SWEDISH VETERINARY AGENCY

WILDLIFE DISEASE SURVEILLANCE IN SWEDEN 2024

SVA report 115

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Photo, Cover: Radiograph of a roe deer (*Capreolus capreolus*) doe. Radiographs of wildlife necropsy cases are mainly done to look for metal from ammunition if the animal has been shot or wounded, or to document skeletal lesions. Photo: SVA.

Photo, others: SVA if no byline is present by the image.

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Introduction

This annual report covers work funded by the Wildlife Management Fund, mainly used for the general wildlife disease surveillance programme, which is a major part of all work at SVA involving wildlife. The report also summarizes all activities regarding wildlife at SVA in 2024, where projects and research studies within the Wildlife Disease Surveillance Program are reported, as well as other activities that have been carried out with the aim of fulfilling SVA's instruction to follow and analyse the health and disease situation in wild animals in Sweden.

28 March 2025
Erik Ågren, Head of Wildlife Section
Aleksija Neimanis, Head of Section for Research and Development

*Red squirrel (*Scurius vulgaris*) found sick, and later it died. Reported with photos to SVA by Tyra Wessman in 2024, as part of the citizen science reporting to the general wildlife disease surveillance at SVA.*

Summary

The health status of Swedish wildlife 2024

Sweden was declared free from African swine fever in 2024, just one year after this first outbreak was discovered. Overall, there were fewer other outbreaks and cases of serious infectious diseases in wildlife this year.

Surveillance of wildlife diseases is mainly done through autopsies and ancillary investigations of found dead wildlife, and targeted surveillance with active sampling. Reporting from the public and authorities contributes to the surveillance at SVA. The focus is on the diseases of wild animals that can be transmitted to or from domestic animals or humans, and those that may affect wildlife populations, especially if endangered species are involved.

African swine fever was detected for the first time in the country in September 2023 in Fagersta municipality affecting wild boar. In September 2024 the disease was successfully eradicated, and Sweden was declared free of this virus.

Avian influenza was detected sporadically, and only in the beginning of the year.

During 2024, 1,781 fallen wildlife cases were registered at SVA; 995 mammals of which 326 were wild boar, 780 birds, four reptiles and two amphibians. Fifty-five cases of communicable diseases were reported to the Swedish Board of Agriculture, as well as 125 cases of infections or diseases that can be reported voluntarily to WOAH (non-listed diseases affecting wildlife).

The national surveillance of the parasite fox tapeworm *Echinococcus multilocularis*, from 2021 to 2024 showed that the infection is still very sporadic, with occasional findings in the southern half of the country. However, in a couple of areas the parasite is established since the monitoring 2011 - 2014.

The programme for health and disease surveillance of marine mammals, with SVA in collaboration with the Swedish Museum of Natural History, necropsied 26 porpoises and 31 seals in 2024, which adds to the knowledge on these species. Three other stranded whales were examined at SVA: A common dolphin and two Sowerby's beaked whales.

A total of 872 large carnivores were registered at SVA in 2024 (1,165 for 2023). SVA's task is to examine all bears, lynxes, wolves, and wolverines that are found dead, or are killed. The results show that the large carnivore populations are generally in good health.

References: SVA Annual report 2024, the Wildlife Section, and SVA database SVALA.

Wildlife disease focus – a lot about wild boar

African swine fever outbreak 2023 - 2024

The first outbreak of the viral disease African swine fever in Sweden was detected in September 2023 in wild boar in Fagersta municipality. A year later, in September 2024, Sweden was declared free of the virus.

African swine fever (ASF) appeared in Georgia in 2007 and spread northwards in wild boar and domestic pigs in eastern Europe and then westwards into the EU in 2014. The infection made occasional longer jumps west, with point introductions in the Czech Republic and Belgium. At SVA, ASF was monitored through our wildlife disease surveillance, with testing of as many found dead wild boar as possible.

At the end of August 2023, hunters in Fagersta reported to SVA via the online reporting form **rapporteravilt.sva.se**, several cases of sick and dead wild boar over a period of one week. When the first sample from one of those cases was analysed, the first outbreak of ASF could be confirmed in the country on September 6.

One of the first reported dead wild boars in the Fagersta area at the end of August 2023. The following week, SVA was able to confirm the first outbreak of African swine fever in the country. Photo: private.

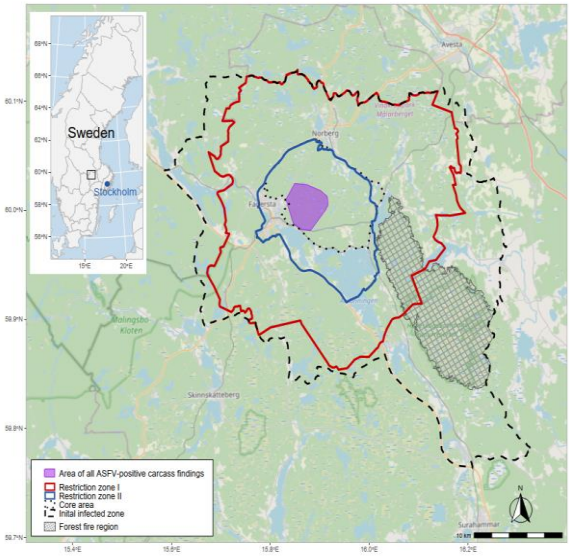
Doctoral student Emil Wikström at SVA conducts research at ASF and participated in sampling of found dead wild boars in the Fagersta area in September 2023. Photo: Estelle Ågren, SVA.

A very quick response and good cooperation between various authorities and other stakeholders who had already been preparing for a long time, meant that the outbreak could be handled efficiently. SVA, which is a risk assessing authority with an ASF expert group, and the Swedish Board of Agriculture, as risk managing and decision-maker of zones and restrictions, were part of a larger collaboration involving municipalities, hunters' associations and local hunters. Thanks to good cooperation, the forests east of Fagersta were quickly searched through to determine how widespread the infection was. For Sweden, unique restrictions were introduced to minimize disturbing surviving wild boar and thus reduce the risk of spreading the infection. It was no longer allowed to move around in nature, only along roads, a major restriction of the right of public access.

Many dead wild boar were found in the first few weeks and most of the recently dead cases were positive for ASF virus. All positive wild boar were found within a radius of 5 km from a suggested ground zero point. This provided information to establish a core area, which then was fenced off in November 2023.

The virus causes high fever and bleeding in wild boar, so infected animals are not able to move very far before they die, usually within a week of

being infected. The occasional wild boar that were not infected within the fenced area were killed. All dead and killed wild boar carcasses were burned to reduce the amount of virus in the environment. When the infection was shown to be limited to the core area, a number of restrictions could be lifted within the surrounding original so-called infected area, which also could be reduced in size.

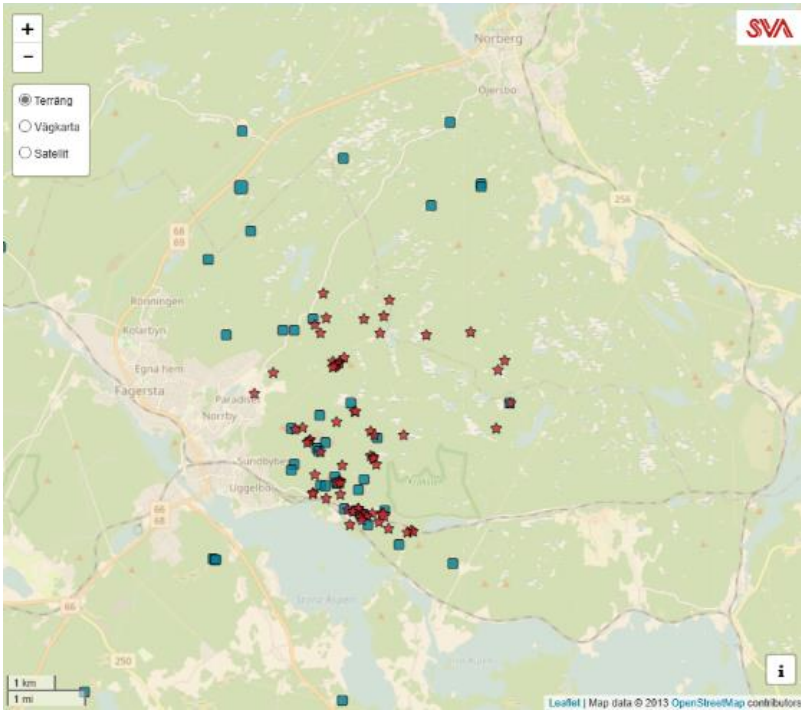


Map with zones around the outbreak of ASF in Fagersta municipality. Original infected area dashed, reduced outer zone red, fenced area blue, purple area shows where all positive carcasses were found. Map: SVA.

Repeated searches of the core area for, and sampling of, dead wild boar were carried out. Testing all dead or killed wild boar in the surrounding buffer zone, as well as wild boar that died in traffic accidents, helped to establish that the last infected wild boar died in September 2023. A total of 70 positive wild boar carcasses or remains of wild boar were found. Based on the data and eradication efforts, Sweden could be declared free from ASF in September 2024, only a year after the outbreak was discovered. Previous point introductions of ASF in Europe have taken at least two years to eradicate. A combination of thorough preparations, good wildlife disease surveillance and geographical location of where the first outbreak of ASF took place, contributed to a small and localized outbreak. The limited core area size contributed to making the outbreak manageable and enabled a swift eradication that has attracted international attention. The hunters, and the entire municipality, were hit hard by the effects of the restrictions that the outbreak entailed. Good cooperation with local hunters was crucial for the practical implementation of the outbreak management, for which we are all very grateful!

To figure out when the virus may have been introduced to wild boar around Fagersta, a so-called taphonomic study was carried out, estimating at what date each infected case had died. This was based on factors such as decomposition of bodies, the presence of fly larvae and the outdoor temperature during the year. The virus was estimated to have begun spreading in the wild boar population sometime in May or June 2023, which is a few months before several dead wild boar first were discovered and reported. The same method was used to determine that the last infected wild boar died at the end of September 2023.

