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EPIDEMIOLOGY REPORT 2020

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VETERINARY SERVICES
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2019 Newcastle Disease Surveillance

Laura Roberts

Active serological surveillance in backyard chickens

Method

As of May 2019, the Western Cape Chicken and Pig Surveillance (CAPS) programme was adjusted to include serology for Newcastle Disease (NCD). Briefly, the CAPS program aims to comply with the national requirement for avian influenza (AI) surveillance, which requires that each province samples at least 50 backyard chicken properties for AI antibodies, every six months.

Blood sampled for AI serology was also tested for NCD antibodies, using the NCD haemagglutination inhibition (HI) test. The owners of the chickens were asked about previous vaccination of the chickens against NCD, as this should cause positive serology, and as is standard for CAPS surveillance, were also asked about any history of deaths or illness in the chickens. If NCD antibodies were detected on a property, the animal health technician (AHT) was requested to return and sample chickens with oropharyngeal swabs for PCR, to test for NCD virus. Sample size was calculated to detect virus if present at a prevalence of approximately 5% or more. The AHTs were also requested to confirm the vaccination and clinical history.

Final presumptive diagnosis in each case was based on vaccination status and clinical signs. The clinical signs according to the OIE Technical disease card for NCD* were used:

Lentogenic NCD strains- subclinical, mild respiratory signs but can be more severe with co-infections
Mesogenic strains- low mortality rate and may cause respiratory disease and neurological signs
Velogenic strains- severe disease with respiratory and/ or nervous signs (tremors, twisted necks, circling, spasms, paralysis). Can also cause swelling and discoloration on heads, diarrhoea, sharp drop in egg production, eggs with abnormal shape or shell and mortality rate can reach 100%

Results

Ninety-four backyard chicken properties were sampled from March to November 2019 (fig 1), for testing with NCD HI. Sampling peaks occurred in May and June (22 and 21 samples respectively) and September and November (17 and 16 respectively).

Twenty-nine properties tested seropositive, of which six had a history of vaccination and no clinical signs. Sample sero-prevalence attributed to infection is therefore 23/95= 24%. Monthly peaks of more than 30% sample sero-prevalence occurred in April and May.

The state vet areas to take the most samples were Malmesbury and Worcester, which roughly matches important commercial chicken areas.

Of the seropositive properties, only six had a history of disease. Two reported deaths only, and no specific clinical signs, but were not re-sampled as follow-up. One reported that egg production ceased and the birds seemed ataxic before death. However, oropharyngeal samples taken at a follow-up visit tested PCR-negative for NCDV. Previous infection with velogenic Newcastle disease cannot be excluded on these three properties.

Another property reported anorexia and diarrhoea, and a carcass submitted for PCR tested negative, as well as oropharyngeal samples taken as follow-up. Carcasses were also tested from the fifth property where the AHT suspected fowl pox and infectious bronchitis. No further testing was done here. The last property reported that the hens were producing abnormal eggs but were also pecking at eggs and that no deaths occurred. Follow-up PCR tests were negative. This property seems unlikely to have been infected with velogenic NCD.

A total of eighteen sero-positive properties (including three with clinical signs, 62%) were revisited and chickens were sampled with oropharyngeal swabs for PCR testing for NCD. All of these PCR tests were negative. It is therefore assumed that these birds contracted subclinical, lentogenic NCDV.

Three properties slaughtered all the chickens before re-sampling was possible (including one with clinical signs) and four were not re-sampled as antibodies were attributed to vaccination. Another three positive

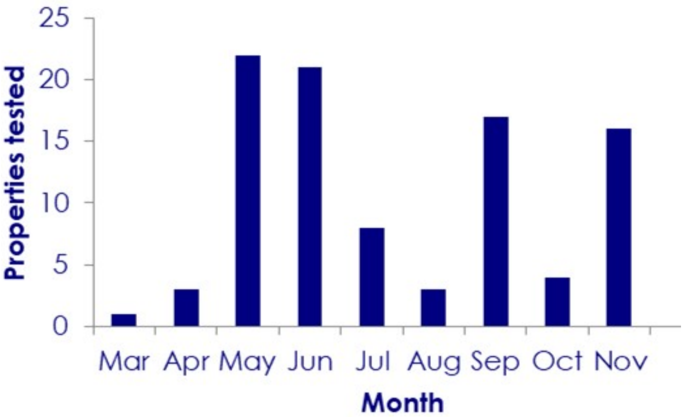

Figure 1: backyard poultry properties tested for Newcastle disease antibodies in 2019

properties were not followed up, with no reason being forthcoming.

Of the total eight properties vaccinated, two were seronegative (HI titres ≤1:16). This suggests that generally, vaccine is being handled and applied properly.

Passive surveillance

Twenty-three reports on PCR testing for NCD in backyard chickens (excluding samples discussed above) were issued by Stellenbosch Provincial Veterinary Laboratory (SPVL) in 2019. Six sets of samples were submitted by AHTs (one concurrently with negative serum) and seventeen by members of the public. One property tested positive for avirulent Newcastle Disease. The history included a suspicion of fowl pox and *Mycoplasma* and a live chicken was submitted for testing.

Three sets of samples from racing pigeons were tested at SPVL. One was positive for pigeon paramyxovirus (PPMV, closely related to NCDV) when tested further and one was negative for PPMV but positive for virulent NCDV. The history on this property included vaccination in response to a suspect NCD outbreak and sampling seems to have occurred after vaccination. It is possible the virus detected here was in fact a vaccine strain but further investigation is required.

Thirty-six reports on PCR testing for NCD in wild birds were issued by SPVL. Nine involved wild doves/pigeons, nine ducks/geese, a pooled goose/ibis sample, two ibises, three blue cranes and a heron, crow, secretary bird, spotted eagle owl and turaco. Five cases were positive for PPMV but the only species involved were doves and pigeons.

Conclusion

It is not possible to draw a definite conclusion about infection with virulent Newcastle disease of backyard chickens in the Western Cape. However, it is certain that infection with some strains is occurring. It will be necessary to sample more actively infected poultry to obtain virus, and therefore to encourage owners to notify the state vet office when illness or mortalities occur. This will be attempted by an intensified awareness program, linked to CAPS and poultry census activities.

Pigeon paramyxovirus is definitely circulating. The effect on poultry in the Western Cape is undetermined, though infection is theoretically possible. However, NCD vaccination should protect poultry against PPMV.

*OIE (2013) Newcastle Disease. Technical Disease Card. Avaiulable at: https://www.oie.int/fileadmin/Home/eng/Animal_Health_in_the_World/docs/pdf/Disease_cards/

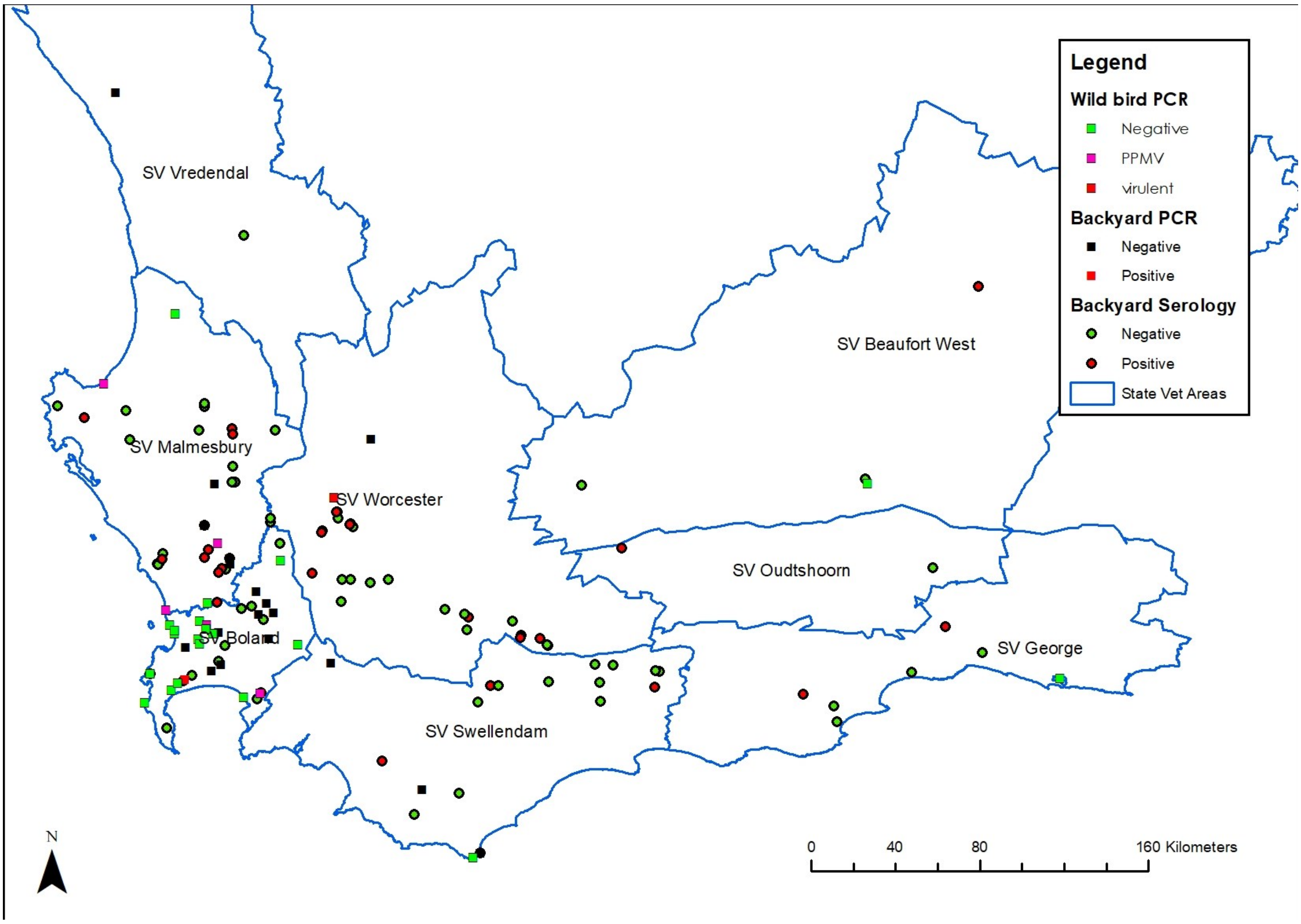

Figure 2: Newcastle disease surveillance in the Western Cape in 2019

Outbreak events

A **cow** slaughtered at an abattoir in Paarl showed multifocal granulomatous lesions on her pleura, lungs and liver. The carcass was condemned owing to suspicion of **tuberculosis**, which was later confirmed on histopathological examination. The cow was traced to a feedlot near **Velddrift**, which had purchased her through an auction at Klipheuwel from a farm near Kalbaskraal. The feedlot and farm have been placed under quarantine pending herd testing at the farm of origin, as well as culture and speciation of the lesions to identify the *Mycobacterium* species responsible. As the lesions are not typical of infection with *Mycobacterium bovis*, it is suspected that this may be a case of *Mycobacterium tuberculosis*.

In **Philadelphia** a **bat-eared fox** entered a farm house and began to attack a mat. The farmer killed the fox before any human or animal contacts occurred and buried the carcass. Unfortunately no samples were taken for confirmatory testing, but a diagnosis of **rabies** was made based on the clinical signs seen.

Sudden deaths of wild **laughing doves** (*Spilopelia senegalensis*) were reported from **Oudtshoorn**, and deaths of laughing doves, **red-eyed doves** (*Streptopelia semitorquata*) and **European starlings** (*Sturnus vulgaris*) were reported from **Hermanus**. Near **Prince Alfred Hamlet**, a racing pigeon hobbyist noticed clinical signs of paramyxovirus in his **domestic pigeons** and vaccinated the flock in response. In all three locations, samples taken from the affected birds tested PCR positive for virulent Newcastle disease and **pigeon paramyxovirus**.

Dead-in-shell **broiler chicks** at a hatchery in the **Paardeberg** area tested positive for ***Salmonella enteritidis***. A *Salmonella* control programme is underway at the broiler breeder farm from which these eggs originated and increased sampling will take place at the hatchery.

Skin lesions of **erysipelas** were seen in a **pig** after slaughter. The pig came from a farm near **Eendekuil** from which a small number of previous cases of erysipelas have been seen after slaughter.

A nine-month-old **pig** was found dead near **Atlantis** after a heatwave. **Oedema disease** is believed to be the cause of death.

Sheep newly brought to the **Vanryhnsdorp** area from Bushmanland in the Northern Cape began showing emaciation, anorexia and death with an initial mortality rate of 3%. On necropsy, **phytobezoars** consisting of small plant fibres were found causing abomasal impaction (fig 3). After changes were made to the feed, the mortality rate decreased.

Milk fever (hypocalcaemia) in a **cow** and **abomasal impaction** in a **lamb** were also reported from the **Vanrhynsdorp** area.

Figure 3: Phytobezoars removed from the abomasum of a sheep post-mortem (Photo: J Kotze)

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The role of the veterinary profession during a pandemic

Lesley van Helden

The novel coronavirus SARS-CoV-2 has gone from a newly emerging pathogen to being the cause of a global pandemic of COVID-19 in the space of just four months. While this is a human disease, transmitted from person to person, the veterinary profession can play a significant role in controlling and mitigating the negative effects of this pandemic.

Be proactive

In South Africa, several cases of COVID-19 have been imported, but there have been no cases of local transmission yet. This is therefore the time to make sure that your household and place of work have plans in place. A plan to prevent cases of contagious human disease should already be put into action, while a contingency plan should be drafted to decide what actions will be taken in the event of community spread of SARS-CoV-2 in South Africa. The World Health Organisation has provided a guidance document on how to do so at https://www.who.int/docs/default-source/coronaviruse/getting-workplace-ready-for-covid-19.pdf?sfvrsn=359a81e7_6

Preventive actions: Encourage good hygiene at home and in the vet practice. All staff should wash their hands frequently using soap and water, especially after contact with other people, before and after eating or preparing food and after going to the bathroom. Surfaces that are touched by many people, such as in the kitchen or in the consult room should be cleaned with disinfectant after each use or between each client . Hand-sanitiser should be available at least at reception desks for staff and clients to use. Staff should know to stay at home if they have symptoms of any contagious disease. Anyone who comes to work sick should be separated from other staff members and sent home as soon as possible. These measures will work to increase the health and productivity of work teams and families at all times, even when there isn't a global pandemic.

Contingency planning: In the case of community spread in your area, every place of work should draft a plan determining what actions to be taken. Decide ahead of time whether any of your staff members are able to work from home and whether your clinic or business will stay open. Plan how you will respond if one of your staff becomes ill or is in contact with a case of COVID-19. Also plan how you will respond if an ill client needs veterinary care for their animals. Consider whether there are telemedicine options available to use for your bona fide clients.

Additionally, make sure everyone at your place of work is familiar with the plan and what actions to take as a result.

Communicate

Vets and paravets generally play an integral role in their communities and are regarded by the public as sources of reliable information. There is therefore significant potential to communicate accurate and useful information to the public.

Pets can provide comfort in times of anxiety, but plans for their care and protection should be made in case of their owners being quarantined or sick. (Photo: L Evans)

Clients should be advised regarding general preventive measures for disease transmission and the importance of developing their own contingency plan, including the care of their animals should they become ill or quarantined.

Questions from the public regarding the risk of their pets getting COVID-19 should be answered with the most current information i.e. that there is no evidence that SARS-CoV-2 causes disease in or can be transmitted by any animals other than humans. In the single reported case of a dog infected by its owner in Hong Kong, the dog showed no clinical signs and the PCR test was weakly positive, meaning that it is unknown if the virus was intact and if the dog would be able to pass it on.

However, in the event of a person becoming sick, common-sense precautions should be put in place by limiting contact with pets. If you must have contact with your pet while sick, wash your hands and wear a mask which you dispose of after use. Pets in contact with sick people may become contaminated with pathogens and can spread illness to other members of the household by mechanical transmission. Both sick and healthy people should always wash their hands after touching their pets.

The public should be pointed towards reliable sources of information, such as the National Institute for Communicable Diseases (NICD) and the WHO to avoid misinformation and sensationalised reporting.

Support

Anxiety and stress lead to both depressed immune systems and irrational behaviour. Reassure members of the public that as long as they are taking reasonable precautions recommended by health authorities, there is no further need to be concerned. Discourage panicking and hoarding of supplies, especially basic necessities and medications that may be needed by others. Reach out to friends, family and colleagues that may be struggling in order to help and encourage each other. Make sure also to take time out for yourself to relax and recharge, and talk to a mental health professional about any issues you may be experiencing.

During times of uncertainty, it is important to maintain a strong sense of community. The actions of every person make a difference in reducing disease transmission, saving lives and protecting the economy.

Resources

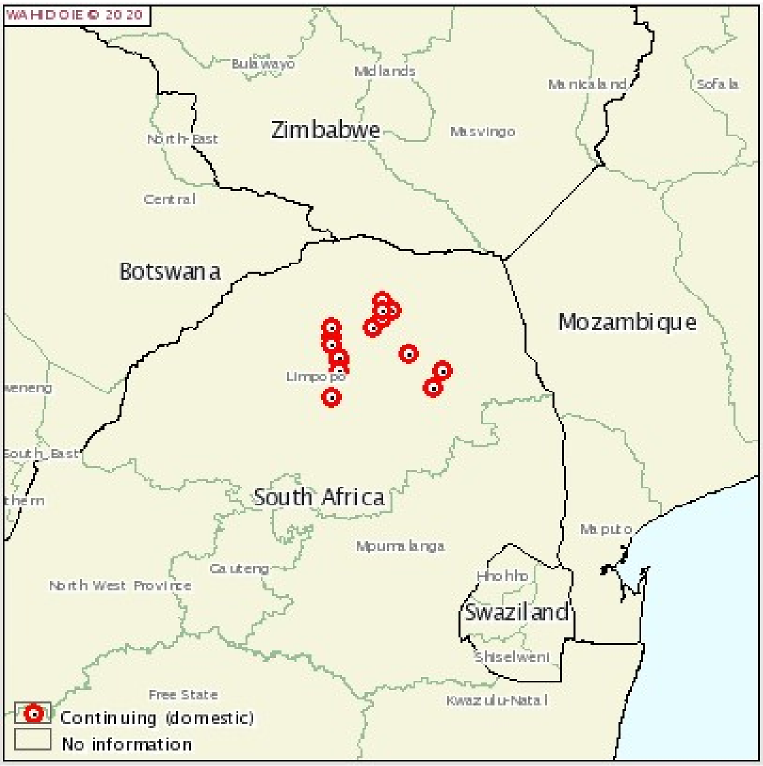
National COVID-19 hotline: 0800 029 999

National Institute for Communicable Diseases South African situation reports, information and advice: http://www.nicd.ac.za/diseases-a-z-index/covid-19/

World Health Organisation advice and information: https://www.epi-win.com/

World Health Organisation COVID-19 global situation reports: https://www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports/

FMD auction ban lifted



On 17 February 2020, the prohibition on gatherings of cloven-hoofed animals to prevent the spread of foot and mouth disease (FMD) was lifted. A total of 19 linked properties were found to be positive for FMD as a result of tracing operations, all within Limpopo Province (fig 1).

