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EPIDEMIOLOGY REPORT 2022

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Zoonotic and anthroponotic SARS-CoV-2: an update

Lesley van Helden

While people continue to be the most important host species of SARS-CoV-2, new developments in the past year have shed light on the virus' ability to include other animal species in its transmission pathways. To date, 31 different species of animals have been shown to be susceptible to either natural or experimental infection with SARS-CoV-2. Two species have stood out in the past year for their potential to become infected in field situations, one of which appears capable of zoonotic transmission of COVID-19.

Herds of wild white-tailed deer (*Odocoileus virginianus*) (Fig. 1) across the United States of America and Canada have been found to be infected with SARS-CoV-2 since late 2020. White-tailed deer appear to be highly susceptible to infection due to the similarity of their angiotensin converting enzyme 2 (ACE2) with that of humans. ACE2 acts as the receptor that binds to SARS-CoV-2 and allows it to enter the cells. The deer can also spread the infection easily from one to the other.

Within their range, white-tailed deer have many opportunities for contact with people through direct interaction (e.g. hand-feeding) or indirect contact such as through the contamination of the environment with human refuse or waste-water. This allows transmission of the virus between the two species.

Figure 1: White-tailed deer are common in North America, often occurring in suburban and agricultural areas. (Photo: S Bauer)

No clinical signs of COVID-19 have been observed in white-tailed deer in infected herds. Experimentally infected white-tailed deer were recorded to have subclinical infections, with only a transient increase in body temperature being observed, though very small numbers of animals were used in the study.

To date, white-tailed deer and mink are the only two species of wild animals found to be infected with SARS-CoV-2. However, a serological study done in France found antibodies to SARS-CoV-2 in several wild pine martens and badgers, indicating that the virus may be infecting more populations of wild animals than we are currently aware. A greater degree of surveillance in wildlife is necessary if the situation is to be monitored in future.

It is currently unknown what the impact of SARS-CoV-2 maintaining itself in a population of wild animals will be, but transmission of the virus between species provides more opportunities for mutation to occur, and could complicate disease control efforts.

Until January 2022, zoonotic transmission (from an animal to a human) of SARS-CoV-2 in the field was recorded only in farmed mink. Now, new evidence implicates Syrian or golden hamsters (*Mesocricetus auratus*) (Fig. 2) in an introduction of COVID-19 into Hong Kong.

In January 2022, a Delta variant of SARS-CoV-2 that had not previously been seen in Hong Kong was detected in an ill staff member of a pet shop. As part of the epidemiological investigation of the case, authorities took samples from all species of animals (hamsters, mice, guinea pigs, chinchillas and rabbits) as well as environmental swabs from the pet shop and its warehouse. SARS-CoV-2 infection was detected in several Syrian hamsters, as well as in environmental swabs from the warehouse. No other species of the small mammals tested was found to be infected.

The hamsters, imported from the Netherlands, are believed to have been the source of infection as this particular variant of SARS-CoV-2 had not previously been detected in Hong Kong. The infected employee had also not been into the warehouse; only the pet shop.

Genomic analysis of the viruses involved support this hypothesis, with evidence suggesting that two separate transmission events occurred from hamsters to people, one of which resulted in onward transmission to other people that had not been in contact with the hamsters.

Figure 2: Syrian hamsters have a limited distribution in the wild, but domesticated versions are kept as pets across the world.

The Hong Kong government responded by humanely destroying all the animals at the pet store. Samples of animals at all other pet shops in Hong Kong were also tested and the public was urged to bring in any hamsters purchased locally in the past month for official testing and euthanasia. Hamsters and environmental swabs from several pet shops under the same group subsequently tested positive.

Hamsters were previously shown to be capable of experimental infection with COVID-19, again due to the affinity of hamster ACE2 to SARS-CoV-2, mediating viral entry into the cell. Experimentally infected Syrian hamsters showed similar clinical signs and pathology to people with COVID-19, including dyspnoea, lethargy, pneumonia and myocardial degeneration. However, no clinical signs were observed in the infected hamsters identified in Hong Kong.

The risk of transmission of SARS-CoV-2 between humans and animals, as well as the risk of numerous other zoonotic and anthroponotic diseases, can be reduced by the use of simple precautionary principles.

- Avoid any unnecessary contact between people and wild animals. Especially do not feed wild animals.
- Remove sources of food that would attract wild animals to residential areas, such as accessible garbage.
- Those working with animals should wear appropriate personal protective equipment (PPE) and observe good hygiene measures.
- Avoid contact with animals when sick. Sole caretakers of animals should observe strict hygiene measures and use PPE while they have symptoms of an infectious disease.
- Sick domestic animals should be isolated from people or other animals as far as possible until a veterinarian has been consulted and further advice given.

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Outbreak events

New outbreaks of **African swine fever** were detected in **George** and **Mossel Bay**, both in areas with many small-scale farmers keeping animals in close proximity, with few biosecurity measures in place. Pigs showed sudden mortalities with haemorrhagic lesions in multiple organs and lymph nodes. Pig owners in the affected areas are being advised not to move pigs and educated about biosecurity and disease prevention.

Increased mortalities of **chickens** with swollen wattles and cyanotic legs were detected on a layer farm in the **Malmesbury** state vet area. The flock subsequently tested positive for **H5 high pathogenicity avian influenza** (HPAI). The farm was placed under quarantine and the affected houses were culled out.

Two **ostrich** farms, near **Tulbagh** and west of **Ladismith** respectively, tested sero-positive for **avian influenza virus (AIV)** in November and December 2021 and have been reported to the OIE as part of the HPAI (H5N1) outbreak. A third ostrich farm near **Albertinia** tested H5Nx seropositive in mid-January and necessitated the quarantine of five farms within a 10km radius.

Bluetongue was diagnosed on clinical signs in unvaccinated **sheep** flocks near **Klawer** and **Vanrhynsdorp** (Fig. 3 and 4). Signs included fever, diarrhoea, nasal discharge, swelling of the face and lips, lameness, recumbency and death.

Sheep scab was diagnosed on two properties belonging to the same owner near **Gouda**. The flocks had been itching since approximately June 2021 and the farmer had treated them repeatedly for red lice, without success. By mid-January he decided to send a sheep to the Provincial Veterinary Laboratory and a diagnosis of sheep scab was made. The origin of the outbreak is uncertain, but possibilities include the introduction of teaser rams or fomite spread through a borrowed truck used to transport the sheep.

Johne's disease was diagnosed in a **sheep** flock near **Piketberg** after the farmer had noticed approximately 2% of ewes losing weight over the past few years. The farm was placed under quarantine and the farmer plans to vaccinate the flock.

A clinical diagnosis of **tetanus** was made in **goat** kids near **Prince Albert** after elastrators were used for castration.

Rumen acidosis was diagnosed on post-mortem examination of **goats** that died in **Klapmuts**, possibly as a result of consumption of oranges.

A **dairy** farm near **Stanford** was depopulated after an outbreak of anti-microbial-resistant **pasteurellosis**.

Dead **ostrich** chicks near **Touws Rivier** tested negative for AIV and clinical signs resolved after treatment with oxytetracyclines.

Two cases of suspect **dog** rabies from **Cape Town and Worcester** tested negative.

Figures 3 and 4: Large numbers of biting midges resulted in many clinical cases of bluetongue and a high mortality rate in sheep on a farm near Vanrhynsdorp (Photos: J Kotzé)

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African horse sickness surveillance in South Africa 2021

Adapted from the African horse sickness control: General AHS surveillance and testing report 2021 by JD Grewar and CT Weyer of South African Equine Health and Protocols (SAEHP) NPC

Introduction

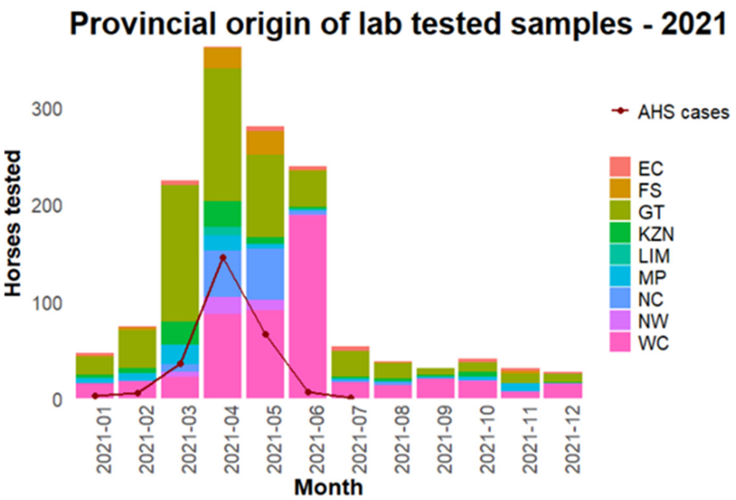
In this report we evaluate the reporting of African horse sickness (AHS) across South Africa during 2021. We evaluate both negative and positive test results which had an impact on the risk-based system in place with regard to movement control of equids into and within the AHS controlled area. AHS movement control aims to limit the risk of introduction of the disease into the controlled area of South Africa. An active surveillance report is published annually which focusses on the sentinel surveillance program within the AHS free and surveillance zones of the controlled area. AHS surveillance is however not limited to this active component. Passive surveillance is undertaken throughout the country, since AHS is a controlled (and therefore notifiable) disease. Clinical investigations by veterinarians will often include testing for the virus, and, since the development of RNA-detection methods, primarily PCR, this has been the diagnostic method of choice for clinicians.

The laboratories in South Africa that tested for AHS during 2021 were Onderstepoort Veterinary Research, the Equine Research Centre – Veterinary Genetics Laboratory and Western Cape Provincial Veterinary Laboratory. In collaboration with the laboratories in South Africa, with support from the Department of Agriculture, Land Reform & Rural Development (DALRRD), the Western Cape Department of Agriculture and the South African Equine Veterinary Association (SAEVA), SAEHP have been provided with access to AHS case reports and testing results since September 2017 and have captured these in the Equine Cause of Disease (ECOD) system from September 2018, coinciding with the start of the 2018/2019 AHS season. This report evaluates available data for the 2021 calendar year.

An outbreak of AHS in the AHS controlled area in the Western Cape occurred in April 2021. For a full review of the events thereof please go to www.myhorse.org.za/ahs2021

Table 1: Summary of all available data regarding AHS diagnoses and categorised by laboratory or clinical-only cases with case status. Data shown in brackets () relate to the 2020 values for the same parameter.

Diagnosis method	AHS status			Total tested
	Confirmed	Suspect	Negative	
Laboratory	264 (259)	0 (3)	1184 (1410)	**1448 (1672)**
Clinical	4 (9)	12 (7)	NA	**16 (16)**
Total	**268 (268)**	**12 (10)**	**1184 (1410)**	**1464 (1688)**



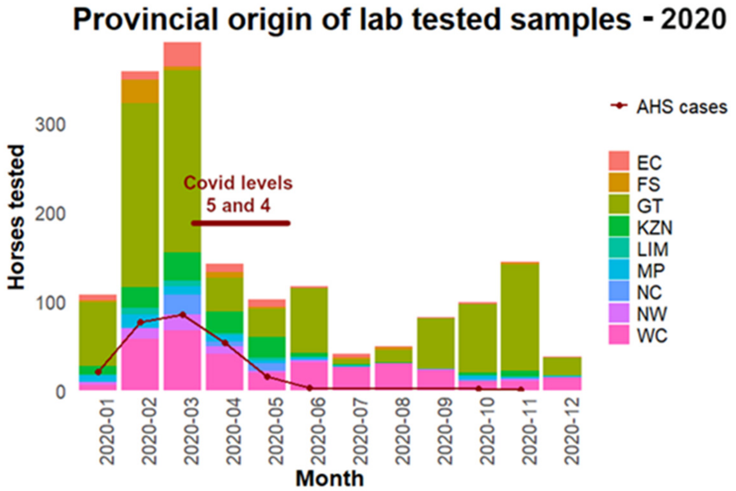


Figure 1: Breakdown of all laboratory testing performed by province and month of year for both 2020 and 2021. The positive laboratory diagnosed AHS cases overlays the bar plot.

Data considerations

General data considerations have been discussed in the 2019 general surveillance report and relate to the ability to follow up on all negative results. While this report focusses on laboratory associated results, it is important to note that clinically diagnosed cases of AHS (with no laboratory result), with an epidemiologic link to a confirmed AHS case, are considered cases that prevent movement of horses from the area concerned. In 2021 there were four confirmed clinical cases of AHS with a further 12 suspect cases in this regard. One data set that is not available is the number of clinical investigations performed by clinicians where AHS was ruled out as a differential diagnosis.

The data depicted here excludes sentinel surveillance evaluation simply because the sentinel program is reported on in detail each AHS season. The data presented does not consider clustering at herd level – results are captured on lab-report basis, and while it can be assumed that all horses tested in a single lab report are associated with a single group it is not possible to confirm this in all cases without further investigation.

Finally, the case totals published here differ slightly from officially published totals by the South African Government, where the latter focus more on cases submitted officially through SR1 reports or monthly disease reporting processes. In 2021, DALRRD reported 255 cases of AHS, 95% (up from 90% in 2020 - see Table 1) of the total reported here and 96.5% of the laboratory confirmed total reported here.

Results

General results

Table 1 shows the overall summary of data presented in this report, with 2020 data bracketed. A total of 1448 individual horse laboratory reports were captured, of which 81.7% were negative and 18.2% were positive.

Spatial and temporal depiction of AHS surveillance

To allow for areas and months to be compared, this section only includes results from laboratory-based testing (N=1448) with the associated 264 confirmed AHS cases by laboratory testing (see Table 1).

Figure 1 shows the temporal spread of testing per province during the 2021 calendar year with a comparison to 2020. The epidemic curve of laboratory confirmed AHS cases is overlaid. The spatial breakdown of testing is shown in Figure 2. While Gauteng tested the most horses (535 – 37%) this was down from 2020 where 918 tests; (~55%) were sampled in Gauteng. The AHS outbreak in the AHS controlled area in April changed the testing dynamic for 2021, as well as an increase in testing in provinces such as the Northern Cape. The Western Cape increased their samples submitted to 513 (from 339 in 2020) while the Northern Cape increased theirs to 120 from 45 the previous year. The testing temporal pattern returned to pre-COVID normality with most testing occurring in the March to June period, although a substantial increase in the Western Cape submissions in this period, due to the outbreak, is evident.

Positive AHS results for the year are shown in Figure 3. Positive cases occurred in all provinces with the AHS controlled area outbreak clearly increasing the case totals for the Western Cape from previous years. Most cases - 81 (30.7%)- still occurred in Gauteng, but this was a decrease from 2020 where ~47% of the total cases were accounted for by Gauteng. The Eastern Cape also showed a downtick in AHS case totals (three reported, down from 35 in the previous year) although, as

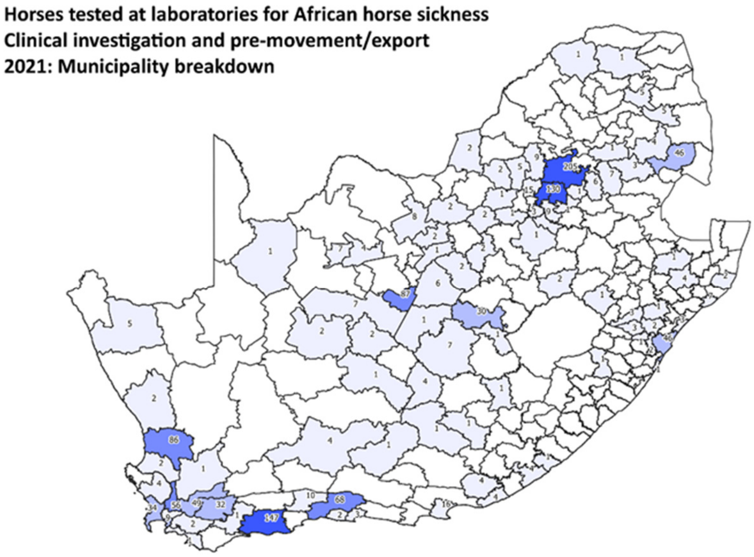


Figure 2

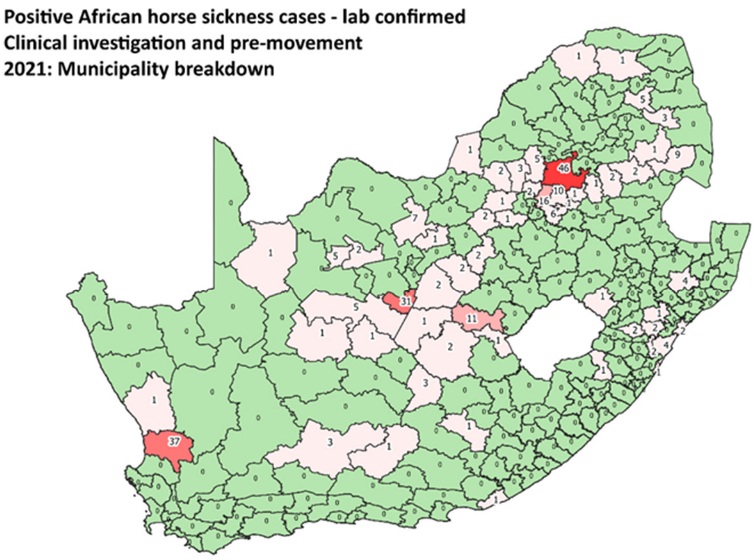


Figure 3

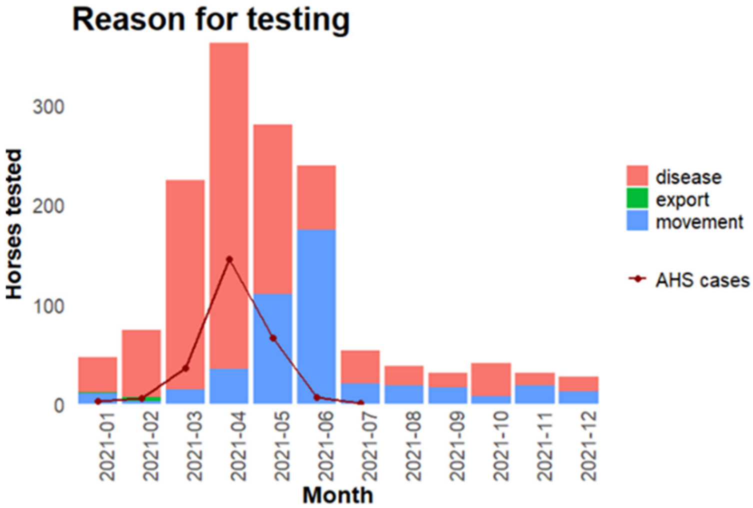


Figure 4: Breakdown of all laboratory testing performed by reason for testing and month of year.

mentioned, the Northern Cape increase between 2020 and 2021 made up for this difference in the total cases.

Reason for testing and proportional laboratory involvement

There are three primary reasons for testing for AHS in South Africa: diagnosis of disease (clinical investigation), movement control (including pre-export testing) and sentinel surveillance. Figure 4 shows the former two reasons depicted over 2021 overlaid by the number of AHS confirmed cases. A substantial change from 2020 was a decrease in samples taken for export purposes – this because of changes in the South African – Mauritius trade protocol that delayed shipments in the second half of the year.

Discussion and acknowledgements

This is the third consolidated report that includes both positive and negative AHS test results for testing performed over the entire country for a calendar year. The report establishes a testing baseline, an overview of the reasons for testing and a summary of the samples processed at the laboratories, with a breakdown of the results, all of which supports and refines a risk-based approach to AHS control in the country.

Overall testing patterns have generally returned to those seen pre-COVID, although test totals are still below those of 2019. An increase in diagnostic testing was noted in the Western Cape where an outbreak of AHS occurred in the controlled area. Gauteng and the Eastern Cape registered fewer than normal cases. Export-associated testing dropped off substantially due to changes in import/export protocols.