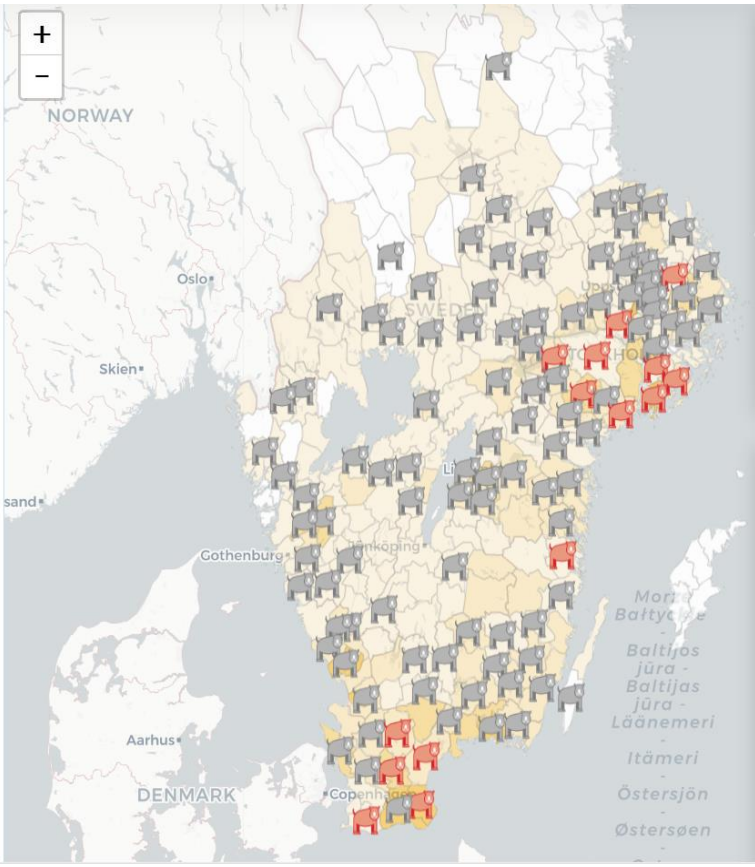
Follow-ups and evaluation of the outbreak management is still ongoing. One interdisciplinary study is being conducted on how the outbreak affected society at large, looking at various aspects. To prevent the spread of infection and avoid any new introduction of ASF in wild boar, recycling and garbage plants need to be fenced and have routines to limit wild boar from access to garbage with leftover food. The threat of another introduction of ASF virus remains due to the spread in Europe, but the risk is still assessed to be low.



Map of the core area of the African swine fever outbreak east of the community of Fagersta. Red stars were carcasses positive for ASF virus, blue squares were carcasses or skeletal remains that were negative. Map: SVA.se

Salmonella Choleraesuis in wild boar

Mapping of salmonella in wild boar has continued in 2024. About 10% of the examined animals carried this zoonotic bacterium. The infection is more widespread in some counties. Monitoring does not yet have full coverage of the wild boar geographic spread, so continued sampling is needed.



Follow the mapping of Salmonella *in wild boar on www.sva.se*

A total of 268 wild boar carcasses were analysed for salmonella in 2024. Of these, 209 wild boar were received as fallen wildlife and 27 of them tested positive for salmonella bacteria, with 23 being typed as *Salmonella* Choleraesuis. Rare cases of three other types of *Salmonella* were found among these positive cases. Of 59 hunter harvested wild boar, only one carried *Salmonella* in the intestine or intestinal lymph nodes, and it was not *Salmonella* Choleraesuis.

It is mainly young wild boar that that have clinical disease from this salmonella, while adult boar can carry the bacterium without clinical signs themselves. In 2025, only fallen game will be sampled, not hunter harvested wild boar.

FACTS ABOUT SALMONELLA

The bacterium *Salmonella* Choleraesuis is a bacterium that particularly affects domestic pigs and wild boars. The bacterium is more often detected in wild boars that are found dead or killed due to disease. More widespread occurrence is seen in some counties such as Skåne and Södermanland, while single findings have been made in other counties.

This type of *Salmonella* was found in the country in 2020 in domestic pigs and wild boar in Skåne and a major monitoring was initiated.

Any type of *Salmonella* can cause illness in humans. The National Food Agency advises that careful hygiene during evisceration and slaughter is very important to be able to safely eat hunter harvested wild boar, even if the animal only carried the infection in the intestines. Note that animals that have shown signs of disease should not be consumed!

Circovirus in wild boar

Circovirus affects the immune system and may explain an increased mortality rate in wild boar piglets. This virus may contribute to an apparent decline of the wild boar population.

Porcine circovirus type 2 (PCV-2) is an important infection in domestic pigs due to its immunosuppressive effect and can lead to the piglet disease PMWS (post-weaning multisystemic wasting syndrome), which is characterized by rapid emaciation, diarrhoea, pneumonia or acute death. The virus can also cause reproductive disorders if sows are infected during pregnancy.

Research on domestic pigs shows that co-infection with PCV-2 and *Salmonella* Choleraesuis causes stronger disease symptoms and that pigs excrete the bacterium longer periods of time than those who have been infected with *Salmonella* alone. Wild boar autopsied and sampled for *Salmonella* have therefore also been tested for PCV-2 to map presence of the virus in the wild boar population.
In 2023 and 2024, lymph node and intestine samples from 135 wild boar were tested for PCV-2 and *Salmonella*. Of these, 58 were collected from healthy hunted wild boar and 77 from fallen game. Virus was found in 93 (69%) of all examined animals. Virus was detected to a higher degree in fallen game (75%) compared to hunter harvested wild boar (60%). *Salmonella* was detected in 20 of the examined wild boar, and 16 of them were positive for both *Salmonella* and circovirus. Two out of 19 PCV-2-negative wild boar were positive for *Salmonella*.

The results show that the occurrence of PCV-2 is high in the Swedish wild boar population, but it is not possible to establish a link between the occurrence of PCV-2 and an increased occurrence of *Salmonella*. Further investigations are underway to determine whether PCV-2 itself causes disease in wild boar or whether there is any link between PCV-2 and other diseases.

You are our eyes and ears!

SVA depends on reports from the interested public all over the country to acquire information on where and when disease or increased mortality occurs in wildlife. SVA is very grateful that so many people report online to **rapporteravilt.sva.se** or by email or phone. Here we present some statistics for 2024, of your contributions to our wildlife disease surveillance.

rapporteravilt.sva.se

Table: SVA's online reporting form for reporting dead and sick wildlife in 2024.

Class	No. reports
Avian	1 503
Mammal	2 059
Amphibian	14
Reptile	8
Unknown	29
Total	**3 613**

vilt@sva.se

Table: The number of emails received and replies, in the wildlife mailbox for the year 2024.

Class	No. email
Avian	2 398
Mammals	4 425
Amphibian, reptile	33
Marine mammal	1 280
Other	137
Total	**8 273**

The digital online reporting form makes it easy to report and has led to an increased number of reports of wildlife cases. Many received reports have attached photos or video, which also facilitates species identification when unclear. Sometimes, also a diagnosis can be made directly from the image material and then the carcass or samples do not always need to be sent to SVA for examination. Photo collage with images received on rapporteravilt.sva.se

Wildlife cases 2024

In 2024, the Wildlife Section handled a total of 1,781 cases of fallen wildlife, i.e. found dead or euthanized sick animals, for the general disease surveillance.

The fallen wildlife cases are listed in descending number of cases per incoming wildlife species; a total of 995 mammals, 780 birds, 4 reptiles (2 lizards, 2 snakes) and 2 amphibians (common toad).

Looking at animal species groups, different hoofed animals (cervids and wild boar) dominate for mammals with 496 cases, most being wild boars with 326 samples, due to monitoring of African swine fever. Predators are 265 cases, 67 leporids, 28 rodents and 72 insectivores. Of the birds submitted, birds of prey numbered 270 cases, which is 34% of all bird cases. A total of 213 mammals and 200 birds were species that belong to the State when found dead (wildlife of the State). Other cases handled by the Wildlife Section are large carnivores that have been killed during licensed or protective hunting, as well as samples collected from healthy wildlife for targeted health and disease surveillance. Other cases are from game farms, i.e. animals with animal owners. Trichinella screening of wild boar and bears are sent directly from hunters to the parasitology lab at SVA.

Mammals	No.
Wild boar	326
Otter	90
Roe deer	83
Moose	83
Red fox	73
Lynx	60
Hedgehog	42
European brown hare	34
Bat	30
Harbour porpoise	28
Red squirrel	19
Wild rabbit	19
Grey seal	15
Harbour seal	15
Mountain hare	14
Brown bear	12
Arctic fox	6
Wolf	8
Wolverine	5
Badger	4
Yellow-collared mouse	4
Fallow deer	4
Ermine	3
Mink	2
Marten	2
Raccoon dog	2
Beaked whale	2
Water vole	2
Beaver	1
Mouse	1
Canid	1
Ferret	1
Red deer	1
Shrew	1
Common dolphin	1
Weasel	1

Avian	No.
White tailed sea eagle	76
Mute swan	47
Dove/Pigeon	35
Siskin	30
Common murre	26
Blackbird, Ural owl	25
Goshawk	24
Common gull, Kestrel	22
Buzzard	20
Sparrow hawk	19
Tawny owl	18
Golden eagle, Rook, Cormorant	17
Greenfinch, Jackdaw	16
Herring gull	15
Great spotted woodpecker	14
Blue tit, Mallard, Eurasian siskin, Magpie, Blackheaded gull	13
Bullfinch, White stork	12
Barnacle goose	11
Great grey owl	10
Eagle owl	9
Greylag goose, Song thrush	8
Fieldfare	7
Canada goose, Peregrine falcon	6
Chaffinch, Eider, Grey crow, Barn swallow, Red kite, Great tit	5
Green woodpecker, Wood pigeon, Merganser	4
Brambling, Osprey, Common tern, Northern gannet, Shorteared owl, Hawk-owl, Sandwich tern, Waxwing, Black woodpecker, Merlin, European shag, Crane	3
House sparrow, Kingfisher, Eurasian hobby, Tree sparrow, Lesser black-backed gull, Pied avocet, Hawfinch, Long-tailed tit, Black-throated diver, Oystercatcher, Whooper swan	2
Greater scaup, Marsh harrier, Ptarmigan, Grey-headed woodpecker, Cuckoo, House martin, Grey heron, Short-eared owl, Goldcrest, Puffin, Jay, Boreal owl, Redstart, Red-breasted merganser, Pygmy owl, Starling, Gold finch, Northern fulmar, Coal tit, Razorbill, Swift, White-backed woodpecker, Montagu´s harrier	1

Notifiable wildlife diseases

SVA reports all diagnosed cases of notifiable animal diseases to the Swedish Board of Agriculture, for further reporting to WOAH.