The implementation of a biosecurity plan for all properties keeping cloven-hoofed animals , as well as vigilance for any clinical signs of disease in their herds is still encouraged for all livestock producers.

Figure 1: The locations of 19 properties in Limpopo Province reported to the OIE as infected with foot and mouth disease since 1 November 2019, indicated by red circles (OIE, 2020)

African horse sickness movement control 2019

Adapted from the African horse sickness control: Movement report 2019 by J.D. Grewar[1] and C.T. Weyer[1]
[1] South African Equine Health and Protocols NPC

The report below describes various movement patterns of horses and wild equids whose travel is regulated as a result of AHS. The period evaluated is the 2019 calendar year. We differentiate between movements from the infected part of South Africa and those that occur within the AHS controlled area, the latter only where movements occur to a zone of higher control. Wild equid movements are also evaluated as well as more detail on those stepwise movements that required a stopover quarantine period prior to entry into the AHS controlled area.

Permit based movements – infected zone to controlled area

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

Domestic equines

A total of 2014 movement events consisting of 4418 domestic equines, all horses, occurred in 2019, with an average of two equines moving per movement application.

The most horses moved were by far Thoroughbreds, with 48.9% of the total representing this breed. Most horses moved between August and October 2019. The AHS surveillance zone was by far the most common destination (62%) for horses moved.

Figure 2 gives an indication of the primary sources of horses moving into the AHS controlled area. In this case we have categorised the movement by the State Veterinary area of origin. These areas are specifically labelled if 200 or more horses moved from that region during the year. The primary two regions of origin are both in the Western Cape Province, namely the George and Beaufort West State Veterinary areas. These two areas of origin accounted for 42% of all horses moved

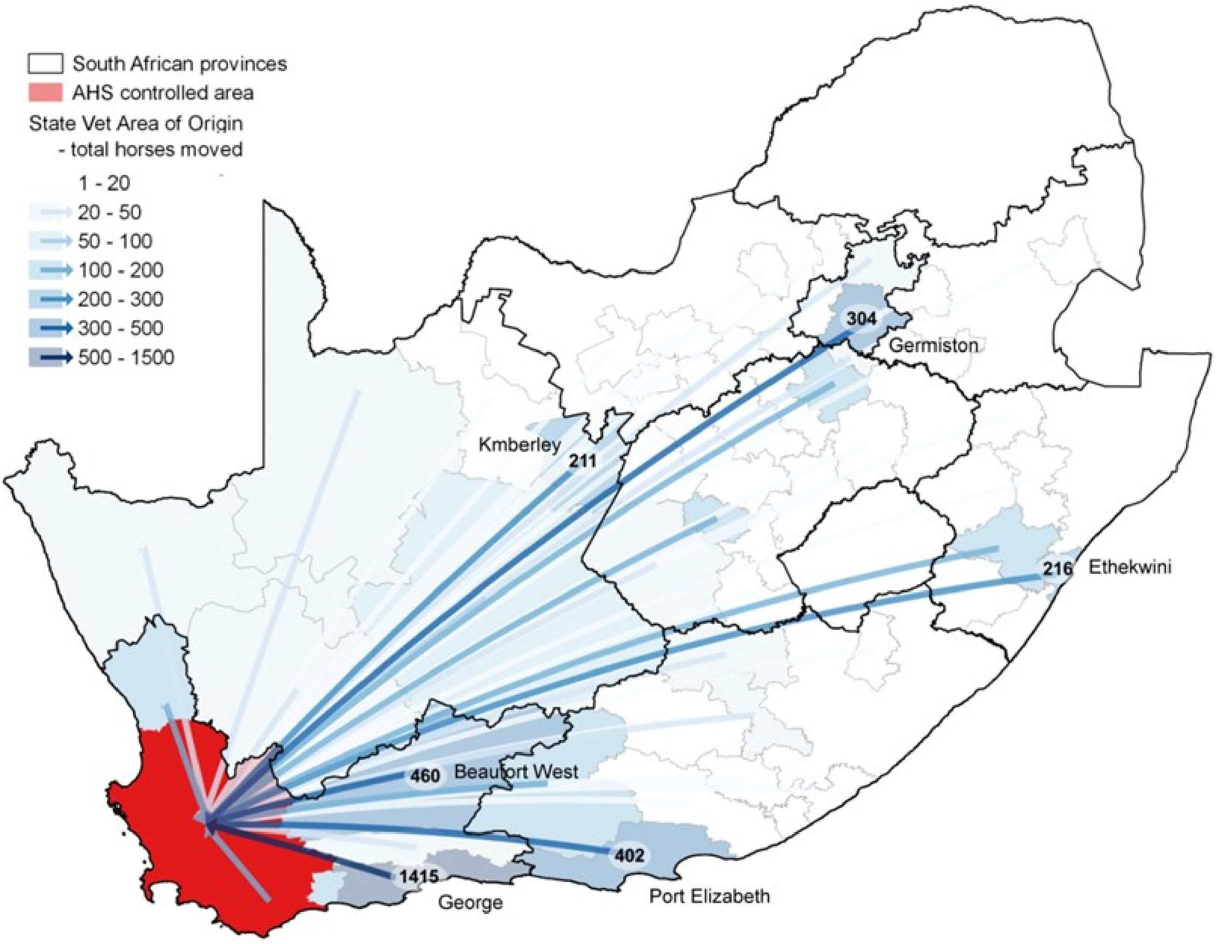


Figure 2: The total number of horses per State veterinary area of origin that moved into the AHS controlled area in 2019. Areas are labelled if more than 200 horses moved from the region during the year.

from the infected area during the year. The six labelled areas in figure 2 accounted for a total of 68% of all horses moved during the year.

A single movement (of a single horse) occurred from outside South Africa into the controlled area where a horse from Namibia moved into vector protected stop-over quarantine in early September 2019. This movement is not shown in figure 2 since the origin was not a South African state vet area.

Stop-over quarantine (SOQ) movements

A total of nine SOQ facilities were used during 2019, two of which are in the AHS controlled area itself (and are hence vector protected stop-over quarantine facilities). 319 horses moved under this protocol, compared to 366 for the previous period reviewed. 36 (11%) horses travelled through the two facilities that were in the controlled area. All stop-over facilities used in 2019 were within the Western Cape boundaries except for the post-import vector-protected quarantine station in Kempton Park.

Wild equids

A total of 26 wild equids (all zebra) were moved into or from the AHS controlled area during 2019. The majority that moved were Burchell's zebra (aka Plains zebra - *Equus burchelli*) and include the zebra associated with the Quagga Project in the Western Cape. One Cape Mountain Zebra (*Equus zebra zebra*) moved, and this was the single animal that moved from the infected zone into the AHS controlled area. The remaining 25 animals that moved were within or out of the controlled area, with the only other movement to a zone of higher control being four zebra that moved from the protection zone to the surveillance zone.

Substantially fewer zebra moved in this 12-month period compared to that of the 2017/2018 AHS season which ran between 1 Sep 2017 to 31 Aug 2018. In that period 118 wild equids moved compared to the 26 moved in 2019. Interestingly, in the period between Sept and Dec 2018, 67 zebra moved, where movement was associated with the AHS controlled area. This would have brought the comparative total between the 2017/2018 and 2018/2019 AHS season closer together. What has changed was the final four months of 2019 where 11 zebra moved in total – this is a drop of 83% compared to the previous year.

Pre-notification only based movements - within controlled area

Within the AHS control area, movements to a zone of higher control require that notification of movement occurs within 48 hours of movement. A total of 3939 horses moved in this fashion during the year. The majority (77%) 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 from the AHS surveillance zone into the AHS free zone on the multiple movement permit system, which is a same day return movement licensing system allowing horses to move in this fashion without pre-notification of movement. The information reported here refers to movements where horses would generally not be returning the same day to their origins.

Discussion

A total of 8362 equids moved to a zone of higher control during the year, which is a 17% increase from the last analysis that accounted for 12 months in 2017/2018. Once again it is clear that the vast majority of movements into a zone of higher control consisted of domestic equids (99.9%) and while it's important to understand wild equid movements, the risk mitigation of AHS spread into the AHS controlled area through domestic equid control remains crucial. The AHS surveillance zone remains the most common zone of destination, both for infected area origin and controlled area origin movements. The majority of movements are associated with Thoroughbred horses, and this breed drives the high areas of origin of Beaufort West and Port Elizabeth where racing and stop-over movements dominate.

Movement regulation requires close communication and interaction between various regulatory and State authorities. Movements originated from 50 of the 126 State vet areas in the country, although only 19 SV areas had more than ten horses move from them during the year. This re-enforces the benefits of centralized movement control.

Stop-over quarantine movements have assisted in facilitating the movement of 319 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 high-level competition) and allows control and an acceptable system for the public needing to move horses. South Africa had a fairly high AHS prevalence during the 2018/2019 season and the extension of suspension periods for parts of the country resulted in higher than normal numbers of horses making use of this system in May. Generally by May most areas in the country are considered low risk for AHS.

Acknowledgements

The South African Equine Health and Protocols NPC have been the authorized permit issuing body during 2019 and provide this service on behalf of State Veterinary services in the Western Cape. Danielle Pienaar, Esthea Russouw, Gillese de Villiers, Marie van der Westhuizen and Johanne Jacobs are responsible for the day to day running of the various movement systems, all supervised by Dr Camilla Weyer.

We are grateful to our State Veterinary colleagues across the country for assisting in the controlled movement of horses, and in particular to State Veterinary Services in the Western Cape, namely Drs Gary Buhrmann, Sewellyn Davey, Christi Kloppers, Edwin

Dyason, Roelof Hugo, Llewellyn Hon and Jaco Pienaar. Furthermore Mr Dawid Visser from Western Cape Veterinary Services Head Office, Mr Nico du Toit from the South African Police Services Stock Theft Unit and Drs Trudie Prinsloo and Aileen Pypers are members of the Western Cape AHS regulatory committee that deals with movement non-compliance. Dr Buhrmann kindly reviewed this report. During 2019 the central auditing of movements was continued by the Department of Agriculture, Forestry and Fisheries and Dr Kerry Loxley has been auditing individual movements in this regard.

We are grateful to all private veterinarians and members of the public who comply with movement control. No cases of AHS occurred in the AHS controlled area during the season and movement control has a large part to play in this.

Outbreak events

Wild **doves** and **pigeons** in the Noordhoek area of **Cape Town** were reported dying acutely after showing neurological and respiratory signs. Samples taken tested positive for **pigeon paramyxovirus**.

An increase in **canine distemper** cases were seen at a dipping day in **Murraysburg**.

Sheep with abomasal sand impaction were seen near **Bitterfontein**.

Rumen flukes, also known as paramphistomes (fig 3) were found in a sheep from the **Clanwilliam** area after slaughter. On investigation, the flock of origin were not showing any clinical signs, but were observed grazing close to a river which was not flowing and therefore contained many pools of stagnant water.

Figure 3: Paramphistomes seen in the rumen after slaughter (Photo: anonymous)

New publications

A report on active surveillance for human infection during the 2017 outbreak of highly pathogenic avian influenza in South Africa was published online by the journal, Influenza and Other Respiratory Viruses, this month.

The paper was co-authored by three officials from Western Cape Veterinary Services: Tasneem Anthony and Michelle Seutloali, state veterinarians from the Provincial Veterinary Laboratory and Lesley van Helden, State Veterinarian: Epidemiology.

Valley-Omar, Z., Cloete, A., Pieterse, R., Walaza, S., Salie-Bassier, Y., Smith, M., Govender, N., Seleka, M., Hellferscee, O., Mtshali, P.S., Allam, M., Ismail, A., Anthony, T., Seutloali, M., McCarthy, K., van Helden, L.S., Cohen, C. and Treurnicht, F.K. 2020, Human surveillance and phylogeny of highly pathogenic avian influenza A(H5N8) during an outbreak in poultry in South Africa, 2017, *Influenza and Other Respiratory Viruses*

https://doi.org/10.1111/irv.12724

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Are diseases invasive species?

Lesley van Helden

When we think of invasive species, the first picture to pop into our heads is probably of alien vegetation choking up waterways, or maybe of an agricultural pest like a borer beetle, causing damage to crops.

Invasive species are commonly defined as organisms that did not occur in a specific area until they were introduced by human activity, and that spread in a way that causes damage to existing ecosystems. Many pathogens thus fit the profile of invasive species just as well as any larger invasive organisms.

Much of the work of state veterinary services involves the prevention and control of diseases designated as controlled disease by law. Many of these diseases are designated as such because they are exotic i.e. have not occurred in South Africa before, and because they have the potential to cause severe harm to natural ecosystems, human health, animal welfare and the economy.

The current global pandemic of COVID-19 is an example that unfortunately illustrates this concept very well. It is, however, not by any means the first introduced disease to have had a profound effect on South African society.

I was privileged to be able to contribute to a chapter in a book published this month, Biological Invasions in South Africa (fig 1). The book details the drivers and impacts of biological invasions in our country, as well as their management and current research. Chapter 10, Pathogens of Vertebrate Animals as Invasive Species (van Helden, van Helden and Meiring), explores aspects of some of the animal and human diseases that have occurred in our country's history.

Some diseases that are introduced never manage to become established, while others move through a susceptible population like wildfire before dying out. A classic example of the latter is rinderpest, which arrived in South Africa in the late 19th century, killing millions of cattle and wild ungulates as it moved across the country. The effects of this disease were numerous on the ecosystem, the agricultural landscape and on the humans who relied on cattle for food, labour and income. For instance, the loss of cattle forced many South Africans to become migrant mine workers, disrupting their previous way of life and leading to many socio-economic and political issues still experienced in our country today.

More insidious damage is caused by diseases that have the ability to establish themselves as endemic when the right set of host, pathogen and environmental circumstances are present. After failure to eradicate the first initial outbreak our resources must be used indefinitely to control the effects of these diseases. For example, many of our veterinary services resources are spent on the perpetual battle against canine rabies.

Previous outbreaks have had profound and lasting effects on our society and environment. That the current global pandemic will change our society is not a question, but it remains to be seen what changes will occur, both within and out of our control.

For those interested in reading the book it is available online (open access) at
https://link.springer.com/book/10.1007/978-3-030-32394-3

Chapter 10 can be read at
https://link.springer.com/chapter/10.1007/978-3-030-32394-3_10

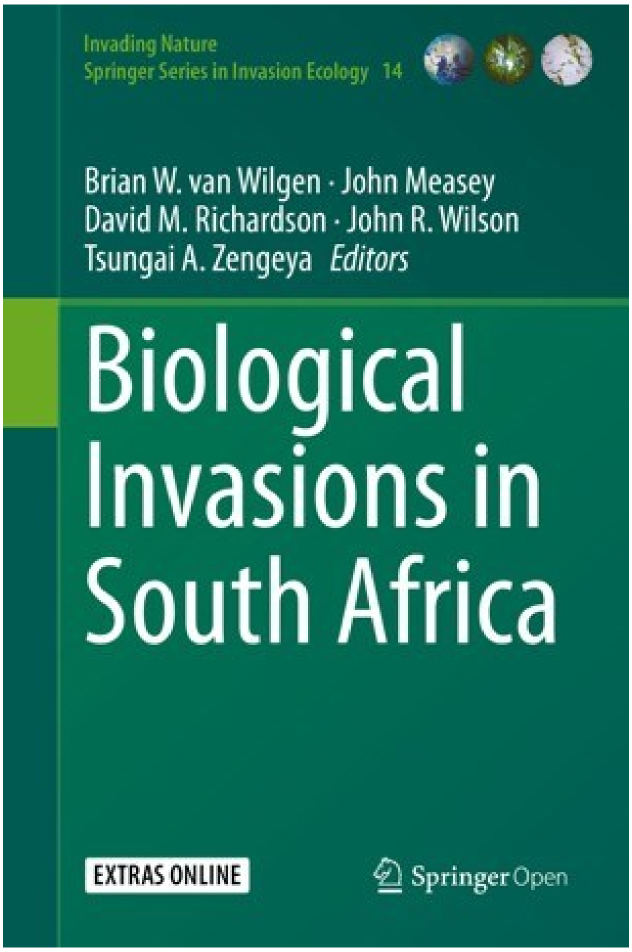

Figure 1: The cover of Biological Invasions in South Africa

Dourine surveillance report

Adapted from the African horse sickness surveillance report: Freedom from dourine, Cape Town Metropole, April 2020 by Drs Aliya Davids and John Grewar

Dourine is a sexually transmitted trypanosomal (*Trypanosoma equiperdum*) disease of equids. Dourine freedom is required for the Cape Town Metropole for horses exported from South Africa to the European Union (EU). This surveillance requirement is over and above the pre-export testing of horses in Kenilworth Quarantine Station (KQS), which is done approximately 21 days prior to export. A freedom from disease survey was therefore undertaken in February 2020 to provide further evidence of freedom from this disease to facilitate the trade of live horses from South Africa.

The disease is considered present in South Africa with an average of 29 cases reported a year between 1993 and January 2018. The Western Cape Province, within which the EU territory of dispatch is located (i.e. the African horse sickness (AHS) free zone), has reported only three cases in this 25 year period, in Paarl, Knysna and Bredasdrop in 1999, 2007 and 2012 respectively.

Export associated testing for dourine has been historically the primary surveillance focus in the current territory of dispatch. The majority of permanent horses in this area are, however, Thoroughbred racehorses in training. This industry has an active dourine surveillance program within its Stud Health Scheme where all maiden and barren mares are tested for a variety of diseases, including dourine. All registered stallions are tested annually prior to the breeding season.

As a prelude to the surveillance described here, two active surveillance events in February 2018 and 2019 where 88 and 95 horses were tested respectively have been performed in the AHS free and surveillance zone using sera from current AHS sentinel animals. No positive cases were detected and these reports are available online at www.myhorse.org.za.

Freedom from dourine infection is required to be shown in the territory of dispatch to comply with EU certification requirements for the export of live horses from South Africa to the EU. This surveillance report focusses on the actual territory of dispatch and shows freedom from dourine at a point in time in the first quarter of 2020.

For the purposes of this surveillance the case definition was based on the complement fixation test (CFT) which was used to screen all selected horses. While information from each horse regarding its sexually active status, its dam and sire and its sex and date of birth were obtained, no positive results were obtained and further follow up and clinical investigation of sampled horses was not necessary.