We are grateful for the continued support of DALRRD and the Provincial Veterinary Services in allowing access to laboratory results from the respective laboratories. The laboratories mentioned in this report have kindly made their information available to the Boland State Veterinary Office, on whose behalf this analysis is performed by SAEHP. The ECOD system was developed for the South African Equine Veterinary Association to report on all equine diseases and syndromes in the country. SAEHP have maintained this system and have adapted it to capture negative AHS testing with the primary purpose of refining risk-based control measures. In this regard we are grateful to SAEHP personnel who have captured much of the negative result and movement data.

Crimean-Congo haemorrhagic fever in Vredendal

Chanel Lombard

A human patient from Vredendal was diagnosed with Crimean-Congo haemorrhagic fever (CCHF) at a health facility in Cape Town on 23 February 2022. The sheep farmer, a 69-year-old man, was admitted on 17 February when he started to feel ill. He had assisted with catching sheep three days earlier. There was no evidence of any tick bites or any history of contact with blood during slaughter. On admission the patient was also diagnosed with COVID-19. The patient unfortunately passed away on 3 March 2022.

Figure 5: Ticks of the genus *Hyalomma* can carry and transmit Crimean-Congo haemorrhagic fever to people (Photo: A Cuerden)

CCHF is a viral zoonotic disease that spreads from animals to humans via tick bites of *Hyalomma spp*. (Fig. 5) or contact with contaminated blood. The virus can also be transmitted between humans. People most at risk are farmers, farm workers, abattoir workers, veterinarians and medical staff treating suspect patients. Early signs include fever, headaches, muscle pain and vomiting, from one to nine days after exposure to the virus. When the disease progresses, haemorrhages under the skin and signs of organ failure are seen. CCHF has a case fatality rate of 10-40%.

The farm was visited by the area's state veterinarian and animal health technician. The workers were educated on CCHF, how to prevent contracting the disease and what to do when they notice a tick bite. The farmer overseeing the sheep was advised to dip them to lower the tick burden. In-contact people were monitored by Department of Health and thankfully no further clinical cases have been reported.

Outbreak events

A pet **dog** in Strand, **Cape Town**, with an unknown vaccination history, presented to a private veterinarian disorientated, ataxic and aggressive. The dog died three days later and tested positive for **rabies**. There were two other dogs and three cats on the property, all with an unknown vaccination history. The owner agreed to euthanase the two dogs and two of the cats. The remaining cat was vaccinated against rabies. The origin of the rabies infection is unknown, but the owner reported that the dogs had escaped and wandered the streets in October 2021, and that the dog that developed rabies had also had a fight with another dog through the fence in early February 2022. Rabies vaccination campaigns were held in Strand in response to the case. Prior to this, the most recent case of rabies occurred in Strand in October 2021. This is the fifth case of dog rabies in the City of Cape Town since August 2021, four of which were in pet dogs kept in enclosed yards. This highlights that, despite perceptions of the public, unvaccinated dogs are at risk of rabies infection whether kept confined or not (Figure 6).

A **common tern** (*Sterna hirundo*) was found dead at the mouth of the **Bot river estuary**. It subsequently tested positive for **H5 avian influenza**.

A **sheep** farmer near **Riebeeck Kasteel** noticed two to three of his sheep losing weight each year for the past few years. Samples taken from the flock by a private veterinarian tested positive for **Johne's disease**. The farm was placed under quarantine.

Lumpy skin disease was reported in **cattle** on nine properties near **Malmesbury**, **Caledon**, **Calitzdorp**, and **Murraysburg**. Rumours of lumpy skin disease were also received from other parts of the province, but outbreaks were not officially reported.

Bluetongue was reported in six **sheep** flocks near **Vanrhynsdorp** and **Murraysburg**.

Severe **wireworm** infestation was found in a **sheep** that died of bluetongue near **Vanrhynsdorp**.

Bovine ephemeral fever (three day stiff sickness) was diagnosed by a private veterinarian in three **cattle** near **Murraysburg**.

Chickens belonging to a small-scale farmer in **Cape Town** died as result of severe **verminosis**.

Chickens and ducks on a free-range farm in **Cape Town** died after showing weakness, immobility and difficulty breathing. The birds tested negative for avian influenza and Newcastle disease and a diagnosis of **botulism** was made based on the history and clinical signs.

Wild birds were found dead at a waste water treatment plant in the **Cape Agulhas** municipality. The carcasses tested negative for avian influenza. **Botulism** is suspected as the cause of death.

Clinical signs of **mastitis** were seen in **ewes** near **Vanrhynsdorp** and they received treatment.

Sheep on a farm near **Nieuwoudtville** showed signs of muscle atrophy and weakness as a result of **malnutrition**. Feeding advice was given to the farmer.

Chicks belonging to a small farmer in **Klapmuts** showed hanging wings before dying suddenly. Omphalitis and prolapse of the intestines were found in two different chicks. ***E.coli*** was cultured and **avirulent Newcastle disease** was detected on PCR.

Figure 6: Unvaccinated dogs are at risk of rabies infection through contact with other dogs whether they are kept in enclosed yards or not.

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Be vigilant for foot and mouth disease

Lesley van Helden

In South Africa, outbreaks of foot and mouth disease (FMD) have been ongoing in cattle in the previously free zones of Limpopo and KwaZulu-Natal, and recently, new outbreaks have occurred on farms in the North West Province, Gauteng and the Free State (Fig. 1).

The outbreaks in KZN have been typed as SAT2, while those in Limpopo are SAT3, and appear linked to the new outbreaks in North West, the Free State and Gauteng through movements of cattle, with auctions being identified as contributing to the spread of FMD to new locations in several instances. The origins of the new outbreaks have been traced to illegal movements of cattle out of the foot and mouth disease control zones.

Clinical signs of FMD have been seen on many of the newly affected farms, including salivation, oral lesions and coronary band lesions. Animals sick with FMD usually develop blisters and erosive lesions in the mouth (Fig. 2) and on the feet (Fig. 3), making it difficult for the animal to eat and walk. Production losses occur as a result, as animals lose weight and produce less milk. Young animals may also die of the disease.

The affected farms in North West, the Free State and Gauteng have been placed under quarantine and back- and forward tracing of all livestock movements has been done, with movement restrictions placed on associated farms while investigation and testing of the herds is underway.

Options for depopulation of infected herds are

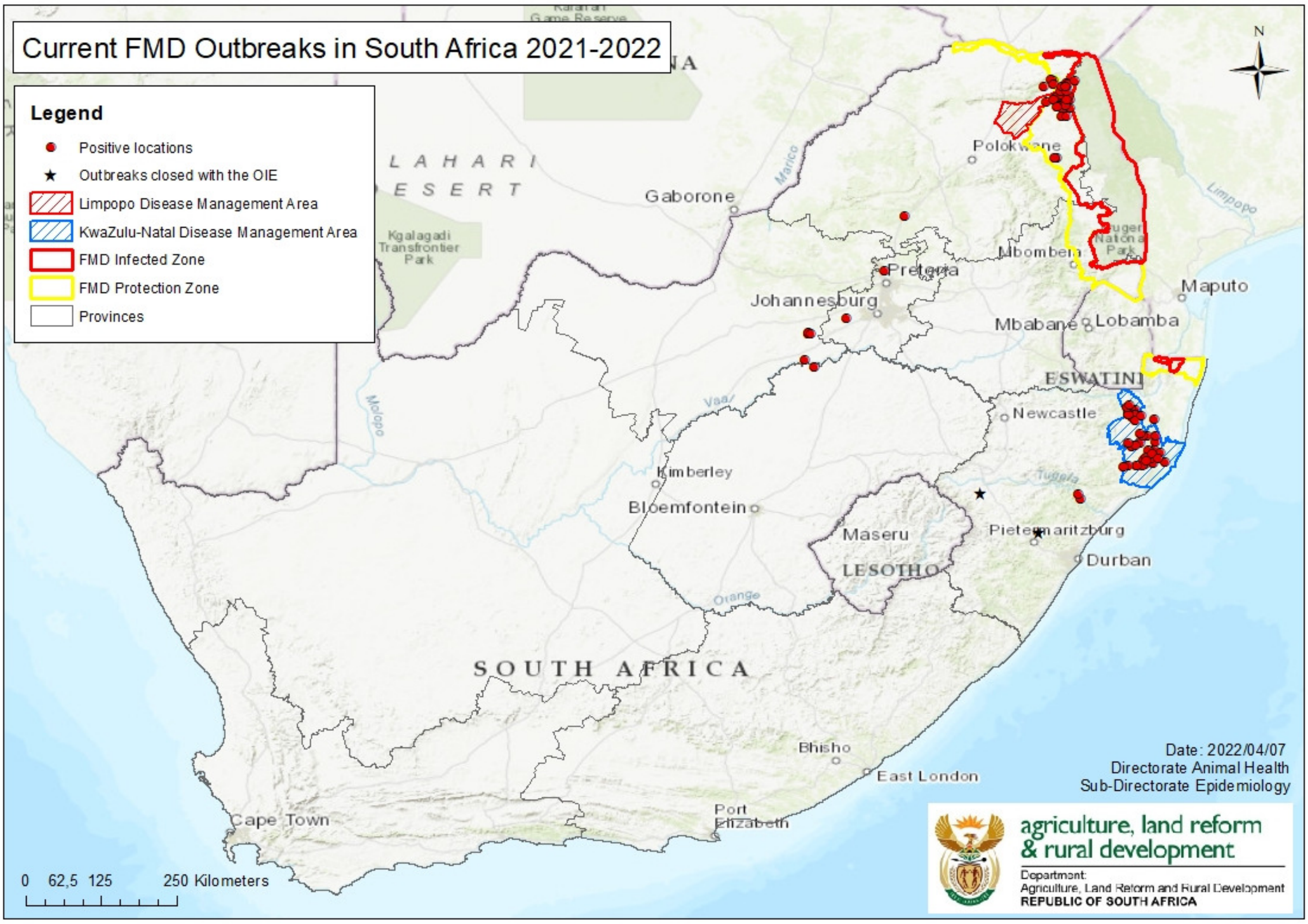

Figure 1: Locations of ongoing outbreaks of foot and mouth disease in South Africa as of 11 April 2022 (Map courtesy of DALRRD)

considered, depending on the situation on the ground. In some cases, vaccination is done to contain the spread of the virus.

Figure 2: Oral FMD lesion in a bovine (Photo: USDA)

Foot and mouth disease is a severe, highly contagious viral disease of cloven-hoofed animals including cattle, pigs, sheep, goats and wildlife. The virus is found in all body fluids, such as saliva, urine, faeces, milk and in the air that diseased animals expel. Transmission of the disease between animals occurs when eating or breathing in the virus from these body fluids. People can also spread the virus through contaminated clothing, shoes, hands, equipment and tyres. FMD spreads easily when livestock move, as infected animals can take up to two weeks to show clinical signs, which can be subtle and not easily noticed. Recovered animals may carry the virus and be able to infect other animals for several months to years.

Given the current outbreaks of FMD caused by livestock movements, there is a high risk of introduction of the disease into the rest of the country, including the Western Cape. Outbreaks of foot and mouth disease must be controlled swiftly in order to prevent the disease from spreading extensively throughout the province and becoming impossible to eradicate. FMD can have a severe impact on food security and economic prosperity. For this reason, the Western Cape is advising farmers to assist with prevention of foot and mouth disease importation into the province as well as early detection of potential outbreaks.

Farmers can protect their livestock by applying the following measures. All of these are good principles to follow to prevent introduction of any disease:

- Be vigilant about where new animals come from. Do not buy animals if you do not know their origin or if they come from a place where they had contact with other animals of unknown origin. Only buy from owners with known healthy animals that can provide a health attestation for their herd from a veterinarian.
- Keep new animals separate for at least two weeks and monitor them for any signs of disease before mixing them in with the rest of your herd. Infected animals can take up to two weeks before showing signs of foot and mouth disease, so animals that look healthy are not necessarily safe.
- Do not allow your animals to have contact with animals belonging to other owners.
- Do not allow unnecessary visitors onto your farm.
- Disinfect hands, shoes, clothing, vehicles and equipment on entry to the farm and between groups of animals being kept separate.
- Report any signs of disease immediately to your local state or private vet. Do not move or sell sick animals.

Figure 3: Interdigital lesion between a cow's claws (Photo: New Zealand Ministry of Primary Industries)

Outbreak events

The owner of a small farm in **Cape Town** reported deaths of **pigs** after they showed blue discolouration and lack of appetite. Samples taken from the dead pigs tested positive for **African swine fever** and the farm was placed under quarantine.

Four outbreaks of **bluetongue** in **sheep** were diagnosed clinically in the **Vanrhynsdorp** area.

Four outbreaks of **lumpy skin disease** in **cattle** were reported after clinical diagnosis near **Murraysburg**.

Outbreaks of **sheep scab** were detected on one property near **Beaufort West** and two near **Moorreesburg**. The properties were placed under quarantine and treated twice under official supervision. In Moorreesburg, the outbreak was detected when the owner of a smallholding was alerted to a skin condition in one of his sheep by a neighbor and he took it to the local private veterinarian, who diagnosed sheep scab. The affected animal was then traced back to a local feedlot, where the sheep were also found to be infested with sheep scab.

After chronic emaciation was seen in **sheep** on two properties near **Piketberg** and **Ladismith**, a diagnosis of **Johne's disease** was confirmed by laboratory testing. Both farms were placed under quarantine.

Racing **pigeons** near **Malmesbury** stopped eating and a 15% mortality rate was recorded. In **Paarl**, another loft of racing pigeons experienced torticollis and an 85% mortality rate in a group of young pigeons that had been bought in. The older pigeons had all been vaccinated against Newcastle disease after an outbreak of pigeon paramyxovirus (PPMV) last year. In both cases carcasses tested PCR positive for virulent **Newcastle disease**. PPMV specific laboratory results are pending.

Wild **laughing doves** in **Paarl** were observed sitting down, looking ill and dying. These also tested PCR positive for virulent **Newcastle disease** and PPMV results are pending.

A **swift tern** (*Thalasseus bergii*) (Fig. 4) found at **Elsenburg** appeared tame, then became ataxic, unresponsive and had cloudy eyes. It was euthanased and subsequently tested positive for **H5 avian influenza**. A **common tern** (*Sterna hirundo*) found dead at the **Bot River mouth** estuary also tested positive for H5 avian influenza.

Near **Velddrif**, nine broiler **chickens** died in the space of two days. The mortalities occurred after the farmer had started using new treated wood shavings. ***Salmonella enteritidis*** was found on bacterial culture of the carcasses.

Wesselsbron disease caused mortalities in young **goats** on three properties in the **Beaufort West** area. Two of the outbreaks were confirmed by PCR and one on clinical signs, necropsy and histopathology. Insect levels are currently high in the area.

In **Klapmuts** a weaner **pig** died of **oedema disease**, caused by ***Escherichia coli*** and confirmed by bacterial culture.

Figure 4: A swift tern, left, and a common tern, right (photos: G. Fergus and T. Monto)

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Bluetongue trends 2021/22

Lesley van Helden

An increased number of bluetongue outbreaks have been reported in the Western Cape in the past few months. This is not unexpected, as April has historically been the month with the highest incidence of bluetongue in the province (see February 2019 epi report for historical incidence of vector-borne diseases in the province). Bluetongue outbreaks usually start in low numbers in December or January, reach a peak in March and then rapidly drop off in May with the start of the cooler weather. This year, however, the peak in bluetongue outbreaks occurred in February, earlier than in previous years (Fig. 1).

All the cases in the last year were reported from the Beaufort West and Vredendal state veterinary areas, with the exception of one outbreak in the Swellendam area in April 2022 (Fig. 2). The Vredendal and Beaufort West areas are both arid, sheep farming areas, but their climates are very different. The Beaufort West area is part of the Great Karoo, which receives summer rainfall, while the Vredendal area is a winter rainfall area.

Along with most of South Africa, the Beaufort West area received heavy rains over December 2021, resulting in many possible breeding sites for the *Culicoides* midges that spread bluetongue virus (Figs 3 and 4).

While *Culicoides* require moist soil for their larvae to develop, they also require sufficiently high temperatures for the larvae to develop into adults. Transmissibility of bluetongue virus is also increased by warmer temperatures, increasing the speed of larval development, abundance of the vector, biting behaviour and viral replication rate.

The importance of temperature partially explains why the Vredendal area saw increased bluetongue cases in the first few months of the year. In other winter rainfall areas of the province, such as Cape Town, *Culicoides* numbers have also been observed to increase from December, peak in March and drop off sharply in May (see Oct 2018 epi report detailing vector surveillance done at Kenilworth racecourse).

In addition, in December 2021, the Vredendal area experienced some thunderstorms with good rains. There was thus a co-incidence of moist soil and hot weather in the area, allowing increased breeding of *Culicoides*. Outbreaks were also reported mostly from farms where irrigation of pastures or crops occurs.