In 2024, avian flu and rabbit haemorrhagic disease dominated the cases of notifiable diagnoses, but the number of diagnosed cases is low compared to other years when extensive disease outbreaks have occurred. Several cases of fox dwarf tapeworm *Echinococcus multilocularis* were found thanks to the ongoing national surveillance during the year.

During the year, a total of 55 cases of notifiable diseases in wildlife and 125 diagnoses for the voluntary reporting to WOAH, the World Organization for Animal Health's non-listed diseases affecting wildlife, were recorded, in 29 different species.

The number of cases of reported diseases in wild animals only reflects how many diagnoses have been found among the cases that have actually been sent to SVA or other laboratory. The total number of wildlife affected by a disease cannot be determined, but with similar monitoring over a longer period of time, trends can be followed if a disease is increasing or decreasing. We can also detect when new infections or diseases are introduced into the country.

The definition of a positive case can vary as not all received cases are verified with a laboratory analysis. This is typical during extensive mortalities and multiple bodies from the same event are submitted. Some bodies are also decomposed and further diagnostics are not always possible.

WOAH Listed disease	Species	No.
African swine fever	Wild boar(†2023)	1
Avian influenza, highly pathogenic	Birds	23
Avian influenza, highly pathogenic	Otter	1
Rabbit viral haemorrhagic disease	Wild rabbit	13
Echinococcus multilocularis	Red fox	14
Trichinellosis	Wild boar	3

WOAH Non-listed willdlife disease, per Species	No.
Lead poisoning	**15**
Golden eagle 12, White tailed sea eagle 2, Merganser 1	
Circovirus	**1**
Wild boar	
Pigeon paramyxovirus	**5**
Pigeon	
Tularemia	**8**
European brown hare 4, Mountain hare 4	
Malignant catarrhal fever	**2**
Moose	
Avian influenza, low pathogenic	**1**
Black-headed gull	
Avian pox	**2**
Jackdaw 1, Crane 1	
Listeriosis	**2**
Roe deer 1, Deer 1	
Parvovirus	**1**
Lynx	
Pasteurellosis	**2**
Fallow deer	
Plasmodium	**3**
Blackbird 2, Magpie 1	
Poxvirus	**3**
Common dolphin,1, Harbour porpoise 1, Beaked whale 1	
Pseudotuberculosis	**3**
European brown hare	
Salmonellosis	**58**
Bullfinch 10, Siskin 15 Eurasian siskin 8, Black-headed gull 2	35
Wild boar	23
Sarcoptic mange	**7**
Lynx 5, Wolf 2	
Toxoplasmosis	**2**
European brown hare	
Trichomoniasis	**10**
Brambling 1, Chaffinch 2, Greenfinch 3, Wood pigeon 3, Sparrow hawk 1	

Targeted wildlife disease surveillance

The Swedish Board of Agriculture finances projects to monitor certain serious infections in animals. It is important with early detection of a newly introduced infection or disease, and to be able to show freedom from certain contagious infections. The Swedish Environmental Protection Agency has emergency funding that SVA can apply for when there is increased morbidity or mortality in wildlife. The targeted surveillance projects during 2024 are mentioned here.

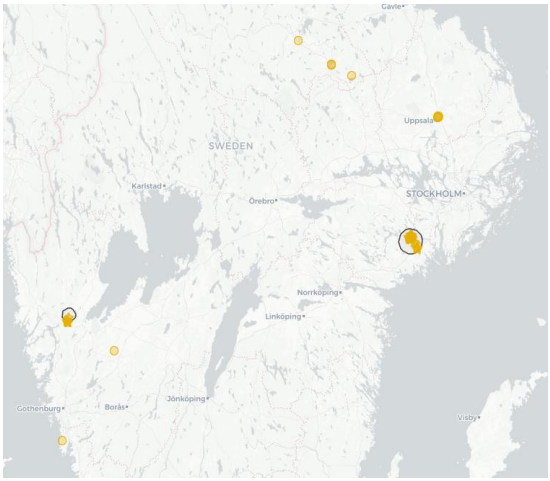
Echinococcus, fox tapeworm national monitoring 2021 – 2024

Photo: iStock

The fox dwarf tapeworm (*Echinococcus multilocularis)* is still only found very sporadically in the country, but there are at least two local areas with established infection since the first discovery in Sweden 2011. These infected areas in Uddevalla and Gnesta municipalities have a higher prevalence of the parasite than the rest of the country.

A national monitoring programme funded by the Swedish Board of Agriculture has been carried out 2021–2024, which is a follow-up of the previous monitoring in 2012–2014. In this second monitoring, novel findings of single positive fox faecal samples have been made in the municipalities of Kungsbacka, Essunga, Avesta and Hedemora. In Borlänge, a single positive sample was found in 2011 and a second single positive sample in 2022. In Uppsala, five positive samples have been found within 1 km in 2024, so follow-up screening needs to be carried out in the future to find out if this could be a third area with established infection.

The results of the monitoring can be seen on SVA's website: Rävens dvärgbandmask — smittläge med karta och tabeller - SVA



Map with positive cases (yellow circles) of E. multilocularis *in red fox faeces or fox droppings 2021–2024. Established infected areas are found in Uddevalla and Gnesta municipalities (dark circles with several yellow stars). Map: SVA*

Since 2012, 17 Swedish human cases of the disease alveolar echinococcosis have been found, some of which could have been acquired within Sweden. To reduce the risk of human infections in areas with established infection, the authorities give advice, such as deworming dogs that eat voles (the intermediate host for the parasite) and to have good hand hygiene before eating when you have been out in nature.

It is conceivable that the infection can be eliminated if it is established only in a limited area, by using treated baits to deworm foxes over a long period of time. Such studies have been conducted in other countries. In 2025, SVA is planning how a deworming study could be carried out under Swedish conditions in an established area and what the cost would be.

Several mute swans and a goosander died of avian flu in Marieberg in Stockholm in January 2024. Accumulation of birds in a small area means that the infection can spread to many birds. Photo: Filippa Lilja.

Avian influenza 2024

Highly pathogenic avian influenza (HPAI) of the H5N1 type continued to circulate among wild birds in Europe, North America and South America in 2024, but the number of cases was lower in Europe in the summer and autumn of 2024 compared to 2023. News in 2024 was that the virus was detected for the first time in dairy cows, in the United States of America.

In Sweden, highly pathogenic, i.e. disease-causing, avian influenza type HPAI-H5N1 was detected in 23 birds of 9 species in 2024 (see table). Most cases were detected in mute swans and geese. The virus was also detected in an otter that was found dead in the county of Halland. No cases of avian influenza were detected in wild birds between March and December 2024 in Sweden.

The number of investigated cases does not fully reflect the number of dead or positive birds since only some dead birds are sent to SVA for analysis. The total number of birds that have died from avian influenza is thus greater than those that can be reported by SVA.

Table with bird species and number of confirmed cases of avian influenza in 2024.

Bird species	HPAIV-positive
Goshawk	2
Herring gull	1
Mallard	2
Jackdaw	1
Canada goose	2
Mute swan	7
Buzzard	2
Merganser	1
Barnacle goose	5
Total	**23**

Trichinella monitoring

In 2024, three cases of *Trichinella* were detected in wild boar. This parasite is still very sporadic in Swedish wildlife.

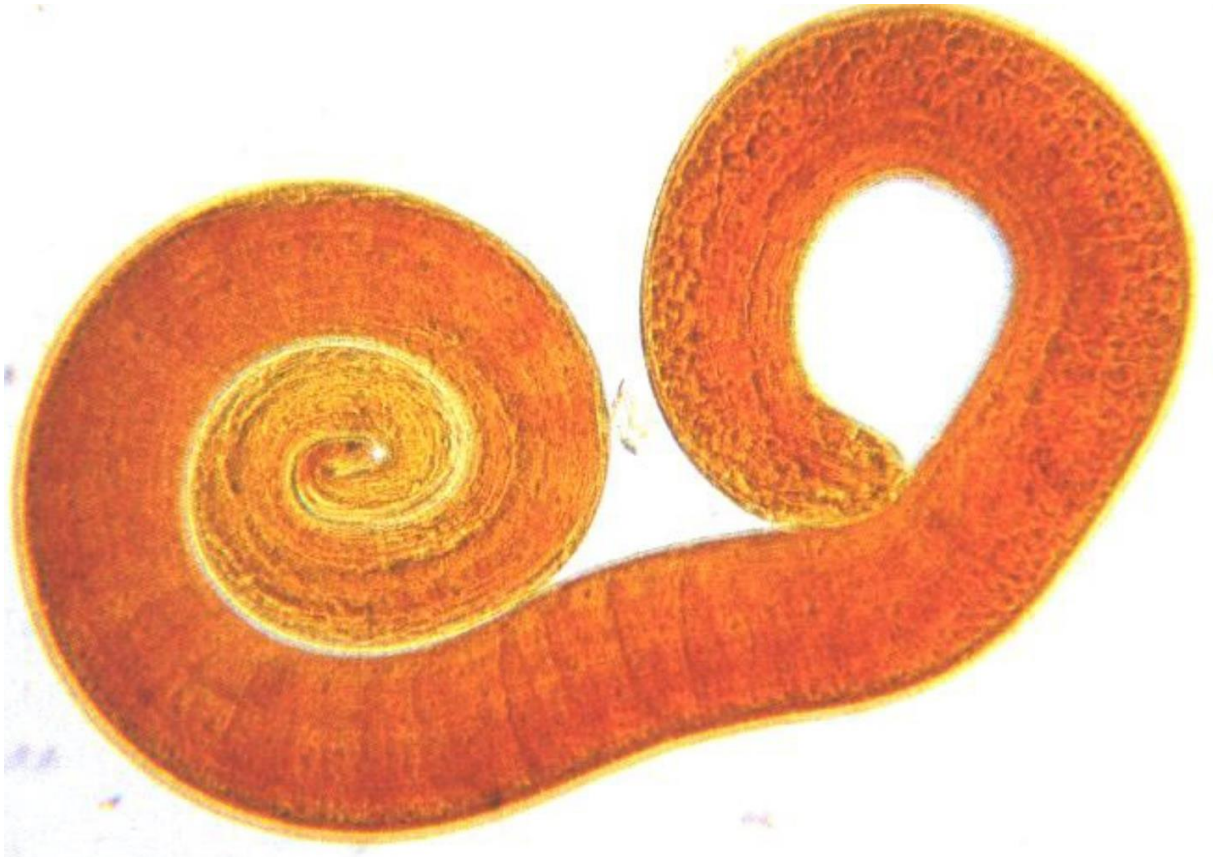
Of 125,025 wild boar carcasses tested in 2024, three were positive for *Trichinella*, i.e. only one infected of approximately 41,700 animals.

