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African horse sickness area status declarations 2022

Adapted from the African horse sickness control: Area status declarations report 2022 by J.D. Grewar, C.T. Weyer and D. Carter of South African Equine Health and Protocols (SAEHP) NPC and L. van Helden of Western Cape Department of Agriculture: Veterinary Services

Introduction

This is the first report on the use of African horse sickness (AHS) Area Status Declarations (ASDs) in South Africa to assist in the mitigation of the introduction of AHS virus (AHSV) into the AHS controlled area of South Africa. The classification of areas in South Africa as high or low risk for AHS has been in place for many years, the former mainly used during the high-risk summer and autumn seasons to prevent the direct movement of equids into the AHS controlled area from South Africa's northern and north-eastern provinces. These areas typically have AHS cases annually during that time. Since the AHS controls were formalized through the AHS Veterinary Procedural notice (VPN) in December 2019, the ASD system was officially implemented in a more systematic and defined manner.

ASDs are the AHS risk level defined by state veterinarians (SVs) and are used by SV Boland (Western Cape) when issuing permits. They fulfill the movement requirements of the VPN by ensuring SVs are involved with movement control and provide a foundational risk evaluation for their respective areas for AHS infection. The risk profile of an SV area is informed by the following guidelines (listed here in approximate order of importance):

- Confirmation of cases of AHS within an area, with the last case occurring within 40 days (WOAH infectious period for AHS).
- Suspicion of disease where AHS could be considered a differential diagnosis, based on deaths and/or clinical signs in a susceptible population.
- Time of year and location: AHS is seasonal based on the epidemiology of vector transmission. Colder months are less likely to have AHS cases and cases are known to occur seasonally.
- Proximity to large populations of equids of unknown AHS status - an example of this would be areas close to the Kruger National Park with its large population of zebra, or proximity to a country border where AHS might be uncontrolled.
- Unexpected weather patterns that may result in higher than expected vector populations.
- Higher than usual prevalence of other vector-borne arbovirus infections. Equine encephalosis virus infection is an example.

Area status declarations are provided by SVs to SV Boland, with the exception of those areas from which equids are not moved. They can be amended by the SV at any point. Since SV Boland receives all laboratory results for AHS and is engaged with the passive surveillance of AHS in the infected zone, they can also implement a high-risk status for an SV area based on surveillance, with this status communicated back to the SV of origin. As a rule, an area with an unknown/ undefined risk status is considered high risk for movement purposes.

The definitions of various AHS risk status for areas are:

AHS high risk

This is where the disease factors or recent history of a disease precludes direct movement into the AHS controlled area. In this case movements into the controlled area can only take place using mitigated movement protocols like stop-over quarantine or vector protected quarantine at origin.

AHS low risk

The risk of AHS is considered low enough to allow direct movements of horses to the AHS controlled zone. Permits are still required for these movements and all standard movement conditions must be met.

AHS partial risk

This occurs where, due to the season and/or size of SV areas, there are parts of an area that are considered AHS high risk and parts that are considered low risk. Individual movements are evaluated in these cases to determine the proximity to known cases and confirmation is made by SV Boland to the SV of origin, prior to the movement, of the pathway that may be undertaken for the movement application. AHS partial risk status is also allocated to areas by SVs where they would like to be consulted on each movement from their area, irrespective of the AHS risk. This generally occurs when the SV is uncertain as to the AHS status of an area.

2022 area status declarations

Since each ASD issued has a start and end date, the status of each of the 126 state vet areas in the country can be defined daily, and area days at risk (ADAR) determined. For the country, there were 45 990 ADAR for 2022. 23 870 of these had a defined area status (52%)

during 2022. 11 958 ADAR were classified as high risk, which makes up 26% of the total ADAR and 50% of the classified ADAR. 10 073 ADAR were classified as low risk, making up 22% of the total ADAR and 42% of the classified ADAR. 1839 ADAR were classified as partial risk, making up 4% of the total ADAR and 8% of the classified ADAR.

Figure 1 depicts the ASD status on the 15th of each month during 2022. This is a generalization of the whole year, but the AHS risk season was prolonged in 2022 with large parts of the country still high risk for movements in June and July, only easing up between August and November. The Western Cape remained generally low risk except for a high-risk status in the Beaufort West region in June 2022 because of confirmed cases. For a time-lapse visualization of the full daily ASD status of the country please visit:
https://myhorse.shiny.com/yerfiles/2022asd.gif

Acknowledgements

The South African Equine Health and Protocols NPC are the authorized permit issuing body and, as part of this process, obtain area status declaration information from state veterinarians around the country on behalf of State Veterinary Services in the Western Cape. We are grateful to our state veterinary colleagues across the country for assisting in the controlled movement of equids through the classification of their areas in respect to AHS.

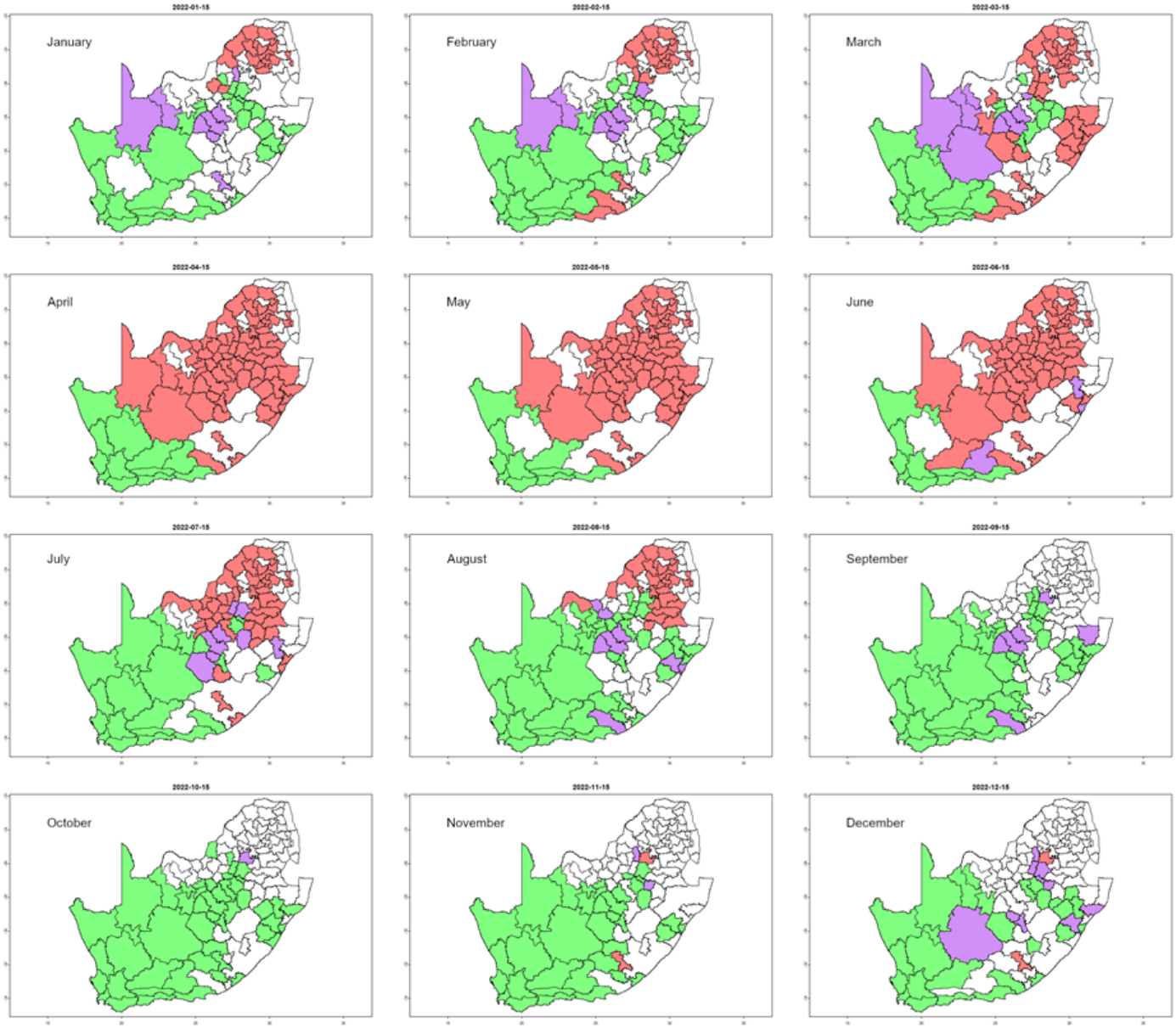

Figure 1: Area status declarations for each state veterinary area in South Africa on the 15th of each month during 2022. Red indicates high risk, green low risk and purple partial risk. White regions are unknown risk and are effectively high risk for movement purposes.

African horse sickness vaccination permissions 2022

Adapted from the African horse sickness control: Vaccination permissions report 2022 by J.D. Grewar, C.T. Weyer and D. Carter of South African Equine Health and Protocols (SAEHP) NPC and L. van Helden of Western Cape Department of Agriculture: Veterinary Services

Introduction

Annual vaccination against African horse sickness (AHS) is compulsory in South Africa (Animal Diseases Act, 35 of 1984) except in the AHS free and surveillance zones in the AHS controlled area in the Western Cape Province. Vaccination against AHS in these zones can only be performed following written approval from the Veterinary Services of the Western Cape Department of Agriculture (WCDOA). Permissions to vaccinate against AHS are granted for vaccination to be performed strictly between 1 June and 31st October each year. This vaccination period is based on the potential for vaccine virus re-assortment/reversion to virulence and the risk of transmission during periods of increased vector activity. The restricted vaccination period mitigates this risk.

Summary of permissions issued

The total vaccination applications received are shown in Table 1 with their comparisons to previous seasons. The number of unique applications and horses applied for have decreased over the years with 2022 the lowest to date at 890 applications for 6530 horses. In 2022 the majority (86 of 123 – 70%) of declined applications related to invalid or non-existent passports, with only 3 (down from 24 in 2021) horses declined due to incomplete applications. Thirty-nine veterinarians and veterinary practices were registered as the associated vet likely to perform the vaccination (same as 2020 and up from 37 in 2021), with the top 5 practices responsible for vaccinating 79.4% of the permission granted horses (n= 5086 of 6407), and the top 10 practices responsible for 91.3% of all permission granted horses.

Applicants are required to give a reason for vaccination. The majority (91.1%, up from 89.4% in 2021) were to enable horses to comply with AHS movement requirements. This is also similar to previous years.

We now have six years of detailed, individual horse information for the vaccination permission process in the AHS controlled area. 4271 horses that were granted permission in 2022 had also been granted permission in 2021 (compared to 4195 in 2002 - 2021 and 4457 in 2019 -2020), making up 66.7% (63.14% in 2020-2021) of the total for the year. Across six years: 1369 horses were granted permission to be vaccinated between 2017 and 2022, accounting for 21.3% of permission granted horses in 2022. There are currently 18 347 horses registered in the AHS surveillance and free zones.

When vaccination permissions are requested it is prospective and verification of vaccination is not done. We evaluated the horses that have been granted vaccination permission since 2017, and queried the movement database to establish what percentage of those granted permission would reasonably have required it. Since 2017: a total of 16 549 individual horses have obtained permission to be vaccinated. Of these, 67.2% have moved in a fashion that would have required AHS vaccination. Of the remaining 32.8%, the primary reason permission was requested was on the basis for movement or competition (83.2%) and individual horse/yard protection (15.6%).

Conclusion

Vaccination coverage within the AHS controlled area, including the AHS surveillance and free zone, continues to be fairly comprehensive, with approximately 40-50% of the known population being vaccinated based on permissions requested during any year. 16 549 different horses have been vaccinated in the AHS surveillance and free zone in the last 6 years (i.e., since 2017). A high number of those horses are associated with repeat requests from year to year, and also since vaccination is a prerequisite for movement into the controlled area, any new adult horses entering the controlled area will be vaccinated already.

References and Acknowledgements

We are grateful to both horse owners and veterinarians for their patience during the vaccination permission season. We acknowledge the continued support of the Western Cape Veterinary Services (in particular Dr Gary Buhrmann) and the team members from the SAEHP: Danielle Pienaar, Esthea Russouw, Marie van der Westhuizen, Johanne Jacobs and Lizel Germishuys.

Table 1: Number of applications received for vaccination permissions with associated horses. Granted applications are shown with a percentage of the total in brackets.

Year	Applications received/Associated holdings	Total horses applied for	Total horses granted
2017	1078/647	7183	6893 (96%)
2018	1117/606	7277	7058 (97%)
2019	1108/610	7330	7044 (96%)
2020	976/567	6691	6476 (97%)
2021	920/568	6775	6643 (98%)
2022 (this report)	890/529	6530	6407 (98%)

Outbreak events

On a farm near **Beaufort West**, deaths of many wild rabbits/hares were seen since November 2022. The carcass of a **Cape hare** was sampled for testing in mid-January and tested positive for **rabbit haemorrhagic disease** virus.

Johne's disease was confirmed in **sheep** on two properties in the **Hopefield** area after sheep were seen losing weight over an extended period of time.

Outbreaks of **sheep scab** were detected in the **Wellington** and **Lambert's Bay** areas. In the latter case, the outbreak had started in April 2022, but was reported only once the skin lesions became severe (Fig. 2).

On a smallholding near **Beaufort West**, 26 of 40 newly brought in **chickens** died suddenly. Subsequent tests were positive for presence of **Newcastle disease** virus. No clinical signs were seen in backyard chickens on neighbouring properties and there are no commercial poultry or ostrich farms nearby.

In Du Noon, **Cape Town**, 44 of 51 small-scale farmers experienced **pig** deaths, resulting in the death of approximately 60% of the pigs kept in Du Noon. **African swine fever** was confirmed by laboratory testing. There were apparently no recent movements of pigs in the area and the suspected origin of the outbreak is raw pork brought from the Eastern Cape and fed to pigs.

A clinical diagnosis of **bluetongue** was made in **sheep** with ulceration around the mouth on a farm near **Uniondale**.

On a broiler **chicken** farm in the **Worcester** area, routine swabs taken at chick placement tested positive for ***Salmonella* Enteritidis**.

Lumpy skin disease was diagnosed clinically on two **cattle** farms in the **Beaufort West** area when lesions were seen during routine surveillance visits.

On a farm in the **Vanrhynsdorp** area, **sheep** showed severe clinical signs of "**dikkop**": swelling of the face, lips and ears as a result of photosensitivity caused by consumption of *Tribulus terrestris* plants.

Orf was diagnosed when crusty lesions were seen on the noses and mouths of **sheep** on two properties in the **Montagu** area.

Figure 2: Sheep scab lesions (Photo: I. Speelman)

Figure 3: Dikkop (Photo: J. Kotzé)

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EPIDEMIOLOGY REPORT

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A rare case of *Verbesina encelioides* toxicity

Chanel Lombard and Lesley van Helden

In late February the Vredendal State Veterinary office was contacted by a farmer of the Sandveld region between Lambert's Bay and Clanwilliam. The farmer complained that he had lost 50 pregnant sheep (out of a flock of 265) overnight after moving them to a new camp. Two duikers were also found dead in the camp. The farm was visited to investigate the deaths and post mortems were done on some of the dead sheep (Fig. 1). No abnormalities were seen except for fluid in the chest cavity.

The camp was previously used for cultivating potatoes. The soil was very sandy and there was very little natural veld for grazing. The animals did not receive any supplementary feed. However, there was abundant growth of *Verbesina encelioides* (Fig. 2) in the camp. The plants were extensively grazed and found in the rumens of the dead sheep.

Verbesina encelioides, also known as golden crownbeard or wilde sonneblom, is a plant native to Mexico and the south-western United States of America. It has become naturalised and invasive in many other parts of the world, affecting regions on all continents. It grows readily in sandy soils on disturbed land, such as roadsides and previously cultivated land. It has an allelopathic effect, which means it inhibits the growth of other plants around it, allowing it to dominate vegetation coverage. The plant is relatively resistant to drought and often remains green after other plants have turned brown and dried up.

Figure 1: Post mortems being conducted on dead sheep (I. Speelman)

Figure 2: *Verbesina encelioides* (I. Speelman)

Mature leaves of *V. encelioides* contain the toxic principle, galegine, as well as very high nitrate levels, posing a threat to grazing livestock. However, the plant is very rarely eaten unless animals are stressed or other sources of food are limited, such as in times of drought. Livestock can also ingest *V. encelioides* in contaminated hay. Sheep are affected worse than cattle by toxicosis, while pigs are the least affected.

Clinical signs of toxicity include lethargy and anorexia, progressing to bloating, dyspnoea and foaming at the mouth, resembling pneumonia. In severe cases, sudden death without any preceding clinical signs is seen.

Galegine is neurotoxic and causes hypotension, resulting in oedema and internal haemorrhaging. Post mortem signs include massive pulmonary oedema and hydrothorax, as well as lesions in other organ systems.

The recommended treatment is to provide animals with alternative feed. The affected flock in the Sandveld was moved to a clean camp and given dried lucerne. No further deaths occurred.

Outbreak events

Two **ostrich** farms in the **Tulbagh** and **Mossel Bay** areas were found to have **avian influenza** antibodies, with an indication of a possible previous clade 2.3.4.4b H5 (HPAI) infection. No virus was detected on follow-up testing.

Bluetongue was diagnosed clinically in **sheep** on three farms in the **Vanrhynsdorp** area. Clinical signs of lameness, nasal discharge, salivation, lethargy and fever were seen. Many sheep in the area have not been vaccinated recently, owing to the shortage of vaccines. Private veterinarians in the Malmesbury state vet area also reported seeing cases of bluetongue in February.

Severe skin lesions and wool disturbance were seen during shearing on a sheep farm in the **Beaufort West** area. **Sheep scab** mites (*Psoroptes ovis*) were seen on samples taken. In September 2022, new sheep had been introduced from a property that belonged to the same owner as other properties that had experienced outbreaks of sheep scab.

***Salmonella* Enteritidis** was cultured during routine sampling on three broiler **chicken** farms in the **Malmesbury** area and one in the **Worcester** area. Positive samples included chick box liners, boot swabs and dead-in-shell chicks.

On a farm near **Stellenbosch,** a pregnant **cow** with nasal discharge was seen by a private veterinarian. Blood samples taken tested positive for wildebeest-associated **bovine malignant catarrhal fever**. Wildebeest are kept on a neighbouring property.

A **pig** carcass from a farm near **Bonnievale** was condemned at the abattoir when skin lesions of **erysipelas** were seen after slaughter. The farm was visited and no signs of clinical disease were observed.

A sick **horse** in **Mamre** was attended to by a private veterinarian. Clinical signs included constipation, foam coming from the mouth, swollen tongue and trembling of the hind legs. The horse did not respond to treatment and died two weeks later. The cause of death could not be determined, but blood was collected from the remaining horse on the property and submitted to UP Veterinary Genetics Laboratory. The horse tested negative for African horse sickness virus but positive for ***Theileria equi***.

Large scale mortalities of wild **birds** at a dam near **Malmesbury** were reported to the local state vet. The dam was visited and 45 dead birds of three species were counted (Fig. 3). Live birds were also seen showing signs of lameness. Carcasses were collected and sent to Elsenburg for necropsy. Organ swabs taken were PCR negative for avian influenza and Newcastle disease viruses. A kelp gull was admitted to a rehabilitation centre and recovered after treatment with fluids and activated charcoal. A final diagnosis of **botulism** was made based on the clinical signs and exclusion of avian influenza and Newcastle disease.

Cattle on a property near **Grabouw** were heavily infested with ticks and some had pale mucous membranes. On post mortem of two mortalities, the gall bladders, livers and spleens were enlarged and thick, green bile was seen in the gall bladders. There was yellow fluid accumulated in the thoracic cavity and the large intestines contained dry faeces with mucus. Advice regarding prevention and treatment of **anaplasmosis** was given to the owners of the cattle.

Red lice were seen on **sheep** near **Bitterfontein** and **Lutzville**.

Figure 3: A yellow-billed duck near Malmesbury showing clinical signs of botulism (M. Swart)

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EPIDEMIOLOGY REPORT

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Avian influenza surveillance report: July-December 2022

Laura Roberts

Introduction

Routine surveillance for avian influenza (AI) in South Africa is necessary to assist with detection of highly pathogenic (HP) strains, i.e. H5Nx or H7Nx, that can cause serious economic losses in poultry and are the most likely strains to lead to human influenza pandemics. These characteristics also make surveillance important for export certification of poultry products.