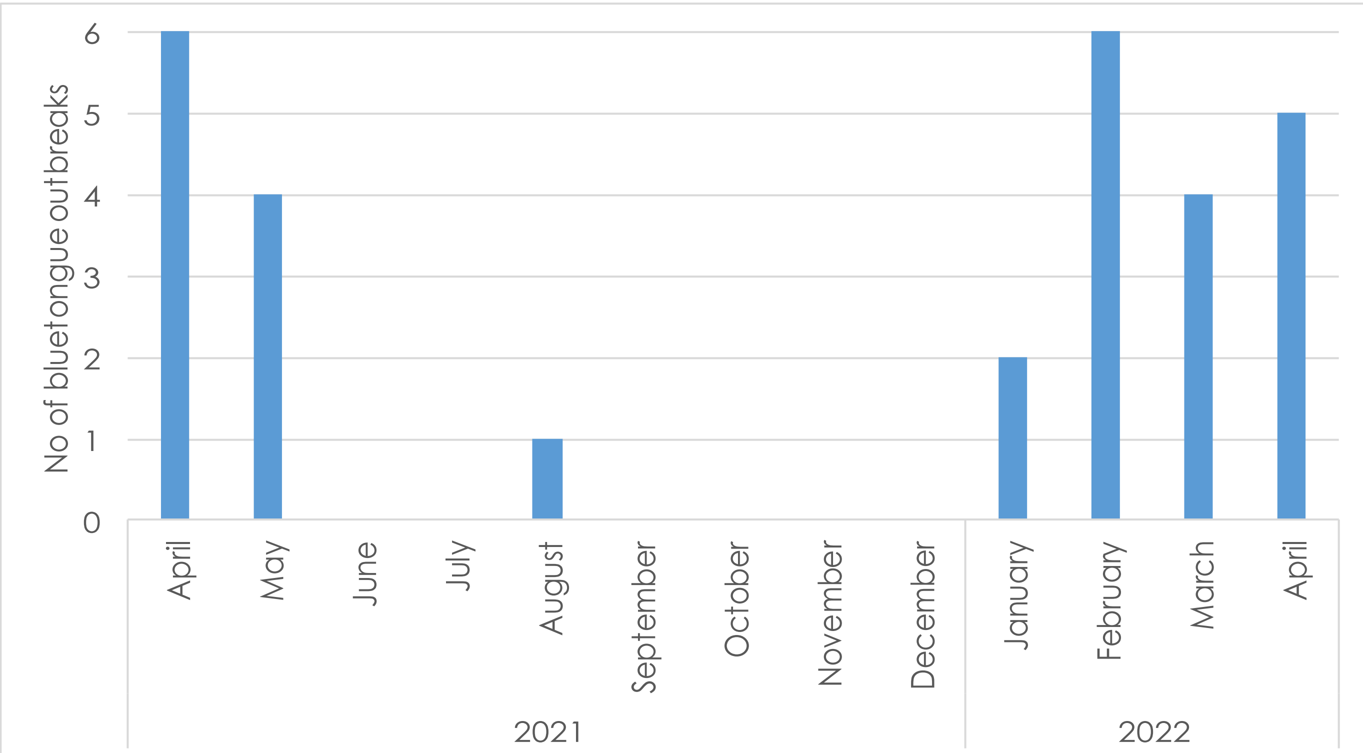

Figure 1: Bluetongue outbreaks reported in the Western Cape by month: 2021-2022

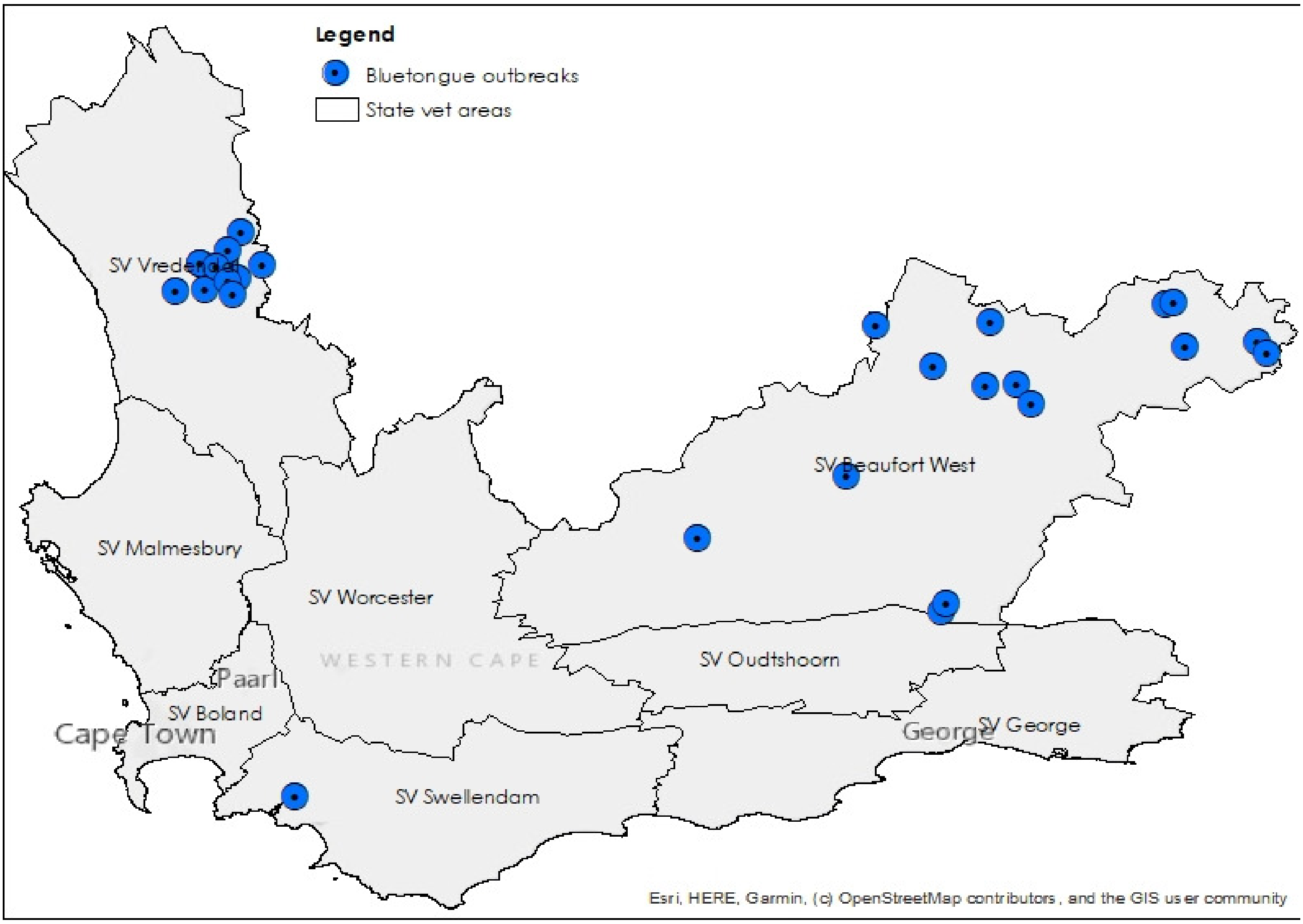

Figure 2: Map of reported bluetongue outbreaks in the Western Cape: April 2021-April 2022

Figures 3 and 4: Bluetongue is transmitted by the midge species *Culicoides imicola* when they bite susceptible sheep.
(Photos: A. Walker and J. Kotzé)

Outbreak events

A free-roaming **dog** in the town of **Suurbraak**, near Swellendam, was found attacking a calf. The dog was previously known to be very friendly and its aggressive behavior alarmed the residents. The dog was removed and euthanased by the SPCA and subsequently tested positive for **rabies**. The dog had a history of spending time in the nearby veld and swimming in the local river, so contact with wildlife species is likely. The attacked calf and four in-contact dogs were also euthanased and the family that owned the dog was referred to a local health facility to receive post-exposure prophylaxis. A vaccination campaign took place to vaccinate all dogs in the town and surrounding area.

Five outbreaks of **bluetongue** were reported in **sheep** near **Bot River**, **Vanrhynsdorp** and **Beaufort West**. All outbreaks were diagnosed on clinical signs, with the exception of the one near Bot River, which was confirmed by PCR testing.

Two further outbreaks of **sheep scab** were detected in the **Beaufort West** area due to forward tracing from a farm that tested positive in March. Sheep in a feedlot that had received sheep from the affected farm were noticed to be itching and scratching. Investigation and examination of a skin scrape resulted in *Psoroptes ovis* mites being seen under the microscope. The affected farmer additionally moved sheep to another of his properties, where an infestation of sheep scab was also found. All affected properties were placed under quarantine and treated under official supervision.

Deaths of several **cattle** occurred on a dairy farm in the **Plettenberg Bay** area. PCR testing confirmed the cause as wildebeest-associated **bovine malignant catarrhal fever**. The farm is adjacent to a nature reserve where wildebeest are present and the access road to the farm runs through the reserve.

Farmers on two farms in the **Vredendal** area reported swelling and crusty lesions on the lips of **sheep** (Fig. 5). A diagnosis of **orf** (contagious pustular dermatitis) was made based on clinical signs.

Deaths of young merino **sheep** with icteric carcasses were seen in the **Beaufort West** area. **Wesselsbron disease** was confirmed by PCR.

Several **piglets** died in the **Malmesbury** area shortly after weaning. Carcasses were disposed of before samples could be collected but the cause of death is suspected to be **oedema disease**.

A **ewe** that died suddenly on a farm near **Riviersonderend** was found to have acute passive congestion. This was likely the result of acute heart failure caused by consumption of **poisonous plants**.

Two **cattle** near **Vredendal** died suddenly of suspect **prussic acid poisoning**. There had recently been some cold nights followed by hot days. The cattle were found dead with blood coming from their noses, but no other post mortem signs.

Suspect **milk fever** occurred in a **ewe** in the Knersvlakte north of **Vanrhynsdorp**. The ewe showed signs of shivering and lameness two days after giving birth to twin lambs.

Cattle infested with **ticks** near **Genadendal** were treated successfully.

Figure 5: Lesions on the mouth of a sheep affected by orf (photo: J. Kotzé)

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EPIDEMIOLOGY REPORT

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What is monkeypox?

Lesley van Helden

Monkeypox has made the news headlines recently owing to an unprecedented outbreak of the virus in several non-endemic countries across the world. Monkeypox is endemic in several countries in West– and Central Africa, where it has been causing increasing cases in the last few years. In countries outside the endemic areas, sporadic cases have been seen, usually in individuals who have recently travelled to endemic areas.

Monkeypox is caused by an orthopoxvirus and causes a disease similar to chickenpox, with symptoms including headaches, fever, malaise, and vesicles on the skin (Fig. 1) which rupture and leave scabs, often beginning on the face and then spreading across the body. However, monkeypox is characterised by swollen lymph nodes, not seen in chickenpox. The disease is usually self-limiting, but can cause severe disease in immunosuppressed people, children and during pregnancy.

As of 31 May 2022, the current outbreak has affected 23 non-endemic countries and over 300 people (257 confirmed and 120 suspect cases reported as of 26 May). Most cases have been detected in Europe, but cases have also been identified in the Middle East, North and South America and Australasia.

There are two distinct clades of the virus in endemic areas. The Central African clade has a case fatality rate of 3-10% when untreated, while the West African clade has a much lower case fatality rate of approximately 1%. The current global outbreak is being caused by a West African strain of the virus.

Monkeypox is a zoonotic disease, but its origin is not currently known. The virus was first identified in laboratory monkeys, which is how it got its name, but monkeys and other primates are merely susceptible to the disease and do not act as reservoir hosts. The virus has been found in several species of African rodents, including Gambian pouched rats (*Cricetomys gambianus*) (Fig. 2), African dormice (*Graphiurus*) (Fig. 3), rope squirrels (*Funisciurus*) and sun squirrels (*Heliosciurus*) (Fig. 4), but whether or not any of these species is a reservoir host has not been determined.

It is also not known exactly how zoonotic transmission to humans occurs. Risk factors for monkeypox infection include eating undercooked meat and having contact with wild animals, bushmeat or products contaminated by wild animals.

Monkeypox is not very transmissible between people, but human-to-human transmission seems to be the driver behind the current outbreaks in non-endemic countries. The virus is spread through the respiratory tract, mucous membranes or broken skin and usually requires close contact, such as extended periods of being face-to-face, kissing, or contact with lesions or body fluids. Transmission can also occur through fomites such as contaminated bedding, clothing or utensils. Infected people are contagious while symptomatic, but there is also a chance some may remain contagious for several weeks after clinical resolution. A lack of research into the disease means there is no clear answer to this question.

Figure 1: Skin lesions caused by monkeypox (Photo: B.W.J. Mahy)

There are some available antiviral treatments that can reduce severity of disease in monkeypox patients. However, as monkeypox is closely related to the smallpox virus, vaccination against smallpox provides protection against monkeypox with approximately 85% efficacy. Additionally, smallpox vaccination can prevent development of symptomatic illness if given shortly after exposure, as the incubation period of monkeypox is quite long, ranging from about 1 to 3 weeks. Severity of symptoms can also be reduced if vaccination is given early in the clinical course of the disease. Smallpox vaccination was routinely done in most countries until about 1980, when the virus was eradicated. Therefore, most people over the age of 40 or 50 will have some immunity against monkeypox. Those younger than 40 are more vulnerable.

In some of the countries where monkeypox outbreaks have occurred recently, smallpox vaccination has been deployed where it is available for high-risk groups such as healthcare workers. Some European countries are also attempting to control spread of the disease by doing ring vaccinations of close contacts of confirmed cases. Other efforts to contain the virus include contact tracing and isolation of cases and close contacts for 21 days.

There is some concern about the virus becoming established in animals in non-endemic countries where it is now occurring. Several species of small mammals are susceptible to the virus, including rats, mice, rabbits, hares, squirrels, guinea pigs, gerbils, hamsters and hedgehogs. Health authorities in Europe have therefore warned that the potential exists for local wildlife or domestic species to become reservoirs in the future if it spills over into their populations.

For this reason, advisory panels in the European Union (EU) and United Kingdom have recommended that rodent pets in households with people infected with monkeypox be removed from the household and kept in a government isolation facility for 21 days, after which they should be tested to exclude monkeypox infection before being returned to their owners or euthanased. Health authorities in the EU are allowing larger pets such as dogs and cats to remain in households with monkeypox patients, but are conducting regular veterinary checks to monitor these pets for signs of infection.

Concern over the infection of pets is not unfounded, as this was the cause of an outbreak of monkeypox in the Midwestern United States in 2003. The outbreak was traced to infected prairie dogs kept as pets. The prairie dogs had been kept at a pet facility together with several species of African rodents imported from Ghana. As a result, import of all African rodents is now prohibited in the USA. The outbreak affected 71 people, but thankfully caused no deaths.

A good principle of biosecurity to follow is to avoid contact with pets or other animals when sick with any type of contagious pathogen. Pets should not be neglected, but their care should be outsourced to a friend, family member or facility, or appropriate personal protective equipment should be worn when feeding, handling bedding or litter and otherwise caring for animals.

There have been no cases of monkeypox reported in South Africa as of the end of May 2022. The National Institute for Communicable Diseases is equipped to assist with investigation and testing of suspect cases.

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Figure 2: Gambian pouched rat (Photo: L. Varley)

Figure 3: African dormice (Photo: H. Osadnik)

Figure 4: Sun squirrel (Photo: C. Sharp)

Outbreak events

Six outbreaks of **sheep scab** were reported near **Mossel Bay**, **Oudtshoorn**, **Moorreesburg** and **Velddrif**. Diagnosis of the infestations was made by visualization of *Psoroptes ovis* mites under the microscope (Fig. 5). Several of the affected properties were identified by tracing of livestock movements during disease outbreak investigation of other affected properties. All properties with sheep scab were placed under quarantine and the flocks treated under official supervision.

New outbreaks of **African swine fever** were reported from **De Doorns** and **Prince Alfred Hamlet**. Both affected areas contain pigs kept by a number of small-scale farmers with very few biosecurity measures in place and some free-roaming pigs. The areas were placed under quarantine and the farmers educated about biosecurity and disinfection.

A **horse** died suddenly at a stable in **Beaufort West**, showing swollen supraorbital fossae. Lung congestion and splenomegaly were seen on necropsy and **African horse sickness** was confirmed by PCR. Horse movements from the Beaufort West area were suspended as a result. The horse was unvaccinated and, although there were 14 other unvaccinated horses, donkeys and a mule at the stable, no other cases of African horse sickness were seen.

Two **sheep** farmers in the **Malmesbury** area noticed two to three sheep losing weight with enlarged lymph nodes. Three of the affected sheep were subjected to necropsies and diagnoses of **Johne's disease** were made based on ELISA and histopathology. The farms were placed under quarantine. On another farm previously positive for ovine Johne's disease in the **Riviersonderend** area, an emaciated dairy **cow** with diarrhoea was euthanased and also tested positive for Johne's disease based on histopathology.

A **ewe** near **Vanrhynsdorp** showed signs of lameness, nasal discharge and a high fever. A diagnosis of **bluetongue** was made based on the clinical signs.

A **cow** with high fever, salivation and lumps all over her body was diagnosed with **lumpy skin disease** near **Vanrhynsdorp**.

A calf near **Plettenberg Bay** appeared blind, became recumbent and died. A diagnosis of wildebeest-associated **bovine malignant catarrhal fever** was made. The calf was bought from a nearby game farm where wildebeest are also kept.

Sudden deaths of four **sheep** were investigated near **Calitzdorp**. On necropsy, pulpy kidney and spleen were seen. A presumptive diagnosis of **pulpy kidney** (enterotoxaemia) was made.

A **ewe** near **Vanrhynsdorp** died two days after giving birth, after showing bloody vaginal discharge, listlessness and lameness. A **clostridial infection** is believed to be the cause of death.

Chickens and **turkeys** near **Robertson** died after appearing depressed. Samples taken from the chickens tested positive for **Newcastle disease** virus matrix gene. Further testing is awaited to determine if a virulent or avirulent strain of the virus is involved.

A **sheep** in **Vanrhynsdorp** died of suspect **pasteurellosis** after showing dyspnoea and weight loss.

A **sheep** farmer near **Kliprand** reported skin lesions on his sheep and was concerned it might be sheep scab. On inspection, lesions were seen on the faces of the sheep and a diagnosis of **ringworm** (dermatophytosis) was made.

In the **Vanrhynsdorp** area a **ewe** was treated for **footrot** and a **heifer** was treated for **bloat**.

A **nasal bot** infestation was reported and treated in **sheep** near **Villiersdorp**.

Figure 5: A *Psoroptes ovis* mite (Photo: A. Storm)

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2021 Equid movements: African horse sickness control

JD Grewar & CT Weyer[1]

Adapted from the African horse sickness control: Movement report 2021

[1] South African Equine Health and Protocols NPC

Introduction

This report evaluates the 2021 calendar year of equid movements in South Africa with respect to controls implemented to mitigate the risk of African horse sickness virus (AHSV) entering the AHS controlled area of the country. All reports are available here. We describe movements from the infected part of South Africa and those that occur within the AHS controlled area, the latter only where movements occur to a zone of higher control. Wild equid movements are also evaluated as well as stepwise movements of horses, that required a stopover quarantine period prior to entry into the AHS controlled area.

Permit based movements – infected zone to AHS controlled area

This section deals with any equid moving from the AHS infected part of South Africa into the AHS controlled area in the Western Cape province. Movements from the infected zone require an AHS risk status classification which is reported by the State veterinarian (SV) of origin in the form of an area status declaration (ASD).

Direct movements of domestic equids

A total of 1640 movement events consisting of 3348 domestic equids, all horses except for 5 donkeys and 1 mule, occurred in 2021, with an average of 2 equids moving per movement application. Thoroughbreds were the most common horse breed moved, at 51%.

Most equids moved between August-December 2021 (Figure 1). The AHS surveillance zone remained the most common destination (70.8%, up from 63.3% in 2020). Year-on-year there was a 24% increase in both the number of movement applications and total domestic equids moved – evidence of post-Covid recovery, although still below 2019 levels.

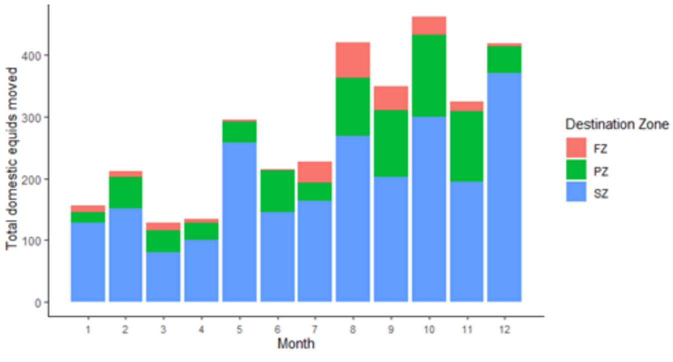

Figure 1: Monthly movements of domestic equids from the AHS infected area, and destinations within the controlled area during 2021 (F: free, P: protection, SZ: surveillance zones)

The main province of origin for equids moving into the AHS controlled area was the Western Cape Province, with the George and Beaufort West State Veterinary areas most represented (Figure 2). Swellendam did not feature as heavily as it did in 2021. The Northern Cape (Kimberley), Kwa-Zulu Natal (Umgungundlovu), Gauteng (Germiston), Eastern Cape (Port Elizabeth) and Free State (Heilbron), were most represented outside of the Western Cape. The seven abovementioned areas accounted for a total of 76.5% of all domestic equids moved during the year.

Stop-over quarantine (SOQ) movements

The introduction and description of stop-over movements has been detailed in previous reports. A total of eight SOQ facilities (Figure 3) were used during 2021, one of which was in the protection zone of the AHS controlled area. These facilities were vector-protected. 303 horses moved under this protocol, compared to 110 for 2020 and 319 for 2019. While 2020 was impacted by Covid, the 2021 trends showed May and June as dominating months, similar to 2019. The surveillance zone was the primary destination, which mirrors the general movement trend.

Wild equids

A total of 80 (compared to 34 in 2020 and 26 in 2019) zebra were moved into, within, or from the AHS controlled area during 2021. As in the previous analyses, zebra generally move during the colder winter months, probably due to the decrease in risk of heat stress during darting and translocation.

Concessions and declined permits

The purpose of the movement permit system is to ensure that movement is only allowed from an area with a low AHS risk at origin as well as compliance with passport (identification) and vaccination requirements prior to movement. During 2021, 14 horses were declined movement due to passport non-compliance, 23 horses were declined due to vaccination non-compliance, and 66 horses were declined due to a high-risk AHS status at origin. Two horses received vaccination requirement concessions – further risk mitigation in these animals required stop over quarantine as well as negative AHSV PCR testing prior to travel.

Pre-notification only based movements - within the controlled area

Movement within the AHS control area to a zone of higher control requires that notification of movement occurs within 72 hours of movement, in place of a permit being issued. The passport, vaccination and health certification requirements are otherwise the same as for a movement into the AHS controlled area. A total of 2728 equids moved in this fashion during the year, down from 2860 in 2020 and 3939 in 2019. Most equids that moved within the controlled area were Thoroughbreds (78%). Most (similar to the 74% and 77% in 2020 and 2019 respectively) moved from the AHS protection zone to the AHS surveillance zone.