Other wildlife species that were tested in 2024 without any *Trichinella* being found were 317 bears, five badgers, three seals and one beaver.

TRICHINELLA FACTS

Wild boar and brown bears that are shot in hunting must be examined for *Trichinella* parasites if the meat is to be sold for human consumption. This testing provides a good monitoring of *Trichinella* infection in these game species, and combining wild boar and bear covers most of the country. However, there are different species of *Trichinella* and not all of them are found equally in the various wildlife species.

SVA is one of several laboratories that offer the service of *Trichinella* analysis. However, if *Trichinella* is found in another laboratory, a sample must be sent to SVA, Sweden's veterinary reference laboratory. Typing of the exact *Trichinella* species is then done at the EU reference laboratory in Italy.



Trichinella spiralis *larva becomes active when infected muscle tissue with inactive larvae is digested in the stomach. This occurs when an animal or human eats meat that contains* Trichinella *larvae. The larvae mature into an adult stage in the intestine, causing bowel inflammation, mate and produce new larvae that then migrate through the intestinal wall into the body muscles, causing muscle pain. The larvae settle into a resting stage and wait to be eaten by the next host animal.*

Roe deer with diarrhoea. Photo: Michaela Tollin

Roe deer diarrhoea

Intestinal *Cryptosporidium* and *Giardia* parasites may cause roe deer diarrhoea but are not the only causes of this syndrome. The cryptosporidia detected in roe deer are different from those that cause disease outbreaks in humans.

Roe deer with diarrhoea have been observed for decades, but what causes the diarrhoea has eluded wildlife disease researchers in both Sweden and Denmark, despite extensive studies and analyses. In a research project 2024, we investigated if the intestinal protozoal parasites *Cryptosporidium* and *Giardia* can be found in roe deer with intestinal inflammation and diarrhoea.

Cryptosporidia (*Cryptosporidium* spp.*)* and *Giardia* spp. are single-celled parasites that infect the intestinal mucosa and causes diarrhoea in several animal species, and in humans. Occasionally, recurrent outbreaks of cryptosporidiosis are seen in humans, sometimes linked to the consumption of leafy vegetables, but it is rare that the source of the infection can be found. Roe deer often spend time in vegetable gardens, so it was of interest to investigate if roe deer carry this parasite and thus could be a possible source of human infection. *Giardia* can also cause disease in both animals and humans and has previously been found in outbreaks of roe deer diarrhoea in Sweden.

In 2023 and 2024, samples from roe deer with diarrhoea or dead roe deer were sent in by hunters and the public in general. We analysed a total of 195 cases and of these 144 had signs of intestinal inflammation and/or diarrhoea, and 51 samples came from roe deer with normal faeces.

Cryptosporidium was detected in 15% of the samples. Molecular diagnostics showed infection with species *C. deer*, *C. ubiquitum* and C. *suis*. The zoonotically important species C. *parvum*, which is also the species identified in recent human outbreaks in Sweden, was not identified in any of the positive samples. Thus, roe deer do not seem to be the source for humans cryptosporidia infections. *Giardia* was detected in 15% of the deer samples.

Roe deer with intestinal inflammation and/or diarrhoea had one of the two parasites in 24% of the samples, while 76% were negative. Thus, there is no clear indication that this infection alone causes diarrhoea in deer. In animals with normal faeces, 20% of the samples were positive for one of the two parasites, which shows that deer can be asymptomatic carriers, which is known from previous studies and also applies to other species.

The project was funded by the Swedish Environmental Protection Agency and the Ivar and Elsa Sandberg Scholarship Fund.

CWD

Monitoring of Chronic Wasting Disease CWD) is performed on suspected clinical cases. This means that SVA examines adult cervids with two or more of the following symptoms that may indicate CWD: emaciation, neurological symptoms, behavioural changes, increased salivation, and increased urination. Emaciated deer found dead are also examined, unless there is an obvious other cause for the emaciation.

In 2024, a total of 34 cases of clinical suspicion in moose and two red deer were investigated for CWD. All cases were negative.

As wild reindeer in Norway have been affected by CWD since 2016, domestic reindeer that graze freely for most of the year are also examined. In 2024, three reindeer with clinical suspicions were, all were negative.

Nilfeber- och Usutuvirus

The closely related West Nile fever (WNF) virus and Usutu virus are spreading in Europe. Both viruses circulate between mosquitoes and birds and can cause disease outbreaks and mortality in some bird species. WNF virus can infect horses and other mammals, as well as humans. SVA has monitored these viruses in wild birds found dead since 2019.

In 2024, 155 birds from the general wildlife disease surveillance that year, and also 114 biobanked bird cases from 2023 were tested for both viruses. All samples were negative.

In August and September 2024, a major usutu virus outbreak took place in Denmark. Although no Swedish cases were detected, there were reports of several dead thrushes in southwestern Skåne, but samples could not be submited. Continued monitoring of these viruses is important for early detection in Sweden. An increased number of dead thrushes is what we can expect to see when an outbreak occurs.

Blackbird is one of the species most affected by usutu virus, a mosquito-borne virus that causes encephalitis and death in birds. Photo: iStock

Research and development

Research projects and collaborative projects that have been ongoing during 2024

Rats as carriers of infection

Rats can carry zoonotic infectious agents and through their ability to enter different spaces, there is a potential risk that they can spread infection to both humans and animals.

The infection situation among Swedish wild brown rats has been largely unknown until now, as wild rats are rarely sent in as cases to SVA. For this reason, the project "Rats as disease carriers" was started by SVA and was a collaboration with SLU and Uppsala University.

Within the project, wild brown rats have been investigated for the occurrence of infections and pathological changes. The rats have been sampled for the bacteria *Salmonella*, *Leptospira,* and the tularemia bacterium *Francisella*, as well as being examined for antibiotic-resistant bacteria. The presence of different viruses was investigated: Hantavirus, SARS-CoV-2 and TBE virus.

A total of 249 rats were collected with the help of Anticimex when they carried out regular pest control in Uppsala and Malmö.

Almost no gross pathology was seen in the examined rats. A single rat had pneumonia caused by the bacterium *Corynebacterium kutscheri*.

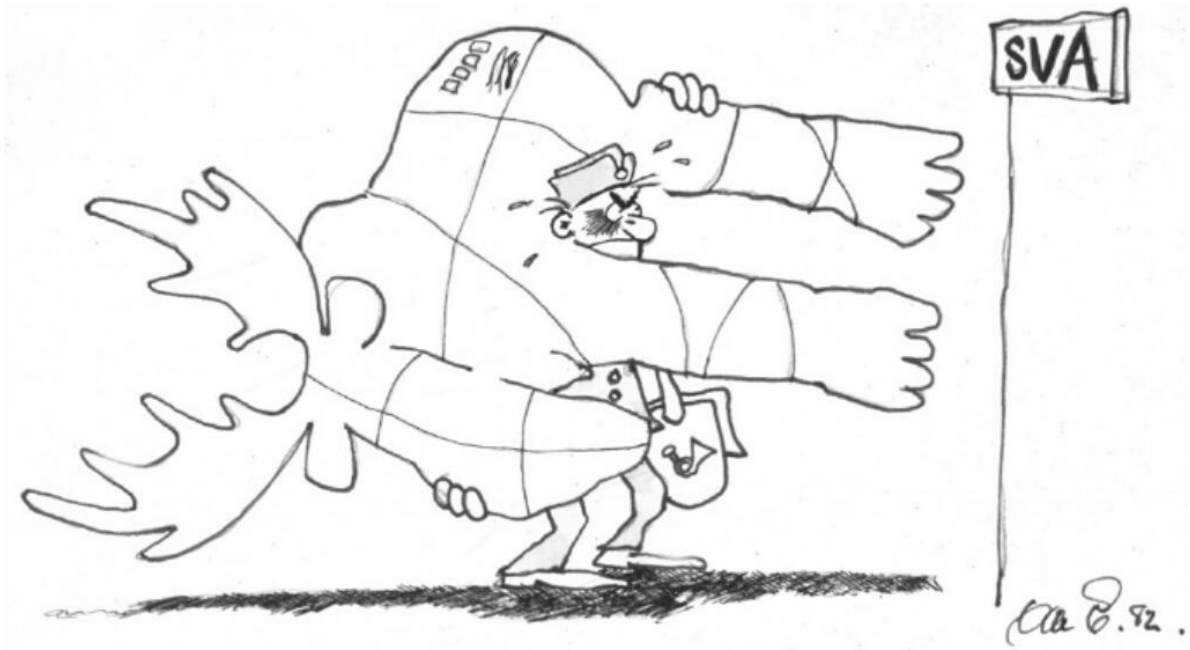
Only one rat tested positive for salmonella bacteria (*S.* Bareilly). This rat was trapped in an urban environment in Uppsala. At necropsy, it had slightly loose fecaes but no other pathology.

The trapped rats were smaller than hoped for and a large proportion were young, immature animals, which are probably easier to catch than older individuals.

Previous studies have shown that larger, and thus often older rats are more likely to have gross pathology findings. The large proportion of young rats may have led to some underrepresentation of disease incidence compared to actual occurrence. We conclude that the young rats in this study were relatively healthy, with few findings of disease.

Results from ongoing analyses of zoonotic agents within the project "Rats as disease carriers" remain to be evaluated.

A rat caught in an urban environment is being examined for various infections. Photo: SVA



Who contributes with fallen wildlife to SVA, and why?