Biannual surveillance in backyard chickens, commercial poultry and ostriches is prescribed by Appendix 9 (Notifiable Avian Influenza (NAI) Surveillance), of the HPNAI contingency plan of 2009.

Bird serum is screened with an influenza A enzyme-linked immunosorbent assay (ELISA). Positive ELISA tests are followed by haemagglutination inhibition (HI) tests to screen for H5, H6 and H7 antibodies.

A farm where serology results in a positive ELISA test should be retested as soon as possible. Further serum samples are taken and also tracheal swabs for detection of viral RNA via polymerase chain reaction (PCR). Samples that are PCR positive for avian influenza RNA must then be screened further for H5 and H7 RNA, using more specific PCR tests. RNA sequencing is required to determine other (non-H5 and –H7) subtypes and to provide further information on the exact strain involved. For more details on the surveillance strategy, please read the introduction to the June 2020 Epidemiology Report.

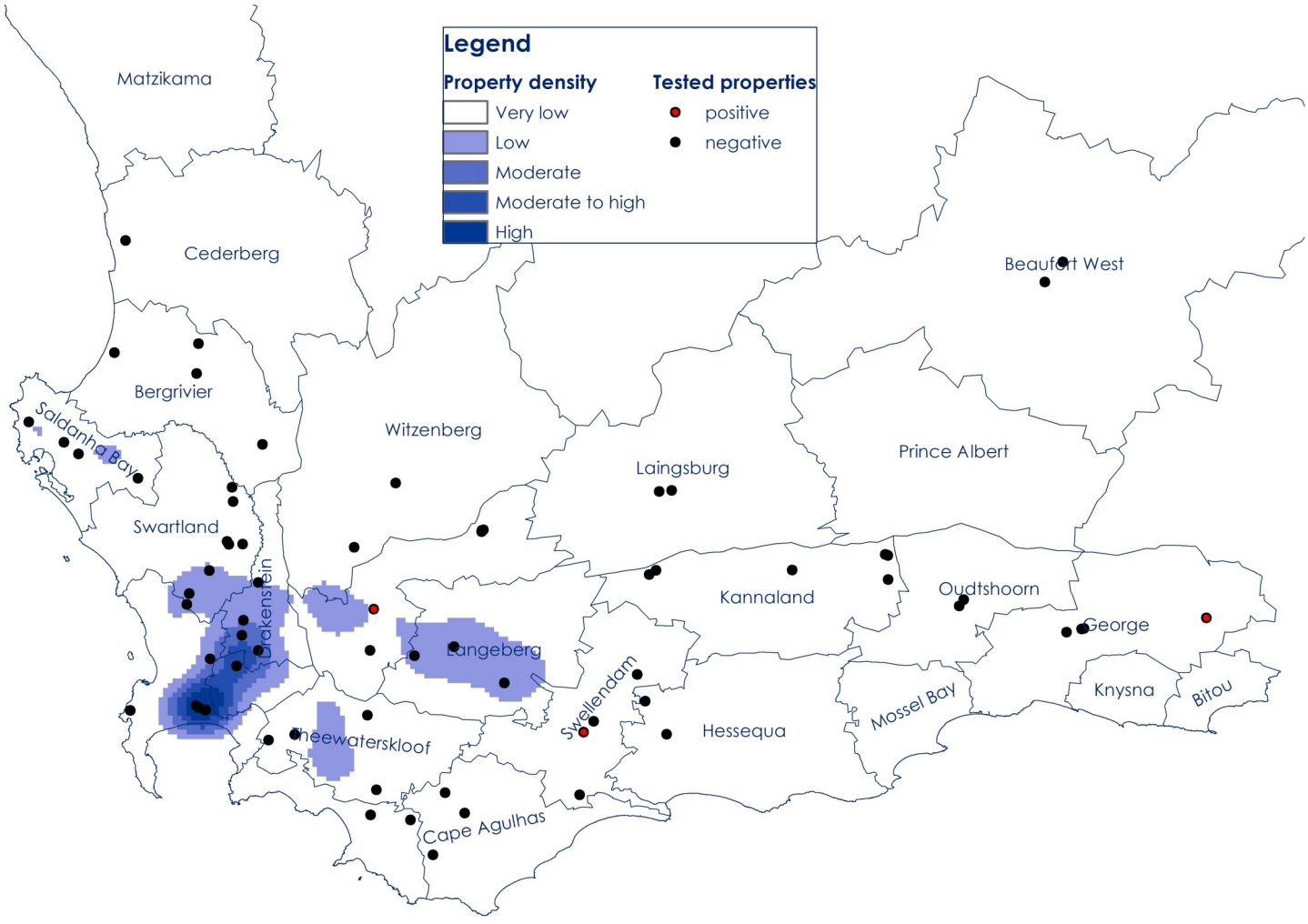

Figure 1: Avian influenza surveillance on properties with backyard chickens in the Western Cape, June-December 2022

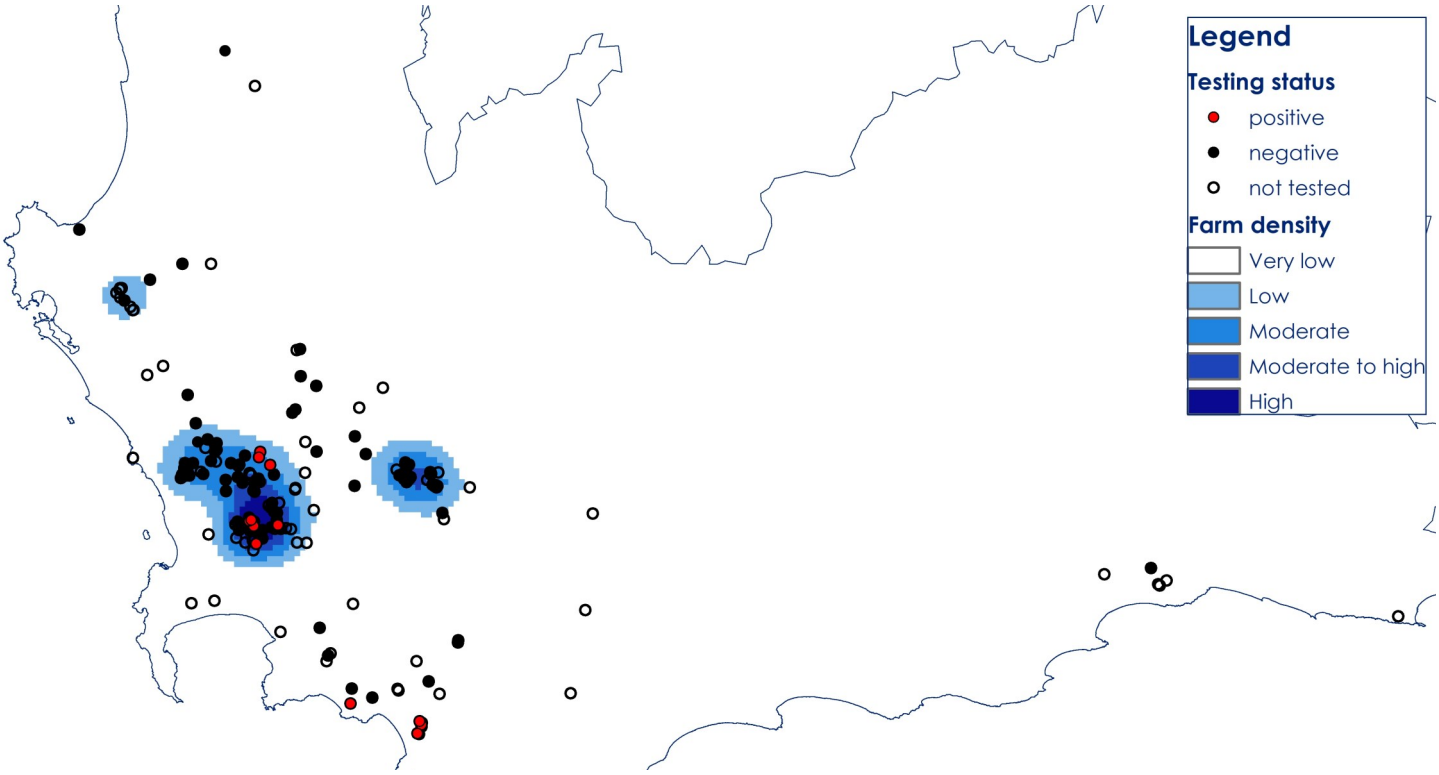

Figure 2: Avian influenza surveillance coverage in commercial poultry in the Western Cape, June-December 2022.

Backyard chickens

Backyard chickens on 78 properties were sampled. Between one and eight properties were tested per local municipality and 20/25 local municipalities were represented (Fig. 1). The provincial target is 90 properties and sampling in the Matzikama, Mossel Bay, Knysna and Bitou municipalities was lacking. However, the majority of the deficit (9 properties) comes from the City of Cape Town. This has the highest density of properties with backyard chickens so the deficit should be addressed in future.

Three properties in the Breede Valley, Swellendam and George municipalities had positive serology results (ELISA positive only, HI-negative), though none of these had any history of disease. Two were followed up with further serology and PCR testing. Neither tested PCR positive and one was seronegative on retesting. The other still had positive ELISA tests on the retest, but no HI reactions.

Commercial poultry

Nine poultry companies performed serum sampling for AIV serology on 106 farms, comprising 140 sites. All of the seven largest companies (operating three or more farms) performed sampling, with an average of 72% of farms per company tested at least once. Maximum testing proportion was 98% and minimum 27%, by a company that only tests their export-approved farms. Farms tested comprise at least half of those in the Western Cape and provide good coverage of the densely populated poultry area (Fig. 2).

60/140 (43%) of tested sites were tested once in the 6-month period, as is required by the NAI surveillance protocol. 21% were tested twice, 30% were tested three, four or five times, and eight sites (6%) were tested six times (every month).

Only two companies reported positive results, one of which has only one farm. No positive H5 or H7 haemagglutination inhibition (HI) tests were reported, and therefore no evidence of potential highly pathogenic viruses was detected.

Twelve farms tested seropositive; four on more than one occasion. Nine farms underwent follow-up testing, though three farms with repeat positive results were followed up only once. The only non-negative PCR test was a suspect result for AIV, but the birds were seronegative at the next sampling.

Two farms had HI tests indicating possible previous infection with an H6 AIV. One farm had 2/40 samples H6- positive (titres of >1:16 on both the H6N2 and H6N8 antigens), but no follow-up testing was done. The other farm had 1/40 samples H6 positive but was sero- and PCR negative on two rounds of follow-up testing.

Commercial Ostriches

The Western Cape had 281 registered ostrich compartments in the period of interest. However, 20 are hatcheries, 59 contained only breeder ostriches (exempt from serological surveillance), 35 were empty (and 13 of these were then de-registered) and three had only small chicks (exempt from sampling). This left 164 compartments with birds suitable for testing.

161 ostrich farms (72% of populated properties) were tested between July and December 2022. Of the three not tested, one had been tested in June and was tested again in January 2023.

Twenty-three farms tested seropositive for avian influenza (14% of those tested) from July to November. There was a

peak in September, when avian influenza antibodies were detected on eight farms, and between two and four tested positive in the other months. Seven of the farms are located east of Oudtshoorn and four in the Heidelberg area, with smaller numbers in six other areas (Fig 3).

One of these farms had been seropositive since 2021 and three tested negative on follow-up tests, leaving 19 positive (12% of tested). Two that were negative on follow-up testing had AIV-positive PCR tests on the first round of follow-up testing but were PCR- and seronegative on the second round.

For eight seropositive farms, HI tests did not indicate a serotype (no positive reactions on paired antigens). One of these farms tested AIV positive on PCR tests but the virus could not be typed further.

Three had HI tests with paired positive reactions on both H6 antigens, though two had other low titre reactions that made interpretation more uncertain. Two of three tested positive on the AIV PCR test but could not be typed further (H5 and H7 PCR tests were negative).

Eight ostrich farms had HI reactions indicating possible clade 2.3.4.4 H5 virus involvement. The majority (five) of these farms tested positive in September. Most (five) are located close to Oudtshoorn and one each in the Langkloof and Mossel Bay area. PCR testing detected fragments of H5, H6, N1 and N2 virus on one farm south of Oudtshoorn, which was reported to the WOAH as part of the HPAI H5N1 outbreak. This was the only H5 seropositive farm where any PCR typing was successful. AIV was detected via PCR on another six of these farms, but the H5 PCR tests were negative. Next generation sequencing was performed at the University of Pretoria on one of these PCR-positive samples from the Langkloof and a partial sequence of an African H5N1 virus-associated PB1 gene was detected. Only one farm had entirely negative PCR tests.

The relatively high proportion (52%) of seropositive farms where AIV was detected was encouraging, but the lack of virus typing was puzzling. Possible causes will be investigated.

A further two farms were never seropositive but tested AIV PCR positive once (H5 and H7 negative) and were both PCR and seronegative on follow-up. The farms were tested with PCR initially because they were near another positive farm.

A last farm had chick mortalities and inconclusive AI PCR results on organ samples. Follow-up tests on the farm were negative and it was discovered that the organ samples had been transported with those from another farm that was AIV positive. Cross-contamination between samples during transport is suspected.

Because breeder ostriches are not included in routine AI surveillance, the presence of breeders on sampled farms was assessed as a possible risk factor for AI infection. Of the seropositive farms, only 6/23 had breeder ostriches present. Additionally, 6 of 68 (9%) of farms with breeders tested positive whereas 17/93 (18%) of farms without breeders tested positive. This provides some reassurance that breeders do not appear to be associated with increased risk of avian influenza exposure.

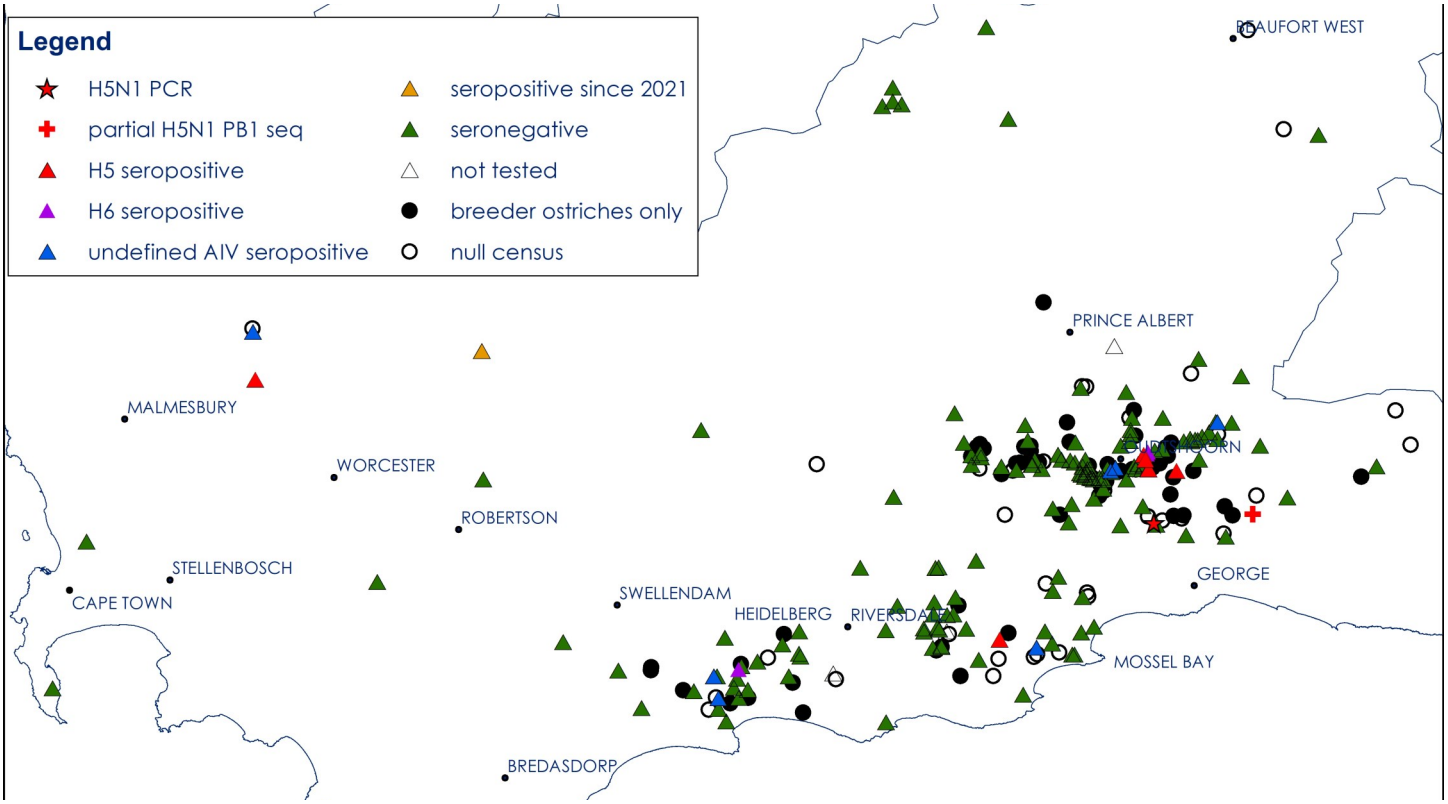

Figure 3: Avian influenza surveillance in commercial ostriches in the Western Cape, June-December 2022. All registered ostrich farms are shown. Farms with ostriches suitable for testing are shown with triangles and those without testable birds with circles.

Outbreak events

A **horse** in the **Plettenberg Bay** area tested positive for **African horse sickness** (AHS) after showing swelling of the supraorbital fossae, laboured breathing and fever. As a result, movements from the George state vet area into the AHS control zones were temporarily suspended. Clinical surveillance was conducted surrounding the case and in horses that moved from the area.

Deaths of wild **Cape hares** were seen on a farm near **Malmesbury**. A carcass was collected and a necropsy conducted. Widespread haemorrhaging was seen (Fig. 4), leading to a diagnosis of **rabbit haemorrhagic disease**.

Highly pathogenic **H5 avian influenza** virus was detected in a wild **kelp gull** and **common tern** in **Cape Town**.

Two **ostrich** farms in the **Heidelberg** area tested **avian influenza** seropositive in March. Follow-up serology and PCR testing found no evidence of highly pathogenic virus so the cause is concluded to be an undefined low pathogenicity avian influenza virus.

Virulent **Newcastle disease** was diagnosed near **Malmesbury** after a farmer found approximately 30 dead wild **guinea fowl** on his property.

After sheep were seen itching during shearing on a farm near **Beaufort West**, **sheep scab** was diagnosed. The sheep were treated twice under official supervision.

An increased incidence of **bluetongue** was seen in **sheep**. Outbreaks were diagnosed clinically in the **Vanrhynsdorp**, **Piketberg** and **Prince Albert** areas. Unconfirmed reports also came from the **Beaufort West** area.

A **sheep** farm near **Riversdale** was placed under quarantine after **Johne's disease** was diagnosed on histopathology of the intestinal tissue.

A **pig** carcass from a farm near **Gouda** was condemned at the abattoir after signs of **erysipelas** were seen.

A **cow** with typical lesions of **lumpy skin disease** was seen near **Malmesbury**.

***Salmonella* Enteritidis** was cultured from boot swabs and dead-in-shell **chicks** on two farms in the **Malmesbury** area.

In **George**, a pyrexic **horse** tested positive for **West Nile** virus.

Orf was reported in a group of **rams** on a farm near **Riviersonderend**.

Mortalities of **wild birds** were reported from a waste water treatment facility in the **Mossel Bay** area. Upon inspection, several birds with signs of paralysis were seen. There were no obvious findings from a necropsy on a moribund duck, and samples taken were negative for avian influenza and Newcastle disease. Based on the history and clinical signs, a diagnosis of **botulism** was made.

Red lice were seen on **sheep** in auction pens near **Gouda**.

An unusual number of **mortalities** of young, apparently healthy **Cape fur seals** occurred in the **Mossel Bay** area. Some neurological signs were reported in affected animals, and brain congestion and haemorrhage was seen on post-mortem. Samples were taken to test for controlled diseases, but were negative for avian influenza, rabies and *Brucella*.

Figure 4: **Haemorrhages seen in the carcass of a wild hare near Malmesbury** (Photo: J. Chapman)

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High pathogenicity avian influenza outbreak in Western Cape poultry

On 18 April 2023, an increase in mortalities was seen on a large layer chicken farm in the Paardeberg area between Paarl and Malmesbury. Samples were taken and the presence of H5 avian influenza virus was detected on 21 April. In the week that followed, four more layer farms in the Paardeberg area became infected (Fig. 1). By 4 May, the virus from one of the farms had been typed as a high pathogenicity H5N1 avian influenza virus. All farms worked to cull the affected sites as quickly as possible and the chicken carcasses were disposed of by burial or composting (Fig. 2). The outbreaks and culling operations resulted in the loss of approximately 1.5 million layers, representing about 25% of the population of layer chickens in the Western Cape.