Please note that that there are a considerable number of horses that move from within the AHS controlled area on the multiple movement permit system, which is a same-day-return movement licensing system allowing horses to move in this fashion without pre-notification of movement. The information reported here refers to movements where horses would generally not be returning the same day, to their origins.

The movement pattern over time is similar to that for the infected area origin movements except for the higher levels early in the year. Generally, the movements between the surveillance and free zone throughout the year will either be equids moving to one of the two veterinary practices that have their premises within the free zone or thoroughbreds in training that move from feeder farms in the controlled area to the training yards in Milnerton.

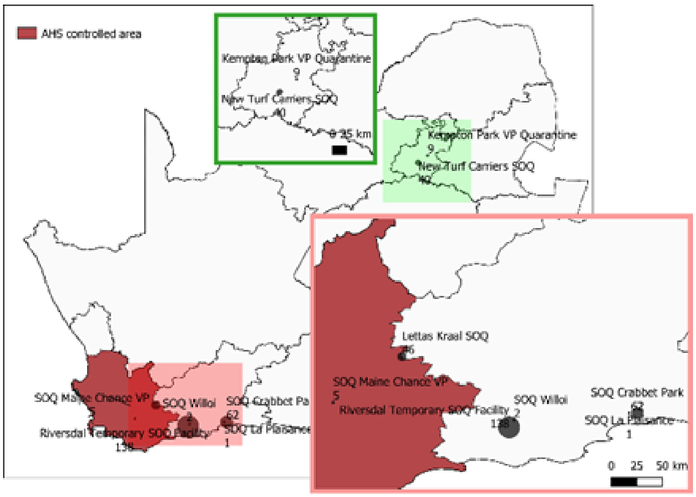

Figure 3: Facilities used for stop-over quarantine movements during 2021. Proportionally-sized circles represent the total number of equids using these facilities.

Discussion

A total of 6028 equids moved into a zone of higher control during the year, which is an 8.5% increase from 5552 in 2020 and an indication of a return (albeit slow) to pre-Covid levels. Once again, it is clear that most movements into a zone of higher control consisted of domestic equids and, while it's important to understand wild equid movements, the risk mitigation of AHS spread into the AHS controlled area through domestic equid control remains crucial. The AHS surveillance zone remains the most common zone of destination, both for infected area origin and controlled area origin movements. Most movements are associated with Thoroughbred horses.

Movement regulation requires close communication and interaction between various regulatory and State authorities. Movements originated from 49 of the 126 State vet areas in the country (as with the 47 used in 2020).

Stop-over quarantine movements have assisted in facilitating the movement of 303 horses that would otherwise not have moved or would have required a 40-day residency in an AHS low risk area prior to direct movement. While this system is expensive and resource-intensive, it promotes the movement of high-value horses or critical movements (such as high-level competition) and allows control and an acceptable system for the public needing to move horses.

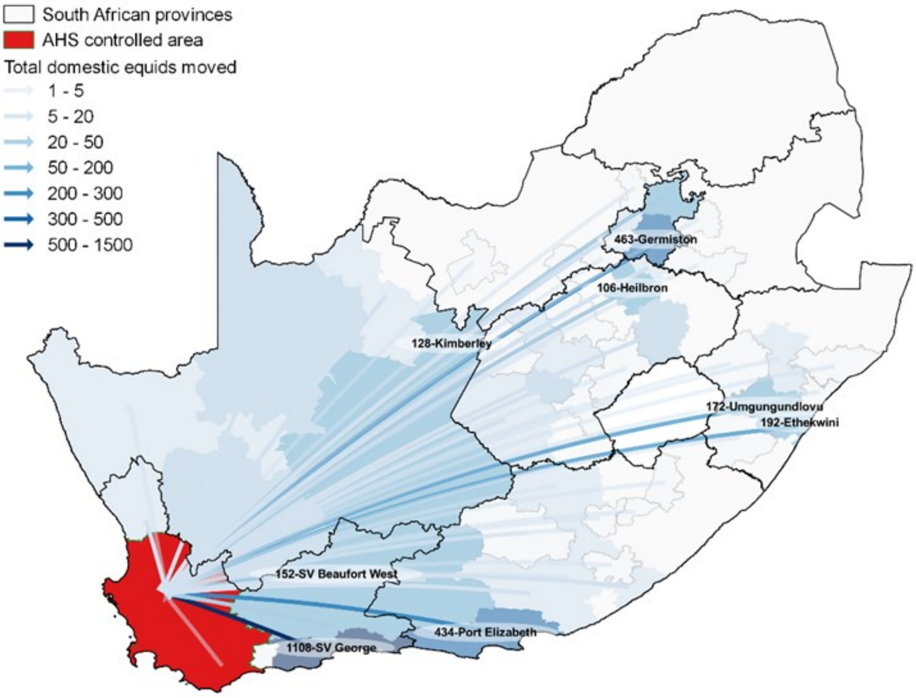

Figure 2: The total number of equids per State veterinary (SV) area of origin that moved into the AHS controlled area in 2021.
Areas are labelled if 100 or more equids moved from the region.

Outbreak events

African swine fever was diagnosed on two properties near **Robertson**, with a link through transport of kitchen waste. The first site has pigs from multiple owners, kept close together, and the other property has a single owner who buys and sells pigs. The municipality assisted with burial of carcasses and the State Vet Office supplied lime and disinfectant.
There was also a third outbreak of African swine fever in **Philippi**, City of Cape Town. Multiple owners keep pigs in the area but only one owner seemed to be affected, with 100% mortality.
Sheep near **Darling** were seen to be losing condition. Histopathology on samples taken in May were indicative of **Johne's disease** and the farmer plans to vaccinate.

Merino **sheep** near **Fisantekraal** were diagnosed as infested with **sheep scab** mite (*Psoroptes ovis*). They had been bought in two months previously. The whole flock was treated twice, 7 days apart, with ivermectin, under official supervision.

Figure 5: *Guinea pigs* can die from *Salmonella* Enteritidis
(Photo (cropped): Jay Reed, shared under a Creative Commons license

A **striped polecat** (*Ictonyx striatus,* stinkmuishond; Fig. 6), that was killed by farm dogs near **Prince Albert** in May, tested **rabies** positive.

In April, wild and domestic **pigeons**, from **Langebaan** and **Malmesbury** respectively, tested **Newcastle disease-**positive on PCR. Results of laboratory tests to further identify the viruses are pending. The domestic pigeons also tested positive for an unidentified, **avian influenza** (assumed low pathogenic) virus.

Pigs from near **Gouda** had skin lesions consistent with **erysipelas of swine** when inspected after slaughter at the abattoir.

Clinical signs of **bluetongue** were observed in **sheep** near **Vanrhynsdorp**.

Clinical signs of **lumpy skin disease** were observed in **cattle** on two neighbouring properties near **Vanrhynsdorp**.

Salmonella Enteritidis was detected in a herd of **Guinea pigs** from **Cape Town** that died acutely in April and May. The surviving animals were isolated and treated with antibiotics and their enclosures were thoroughly disinfected.

Goats from near **Hopefield** died acutely in May after eating *Eucalyptus* (gum) tree leaves. Post-mortem and histopathological findings were consistent with a diagnosis of **cyanide (prussic acid) toxicity**, which has been associated with consumption of eucalyptus leaves.

Figure 4: *Eucalyptus* (gum) trees, which can cause cyanide toxicity in livestock.
(Photo (unchanged): Bidgee, shared under a Creative Commons license

A **ewe** died acutely on a farm near **Theewaterskloof** Dam and the farmer suspected **pasteurellosis** based on his post-mortem examination.

An AHT noticed damaged wool and diagnosed **red lice** infestation on **sheep** near **Melkbosstrand** and at an auction in **Gouda**. The sheep at the auction had originated on a farm near Piketberg.

Goats near **Bonnievale** showed lethargy and progressive weakness in May. A diagnosis of suspected nervous **coccidiosis** was made, based on small intestine inflammation observed on histopathology and high faecal coccidia count.

Sudden deaths in **lambs** near **Malmesbury** in May were attributed to **cryptosporidium** and ***E. coli*** septicaemia, diagnosed on post-mortem, bacteriology and faecal smear.

Figure 6: Striped polecat, susceptible to rabies
(K Roberts (with permission) Roan NEWS , Feb 1995, p30)

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EPIDEMIOLOGY REPORT

An update on high pathogenicity avian influenza, locally and globally

L Roberts

In **South Africa**, detection of the 2021 clade 2.3.4.4 high pathogenicity avian influenza (HPAI) H5N1 virus, and reports of suspected cases, slowed dramatically from January 2022 onwards. However, outbreaks were still being reported from commercial poultry from Gauteng in early May, and April was the only month without a case in wild birds in the Western Cape (July cases described on the back page). Sequencing, thanks to Prof Celia Abolnik, has confirmed that the July detections are still essentially the same virus that caused outbreaks in 2021.

Further north, in **West Africa**, poultry outbreaks of H5N1 in April were reported from Guinea and Gabon to the World Organisation for Animal Health (WOAH). Mali, Cameroon and Senegal (Great White Pelicans infected) had outbreaks earlier in the year.

The **European** avian influenza season started in October, and has been particularly destructive, mostly dominated by HPAI H5N1. **North America** has been affected since December 2021, though it escaped HPAI H5Nx outbreaks for the last 5 years or so. The US Department of Agriculture estimates 40.3 million poultry have been affected in the USA and the EU reference laboratory counts 2369 outbreaks in poultry and 3132 in wild birds, compared to a total of 3792 for the 2020/21 outbreak, reported in the latest EFSA AI update report. The outbreak numbers seem to have decreased now.

Another new development is the high numbers of **seabird species** affected by HPAI (H5N1) in the **Northern Hemisphere**, since late 2021, and high mortalities in breeding colonies. The virus appears to have devastated the largest colony of Northern Gannets, on Bass Rock, in Scotland and almost half a colony of Sandwich terns (Figure 4) in the Netherlands, among others.

Further news is the escalating number of human and mammal cases of clade 2.3.4.4 HPAI. There have still not been many **humans affected** but the increase is worth noting. The European Centre for Disease Prevention and Control has revised the estimated threat from "very low" to "low" for the general population and from "low" to "low-medium" for occupationally-exposed groups. H5N6 virus has been detected in humans since 2014 and has had a 42% case fatality rate, but there have only been 79 recorded cases to date, all linked to poultry exposure. The only recorded H5N8 cases were the seven asymptomatic Russians in 2020, who worked on an infected poultry farm. Three asymptomatic Nigerian bird handlers, exposed to clade 2.3.4.4 H5N1, tested positive for H5Nx virus in March 2021 and there have also been

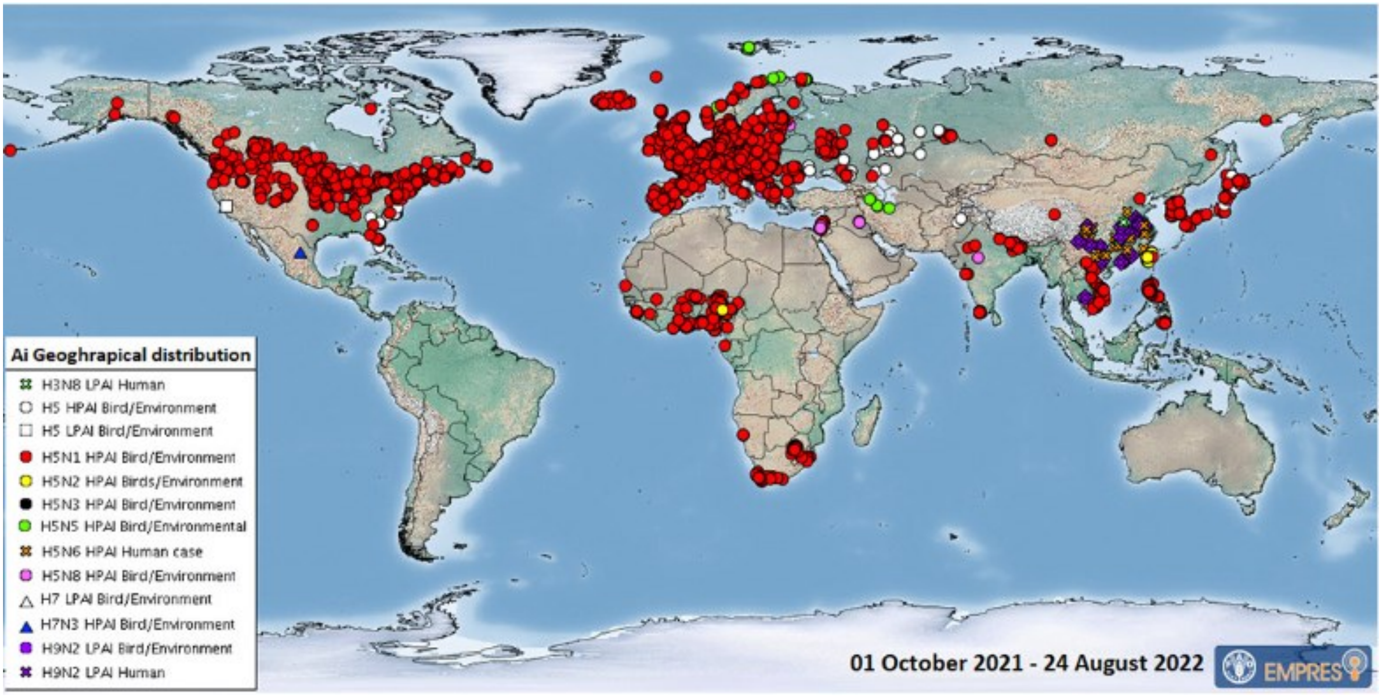

Figure 1: Global distribution of AIV with zoonotic potential observed since 1 October 2021 © FAO (2022) Global Avian Influenza Viruses with Zoonotic Potential situation update, accessed 31 Aug 2022

two cases of H5N1 in the UK and US, in December 2021 and March 2022, respectively.

The number of cases in **other mammals** in the Northern Hemisphere is much higher. H5N8 viruses were detected in a small number of seals and one red fox between 2016 and 2021, but reports of H5N1 in mammals have escalated fast. Most recently, H5N1 has been detected in 15 dead harbour seals in Canada in July and linked to nearly 100 deaths. In June, it was detected in seals in Maine, USA, and suggested to be the cause of an elevated mortality rate. It is not clear yet whether seal-to-seal transmission is hypothesised, or just widespread exposure to infected birds. Other cases have been more isolated and probably linked to scavenging of birds. Affected animals exhibit neurological clinical signs and species include red fox, skunk, raccoon dog (Figure 2), Eurasian otter, European badger, European polecat, lynx and ferret. The viruses detected in these mammals have genetic mutations associated with mammalian adaptation.

It is therefore important that protective clothing, including masks, is worn when handling suspected HPAI cases and that people exposed to HPAI, that become ill, are tested for avian influenza.

Further reading and references:

https://wahis.woah.org/#/events
https://promedmail.org/

https://www.gov.uk/government/publications/avian-influenza-bird-flu-in-europe#full-publication-update-history

Figure 2: Raccoon dogs are one of the mammal species in which HPAI (H5N1) viruses have been detected, in Japan (KKPCW, Wikimedia Commons, unchanged, obtained under a Creative Commons Attribution-Share Alike 4.0 International license

New publications

"Containment and conversion: Urban livelihoods and the circulation of value amid South Africa's avian influenza outbreak"

Thomas Cousins, Michelle Pentecost, Lesley van Helden

This paper, published in the August 2022 issue of American Ethnologist, explores the social and societal effects of the 2017 highly pathogenic avian influenza (HPAI) H5N8 outbreak in Western Cape poultry. It discusses how the outbreak exposed the importance and complexity of the spent layer hen market and how disease management decisions were influenced as a result.

The sale of spent layer (cull) hens, that have reached the end of their egg-laying lifespan, provides an opportunity to boost profits from an egg-producing farm, with little further cost. It also prevents the waste of valuable protein (cull hens in other countries are killed and disposed of). Sale of cull hens from the farm gate provides job opportunities for the person who collects and transports the hens, the person who runs the business selling the hens, and those employed by the business. And this business is providing a product that is in demand for both the lower price and desired meat taste and texture, compared to a commercially-produced broiler chicken. There is also a demand for these chickens for celebrations and other cultural reasons.

When a layer farm is infected with HPAI, both the production of eggs and the cull hen value chain is affected. Furthermore, what emerged in 2017 was that attempts to control HPAI through vaccination would also have serious consequences for the cull hen market, besides the possible negative effects on the formal industry. Because vaccines do not necessarily prevent infection with and spread of HPAI viruses, but may only modulate clinical signs, vaccination can hide circulation of HPAI virus. For a vaccinating country to trade in poultry products and demonstrate adequate HPAI surveillance, it is necessary to control movement of vaccinated birds and adapt surveillance strategies. Selling vaccinated layer hens in an informal market could pose a significant risk for spread of HPAI. However, discussions about vaccination, between the egg-producing industry and government, reached a stalemate , largely over the issue of sale of live cull hens.

This article highlights another example of how disease control is affected by the complexities of farming systems and animal product value chains, and how understanding and accommodating these is necessary to allow progress.

Read the full article at:

https://anthrosource.onlinelibrary.wiley.com/doi/10.1111/amet.13083

Outbreak events

Rabies was detected in a **bat-eared fox** near **Leeu Gamka.** It attacked farm dogs and was shot by the farmer. The farm dogs had been vaccinated previously and received boosters.

H5Nx avian influenza (AI) virus was detected in a **Common Tern** (Figure 4) found in **Durbanville** in mid-June. Another Common Tern with neurological signs was found on **Macassar Beach** by a member of the public in late July, and subsequently tested PCR-positive for **high pathogenicity AI (H5N1)**. HPAI (H5N1) was also detected in an **African Penguin** that was one of thirteen that died on Dy**er Island**, near Gansbaai, in late July.

There have also been detections of **avian influenza** virus on **ostrich** farms in the **Witzenberg** Municipalitiy. The viruses appear to be low pathogenicity viruses of unknown subtype.

Newcastle disease was detected in **ostriches** in **Witzenberg** Local Municipality. One outbreak was confirmed to be virulent NCD but pathotyping results are still pending for the other.

African swine fever is suspected to have spread to a new are near **De Doorns.** The mortality rate and clinical signs were consistent with ASF but it has not been possible to obtain samples for laboratory confirmation.

Sheep scab was reported from the **Beaufort West** and **Oudtshoorn** areas. One outbreak is linked to farms in the Eastern Cape that were infested in 2021.

Figure 3: Orf (contagious pustular dermatitis) in a goat (*W Gouws)*

Suspected **plant poisoning** was reported in **sheep** near **Vanryhnsdorp.** Clinical signs included frothing at the mouth, tremors and spasms, lameness, galloping movements with legs while lying down and then death. This started two weeks after moving to a new camp.

Orf (contagious pustular dermatitis) was diagnosed in **goats** in **Riviersonderend** (Figure 3).

Sheep near **Darling** were diagnosed with **coccidiosis** and **protein-energy malnutrition** after post-mortem (PM) examination and histopathology.

A report of high mortality in **pigs** near **Remhoogte** was investigated. Deaths were attributed to poor husbandry and suspected **oedema disease. Neurological pigs** from **McGregor** were diagnosed with suspected **salt poisoning**, based on PM examination and histopathology. Salt poisoning can occur with water deprivation and/ or a high salt diet.

Haemorrhagic enteritis was diagnosed on PM in **finches** from **Malmesbury** and **Spur-winged Geese** from **Porterville** at the end of July. AIV tests were negative.

Figure 4: Common Terns, with a Swift Tern (larger, yellow beak) and Sandwich Tern (far right) for comparison *(D Roberts)*

Epidemiology Report edited by State Veterinarians Epidemiology:

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Western Cape ostrich avian influenza surveillance: Jan 2021-June 2022

L Roberts

The results of avian influenza (AI) surveillance on Western Cape ostrich compartments are presented for the three six-month periods that fell between January 2021 and June 2022 and are summarised, with the population structure, in the table below.