How can we improve the general wildlife disease surveillance? An interdisciplinary research project led by veterinarians and behavioural scientists investigated this from 2021 to 2024. The project was funded by both the Swedish Wildlife Conservation Fund and the Swedish Hunters' Association.

Sweden's surveillance of wildlife diseases at SVA is based on general disease surveillance with examinations of dead or killed sick wildlife. The data generated is dependent on voluntary reporting and the assistance of the public with the submission of animal carcasses from the field.

The study aimed to investigate what material is examined by SVA, what factors affect the submission of material, who voluntarily contributes, what motivates these people to contribute and what the perceived obstacles there are to do this. The knowledge is needed to improve and develop SVA's disease surveillance and its resulting knowledge that is used for decision-making in wildlife management.

Some important results from the project are:

- **Uneven geographical coverage** and that some species are examined more often than others. Legislation requires certain reporting and targeted surveillance can be used to supplement the general surveillance.
- **Distance to SVA** and **the size of the animal** have major impacts on what material is examined. Functional logistics are important. The main practical obstacles to receive cases is storage and transport of animal carcasses.
- **A high degree of intrinsic motivation** is what drives many to contribute to the programme. Participation relies on a great interest in nature, being curious and wanting to contribute. Those who spend lots of time in nature could be involved in targeted surveillance efforts.
- **The feedback from SVA** is very important for reporters and submitters for their motivation to contribute. There is also development potential in **making results** continuously available online with interactive maps and data.

Suggestions for improvement from the survey, focus group discussions and workshop include:

- Raising public awareness of surveillance
- Clarification of the purpose of reporting
- Improve information to reporters when reporting
- Regional coordination of sampling, storage and transport

General disease surveillance

Fallen wildlife are cases found dead or sick wildlife that have been euthanized and disease or infection cannot be ruled out. Traffic-killed wildlife is not considered fallen wildlife, although unfortunately, it is an important cause of death of wildlife. Here we present some wildlife diseases that have been more common in the 2024 surveillance, but we also present a few unusual cases and cases of interest.

Dermatitis in moose

Many cases of widespread skin lesions over the lumbar dorsal area in moose were reported during the year, but only a few samples were submitted to SVA. Almost Many cases were reported from the southern half of the country almost 10 years ago and after that it seems to occur, but the number of cases varies between years. There seems to be a connection with an increase of cases when there also is a mass swarming of deer ked during hot and humid autumns.

Interesting wildlife cases 2024

Lymphoma in a wolf

An emaciated old male wolf was found dead in a shelter in a horse pasture in Askersund municipality. The wolf (24-VLT000409) had widespread lung tumours, a blood-cell cancer (lymphoma) that had destroyed 80 % of the lung tissue. The animal also had sarcoptic mange. An unusual finding was heavily worn-down incisors (see picture). The attrition indicates that the wolf had rubbed the teeth against a hard, abrasive surface – maybe a stereotypical behaviour due to severe illness.

Three-legged cormorant

A cormorant (24-VLT003808) that was shot during a protective hunt in Kalmar county was found to have three legs and the carcass was sent to SVA for examination. The extra leg was attached to the ceiling of the pelvic bones with a ligament. The foot was missing on the extra leg, but an old injury at the end stump of the leg, with old haemorrhage and chronic inflammation was seen. The femur, tibia and metatarsal bones were present, but were not normal or fully developed. The cormorant was a juvenile male in good physical condition and had no other pathology findings.

Having more legs than normal is called polymelia and is generally very rare in wildlife, and even more rarely described in wild birds, with only about 10 cases described worldwide. We thank the hunter for allowing us to document this unusual case!

Dermal onchocercosis in a moose

In September 2024, a young female moose (24-VLT003027) with abnormal gait was euthanised in Kronoberg county. At examining, the hunters found a curved spine (scoliosis). The moose also had wounds on her hind legs of unknown origin. Pieces of skin were sent to SVA. Examination of the skin samples revealed several nodules (0.5 – 2.5 cm in diameter). The larger were hairless with an ulcerated centre, which gave the lesion a crater-like appearance.

On microscopic examination the thickened skin had a severe chronic inflammation with the presence of many small nematode larvae, microfilariae. The changes were consistent with the disease onchocercosis, an infection of the connective tissue by nematodes of the genus *Onchocerca*.

Onchocerca is spread by biting insects such as gnats. The parasite is hair-thin, but up to several decimetres in length. The parasite is ususally harmless for moose, but the lesions can be secondarily infected. In severe cases, tendons and joints can also be affected. This type of skin lesion in moose has been described in North America (Alaska). Onchocercosis is seen in reindeer and red deer in Sweden, but seems to be uncommon in moose.

Herring gull with cranial neoplasm

Herring gull with neoplastic mass on the skull. Left image:. Photo taken of the underside of the skinned head, with the large tumour mass behind the beak, with three scalpel incisions.
Right image: Cross-section of the head with the skull (brain removed) at the top of the image and the tumour mass as a round dark structure on the right lower side of the head.

An adult female herring gull *Larus argentatus* (Id 24-VLT003558) was found in Västra Götaland county and taken into care for rehabilitation. The bird was later euthanized for animal welfare reasons due to breathing difficulties and a poor prognosis for survival.

At necropsy, a large round 4 cm mass was seen covering the entire right side of the skull. The mass displaced the lower half of the beak on the right side, which made the bird unable to close its beak.

The mass had filled out the beak cavity, pressed upon, and had damaged the right eye. The mass was partially encapsulated and was assumed to have originated in the ear. The soft tissue around the mass had been compressed and damaged. The tumour had not grown into the brain cavity but was adhered to the skull bone. Microscopic examination showed the mass to be compact connective tissue. The mass could either have been a chronic inflammation with proliferation of connective tissue or a neoplastic change. Diagnosis was challenging as immunohistochemical methods developed for mammals do not work well for bird tissues. The morphologic microscopic appearance with aggressive, infiltrative growth pattern and abundant mitotic activity led to a tentative diagnosis of connective tissue tumour.

Lynx with parvoviral infection

In September 2024, a young male lynx (24-VLT002931) was found dead in Stockholm County. At necropsy, the stomach and intestines were distended by large amounts of yellowish-brown fluid, indicating intestinal inflammation. Microscopic examination confirmed a severe inflammation of the intestine with necrosis and fewer lymphoid cells in the spleen than normal. Immunohistochemical examination detected panleukopenia virus in the spleen and small intestine. The lynx had died of a parvoviral infection, a virus that attacks cells that divide rapidly in the intestine and in lymphatic tissue. This disease is very rare to find in lynx in Sweden but occurs in domestic cats. The lynx had probably been infected by a domestic cat.

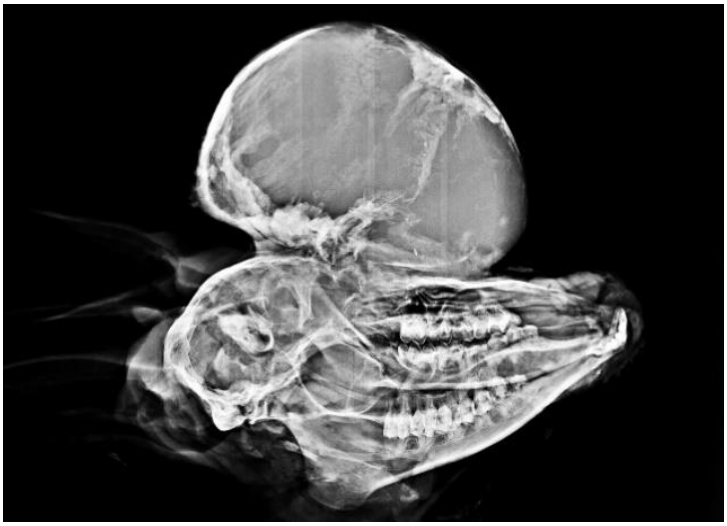
Wild boar without ears

A few cases of wild boar without ears have been documented at SVA. Symmetrical absence of outer ears can be a congenital defect, but it is not always possible to determine for sure. One case was investigated in 2024.

A wild boar that lacked external ears, probably a congenital change, although an injury early in life cannot be ruled out. Photo: private.

Roe deer with cranial tumour

In November 2024, a roe deer (24-VLT003554) from Norrtälje in Stockholm county was examined with a 10 x 13 cm mass on the left side of the head, compressing the left eye. Under a capsule of bone tissue, the mass was of solid glossy white connective and cartilage tissue. The tumour is suggested to have originated from bone tissue (osteosarcoma).



Marine mammals 2024

Carcasses of 26 porpoises and 31 seals were examined in 2024, as well as a common dolphin and two Sowerby's beaked whales. The annual number of marine mammals examined is limited, but long-term monitoring shows trends in health, diseases and causes of death over time.

A dead, stranded harbour porpoise calf (24-VLT002464) that was reported by a private individual to SVA and NRM in 2024. Photo: Ulla Jönsson.

Health and disease surveillance

Since 2020, the Swedish National Veterinary Institute (SVA), together with the Swedish Museum of Natural History (NRM), have been running a health and disease surveillance program for marine mammals, on behalf of the Swedish Agency for Marine and Water Management (HaV). The monitoring program includes stranded (found dead with unknown cause of death) and bycaught (accidentally caught in fishing gear) cetaceans and stranded seals. SVA and NRM collect data to follow where and when marine mammals die. Furthermore, a set number of suitable carcasses are submitted for necropsy and sampling, to analyse and investigate health, diseases and causes of death, resulting in data that contributes to research and knowledge about these species.

A summary of the marine mammals work at SVA in 2024 is that 60 marine mammal carcasses have been examined: 26 porpoises, 14 grey seals and 17 harbour seals. In addition, 125 samples from hunter harvested seals were analysed for avian influenza virus. Other examined cetaceans were a common dolphin (*Delphinus delphis*) and two Sowerby's beaked whales (*Mesoplodon bidens*). For more details, and description of autopsy findings, see the report "Health, diseases and causes of death in marine mammals 2024" available at sva.se.

Whales

Harbour porpoise

Of the 17 harbour porpoises found stranded and examined, the most common cause of death was bycatch, identified by net marks and signs of drowning (n=6, see diagram below).