<u>Survey parameter definitions</u>

Unfortunately the epidemiologic description and published information regarding dourine occurrence is sparse, and survey parameters could not be chosen on well-defined proportions. A single stage random sampling frame was chosen for this survey since:

- the population all occur in a very small area within the greater survey area at risk (see Figure 2)
- they are all horses that are imported into the survey area (no breeding occurs in the survey area to the best of our knowledge) and will come from a variety of different holdings/locations
- planned sexual contact is unlikely between animals and this is true for all establishments in the survey area
- a census level individual horse sampling frame was available

Minimum expected prevalence: In the absence of

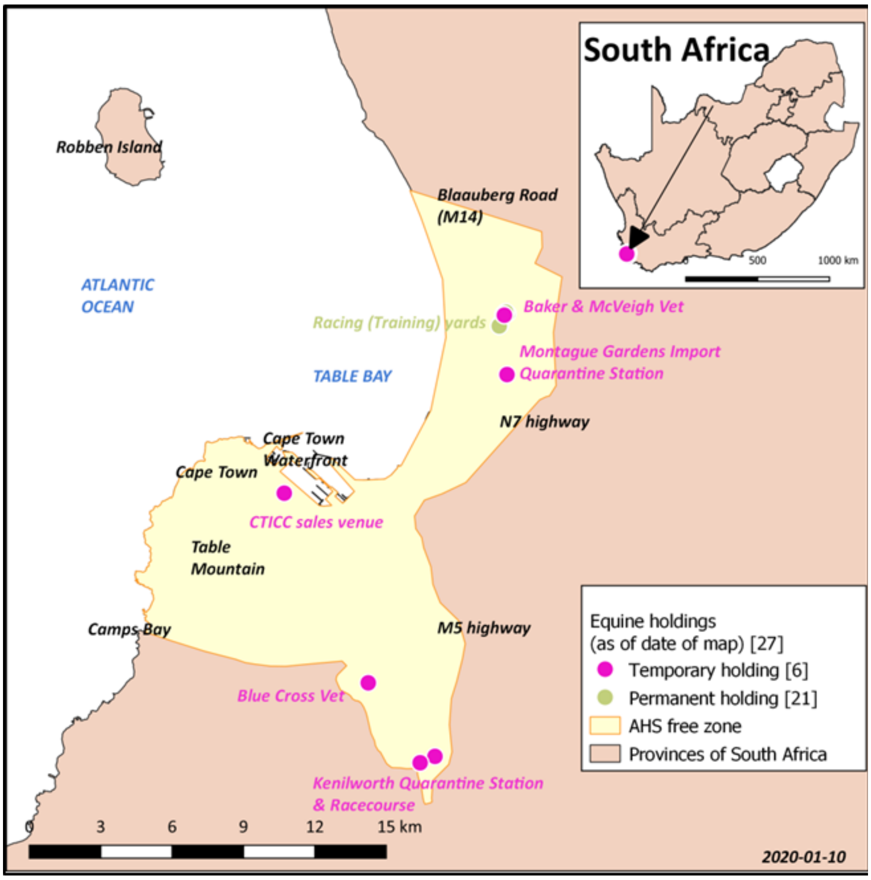

Figure 2: ZA 1 - Cape Town metropole area defined in EU 2018/659 including the initial sampling frame for this surveillance activity

international, regional and trade partner guidelines, the minimum expected prevalence (design prevalence) of 2% of horses was chosen.

Test sensitivity and specificity: The test sensitivity of the CFT has not been explicitly published, particularly in the South African context. Internationally it has been shown that the CFT may be less sensitive than other serological tests for dourine. The CFT has been the global standard for international movement of horses and the sensitivity should be relatively high – a best scientific guess of 90% CFT sensitivity was used to determine the sample size. A test specificity of 100% was assumed since any suspect or positive result would have been followed to a final decision based on the case definition used.

Population-level sensitivity: A type one error rate of 5% was used reflecting a 95% probability level of detecting dourine should it exist within the survey parameters.

Population size: Population data (herd (N=21) and individual horse level (N=636)) were obtained through census derived from existing systems within the Western Cape Province. Census information (on individual horse level) is available since the permanent holdings are part of the existing AHS Multiple Movement Scheme which requires ongoing census updates. The sampling frame was extracted on 10 January 2020. There were 21 holdings with a total of 636 horses. Holdings averaged 30 horses; had a median of 28 horses; and ranged between 1 – 118 horses. Evaluation of the surveillance after it was performed used an updated population census reflecting the changes between January and February when the surveillance was performed.

Random replacement horses were selected from the same holding where pre-selected horses were not available to sample.

Horses to sample calculation: Calculations for the total number of horses to sample were made in EpiTools (Ausvet (Pty) Ltd: http://epitools.ausvet.com.au/) using the "*Sample size to achieve specified population level sensitivity*" option. Using the variables mentioned a sample size of 146 horses was established. The 146 horses in the final sample selection were selected randomly from the outbreak population using a random sample selector, also in EpiTools – "*Random sampling from a sampling frame*", with a simple random sampling strategy, sampling without replacement, and, as mentioned earlier, no stratification or subgrouping.

Results

A total of 145 horses were sampled on 18 holdings across the AHS free zone from 17-18 February 2020. A total of 596 horses were present in the free zone in this period. All 145 samples tested negative for dourine antibody using the CFT (tested at the Agricultural Research Council's Onderstepoort Veterinary Institute). Post-surveillance evaluation was performed and the sensitivity of surveillance was 94.8% with a 95% probability of freedom if a prior probability of freedom of 50% was assumed, and a 99.4% probability of freedom if a prior probability of freedom of 90% was assumed.

A total of 68 of the pre-selected horses were not available for sampling when the survey took place. The majority (n=40; 59%) were not present when sampling took place, with the remainder not sampled for the following reasons: due to race within 7 days (n=11); recently treated by a veterinarian (n=2); trainer not present to give consent (n=9) and unsafe to sample (n=6). Replacement horses were selected randomly.

There were a further three holdings that were no longer training and did not have horses present in February when the sampling was performed. One holding had only one horse in the initial sampling frame and it had not been selected for sampling. In the interim however, a new trainer had started in the Milnerton training yards. A random selection of horses from this yard were used to replace the three holdings that had been selected to be sampled but were not available to sample.

Discussion, considerations and conclusion

We conclude that, if dourine was circulating in the AHS free zone in February 2020 at a level of 2% or higher, we would have been 95% sure that our surveillance would have detected it, and there is a 95-99% probability that the area is free from dourine. This surveillance activity was primarily driven by the definitions of freedom required for trade of equines between South Africa and the EU. The geographical scope of the event was very limited and by default limited to a very distinct population of horses. This underlying population at risk would be low risk for dourine infection as they are young Thoroughbreds in training from a sector of the industry that has a stud health scheme which includes dourine surveillance. This program is just a part of the overall dourine surveillance undertaken in the Western Cape, and adds to the evidence that allows dourine freedom statements to be certified by exporting officials.

The historical case occurrence within the Western Cape Province is very low and cases have not, to our knowledge, occurred within the targeted surveillance area. While cases have occurred in the country, reported cases have occurred sporadically. This situation makes it difficult to establish a minimum expected prevalence to survey for, should dourine exist within the population.

Funding and Acknowledgments

Funding of this project was obtained from the South African Equine Health and Protocols (80% - sampling, logistic and testing costs) and the Western Cape Department of Agriculture (3% - sample kits). Dr Aliya Davids is a compulsory community service veterinarian allocated to the SAEHP for 2020. Her salary costs are covered by the DALRRD (17% of total cost). Administration and client communication was conducted by Marie van der Westhuizen from SAEHP. We are very grateful to the owners and managers of the training horses in the AHS free zone in the Western Cape, for their kind assistance.

Outbreak events

Two **ostrich** compartments in the **Riversdale** area tested avian influenza (AI) sero-positive in November and February respectively. Although the first compartment tested sero- and PCR-negative on follow-up testing, suspicious results from the initial positive test and testing of the positive birds at the abattoir meant that highly pathogenic avian influenza (**HPAI**) could not be ruled out. The outbreak was therefore reported to the OIE.

The second compartment in the Riversdale area showed antibody reactions suspicious for HPAI H5 on a slaughter test but was completely negative on follow-up testing, so has been reported to national Animal Health as resolved.

The slaughter bird group on an **ostrich** compartment in the **Heidelberg** area tested **AI** sero-positive in early January. The initial positive test was suspicious for HPAI H5 but there were no reactions to H5, H7 or H6 antigens on the follow-up test and the younger birds tested negative after the slaughter group was sent to the abattoir. This outbreak is therefore also resolved.

An **ostrich** compartment near **Oudtshoorn** tested AI sero-positive mid-January. Initial antibody tests showed reactions on a wide variety of antigens, including H5 and H6, so the compartment was reported to the OIE as infected with **HPAI**. Follow-up testing showed only low-titre reactions on antigens that would indicate H5 infection and rather suggested a HxN2 infection.

An **ostrich** compartment in the **Mossel Bay** area tested sero-positive for **avian influenza** in late March. The property contains birds older than five months, destined for slaughter. A group of birds was moved onto the farm in early March, but tested negative pre-movement and comes from a farm with a history of other recent negative tests. Trace back testing will be done. No virus has been found in follow-up testing.

Sudden deaths of wild doves were seen in **Cape Town**:

⇒ In Bothasig, several **laughing doves** and **Cape turtle doves** (fig 3) found dead tested positive for **pigeon paramyxovirus**.

⇒ In Kraaifontein, a **Cape turtle dove** was found showing signs of respiratory distress and died shortly afterwards. A necropsy revealed pneumonia and further testing showed the cause of death was **psittacosis**, caused by *Chlamydophila psittaci*. In the past few years, there have been several cases of psittacosis in pet parrots kept outdoors, and it has been suspected that the disease was transmitted by infected wild birds. This case provides evidence of a wild bird infected with psittacosis.

A **bat-eared fox** on a farm near **Darling** showed abnormal behavior when it did not run away from the farm dog or fight back when attacked. The fox tested positive for **rabies**. The farm dogs and cat had been previously vaccinated against rabies and were revaccinated in response to this case.

An emaciated ewe on a farm near **Moorreesburg** was slaughtered and tested positive for **Johne's disease**. The farmer had been noticing the occasional **sheep** becoming emaciated for the past six months. The farm was placed under quarantine and the farmer plans to vaccinate the flock in future.

A **sheep** died of ***Pasteurella*** and two ewes were affected by **pulpy kidney** in **Lutzville**. Two rams were also badly affected by **pasteurellosis** near **Ebenhaezer**.

A **dog** was euthanased as a result of **distemper** in **Beaufort West**.

Many cases of **pig mange** were seen near **Atlantis**.

Red lice infestation was detected in a **sheep** flock near **Caledon**.

Figure 3: a laughing dove (left) and Cape turtle dove (right) (Photos: C Sharp and B Ralphs)

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EPIDEMIOLOGY REPORT

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Animals and COVID-19: what do we know?

Lesley van Helden

As the COVID-19 pandemic continues to develop, new scientific findings are being made every day around the world that help us to learn more about the epidemiology of the virus, SARS-CoV-2.

There is no doubt that the pandemic is being driven by transmission from human to human, and that spread of the disease must be tackled by preventing this. However, as veterinarians, it is important to stay informed regarding the potential role of animals in the origin and transmission of SARS-CoV-2, both for our own efforts to prevent further spread of the disease, as well as to educate the public and dispel rumours and misinformation.

The zoonotic origin of SARS-CoV-2

Although the exact origin of the virus is not currently known (and may never be), the evidence strongly points towards its originally being a zoonotic disease. A coronavirus discovered in intermediate horseshoe bats in China in 2015 is the most closely related virus to SARS-CoV-2 found so far, with a 96% similarity between the genomes. It is therefore likely that the virus originated in bats and may have been transmitted to humans through another species acting as an intermediate host.

Pangolins were identified as possibly involved when a high degree of similarity (97%) was found between SARS-CoV-2 and a pangolin coronavirus in the specific part of the genome encoding the receptor-binding domain. However, the genomes have only an 85% similarity overall, making it unlikely that pangolins were involved as an intermediate host.

Many of the early detected cases of COVID-19 occurred in people who had been to the Huanan Seafood Market, a wet market in Wuhan, China at which a variety of live wild animals were sold. It is therefore believed that the market may have been the location of spillover of the virus from animals to humans. However, the virus was found in environmental samples taken at the market, but not in any live animals there. Considering that several early cases of COVID-19 were not associated with the market, and the lack of evidence of an animal reservoir there, it is not possible to conclude whether the market was the point of origin of the virus or simply a location where the virus spread between people.

The city of Wuhan is a transportation hub with a large human population, so would be an ideal location for the spread of an emerging disease that reached the city from another area.

Regardless of the origin of the disease, we know that currently COVID-19 is a disease of humans. However, the disease does not appear to be exclusive to our species and potential exists for humans to infect other animals. This is known as a reverse zoonosis or anthroponosis.

SARS-CoV-2 as an athroponosis

Reports from several countries have provided evidence of some species of animals being infected by people, as well as animal-to-animal transmission and even cases of the virus being transmitted back to people.

In field settings, infections with clinical signs have been reported in domestic cats, lions and tigers in a zoo and farmed mink. A small number of domestic dogs have tested positive after close contact with infected people but there have been no confirmed cases of clinical signs in dogs.

In laboratory settings, domestic cats, ferrets, golden Syrian hamsters, Egyptian fruit bats, cynomolgus monkeys and rhesus macaques have been

Minks, domestic cats, tigers and lions have all been observed showing clinical signs of COVID-19 after being infected by humans in field settings.

experimentally infected. Dogs, pigs and poultry appeared relatively resistant to infection.

Testing of animals

In most countries, resources required for the testing of people are limited, and testing capacity is sub-optimal. Routine testing of animals should therefore be considered only if it can take place without competing for resources needed for human testing. This testing should also be consistent with the public health goals of the area. The OIE recommends that "Sampling and testing of animals could be considered in situations where the results will inform decision making, animal case or population management, or public health response, or further the body of knowledge on the transmission of the virus."

Testing of individual animals should occur only when there is a clear rationale for doing so, such as suspicious clinical signs or exposure to an infected person. The general public should be discouraged from bringing their pets to their veterinarian for testing, as this is largely unnecessary and increases the risk of disease transmission through contact between people. Additionally, it is currently not possible to test animals in South Africa as there is no available animal test for SARS-CoV-2.

Preventing zoonotic and anthroponotic transmission

While the vast majority of infection risk for all sectors of the population comes from other people, those working in close contact with animals should observe precautionary principles to prevent both human-to-animal and animal-to-human disease transmission. Veterinarians and paraveterinarians should take precautions when working with animals, including wearing personal protective equipment that includes a mask, washing or sanitising hands frequently and avoiding unnecessary close contact with animals. Standard hygiene and biosecurity measures should be strictly observed.

Sanitary and phytosanitary measures

There is currently no evidence that SARS-CoV-2 can be transmitted in animal products or other food. Sanitary and phytosanitary requirements to prevent disease spread between countries in food are therefore not justified in this case. Additionally, unnecessary requirements cause disruption in the food supply chain and can lead to exacerbation of existing problems such as economic damage, food insecurity, malnutrition and food wastage. The OIE is currently developing guidelines regarding sanitary and phytosanitary measures related to COVID-19.

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There is no rationale for imposing sanitary and phytosanitary measures on food products being transported internationally to prevent transmission of COVID-19.

African swine fever update

Three new outbreaks of African swine fever were reported in South Africa within the last month.

Mpumalanga: Outbreaks have been ongoing in Mpumalanga province with five outbreaks still open since September 2019 and one new outbreak reported in the province. All outbreaks have been associated with movement of pigs at auctions or other trade in live pigs.

Free State: A new outbreak was reported in Mafube local municipality, linked to movement of animals from another province where there was an active outbreak.

Eastern Cape: The first outbreak that has been reported from the Eastern Cape occurred in the Amathole district. Unusual pig mortalities occurred in the area and inspection of the affected property was done with samples taken during post-mortem examination of the dead pigs. African swine fever was diagnosed and confirmed by PCR testing. Subsequent investigations by veterinary services officials identified at least two affected villages in the Mnquma local municipality where over 200 pigs have died. The area is home to many free-ranging pigs, making control of the disease using quarantine and biosecurity measures challenging.

Outbreaks that have occurred in the Northern Cape, Gauteng and North-West province since April 2019 are either resolved or in the final stages of surveillance before resolution.

Properties on which there is a suspicion of an outbreak of African swine fever should be quarantined immediately. Samples taken from dead pigs should include spleen and lymph nodes and these should be sent to TAD for PCR testing. Serological testing is not recommended as it is not useful in detecting acute cases of African swine fever.