Ostrich farms in South Africa undergo compulsory biannual (6-monthly), pre-movement, pre-slaughter and post-movement avian influenza antibody testing (serology). Chicks younger than 6 weeks old and breeder ostriches are exempt. Further background to avian influenza surveillance in ostriches is provided in the 2018-2019 surveillance report, published in June 2020. The 2020 surveillance report was published in December 2020 and both are available on the Vet Epi website.

Serology is used to demonstrate AI virus freedom on ostrich farms for export purposes, among others. All positive serology suggesting presence of a new infection is followed up as soon as possible, ideally within a week, with polymerase chain reaction (PCR) testing, to attempt to detect and identify the virus involved and determine its pathogenicity. If viral genetic material is detected with PCR, genetic sequencing is also attempted, to characterise the virus further. Only high pathogenicity avian influenza (HPAI; H5 and H7) viruses should affect export status.

In each of the three six-month periods (Jan-Jun 2021, Jul-Dec 2021 and Jan-Jun 2022) respectively, 77%, 72% and 74% of populated ostrich farms were tested with AI virus serology. The majority of breeder farms and those with only small chicks were excluded. In each 6-month period, of testable farms with birds between 6 weeks old and slaughter age, 93%, 97% and 97% respectively were tested. Of tested farms, 3%, 10% and 2% were found to be newly sero-positive.

Table: Western Cape ostrich compartments, age structure and avian influenza surveillance results:
January 2021 to June 2022, for each six-month period

No. of ostrich compartments	Jan-Jun 2021	Jul-Dec 2021	Jan-Jun 2022
Total compartments	292	288	286
Hatcheries	21	18	18
Unpopulated (null census)	29	27	31
Populated	242	243	237
Breeders only (not testable)	45*	60	56
Testable farms**	197	183	181
Not tested	14	9	6
Tested	187	174	175
AIV sero-positive	21	27	11
Old antibodies	16	10	9
New detections	7 (6)	18	3
Negative follow-up	0	5	1
Undefined LPAI	2	1	1
H6Nx	1	4	0
H7N1	1	0	0
LP H5N2	1	(2)	0
HP H5N1	2 (1)	8 (6)	1

* Four breeder farms were tested (and found to be still sero-positive, since 2017). They have been counted as testable in this 6-month period
** Usually only birds 6 weeks old to slaughter age
Numbers in brackets indicate where 3 farms may have had LPAI H5N2 and not HP H5N1.

Avian influenza outbreaks detected in 2021

Eighteen ostrich farms tested avian influenza sero-positive in nineteen different events in 2021 and virus was detected on eight farms (44%).

Low pathogenicity avian influenza (LPAI) H5N2 virus, confirmed with next generation genetic sequencing, was detected on an ostrich farm on the eastern side of Hessequa municipality in March (Fig. 1).

One ostrich farm in Mossel Bay municipality was diagnosed with LPAI H7N1, using serology, in February. It was the last to be reported as part of the 2019 LPAI H7N1 outbreak.

Two farms were concluded to have had undefined, non-H5, -H6 or -H7 avian influenza infections in May and June. One had also had a suspect positive PCR test a few months earlier, but had been PCR- and sero-negative on follow-up testing.

High pathogenicity avian influenza (HPAI) H5N1 outbreaks were reported to the World Organisation for Animal Health (WOAH) from ten ostrich farms in the Western Cape in 2021. One additional farm was reported from mid-January 2022, based on serology.

Four H5N1 farms were HPAI H5 PCR-positive (36%), indicating presence of virus. Two, in Witzenberg and western Hessequa municipalities

(Fig. 1), experienced mortalities in June and July respectively, and HPAI H5N1 was confirmed with genetic sequencing. Of the other two PCR-positive farms, one was detected in late July, in the western part of Oudtshoorn municipality, and serological tests also indicated an H5N1 infection. The other farm, in the eastern Hessequa municipality, was PCR-positive in early June, but further virus tying was unsuccessful and the serological results were not aligned. The serology observed could be explained by the HPAI (H5N2) detection, on the same farm, mentioned above.

The remaining six HPAI H5N1 outbreaks were reported based only on serology, taking a precautionary approach. However, two did not have consistent cross-reactions on the relevant H5 haemagglutination inhibition (HI) antigens and could have in fact been infected with the LPAI H5N2 virus. They were reported as HPAI-infected due to proximity to the abovementioned property in eastern Hessequa municipality (Fig. 1).

One ostrich farm in Witzenberg municipality was found to be sero-positive for H6Nx avian influenza in February, and another four farms in the Beaufort West, Oudtshoorn and Mossel Bay municipalities (Fig. 1) were diagnosed in September and October 2021, all based on virus detection (PCR).

Avian influenza outbreaks detected between January and June 2022

Two new avian influenza outbreaks were detected in the first half of 2022. The first was the eleventh HPAI H5N1 ostrich outbreak to be reported to the WOAH, in January, diagnosed on serology. The second was classified as undefined AIV after carcasses tested AIV PCR-positive in April and follow-up serology did not indicate a virus subtype.

2021 avian influenza surveillance in the European Union

The 2021 EU avian influenza surveillance report was published in August 2022, in the EFSA Journal. To compare virus detection success: of 24 290 poultry establishments that were sampled, 27 were sero-positive for influenza A(H5) and four for A(H7) viruses (total 31). Of these, 24 were also tested with PCR (77%) and five establishments were PCR-positive (21%). These sero-positive establishments mainly raise waterfowl for hunting and breed ducks and geese, so the birds may have shown few signs of avian influenza infection, similar to what is experienced with ostriches.

For interest, 122 of the tested EU poultry establishments contained ratites (including ostriches), of which two were sero-positive and neither was PCR-positive.

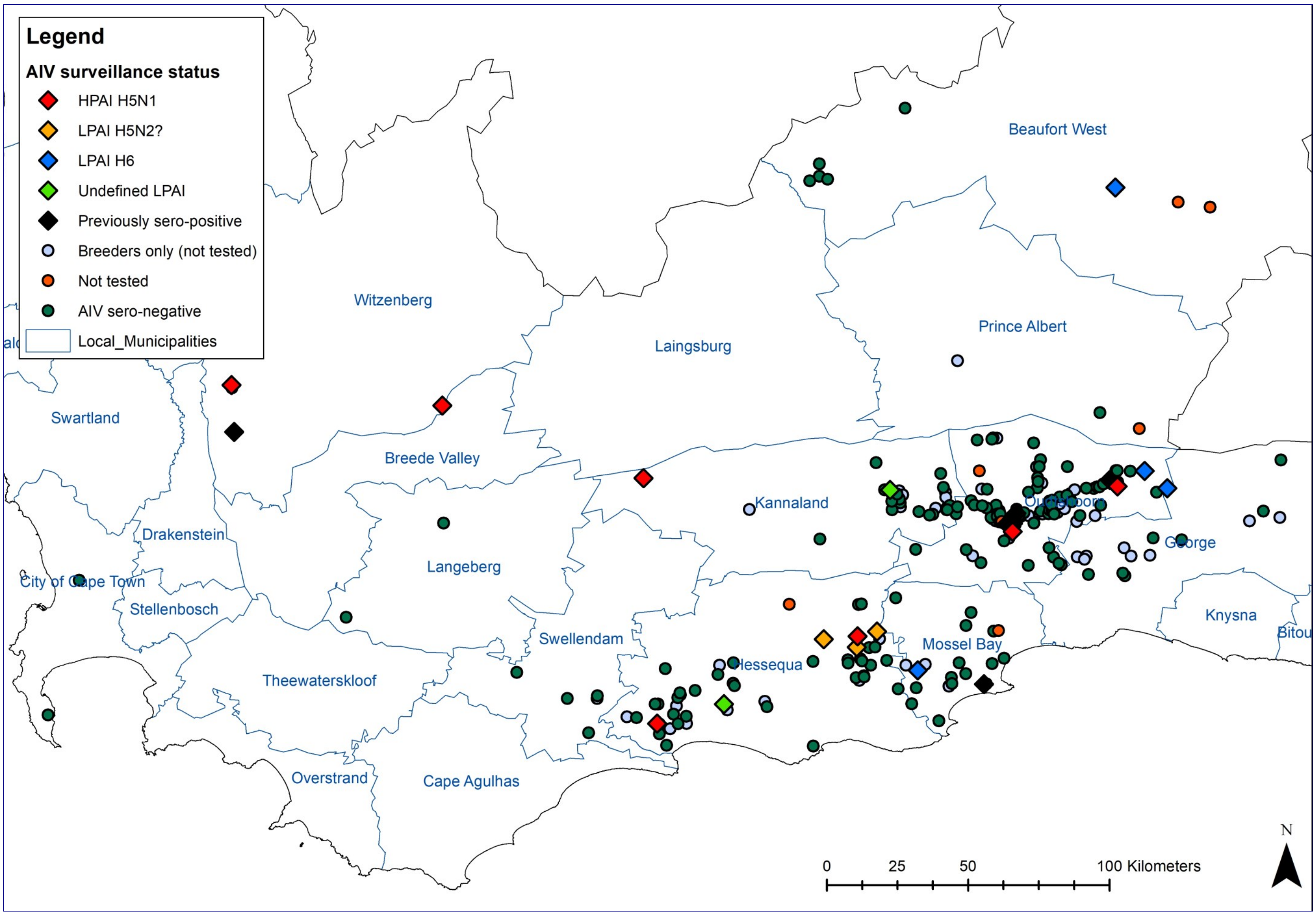

Figure 1: Ostrich avian influenza surveillance in the Western Cape, from July to December 2021: Locations of populated ostrich farms, showing avian influenza surveillance status and testing result

"LPAI H5N2?" denotes farms reported as HPAI H5N1 but that may have rather been infected with LPAI H5N2.

One farm marked as LPAI H5N2? was detected earlier, in March 2021, but is included for convenience.

Outbreak events

Rabies was diagnosed in a **bat-eared fox** near **Riviersonderend.** The animal attacked a farm dog outside the house and was shot by the farmer. Since the dog was not vaccinated against rabies, euthanasia was advised and the owner agreed to it.

High pathogenicity avian influenza (HPAI) H5N1 was confirmed in a **Common Tern** from **Macassar Beach** and in three **African Penguins** from **Melkbosstrand**, **Simon's Town** and **Strand**.

An **ostrich** farm **south of Oudtshoorn** was diagnosed with HPAI H5N1 and **LPAI H6N2**, based on PCR, and sequencing of the H6N2 virus. Two ostrich farms **east of Oudtshoorn** were classified as infected with H6 virus, based on serology but no virus typing was possible on a third sero-positive farm. Virus was detected via PCR on two of these farms and H5 and H7 tests were negative but no further typing results have been received.

Two **poultry** farms in **Overstrand** Municipality received positive ***Salmonella* Enteritidis** test results from boot and bait station swabs respectively. No signs of illness were recorded and no source has been traced.

Community members reported wild birds dying in **Stanford**. A **dove** tested positive for virulent **Newcastle disease** virus and was probably infected with pigeon paramyxovirus but laboratory confirmation has not been received.

An **ostrich** farm in the **Witzenberg** municipality tested positive on the screening test for Newcastle disease but further PCR testing and genetic sequencing confirmed a **lentogenic avian orthoavulavirus 1**, which does not fall under the definition of Newcastle disease. The younger group of ostriches showed decreased appetite, weight loss and conjunctivitis.

Anaplasmosis (gall sickness) was diagnosed in a **cow** from **Botrivier**. The animal was recumbent and unresponsive and had reddish urine and pale mucous membranes. According to the owner, the diagnosis was made on post-mortem examination at the Western Cape Provincial Veterinary Laboratory.

Bovine babesiosis (redwater) was diagnosed by a private vet in **Grabouw**. Eight of 22 6 to 9 month-old calves died, showing pale yellow mucous membranes and urine that looked like blood. Five affected animals survived after treatment with imidocarb and tetracycline. The animals were suffering from a severe tick burden (mostly blue ticks).

Sarcoptic mange was diagnosed in **pigs** (Fig. 2) showing emaciation and scabs, itching and discomfort, near **Nuwerus**.

Sheep near **Bergrivier** were diagnosed with **red lice**.

Urolithiasis was diagnosed in two **rams** on two properties near **Vanrhynsdorp** and **sand impaction** was suspected in lambs on another farm in the same area.

Sheep on a farm near **Kliprand** were found to be suffering from **footrot**.

A pig from **Chatsworth** was euthanised after it developed purple ears, and nystagmus, started shivering and became anorexic. On post-mortem examination it was found to have septicaemia and a cerebellar abscess and meningitis caused by ***Trueparella pyogenes***.

Western Cape Animal Health officials have been on high alert for foot-and-mouth disease (FMD). A heifer with an ulcerated lesion on the nose, diarrhoea and fever, near Hermon, was diagnosed with **bovine viral diarrhoea**. Two cattle on a property near Albertinia were found on have erosions in the mouth, but there were no epidemiological links to FMD outbreaks and FMD tests were negative. **Officials visited another 118 properties with cattle in August, from which they reported no signs of FMD.**

Figure 2: Lesions on a pig with sarcoptic mange *(J Kotze)*

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Dourine surveillance in the AHS Surveillance Zone: June & December 2021

J. Grewar & C Weyer

The following article has been adapted from the full surveillance report available on the [myHorse website](#)

Introduction

Since 2018, active dourine surveillance has taken place in the Western Cape province in the form of the testing of either sentinel horses (that make up the African horse sickness (AHS) sentinel program) in [2018](#) and [2019](#) or formal surveys of randomly selected horses in the AHS free zone ([2020](#)). The scope of the surveillance is to provide evidence for freedom of dourine within the same area where active surveillance is undertaken for AHS. The intent has been to perform surveillance in sentinel animals at 6- monthly intervals. The program in 2018 and 2019 was only performed in the first half of these years respectively. In 2020, the targeted AHS free zone survey was performed in the first half of the year as well. In 2021 (the period reviewed in this report) the biannual target was achieved with sentinels tested from both the June and December cohorts. An introduction to dourine, and the reason surveillance is required, has been thoroughly described in previous reports, available through links above or at https://www.myhorse.org.za.

Surveillance parameters

A goal of 60 serological sentinels per month is the requirement for AHS sentinel surveillance testing for direct exports from South Africa to the European Union (EU). Over and above this, South Africa samples another 90 horses in the AHS surveillance zone to test approximately 150 horses in the zone using PCR testing. Given that serum samples are taken from all 150 horses, the sampled horses for the dourine surveillance were targeted from the remaining horses sampled that were

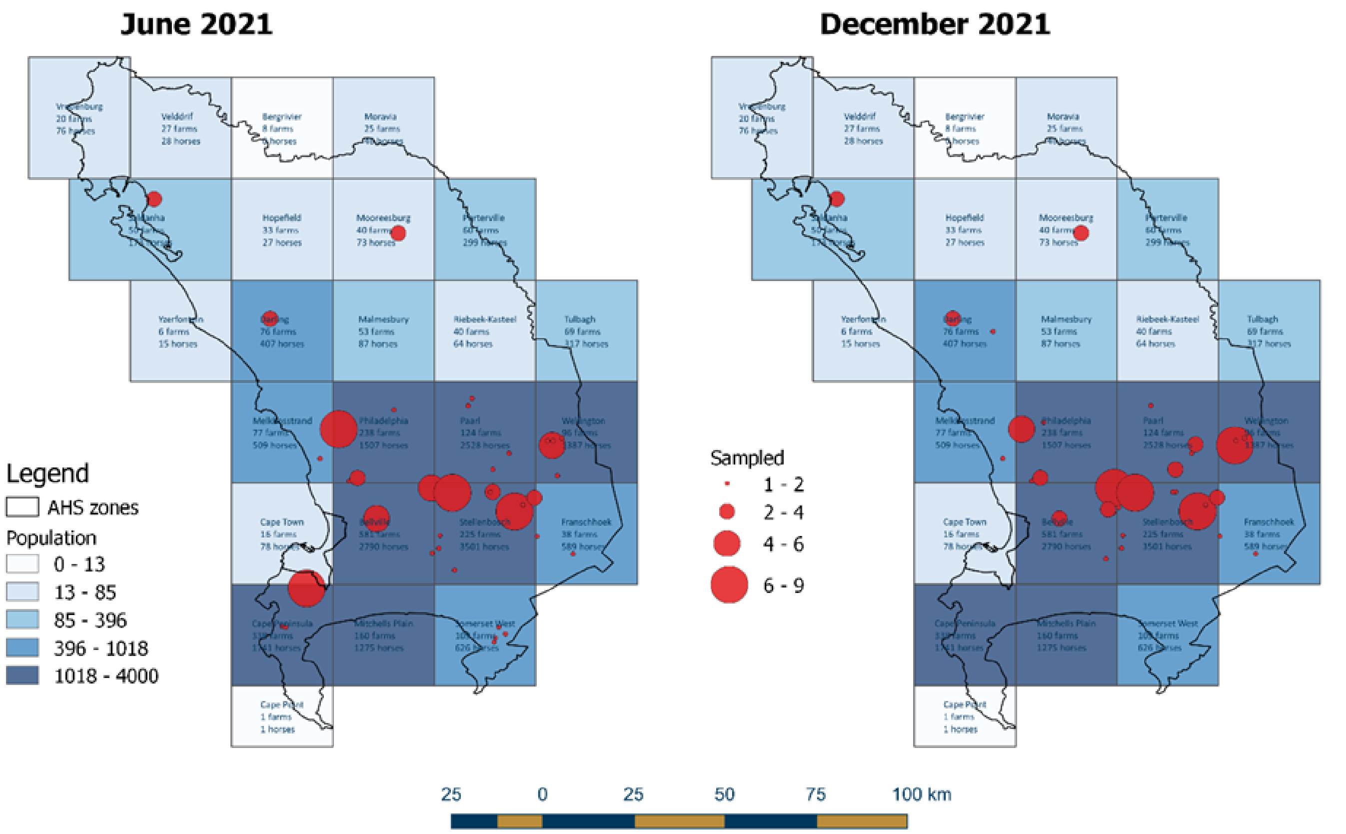

Figure 1: Dourine survey locations showing proportional circles for number of horses tested per location in June and December 2021 respectively. The underlying population at risk is shown as a light to dark blue gradient, to show that locations were chosen to reflect the relative underlying population at risk.

Table 1: Surveillance parameters used in design and evaluation of the surveillance event

Parameter	Value	Comments
Population at risk	16000	All horses in the surveillance and free zones. 16000 is an estimate; there are currently 16795 and 476 horses registered in the AHS surveillance and free zones respectively although data is captured only for horses entering the area.
Design Prevalence	~5%	Minimum expected prevalence in the population should dourine occur; parameter taken from the serological survey requirements of the EU for AHS sentinel surveillance given that the same population was used for the dourine sampling.
Test Sensitivity	90%	Estimate based on best scientific guess. The sensitivity of the complement fixation test (CFT) has not been established, although given the false positive rates (see specificity) the sensitivity is likely to be relatively high. The CFT is seen as a gold standard for individual horse testing prior to export and this also supports a test with relatively good sensitivity.
Test Specificity	Unknown but system specificity of 100% assumed	The CFT test is prone to false positives and probably does not have a particularly good specificity. However, given that any positive CFT result will be investigated to establish a final diagnosis a specificity of 100% was used in establishing the outcome of the sensitivity of the surveillance.
Type 1 error	5%	Used to provide a final probability of 95% that Dourine was not present if it was not detected using the surveillance parameters.

not tested serologically for AHS. Samples were taken in June and December for the two surveillance periods respectively.

Results

A total of 100 horses were sampled at 39 locations across the AHS surveillance zone in June 2021. In December, 100 horses were sampled at 36 locations. Proportional numbers of horses sampled across the surveillance zone are shown in Figure 1. The AHS sentinel surveillance program makes every effort to sample horses in proportion to their relative underlying population at risk using a gridded surveillance system. Most samples were thus taken from an area of approximately 50 km around the Kenilworth Quarantine Station, from which horses are exported.