Figure 2: Chicken carcasses being prepared for composting on one of the affected farms

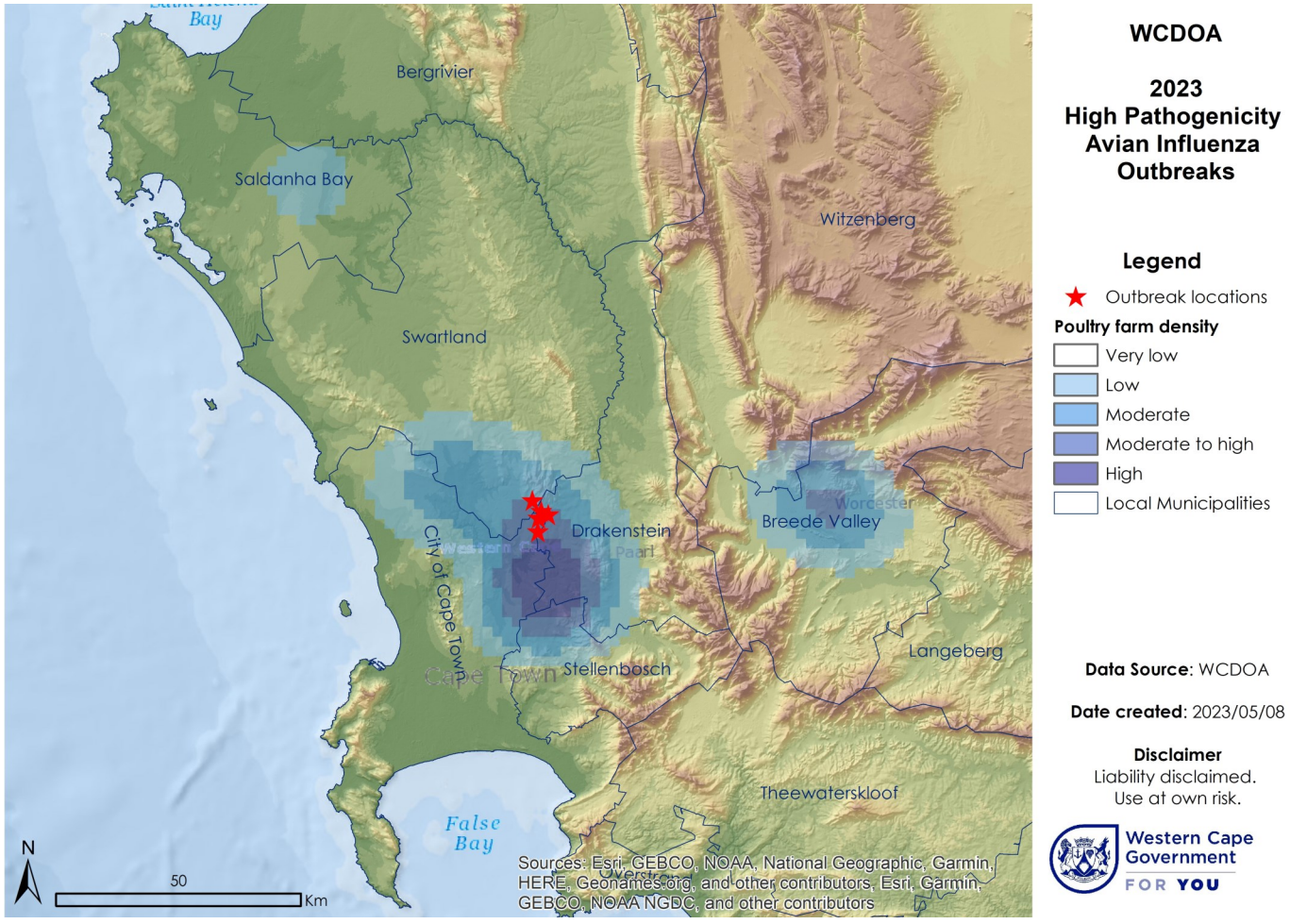

Figure 1: Locations of farms affected by high pathogenicity avian influenza in the Paardeberg area in April 2023

Zoonotic potential of clade 2.3.4.4b H5N1 avian influenza

Lesley van Helden

High pathogenicity avian influenza (HPAI), subtype H5N1, clade 2.3.4.4b originated in Europe in 2020. Since 2021, it has been causing outbreaks and mass mortalities in domestic poultry and wild birds all over the world, with the exception of Australasia and Antarctica (Fig. 3). As a result of the disease, over 200 million bird deaths have been reported to the World Organisation for Animal Health since 2021. In South Africa there have been outbreaks in 2021, 2022 and 2023.

What makes this HPAI different from previous viruses is the unprecedented number of reports of infection in mammals. As of 28 April 2023, 30 species of marine and terrestrial mammals have been reported infected in North and South America, Europe and Asia. Many of the species were diagnosed after showing clinical signs of disease or being found dead. The majority of affected species are carnivores that could have been exposed to infected birds by hunting or scavenging. A full list of the affected mammal species is available in the European Food Safety Authority's latest Avian influenza overview.

Of concern is that several of the reports of mammal mortalities suggest the possibility that the virus is able to be transmitted between mammals.

In June 2022, the first mass mortality event of mammals was reported in harbour seals and grey seals in Maine, USA. The mortalities coincided with an HPAI outbreak in wild birds in the area. Most seals were found dead, but the few that were found alive showed respiratory and neurological signs. Investigators considered it unlikely that the seals were infected by consumption of infected birds, as this is not a normal part of the diet of the affected species. They concluded that infection could have occurred from environmental exposure or that seal-to-seal transmission could have occurred.

More convincing evidence of mammal-to-mammal transmission came in October 2022, when an outbreak of HPAI occurred on a mink farm in Spain. An increased mortality rate was seen on the farm, where 52 000 American minks were kept for fur production. Affected minks showed mainly neurological signs before death. The minks were fed a diet containing raw poultry by-products, but these were sourced from areas in which there had not been reported outbreaks of HPAI. Wild bird deaths from HPAI were, however, reported from the coast nearby to the mink farm. As the minks were kept in partially open housing, the initial introduction of the virus likely occurred from contact with wild birds. The disease was observed to spread from hot spots in barns on one side of the farm to the neighbouring barns and across the farm, resulting in a 4.3% mortality rate by week three. At this point, culling operations began and the farm was depopulated over the next month.

Since February 2023, mass mortalities of wild sea lions have been reported from Peru and Chile. Some sea lions were seen with neurological and respiratory signs, but the majority were found dead, either floating at sea or stranded along the coast (Fig. 4). Observed deaths have coincided with HPAI outbreaks in seabirds in the same areas. Approximately 7000 sea lions have been reported

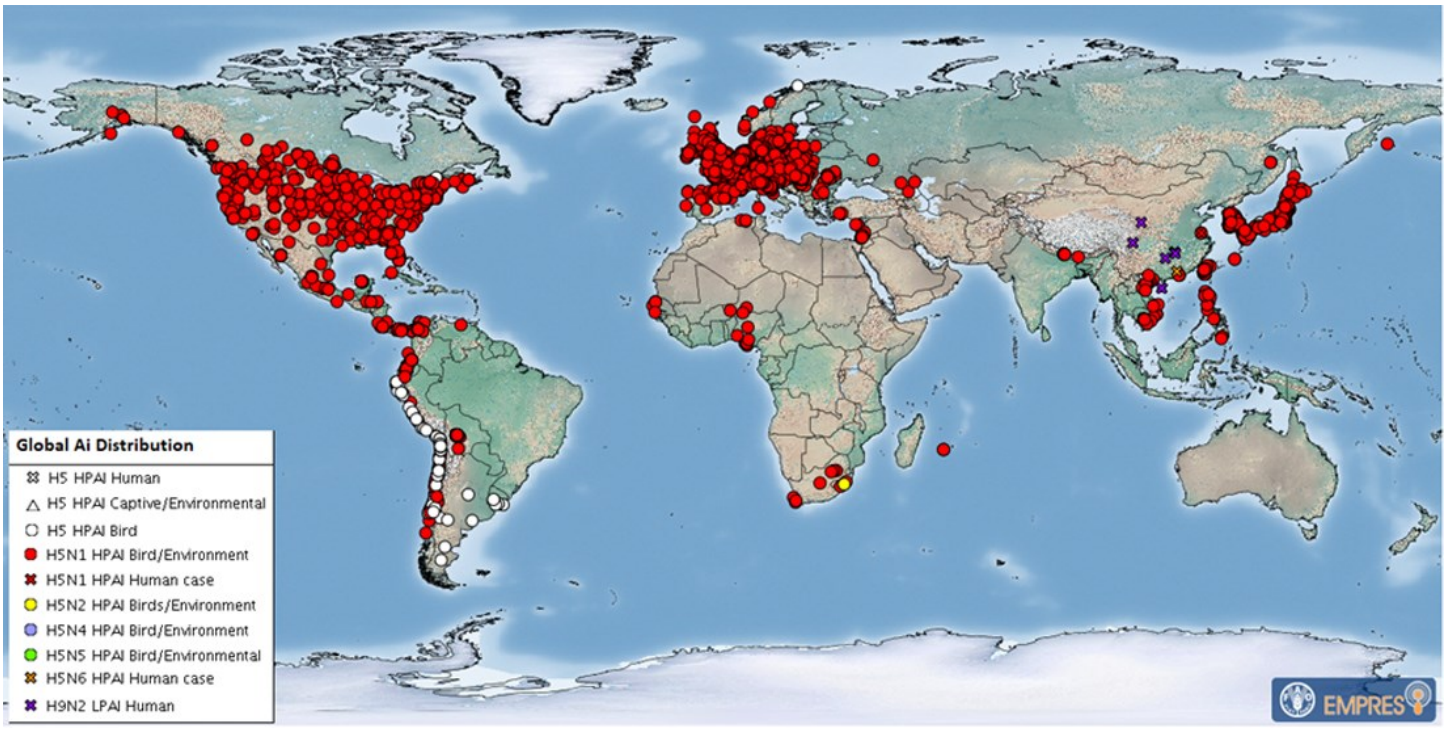

Figure 3: Global avian influenza events from October 2022 until 27 April 2023 (FAO)

dead in Peru and Chile combined. Given the number of affected sea lions, it seems more likely that transmission occurred between them than that each one was infected through individual exposure to infected birds. This cannot be ruled out, however, as hunting and scavenging of seabirds by sea lions is common.

Since January 2022, eight cases of H5N1 HPAI, clade 2.3.4.4b have been reported in people in several countries, including China, the UK, Spain, the USA, Ecuador and Chile. These cases have occurred mostly in people who had occupational or domestic exposure to infected birds. However, some of the cases had no direct exposure to birds, raising the possibility that the virus could have been transmitted in the environment.

Figure 4: A dead sea lion in Chile is examined by the National Fisheries and Aquaculture Service (Photo: SERNAPESCA)

In March 2023, a viral specimen taken from a hospitalised Chilean patient showed two mutations in the polymerase basic protein 2 (PB2) gene which allow the virus to replicate more efficiently in mammalian cells. Similar mutations have been found in about half of the viruses collected from other mammals infected with this virus. These mutations are rarely seen in viral samples from birds, indicating that the mutations have likely occurred upon transmission to mammals.

Two additional classes of mutations would be necessary to allow the virus to maintain transmission from person to person. PB2 mutations have been seen in previous versions of H5N1 that did not evolve further to be able to be transmitted between people. However, the widespread outbreaks currently occurring provide numerous opportunities for viral spillover between birds and mammals, increasing the risk of viral adaptation. Vigilance and caution is therefore necessary.

The risk of HPAI to the general public is low and consumption of poultry products carries a negligible risk. For those with occupational or other close contact with potentially infected birds, the risk is low to moderate, according to the World Health Organisation. To decrease the risk, the use of personal protective equipment when handling or being otherwise exposed to potentially infected birds is recommended. According to guidelines from the Centers for Disease Control and Prevention, this should include:

- Snugly fitting safety goggles (unvented or indirectly vented)
- Disposable gloves
- Waterproof boots that can be disinfected or boot covers
- An N95 respirator. If this is not available, a well-fitting facemask such as a surgical mask
- Disposable, waterproof overalls
- A disposable head cover or hair cover

Those that have been exposed to birds with HPAI should monitor their own health and, if signs of respiratory illness develop, should visit their nearest health care facility and report exposure to HPAI.

Pets are also at risk of HPAI infection. Severe neurological signs and deaths have been reported in domestic dogs and cats that had contact with infected wild birds. It is therefore important to prevent pets from roaming and make sure that they are supervised when outside the home.

In the Western Cape, sampling and testing for HPAI has taken place in some wildlife species, including fur seals with unexplained mortalities. However, HPAI has not been detected in South African mammals to date.

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Outbreak events

Outbreaks of **high pathogenicity avian influenza (H5N1)** occurred on five commercial layer **chicken** farms in the **Paardeberg** area. Details are provided on page 1 of this report.

Avian influenza virus was detected on an **ostrich** farm in the **Kannaland** Local Municipality. There has been an increase in rainfall in the area in the last two months, with lots of water in the surrounding dams available for wild birds and a large number of Egyptian geese noted in the area. Despite virus being detected in a high proportion of samples, no high pathogenicity virus has been identified.

Low pathogenicity avian influenza (H5) was detected in **wild bird** faeces collected in **Worcester** town.

Avian influenza virus was detected in **wild bird** faeces collected near **Stanford**.

An **aardwolf** on a farm near **Murraysburg** appeared tame and approached people. The aardwolf was killed and subsequently tested positive for **rabies**. No human or animal contacts occurred.

Small scale farmers in Kwanonqaba, **Mossel Bay** experienced deaths amongst their **pigs** as a result of **African swine fever** (ASF). A previous outbreak of ASF occurred in this area in January 2022, but was resolved by March 2022.

Three sheep kept by a small-scale farmer in **Atlantis** showed advanced skin lesions from **sheep scab** infestation. The sheep were treated twice under official supervision.

Skin lesions characteristic of **erysipelas of swine** were seen after slaughter on pig carcasses originating from farms near **Bonnievale** and **Paarl** (Fig. 5).

Fever, nasal discharge, oral lesions, salivation and lameness were seen in **sheep** from three farms in the **Vanrhynsdorp** area. Clinical diagnoses of **bluetongue** were made.

***Salmonella* Enteritidis** was cultured from routine samples taken from seven commercial **chicken** establishments in the **Cape Town**, **Malmesbury** and **Worcester** areas.

Orf lesions were seen in **ewes** on a farm near **Riviersonderend**. An outbreak of orf occurred on this farm previously in March, but in the ram group in a different camp.

Two **rams** on a farm in the **Bitterfontein** area showed signs of severe penile swelling with bleeding as a result of **pizzle rot** (peestersiekte). The rams were treated with antibiotics and topical antiseptic.

A **horse** near **George** with a fever tested positive for **West Nile virus**.

Red lice were seen on **sheep** in auction pens near **Gouda**.

Figure 5: **Erysipelas lesions on a pig carcass**
(Photo: M. Hendricks)

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Dourine surveillance 2022

Adapted from the 2022 Dourine Surveillance Report by John Grewar(SAEHP), Camilla Weyer (SAEHP) and Lesley van Helden (WCDOA)

Since 2018 active dourine surveillance has taken place in the Western Cape Province in the form of the testing of either sentinel horses pulled from the African horse sickness (AHS) sentinel program or formal surveys of randomly selected horses in the AHS free zone (2020). 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 halves of these years. In 2020 the targeted AHS free zone survey was performed in the first half of the year as well. In 2021 the biannual target was achieved with sentinels tested from the June and December cohorts. This has again been achieved in the same manner in 2022, the period evaluated in this report. An introduction to dourine, and the reason surveillance is required, has been thoroughly described in previous reports – available at https://www.myhorse.org.za.

Scope

To provide evidence for freedom of dourine within the same area where active surveillance is undertaken against AHS, i.e. the AHS surveillance and free zone in the Western Cape Province.

Surveillance parameters

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

Parameter	Value
Population at risk	16000
Design Prevalence	~5%
Test Sensitivity	90%
Test Specificity	Unknown but system specificity of 100% assumed
Type 1 error	5%

A goal of 60 serological sentinels per month is the requirement for AHS sentinel surveillance testing for direct exports from South Africa to the 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 sentinels, the sampled horses for the dourine surveillance were targeted from the horses sampled that were not tested serologically for AHS. Samples were taken in June and December for the two surveillance periods respectively.

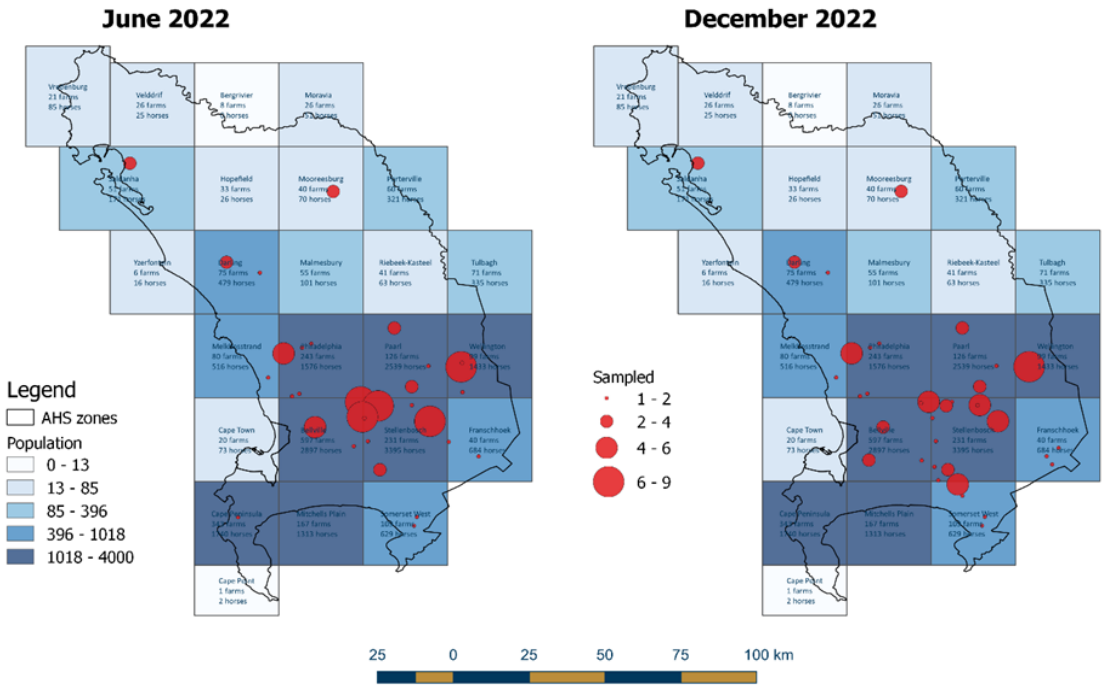

Figure 1: Dourine survey locations showing proportional circles for number of horses tested per location in June and December 2022. The underlying population at risk is shown with a light to dark blue gradient. This is to show that locations were chosen to reflect the relative underlying population at risk per surveillance grid.

Results

A total of 100 horses were sampled at 34 locations across the AHS surveillance zone in June 2021. In December, 100 horses were sampled in 38 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, as depicted in Figure 1. Most samples were thus taken from an area of approximately 50-75 km around the Kenilworth Quarantine Station, from which horses are exported. In June and December 2023, the 100 samples taken per surveillance month tested negative for dourine antibody using the CFT. The sensitivity (and resulting probability of freedom) of the surveillance program is shown in Table 2 below. This evaluation is independent of any prior surveillance. While the sentinel surveillance program is based on a single stage sampling strategy (evaluated in 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 in an effort to depict a reasonable minimum expected prevalence with so few cases of dourine reported in the prior two decades in the AHS surveillance zone.

Table 2: Design prevalence 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.