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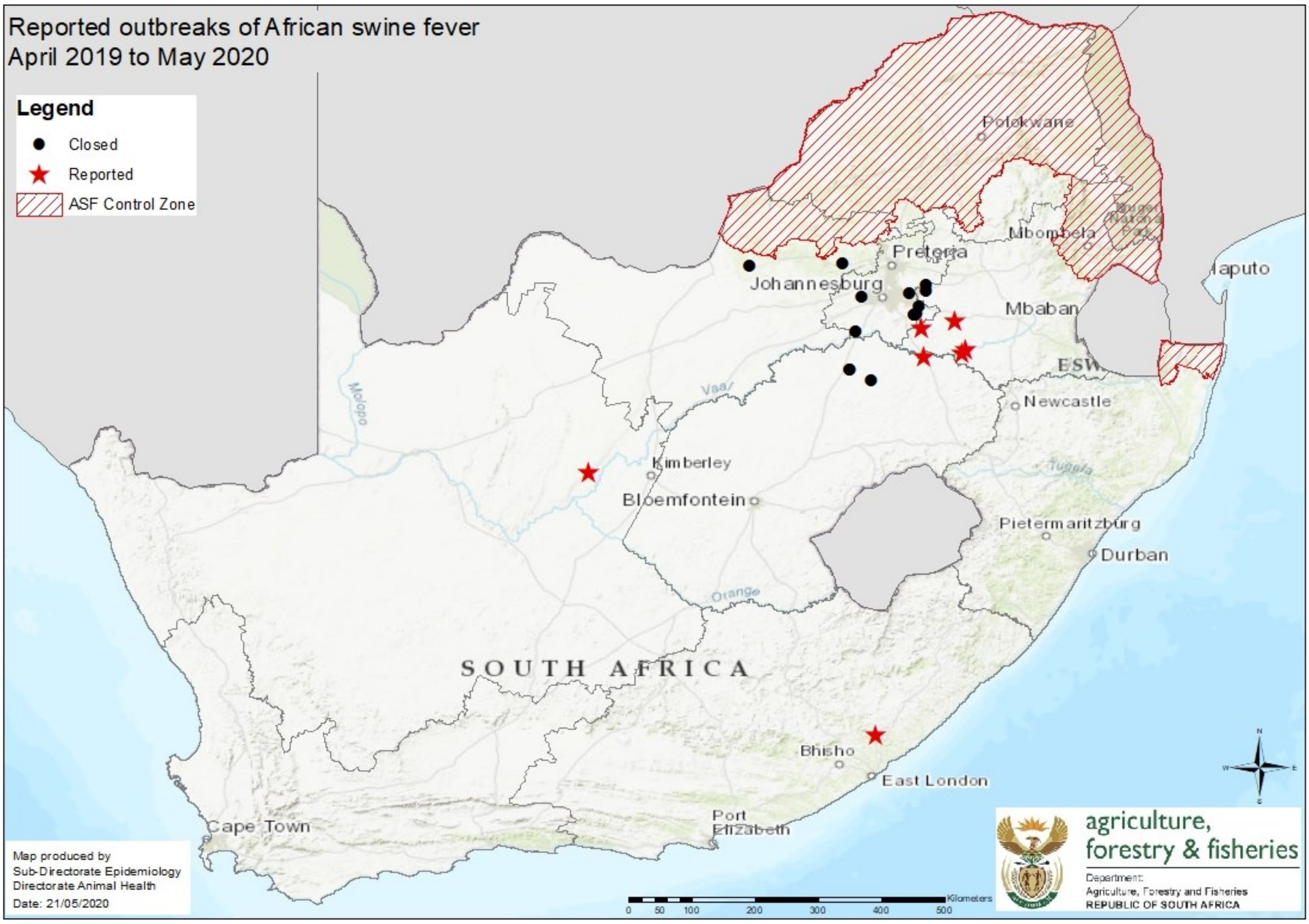

Outbreak events

The owner of a **horse** living on a farm near **Beaufort West** noticed severe acute swelling of the ocular mucous membranes and supraorbital fossae and reported it to the state vet who investigated and took samples. The horse died overnight. Test results were positive for **African horse sickness** (AHS) virus, genotype 7. Increased surveillance in the area detected no other cases of AHS within 30km for more than 40 days after the initial case.

Bluetongue outbreaks in **sheep** were reported from ten different properties in the **Beaufort West** area.

After moving from Worcester to **Porterville** for training, a **stallion** showed nervous signs and had pyrexia. Test results were positive for both **West Nile virus** and **equine encephalosis virus**.

Domestic pigeons kept in **Cape Town** began to die acutely with no clinical signs. Subsequent cases showed green diarrhoea and nervous signs. Samples taken were positive for **pigeon paramyxovirus**, against which the surviving pigeons were vaccinated in response.

Rams that became emaciated near **Moorreesburg** were slaughtered and a diagnosis was made of **ovine Johne's disease**. The affected farm is the neighbor of an already positive flock.

Dead-in-shell chicks at a hatchery in the **Paardeberg** area tested positive for ***Salmonella enteritidis***. On a broiler farm in the same area, boot swabs from a broiler house tested positive. No clinical signs were seen in the **chickens**.

On a farm near **Atlantis**, **chick**-box liners also tested positive for ***Salmonella enteritidis***. Follow-up cloacal swabs tested negative.

Infectious bovine rhinotracheitis was confirmed on a blood test of a Nguni bull near **Piketberg**. The bull was in quarantine on the farm after being bought in from Malmesbury.

A two-year-old Jersey ox near **Kalbaskraal** showed clinical signs of snotsiekte and died a few hours later. PCR testing of blood confirmed sheep-associated **bovine malignant catarrhal fever**. There are sheep on the farm kept separately quite far away from the dairy herd.

Sheep were bought from the Northern Cape in December 2019 to a farm near **Langebaan**. On arrival the sheep were scratching and biting, but stopped after they were sheared and treated once with ivermectin. In April 2020 80% of sheep on the farm started showing signs of pruritis and a diagnosis of **sheep scab** was made. The farm was placed under quarantine and treatment was done under official supervision.

Two **ewes** in **Lutzville** showed clinical signs of **pasteurellosis**. Near **Koekenaap** 40 **lambs** also died of *Pasteurella* infection.

Erysipelas lesions were seen on the skin of **pigs** from **Eendekuil** after slaughter.

Cases of **canine distemper** were seen in **Beaufort West**.

Typical, raised, diamond-shaped lesions of swine erysipelas (Photo: S Swart)

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EPIDEMIOLOGY REPORT

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Epidemiology of animal field infections with SARS-CoV-2

Lesley van Helden

In the April Epidemiology Report we summarised what is known about the potential of SARS-CoV-2 to infect non-human animals. This month we look in a little more detail at the species that have been infected in field settings.

Minks

Minks are farmed in many parts of the world for their fur. Mink farming is currently being phased out in the Netherlands, set to be banned completely by 2024, but several mink farms remain. In April, two large mink farms reported outbreaks of infection with SARS-CoV-2, with increased incidence of respiratory and gastrointestinal clinical signs and increased mortality in the mink herds. Dust and air samples surrounding the farms were taken to test the distance which the virus could spread, and people in the vicinity were advised to keep at least 400m away from the affected farms, but all environmental samples ultimately tested negative. As of 1 June, eight mink farms in the Netherlands have tested positive. Although it is likely that the virus was introduced to the mink herds by an infected person, sequencing of SARS-CoV-2 from the minks and workers on an affected farm indicates that the virus can be transmitted between minks, and at least two people were probably infected by the minks. The Dutch government has made a decision that all infected mink herds will be culled.

Detection of SARS-CoV-2 was more recently reported from two mink farms in the North Jutland region of Denmark. A small number of infected mink were found with no clinical signs or increased mortality in the herd. The Danish government is doing surveillance of 120 mink herds in the country in response.

Mink on fur farms are often kept in high concentrations in houses equipped with battery cages. (Photos: A Nowicka and tsaiproject)

Domestic cats

The first report of a positive SARS-CoV-2 PCR from a cat came from a pet whose owner returned to their home in Belgium from Italy and became ill with COVID-19 shortly thereafter. The cat was asymptomatic, but viral RNA was found in samples of faeces and gastric fluids. Eleven more PCR-positive cats have since been detected in Hong Kong (1), USA (3), France (2), Spain (2), Germany (1), the Netherlands (1) and Russia (1). All feline cases had close contact with probable or confirmed human COVID-19 cases. Some of the infected cats showed respiratory clinical signs, while others showed no clinical signs.

Additionally, limited serological studies show evidence of infection of domestic cats. The Netherlands reported that seven of 24 farm cats kept in the vicinity of infected mink herds showed presence of virus neutralising antibodies. There have also been preliminary reports of small antibody surveillance studies in cats and dogs in Wuhan, China, indicating that pets were infected with SARS-CoV-2.

Big cats

At the Bronx Zoo in New York City, USA, five tigers and three lions were kept in two enclosures. In April, one of the tigers developed a dry cough and wheezing. She was isolated from the others, but subsequently three more tigers and three lions developed dry coughs and inappetence. All eight big cats tested PCR positive for SARS-CoV-2, with one of the tigers remaining without clinical signs. They are believed to have been infected by zoo staff as they have all been at the zoo for a long time with no new additions, although the virus may have also been transmitted between the big cats. All are currently recovering well and no clinical signs were seen in any other zoo animals.

Domestic dogs

The first dog that tested positive for SARS-CoV-2 was a 17-year-old Pomeranian in Hong Kong. Its owner was a COVID-19 patient hospitalised in February 2020. Three successive samples of saliva and nasal secretions were taken from the dog in February and March and small amounts of viral RNA were found in all of the samples. A blood sample taken later showed presence of virus-neutralising antibodies, meaning that the dog had developed an immune response to SARS-CoV-2. The dog died in March 2020, shortly after being released from an isolation facility, but this was attributed to old age with concurrent heart and kidney failure, as it had never shown clinical signs consistent with COVID-19.

Another dog in Hong Kong, a German shepherd, tested positive for SARS-CoV-2 in March, also without any clinical signs. Viral sequences from its sick owner and the dog were identical, indicating that the dog had been infected by the owner. The other dog in the household remained negative.

In the USA, one German shepherd in New York tested PCR positive and had virus neutralising antibodies for SARS-CoV-2, as well as respiratory clinical signs. Another dog in the same house also tested positive for antibodies, but showed no clinical signs. These dogs belonged to an owner who was sick with COVID-19.

The three examples above are the only dogs worldwide that have been confirmed positive by detection of viral RNA so far. An earlier report of a dog testing positive in North Carolina, USA, in April was found to be negative on confirmatory testing.

A bulldog with respiratory clinical signs tested positive for virus neutralising antibodies (but negative on PCR) in the Netherlands. A single dog (of nine tested) was also found antibody positive during a survey of pets belonging to COVID-19 patients in Wuhan.

Pets' infection risk

With over ten million human cases of COVID-19 confirmed worldwide as of the end of June 2020, the comparatively tiny number of cases detected in animals is an indication of the very low significance of the role that animals play in transmission of the virus.

This is further demonstrated in a limited capacity by a pre-print study of 21 pet dogs and cats belonging to a group of French veterinary students, most of whom tested positive or showed clinical signs of COVID-19. Despite close contact with their owners, none of the pets tested positive for presence of viral RNA or neutralising antibodies of SARS-CoV-2.

Current evidence shows that pets do not play a significant role in the transmission of COVID-19.

Nonetheless, precautions should be taken to prevent transmission of the virus between humans and animals in order to prevent the establishment of SARS-CoV-2 in any other species. People suffering from COVID-19 should isolate themselves from their pets as much as possible and observe strict hygiene measures when feeding or caring for them if they are the sole caretaker.

If it is suspected that an animal is infected with SARS-CoV-2, it should be isolated from other animals and people in the same way that an infected person should be isolated. A veterinarian should be consulted to rule out other diseases which may be the cause of any suspicious clinical signs.

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Outbreak events

Outbreaks of **bluetongue** were reported in **sheep** from 18 properties in the areas of **Vredendal** (1), **Vanrhynsdorp** (1), **Murraysburg** (5), **Nelspoort** (3), **Prince Albert** (4), **Merweville** (3) and **Leeu-Gamka** (1).

A low on-farm incidence of **lumpy skin disease** was reported in **cattle** herds from three properties near **Riviersonderend** and one near **Darling**. Some of the affected farmers had previously vaccinated some of their animals, but all vaccinated the remainder of their herds in response to the outbreaks.

An **ostrich** farm in the **Riversdale** area tested **avian influenza** (AI) seropositive. Low titre reactions on H5N6 and H5N8 antigens were confirmed as negative by two rounds of follow-up testing. PCR tests were negative, indicating a lack of AI virus at 5% prevalence or more, and serology showed an absence of H5, H6 and H7 antibodies, though ELISA reactions persisted. The ostriches are kept on pastures and wild birds were present at dams and in the ostrich camps.

Wild **yellow-billed ducks** on a farm near **Stellenbosch** showed nervous signs and high mortality. Samples take from the carcasses tested PCR positive for **avian influenza**, but negative for H5 and H7. Sequencing is underway to try and identify the AI virus present. Chickens kept on the property were sampled and tested AI negative.

A **bat-eared fox** was seen on a farm near **Paarl** showing no fear of humans. The fox was darted and euthanased by a private vet. The fox subsequently tested positive for **rabies** and dogs and cats within a 3km radius were vaccinated in response. Another rabid bat-eared fox was seen during the day near **Mooreesburg** and was found dead the next day. All dogs on the farm had up-to-date rabies vaccinations already, owing to previous cases of rabies on this property.

Johne's disease was diagnosed on **sheep** farms near **Tulbagh**, **Caledon** and **Bredasdorp** after emaciation was noticed in some sheep. All three farmers plan to manage the disease using vaccination.

Salmonella enteritidis was cultured from routine samples taken from four **chicken** farms in the **Malmesbury** and **Boland** state vet areas: three from chick-box liners and one from dead-in-shell chicks.

Mortalities of wild **laughing doves** (*Spilopelia senegalensis*) in **George** were reported. Unfortunately no samples could be obtained, but the cause of death is **suspected** to be an outbreak of **pigeon paramyxovirus**.

Infectious bovine rhinotracheitis was confirmed in a dairy **cow** near **Klipheuwel** by means of ELISA.

Itching **sheep** were reported from a farm near **Vanrhynsdorp** and another near **Malmesbury**. In both cases, presence of **sheep scab** mites was found. In one of the flocks, the new, infected sheep had been quarantined on the farm on arrival, making treatment of the problem much easier. In the other flock, new arrivals had been mixed with the existing flock after a single treatment with ivermectin. A mixed infection of red lice and sheep scab was found and the entire flock had to be treated under supervision as a result.

Milk fever and **prussic acid poisoning** in **cattle**, **pasteurellosis** in a **goat**, and **mastitis**, **redgut**, **navel ill**, **sand impaction**, **ketosis** and **white muscle disease** in **sheep** were reported from the **Vredendal** and **Vanrhynsdorp** areas.

In the **Beaufort West** area, **mastitis** was reported in **goats** as well as **suspected cardiac glycoside poisoning** in **sheep** and **sarcoptic mange** in **dogs** coming to be dipped at the CCS vet clinic in Beaufort West.

Mastitis was reported in a **cow** near **Riviersonderend**.

A yellow-billed duck, *Anas undulata* (Photo: D Daniels)

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Avian influenza surveillance in Western Cape ostriches: 2018-2019

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Introduction

The aim of this report is to demonstrate the extensive avian influenza (AI) testing of ostrich farms in the Western Cape in 2018 and 2019, recent improvements in typing viruses detected and the challenges experienced when interpreting serological findings. There is an urgent need to establish whether the 2017 clade 2.3.4.4 highly pathogenic avian influenza (HPAI) H5N8 virus is still present in South African poultry (ostriches included). Over 80% of populated ostrich farms in the province were tested each year, with only breeding farms and birds being excluded. A variety of low pathogenic (LP) viruses have been detected and sequenced in ostriches in the last two years but HPAI H5N8 has not been sequenced or isolated in any species since June 2018. Continued serological reactions in ostriches have created doubt, but this report will demonstrate how inconsistent these reactions have been on individual farms and why other reasons for these reactions should be explored.

Background

Routine surveillance for AI in South Africa is necessary to allow detection of highly pathogenic (HP) strains 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. The HP strains have historically only been those with hemagglutinin (H) surface proteins denoted H5 and H7, so surveillance prioritises detection of these serotypes.

Ostriches are susceptible to infection with avian influenza virus (AIV), but clinical signs are very variable. Farms are therefore tested at least every six months by animal health officials but also within the 21 days before any movement or slaughter, and after moving to a new farm. Breeder ostriches and ostriches younger than six weeks are currently exempt from this testing. This routine testing involves serology on a sample of birds designed to have 95% confidence of detecting at least one bird with influenza A antibodies if antibodies are present in a flock at 10% prevalence or more. This equates to a maximum of 30 samples per separate epidemiological group on the farm. Epidemiological groups are designated as birds in different age groups (younger than five months or older than five months) or birds that may be in the same age group but are separated by more than 500m.

Three laboratories are used for testing for avian influenza on Western Cape ostrich farms. Generally, the NOSA laboratory (previously Deltamune, until December 2019) in Oudtshoorn is used for most routine surveillance testing. The Stellenbosch Provincial Veterinary Laboratory (SPVL) and ARC-Onderstepoort Veterinary Research (OVR) laboratory are used for sampling farms that have tested positive during surveillance.

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. H6 antibodies are of interest because some H6 viruses cause losses in commercial poultry in South Africa. Two antigens with the same haemagglutinin (H) type but different neuraminidase (N) types are used in AI HI testing, either in parallel or in sequence (in the latter case, the second antigen is only used if the first is positive). If both tests using antigens of the same H type are positive, it is an indication that the antibodies were produced against a virus of that H type. Antigens with different N types are used to eliminate the effects of non-specific inhibition of agglutination caused when the H antigen and serum in the HI test have the same N subtype. According to the OIE Manual, "HI titres may be regarded as being positive if there is inhibition at a serum dilution of 1/16 (2^4 or $\log_2$ 4 when expressed as the reciprocal) or more against 4 HAU of antigen."

Owing to the differences between "older" H5 clades and "newer" clade 2.3.4.4 H5 viruses, separate pairs of H5 antigens have been used to screen for antibodies

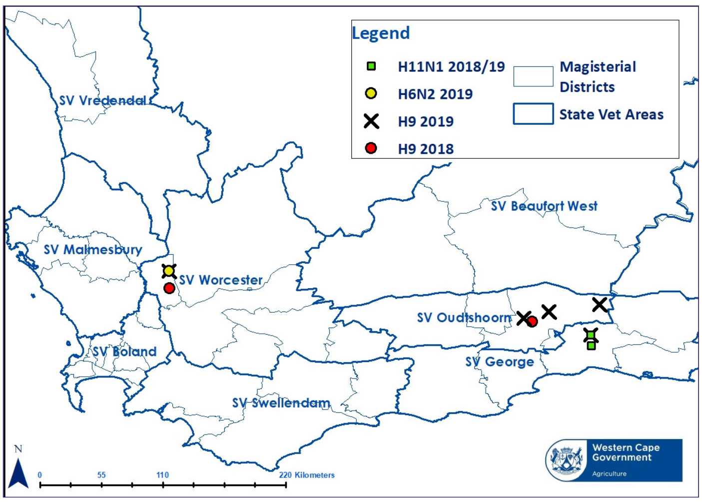

Figure 1. Results of AIV sequencing on Western Cape ostrich farms in 2018 and 2019

against the different groups of H5 viruses since September 2019, in South Africa. H5N1 and H5N2 antigens screen for the "older" viruses and H5N6 and H5N8 for the clade 2.3.4.4 H5 viruses.

A farm where serology results in a positive ELISA test should be retested as soon as possible, sampling serum and tracheal swabs for detection of viral RNA via PCR (polymerase chain reaction) with a sample size aimed at detecting at least one bird with antibodies and avian influenza RNA if present at 5% prevalence or more. This equates to a maximum of 60 samples per epidemiological group. The aim has been to test the farm as soon as possible after positive serology and a second time after approximately a week.

Samples that are PCR positive for avian influenza RNA must then be screened further for H5 and H7 RNA, using more specific PCR tests. If these tests are negative, some laboratories are able to also screen for H6 viral RNA. Otherwise, RNA sequencing is required to determine the subtype. Viral isolation is desirable to study a virus in detail but successful sequencing is rarely achieved from ostrich tracheal swab samples.