In June, 98 samples tested negative for dourine antibody using the complement fixation test (CFT), with two animals having anti-complementary results, which cannot be interpreted. In December two results were suspect and one was positive, on three different holdings. As per protocol, the January 2022 serum samples from these animals (two horses and one donkey) were then tested. The two suspect horses tested negative. Samples from January 2022 and May 2022 were submitted for the positive animal, with negative results. With follow up negative tests and negative clinical signs in these animals, they are considered negative. Efforts will however be made to include them in future surveillance events.

The sensitivity (and resulting probability of freedom) of the surveillance program is shown in Table 2. This evaluation is independent of any prior surveillance. While the sentinel surveillance program is based on a single stage sampling strategy (column 2 of Table 2), we have estimates of the underlying number of herds in the surveillance zone as well as estimates of the herd sizes of the sampled herds. This allows an estimate of surveillance sensitivity in a more realistic setting (column 3 of Table 2). Note that in this latter analysis we reverted to an effective population design prevalence of 2% (within herd design prevalence of 20% and herd level prevalence of 10% throughout the population). This is in an effort to depict a reasonable minimum expected prevalence with so few cases of dourine reported in the prior 20 years in the AHS surveillance zone (Figure 3).

With surveillance evaluation it is also appropriate to evaluate probability of freedom outcomes given prior surveillance events. Figure 2 shows the evaluation of all 5 surveillance events undertaken to date in the AHS surveillance and free zones. Where surveillance was missed (second half of 2018, 2019 and 2020), a zero sensitivity is assumed. Note also that the

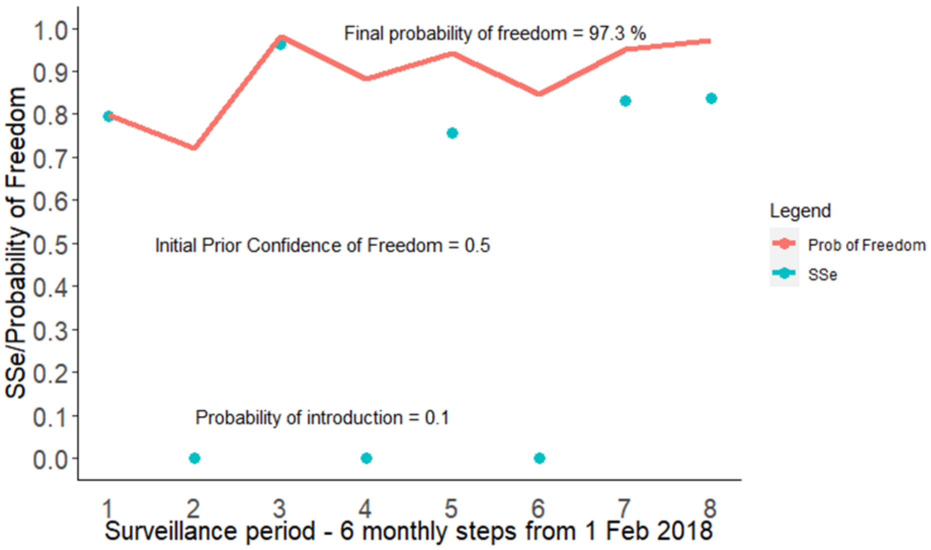

Figure 2: Surveillance system sensitivity and probability of freedom assuming an introduction probability of 10%, an underlying herd and animal prevalence of 20 % and 10% respectively and an uninformed prior probability of 50% in period 1.

Table 2: Design prevalences with resulting surveillance sensitivity and probability of freedom outcomes for two different scenarios independently analysed: the sentinel program design prevalence and the generic values used given the history of cases in the AHS controlled area. NOTE: This evaluation is for a single point in time and does not consider previous surveillance outcomes.

Parameter	**Descriptions and values based on varying data sources**			
	Single stage population sensitivity		Generic prevalences to result in effective design prevalence of 2% with 2-stage analysis	
Animal level prevalence (P^*_U)	0.05		0.2	
Herd level prevalence (P^*_C)	n/a		0.1	
Effective population prevalence (P^*_U x P^*_C)	0.05		0.02	
	June 2011	December 2011	June 2011	December 2011
***MeanSSH* - Mean herd level surveillance sensitivity**	n/a		0.449	0.5
***SeP* - Population surveillance sensitivity**	0.989	0.989	0.83	0.838
***PFreeU* - Confidence of population freedom – uninformed prior**	0.987	0.987	0.828	0.834

surveillance in 2020 (period 5) was targeting the AHS free zone only, but the evaluation below assumes a population at risk across the AHS free and surveillance zone.

The dourine probability of freedom in the AHS free and surveillance zone in 2021, given the 2021 surveillance efforts, ranges between 82.8% and 98.7%, depending on the analysis used. An overall probability of freedom, taking prior surveillance into account, is 97.3%.

Discussion

Stand-alone surveillance efforts like the one described here supplement the current clinical passive surveillance and Thoroughbred pre-breeding dourine surveillance efforts in South Africa. While the scope is limited to the AHS free and surveillance zone, we believe this will assist in export protocols that require dourine freedom statements where horses are exported from AHS free zone quarantine facilities such as Kenilworth Quarantine Station.

Figure 3 shows all dourine cases reported in South Africa from 1993 through Jan 2018 (data accessed May 2022 from www.dalrrd.gov.za and collated to South African local municipalities). The last case in the Western Cape, in 2012, occurred in a working mule in the Bredasdorp region. Details of that case can be found on the VetEpi website.

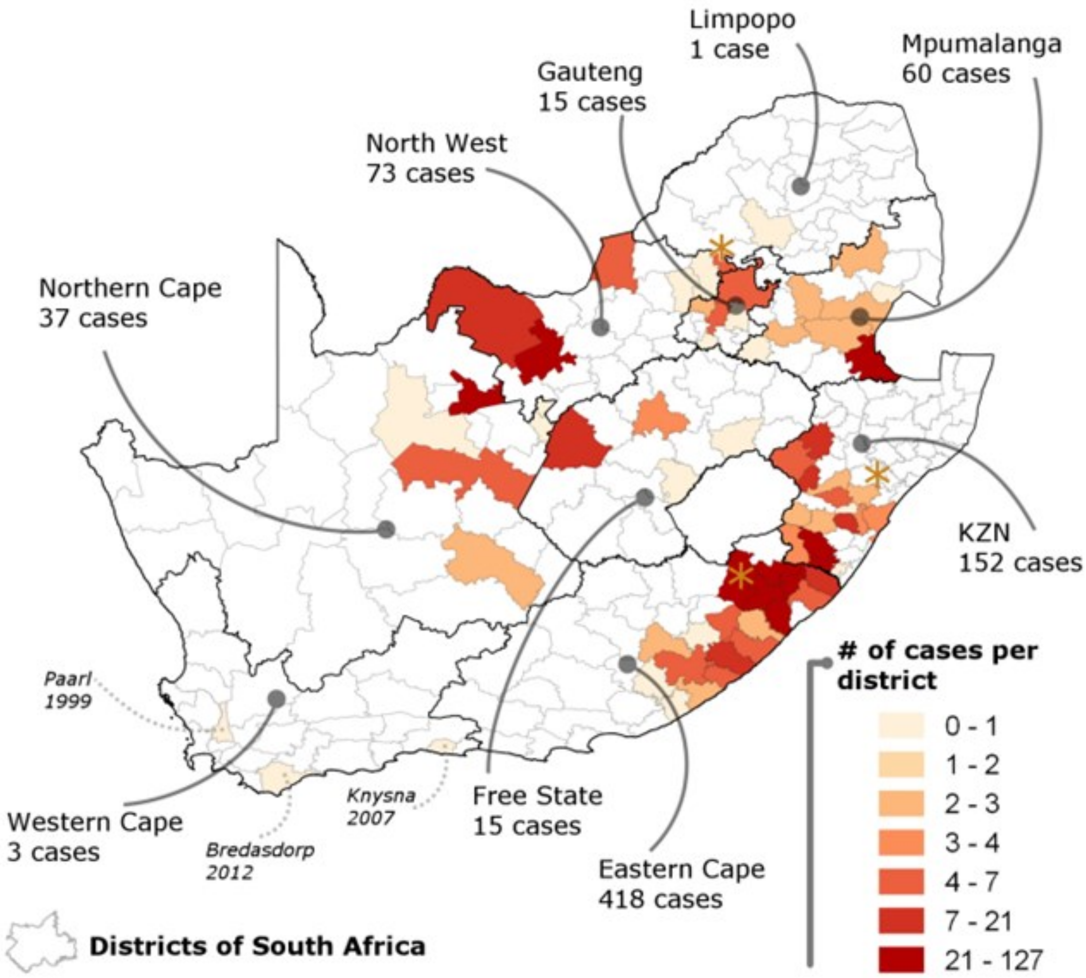

Figure 3: Historical dourine cases reported to DALRRD from 1993 through Jan 2018 (the last case as reported by DALRRD) to date. Cases have been aggregated by district while case totals per province are labelled. The three cases reported in the Western Cape are also labelled specifically with the last case reported in 2012.

Outbreak events

Two **cattle** died on a farm near **Herbertsdale** and one tested positive for **wildebeest-associated malignant catarrhal fever** virus. There are wildebeest on a game farm in the vicinity but not adjacent to the cattle farm.

A farmer near **Nieuwoudtville** had borrowed a **ram** and he had it tested for ***Brucella ovis*** before returning it. Unfortunately, *B. ovis* antibodies were detected.

The carcass of a **pig** from a farm near **Saron** was condemned at the abattoir for lesions indicating **erysipelas of swine**.

A farmer near **Darling** had noticed **sheep** losing condition for a number of years. A private vet euthanised one sheep and took samples post-mortem. Culture of *Mycobacterium avium* subspecies *paratuberculosis* led to a diagnosis of **Johne's disease.**

Sheep scab was diagnosed by a private vet on a farm south of **Darling**. There had been contact with another farm, which also had to be treated.

Wild doves from **Stellenbosch** tested positive for **Newcastle disease virus**. Pigeon paramyxovirus infection is suspected but has not been confirmed.

A **galah** (Fig. 4) chick's liver sample tested positive for chlamydiaceae species and was diagnosed with **psittacosis** (avian chlamydiosis). The other three chicks from the nest had died.

Ten **ostrich** farms in the **Oudtshoorn, Mossel Bay** and **Heidelberg** areas received positive **avian influenza** test results. Six were tested as part of disease investigations on another ostrich farm in the area. Eight farms had positive PCR tests, indicating presence of avian influenza virus, but the virus has not yet been typed, besides performance of H5 and H7 tests, which were negative. This suggests that a high pathogenicity subtype is not involved. Two farms were PCR negative, but positive for avian influenza antibodies.

A **broiler chicken** farm had repeated positive ***Salmonella* Enteritidis** test results from chick crates used to deliver chicks from the hatchery, while the farm was being re-stocked. The broiler breeder parent farm also tested positive and those birds were culled. A *Salmonella* reduction plan is being followed on the broiler farm.

A **pig** from **Saldanha** was diagnosed with **salt poisoning** on post-mortem examination. Before death, it showed ataxia and ventral skin discoloration.

Weaner **pigs** from **north of Cape Town** died after becoming anorexic and recumbent. **Oedema disease** (*E. coli*) was diagnosed on post-mortem examination.

Figure 4: *Galah or pink and grey cockatoo (Eolophus roseicapilla)* (R Taylor, shared under a Creative Commons Attribution 2.0 Generic license

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Rabbit haemorrhagic disease (RHD) frequently asked questions

Laura Roberts

Rabbit haemorrhagic disease is an acute, highly contagious disease of rabbits and hares (lagomorphs).

What causes rabbit haemorrhagic disease?

RHD is caused by rabbit haemorrhagic disease virus (RHDV) from the calicivirus family. Three distinct groups of RHDV have been identified that cause severe disease, of which the emerging **RHDV2** has been reported from most European countries, Asia, North Africa, Australia, nearly half the USA and Canada, and now from South Africa in 2022.

RHD and South Africa

South Africa was previously free from RHD and it is therefore a controlled animal disease in terms of the Animal Diseases Act (Act No 35 of 1984). Stringent import requirements have been in place for several decades (import of hares and rabbits is not allowed) to prevent the introduction of this disease into South Africa.

Which animals in South Africa may be susceptible?

Apart from domesticated rabbits related to the European rabbit, South Africa has the indigenous Cape hare (vlakhaas), scrub hare (kolhaas; Fig. 1), red rock hare (rooiklipkonyne; Fig. 2) and the critically endangered riverine rabbit (oewerkonyn), of which only hundreds are left. We do not know yet which of our indigenous species are susceptible, but RHDV2 affects both hares and rabbits in other parts of the world.

Figure 1: Scrub hare (long ears, white tail, pure white underparts with no browner bands along sides, like Cape hare) (B Dupont, Wikimedia Commons, cropped, obtained under a Creative Commons Attribution-Share Alike 2.0 Generic license)

What are the signs of RHD in rabbits and hares?

Sudden death is the most striking sign. However, other possible clinical signs include fever, neurological and respiratory signs, depression, inactivity and poor appetite. Death usually occurs 12–36 hours after the onset of fever but animals infected with RHDV2 may survive longer. RHDV2 causes disease and mortality in young animals from 15–20 days old and is believed to have an incubation period of 3-5 days.

What signs are visible on necropsy?

There is primary liver necrosis (pale, often with a lobular pattern), splenic congestion and a disseminated intravascular coagulopathy in all organs and tissues, causing hyperaemia of the trachea and oedematous and congested lungs.

Photographs are available on the Center for Food Security and Public Health, Iowa State University website.

How can one test for RHDV?

Testing for RHDV can only be done in a laboratory approved by the national Director: Animal Health. Currently the only approved laboratory is at ARC-Onderstepoort Veterinary Research.

Liver is the sample of choice but spleen, blood, urine or faeces (the latter three also from live rabbits) can also be submitted fresh, on ice for PCR testing. Swabs can be submitted but must be transported in PBS.

Testing of domestic rabbits will be at the cost of the owner, but the national Director: Animal Health will consider applications to test wild lagomorphs, submitted via the responsible state veterinarian.

What will happen if domestic rabbits are infected or suspected to be infected with RHDV?

The state vet must be notified of any suspected or confirmed cases. He or she can assist with advice on limiting spread of the disease and in disposing of carcasses and will place the property under quarantine to ensure that the virus does not spread to other properties.

How many animals will die?

The morbidity and mortality rates vary among populations. RHDV2 has been reported as causing 5-70% mortality. In Europe, RHD has caused dramatic declines in wild rabbit populations in France, Portugal and Spain, but wild rabbits in the United Kingdom and some other Northern European countries have been less severely affected possibly due to the presence in wild rabbits of non-virulent RHDV-like strains, which may induce variable levels of cross protection within each population. Rabbits that recover from infection will develop good immunity to RHDV2.

How do animals get RHD?

RHDV is present in faeces and urine of infected rabbits and transmitted through either inhalation or ingestion. Contact with contaminated feed, bedding or equipment is also a possible source of RHDV, as it is highly resistance to physical and chemical inactivation, particularly when protected by organic material. It can survive for months in carcasses and possibly in feed.

Other animals, including insects, are not infected by the virus but may act as mechanical vectors and play a role in spreading virus.

Can humans and other animals get RHD?

No, the disease is specific to rabbits and hares.

What disinfectants work against RHDV?

Remember to clean off all biological material and then use one of the following:

- **Bleach** (3.5% sodium hypochlorite) mixed at 200ml per litre of water with 10 minutes contact time
- 1 % **potassium peroxymonosulfate** (e.g. Virkon S) with 10 minutes contact time
- **F10 SC** mixed STRONG (same as for parvoviruses): 8ml/L water with 30 minutes contact time
- 1% **Sodium hydroxide** (e.g. Milton sterilising fluid)

Figure 2: Red rock hare (red-brown tail and relatively short ears)
(B. du Preez, Wikimedia Commons, cropped, obtained under a Creative Commons Attribution-Share Alike 4.0 International license)

How can RHD be prevented?

Like many contagious diseases, RHD can be prevented from entering a property by practicing good biosecurity:

- Avoid buying in/ introducing any new rabbits until there is a better idea of the disease's distribution in South Africa. If it is absolutely necessary, keep new rabbits completely separate from the others, use separate equipment, wear gloves and wash hands and clothes thoroughly after working with the new rabbits.
- Do not allow other rabbit owners onto your property.
- Do not allow any possible contact between pet rabbits and wild hares or rabbits.
- Do not touch any rabbits or hares belonging to anyone else.
- Disinfect any potentially contaminated equipment or other objects, after removing all dirt, with a disinfectant listed above. Ensure the correct concentration and contact time.

Is there a RHD vaccine available?

There are several vaccines available overseas but not registered in SA. As RHD is a controlled disease, no vaccine can be imported or used without a permit.

The DALRRD has stated that they are "actively working... to make provision for the legal use of RHD vaccines in South Africa. Only legally imported, registered vaccines approved by SAHPRA/Act 36 may be used. For more information on the relevant import permits... contact SAHPRA and Agricultural Inputs Control (Act 36)"

What should be done with dead wild hares and rabbits?

Notify your local state veterinarian of the species, number and location, take photographs so that accurate species identification can be done.

If not required for testing, bury carcasses at least 1,5m deep but ensure that it is not too close to the groundwater level and is at least 100m from marshes, dams and waterways. A maximum of 60kg of carcasses can be buried but larger numbers of carcasses need to be dealt with via an application to Western Cape Waste Management. Complete burning is an alternative.

Remember that anything that touches a carcass may be able to spread virus to healthy animals, so wear gloves that can be disinfected afterwards and disinfect any equipment used.

Sources and more information:

WOAH RHD card

Spickler, Anna Rovid. 2020. Rabbit Hemorrhagic Disease

Department of Agriculture, Land Reform and Rural Development, South Africa. Guidelines for Rabbit Haemorrhagic Disease control. Version 1: Nov 2022.

Outbreak events

Deaths of domestic rabbits and wild **rabbits and hares** were reported from several locations in the province. On a farm south of **Laingsburg** where wild rabbits/hares were seen dying, four domestic rabbits also died suddenly. The carcass of one of the rabbits was submitted for a post-mortem and subsequent testing showed presence of **rabbit haemorrhagic disease** virus (RDHV). The virus was sequenced and determined to be RDHV2.

A farmer near **Nelspoort** bought in **cattle** from the Oudtshoorn area in May and had them tested them for **brucellosis** in October. Three cattle tested seropositive. The farm was placed under quarantine, all cattle in the herd will be tested and positive cattle will be branded and slaughtered. Cattle on the farm of origin in the Oudtshoorn area will also be tested.

Two **ostrich** farms from the **Heidelberg** area tested sero-positive for **avian influenza** (AI) in September. One farm had serology indicating an H6 virus and AI virus was detected via PCR testing. H5 and H7 PCR tests were negative. No indication of subtype was seen with the other farm. Unidentified AI was also diagnosed on a farm in the **de Rust** area and another in the **Mossel Bay** area in October.

Scratching sheep with old skin lesions were seen on a farm near **Oudtshoorn**. Skin scraping samples contained **sheep scab** mites (*Psoroptes ovis*). The farm was placed under quarantine and all sheep treated under official supervision.

One house on a broiler farm near **Paarl** tested positive for ***Salmonella enteritidis*** on routine testing. No clinical signs were seen amongst the **chickens**. The affected house was treated with antibiotics and repeat tests, before slaughter, were negative. After slaughter the whole farm was cleaned and disinfected.

A **horse** in **Atlantis** was reported suffering from stiffness, anorexia, fever, nasal discharge, increased respiratory effort and swollen legs. It was treated with antibiotics and anti-inflammatories, but died the next day. Samples taken during a post-mortem examination tested negative for African horse sickness, but positive for ***Theileria equi.***

Two **sheep** died suddenly on a farm near **Vanrhynsdorp**. After necropsies on the sheep were performed, the responsible AHT suspected **plant poisoning** was the cause of death. Inspection of the property revealed large stands of **chincherinchee** (*Ornithogalum thyrsoides*) (Fig. 3) on the land where the dead sheep had been grazing. The farmer was advised to move sheep to a part of the farm where chincherinchee was not growing to prevent further poisoning.