Parameter	Descriptions and values based on varying data sources			
	Single stage population sensitivity		Generic prevalence 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	
	Jun 2022	Dec 2022	Jun 2022	Dec 2022
***MeanSSH* - Mean herd level surveillance sensitivity**	n/a		0.435	0.474
***SeP* - Population surveillance sensitivity**	0.989	0.989	0.77	0.838
***PFreeU* - Confidence of population freedom – uninformed prior**	0.987	0.987	0.78	0.834

With surveillance evaluation it is also appropriate to evaluate probability of freedom outcomes given prior surveillance events. In Figure 2 below, this evaluation shows all seven surveillance events undertaken to date in the AHS surveillance and free zones (see previous reports). Where surveillance was missed (second half of 2018 (H2), 2019 (H4) and 2020 (H6)) a zero sensitivity is assumed. Note also that the surveillance in 2020 (H5) was targeting the AHS free zone only, but the evaluation below assumes a population at risk across the AHS free and surveillance zone for standardization purposes. The dourine probability of freedom in the AHS free and surveillance zones in June and December 2022, given the 2022 surveillance efforts alone, ranges between 78% and 98.7% depending on the analysis used. The overall probability of freedom taking prior surveillance into account is 97.7%.

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.

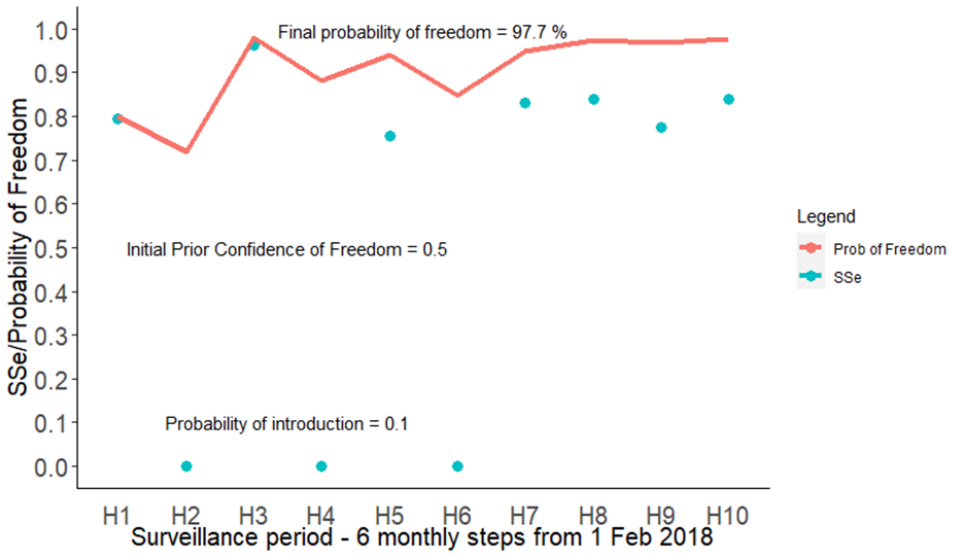

Figure 2: Surveillance system sensitivity and probability of freedom assuming an introduction probability of 10%, an underlying herd and animal prevalence of 20% and 10% respectively and an uninformed prior probability of 50% in period 1

Outbreak events

A commercial layer **chicken** farm near **George** experienced a sudden increase in mortalities and **H5N1 high pathogenicity avian influenza** was confirmed as the cause shortly thereafter. Chickens in the affected houses were culled and buried along with their eggs on the farm.

Mortalities of **wild birds** as a result of **high pathogenicity avian influenza** was reported from several locations along the **west coast** of the province between Cape Town and Lambert's Bay. Affected species included swift terns (*Thalasseus bergii*), a common tern (*Sterna hirundo*) and a kelp gull (*Larus dominicanus*).

After sudden deaths of 40/120 young racing **pigeons** occurred in a loft in **Cape Town**, test results were positive for **pigeon paramyxovirus** and **H5 avian influenza**.

A **marabou stork** (*Leptoptilos crumenifer*) died at a bird sanctuary in **Cape Town** and tested positive for **avian influenza**, but negative for H5 and H7.

A **bat-eared fox** was seen on a farm near **Witsand** showing neurological signs and abnormal behaviour. The farmer shot the fox and submitted it for testing before it had contact with any other animals or people. The fox tested positive for **rabies**. Dogs and cats in the area were vaccinated against rabies in response.

Deaths were seen amongst a colony of feral **rabbits** living in Brenton-on-Lake near **Knysna**. Carcasses that were submitted tested positive for **rabbit haemorrhagic disease**. Biosecurity measures and preventive vaccination were discussed with the local private veterinarian and community representative.

A case of **bovine malignant catarrhal fever** (BMCF) was diagnosed clinically on a farm near **Stellenbosch** that had previously experienced cases of wildebeest-associated BMCF. Black wildebeest are kept on a neighbouring property. Later in May, classic clinical signs of BMCF, including corneal opacity, blindness and nasal discharge (Fig. 3) were seen in a cow on another farm in the area, approximately 3km away from the first case.

Cases of **bluetongue** occurred in **sheep** near **Worcester** and **Oudtshoorn**.

Lesions of **swine erysipelas** were seen after slaughter on pig carcasses originating from the **Ashton** and **Malmesbury** areas.

A diagnosis of **ovine Johne's disease** was confirmed on a farm near **Darling** after the farmer had noticed a few ewes losing weight each year during lambing season.

Oedema disease (caused by *E. coli*) caused deaths of **piglets** near **Atlantis**.

During an inspection at an auction near **Gouda**, **red lice** were seen on **sheep**.

***Salmonella* Enteritidis** was cultured from samples taken during routine surveillance on 12 broiler **chicken** properties in the **Paarl**, **Malmesbury** and **Worcester** areas. The majority of these were linked to a single parent flock.

Figure 3: **a cow showing clinical signs of bovine malignant catarrhal fever** (Photo: A. Kidd)

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AHS movements 2022

Adapted from the African horse sickness control: Movement report 2022 by John Grewar, Camilla Weyer, Debra Carter and Lesley van Helden

Introduction

This is the fifth detailed report on 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. The period evaluated is the 2022 calendar year. We differentiate between movements from the infected part of South Africa and those that occur within the AHS controlled area to a zone of higher control and stepwise movements that required a stopover quarantine period.

Permit based movements

A permit is required for 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 of origin in the form of an area status declaration.

Domestic equids

A total of 1559 movement events, consisting of 3333 domestic equids (all horses), occurred in 2022, with an average of 2 equids moving per movement application. Thoroughbreds represented 52% of the total horses that moved. Other breeds that moved relatively frequently were American Saddlebreds (7.1%), SA Warmbloods (6.8%), Arabians (5.4%), Hackneys (4.7%) and Vlaamperde (2.5%). This breed breakdown is similar to previous years.

As in the previous year, most equids moved between August and December 2022. The AHS surveillance zone remained the most common destination (66.1%) for equids moved. The free zone was the destination for 10.8% of equids moved.

Figure 1 gives an indication of the primary origin of equids moving into the AHS controlled area. In this case, we have categorised the movement by the state veterinary area of origin. The main province of origin was the Western Cape, with the George, Swellendam and Beaufort West state veterinary areas most represented. These three areas of origin accounted for 41% of all equids moved from the infected area during the year. KwaZulu Natal (Umgungundlovu, Ethekwini), Gauteng (Germiston) and the Eastern Cape (Port Elizabeth) were most represented outside of the Western Cape. The eight labelled areas in Figure 1 accounted for a total of 79.7% of all domestic equids moved during the year.

Stop-over quarantine (SOQ) movements

A total of 7 SOQ facilities were used during 2022, all in the AHS infected zone. All Gauteng facilities are vector protected facilities. 379 (up from 303 in 2021) horses moved under this protocol. All stop-over facilities used in

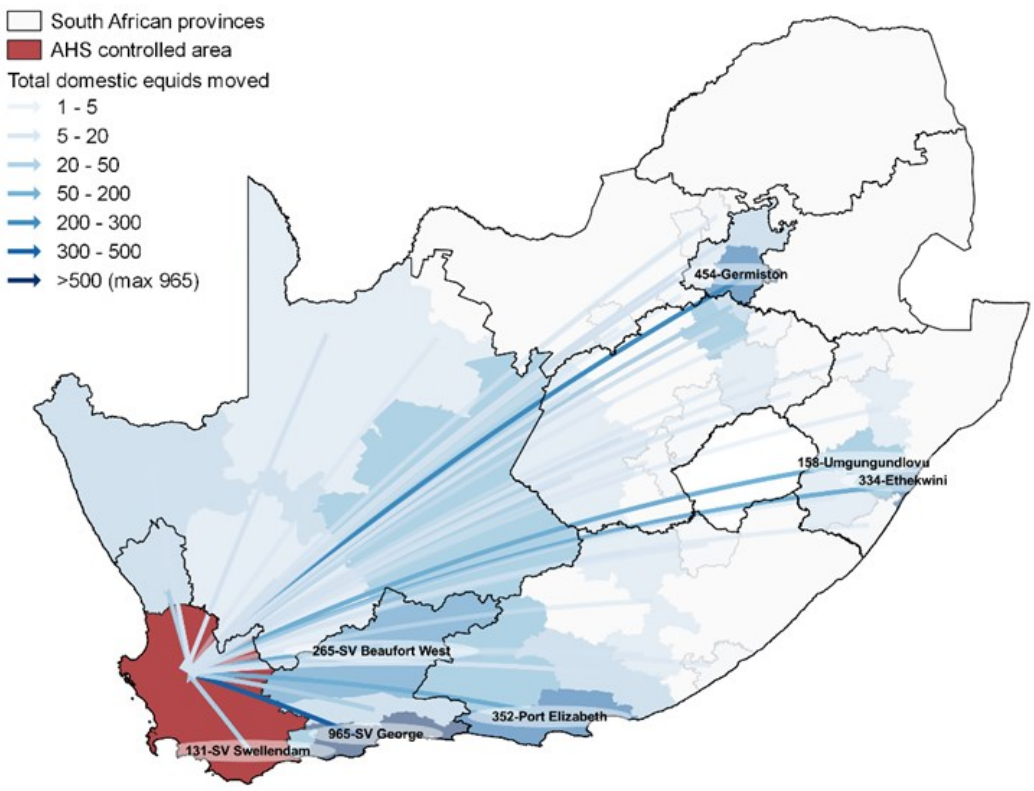

Figure 1: The total number of equids per state veterinary area of origin that moved into the AHS controlled area in 2022. Areas are labelled if 100 or more equids moved from the region during the year.

2022 were within the Western Cape boundaries except for the Gauteng vector proof facilities.

Wild equids

A total of 73 wild equids were moved into, within or from the AHS controlled area during 2022 (Figure 2). All were Burchell's zebra (*Equus burchelli*). As in the previous analyses, zebra generally move during the colder winter months.

Concessions, declined and retracted permits

The purpose of permits issued for movements from the AHS infected zone into the AHS controlled area is to ensure AHS risk is mitigated through vaccination, health checks and AHS status at origin declarations. During 2022, 11 horses were declined movement due to passport non-compliance or lack of information on application, 38 horses were declined due to vaccination non-compliance and 59 horses were declined due to a high-risk AHS status at origin. Permits were retracted for 8 horses due to a change in AHS risk status before movement occurred. Two horses received vaccination requirement concessions. This occurred for veterinary care in the AHS controlled area and required post arrival vector protected quarantine.

Movements within 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 for a movement into the AHS controlled area. A total of 2876 equids moved in this fashion during the year: 2868 horses, 1 mule and 7 donkeys. Most equids that moved within the controlled area were Thoroughbreds (70%). Most (62%) moved from the AHS protection zone to the AHS surveillance zone.

An important consideration for these movements is that there are a considerable number of horses that move 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 to their origins on the same day.

The movement pattern over time is quite like that of infected area origin movements except for 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.

Discussion

A total of 6209 equids moved into a zone of higher control during the year which is a 3% increase from the 6028 in 2021, and a further indication of a return to pre-COVID levels. Once again, most movements into a zone of higher control consisted of domestic equines. The AHS surveillance zone remains the most common zone of destination, both for infected area origin and controlled area origin movements. Thoroughbred horses are the most common breed moved.

Movement regulation requires close communication and interaction between various regulatory and state authorities. Movements originated from 42 of the 126 state vet areas in the country (down from the 49 state vet areas in 2021).

Stop-over quarantine movements have facilitated the movement of 379 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 intensive, it promotes the movement of high value horses or critical movements (such as for high-level competitions) and allows control and an acceptable system for the public needing to move horses.

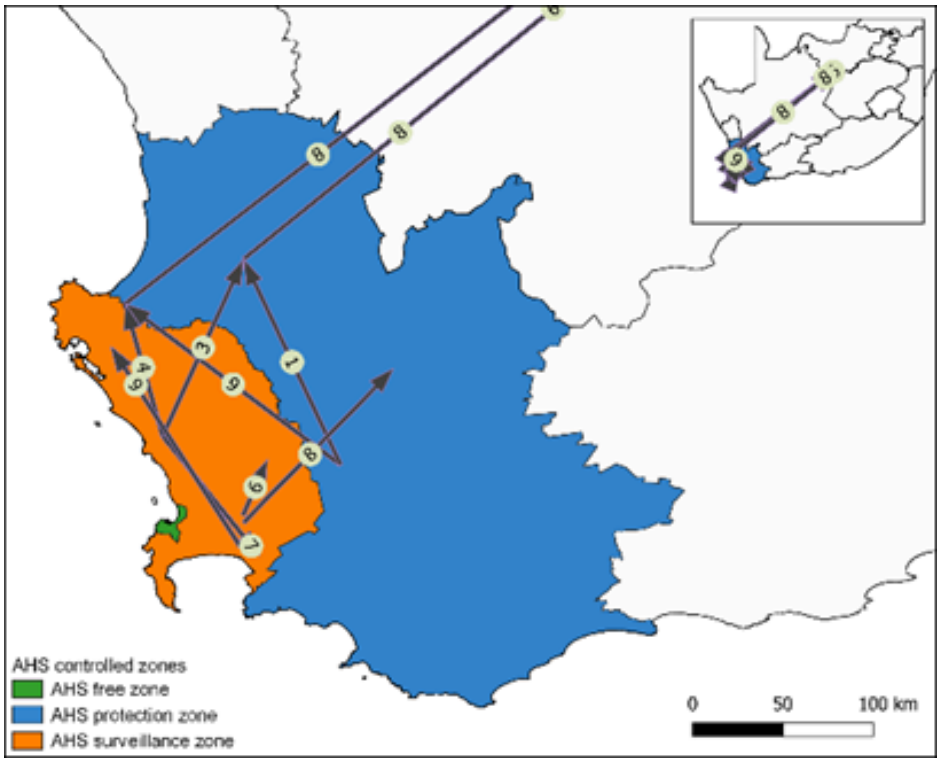

Figure 2: All zebra movements during 2022 that were associated with the AHS controlled area. Numbers on each line represent the total moved for each of the 11 movements that occurred.

New publication

The Molecular Epidemiology of Clade 2.3.4.4b H5N1 High Pathogenicity Avian Influenza in Southern Africa, 2021–2022 by Abolnik et al. was published this month in the journal Viruses (Fig. 3), including last author Laura Roberts.

Clade 2.3.4.4b H5N1 HPAI originated in Europe in 2020 and has since spread around the world, causing outbreaks in many countries, including South Africa since April 2021. The paper analyses the genomes sequences of 117 high pathogenicity avian influenza viruses obtained from samples taken from wild birds, ostriches and poultry in South Africa in 2021 and 2022, and compares them to avian influenza viruses from neighbouring countries.

Initial outbreaks were associated with seven H5N1 sub-genotypes, which diminished to two sub-genotypes (one in seabirds) by late 2022. Point introductions from wild birds were shown to be the source of infection for at least 83% of HPAI outbreaks in commercial poultry in South Africa. Outbreaks in poultry in Lesotho and Botswana were not caused by South African poultry, but were also likely introduced by wild birds. Wild bird viruses from Botswana were subsequently introduced back into South Africa and caused an outbreak in ostriches in the Free State in 2022. Viruses from seabirds in the Western Cape also spread to cause outbreaks in seabirds in Namibia by late 2021.

Read the full paper here: https://doi.org/10.3390/v15061383

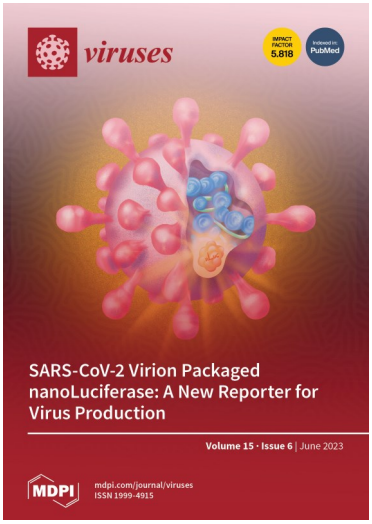

Figure 3: **Viruses: volume15, issue 6**

Outbreak events

High pathogenicity avian influenza (H5) was detected on a second commercial layer **chicken** farm near **George** after an increase in mortalities. The farm was quarantined and the chickens culled.

High pathogenicity avian influenza was identified in dead **African penguins** on **Robben Island** (H5N1) and **swift terns** in **De Hoop Nature Reserve** (H5).

A wild **bat-eared fox** was spotted in the town of **Prince Albert** looking disorientated, with hanging, blood-stained ears. The fox was shot by a farmer and the local animal health technician collected a brain sample, which subsequently tested positive for **rabies**.

Sheep scab was diagnosed in a flock of sheep near **Vanrhynsdorp**. The sheep showed signs of previous wool loss with new wool growth (Fig. 4).

Lesions of **swine erysipelas** were seen on two carcasses from two pig farms in the **Piketberg** area at the abattoir after slaughter.

***Salmonella* Enteritidis** was cultured from routine samples taken on five commercial broiler **chicken** properties in the **Stellenbosch** and **Malmesbury** areas, linked to an infected breeder flock.

Evidence of **red lice** infestation was seen on **sheep** in **Atlantis** and **Gouda**.

Orf lesions were seen in **sheep** near **Prince Albert** during a herd health visit.

Figure 4: **Wool loss as a result of sheep scab** (Photo: J. Kotzé)

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African horse sickness sentinel surveillance 2022

Adapted from the African horse sickness control: Sentinel surveillance report 2022 by John Grewar, Camilla Weyer and Lesley van Helden

The African horse sickness (AHS) sentinel surveillance program provides additional confidence of AHS freedom in the AHS free (FZ) and surveillance zones (SZ) of South Africa. The program incorporates the monthly sampling of recruited horses proportionately selected within the zones, based on the estimated underlying population. The program has two components – a sero-sentinel program that evaluates the changing serological status of horses on a month-to-month basis; and a PCR-based program that is used to detect the presence of AHS viral RNA within recruits. The sero-sentinel sampling target is drawn up to detect AHS at approximately a 5% minimum expected prevalence (with a 95% confidence level) whilst the PCR surveillance aims for a 2% minimum expected prevalence. Monthly sampling targets are therefore approximately 60 and 150 recruits, respectively. Individual recruits can be part of both programs. Sero-sentinels are required to be completely unvaccinated and are screened using serology prior to recruitment. Recruits used in the PCR - based program are required to be unvaccinated for at least the previous two years. The vaccination status of PCR sentinels does not influence their recruitment unless vaccination against AHS took place sufficiently recently to result in positive PCR results on initial testing.

This report covers 1 September 2021 to 31 December 2022. The results confirm that it is unlikely that AHS was circulating in the AHS free and surveillance zone during this period.

The serological test performed is the indirect ELISA (Maree & Paweska 2005). It is a non-quantitative assay and changes across paired sample events are used for evaluation. Follow-up serological tests include the serum neutralisation test (SNT), which is AHS serotype specific. All serology was performed at the Agricultural Research Council - Onderstepoort Veterinary Research (ARC-OVR). Viral RNA testing was performed at the Stellenbosch Provincial Veterinary Laboratory (SPVL) with the final month of evaluation's samples tested at the University of Pretoria/Equine Research Center's Molecular Diagnostics Laboratory. The test method used is a University of Pretoria (Equine Research Center) developed and OIE validated real-time RT-PCR (Guthrie et al. 2013).

General overview of sampling

A total of 782 sero-sentinel samples were analysed from 39 different farms, at an average of 49 samples from 25 different farms per month. Of the tested serological samples: 729 (average of 45 per month) could be evaluated as they had relevant paired results (Figure 1).

A total of 2267 PCR sentinel samples were analysed from 73 different farms, at an average of 142 samples from, on average, 50 different farms per month. Average numbers per month were improvements on both serology and PCR compared to the previous season's evaluation.

Results

Figure 1 shows the broad serological outcomes for the period. The serology samples that could not be evaluated, for lack of a paired sample, totaled 25 samples (3.1% of the total, an increase from 2.6% the previous season).