Table 1: Age group composition on Western Cape ostrich compartments (* Tested with ELISA)

Compartment type	2018	2019
Hatcheries	23 (7%)	24 (7%)
Breeder-only	38 (11%)	40 (12%)
Breeders & other age groups*	148 (45%)	130 (40%)
No breeders*	87 (26%)	96 (30%)
Null census	31 (9%)	33 (10%)
Only small chicks and breeders	4 (1%)	-
Total compartments	331	323

AIV detection via PCR in 2018 & 2019

There were twenty PCR positive events in 2018 (8) and 2019 (12), on 16 of approximately 230 farms tested.

Three **H5N8** detections occurred. The last detection supported by serology was in January 2018, in the Oudtshoorn magisterial district and the farm had been PCR positive since late October 2017. The next detection on 14 March 2018, on a farm already quarantined for H5N8 since 2017, was not supported by any antibody detection and the most recent detection in October 2019 was unsupported by HP H5 PCR typing, sequencing or serology.

One property in January 2018 only tested positive on the **N8 PCR.** It showed no H5 antibodies except H5N8 but also had reactions on both H6 antigens.

Between September 2018 and September 2019, five farms tested positive on **H6 PCR**. Three, detected in May and September 2019, had non-H6 viruses sequenced in the same period and two of these, where serology was done, did not have consistent H6 cross-reactions.

There has been one detection of **low pathogenic H5N2** RNA in November 2018 in the Riversdale district.

Of the remaining events ten events that were **only AIV positive on PCR**, six were associated with successful sequencing. This leaves a total of six of 20 AI events (30%) un-typed, if the questioned H5N8 results are included; four in 2018 and two in 2019 respectively.

AIV RNA Sequencing in 2018 & 2019

Sequencing has been achieved on AIV from **eight ostrich farms, in ten separate events,** occurring between August 2018 and November 2019**.** Deepest appreciation must be expressed here to Prof. Celia Abolnik (University of Pretoria) and Dr Lia Rotherham (ARC-OVR), for their efforts in this regard.

Viruses sequenced were H11N1, H6N2, undefined H9, H9N2 and H9N8 (fig. 1).

The two farms infected with **H11N1** are in the George magisterial district, 10km apart and were infected nine months apart in September 2018 and June 2019.

The first detections of **H9** viruses were in August 2018 in the Tulbagh district and approximately 280km away, in the Oudtshoorn district. The N types could not be determined.

The first **H9N2** was detected in August 2019 in the George district on the farm with H11N1 in 2018 and the second was in September, 30km north, in the eastern area of the Oudtshoorn district. The next was found in October 50km to the west. The latest H9N2 was detected in November 2019, also from the Oudtshoorn district but 15km back towards the northeast.

The **H9N8** virus was detected in the Tulbagh district in August 2019. The NA gene of the H9N8 appears closely related to an H3N8 virus detected in Europe in 2007.

The **H6N2** virus was detected in the Tulbagh district on the same farm as the H9N8 in October 2019.

Table 2: Number of ostrich farms tested with avian influenza serology annually in the Western Cape and positive results (* Estimated)

Year	Tested	ELISA positive	Newly positive	% positive
2013	279	38	19*	7
2014	275	39	22*	8
2015	297	73	48*	16
2016	284	61	23*	8
2017	263	79	50*	19
2018	236	75	44	19
2019	226	44	33	15

Challenges with AI serology

The main AIV of interest currently, given the 2017 outbreak, is HPAI H5N8. The 2017 outbreak in South Africa has not yet been resolved, mostly due to persistent serological reactions to both the H5N6 and H5N8

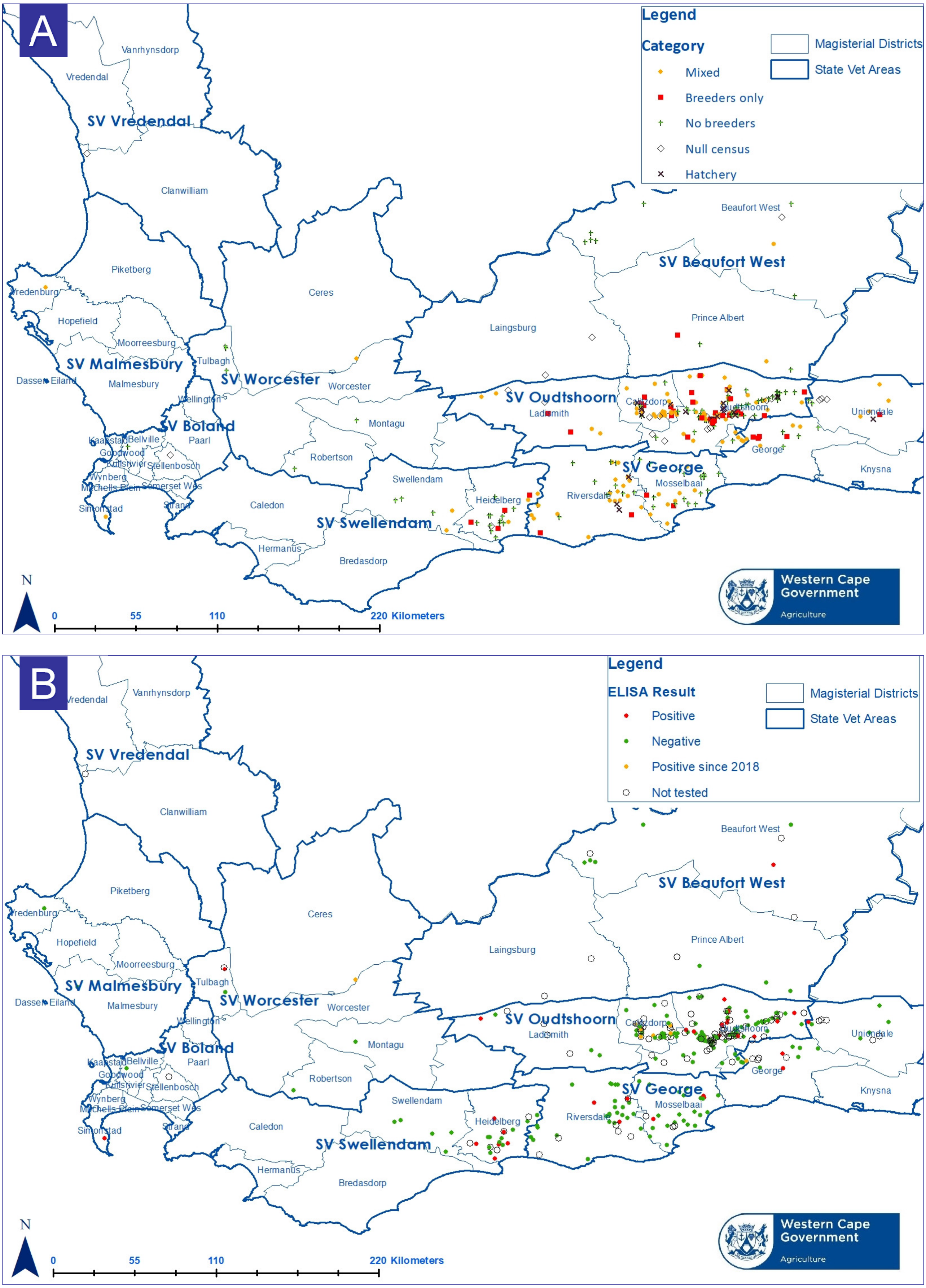

Figure 2: Western Cape ostrich compartments in 2019: (A) Age group composition based on the maximum census for each age group recorded in 2019. (B) Overall results of serological surveillance for avian influenza.

antigens in ostriches. However, there is doubt in some quarters as to the meaning of these reactions, as the reactions required on both antigens to show presence of a clade 2.3.4.4 H5 virus very often appear inconsistent. There are inconsistencies between laboratories testing the same farm, and even the same birds sampled on the same day, and also between samples tested at the same laboratory a few weeks apart. Titres drop between tests or disappear and the pattern of serological reactions changes. This could be explained by the period since infection or a dual infection with different viruses but, combined with a lack of detection of H5N8 virus as demonstrated below, seems less likely. A theory currently under investigation and showing promise is that these reactions are false positives caused by non-specific haemagglutination inhibitors present in ostrich serum.

For comparison with serology discussed later, of the six farms classified as infected with HPAI H5N8 in 2017 that still contained seropositive breeders in 2020, three (two HP H5N8 and one AIV PCR positive in 2017) have continued, when tested annually, to show reactions to the H5N8 antigen, with lower and fewer Eurasian H5 titres and some H6N8 reactions. The two farms that were HPAI PCR positive in 2017 showed H5N8 sample seroprevalences of 70% and 63% in 2020 and the first H5N6 tests done on these farms, in 2020, showed seroprevalences of 17 and 21% respectively, with many more low titre (<4) reactions (75 and 83%).

One farm that only tested N8 PCR positive in 2017 showed only one positive HI reaction to the H5N2 antigen and a few low titre reactions to other H5 and H6 antigens in 2017. In 2020, of 44 ELISA positive birds, two had H5N8 titres ≤2 and only one had a corresponding H5N6 reaction with a titre of 2. Another farm was only H6N8 PCR-positive in 2017 and showed only H5N8 and H6N8 HI reactions (no other H5) in 2019 and 2020 and was negative on the H5N6 antigen in 2020. The last farm from 2017 also tested HP H5N8 positive in 2017 but the slaughter birds were never seropositive and the breeders tested H5N8 HI-negative in 2018, with only low H5N1 and H5N2 HI titres. A small proportion of birds tested seropositive with only low Eurasian H5 titres in 2019 and had a similar picture, with negative H5N6 and H5N8 HI tests in 2020.

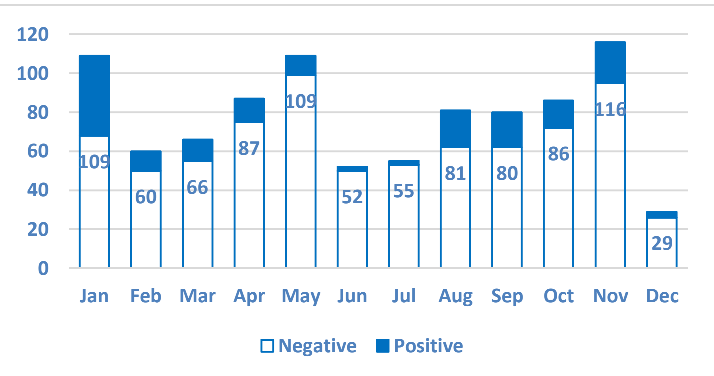

Figure 3: Results of monthly serosurveillance in ostriches in the Western Cape in 2018. The number in each bar denotes total number of ELISA reports.

2018 AI Serology

All farms containing birds suitable for testing were tested at least once in 2018. 236 farms were tested using ELISA tests; 149 with breeders and one that only contained breeders (Table 1). A total of 930 reports were issued.

Monthly ELISA testing results are shown in figure 3. Testing at least 60 farms a month indicate monthly if AI antibodies are present at a between-farm prevalence of roughly 5% or more, depending on how the sampling is distributed over the province. Sixty testing events took place most months, except in the less active slaughtering time of June and July, and over the holidays in December.

Seventy-five positive farms (32% of those tested) were ELISA positive on at least one test. However, 36 had been seropositive since 2017 and 31 of these were not re-infected (Table 2). Of the 44 new detections, 33 (75%) were followed up with serology and PCR testing. Eight of the detections, including four with H5N8 reactions, proved to be sero- and PCR negative on follow-up testing, leaving **38 new infections (16% of farms tested)**.

Of the 38 new infections, viral **RNA was detected via PCR in 8 cases (21%)** on eight different farms. Sequencing results were provided for three infections (two H9 and the H11N1), with sub-typing based on PCR for one (the LP H5N2) and partial subtyping for two (N8 and H6), so 6/8= 75% were at least partially typed.

15/38 infections (39%) (15 farms) were negative on H5 HI tests, including all 11 detections not followed up. One of the three that were followed up was H6 positive on the initial test.

Of the 23 remaining H5 positive infections, two were only ELISA positive on follow-up, and a third was tested at two labs for the first follow-up test and tested HI negative at one of the labs, and on follow-up tests. This brings the total **HI negative detections** to 18 (**47%**).

Of 20 remaining H5 positive events, **four** never tested H5N8 positive; they were **suspected H9N2** infections with H5N2 (and H6N2) reactions. H9 virus was sequenced on one farm and the other three farms were all within 3km.

Of the **16 remaining H5N8-HI-positive detections** on 15 farms (**42%** of sero-positive detections, 6% of farms) five had serology that could indicate an H5N8 infection, but without a second suitable HI antigen or any virus detection, this cannot be confirmed. Four possible H5N8 infections were detected in January 2018 with serology consistent with H5N8 (reactions on two or more H5 antigens and H6N8) and a fifth in December but with only a small number (maximum 3/60) of birds positive.

Of the remaining 11 detections, five involved partial to full virus typing on PCR or sequencing, with serology matching to a varying extent.

Tentative subtyping can be done for two more farms. One H5N8-HI-positive farm had repeated HxN2 reactions and was positive on both H9 HI-antigens at OVI (the only lab using these antigens) on one test which was negative for H5N8. This farm was AI PCR positive but negative on the H5 and H7 tests. The second farm had reactions to H5N2, H5N8 and both H6 HI antigens in 2018. Continued testing has indicated that although the breeder birds on this farm were probably infected with H5N8 in 2017 when H5N8 was known to be circulating, though they were only tested in 2019, the younger birds tested in 2018 may only have been exposed to a H6 virus.

Serology on the last four farms does not allow any subtyping, lacking sufficient consistent cross-reactions between HI antigens.

2019 AI Serology

All farms containing birds suitable for testing (85%) were tested at least once (Table 1, fig, 2). 1049 ELISA reports were issued in 2019, 118 with positive results (11%). In all months except December, 60 or more tests were achieved (fig. 4).

Eighteen positive ELISA tests were from fourteen outbreaks detected before 2019 and, of the farms that were sero-positive at the start of 2019, eleven farms did not show serology indicating new infection ("Positive since 2018" in fig. 2). This leaves 33 newly positive farms (15%) (Table 2). Of the 34 ELISA reports indicating possible new infections (two on one farm), 31 were followed up (91%).

Three events proved negative on ELISA and PCR on follow-up. Therefore **31 farms remain as seropositive (14%)** ("Positive" in fig. 2).

Seven farms tested PCR positive, including a breeder farm without a preceding positive ELISA test, and typing via PCR or sequencing was obtained for all seven (19% of sero-positive farms). On one, two different viruses were sequenced. The possible exception to the successful typing was a contested H5N8 PCR positive result from an already-positive (with virus sequenced) farm. Serology, including some of the same birds that were apparently PCR positive, did not support a new infection or a diagnosis of any H5 virus. Additionally, the RNA was not successfully sequenced.

With regard to serology, the farm that tested H11N1 positive essentially tested ELISA negative. After initially showing positive H5N8 and H7N1 reactions, it only showed low H7N1, H5N1 and later one round of low H5N8 reactions. Four other PCR positive farms also had inconsistent H5N8 and/or H5N6 reactions. Two of the H9N2 farms initially had reactions on

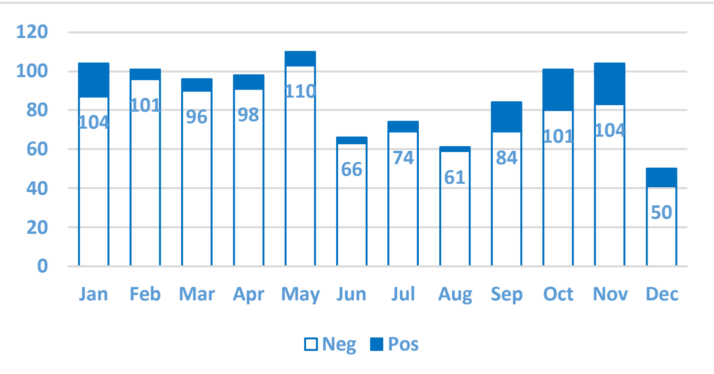

Figure 4: Results of monthly serosurveillance in ostriches in the Western Cape in 2019. The number in each bar denotes total number of ELISA reports.

both antigens but only had HxN2 reactions on later tests. The H6N2/H9N8 farm also had reactions on both H5N6 and H5N8, but only H6 reactions later and, as already mentioned, one farm that was H6 PCR positive initially was H5N8 HI positive but only H6 and N1 positive later.

Of the remaining 25 seropositive farms, 11 (**35% of seropositives), are classified as ELISA positive only** and include the three farms not followed up.

Of the remaining fourteen farms, thirteen tested positive on the H5N8 HI antigen. Of eight of these also tested with the H5N6 antigen, six also tested positive for H5N6 but only four of these were positive on both antigens on the same day. However, there was no consistency between labs with regard to these antigens, because another lab found one of these farms seronegative on follow-up; the second tested HI negative and the other two were H5N6 and H5N8 negative. Serology on these other two farms suggests rather a Eurasian H5 and an HxN2 infection respectively. The latter farm is additionally within 10km of one with sequenced H9N2 AIV.

Of the four farms not tested with H5N6, one was only positive on H5N8 on one test (the first round of follow-up) and otherwise was positive on H6 antigens. One had a variety of HI reactions, with a concerning set of H5Nx and H6N8 reactions on the (one) follow-up test, but some of the same birds were completely seronegative four months later. One was HI negative until the second follow-up test when there were reactions on H5N8 and H5N1 antigens and serology was not repeated on the farm until a year later. The last farm had consistent H5N8 and/or H6N8 HI reactions (but no other H5 reactions) until slaughtered out.

Of the two farms positive on H5N8 but negative for H5N6, one was HI positive only on the first follow-up test, on H5N8 with low H6N8 reactions, and the other had H5N8 reactions initially, and on the first follow-up test, but then the same birds were HI-negative.

Of the farms that were H5N6 and H5N8 positive, but on different days, one was finally seronegative on the second follow-up test, with the same birds having been retested and the other had consistent HxN2 reactions. The farm is additionally within 10km of one with sequenced H9N2 AIV.

Of the two farms never H5N8 HI positive, one was consistently positive on the H6 antigens and had initial positive reactions on HxN1 antigens, with lower titres on these antigens later. It is also within a few kilometres of a farm PCR positive for H6 AIV. The other farm had one bird that was initially H5N6 positive, had low H5N6 reactions on the first follow-up test and was then seronegative at the next test, along with all the other birds tested.

In conclusion, another two farms may have been infected with an H6 virus and two with an HxN2, possibly H9, in 2019. Another has serology indicating a Eurasian H5 infection. Three farms may have been AIV-negative and three H5, 6 and 7 negative. Three have concerning serology where H5N8 infection cannot be conclusively excluded or concluded (due to lack of testing with a homologous antigen).