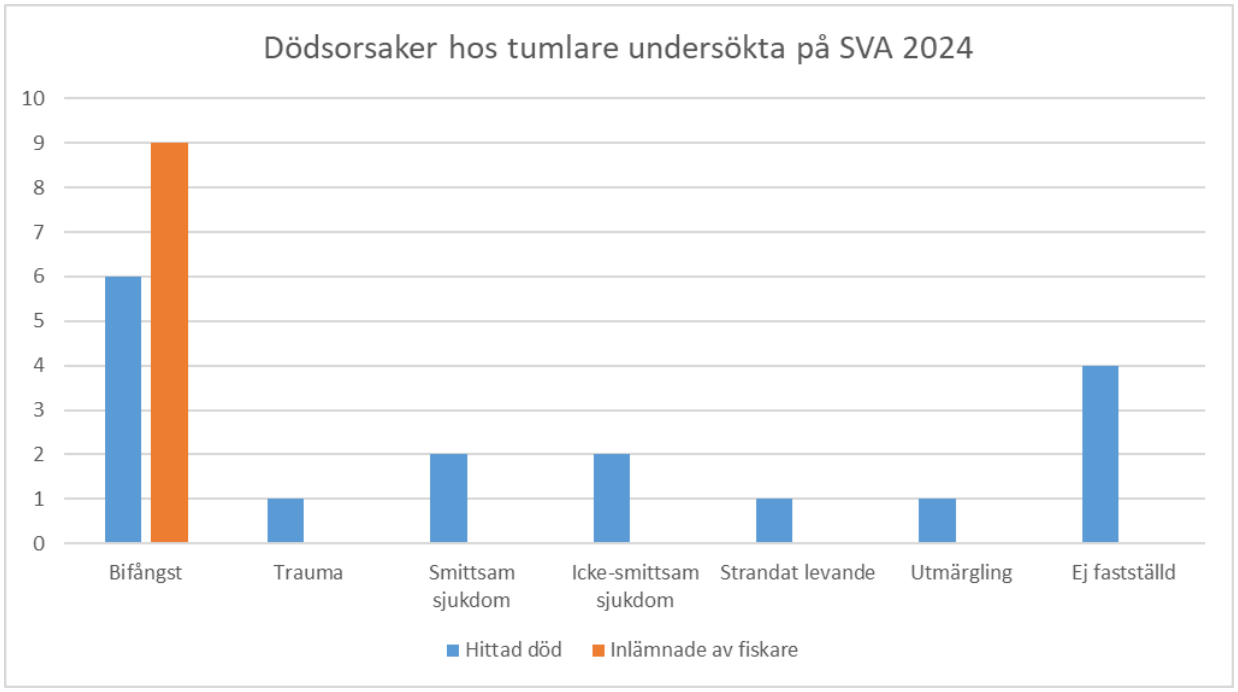
Also, in the nine porpoises submitted as bycatch, typical lesions were seen: linear pressure marks and fine skin cuts (from nylon lines) on the frontal areas and fins. Lungs were often fluid-filled and stable foam found in the trachea, considered consistent with drowning. In some cases, bruises/bloodshed and internal injuries were also seen. In addition, other skin lesions were detected (n=9), consistent with poxvirus infection, but interpretation is difficult as other viruses as well as bacterial or fungal infections can cause similar changes or be secondary infection, as co-infections are frequent.

Parasites are common findings. Moderate to severe parasite infestation in one or more organs was seen in 15 animals. The most common was lungworm in airways and in vessels, nematodes in the ears and liver flukes in bile ducts.

Avian influenza virus was not detected in any of the porpoises examined in 2024.

Twenty of the porpoises necropsied in 2024 were analysed for *Erysipelas* bacteria, which was found in the tonsils of three bycaught animals without signs of actual disease. In 22 porpoises, lung tissue was cultured and in two cases the presence of bacteria in the lung could be linked to ongoing disease.

Graph with overview of primary diagnosis (or cause of death) of harbour porpoises examined in 2024 at SVA.



Bycatch *Trauma* *Infectious disease* *Non-infectious disease* *Stranded, live* *Emaciation* *Inconclusive*

Blue bar: Found dead. Orange bar: Submitted by fishermen as bycatch

Other whales

During the Easter weekend of 2024, a stranded common dolphin was observed in the Baltic Sea outside Kalmar, on the east coast of Sweden. The dolphin carcass, an adult male, was examined at SVA. It had stranded alive, as it did not show signs of drowning. The necropsy revealed no obvious cause for the dolphin to strand. There was chronic inflammation in the genitals, possibly caused by parasites. It is unclear if these changes would have had a negative impact on the reproductive ability of this dolphin.

Veterinarian examining a common dolphin during necropsy at SVA. Photo: SVA

In late July, three Sowerby's beaked whales stranded in Hovs Hallar outside Båstad on the west coast of Sweden. Two of the whales died, the third managed to refloat and swam away, but stranded and later died in Denmark. The first two beaked whales were transported and examined at SVA. One was a 409 kg female and the other a 522 kg male, both were 3.5 meters long, both were not sexually mature juveniles. Both were in good body condition, and the female showed no pathology. The male had moderate parasitic infection of the lungs and stomach, as well as pneumonia with several minor abscesses in one lung caused by the bacterium Aeromonas. In collaboration with the Swedish University of Agricultural Sciences (SLU), a CT-scan was done of the two whale heads. No changes were detected except for minor fractures of the lower jaws, probably from the stranding or during transport.

A Sowerby's beaked whale necropsy at SVA. Photo: SVA.

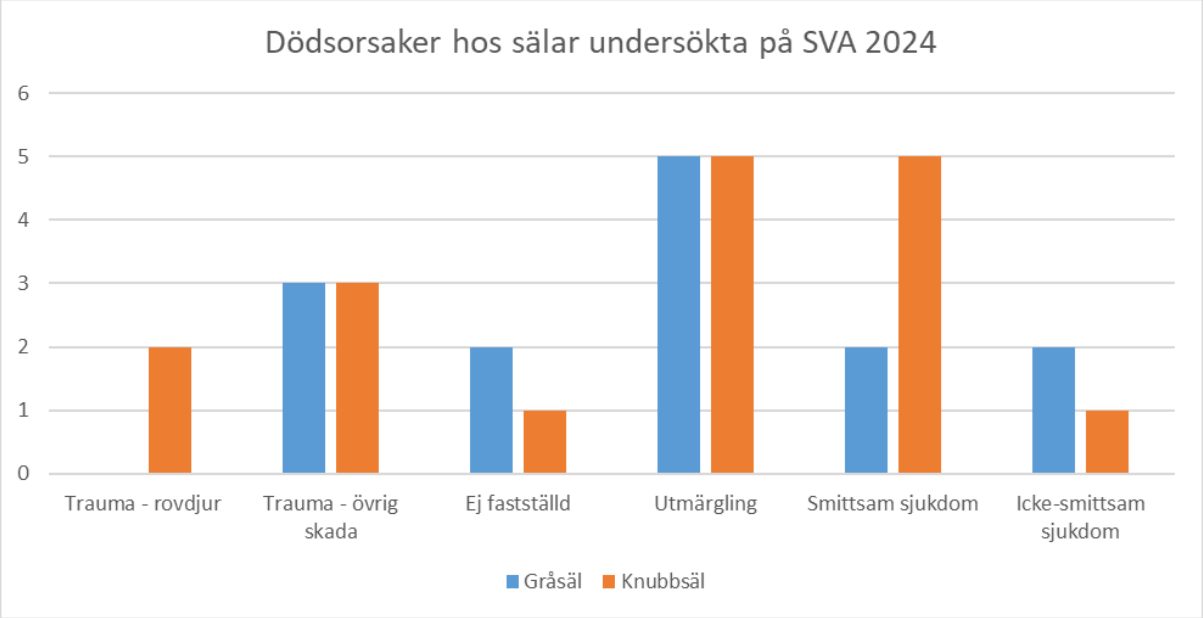
SEALS

The most common causes of death of the 17 harbour seals were trauma (n=5), emaciation (n=5) and infectious disease (n=5). In 14 grey seals, emaciation was the most common cause of death (n=5). Most seals that died of trauma and emaciation were young cubs and yearlings. In three seals, the cause of death could not be determined (see diagram).

Surveillance of avian influenza detected AIV antibodies in eight adult grey seals, indicating that the seals have been exposed to the virus and survived the infection. No seals had signs of ongoing infection.

Bacteriological cultures of lung tissue from all 31 seal carcasses showed four cases with bacteria linked to lung lesions.

Graph with overview of the primary diagnosis (or cause of death) for seals examined at SVA 2024.



Trauma – predator *Trauma – other* *Inconclusive* *Emaciation* *Infectious disease* *Non-infectious disease*
Blue bar: Grey seal. Orange bar: Harbour seal.

Harbour seal pup that died of emaciation - a common cause of death in young seals, as noted at SVA. Photo: SVA.

Large carnivores 2024

SVA works with, according to an agreement with the Swedish Environmental Protection Agency, all dead large carnivores (bear, lynx, wolf and wolverine) that are either found dead, or hunter harvested, with the carcasses or tissue samples that must be sent to SVA for examination and data collection.

SVA handled 872 large carnivores in 2024. Most submitted whole carcass cases have been harvested in licensed hunting or other management-related measures. Traffic-caused death is the second most common cause. The most common disease in some large carnivores is sarcoptic mange, which usually leads to emaciation and death. Forensic pathology is done in cases that are part of a crime investigation.

Handling data, samples and carcasses of large carnivores is financed by the Swedish Environmental Protection Agency (EPA) as part of the management of large carnivores. The EPA regulations NFS 2002:18 42§ state that all found dead animals or animal parts of these species must be reported to the Police, who then hand the material over to SVA for investigation.

When large predators are culled during protective or licensed hunting, the carcass belongs to the holder of the hunting rights or the landowner. But, a condition for the hunts is usually that certain parts or samples from the carcass should be sent to SVA. The work at SVA is an important part of monitoring the health situation of these populations. With similar monitoring over many years, trends in diseases and causes of death can be seen.

Below are summaries of data on causes of death bears, wolverines, lynxes and wolves investigated at SVA in 2024. More details are published in SVA's report on Large Carnivores 2024, and in reports published after each licensed hunt, in 2024 for wolves, lynxes, wolverines and bears, all reports can be found on SVA's website sva.se.

Table of number of carnivores from the period 2020 –2024. Source: Annual reports on large carnivores 2020 –2024.