All samples for the PCR-based surveillance tested negative.

Follow-up investigations

Non-specific ELISA positives

All cases in which positive serological results were obtained were thoroughly investigated and no evidence of infection with African horse sickness virus was found. Details of these investigations are available in the full report, accessible here.

Sentinel fevers

Horse 26561, a sentinel since March 2020, had a fever of over 40 ºC in October 2021. It and a stablemate that also had fever were sampled and tested negative for AHSV and EEV on 15 October. The horse maintained this

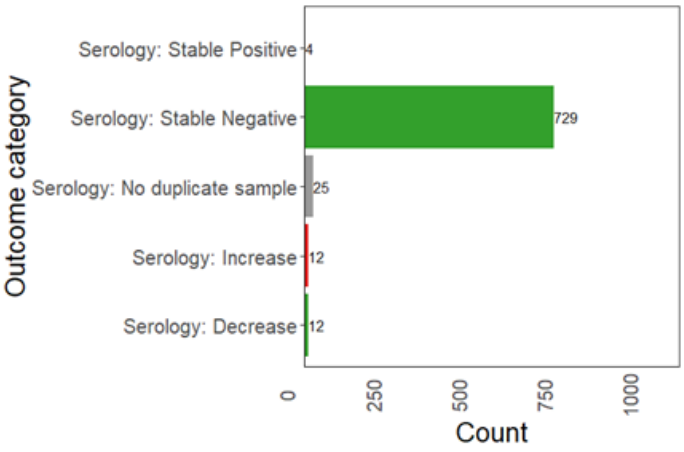

Figure 1: Broad outcomes for serological evaluation for the period under review

negative status throughout the rest of 2021 and 2022.

Horses 34072 and 24273 both had fever and were lethargic in April 2022 and were tested for both AHSV and EEV. The AHSV results were negative, but both were positive for EEV with Ct values of 28.9 and 26.9 respectively. They continued to test AHSV negative for the remainder of the surveillance season.

Spatial considerations

The sentinel surveillance program is based on a proportional sampling system with most sentinels in areas of the surveillance area that have the highest population of horses. Figure 2 shows the monthly average distribution of sentinels in the PCR sentinel programs.

The areas requiring most improvement remain Paarl, Mitchells Plain and Philadelphia (which lacked serum samples only).

Surveillance system evaluation

The surveillance program is designed to detect AHS in the AHS surveillance zone at a minimum expected prevalence of 5% (serology) or 2% (PCR). In this section of the report, we establish the monthly sensitivity of the surveillance program where any sentinel tested negative in the month (on paired serology or negative PCR).

Parameters used in this evaluation are shown in the full report and analysis is based on evaluating sensitivity of surveillance programs (Martin et al. 2007). The historical surveillance outcome is considered as it provides information that aids in determining an accurate final probability of freedom as of December 2022. The final probability of freedom from Sept 2016 through December 2022 (76 months) was 91.5%, an increase of 17% from the 74.5% of the previous evaluation (Figure 3).

The sensitivity of the sentinel surveillance alternates around the 30% mark throughout. This is the sixth AHS season running where cases of the disease have not been detected in the AHS surveillance and free area, although an outbreak of AHS occurred in the AHS protection zone in 2021.

Discussion and Conclusion

The primary goal of demonstrating AHS freedom for the 2021/2022 AHS season was achieved. The PCR testing in conjunction with the serology testing does assist greatly in the analysis of the system and for follow-up in suspect cases. All investigation reports are shared with Provincial and National Veterinary Services.

A 6-year review of sentinel results show that the probability of freedom attained for this program, at an animal design prevalence of 5% and herd-level design prevalence of 2%, shows a 91.5% probability of freedom from AHS in the AHS surveillance and free zones. This level was achieved in the face of the AHS outbreak that occurred ~ 88km from the border of the AHS surveillance zone in 2021.

Spatial representativeness remains challenging. The target minimum prevalence of 5% has however been achieved using EDTA sampling and PCR testing; the goal remains however to get as close to the 2% MEP level as often as possible.

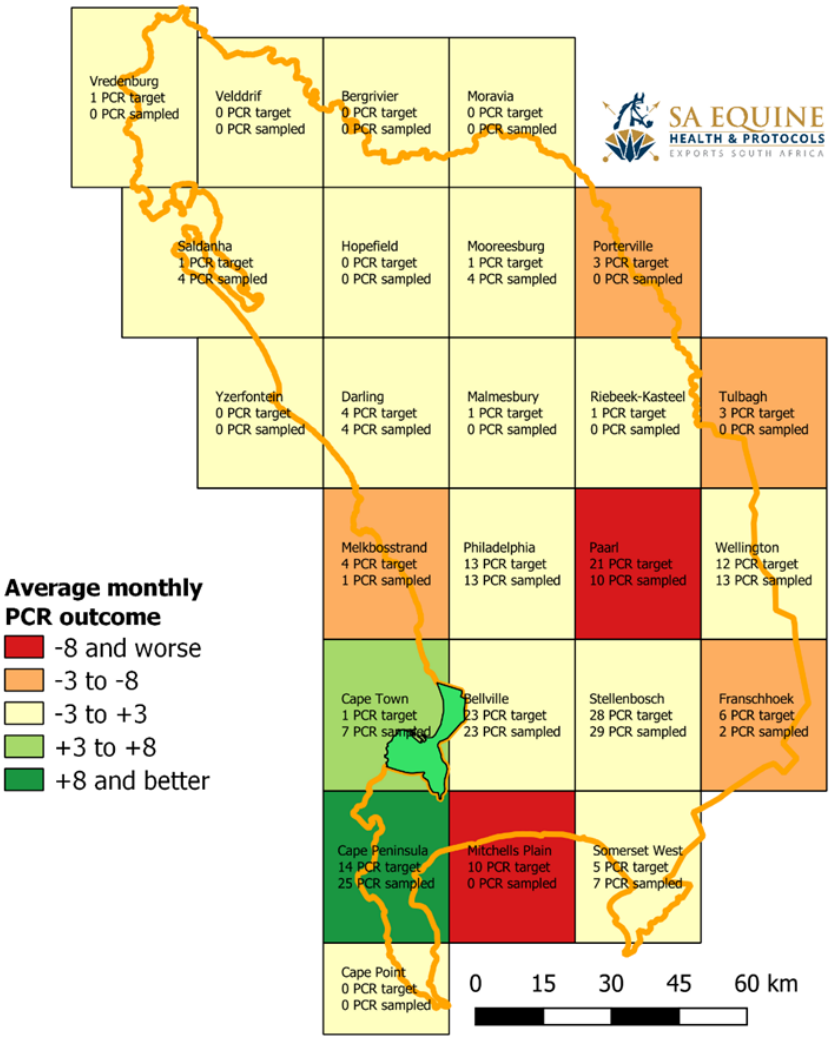

Figure 2: A map showing the AHS surveillance and free zone where PCR-sentinel surveillance has taken place for the 2021/2022 season. The map depicts the various areas with their target PCR samples to detect a 2% minimum expected prevalence using a proportional sampling frame. The orange areas are areas where PCR-sentinels were lacking on average while the light green to green areas show where surplus PCR-sentinels were sampled. Cream areas depict where the target was generally attained.

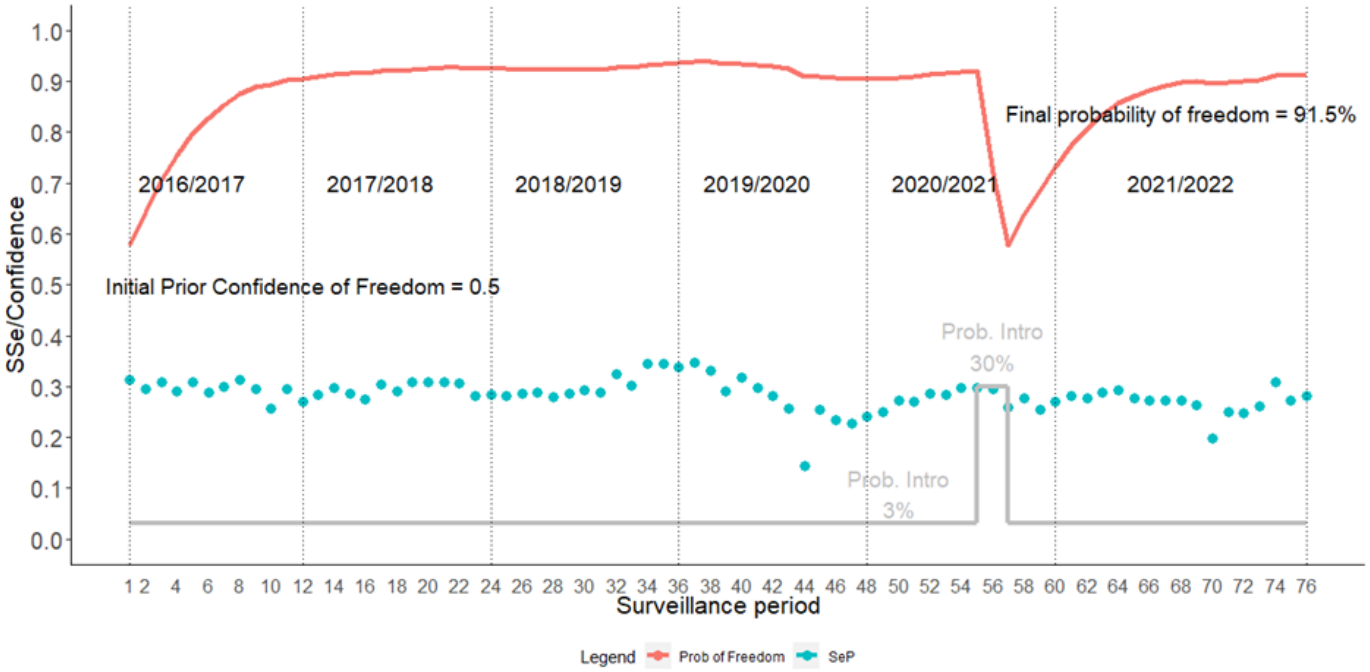

Figure 3: The sentinel surveillance sensitivity of individual surveillance periods (dots) with probability of freedom curve (red line) based on a non-informative 50% prior probability of freedom for the past six surveillance seasons: the season currently reviewed is the right pane – i.e. the 2021/2022 season running between September 2021 and December 2022. Probability of AHS introduction of 3% is set for periods where no AHS outbreaks are present in the AHS controlled area (grey line at 0.03 on y-axis) but at 10X that rate for where outbreaks are present as in April and May 2021 in the Cederberg AHS Protection zone.

Outbreak events

The carcass of a **Hewitt's red rock hare** was found next to the road between Matjiesfontein and **Touwsrivier**. Samples from the carcass subsequently tested positive for **rabbit haemorrhagic disease** virus. On a farm near **Oudtshoorn**, eight out of 20 **domestic rabbits** died suddenly. No samples were taken, but the cause of death is also suspected to be rabbit haemorrhagic disease.

Five **ostrich** farms in the **Oudtshoorn, Merweville** and **Touws River** areas were investigated for **avian influenza** (AI). Two were detected as part of the disease investigation on another farm close by. Avian influenza virus was detected on four of the farms but PCR tests for high pathogenicity subtypes were negative and haemagglutination inhibition serology tests did not indicate HPAI either. Low pathogenicity AI is therefore suspected.

***Salmonella* Enteritidis** was cultured from routine samples taken from five commercial broiler **chicken** properties in the **Malmesbury** state vet area.

A second case of **bovine malignant catarrhal fever** occurred on a property near **Stellenbosch** that had experienced its first case in May. Cases of wildebeest-associated BMCF occurred on a nearby property in February and May this year, but laboratory testing showed that this property's virus was sheep-associated. Sheep are kept on the property with the cattle.

One **pig** carcass from a farm in the **Malmesbury** state vet area was condemned after skin lesions of **erysipelas** were seen at the abattoir after slaughter.

Reproductive syndromes, including a still birth, a weak foal that died within hours of birth and an abortion were reported from a farm keeping **horses** in the **Ceres** area. All affected horses tested positive for **equine herpes virus** (EHV-1).

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Western Cape avian influenza surveillance: January-June 2023

Laura Roberts

Routine surveillance for avian influenza (AI) in South Africa is necessary to assist with detection of high pathogenicity (HP) strains, i.e. H5Nx or H7Nx, that can cause serious economic losses in poultry and are the most likely strains to lead to human influenza pandemics. These characteristics also make surveillance important for export certification of poultry products.

Biannual surveillance in backyard chickens, commercial poultry and ostriches is prescribed by Appendix 9 (Notifiable Avian Influenza (NAI) Surveillance), of the HPNAI contingency plan of 2009.

Bird serum is screened with an influenza A enzyme-linked immunosorbent assay (ELISA). Positive ELISA tests are followed by haemagglutination inhibition (HI) tests to screen for H5, H6 and H7 antibodies.

A farm where serology results in a positive ELISA test should be retested as soon as possible. Further serum samples are taken and also tracheal swabs for detection of viral RNA via polymerase chain reaction (PCR).

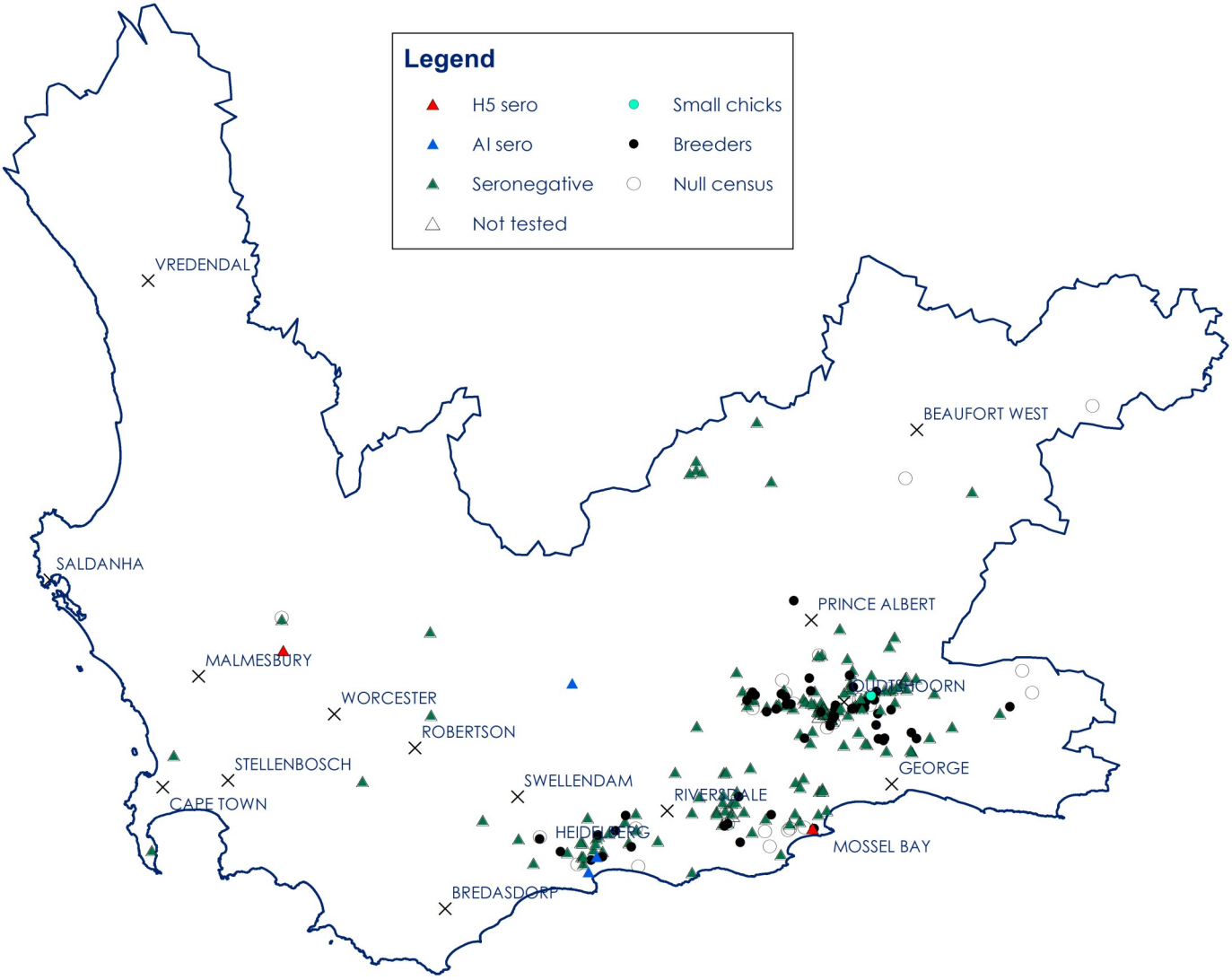

Figure 1: Avian influenza surveillance in commercial ostriches in the Western Cape, January - June 2023. All registered farms are shown. Farms with ostriches suitable for testing are shown with triangles and those without testable birds with circles.

Samples that are PCR positive for avian influenza RNA must then be screened further for H5 and H7 RNA, using more specific PCR tests. RNA sequencing is required to determine other (non-H5 and H7) subtypes and to provide further information on the exact strain involved and its possible origins. For more details on the surveillance strategy, please read the introduction to the June 2020 Epidemiology Report.

Ostriches

Between January and June 2023, 272 ostrich compartments were registered in the Western Cape, of which 19 were hatcheries. 163 farms (64%) were tested for avian influenza antibodies (Fig 1).

Of 90 not tested, 54 had breeder birds only, 32 were empty (of which eight were deregistered and two were new registrations), one sells small chicks (younger than 8 weeks), which do not require testing, and three were missed by mistake.

Of the 163 tested, sixteen were positive (10%). Nine of these had been positive since 2022. One of these was investigated for a suspected new infection but the follow-up investigation had negative results.

Of the other seven new detections, two had negative follow-up results, leaving **five new infections with avian influenza (3%)**. Of these, three were ELISA positive only. One also had AIV detected on PCR but H5 and H7 PCR tests were negative. Another one had low clade 2.3.4.4 H5 HI titres and one had positive clade 2.3.4.4 HI titres (both PCR-negative). Therefore there were a maximum of two possible HPAI H5 infections, that could not be confirmed.

Commercial poultry

Serological surveillance for avian influenza was done on 93 commercial poultry farms, eight of which had multiple sites, bringing the total to 117 sites tested (Fig 2). This equates to approximately half the farms in the province. However, 86% of farms tested were part of the broiler industry.

Twenty sites from 18 farms (17%) tested avian influenza seropositive. Only one keeps layer chickens. Some sites continued to test seropositive in subsequent months, bringing total detections to 29.