Outbreak events

Six outbreaks of **bluetongue** were reported from **sheep** farms in the province near **Laingsburg**, **Beaufort West** and **Prince Albert**.

Goats kept in **Klapmuts** were diagnosed with **orf** (contagious pustular dermatitis) (fig. 5). The lesions were debrided and disinfectant was applied to the affected areas.

A **yellow mongoose** was found dead on a property near **Abbotsdale** and subsequently tested positive for **rabies**. A dog that lives on the property was vaccinated against rabies in response.

Another farmer near **Moorreesburg** found his three dogs attacking a **bat-eared fox** in front of his house. After calling off the dogs he shot the fox, which tested positive for **rabies**. The dogs had all been recently vaccinated against rabies.

Salmonella enteritidis was cultured from chick box liners on a farm near **Atlantis**, dead-in-shell chicks near **Hermon** and from **broilers** near **Somerset West**.

Goats near **Leeu-Gamka** showed clinical signs of **dermatophilosis** (klontwol).

Contagious opthalmia was seen in cattle near **Vanrhynsdorp**.

Lesions caused by **swine erysipelas** were seen after slaughter on pig carcasses from five pig farms near **Malmesbury**, **Paarl**, **Saron** and **Eendekuil**. None of the affected pigs showed clinical signs of disease prior to slaughter. Four of the farms are large commercial farms that practice vaccination against erysipelas and a small number of pig carcasses were affected. The fifth farm is a small-holding where five of the 20 pigs slaughtered were affected.

Lambs from three properties surrounding **Vanrhynsdorp** were recorded suffering from **sand impaction**.

Sheep belonging to smallholder farmers near **Vanrhynsdorp** were observed **eating each other's wool**. The sheep were given a phosphorus lick block.

Protein energy malnutrition was seen in **sheep** in the far north of the province and near **Nuwerus**.

Figure 5: Orf lesions on the faces of goats (Photo: M Fourie)

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EPIDEMIOLOGY REPORT

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African horse sickness surveillance across South Africa

Adapted from The SA Equine Health & Protocols report, African horse sickness control: General surveillance & testing 2019 by JD Grewar, CT Weyer, BJ Parker and G Bührmann. The full report is available at http://jdata.co.za/myhorse/

Introduction

In this report we evaluate the reporting of African horse sickness (AHS) across South Africa during 2019. We evaluate both negative and positive test results which had an impact on the risk-based system in place with regards to movement control of equids into and within the AHS controlled area. AHS movement control aims to limit the risk of introduction of the disease into the controlled area of South Africa. An active surveillance report is published annually which focusses on the sentinel surveillance program within the AHS free and surveillance zones of the controlled area. AHS surveillance is however not limited to this active component. Passive surveillance is undertaken throughout the country since AHS is a controlled (and therefore notifiable) disease. Clinical investigations by veterinarians will often include testing for the virus, and, since the development of RNA-detection methods, primarily PCR, this has been the testing method of choice for clinicians.

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

General results

Table 1 shows the overall summary of data presented in this report. A total of 2942 individual horse laboratory reports were captured, of which 79.8% were negative, 20% were positive and the remaining 0.2% were considered suspect.

Table 1: Summary of all available data regarding AHS diagnoses and categorised by laboratory or clinical-only cases with case status

Diagnosis method	AHS status			Total tested
	Confirmed	Suspect	Negative	
Laboratory	588	6	2348	**2942**
Clinical	25	10	-	**35**
Total	**613**	**16**	**2348**	**2977**

Provincial and Municipal breakdown of testing and laboratory positives

Figure 1 shows the temporal spread of testing per province during the 2019 calendar year with the epidemic curve of laboratory confirmed AHS cases overlaid. Gauteng tested the most horses (1483 tests; ~50% of the total) and in general most testing took place between March and May. The Western Cape tested the

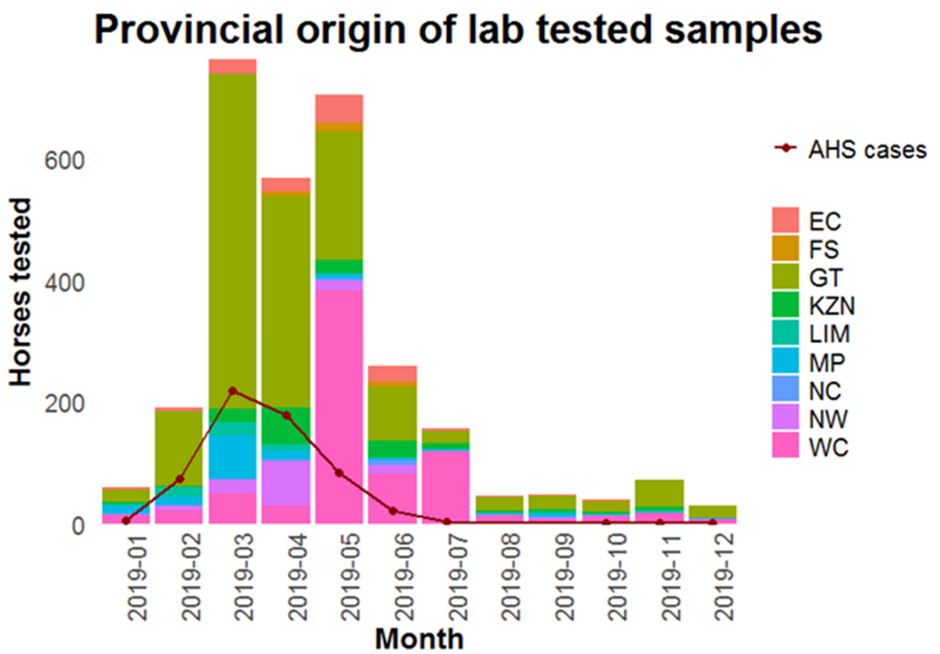

Figure 1: Breakdown of all laboratory testing performed by province and month of year. The positive laboratory diagnosed AHS cases overlays the bar plot.

second greatest number of horses (760; ~26%) and most tests in the province took place in May. (*Figure 2 below indicates that May was the peak for movement based testing and this peak for the Western Cape would include horses moving from stop-over quarantine facilities located in the Province after completion of the stepwise protocol for risk mitigation*)

Figure 3 further categorises the number of tests performed from each municipality where horses were tested. Mpumalanga had the majority of testing performed in the Mbombela Local Municipality. Over 95% of Mpumalanga's reason for testing was for diagnostic (disease) purposes, and that area had 13 of the 34 lab confirmed cases from the province (Figure 4). The Western Cape tested more horses for movement than for diagnostic purposes (57.6%), and this is highlighted by the dominance of testing in the Beaufort West, Worcester and George regions, where stop-over quarantine facilities are also situated.

Positive AHS results for the year are shown in Figure 4. Positive cases occurred in all provinces except for the Western Cape. Most cases occurred in Gauteng (350; ~60% with 63% of those in the City of Tshwane) with the remaining distributed primarily between Limpopo, North West, Mpumalanga and the Eastern Cape. The Eastern Cape cases predominantly occurred in the Makana and Ndlambe Local Municipalities.

Reason for testing

There are three primary reasons for testing for AHS in South Africa: diagnosis of disease (clinical investigation), movement control and sentinel surveillance. Figure 2 below shows the former two reasons depicted over 2019 overlaid by the number of AHS confirmed cases. The majority of samples collected for clinical investigation were collected between March – May and as expected the majority of laboratory confirmed cases also occur during these three months. Most samples tested prior to movement were collected between April – June. As expected testing is limited from winter through to the end of the year when cases are minimal – this is due to the seasonal epidemiology of the disease in South Africa where cases are historically associated with the late summer and autumn periods of the year.

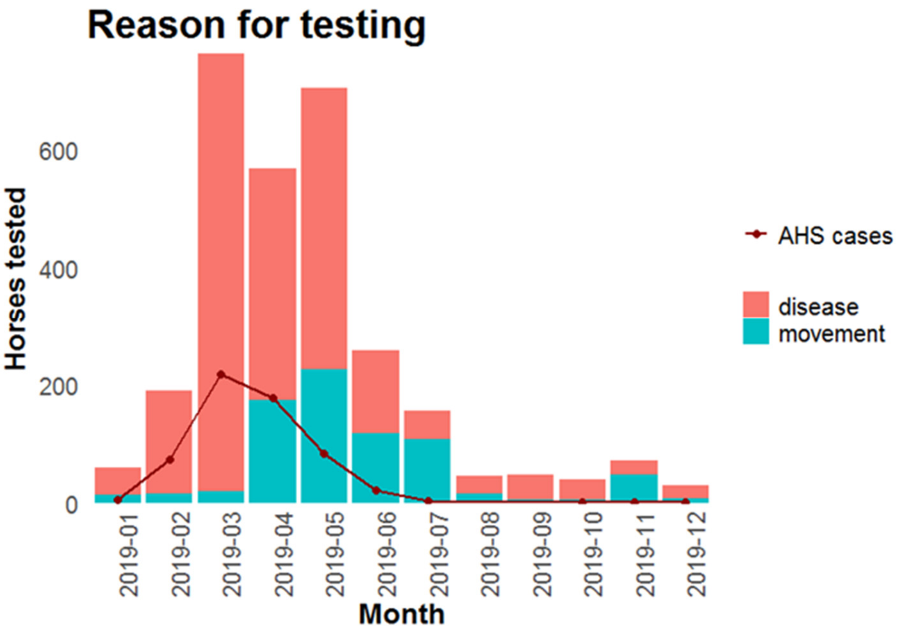

Figure 2: Breakdown of all laboratory testing performed by reason for testing and month of year

Discussion and acknowledgements

This is the first consolidated report that includes both positive and negative AHS test results for testing performed over the entire country for a calendar year. The report establishes a testing baseline, an overview of the reasons for testing and a summary of the samples processed at the different laboratories with a breakdown of the results, all of which supports and refines a risk based approach to AHS control in the country. An objective understanding of why samples are collected, where samples are sent for processing and the number of positive and negative results over a calendar year will assist in future planning and provides clarity relating to some of the deficiencies highlighted in the 2013 EU FVO[3] report.

We are grateful for the continued support of the DALRRD and the Provincial Veterinary Services in allowing access to laboratory results from the respective laboratories. The laboratories mentioned in this report have kindly made their information available to the Boland State Veterinary Office, on whose behalf this analysis is performed by SAEHP. The ECOD system was developed for the South African Equine Veterinary Association to report on all equine diseases and syndromes in the country. SAEHP have maintained this system for the past 2 years and have adapted it to capture negative AHS testing with the primary purpose of refining risk-based control measures. In this regard we are grateful to SAEHP personnel who have captured much of the negative result and movement data.

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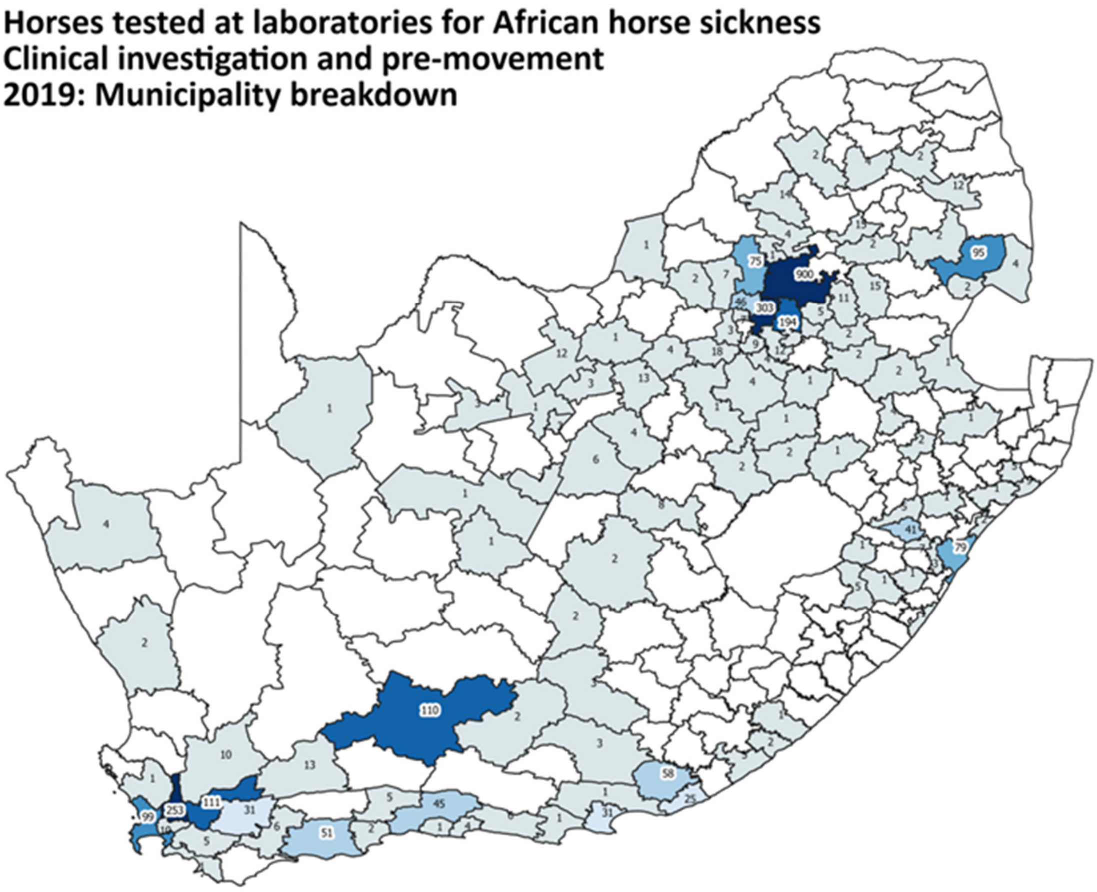

Figure 3

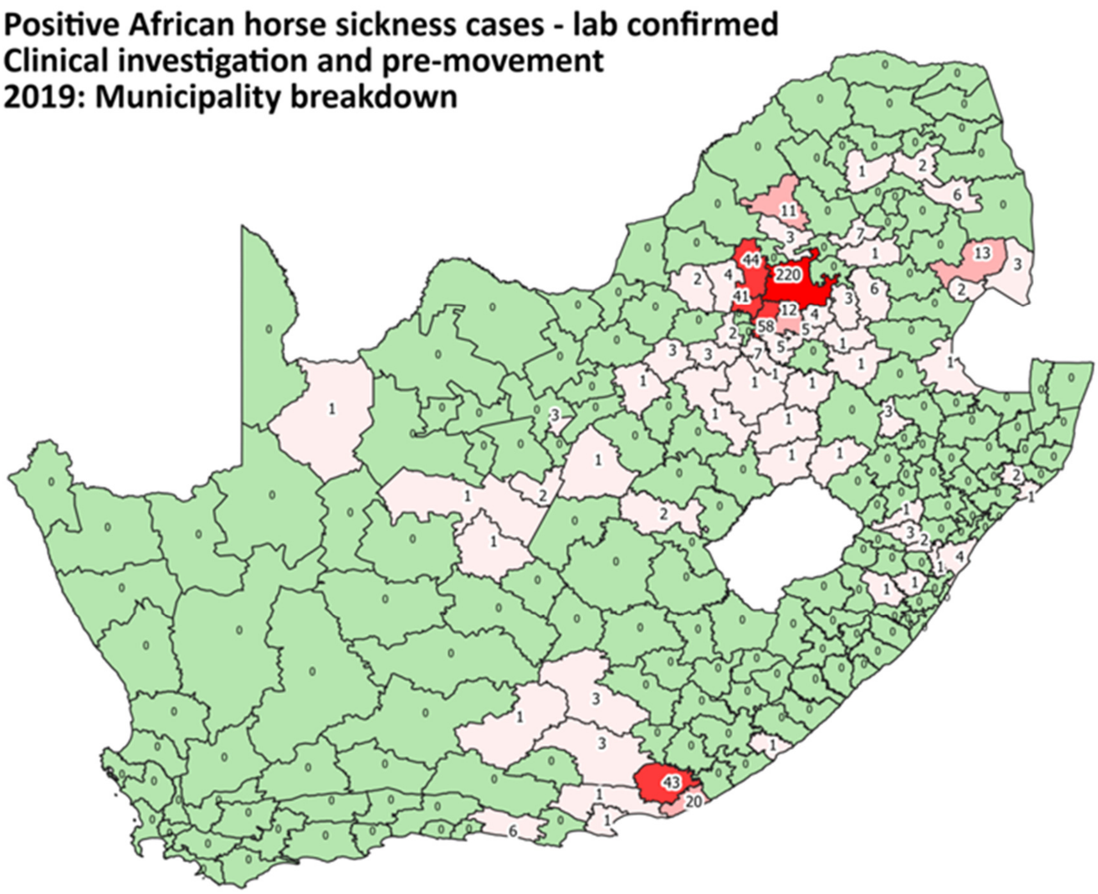

Figure 4

Outbreak events

Two **ostrich** farms in the **Mossel Bay** and **Oudtshoorn** areas were found to be infected with **H7 low pathogenic avian influenza**, with pathotype confirmed by sequencing of the cleavage site of the haemagglutinin gene. No clinical signs have been observed. The first detection was in Mossel Bay on samples from slaughter-age birds, taken on 15 July. The second detection was on samples from 20 July, mostly from breeder ostriches tested pre-slaughter. AIV was detected via PCR on the farm next door from wild Egyptian geese and ibis in June, though typing results have not been received yet. There appears to have been a recent influx of wild birds into the ostrich producing areas, with planting of crops and recent rain, and these birds are suspected to be the source of the H7 virus.

Cattle were reported as affected by **lumpy skin disease** on five properties near **Riviersonderend** and **Genadendal**.

One outbreak of **bluetongue** in **sheep** was reported from the **Vanrhynsdorp** area.

An animal rescue organisation in **Cape Town** received several dead and dying **wild birds**, including pigeons, laughing doves and olive thrushes (fig 5) from members of the public. All birds were apparently showing signs of respiratory distress. The pigeons and doves tested positive for Newcastle disease and **pigeon paramyxovirus** (PPMV), while the olive thrush tested positive for Newcastle disease but negative for PPMV.

Salmonella enteritidis was cultured from routine samples taken on nine broiler **chicken** farms north of **Cape Town**.

A farmer near **Klipheuwel** bought sheep from an auction and treated them for lice when he observed them scratching. When a third party reported the clinical signs, the local state vet went to inspect and diagnosed sheep **scab**. The sheep will be treated twice under official supervision.

A flock of neglected sheep near **Porterville** were also diagnosed with **sheep scab**. The sheep are pruritic with large areas of alopecia. The farm has been placed under quarantine and the sheep will be treated under official supervision.

Eight **ewes** died as a result of **pasteurellosis** in the **Vredendal** state vet area.