Species	2020	2021	2022	2023	2024
Bear	444	596	737	767	557
Lynx	168	168	186	271	216
Wolf	31	57	49	91	64
Wolverine	30	16	15	36	35
Total	**673**	**837**	**987**	**1165**	**872**

Table of number of carnivores that have been submitted to SVA per year, for the period 2020–2024, as whole carcass, part of body, or tissue samples. Source: SVALA and Annual reports on large carnivores 2020–2024.

Mortality		2020	2021	2022	2023	2024
Licensed hunt	Bear	284	463	623	643	491
	Wolf	-	27	28	57	35
	Lynx	93	81	106	182	137
	Wolverine	-	-	-	22	23
	Totalt	**377**	**571**	**757**	**904**	**686**
Protective hunt (Incl. §28)	Bear	144	111	87	92	50
	Wolf	20	18	14	25	19
	Lynx	29	26	25	25	19
	Wolverine	25	13	9	7	8
	Totalt	**218**	**168**	**135**	**149**	**96**
Fallen - traffic	Bear	8	10	15	15	11
	Wolf	8	6	7	3	5
	Lynx	33	42	35	48	48
	Wolverine	1	2	2	1	1
	Totalt	**50**	**60**	**59**	**67**	**65**
Fallen - other mortality	Bear	2	1	4	5	2
	Wolf	3	5	-	-	1
	Lynx	8	14	9	7	12
	Wolverine	4	-	4	1	2
	Totalt	**17**	**20**	**17**	**13**	**17**
Forensic case	Bear	1	5	4	5	3
	Wolf	-	2	1	4	4
	Lynx	-	-	2	-	-
	Wolverine	-	1	-	3	1
	Total	**1**	**8**	**7**	**12**	**8**

BROWN BEAR

A total of 557 bears, as carcasses or parts, were submitted to SVA in 2024. The majority came from management-related measures, i.e. licensed hunting and protective hunting. Eleven bears were killed or injured and then euthanized after in accidents with trains or in road traffic. Three bears were submitted as forensic cases, with confidentiality. At necropsy, some cases of old or recent naturally occurring injuries were found. A few other minor or secondary findings, such as deformities, parasites and dental health remarks, were made. The results indicate the bear population to be in a good state of health.

WOLVERINE

A total of 35 wolverines were received during the year; eight from protective hunting and 22 from licensed hunting (three animals felled during the 2024 licensed hunt were received by SVA in 2025). One animal had died in road traffic and two had been killed by another predator. Moderate tooth wear, missing or broken incisor teeth were noted in 13 wolverines. One wolverine was a confidential forensic case. Based on the animals examined at SVA, wolverines can be considered to have a good health condition. Most years, no serious disease findings are found.

LYNX

A total of 216 lynx were received during the year, of which 137 were harvested during licensed hunting and 19 during protective hunting. As in previous years, traffic accidents were the most common cause of death in lynx found dead. A few secondary findings were noted during the necropsies. Three females had an additional adrenal gland, and one lynx had a kidney cyst. Seven lynx had sarcoptic mange, which is the most common serious infectious disease in this population. Otherwise, the health of the lynx population seems to be good.

WOLF

A total of 64 wolves were submitted to SVA, the majority of which had been harvested during licensed hunting or protective hunting. In the category of found dead, five wolves had died in traffic accidents. Other necropsy findings were occasional old skeletal injuries. Three males were cryptorchid. A few animals had dental defects of minor significance. *Echinococcus* tapeworms have not been detected in any sampled wolf. Based on the results, the wolf population is in general considered to have a good health status, despite presence of some findings not necessarily crucial for an individual, i.e. cryptorchidism or dental issues.

Lynx affected by Sarcoptic mange. Photo: Erik Ågren, SVA

Wildlife disease surveillance

The Swedish Government instructions to SVA (2009:1394) state that this veterinary expert authority shall *"…monitor and analyse the development of disease conditions in… wild animals"* in Sweden.

SVA is the only veterinary laboratory in the country that systematically works with disease surveillance of wildlife. The work is mainly based on necropsies of dead wildlife or samples from sick animals that have been euthanised.

Reports of found dead or sick wildlife are collected from the interested public and appropriate cases are submitted for investigation.

This citizen science is supplemented by world-wide disease outbreak monitoring that indicates when new infections are approaching the country and the need for surveillance increases.

Targeted research projects are carried out to deepen the knowledge on or develop new diagnostics for diseases in wildlife.

The general wildlife disease surveillance was initiated in 1948, and in 2006 the Swedish Environmental Protection Agency (EPA) contributed with additional funding to increase the basic surveillance of fallen game and include targeted disease surveillance in wildlife in Sweden.

The Wildlife Disease Council
consists of experts and officials from both EPA and SVA who have meet and exchange information on wildlife disease issues and discuss appropriate relevant research projects for SVA each year. In 2024, the council consisted of Klas Allander, David Schönberg-Alm and Erica Stigblom from the EPA, and. Dolores Gavier-Widén, Erik Ågren and Aleksija Neimanis from SVA, with Henrik Uhlhorn as deputised secretary. There have been two meetings during the year.

*Gapworm (*Syngamus *sp.) is a beautiful parasite that is sometimes found in the trachea of birds. The parasite can be seen in avian species such as pheasants, magpies and owls. The larger roundworm is the female, with long white winding fallopian tubes that contrast with the blood-filled body. The smaller narrow dark thread is the male and is permanently attached to the female. Photo: SVA.*

Financing the wildlife disease surveillance

The wildlife work at SVA is financed mainly by grants from the Swedish Game Management Fund (*Viltvårdsfonden*), the Swedish Environmental Protection Agency, Governmental funding, the Swedish Agency for Marine and Water Management, and project funding from the Swedish Board of Agriculture.

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The Game Management Fund is based on the annual state game conservation fee that each person participating in hunting in Sweden must pay. SVA received 5 million SEK in 2023. As this funding originates from hunters, focus is on game species, but all wild mammals, birds, amphibians, and reptiles are included in the overall work.

Governmental funding

The prerequisite for conducting wildlife disease surveillance is that facilities such as necropsy rooms and incinerators are available, and part of the infrastructure at SVA. The governmental funding is used to finance technical staff for pathology work and administrative authority-related work on wildlife disease surveillance at SVA.

The Swedish Board of Agriculture may provide grants for specific studies of selected reportable animal diseases after an annual application process. The purpose is to monitor the occurrence of a specific disease or pathogen in wildlife, or to show freedom from a specific disease. In 2024, funding was received to monitor *Echinococcus*, avian influenza, *Trichinella*, as well as salmonella and African swine fever in wild boar.

The Swedish Environmental Protection Agency funds the work with large carnivores. The EPA also funds targeted surveillance projects to investigate current disease outbreaks, ongoing mortality or other relevant efforts concerning wild animals, projects that SVA does within the Wildlife Disease Surveillance Program.

The Swedish Agency for Marine and Water management finances the work with health and disease surveillance of marine mammals at SVA, done in collaboration with the Museum of Natural History as part of the Swedish environment surveillance. SVA monitors where and why marine mammals die, collect and necropsy suitable carcasses of stranded individuals Samples for research and biobanking are collected.

Wildlife staff

The wildlife work is conducted by staff within SVA, mainly from the Department of Pathology and Wildlife Diseases (POV). The surveillance is based on pathology, with necropsies of wildlife cases, but specialists and other laboratories throughout SVA are also involved.

The Wildlife Section 2024

Erik Ågren Deputy head of Department, Head of Section, State veterinarian, Dipl. ECVP, DipECZM (Wildlife population health). WOAH National focal point for wildlife.
Karin Olofsson-Sannö Assistant state veterinarian, VMD, Resident ECVP
Gustav Averhed Veterinarian
Henrik Uhlhorn Assistant state veterinarian, VMD
Elina Thorsson Veterinarian, Marine mammals. Resident ECZM (Wildlife population health)
Emma Höök Agronomiskt, biologist for large carnivore programme
Marit Liljefors Technician

The Section for Research and Development 2024

Aleksija Neimanis Head of Section. State veterinarian, Assistant professor, MSc, MVetSci, DipACVP
Caroline Bröjer State veterinarian, MSc, VMD, DipECZM (Wildlife population health)
Ellinor Spörndly-Nees, Assistant state veterinarian, VMD
Ulrika Larsson Pettersson Research engineer
Emil Wikström-Lassa Laboratory veterinarian, PhD student
Moa Naalisvaara Engman, Marine biologist

Other department staff working with wildlife

Administrators Carina Bohlin, Julia Tibell, Christina Rosander. Necropsy assistants Hans Kanbjer, Johan Karevik, Lars Hammarsten. Technicians Sandra Karevik, Katarina Jendelöv, Benny Eriksson, Anders Åslund. Biomedical analysts Gudrun Andersson, Shaqe Hafstad, Mariam Kerro, Angelica Stefansdotter. Dolores Gavier-Widén, head of department.

Both the Wildlife and Research Development Sections at SVA: From left, top row: Carina, Emma, Christina, Emil, Aleksija, Julia, Gustav, Caroline, Ellinor, Henrik. From the left, bottom row: Karin, Erik, Moa, Ulrika, Elina, Marit. Photo: SVA

Publications 2024

Below is a selection of publications from 2024 involving wildlife, where the names of authors from the Wildlife Section or SVA in general, are listed in bold.

Scientific publications, selection

Hopp P, Rolandsen CM, Korpenfelt SL, Våge J, **Sörén K**, Solberg EJ, **Averhed G**, Pusenius J, **Rosendal T**, Ericsson G, Bakka HC, Mysterud A, **Gavier-Widén D**, Hautaniemi M, **Ågren E**, Isomursu M, Madslien K, Benestad SL, **Nöremark M.** 2024. Sporadic cases of chronic wasting disease in old moose - an epidemiological study. *J Gen Virol*.;105(1). doi: 10.1099/jgv.0.001952.