In the **Ceres** area, **pigs** belonging to small-scale farmers died after showing reddening of skin etc. African swine fever (ASF) was suspected, but ASF virus was not detected in samples taken from the dead pigs. After post-mortem examination was done, it was concluded that the cause of death was **salt poisoning**.

Contagious ophthalmia caused blindness in **sheep** on two properties in the **Vredendal** area. Sheep were treated with topical antibiotics.

Figure 3: Flowering chincherinchee plants (*Ornithogalum thyrsoides*) (Photo: L. van Helden)

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Western Cape Government

EPIDEMIOLOGY REPORT

Agriculture
VETERINARY SERVICES

November 2022
Volume 14 Issue 11

Rabbit haemorrhagic disease outbreaks in the Western Cape

Laura Roberts and Lesley van Helden

Dying rabbits and hares started to be reported from the Northern Cape Karoo in early October 2022 and shortly afterwards in the Western Cape. In November, rabbit haemorrhagic disease virus (RHDV) was confirmed in the Karoo Hoogland Local Municipality. In October and November, suspected outbreaks have been reported in the Western Cape from approximately 30 properties across the province (Fig. 5). Five outbreaks have been confirmed as RHD by PCR (Fig. 6) and two of these have been sequenced and identified as RHDV2.

Identified affected species include domestic rabbits (*Oryctolagus cuniculus*), Cape hare (*Lepus capensis*) and scrub hare (*Lepus saxatilis*; Fig. 1).

Mortality rates in domestic rabbits varied from 27-100%. Usually only acute death was described but a vet reported collapse and hypoglycaemia, one owner saw blood around the tail and another noticed inactivity, slow breathing, diarrhoea and droopy ears. Two owners reported having fed lucerne that came from the Northern Cape.

Carcasses of scrub hares from two farms in the Laingsburg area and from domestic rabbits in Nelspoort were received for sampling and testing. Photographs taken at necropsy are included as Figures 1-4. RHDV was detected in all three cases.

Figure 1: Scrub hares found dead (Photo: J. Pienaar)

Figure 2: Domestic rabbit with petechiae on internal organs (Photo: J. Pienaar)

Figure 3: Splenomegaly (Photo: J. Pienaar)

Figure 4: Haemorrhagic enteritis (Photo: J. Pienaar)

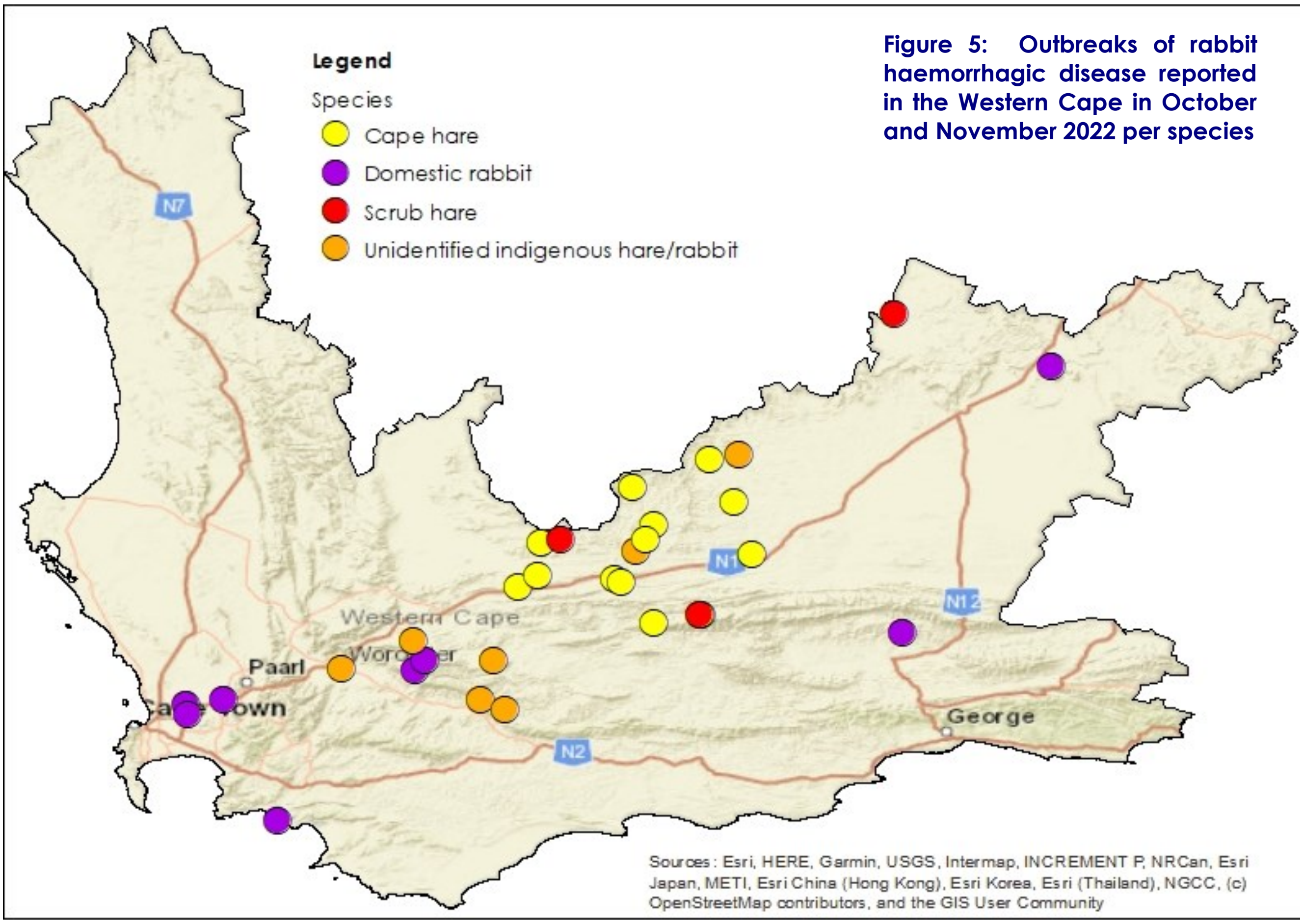

Figure 5: Outbreaks of rabbit haemorrhagic disease reported in the Western Cape in October and November 2022 per species

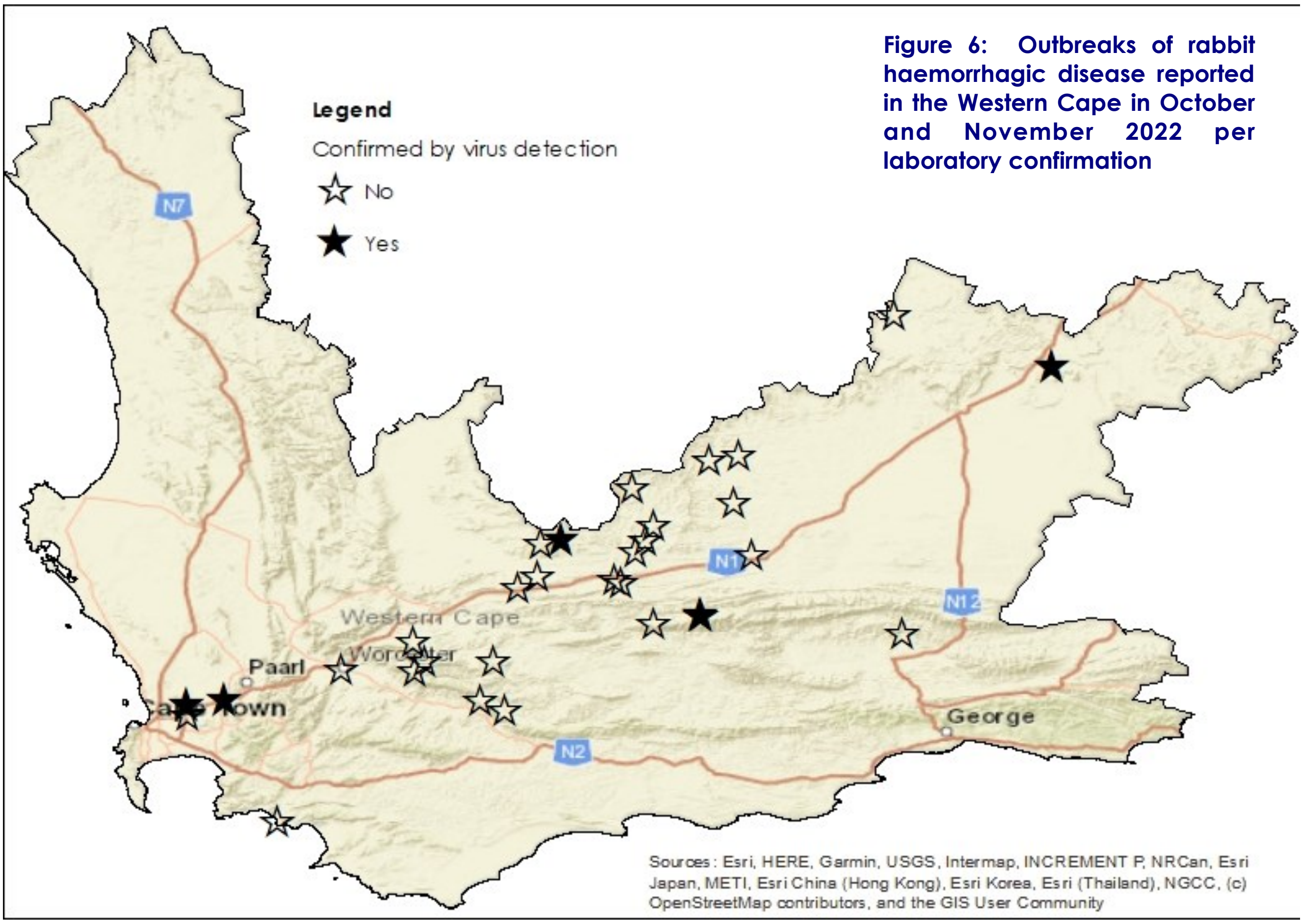

Figure 6: Outbreaks of rabbit haemorrhagic disease reported in the Western Cape in October and November 2022 per laboratory confirmation

Outbreak events

*See details of **rabbit haemorrhagic disease** cases above.*

A **bat-eared fox** was seen near **Piketberg** lying under a bush and showing no fear of people. It was found dead the next day. Near **Beaufort West,** another apparently tame bat-eared fox entered a farmyard and was shot by the farmer. Both bat-eared foxes subsequently tested positive for **rabies**. No human or animal contact had occurred with either fox, and dogs and cats in the surrounding areas were vaccinated in response.

Highly pathogenic avian influenza was detected in wild seabirds. 32 cases were reported from **African penguins** from **Simon's Town** and in a penguin from **Betty's Bay**, as well as in penguins at a rehabilitation centre in Cape Town. The virus was also detected in **Cape cormorants** from **Cape Point** and **Velddrif**, and in a **Cape gannet** from **Malgas Island** (West Coast National Park).

An outbreak of unidentified **low pathogenic avian influenza** was detected on an **ostrich** farm near **Oudtshoorn**.

Wool disturbance was seen in sheep on a farm near **Beaufort West** and live **sheep scab** mites (*Psoroptes ovis*) were seen when wool samples were examined under the microscope. The farmer has several farms in the area and has experienced recurring outbreaks of sheep scab since March 2022. The farms remain under quarantine and the sheep are being treated under official supervision.

In the **Piketberg** area, a heifer was seen with aggression and mucopurulent nasal discharge before death. The **cattle** herd was grazing together with black wildebeest and the dead heifer tested positive for wildebeest-associated **bovine malignant catarrhal fever**. The farmer was advised to separate the species by at least 1km in future.

Sheep on two properties near **Vanrhynsdorp** suffered from **acidosis** after being put on leftover grain fields to graze.

Four free-range layer **chickens** belonging to small-scale farmers near **Malmesbury** were seen with swollen eyelids and difficulty breathing. **Mycoplasmosis** was suspected and the farmer was advised to treat the chickens with antibiotics.

Two **piglets** died of suspected **oedema disease** caused by *E. coli* infection near **Malmesbury**.

Deaths of four **lambs** and one goat **kid** in the **Beaufort West** state vet area were caused by **enterotoxaemia**, diagnosed on post-mortem. The dams were all vaccinated, but it is suspected that the lambs and kid that succumbed to the disease did not receive enough colostrum, as most of the lambs were one of a pair of twins.

In a feedlot in the **Beaufort West** area, acute deaths of **sheep** occurred, with a few sheep showing signs of colic and not wanting to get up. On post mortem examination, marked oedema was seen in the small and large intestines and intestinal lymph nodes (Fig. 7). As the cases were seen shortly after a starter ration containing salinomycin was given, ionophore toxicity was suspected. However, histopathology and feed analysis were negative for ionophore toxicity. A diagnosis of **salmonellosis** was made on exclusion of all other differential diagnoses (acidosis, clostridial diseases, urea poisoning, adaptation and other feedlot diseases).

Figure 7: **Oedema of mesenteric lymph nodes as a result of ovine salmonellosis** (Photo: J. Pienaar)

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Western Cape Government
Agriculture

EPIDEMIOLOGY REPORT

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2022 in review

Surveillance/ field activities

In 2022, Animal Health field officials visited approximately 13 000 properties in order to do animal disease surveillance, animal census, farmer education, primary animal health care and disease control.

Rabies (Fig. 1)

Sporadic cases of wildlife rabies were seen in various parts of the province, though fewer cases were reported than in previous years: five versus the long-term average of 13. Three cases of canine rabies were also reported. One of them was imported from the Eastern Cape over the festive season. The other two dogs, in Strand (Cape Town) and Suurbraak, were long-term residents of the province and the origin of their rabies is not known. Given the currently high incidence of dog rabies in the Eastern Cape and KwaZulu-Natal, and the risk of introduction of rabies from these areas, Veterinary Services is prioritising rabies awareness and vaccinations.

Approximately 143 000 pets were vaccinated with state-sponsored vaccine in the province in 2022. An analysis of the 134 000 vaccinations for which metadata was recorded is shown in Figure 2. The majority of vaccinations were done in densely-populated areas.

Brucella canis

A dog that had been adopted from a welfare organisation in Cape Town presented with hindquarter lameness and signs of discospondylitis were subsequently seen on MRI. Serology, bacterial culture and isolation resulted in a diagnosis of canine brucellosis. The owners elected to quarantine and treat the dog.

Pig diseases (Fig. 3)

Outbreaks of African swine fever (ASF) continued to be

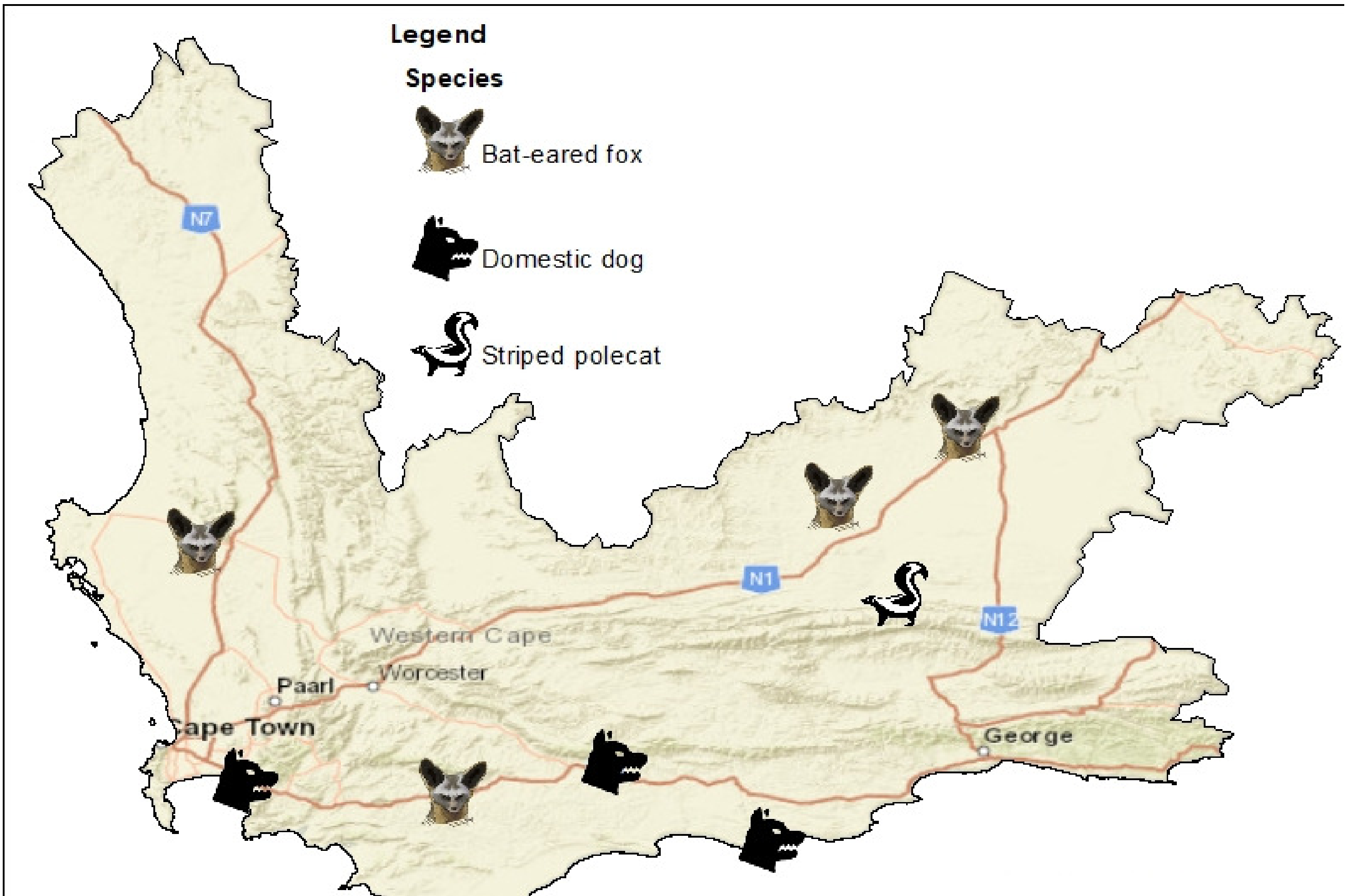

Figure 1: Rabies cases reported in the Western Cape in 2022

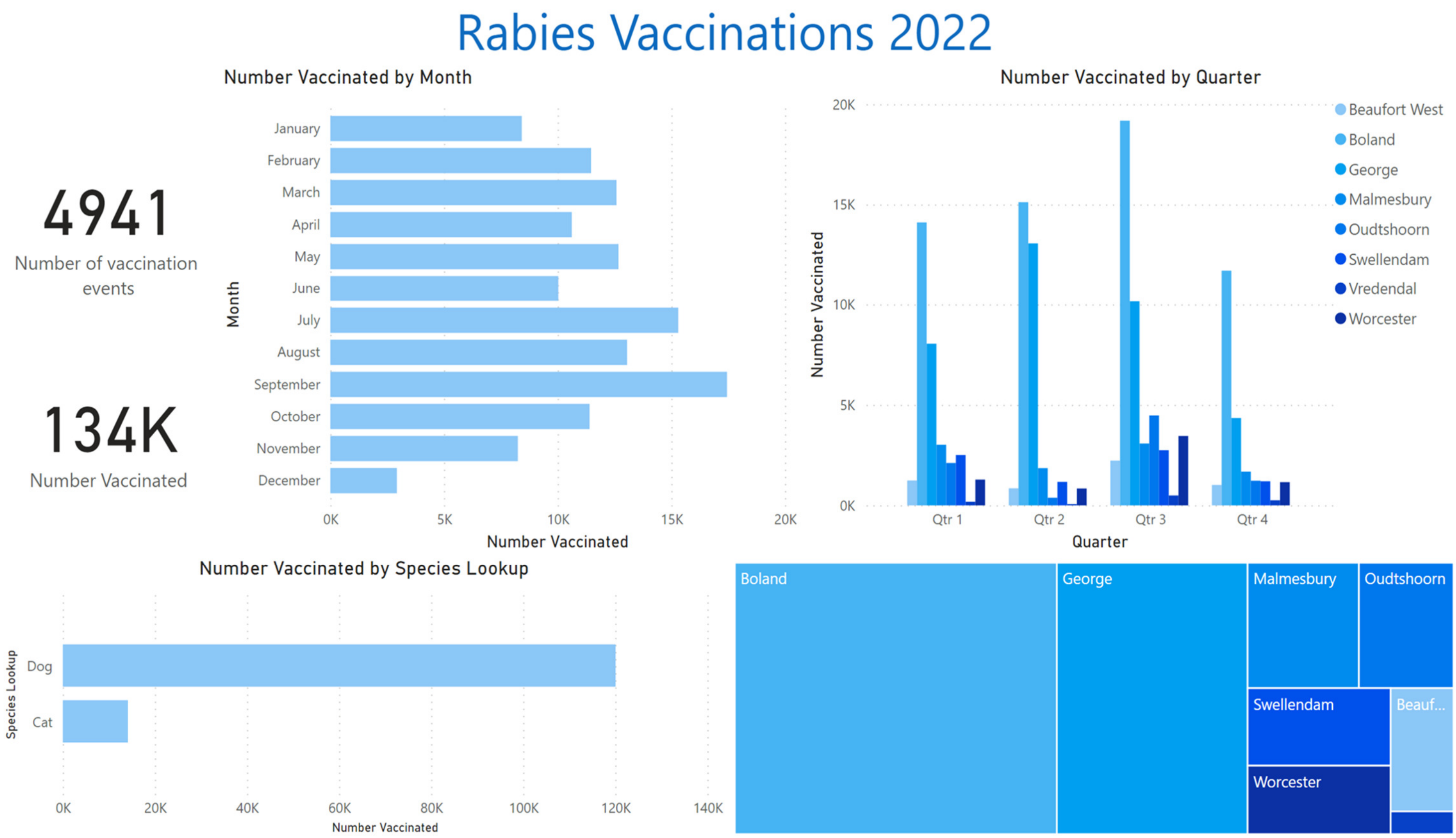

Figure 2: Rabies vaccinations done by Western Cape Veterinary Services during 2022