Skin lesions typical of **erysipelas of swine** were seen on a pig carcass from the **Klipheuwel** area after slaughter. No clinical signs of disease were detected during pre-slaughter inspection.

A case of **pizzle rot** (peestersiekte) was seen in a **ram** in the **Vanrhynsdorp** area.

Sheep newly brought into the **Vanrhynsdorp** area were seen to be severely emaciated due to **protein energy malnutrition**.

Bovine mange was seen on a farm near **Vanrhynsdorp**.

Haemonchus contortus (wireworm/ haarwurm) infestation was found in a **sheep** during a post-mortem examination near **Leeu-Gamka**.

Figure 5: Olive thrush (Photo: L Roberts)

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Western Cape Government
Agriculture

EPIDEMIOLOGY REPORT

VETERINARY SERVICES
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2019/2020 Newcastle disease surveillance

Laura Roberts

NCD Surveillance on ostrich compartments

VPN04 (Revision 6) requires every ostrich compartment to be tested for Newcastle Disease (NCD) every year, using PCR testing. Because compartments exporting meat to the European Union are required to have an NCD test every 6 months, many compartments are tested twice a year.

In 2019, 218 ostrich compartments were tested for NCD (fig 1). Only one, near Cape Town, tested positive on the Newcastle disease virus (NDV) matrix gene PCR in December and an investigation by the state vet failed to detect an increased mortality rate or any clinical signs. Additionally, follow-up testing of the positive samples at ARC-OVR and two rounds of follow-up testing of the compartment were negative.

So far in 2020, 203 of 290 compartments (excluding hatcheries) have been tested up until 14 August (fig 1). Those not tested include 16 where a reason is not obvious, 66 that either contain only breeders or are empty and five that are new registrations.

Five compartments have tested NCD PCR positive so far in 2020 but all have been shown to be avirulent infections. One compartment in the Langkloof (George State Vet area) tested positive in early February but RNA sent to OVI tested negative for virulent and avirulent NDV, using PCR. Four rounds of follow-up sampling were done on the farm and the second and fourth rounds detected avirulent NDV via PCR. Another four compartments tested NDV matrix gene positive on PCR on samples taken between 14 and 23 July and all were confirmed as infected with an avirulent virus via sequencing of the cleavage site of the fusion protein gene. One compartment is in the Heidelberg area and the other three are in the Oudtshoorn/De Rust area. There were no clinical signs or increased mortality rates on any of the four compartments, and all affected birds

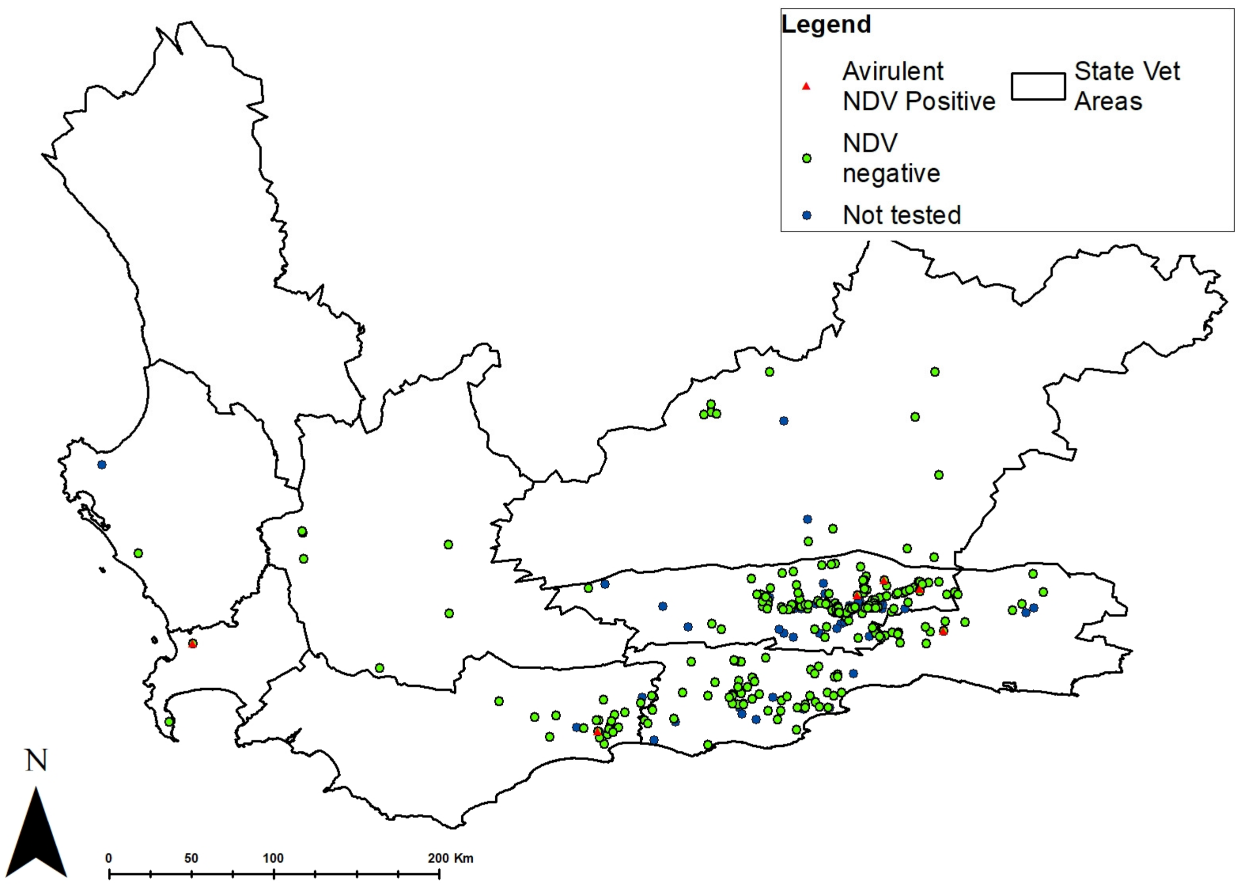

Figure 1: Surveillance for Newcastle disease in Western Cape ostriches in 2019 and 2020

had been officially vaccinated between December 2019 and June 2020.

Active serological surveillance in backyard chickens (2019)

From May to December 2019, the Western Cape Chicken and Pigs Surveillance (CAPS) programme was adjusted to include serology for Newcastle Disease. Briefly, the CAPS program aims to comply with the national requirement for avian influenza (AI) surveillance, which requires that each province sample at least 50 backyard chicken properties for AI antibodies, every six months.

Blood sampled for AI serology was also tested for NCD antibodies, using the NCD haemagglutination inhibition (HI) test. The owners of the chickens were asked about previous vaccination of the chickens against NCD, as this should cause positive serology and, as is standard for CAPS surveillance, were asked about any history of deaths or illness in the chickens. If NCD antibodies were detected on a property, the animal health technician (AHT) was requested to return and sample chickens with oropharyngeal swabs to be tested with PCR for NCD virus. Sample size was calculated to detect virus if present at a prevalence of approximately 5% or more. The AHTs were also requested to confirm the vaccination and clinical history.

Final presumptive diagnosis in each case was based on vaccination status and clinical signs. The clinical signs according to the OIE Technical disease card for NCD were used:

Lentogenic NCD strains: subclinical, mild respiratory signs but can be more severe with co-infections

Mesogenic strains: low mortality rate and may cause respiratory disease and neurological signs

Velogenic strains: severe disease with respiratory and/or nervous signs. Can also cause swelling and discolouration on heads, diarrhoea, sharp drop in egg production, eggs with abnormal shape or shell and mortality rate can reach 100%.

Results of serological surveillance

Ninety-four backyard chicken properties were sampled from March to November 2019 for testing with NCD HI (fig 2).

Twenty-nine properties tested seropositive, of which six had a history of vaccination, without clinical signs. Sample seroprevalence attributed to infection is therefore 23/95= 24%. Monthly peaks of more than 30% sample seroprevalence occurred in April and May.

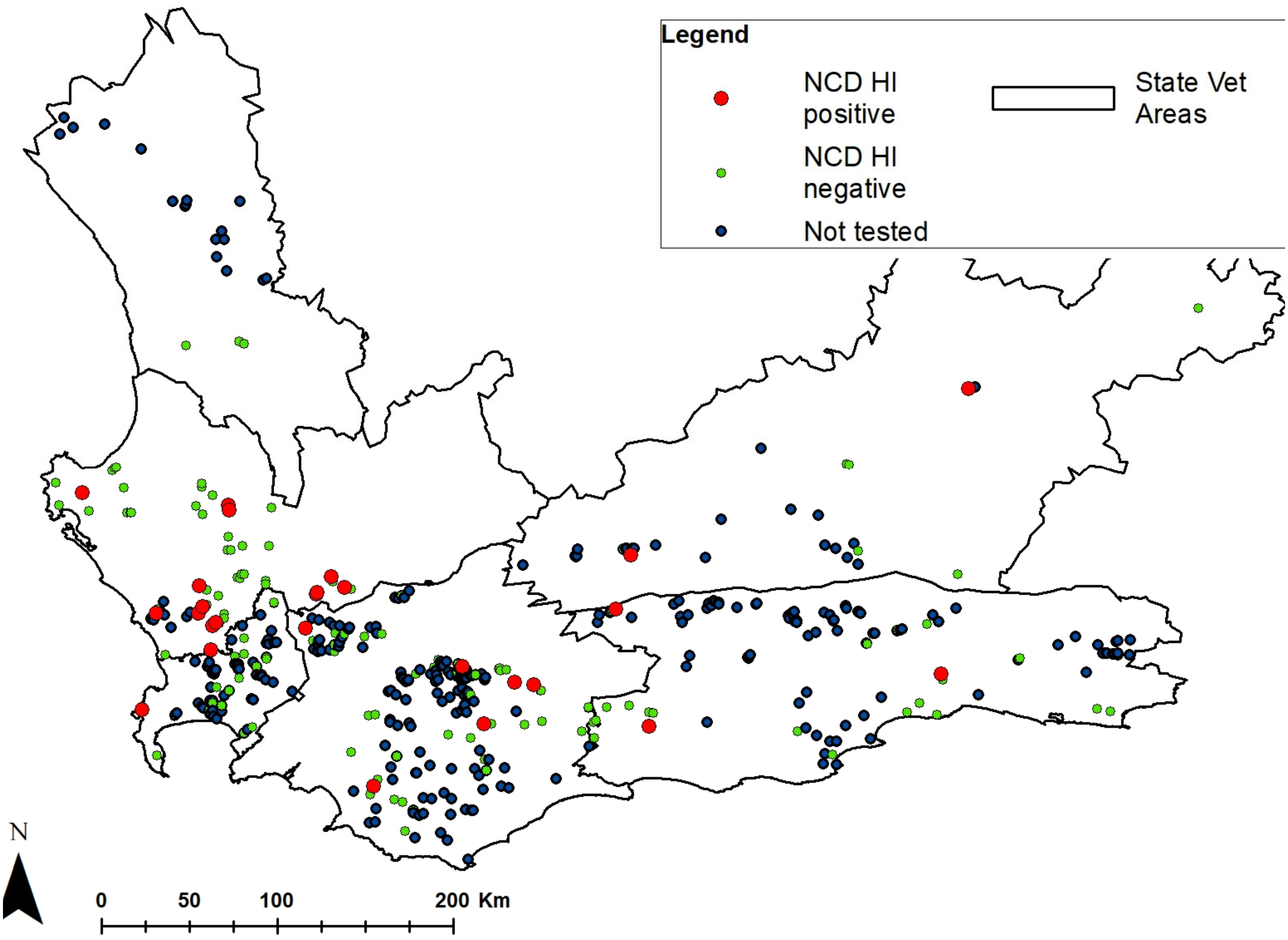

Figure 2: Clinical and serological surveillance for Newcastle disease in backyard chickens in the Western Cape in 2019 and 2020.

The state vet areas to sample the most properties were Malmesbury and Worcester (25 and 29 respectively), which roughly matches important commercial chicken farming areas. A total of eighteen seropositive properties (including three with clinical signs, 62%) were re-visited and chickens were sampled with oropharyngeal swabs for PCR testing for NCD. All of these PCR tests were negative. It is therefore assumed that these birds contracted subclinical, lentogenic NDV.

Of the seropositive properties, only six had a history of disease. Two reported deaths only, and no specific clinical signs, but were not re-sampled as follow-up. One reported that egg production ceased and the birds seemed ataxic before death. However, oropharyngeal samples taken at a follow-up visit tested PCR negative for NDV. Previous infection with velogenic Newcastle disease cannot be excluded on these three properties.

Another property reported anorexia and diarrhoea, and a carcass submitted for PCR tested negative, as well as oropharyngeal samples taken as follow-up. Carcasses were also tested from the fifth property where the animal health technician suspected fowl pox and infectious bronchitis. No further testing was done here. The last property reported that the hens were producing abnormal eggs but were also pecking at eggs and that no deaths occurred. Follow-up PCR tests were negative. This property seems unlikely to have been infected with velogenic NCD.

Three properties slaughtered all the chickens before re-sampling was possible (including one with clinical signs) and four were not re-sampled, as antibodies were attributed to vaccination. Another three positive properties were not followed up, with no reason being forthcoming.

Of the total eight properties vaccinated, two were seronegative (HI titres ≤1:16). This suggests that generally, vaccine is being handled and applied properly.

Clinical NCD Surveillance in backyard chickens

Clinical surveillance for controlled poultry diseases is also performed in the Western Cape as part of the CAPS program.

In 2019, 444 properties with backyard poultry were visited, including those where serological surveillance was done. Of 17 that reported any clinical disease, ten were tested with NCD serology. Of the seven others, only three had unexplained deaths.

In 2020, 184 properties with backyard chickens have been visited, until August. Three properties reported signs of disease in chickens and one in wild ducks, in June. Avian influenza virus was detected in the ducks, though typing is still pending. One property had NCD seropositive chickens and respiratory signs, but PCR was negative and no more deaths occurred after antibiotic treatment. On the third property, the chickens had nasal and ocular discharge but were sero- and PCR negative for AI and NCD and though a carcass tested positive for avirulent NDV ten days later, the AHT had vaccinated when sampling before. The fourth property was AIV seronegative and was not tested for NDV but the AHT suspected a nutritional problem.

Another six properties were tested using NDV serology, though NDV serology is no longer officially part of the disease surveillance plan. One property was negative. Three properties were seropositive but had no history of disease and follow-up PCR tests were negative. Two were seropositive and follow-up investigation is underway. The vaccination histories are not available.

Conclusion

There has been no detection of virulent Newcastle disease virus in the Western Cape in 2019 or so far in 2020, though there is evidence of exposure to avian paramyxovirus type 1.

It is not possible to draw a definite conclusion about infection of backyard chickens in the Western Cape with virulent Newcastle disease strains, however, it is certain that infection with some strains is occurring. It will be necessary to sample more actively infected poultry to obtain virus, and therefore it is important to encourage owners to notify the state vet office when illness or mortalities occur.

Outbreak events

A parrot fancier in **Kalbaskraal** experienced the deaths of several baby **eclectus parrots** (fig 3) that he was hand-rearing. When the sixth one died, he took it to a vet and subsequent testing was positive for *Chlamydophila psittaci*. The owner was warned of the zoonotic potential of **psittacosis** and informed about preventive measures and clinical signs to be aware of. The eclectus parrots used for breeding were traced back to another parrot fancier in Montagu that had died of an unknown respiratory illness.

Figure 3: Eclectus parrots (Photo: H Braxmeier)

Twelve more **ostrich** compartments were classified as affected by the **H7 avian influenza** (AI) outbreak, bringing the total to fourteen in August. Three are in the **Calitzdorp** area, four near **Heidelberg**, one more near **Mossel Bay** (total now two) and four more near **Oudtshoorn** (total five). H7 AI virus was detected via PCR on seven of the compartments, at least one in each area, and has been confirmed as **low pathogenic** via sequencing from three compartments, in Calitzdorp, Mossel Bay and Oudtshoorn. No clinical signs have been reported, except for green urine observed on one compartment. Intensified surveillance, using serology and PCR tests, has been completed within a 3km radius of farms detected in August, and led to the detection of seven of the cases. Twenty-eight compartments tested have been AI negative.

Lumpy skin disease (fig 4) was reported in **cattle** near **Genadendal** and **Riviersonderend**.

Bluetongue was reported in a flock of **sheep** near **Vanrhynsdorp**.

The owner of a loft of racing **pigeons** in **Suiderstrand**, near Cape Agulhas, noticed some pigeons not eating well, with respiratory signs and showing a puffed-up appearance. The pigeons had previously been vaccinated twice against pigeon paramyxovirus, but tracheal swabs tested positive on PCR for Newcastle disease and **pigeon paramyxovirus**. The outbreak was controlled by isolating and destroying the sick birds.

A **bat-eared fox** was seen on a farm near **Riebeek-Kasteel** lying next to a pond and panting. The next day it was found dead. This is the third bat-eared fox to die recently on the farm. On another farm near **Klipheuwel**, an ataxic bat-eared fox was seen by a farmer before it attacked his vehicle. The farmer drove over the fox to kill it. Samples taken from both foxes tested positive for **rabies**. Pets on the surrounding farms were vaccinated in response.

A sheep farmer in the **Albertinia** area noticed **sheep** becoming emaciated over time. Serum samples tested positive for **Johne's disease**. On another farm near **Bredasdorp**, similar signs were seen in the sheep flock and a post-mortem examination was performed on one of the affected sheep. Histopathology showed granulomatous enteritis with many acid-fast rods within the histiocytes, indicating Johne's disease. Both farms were placed under quarantine.

Pruritis and wool loss were seen in a flock of sheep in the **Koue Bokkeveld** area and **sheep scab** caused by *Psoroptes ovis* mites was diagnosed. The sheep were treated three times with an injectable product under official supervision.

Escherichia coli was cultured from **hens** on a commercial layer farm in the **Paardeberg** area. The hens were treated and the eggs produced pooled during this time to reduce the *E. coli* concentration to acceptable levels.

Urea poisoning and **prussic acid poisoning** were reported in **sheep** in the far **north of the province**, along the border with the Northern Cape.

Cases of **nasal bots** were seen in **sheep** near **Kalbaskraal**.

E.coli infection was diagnosed in **sheep** near **Vanrhynsdorp**.