Chenais, E., Ahlberg, V., Andersson, K., **Banihashem, F.,** Björk, L., Cedersmyg, M., **Ernholm, L., Frössling, J. Gustafsson, W**., Hellqvist Björnerot, L., **Hultén, C., Kim, H., Leijon, M**., **Lindström, A**., **Liu, L.,** Nilsson, A., **Nöremark, M., Olofsson, K.M., Pettersson, E., Rosendal, T., Sjölund, M**., Thurfjell, H., **Widgren, S., Wikström-Lassa, E., Zohari, S**., **Ågren, E.O, Ågren, E., Ståhl, K**. 2024. First Outbreak of African Swine Fever in Sweden: Local Epidemiology, Surveillance, and Eradication Strategies. *Transboundary and Emerging Diseases*, doi.org/10.1155/2024/6071781

Waldo, Å., **Neimanis, A**., **Ågren, E**., **Nöremark, M**., Johansson, M. 2025 Understanding People's Motivation to Contribute to Wildlife Disease Surveillance. *Society & Natural Resources*, pp.1-21.

Sánchez-Cordón, P.J., Lean, F.Z., Batten, C., Steinbach, F., **Neimanis, A**., Le Potier, M.F., **Wikström-Lassa, E**., Wynne, F., Strong, R., McCleary, Crooke, H., **Gavier-Widén, D.**, Núñez, A. 2024. Comparative evaluation of disease dynamics in wild boar and domestic pigs experimentally inoculated intranasally with the European highly virulent African swine fever virus genotype II strain "Armenia 2007". *Veterinary Research*, *55*(1), p.89.

Ulfsson V, **Kim H**, Cervin L, Roos A, **Neimanis A**. 2024. Investigation of Spatiotemporal Patterns of Harbour Porpoise (*Phocoena phocoena*) Strandings in Swedish Waters for Improved Monitoring and Management. *Oceans* 5:2, pp. 166-180.

Almeida, T., Lopes, A.M., Estruch, J., Rouco, C., Cavadini, P., **Neimanis, A**., **Gavier-Widén, D**., Le Gall-Reculé, G., Velarde, R., Abrantes, J. 2024. A new HaCV-EBHSV recombinant lagovirus circulating in European brown hares (Lepus europaeus) from Catalonia, Spain. *Scientific Reports*, *14*(1), p.2872.

Fusaro A, Zecchin B, Giussani E, …., **Bröjer C**, .., **Zohari S**, …, Monne I. 2024. High pathogenic avian influenza A(H5) viruses of clade 2.3.4.4b in Europe-Why trends of virus evolution are more difficult to predict. *Virus Evol*. 6;10(1):veae027. doi: 10.1093/ve/veae027.

Reports and popular science

Annual report Infectious diseases in animals and zoonoses in Sweden 2023 (in Swedish). Wildlife necropsies, Echinococcosis **E. Ågren**. Tularaemia, **H. Uhlhorn.**

SVA annual report 2023. Wildlife. **E. Ågren**

Wildlife disease surveillance in Sweden 2023. SVA report 93/2024. Editor: Erik Ågren

Health, diseases and causes of death in marine mammals 2023. SVA report 95/2023. **M. Naalisvaara Engman, A. Neimanis, G. Averhed, N. van de Velde, E. Thorsson,** Anna Roos

Licensed wolverine hunt 2024. SVA 112/2025. **E Höök, E Ågren**
Licensed wolf hunt 2024. SVA 98/2024. **E Höök, E Ågren**
Licensed lynx hunt 2024. SVA 103/2024 **E Höök, E Ågren**
Licensed bear hunt 2024. SVA 105/2024. **E Höök, E Ågren**

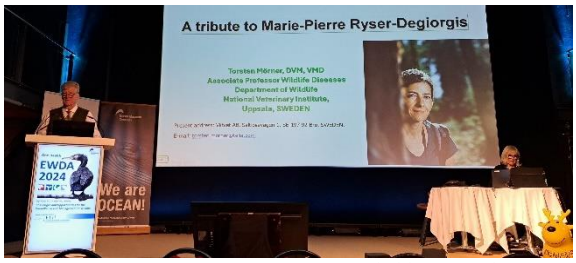
Presentations 2024, selected

Environmental Protection Agency, Wildlife conference 12–13 March, Stockholm

Ågren, E. Wildlife disease surveillance 75 year.

Neimanis, A., Johansson, M., Waldo, Å. Wildlife disease surveillance – what wildlife is examined at SVA, who contributes and why?

15th conference of the European Wildlife Disease Association (EWDA), 9–13 sept, Stralsund, Germany



Former state veterinarian Torsten Mörner held an introductory talk at the session commemorating a Swiss wildlife colleague who passed away too early. Photo: Erik Ågren.

Neimanis A, Nöremark N, Spörndly-Nees E, Kim H, Johansson M, Waldo Å, **Uhlhorn H, Ågren E.** Citizen science and wildlife disease surveillance: what comes in, who participates and why?

Bröjer B, Uhlhorn H, Olofsson-Sannö K, Hestvik G, Thorsson E, Zohari S, Averhed G, Spörndly-Nees E, Ågren E, Neimanis A. Highly Pathogenic Avian Influenza A (H5N1) virus with evidence of widespread systemic infection in wild red foxes in Sweden 2021-2023

Macieira M, Bäcklin B-M, Cervin L, **Neimanis A.** End-stage liver and systemic amyloidosis in a grey seal (*Halichoerus grypus*) from Gotland, Sweden.

Naalisvaara Engman M, Thorsson E, Van de Welde N, Averhed G, Roos A**, Tibbell J, Larsson Petersson U, Neimanis A.** Expanded health and disease surveillance of marine mammals in Sweden: Cause of death, diseases and other findings in seals and porpoises 2020-2023

Thorsson E, Bäcklin B-M, **Larsson Pettersson U, Neimanis A.** First report of fatal infection of zoonotic liver fluke (*Pseudamphistomum truncatum*) in a Baltic ringed seal (*Pusa hispida botnica).*

Hydeskov H, Arnemo J, Rodushkin I, **Feinstein R, Neimanis A**, Lloyd Mills C, Gentle L, Uzal A. Lead (Pb) concentrations and associated pathology in tissues of Scandinavian brown bears (*Ursus arctos*) and One Health concerns.

Spörndly-Nees E, Hakhverdyan M, Uhlhorn H, Averhed G, Thorsson E, Neimanis A, Ågren E, Bröjer C. Significance of Porcine circovirus 2 in wild boar in Sweden.

72nd International Wildlife Disease Association Conference 1- 6 Dec, Canberra, Australia

Ågren, E., Comin, A., Osterman Lind, E. Echinococcus in Sweden.

Neimanis, A. Learning Endings – and learning from cross-disciplinary collaboration.

35th Annual European Cetacean Society Conference, 10 -12 Apr, Catania, Italy,

Roos A, Eriksson U, Egebäck A-L, **Neimanis A.** PCB, pesticides, PBDE and HBCDD in harbor porpoises from Swedish waters 2005-2019.

Stedt J, Brokmar L, Roos A, **Neimanis A**, Englund W, Carlsson P. Diet of the harbour porpoise using multi-analysis approach.

Outreach

Inspection of large carnivores, course

In June, the annual course for official game inspectors was held at SVA together with the organiser Viltskadecenter (SLU). The aim of the course is for the County Administrative Board's inspectors to learn the practical and administrative aspects of inspecting hunter harvested large carnivores, and learning the procedures and regulations involved.

Training in forensic investigations and wildlife crime, for the Police crime scene technicians. December 2024, Henrik Uhlhorn.

Expert opinions

To the Board of Agriculture: Opinon on fencing of pig farms.

To the County Board Administration in Västerbotten: Opinion on updated management plan for Arctic fox 2024–2028.

Government assignments

The **Game Management Fund** contributes with funds for SVA's wildlife disease surveillance. The activities are reported annually with an interim report on 1 October and a final report on 1 April, to the responsible ministry.

Continuing education

Training centre for wildlife specialists

At the Wildlife Section, there has been one resident for ECZM, the European College of Zoological Medicine, within the specialty *Wildlife Population Health*. There are two Diplomates of ECZM at SVA, now responsible for training and supervising residents. The programme is partly funded by the Marie-Claire Cronstedt Foundation. In addition, two veterinarians in the wildlife section are also board certified specialists in the European and American veterinary pathology colleges (ECVP and ACVP respectively).

Expert groups

Staff members have in 2024 been part of the following expert groups:

Wildlife Disease Council. Swedish Environmental Protection Agency (EPA) & SVA, SVA-members: Dolores Gavier-Widén, Erik Ågren, Aleksija Neimanis. Secretary: Henrik Uhlhorn.

SVA Wildlife Disease Surveillance Council Dolores Gavier-Widén, Erik Ågren, Aleksija Neimanis. The Dept of Epidemiology and Disease Control: Gunilla Hallgren, Karl Ståhl, Maria Nöremark,

SVA Scientific council Aleksija Neimanis

SVA Environmental and Climate committee Emma Höök

SVA Zoonosis centre working group Henrik Uhlhorn

SVA R&D Coordination group Ellinor Spörndly-Nees

SVA expert group African swine fever Erik Ågren

SVA Poultry forum Caroline Bröjer

Hoofed wildlife council (EPA), SVA representant: Gustav Averhed

Swedish Board of Agriculture Wildlife reference group, SVA representative: Erik Ågren

Reference group Invasive species (Swedish Association for Hunting and Wildlife Management), SVA representative: Caroline Bröjer

Marine Information Centrals SVA representative: Caroline Bröjer, Moa Naalisvaara Engman

EWDA, European section, Wildlife Disease Association. Chair: Erik Ågren

EWDA Network for Wildlife Health Surveillance in Europe, committee member: Aleksija Neimanis

NWDA, Nordic section of Wildlife Disease Association, Board member: Henrik Uhlhorn

Wildlife Health Community of Practice; Erik Ågren

ECZM, European College of Zoological Medicine, Wildlife Population Health specialty: Caroline Bröjer *examination committee* and *resident programme director*, Erik Ågren *resident supervisor*

Journal of Wildlife Diseases, Associate editors: Erik Ågren, Aleksija Neimanis

WOAH Focal point for wildlife: Erik Ågren

WOAH Working Group on Wildlife: Dolores Gavier-Widén

Radiograph of a road-killed otter, examined at SVA. The most common cause of death for otters is unfortunately traffic.

Healthy wildlife – Safe people

The Swedish Veterinary Agency, SVA is an expert authority that through diagnostics, research and advisory capacities strengthens the national capabilities to handle animal diseases that may be a threat to critical societal functions. The SVA motto is: Healthy animals – Safe people.

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