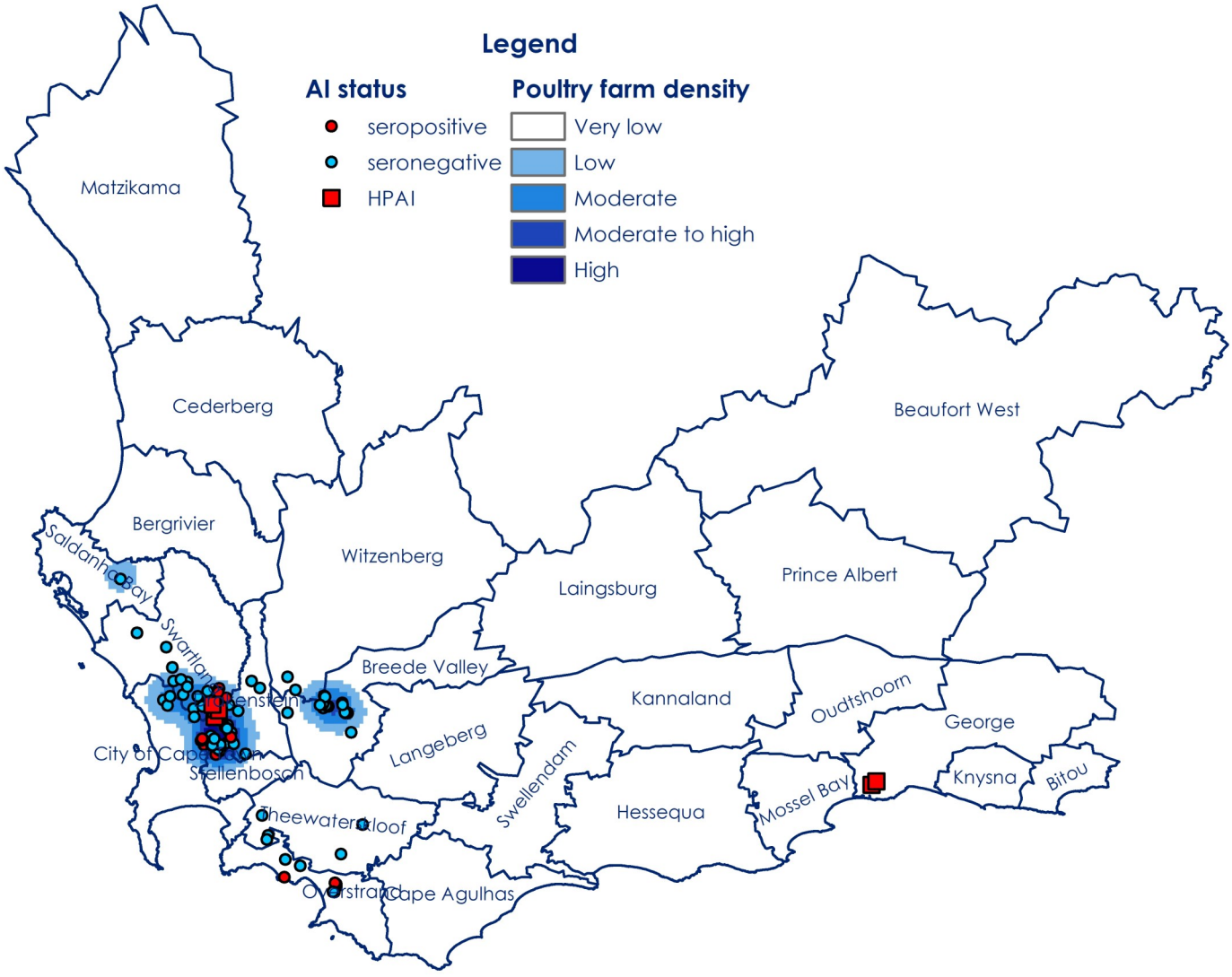

Figure 2: Avian influenza surveillance coverage in commercial poultry in the Western Cape, January - June 2023

Twenty-seven antibody detections were followed up. The other two were not followed up because the broilers had already been slaughtered.

There were single positive HI tests without matching titres, so serology could not give an indication of serotype, though H5 and H7 is unlikely.

Four farms had positive AIV PCR tests, though H5 and H7 tests were negative and there were no reported clinical signs. All farms were PCR-negative on further PCR testing and post mortem samples were included from at least one farm.

One smaller layer farm tested seropositive after a drop in egg production. The hens were otherwise healthy and PCR tests were negative. Only non-specific (HI-negative) AI antibodies were detected, but were confirmed with a second round of sampling.

Backyard poultry

Eighty-one properties with backyard chickens were sampled (Fig 3). Of these, **55 (68%) tested avian influenza seropositive** but HI tests were negative. No clinical signs were reported. Thirty-seven (67%) of these properties were sampled again and nine (25%) had negative serology on follow-up, indicating that the initial test results may have been false positives. All except two properties had negative HI tests on follow-up. The only positive HI tests were with the H6N2 antigen and both properties were sampled on the same day, in the Ladismith area. Without a matching H6N8 reaction, one cannot conclude there was a H6 infection. However, the H6N8 antigen is not closely matched to some currently circulating H6 viruses, so an H6 infection is still possible.

One backyard property had positive AIV PCR tests after follow-up sampling, but the H5 & H7-speciifc tests were negative and there were no clinical signs of AI infection, so LPAI virus infections were concluded.

HPAI (H5N1)

Commercial poultry

Five commercial layer chicken farms in the Paardeberg area, northwest of Paarl, were confirmed infected with H5N1 high pathogenicity avian influenza between 18 and 27 April 2023 (Fig 2). The farms all fall within a small,

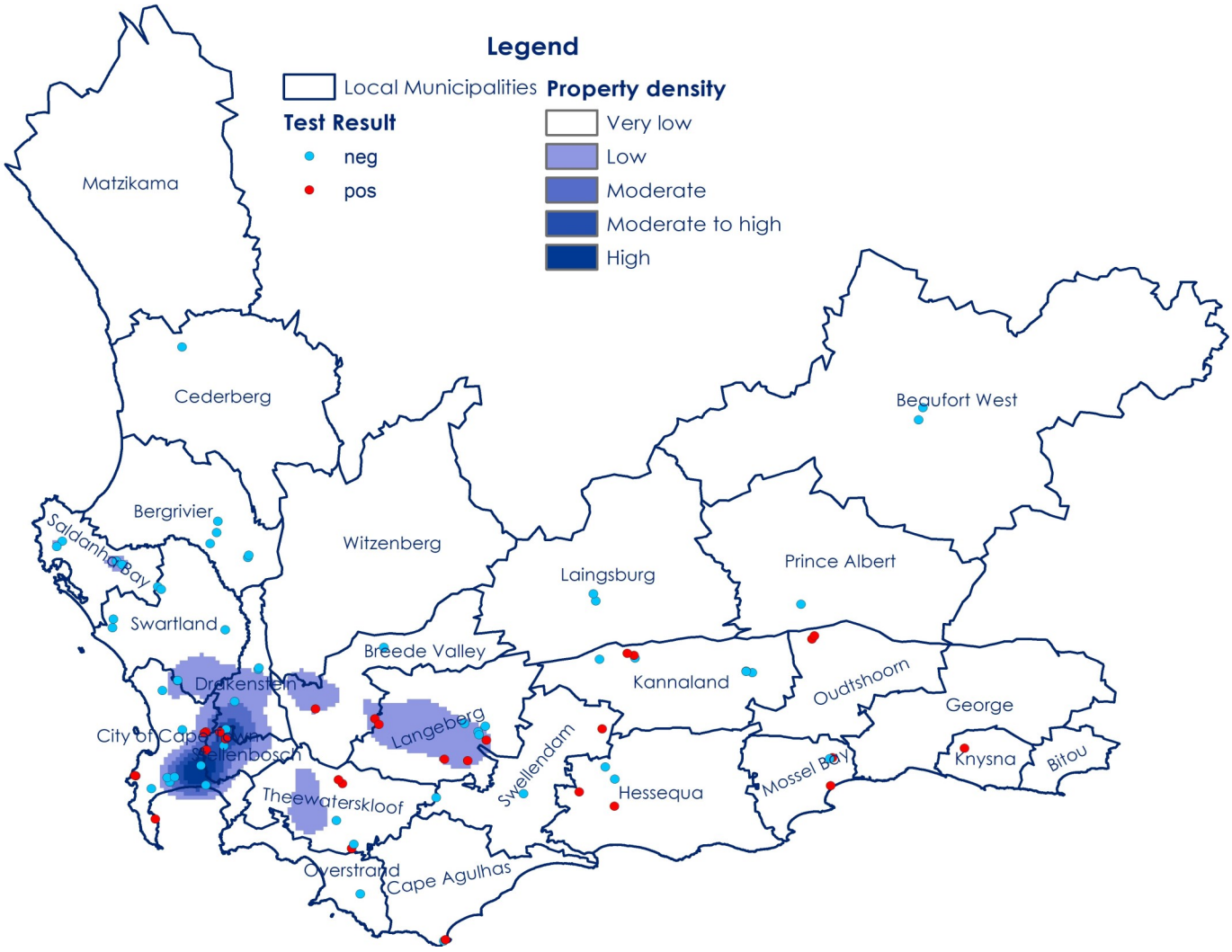

Figure 3: Avian influenza surveillance on properties with backyard chickens in the Western Cape, January - June 2023

6km diameter, area and there were only two other farms in that area, that were not affected. The University of Pretoria has assisted with genetic analysis of viruses from four of the five farms and preliminary results indicate that most farms were individually infected by wild birds, some more than once, and that there was little spread of virus between farms. The infection on one farm was linked to a virus detected in a wild goose that was sampled by Western Cape Animal Health officials near McGregor in April. The viruses are related to those that caused outbreaks in 2021 and 2022 but have been introduced to the country more recently.

HPAI infection was detected on **two more layer farms near George** in late May/ early June. The first has been confirmed to be another introduction by wild birds. Both these farms were also affected by the 2021 outbreak, so appear to have characteristics that predispose them to infection.

All affected farms chose to cull all chickens in the affected houses. Approximately 1.5 million chickens died from HPAI infection or as a result of the culling operations: about 30% of the layer chickens in the province.

All seven farms have been cleaned and disinfected and, as of end September, quarantine has been lifted on six. One is waiting out the 28 day period after the first disinfection, before quarantine can be lifted.

HPAI in wild birds

The HPAI H5N1 detections in commercial poultry were preceded by a detection of a closely-related virus in a wild Egyptian goose that was sampled by veterinary officials near McGregor on 18 April.

Thirty-four seabirds of six species tested HPAI H5N1 positive in March (2), May (13) and June (19). Swift terns (12), African penguins (9) and common terns (7) accounted for most cases. Approximately a third were found in Simon's Town, another third on the west coast and smaller numbers elsewhere on the Cape peninsula and as far east as Nature's Valley. Most viruses detected were related to the strains present since 2021, and only 3/35 sequenced, all in gulls, were more closely related to the viruses from the goose and commercial poultry.

Discussion

The AI commercial poultry site seroprevalence for January to June 2023 is not very different from that in the same period in 2022 (17% vs 14% in 2022) and the ostrich farm seroprevalence was also relatively typical. However, only 1% of backyard properties were seropositive between January and June 2022, compared to 68% this year, which is very unusual.

Cape Town International Airport had received rainfall equal to the annual long-term average (500mm) by mid-June and the amount usually received by the end of August (approx. 375mm) had been reached by mid-May (SA Weather Services data). Wild water birds are suspected of being mainly responsible for introduction and spread of avian influenza viruses, and they are believed to move around southern Africa in response to water and food availability. It is possible that the high rainfall attracted a wider variety of water birds than usual, or birds from further away, and this could explain the high AI seroprevalence in backyard flocks, but also the evidence of a variety of HPAI and LPAI viruses.

Outbreak events

A farmer near **Piketberg** noticed his dogs playing with a **bat-eared fox**. He went to collect his gun and when he returned, the fox was fighting with one of his dogs in a kennel. The farmer then shot the fox and contacted the local AHT who collected the carcass. The fox tested positive for **rabies**. The farm dogs had been vaccinated previously and no broken skin could be found on them. The dogs were therefore vaccinated against rabies again after this incident and were recommended to be kept in isolation for at least a month.

In the **Oudtshoorn** area, the presence of **high pathogenicity H5 avian influenza** was detected on an **ostrich** farm. On four other ostrich farms in the **Oudtshoorn** and **Witsand** areas, antibodies against **avian influenza** were detected, as well as avian influenza matrix gene on two of the farms, but the viruses could not be typed further.

Cattle that had shared grazing with brucellosis infected herds near Darling were moved to the **Hopefield** area in 2021. Four cows in the herd of 56 tested positive for **brucellosis**. The farm was placed under quarantine and will be following a test-and-slaughter strategy to rid the herd of brucellosis.

The carcass of a **Hewitt's red rock rabbit** *(Pronolagus saundersiae)* was found on the Witteberg Road, between Konstabel and **Laingsburg**. The carcass did not show any obvious injuries and was moved to Bijstein Nature Reserve, from where samples were sent that tested PCR positive for **rabbit haemorrhagic disease** virus.

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World Rabies Day 2023

Lesley van Helden

World Rabies Day has been observed for the past 17 years on 28 September, the anniversary of the death of Louis Pasteur, who developed the first rabies vaccine in 1885. World Rabies Day is coordinated and promoted each year by the Global Alliance for Rabies Control (GARC), with the aim of raising rabies awareness and preventing rabies deaths, with the ultimate goal of eliminating rabies. This year, 100 World Rabies Day events taking place in South Africa were registered on the GARC website.

In the Western Cape, rabies prevention activities take place throughout the year, but World Rabies Day and the month around it provide a good opportunity to highlight this part of our work and raise further awareness of the need for action to eliminate rabies deaths.

Figure 1: Animal health technician, Janica Chapman, vaccinates a dog at a rabies prevention campaign in the Malmesbury area. (Photo: M. Chapman)

In our province, 34 different rabies vaccination campaigns were organised, marketed and carried out by our team of animal health technicians in the field (Fig. 1). Approximately 23 000 dogs and cats were vaccinated in September, both during these campaigns and as part of routine vaccinations done during farm visits.

Vaccination campaigns were complemented by liaison with 19 different local animal welfare organisations during the month and providing them with free rabies vaccines to increase vaccination coverage in the communities in which they work.

In addition to vaccinations, our

Figure 2: Michael Swart (State Veterinarian: Malmesbury) spoke to Mia Slabbert on Grootplaas. Watch the video at https://www.youtube.com/watch?v=qZUq5_x-nFc&t=9s

Figure 3: Pippa Hudson interviewed Lesley van Helden (State Veterinarian: Epidemiology) on CapeTalk. Listen to the podcast at https://omny.fm/shows/afternoons-with-pippa-hudson/world-rabies-day-1

officials organised and participated in a range of other rabies awareness activities.

Rabies awareness talks for school children are one of the most frequent and effective awareness activities done (Fig. 4). In September, 14 schools in the Western Cape were visited for this purpose. Children learn about caring for their pets' basic needs and how providing healthcare for animals protects the health of their families at the same time. Fun activity books produced by GARC are handed out to reinforce the message.

The NAMPO Cape Expo, which took place in Bredasdorp this month, provided another opportunity to raise awareness about rabies and other veterinary issues among the agricultural community. Officials from the Swellendam office staffed a Veterinary Services exhibit at the expo where they could interact with members of the public (Fig. 5).

In Oudtshoorn, the state veterinary office organises the annual Oudtshoorn Animal Day, in collaboration with local schools, businesses and non-profit organisations. The day is a fun day out for the whole family and includes a children's magic show, a dog obedience show, a school animal art competition (Fig. 6), a family pet lookalike photo competition, a colour run, musical performances, a reptile display and educational show, barrel tractor rides, a jumping castle, carnival games, face painting, pawprint nail art, market stalls and primary animal healthcare services including, of course, free rabies vaccinations for all dogs and cats attending. All funds raised on the day are used to finance animal welfare sterilization campaigns.

Most events and vaccination campaigns are advertised on local radio. To create more general awareness, two of our state veterinarians, Michael Swart and Lesley van Helden, also did media interviews about World Rabies Day on national television (Fig. 2) and radio (Fig. 3), respectively.

Figure 4: Children ready to listen to a rabies awareness talk at their school (Photo: M. Vrey)

Figure 5: Veterinary Services created awareness of rabies at NAMPO Cape in Bredasdorp. (Photo: M. James)

Figure 6: Oudtshoorn Animal Day children's art competition (Photo: C. Fox)

Outbreak events

Two cases of **rabies** were confirmed by laboratory testing in the province this month:

⇒ An **aardwolf** came onto a farm near **Murraysburg** and chased the workers. It was shot before it could make contact with people or other animals on the farm. Dogs and cats on the farm had been vaccinated previously against rabies and so were revaccinated by the local animal health technician in response to this case.

⇒ A **goat** near **Beaufort West** stopped eating and drinking and was biting the two goat kids housed with it. The goat was killed and the carcass collected by the local animal health technician for testing. She had coincidentally vaccinated all dogs and cats on the farm and on neighbouring farms against rabies earlier that same week. All people who had had contact with the goat received post-exposure prophylaxis.

Two out of six **chickens** kept at an animal welfare association near **Malmesbury** died suddenly. Samples taken from the carcasses tested positive for **H5 avian influenza** virus, but further typing results have not been received.

Avian influenza (AI) virus and/or antibodies were detected on eighteen **ostrich** farms in the **Oudtshoorn** (10), **de Rust** (2), **Langkloof** (3), **Heidelberg** (2) and **Touwsrivier** (1) areas. Avian influenza virus was detected via PCR on ten farms but all except one were negative on the H5 and H7 subtyping tests and so the subtype is unknown. H5 virus was detected via PCR on one farm near Oudtshoorn, bringing the total H5 virus detections in ostriches to two in 2023. Four farms in the Oudtshoorn area have been shown to be AI-negative after follow-up testing.

Several **wild hares** were found dead in the veld on a property in the **Ladismith** area. The carcasses had already been partially consumed by scavengers, so samples could not be taken, but an outbreak of **rabbit haemorrhagic disease** is strongly suspected.

***Salmonella* Enteritidis** was cultured from crates of **chicks** arriving on a broiler farm near **Worcester**. The farm has implemented a *Salmonella* monitoring and reduction programme in response.

Erysipelas lesions were seen on a small number of **pig** carcasses after slaughter from two farms in the **Swartland**.

Abscesses were treated in a billy **goat** and a **sheep** ram on a property near **Vanrhynsdorp**.

Red lice were identified in a flock of **sheep** near **Beaufort West**.

A farmer in the **Vanrhynsdorp** area suspected bluetongue in his **sheep** and called the local animal health technician. On inspection, the sheep were found to be suffering from **dikkop**: swelling of the face caused by photosensitivity from ingestion of toxic plants, usually wilted *Tribulus terrestris* (Figs 7 and 8).

Figures 7 and 8: Sheep showing clinical signs of dikkop (Photos: J. Kotzé)

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H7 high pathogenicity avian influenza update

Lesley van Helden

After H5N1 high pathogenicity avian influenza (HPAI) caused several outbreaks in commercial chicken flocks in South Africa in the first half of 2023, another strain of HPAI emerged in the northern part of the country. H7N6 HPAI was first detected in commercial chickens in Gauteng in June 2023 and quickly spread to infect many other chicken farms in the months that followed. Unlike H5N1, which circulated in and was spread by wild birds, the new H7N6 appeared to infect only chickens. To date, evidence of this virus has not been found in wild birds or in any bird species other than chickens. How the virus spread between farms is unknown in most cases, but it is likely that it was transmitted either by movement of live birds, or by fomites such as vehicles, feed and/or equipment.

There have been over 100 outbreaks of H7 HPAI in South Africa (Fig. 1), with the majority clustered in and around Gauteng. A total of 70 outbreaks are within Gauteng Province, affecting mostly layer chickens.

In September and October, a layer chicken farm near George restocked with pullets sourced from a farm in the North West Province. After clinical signs of HPAI were seen in pullets on the farm of origin in early October, tracheal and cloacal swabs were taken from mortalities in the flock in the Western Cape. These samples subsequently tested positive for H7N6 HPAI. To prevent the spread of the outbreak, all chickens on the farm were culled and destroyed, along with all potentially infectious material. The farm was cleaned, disinfected and fumigated twice.

With many unresolved outbreaks ongoing in South Africa, H7 HPAI remains a threat to the poultry industry in the Western Cape. Chicken farmers are strongly discouraged from transporting chickens from other provinces if at all possible.