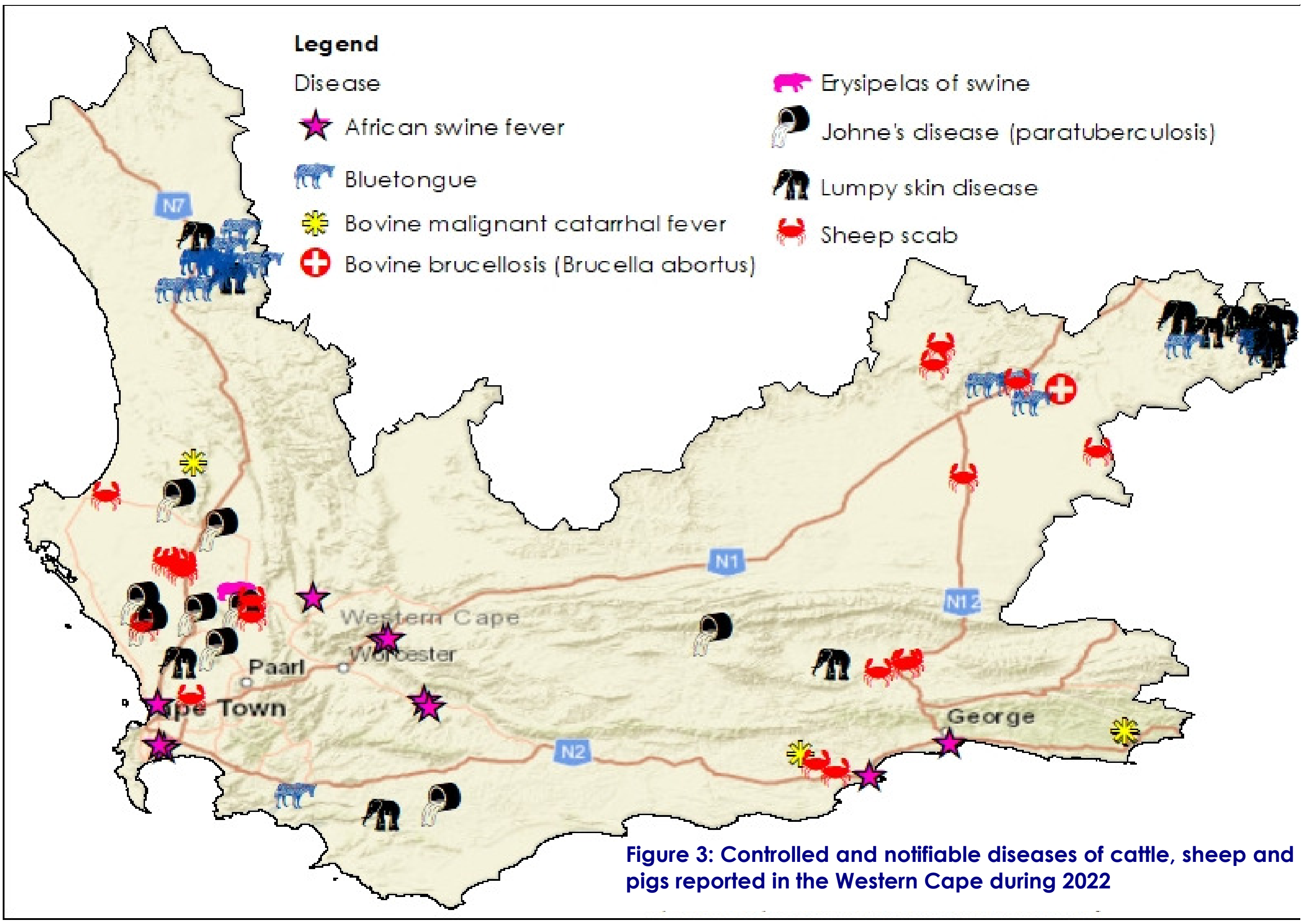

Figure 3: Controlled and notifiable diseases of cattle, sheep and pigs reported in the Western Cape during 2022

reported in areas where multiple small-scale farmers keep pigs in close proximity with few biosecurity measures in place. Control of these outbreaks remains a challenge and cases of ASF in these areas are almost certainly being under-reported. In 2022, outbreaks of ASF were reported at ten new locations in the province, while 17 outbreaks from 2021 remain unresolved. No new outbreaks have been reported since July 2022.

Small stock (Fig. 3)

Nineteen outbreaks of sheep scab were reported and treated under official supervision during 2022.

Johne's disease was confirmed on nine sheep farms, mainly in the Swartland area. These farms were placed under quarantine and the affected farmers were advised to consider a vaccination programme to reduce clinical disease in the future.

Bluetongue outbreaks were reported from 19 sheep flocks in the Western Cape. The majority occurred between February and April in the Karoo.

Cattle (Fig. 3)

Three newly-bought cattle on a farm near Beaufort West tested positive for brucellosis, after mixing with the rest of the herd. The farm was placed under quarantine and is implementing a test-and-slaughter strategy to become free of the disease.

Outbreaks of lumpy skin disease were reported from 16 farms in various parts of the province between January and June but no cases were reported from July to December.

Despite outbreaks of foot and mouth disease in cattle in several other provinces of South Africa in 2022, the Western Cape remains free of the disease. A high level of vigilance is being maintained, with officials doing passive surveillance and awareness activities.

Equine diseases

A single case of African horse sickness was reported in an unvaccinated horse that died in a stable in Beaufort West. Despite a low level of vaccination in the area, no other equines were affected.

Avian diseases (Fig. 4)

At eight locations within a 100km radius of Cape Town, 147 seabirds were reported affected by highly pathogenic avian influenza (HPAI) (H5N1). The largest outbreaks occurred among African penguins in Simon's Town from September to November and in a rehabilitation centre in November. HPAI (H5N1) was also detected on a commercial layer chicken farm in February 2022. All the chickens were culled and the sites

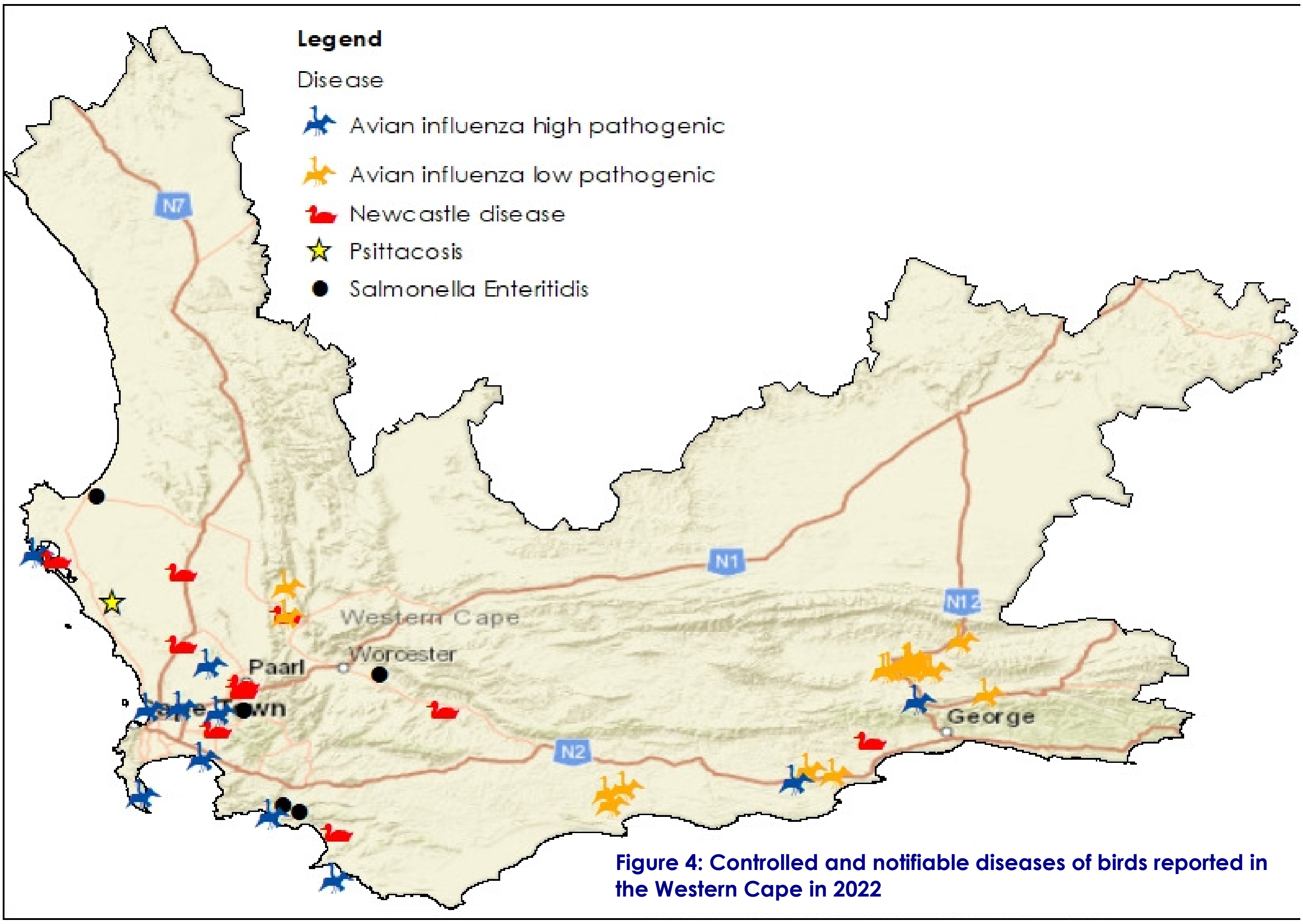

Figure 4: Controlled and notifiable diseases of birds reported in the Western Cape in 2022

disinfected.

One ostrich farm in the Mossel Bay area and another near Oudtshoorn were reported as affected by HPAI in February and July respectively. Avian influenza (AI) outbreaks were detected on another nineteen ostrich farms between August and November, but no specific subtype was identified. PCR detected AI virus on eight of the farms, but the H5 and H7 subtyping assays were negative, indicating absence of HPAI.

Outbreaks of Newcastle disease (NCD) occurred on two ostrich farms in the George and Worcester state vet areas and in chickens and turkeys on a smallholding near Robertson. PCR tests were also positive for NCD virus from four locations in the province where wild doves were found dead and three locations where deaths were seen in domestic pigeons. It is likely that these outbreaks were caused by pigeon paramyxovirus.

Psittacosis caused the deaths of galah chicks at a breeder near Darling. All birds at the facility were treated with doxycycline.

Salmonella Enteritidis (SE) was detected on five broiler chicken farms during routine testing. Clinical signs and deaths of chickens occurred on only one of the smaller farms, where SE was cultured from the carcasses.

Rabbit haemorrhagic disease (Fig. 5)

After deaths of domestic and wild rabbits and hares were reported in the Northern and Western Cape, rabbit haemorrhagic disease was confirmed for the first time in South Africa. Deaths of domestic rabbits occurred across the province, while deaths of wild hares were reported mainly from the Karoo. The impact of the disease on populations of indigenous rabbits and hares is currently unknown.

***Salmonella* Enteritidis in guinea pigs**

After sudden deaths of 75% of a guinea pig herd kept at a wildlife sanctuary in Cape Town, *Salmonella* Enteritidis was diagnosed. The surviving animals were isolated and treated with antibiotics and their enclosures were thoroughly disinfected.

Acknowledgements

We would like to thank all of the animal health technicians and state vets who collect and report data from the field, as well as the members of the public and animal keepers who participate in reporting suspect outbreaks of animal diseases. Without your efforts this report would not be possible. A special word of thanks must also go to animal health technician, Werner Gouws, for his invaluable assistance with data management and analysis.

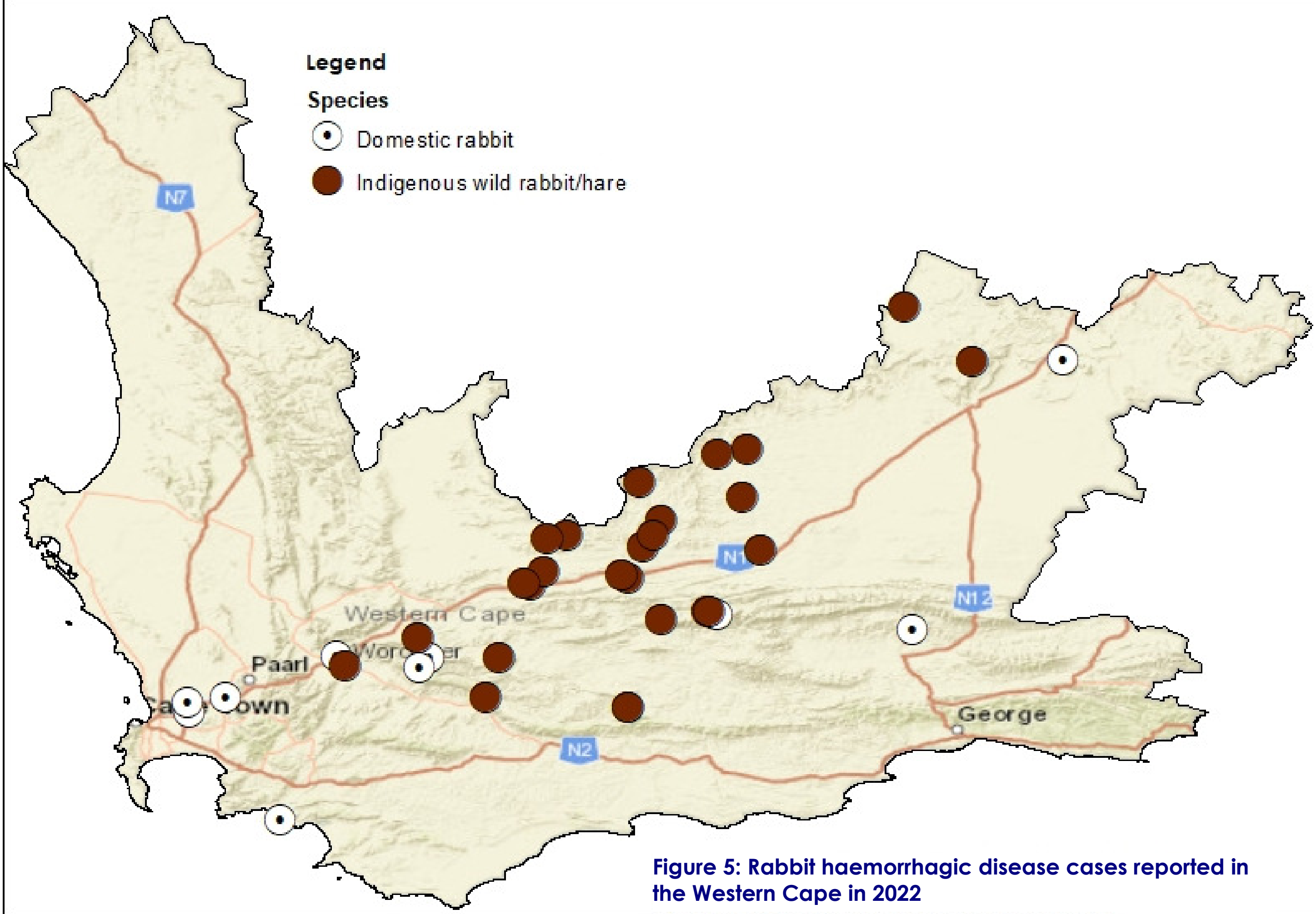

Figure 5: Rabbit haemorrhagic disease cases reported in the Western Cape in 2022

Outbreak events

An ill **dog,** in very poor condition, was brought from Jeffrey's Bay in the Eastern Cape to **Still Bay** by two residents of the Western Cape. The dog spent the night in Still Bay and was observed acting strangely: biting people and ripping up the carpet. The next morning the dog was taken to a private veterinarian, who euthanased it and contacted the state vet to collect brain samples. **Rabies** test results were positive. The Western Cape Department of Health followed up all human contacts to provide post-exposure prophylaxis.

Approximately 210 of 250 three-week-old **ostrich** chicks died at a chick raiser near **Mossel Bay**. The chicks showed diarrhoea, neurological signs and recumbency before death (Fig. 6). The chicks were treated with antibiotics in their water and, after no improvement was seen, the state vet was contacted. Necropsies were done in which inflammation and haemorrhage of the intestines was observed (Fig. 7). Organ swabs tested positive for virulent **Newcastle disease** virus. The farm was placed under quarantine and export suspended from all ostrich farms within 10km. Surrounding farms will also be sampled for Newcastle disease.

Outbreaks of **rabbit haemorrhagic disease** (RHD) continued to be reported in the month of December in both wild hares and domestic rabbits.

⇒ An orphaned wild hare and 4/12 domestic rabbits kept as pets died suddenly on a farm near **Barrydale**. Dead wild hares were also seen on the farm.

⇒ Deaths of 5/12 domestic rabbits kept on a farm in the **Worcester** area were reported.

⇒ Cape hares were found dead on two farms in the **Laingsburg** area.

⇒ A mortality rate of 57% was seen in domestic rabbits kept at a resort near **Montagu**. Over a short time period, 110/194 of the rabbits died. Samples were sent for testing and results are pending.

No samples were taken from the first three of these locations for confirmation of presence of the RHD virus, but a presumptive diagnosis of RHD was made based on clinical signs.

Figure 6: Ostrich chick showing recumbency and neurological signs (Photo: L. Janse van Rensburg)

Figure 7: Haemorrhagic enteritis of ostrich chicks seen at necropsy (Photo: L. Janse van Rensburg)

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