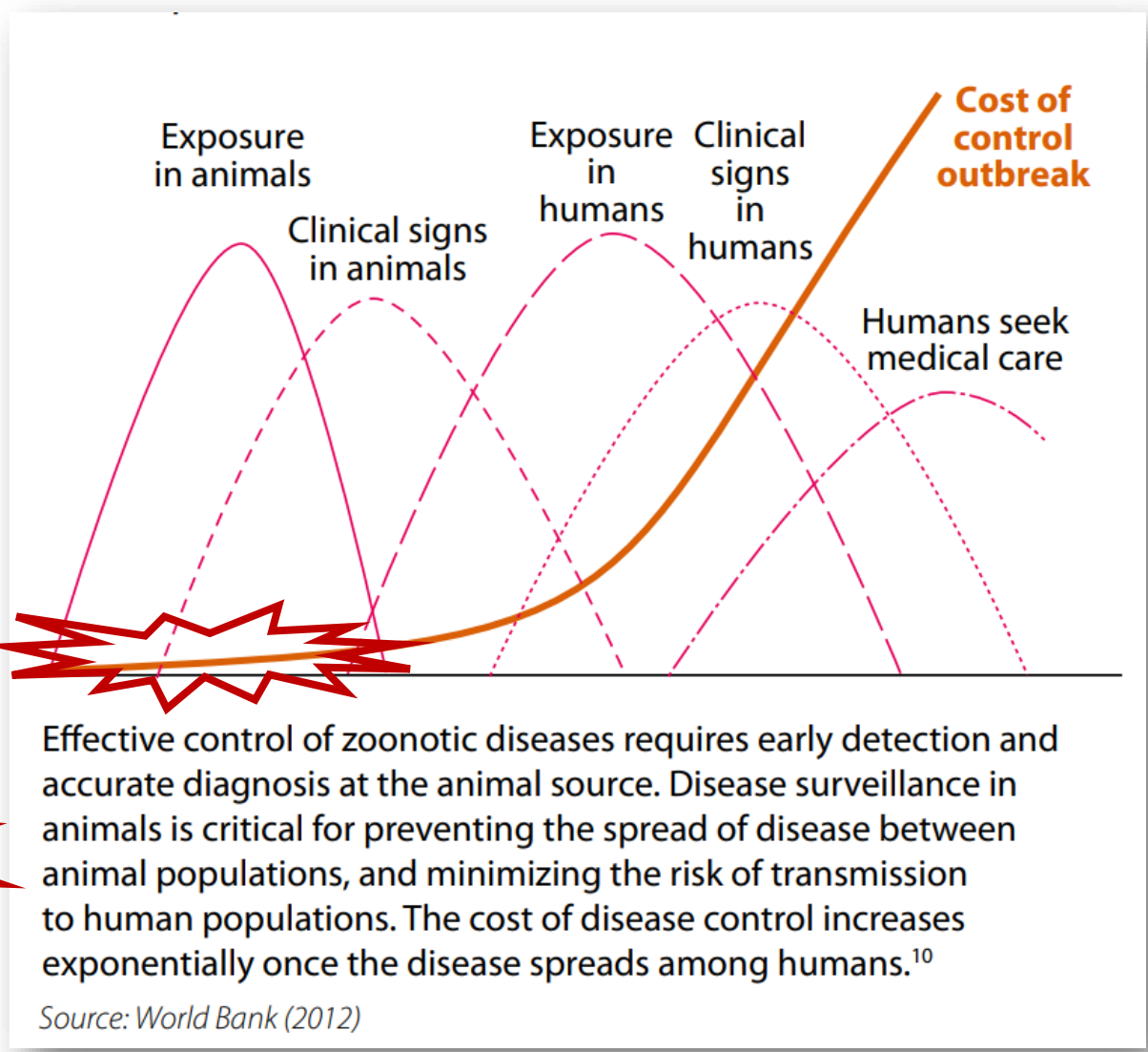
Field necropsy, killer whale (*Orcinus orca*)



OHEJP-Strategic-Research-
and-Innovation-Agenda

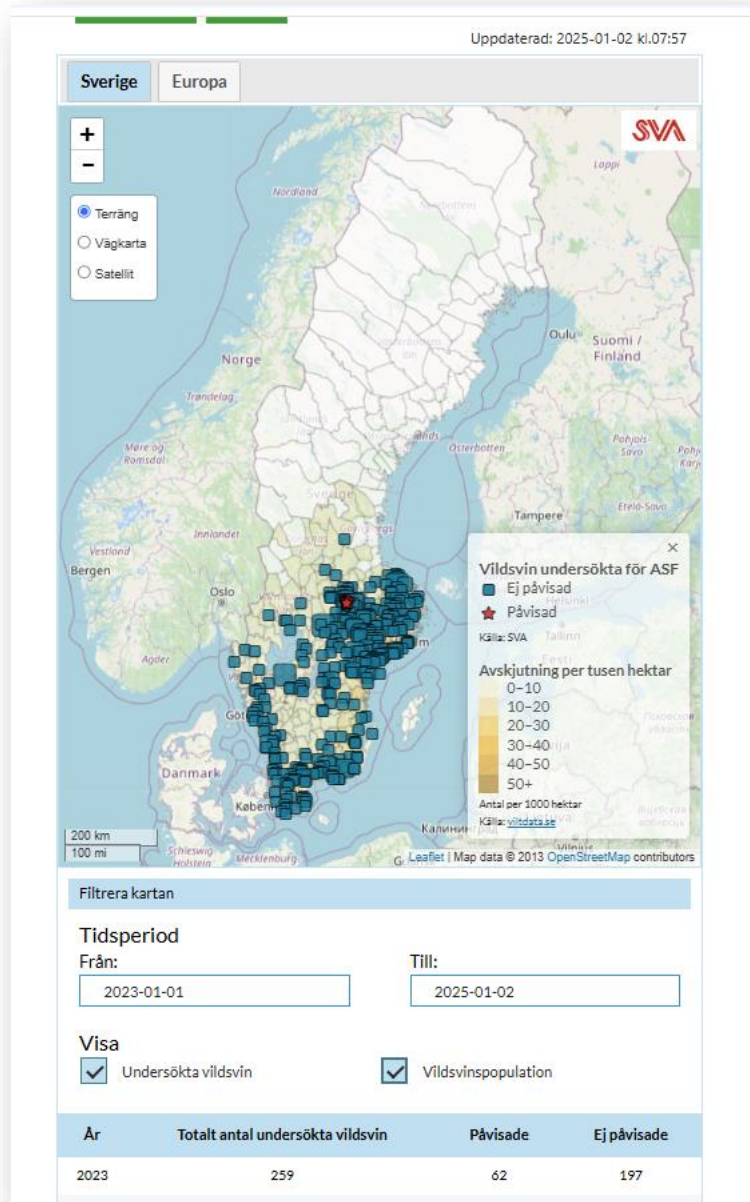
WDS →

Early detection



“The cost of prevention is 100 times less than the cost of responding to pandemics” (WHO) SVA

Communication of results and data sharing



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



Acknowledgements



SVAs wildlife team (www.SVA.se)