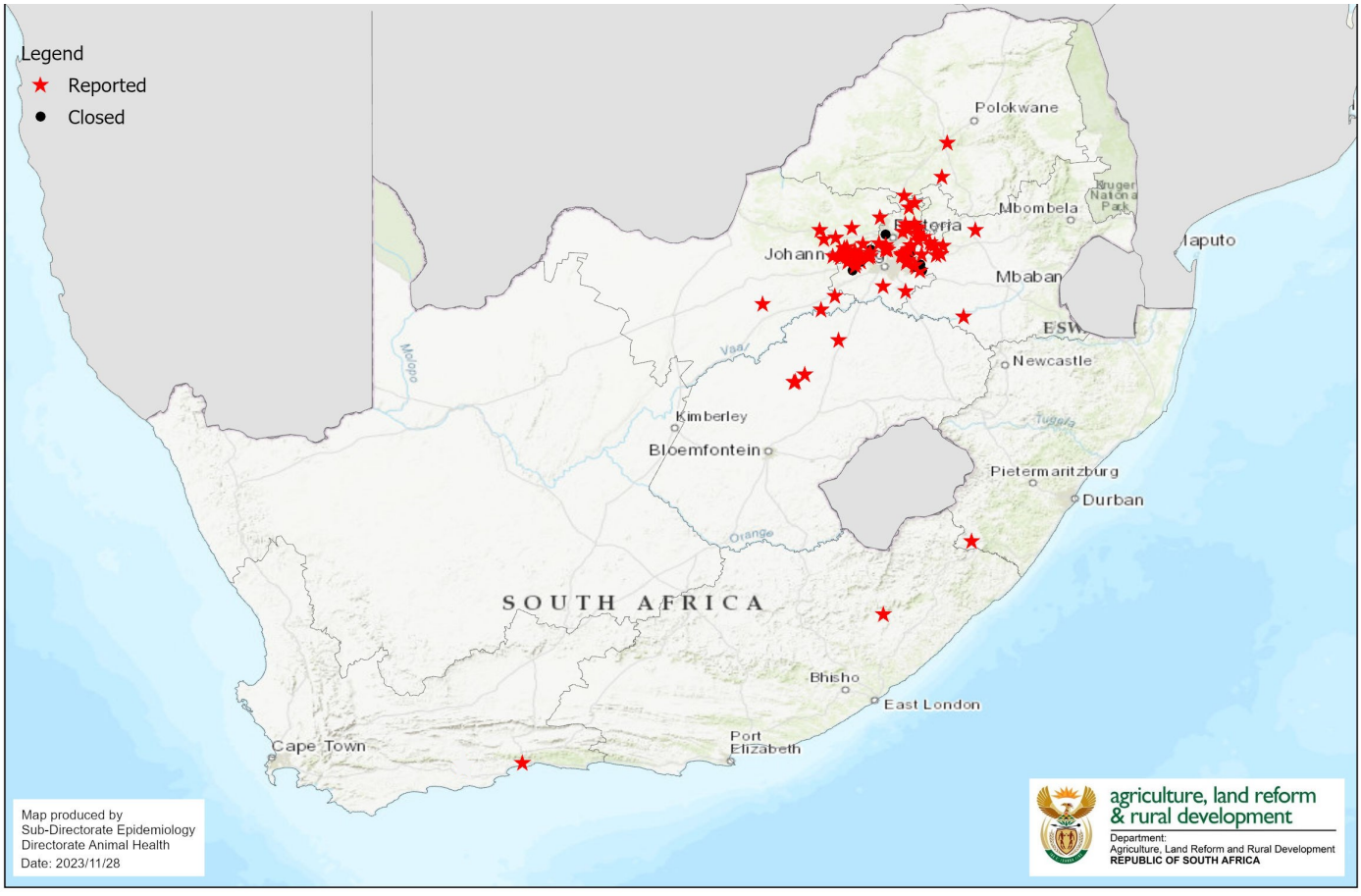

Figure 1: Outbreaks of H7 avian influenza in commercial chickens in South Africa in 2023 (Map provided courtesy of DALRRD)

Outbreak events

H7N6 high pathogenicity avian influenza broke out on a layer **chicken** farm near **George**. This outbreak is detailed on the first page of this report. Cleaning and disinfection took place under official supervision (Fig. 2) and quarantine was lifted once the process was complete.

Avian influenza antibodies were detected on two **ostrich** farms: one near **Heidelberg** and one near **Swellendam**. No virus was detected via PCR and serology did not indicate a subtype, so a previous low pathogenicity infection is assumed.

On a farm near **Moorreesburg**, a **bat-eared fox** was seen attacking a vehicle. The fox returned the following day to repeat this behaviour and was shot by the farmer. Samples of he fox's brain tested positive for **rabies**. The neighbouring farms were visited and all dogs and cats vaccinated against rabies in response to this case.

A few poor doers were seen in a **sheep** flock in the **Uniondale** area. One of the ewes was sacrificed and evidence of **Johne's disease** was seen on histological examination of her organs.

Four feral **rabbits** were taken in by a resident of **Paarl**, but all of them died suddenly. On necropsy the lungs were found to be filled with blood. Based on the history and clinical signs, an outbreak of **rabbit haemorrhagic disease** is suspected.

***Salmonella* Enteritidis** was cultured from routine samples taken on six different properties keeping broiler **chickens** in the **Malmesbury** and **Worcester** areas.

Skin lesions characteristic of **erysipelas of swine** were seen on a pig carcass after slaughter at an abattoir. The pig originated from a farm near **Moorreesburg**.

A farmer near **Tesselaarsdal** reported that five of his 19 **pigs** had died suddenly. On inspection of the remaining pigs, no signs of illness were seen other than evidence of mange, which the owner had recently treated. The animal health technician noted that water was supplied in black, above-ground pipes and a black plastic bucket. The weather in the preceding few days had been very hot, so he suspected that the pigs had not consumed enough water and therefore developed **salt toxicity**.

Sores were seen on the lips, gums and teats of **sheep** and **goats** belonging to several farmers keeping livestock on a commonage in **Riviersonderend**. A private veterinarian diagnosed **orf** (contagious pustular dermatitis).

Two **sheep** in **Vanrhynsdorp** showed black, foul-smelling diarrhoea with mucus and blood, as well as loss of appetite and signs of abdominal pain. **Coccidiosis** was suspected and the sheep were treated with long-acting sulfonamides.

During an inspection, hair loss due to scratching was seen on three **pigs** belonging to a small-scale farmer in **Atlantis**. The farmer was advised regarding how to treat **mange** and the pigs were injected with ivermectin.

Figure 2: State Veterinarian: George, Leana Janse van Rensburg, demonstrates the use of gumboots and single-use overalls worn as personal protective equipment on a farm with highly pathogenic avian influenza.
(Photo: E. Lottering)

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Vaccination against avian influenza

Laura Roberts

Vaccination of birds against avian influenza (AI) is a hot topic currently in the poultry industry. While it may be the way forward for control of avian influenza, it is a complex endeavour with many aspects to consider. There are serious risks associated with poorly–implemented AI vaccination programs.

Planning a vaccination program

The aims of a vaccination program should be defined clearly from the start and aligned with the capabilities of vaccine candidates. Few vaccines prevent all infections, and consequently disease and pathogen shedding, and some induce waning, binary or partial immunity. Immunity may not last or may need repeated vaccinations to maintain sufficient levels (waning), and some individuals may never develop immunity while others react fully (binary immunity). A vaccine may achieve only partial immunity by failing to prevent infection or morbidity and mortality and (or) allowing shedding and further pathogen spread. Besides not achieving its purpose, partial immunity could select for increased pathogen virulence. Vaccines that convey only partial protection against infection and shedding may raise the infectious dose required and drive evolution of a raised pathogen reproduction rate. Animals that are protected from death, but are not prevented from shedding, may survive to spread virulent pathogen for longer (Barnett and Civitello, 2020).

Avian influenza vaccines

Swayne and Sims (2021) list the properties of an ideal vaccine for poultry, which include: 1) low cost, 2) effective in multiple species and (3) after a single dose, 4) easily applied to large numbers of birds, 5) ability to distinguish infected from vaccinated birds (DIVA), 6) effective in young birds (ideally day-old) with residual maternal antibodies and 7) close antigenic match to field virus.

Leslie Sims has compiled a list of twelve aspects of good "Vaccine Stewardship", which were explained by David Swayne at an FAO meeting in April 2023 (Swayne and Sims, 2023) and by Sims at the Global Consultation on Highly Pathogenic Avian Influenza (FAO, 2023). These points include employing other mitigation measures where possible and not just relying on vaccination, using a vaccine that protects against circulating strains, and at the correct dose and time, and monitoring vaccinated birds to ensure immunity is achieved and maintained (with boosters if necessary). Circulating viruses need to be monitored for antigenic changes or new introductions that may require updating of vaccines. It should also be ensured that the process of vaccinating does not spread virus and the vaccination program must be regularly re-assessed to gauge its ongoing necessity and effectiveness.

Avian influenza viruses evolve rapidly through genetic mutation and reassortment of gene segments and vaccines against high pathogenicity strains can lose effectiveness fast. Vaccine seed strains must constantly be compared to circulating field viruses, and updated if necessary, to ensure continued protection and prevent extra evolutionary pressure. Vaccination may have been one cause of the rapid evolution, associated with antigenic variation, of the Goose-Guangdong lineage viruses that emerged in the 1990s. Cattoli et al. (2011) found higher evolutionary rates, and numbers of codons that were likely under positive selective pressure in viruses, from countries that vaccinated against HPAI H5N1, relative to those that did not. These countries had carried out unsuccessful vaccination programs, though other countries' programs had been effective. Possible causes for failure were poor vaccine coverage and poor vaccination monitoring. Vaccination against a low pathogenicity avian influenza H6N2 has been done in South Africa since 2001, with a vaccine derived from one of the two original sub-lineages. Viruses of both lineages, detected in 2012 and 2013, were compared with viruses from 2002 and there was a much higher mutation rate in the vaccine strain sub-lineage (Rauff et al., 2016).

Commercially available vaccines include 1) inactivated, adjuvanted whole virus vaccines, 2) recombinant vaccines with HA and (or) neuraminidase (NA) genes inserted into live virus vectors, such as Herpes and Newcastle disease viruses, 3) haemagglutinin DNA administered in a plasmid, 4) haemagglutinin (HA) antigen or virus-like particles grown in insect cells, and 5) defective-replicating alphavirus (da-H5; equine encephalitis virus) with a H5 AI virus gene insert.

Inactivated whole virus vaccines are most widely used, although introduction of new vaccine antigens can be slow and lag behind the development of antigenic changes in field viruses. Inactivated vaccines can

induce a good humoral response but this can be transient and there is poor stimulation of cellular immunity, possibly related to the need to administer them parenterally.

Determinants of vaccine immunogenicity

Antigenic content of an avian influenza vaccine and the adjuvant, as well as antigenic match to the challenge virus, contribute to immunogenicity.

Adjuvants can be added to or built into vaccines to improve their performance in a variety of ways, including increasing the magnitude and duration of immune response. Adjuvants comprise a wide range of chemicals and compounds but a common function is to stimulate the immune system appropriately, to ensure an adequate response to the vaccine's active ingredient. Virus-like particle vaccines can display additional proteins that assist with stimulating the immune cells and ensure a robust response. Mineral oil adjuvants increase antibody production, partly by delaying release if vaccine and prolonging the immune response.

Immune response to a vaccine can also be affected by characteristics or physiological status of the recipient. Examples include sex, age, genetic factors, physiological stress, nutrition and immunosuppression caused by concurrent infection. Environmental factors known to affect immune response in poultry include toxin exposure, water deprivation , excessive heat and cold and overcrowding, and could also affect response to vaccination. Presence of maternally-derived antibodies in young animals can also suppress antibody response to vaccines.

Objectives and associated vaccine specifications (example of California condor vaccination)

The aims of a vaccination program should be defined clearly from the start. Do they include preventing virus transmission, or just disease and deaths? The objectives will then dictate minimum requirements for vaccine candidates, including the magnitude and duration of antibodies elicited in the target species, or closely-related species, and whether these are likely to achieve the desired objective.

As an example, the United States Department of Agriculture's Animal and Plant Health Inspection Service approved vaccination of critically endangered California condors (*Gymnogyps californianus*) (Fig. 1) after twenty-one out of 561 died from high pathogenicity avian influenza in March and April 2023. Approval was granted on the grounds that they are critically endangered, carefully managed and the small population allows monitoring and control of the vaccine. An inactivated vaccine was approved and trials in black vultures, as a less vulnerable species and relatively close relative of condors, were carried out to assess the safety and immunogenicity of the vaccine and the required dosing regimen. Since safety and satisfactory antibody levels were established, trials in a small number of captive condors started in July 2023. However, two doses were required to achieve antibody levels consistent with

Figure 1: The California condor is a critically endangered species vulnerable to avian influenza. (Photo: C. Szmurlo)

protection in 9/10 vultures and only 7/10 of the single-dose group had protective antibody levels (U.S. Fish and Wildlife Service, 2023). In such an endangered population and with probable outside sources of HPAI virus, 70% protection is probably unacceptable and even 90% may be too low. However, the risk that the vaccine will not be completely effective needs to be weighed against the resources required to carry out the vaccine program and the associated risks to the condors (injury, disrupted breeding etc.).

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New publication

Dr Laura Roberts et al. investigated the feasibility of vaccinating African penguins (Fig. 2) against avian influenza by doing a vaccination trial using two different types of vaccines. The study found evidence that vaccination using a tobacco leaf-produced H5 haemagglutinin-based virus-like particle could be a more practical and effective option than vaccination with inactivated whole viruses. The logistical challenges of wildlife vaccination require that the number of doses be minimized and further research should explore mass application methods.

The work was published this month as a short communication in the Veterinary Record. Read the full paper at: https://doi.org/10.1002/vetr.3616 .

Figure 2: African penguin parent and chick (Photo: D.G. Roberts)

Outbreak events

A **Cape fox** came into the town of **Velddrif** on the West Coast and attempted to enter houses. It appeared extremely aggressive, biting inanimate objects in its path, and had saliva and blood dripping from its mouth. The fox was killed and subsequently tested positive for **rabies**. A vaccination campaign was held in Velddrif in response to the case and approximately 120 dogs and cats were vaccinated against rabies.

Six **rock pebblers** (Fig. 3) kept as pets in **Swellendam** died over a two-week period. Samples taken from one of the parrots tested positive for *Chlamydia*, indicating an outbreak of **psittacosis**. The property was placed under quarantine and all remaining birds were treated with doxycycline. The owner was also advised of the zoonotic potential of psittacosis and precautions to take to avoid infection.

***Salmonella* Enteritidis** was cultured from chick box liners on four broiler **chicken** properties around **Worcester** and **Cape Town**. The parent flock is the likely source of infection.

A **horse** died near **Loxton** after showing clinical signs suspicious for **African horse sickness**, including swelling of the head and eyes and frothy fluid coming out of the nostrils.

Eight pet **rabbits** at a school in **Langebaan** died suddenly. The school reported that the rabbits had bloody discharges, so **rabbit haemorrhagic disease** is suspected to be the cause of the deaths.

Figure 3: Rock pebbler or regent parrot (Photo: J.J. Harrison)

Serological evidence of a previous infection with an **H6 low pathogenicity avian influenza virus** was seen after routine testing on an **ostrich** farm near **De Rust**.

A **pig** carcass from a farm near **Paarl** was condemned at the abattoir after lesions characteristic of **erysipelas** were seen on the skin after slaughter.

Two **cows** were treated for **mastitis** in **Genadendal** after clinical signs were seen during routine disease surveillance.

A **ram** recently brought onto a farm near **Vanrhynsdorp** developed dyspnoea and lack of appetite. **Pasteurellosis,** triggered by the stress of transport, was suspected and the ram was treated with antibiotics and anti-inflammatories.

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2023 in review

Surveillance/ field activities

In 2023, the 36 animal health technicians working in the field for Western Cape Veterinary Services made approximately 12000 visits to properties where animals are kept in order to do animal disease surveillance, animal census, farmer education, primary animal health care and disease control.

Rabies (Fig. 1)

Nine sporadic cases of wildlife rabies were seen in various parts of the province. The only domestic animal affected was a goat in the Beaufort West area, likely as a result of contact with a rabid wild animal. Thankfully, no cases of dog rabies were reported in the Western Cape this year.

Approximately 129 000 pets were vaccinated with state-sponsored vaccine in the province in 2023. This took place in the form of rabies vaccination campaigns, routine vaccinations during farm visits and provision of vaccines to animal welfare organisations.

Small stock (Fig. 2)

Eight outbreaks of sheep scab were reported and the infested flocks were treated at least twice under official supervision.

Johne's disease was confirmed on six sheep farms. 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 14 sheep flocks in the Western Cape. All the outbreaks occurred in the high-risk season for vector-borne diseases, between late January and early May.

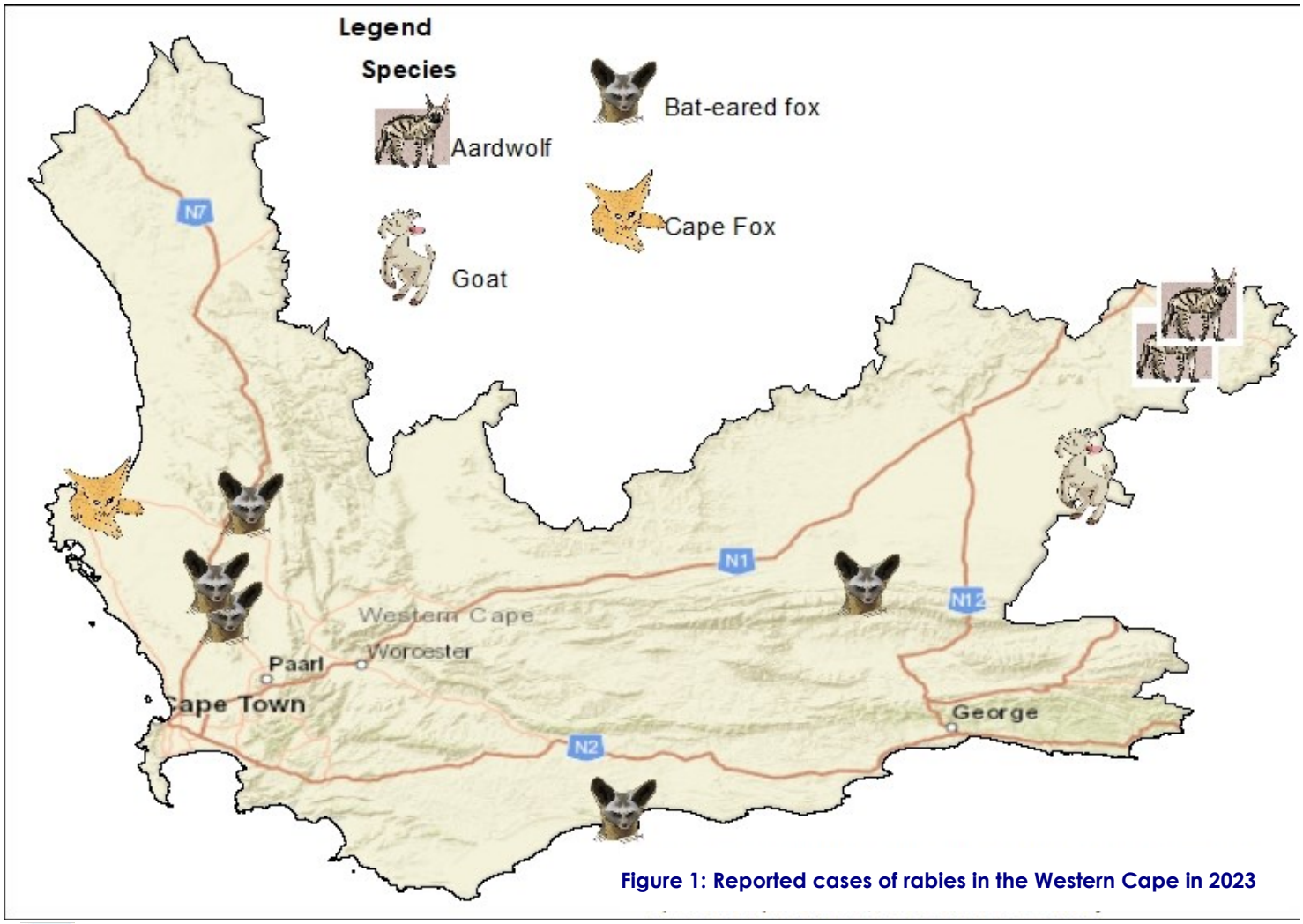

Figure 1: Reported cases of rabies in the Western Cape in 2023

Cattle (Fig. 2)

A cattle herd in the Darling area tested positive for bovine brucellosis in June. After forward and backward tracing were done, another positive herd was detected. The cattle had grazed together two years prior to the detection of infection.

Three cases of lumpy skin disease were reported between January and March.

One animal, in a herd of 32 cattle tested for export purposes, was PCR positive for bluetongue virus. The animal showed no clinical signs of disease and had not been vaccinated previously against bluetongue.

Cases of bovine malignant catarrhal fever (BMCF) were reported from two properties close to each other in the Stellenbosch area. However, the cases were not related, as one property was found to be infected by wildebeest -associated BMCF, from wildebeest kept on a neighbouring farm, while the other was infected by sheep-associated BMCF from sheep kept on the premises.

Pigs (Fig. 3)

Two new outbreaks of African swine fever were detected in Du Noon, Cape Town and Kwanonqaba, Mossel Bay. Both outbreaks were resolved and quarantine was lifted in 2023.

Sporadic cases of erysipelas of swine were reported from 12 different locations in the Western Cape. Lesions were detected most commonly on pig carcasses after slaughter.

Equines

Two cases of African horse sickness were reported this year, both in the infected zone of the province. The first was a horse with clinical signs, confirmed positive with a laboratory test, from the Plettenberg Bay area. Clinical surveillance was conducted surrounding the case and in horses that moved from the area, but no further cases occurred. The second case was diagnosed on clinical signs after a horse died in the Loxton area with swelling of the head and eyes and frothy fluid coming out of the nostrils.

Avian diseases (Fig. 4)

Eight outbreaks of high pathogenicity avian influenza (HPAI) occurred in commercial poultry in 2023, involving seven farms.

Five commercial layer chicken farms in the Paardeberg area, northwest of Paarl, were confirmed infected with H5N1 HPAI in April 2023. The farms all fall within a small area of 6km in diameter and there were only two other

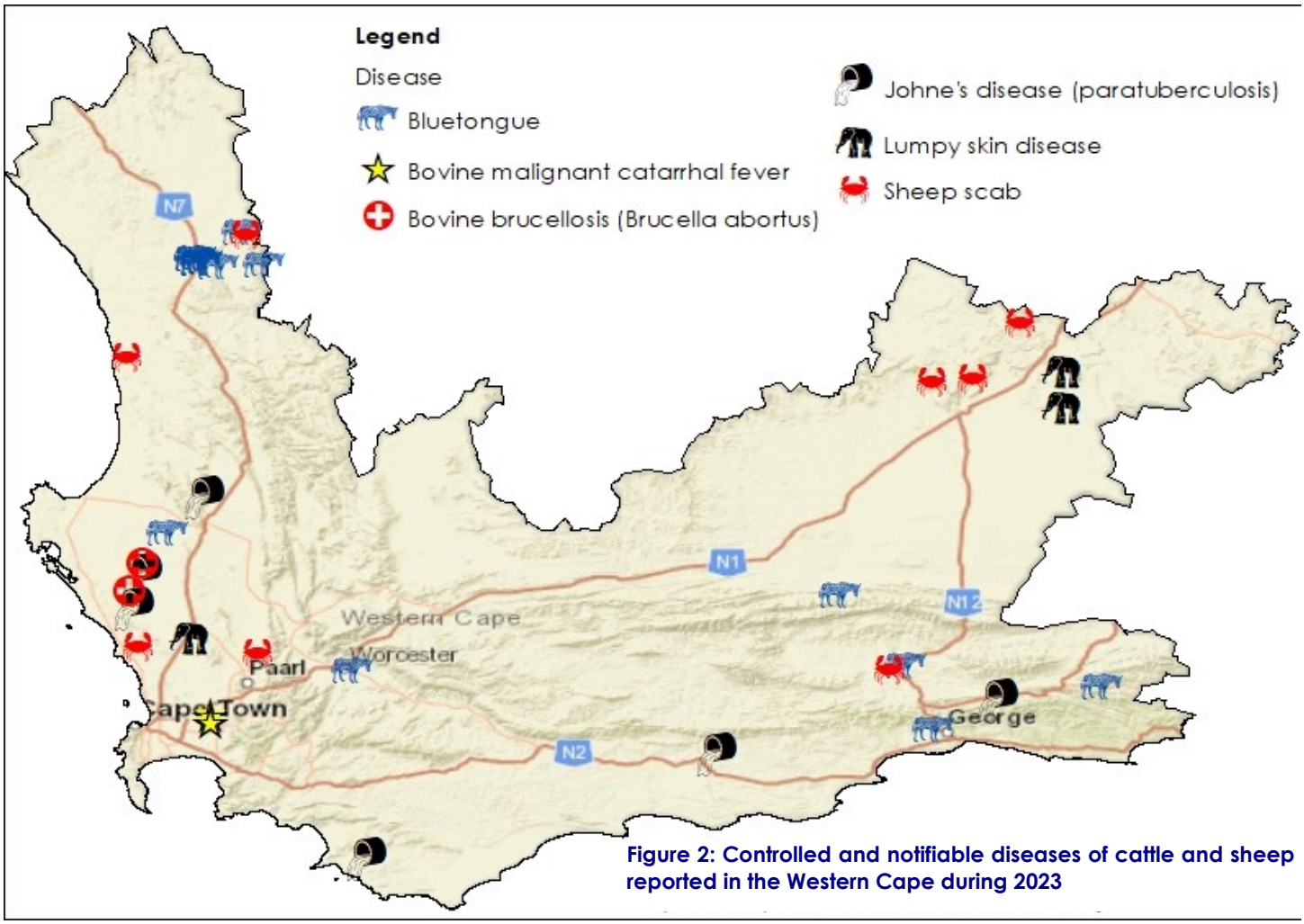

Figure 2: Controlled and notifiable diseases of cattle and sheep reported in the Western Cape during 2023

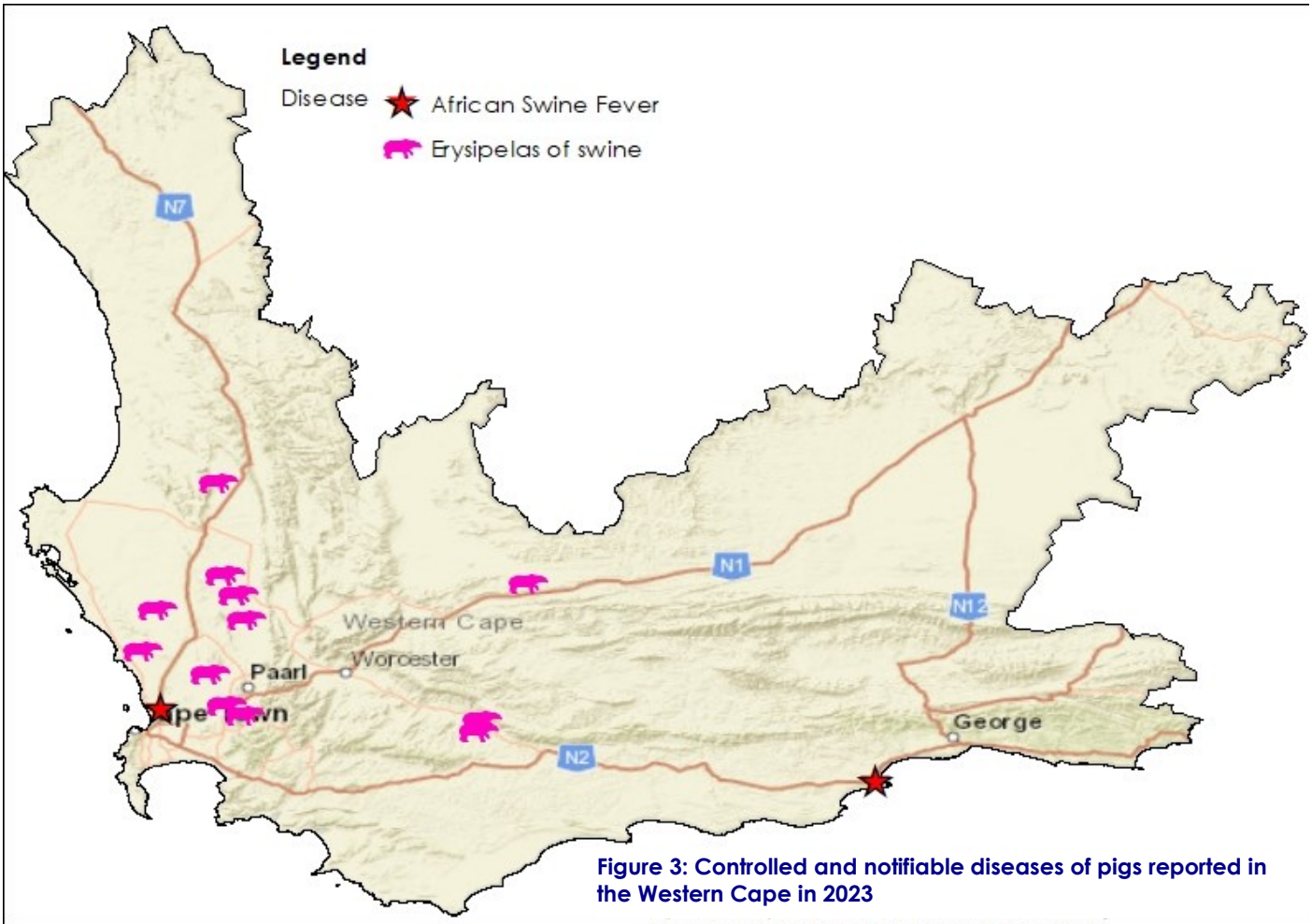

Figure 3: Controlled and notifiable diseases of pigs reported in the Western Cape in 2023

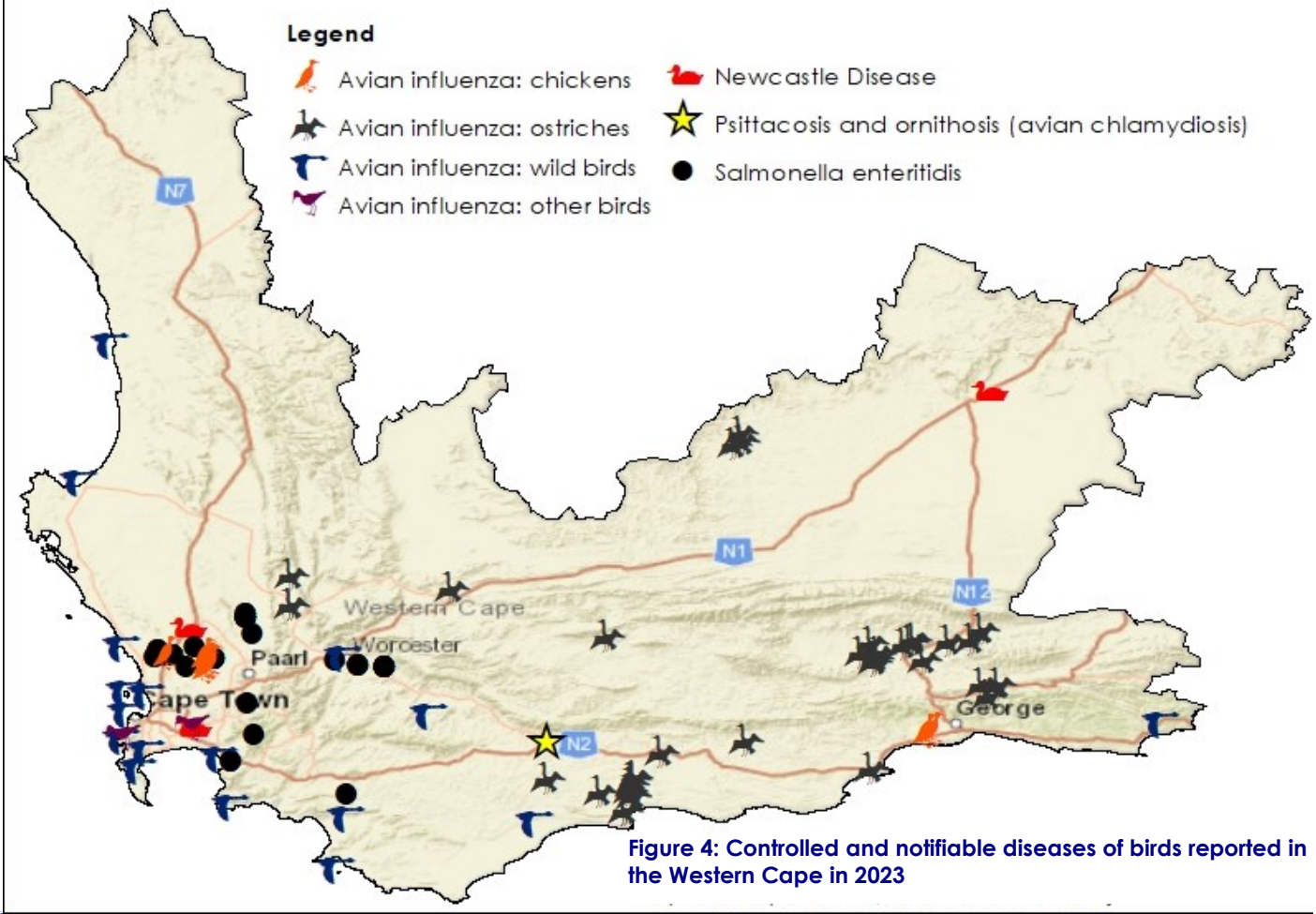

Figure 4: Controlled and notifiable diseases of birds reported in the Western Cape in 2023

poultry farms in the area that were not affected. Genetic sequencing of viruses from four of the five farms was done at the University of Pretoria and preliminary results indicate that most farms were individually infected by wild birds, some more than once, and that there was little spread of virus between farms. The infection on one farm could be linked to a virus detected in a wild goose that was sampled by veterinary officials near McGregor. The viruses are related to those that caused outbreaks in 2021 and 2022 but were introduced to the country more recently.

H5N1 HPAI infection was detected on two more layer farms near George in late May and early June. The first was confirmed to be another introduction by wild birds. Both these farms were also affected by the 2021 outbreak, so appear to have characteristics that predispose them to infection.

The affected farms chose to cull all chickens in the affected houses. Approximately 1.5 million chickens died from HPAI infection or as a result of the culling operations: about 30% of the layer chickens in the province.

One of the layer chicken farms near George restocked with pullets sourced from a farm in the North West Province in September and October. HPAI (H7N6) was diagnosed in pullets on the farm of origin in early October and then in the flock in the Western Cape. To prevent virus spread, all chickens on the farm were culled and destroyed, along with all potentially infectious material. No further H7 virus has been detected in poultry in the Western Cape.

Two of six backyard chickens died on a property near Malmesbury in September. An H5 PCR test was positive but no further subtyping results are available and the remaining chickens remained healthy.

A racing pigeon loft near Cape Town experienced approximately 30% mortality in June and organ swabs tested positive for both pigeon paramyxovirus and H5 avian influenza virus.

Thirty-six ostrich farms were confirmed as avian influenza seropositive in the Western Cape in 2023. For fifteen, the virus subtype could not be determined and eleven appeared to have had an H6 infection, according to serological tests. Two of these farms were also reported to the WOAH as having had HPAI (H5N1) outbreaks and one an H7 infection, based on detections of H5 virus fragments on sequencing, serology and an H7-positive PCR test respectively. A second ostrich farm was reported as having had an H7 outbreak, based on serology, though a low pathogenicity virus exposure is also possible. Eleven ostrich farms in total were reported as exposed to H5N1 viruses, most based on serology,

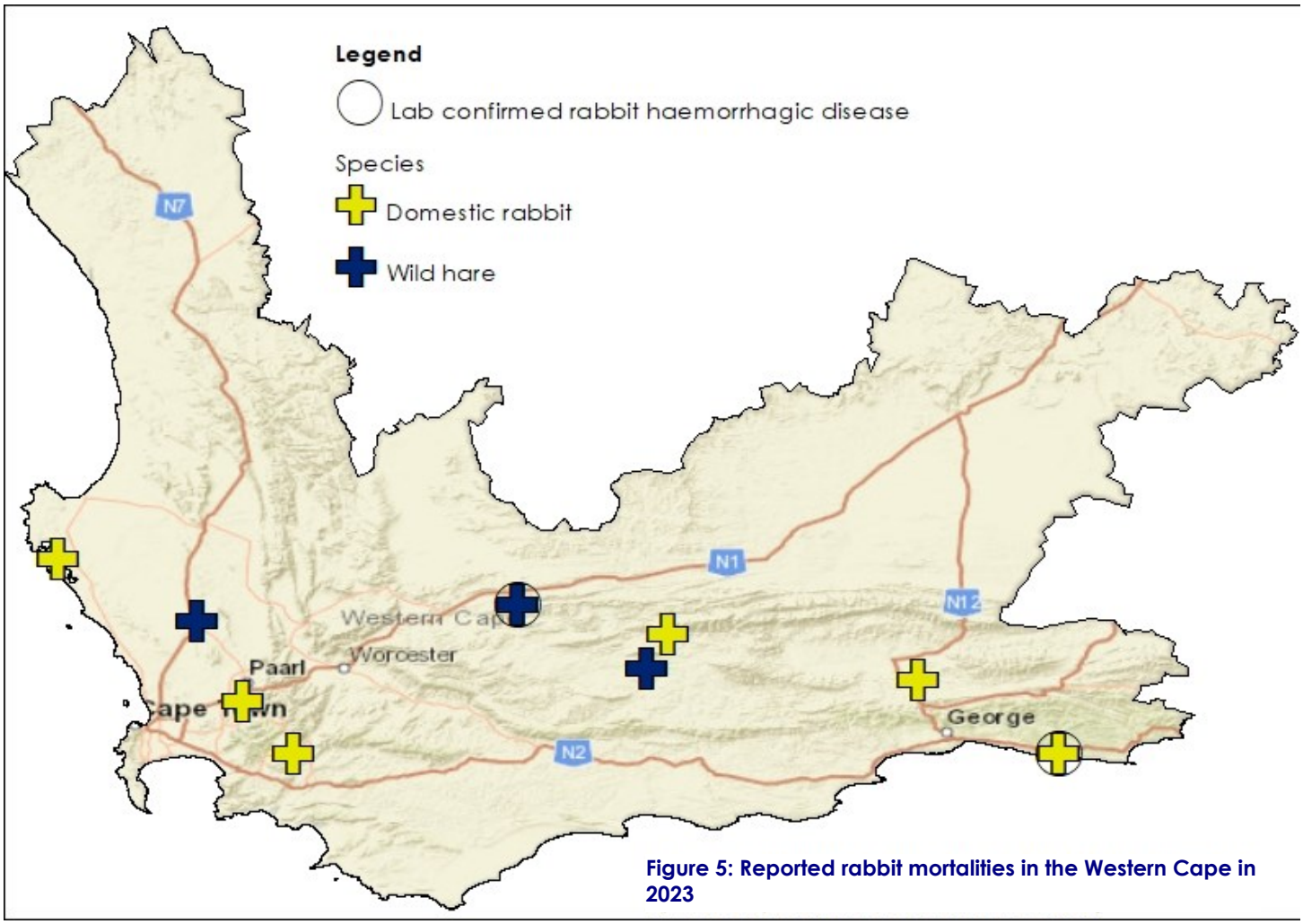

Figure 5: Reported rabbit mortalities in the Western Cape in 2023

though HPAI H5 was detected via PCR on one farm and H5 on a second.

AIV antibody detections peaked in ostriches over winter and early spring, with a third of the detections (12) made in September. The farms with positive H6 serology clustered around Oudtshoorn, though two farms were in the Langkloof. The Heidelberg area was overrepresented, though most infections were of an undefined subtype. Farms with possible H5 infections were relatively widely distributed.

HPAI (H5N1) was detected in wild birds at fifteen locations in 2023, and in seven species: six coastal species and an Egyptian goose. Thirty-nine birds tested positive and most detections were in African penguins (13), swift terns (12) and common terns (7), with an additional 70 suspected swift tern cases, mostly from Simon's Town, and another seven suspected penguin cases from three different colonies. The total observed confirmed and suspected cases is approximately 130.

Outbreaks of Newcastle disease (NCD) caused mortalities in wild guinea fowl near Robertson and backyard chickens in the Beaufort West area.

Psittacosis caused the deaths of pet rock pebblers in Swellendam. All birds at the property were treated with doxycycline.

Salmonella Enteritidis (SE) was detected 53 times on 19 broiler chicken farms during routine testing. The source of the high number of repeat detections is likely an infected parent flock.

Rabbit diseases (Fig. 5)

Nine cases of sudden or extensive rabbit mortalities were reported in the province, raising suspicion for rabbit haemorrhagic disease (RHD). In two of these cases: a wild Hewitt's red rock hare near Matjiesfontein and feral rabbits in Brenton on Lake, the diagnosis of RHD was confirmed by laboratory testing.

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.

Outbreak events

Itching, wool loss and skin lesions were seen in two sheep flocks near **Oudtshoorn** and **Three Sisters**. A diagnosis of **sheep scab** was confirmed when live sheep scab mites were seen in wool and skin samples taken from both flocks. The sheep were treated twice under official supervision.

Approximately 200 **domestic rabbits** kept as pets died suddenly near **Theewaterskloof** dam. No samples were taken to determine the cause of death, but an outbreak of **rabbit haemorrhagic disease** is a possibility.

Swine erysipelas was diagnosed in pigs belonging to a small-scale farmer in **Mamre**, when a photo of a pig showing characteristic skin lesions was sent to the animal health technician.

***Salmonella* Enteritidis** was cultured from routine chick crate swabs taken on a broiler **chicken** farm near **Worcester**.

A **goat** near **Philadelphia** died overnight without showing any clinical signs. A necropsy revealed that the stomach was full of Port Jackson willow (*Acacia saligna*, Fig. 6) leaves, while the rest of the gastro-intestinal tract was empty. **Tannin poisoning** from the leaves is suspected.

Figure 6: *Acacia saligna* leaves and flowers (Photo: Chesna)

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