Figure 4: Bull showing clinical signs of lumpy skin disease (Photo: PB Kloppers)

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EPIDEMIOLOGY REPORT

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African horse sickness sentinel surveillance 2019/20

Adapted from The AHS sentinel surveillance program 2019-2020 season report by J.D. Grewar[1] and C.T. Weyer[1]

[1] South African Equine Health and Protocols NPC

The African horse sickness (AHS) sentinel surveillance program provides additional confidence of AHS freedom in the AHS free and surveillance zones 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 circulating AHS viral RNA within recruits. The sero-sentinel sampling frame 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 unvaccinated for at least the previous two years and are screened using serology prior to recruitment. The vaccination status of PCR sentinels is captured but does not influence their recruitment unless vaccination against AHS took place sufficiently recently to result in positive PCR results on their initial testing.

The serological tests performed rely on the indirect ELISA (i-ELISA) as the base serological test (Maree & Paweska 2005). It is a non-quantitative assay and changes

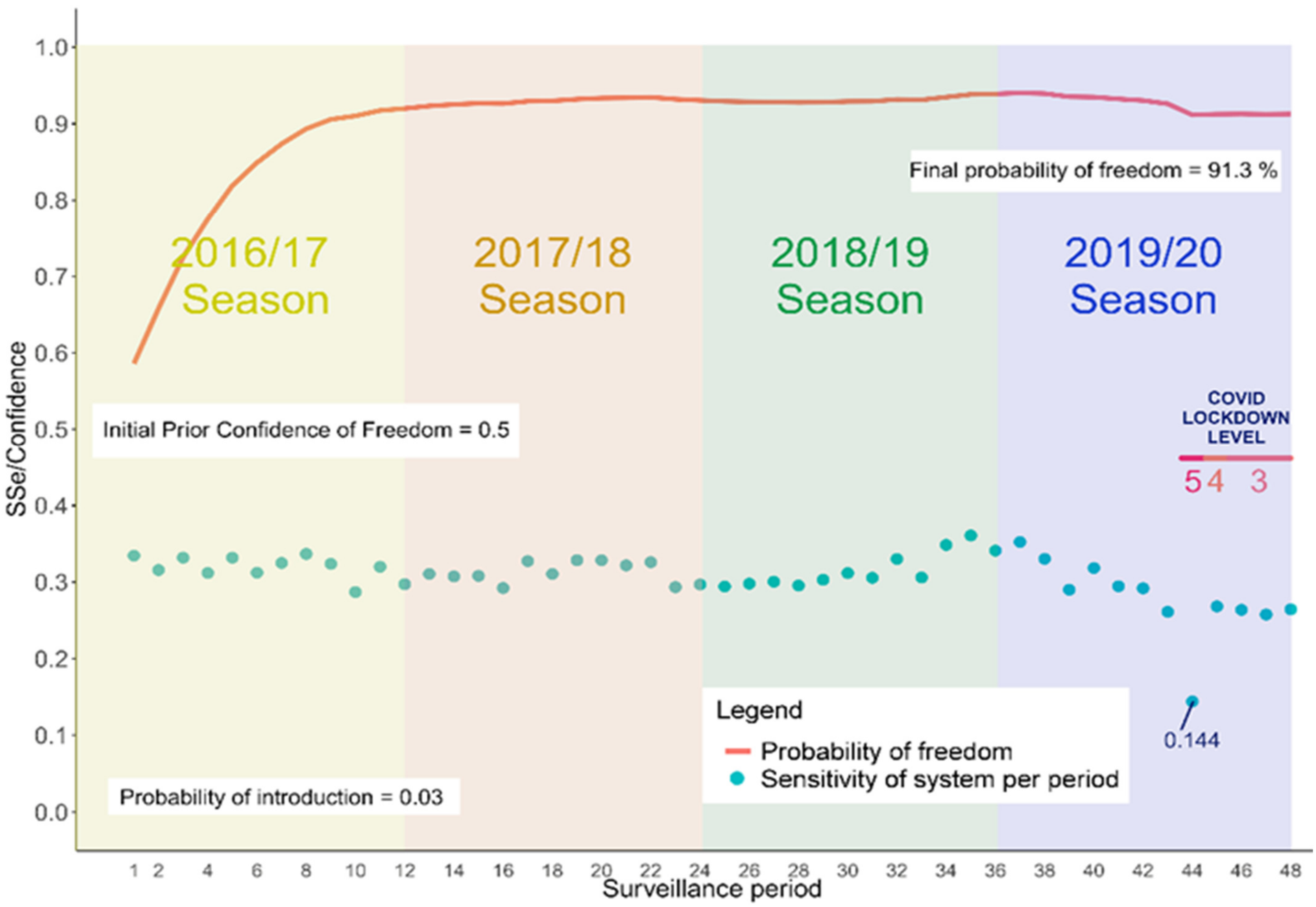

Figure 1: The sentinel surveillance sensitivity of individual surveillance periods (dots) with probability of freedom curve (red line) based on an uninformed 50% prior probability of freedom and a probability of AHS introduction of 3% for the past four surveillance seasons: the season currently reviewed is the right pane – 2019/2020 season running between Sept 2019 and Aug 2020. COVID lockdown periods are also shown starting April 2020 – period 44.

between positive, suspect and negative results across paired sample events are used for evaluation. Follow-up serological tests include the serum neutralisation assay (SNT), which is AHS serotype specific. All serology is performed at the Agricultural Research Council - Onderstepoort Veterinary Research (ARC-OVR). Viral RNA testing was performed at the regional Stellenbosch Provincial Veterinary Laboratory (SPVL). 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 results

A total of 600 sero-sentinel samples were analysed from 37 different farms at an average of 50 samples from 24 different farms per month. This was a sero-sampling decrease of 14% from the 2018/2019 surveillance period. Of the tested serological samples 589 (average of 49 per month) could be evaluated as they had relevant paired results.

A total of 1746 PCR sentinel samples were analysed from 72 different farms at an average of 146 samples from, on average, 51 different farms per month. This was a decrease of 7% from the previous season.

Results

The serology samples that could not be evaluated for lack of a paired sample totaled 12 samples (2% of the total, a decrease from 3.8% the previous season).

Like the 2018/2019 season there was one investigation of importance for the period reviewed. In this case it was a horse that went from a negative serological status to suspect and then weak-positive between February and May 2020

Follow-up of positive results

Horse 28836 had a changing serological status from negative to suspect, to weak positive and back to suspect between February and June 2020.

Suspect false positive results on serology do occur from time to time in the program because of the sensitivity of the test. When the horse tested weak positive from the May sample a full investigation was instituted. The affected horse and other horses (non-sentinel) on the property were tested in mid-July. Other than the suspect result from sentinel 28836, no other samples tested positive.

A trace-back investigation was also undertaken. Because of COVID-19 movement restrictions, however, there had only been a total of 3 horses moving to within 10 km of farm 6020 between 2 weeks prior to the Feb 2020 sampling (negative) and the second sample (suspect) in April 2020. These horses all originated in the Western Cape Province. Two came from stop over quarantine facilities, and horses moving from these had a negative AHS PCR test prior to movement. The third came from Riversdale, historically and in 2020 a AHS low risk area, and within ~50 km of the nearest point of entry into the AHS controlled area.

There were an additional 4 sentinel holdings (constituting 12 PCR-sentinels) within 10 km of holding 6020 and results from these holdings were also considered during the investigation. All PCR results from Jan-June were negative where horses were tested – in total 62 sampling events.

The outcome of the investigation in summary: The test results did not indicate that a wild strain AHS virus was responsible for the ELISA suspect and low positive result. The ELISA and SNT levels were low and not what one would expect from an active seroconversion because of AHSV infection. PCR remained negative throughout. Follow-up investigations provided no evidence of suspect or positive AHS infection, and this included active surveillance on both the property affected and surrounding sentinel properties.

In the past in the controlled area AHS vaccine virus has been responsible for several outbreak events. In this case the suspect sero-conversion happened well before the start of the legal vaccination period in the controlled area (1 June 2020), and is unlikely to have been a source of the serological picture seen. Past outbreaks because of vaccine re-assortment or reversion to virulence have also resulted in spread which was not detected in this instance. Finally, the SNT response was not consistent with a vaccine-associated response.

Horse 8612 tested suspect on ELISA during the months of October and February 2020. This horse has previously had similar results and results indicate either an underlying cross-reaction on serology or residual maternal antibody playing a role in the results noted. The horse has a long history and maintained its negative PCR status throughout the season. It has since been de-recruited as a sero-sentinel and remains on the PCR-only program.

Horse 23470 had a serological profile that changed between negative, low positive, negative and finally suspect between May and July 2020. Other sentinels (a further 6) on the property tested consistently negative – 4 of which were sero-sentinels as well as PCR sentinels. Interestingly this horse was EEV positive in April 2020. Whether this plays a role in false-positive AHS ELISA results is not yet known but in future sentinels presenting with similar serological profiles will have prior EDTA blood samples tested for EEV.

Horse 9797 had tested both positive on PCR and ELISA in Nov 2019. Investigations revealed that it had been vaccinated illegally in October 2019. While unplanned, this event showed the program detected a 'positive case', albeit because of vaccination. The horse was removed from the sentinel program.

The investigations above account for serological and PCR results that resulted in investigations. There were a further 5 events (4 horses) that required investigation but where results and sample events needed to be removed from the program as a result. Horse 1530 was incorrectly identified during sampling in Jan 2020. Horse 5831 was a PCR sentinel whose serum was tested on ELISA in June and July 2020. Horse 19616 had suspect serological results which were not repeatable on testing by the laboratory

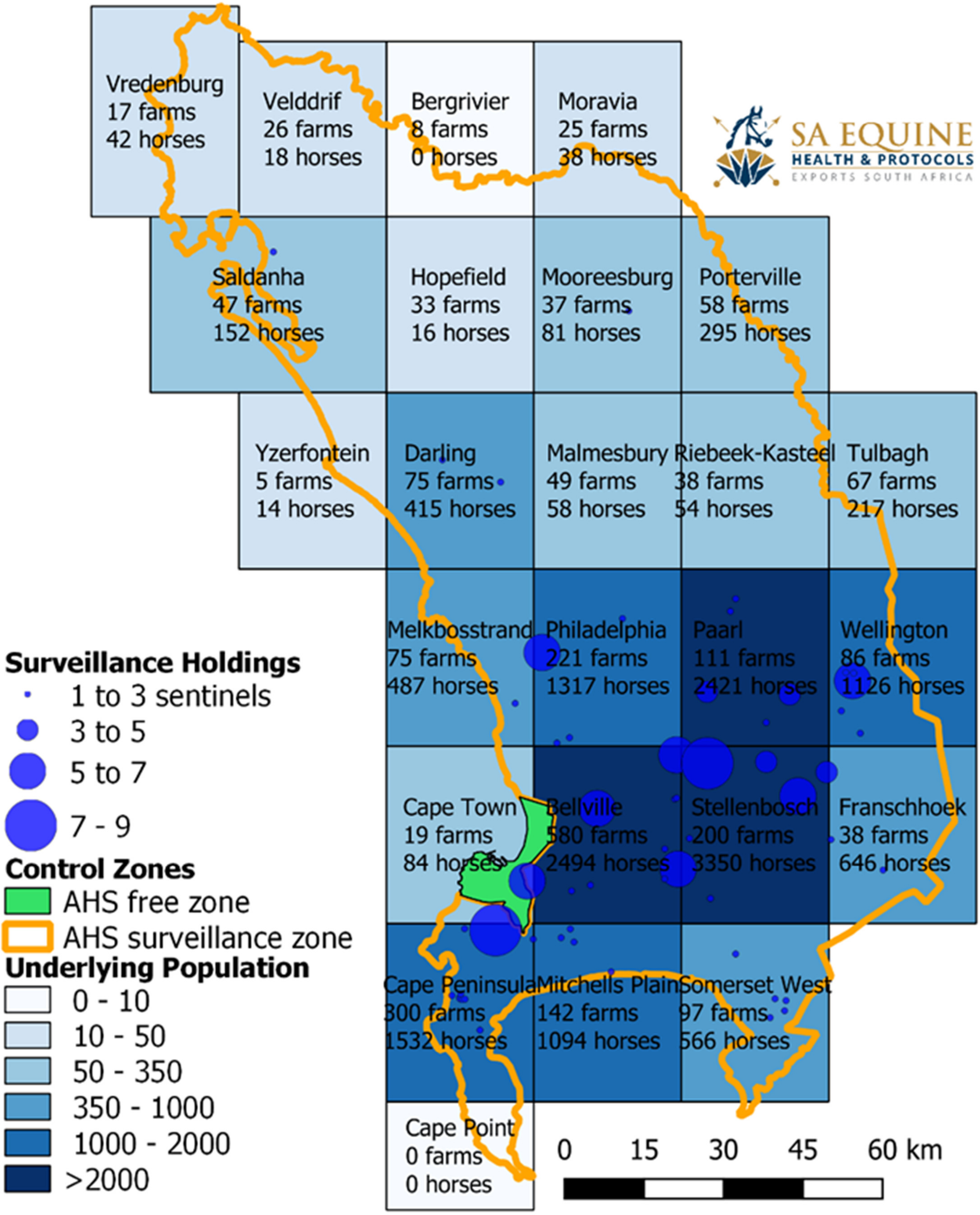

Figure 2: The underlying population of horses in the African Horse Sickness Surveillance and Free Zones of South Africa. These populations have been revised based on new population data collected between 1 April 2016 and 1 September 2020. The proportional circles represent the current sentinel populations.

and the initial suspect result was retracted. Follow-up samples also tested negative. Horse 25865 was also a PCR-only sentinel who was tested on serology in Jan 2020.

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 underlying population and current sentinel farms.

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 Table 1 and analysis is based on evaluating sensitivity of surveillance programs (Martin et al. 2007). The previous surveillance program is considered as it provides historical information that aids in determining an accurate final probability of freedom as of August 2020. The final probability of freedom at the end of the four-year period (48 months) was 91.3%, a drop of 3% from the previous evaluation (figure 1).

The sensitivity of the sentinel surveillance alternates around the 30% mark throughout. This is the fourth AHS season running where cases of the disease have not been detected in the AHS controlled area. The last time this occurred was in the period between the 2006 and 2011 outbreaks where, for four full seasons running, the area was AHS free.

Impact of COVID-19 lockdown

Evaluating the surveillance system gives an insight into the impact that lockdown restrictions had on the ability to detect AHS should it have occurred. While the ability to perform regulatory Veterinary services was considered essential, the ability to move around freely and easily, and the consent for allowing officials onto properties for surveillance was hampered and clearly shows in the number of samples that were taken in April 2020 and after. April 2020 was the month most affected when level 5 lockdown restrictions were in place, and during that month the sensitivity of the program reached a 4-year low of 14.4%. This results in a drop of 56.7% from a pre-COVID April average of 33.18% and a 54.2% drop in sensitivity from the pre-COVID monthly average of 31.42%. The drop in system probability of freedom was affected but because of the ability for prior probability of freedom to inform ongoing probability of freedom the impact was not as dramatic – a drop from 92.6% to 91.15% between March to April 2020 occurred. Relatively, this is high – the standard deviation in the plateau phase of probability of freedom between Sept 2018 to December 2019 was 0.45 percentage points.

Overall the 3% drop in probability of freedom from Aug 2019 to Aug 2020 relates to the impact of COVID restriction on movement as well as (albeit slightly) on the increase (1259 compared to 1181) in total herds estimated in the surveillance area year on year.

Discussion and conclusion

The primary goal of demonstrating AHS freedom for the 2019/2020 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 4-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 91.3% probability of freedom from AHS, in the AHS surveillance and free zones, as a result of sentinel surveillance.

References and acknowledgements

This program would not be possible without the support of the horse owners in the AHS surveillance zone who freely give of their time and resources to allow and facilitate the monthly sampling of horses. We are grateful to the Onderstepoort Veterinary Research Institute and the Stellenbosch Provincial Veterinary Laboratory who performed the testing of samples this season.

In this season we again made use of compulsory community service and Western Cape State vets who assisted in sampling. In this regard we specifically acknowledge Drs. Tasneem Anthony, Aliya Davids, Katie Edmonds, Gina Anstey and Leandri Klopper. We are grateful to our SAEHP team who are directly involved with the program – Esthea Russouw and Lizel Germishuys.

The sentinel surveillance program costs in the region of R1.5 million a season. This cost is made up of testing, personnel, travel/logistics and equipment costs. Funding primarily comes from the South African Health and Protocols NPC and the Western Cape Department of Agriculture (both Animal Health and Provincial Laboratory). The sentinel surveillance program is performed in partnership with the Western Cape Department of Agriculture and we thank Dr Gary Buhrmann (State Vet Boland) who is the primary liaison and supervisor of the program and to whom we report.

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New publications

A special issue of the Scientific and Technical Review of the World Organisation for Animal Health (OIE) was published this month. The issue focusses on the impacts of disasters on animals, people, the environment and the economy. Case studies are included detailing the response by Veterinary Services to previous disaster events around the world, including hurricanes, disease outbreaks, drought and human conflict. The goal of the special issue is to increase resilience by encouraging capacity building for response and preparedness in the future.

Western Cape Veterinary Services were invited to contribute an article discussing the adaptations made by Veterinary Services in response to the drought and impending "Day Zero" crisis in the province in 2018 (fig 3). At the time, many water-saving changes were made by staff, both in the office and in our personal lives. The combined efforts of citizens of the Western Cape resulted in disaster being averted.

Figure 3: Theewaterskloof dam in February 2018 (Photo: M North)

The paper was authored by the two State Veterinarians in the Epidemiology Section: Laura Roberts and Lesley van Helden, as well as State Veterinarian Oudtshoon, Cathy Fox; State Veterinarian Export Control, Fabian Fiff and Technical Manager of Animal Health, Dawie Visser.

Roberts, L.C., van Helden, L.S., Fox, C.A., Fiff, F. & Visser, D.J., 2020, Provincial Veterinary Services respond to drought in South Africa, *Scientific and Technical Review*, 39(2). https://doi.org/10.20506/rst.39.2.3092

Our colleague, Tasneem Anthony, from the Provincial Veterinary Laboratory published an case report of vaccine-induced meningoencephalitis in alpacas given live attenuated Rift Valley fever vaccine. The abstract was published in the Journal of the Federation of American Societies for Experimental Biology earlier this year.

Anthony, T., van Schalkwyk, A., Romito, M., Odendaal, L., Clift, S.J. & Davis, A.S., 2020, Rift Valley fever virus live attenuated vaccine strain Smithburn can cause meningoencephalitis in alpacas, *Journal of the Federation of American Societies for Experimental Biology*, 34(S1). https://doi.org/10.1096/fasebj.2020.34.s1.03843

Outbreak events

Five more **ostrich** compartments were reported as affected by the **H7 avian influenza** (AI) outbreak, bringing the total to 19 in September. One is west of the **Heidelberg** area (total now five), one in the **Riversdale** area and three near **de Rust**, east of Oudtshoorn. H7 AI virus was detected via PCR on one of the compartments near de Rust, but the tentative H7 diagnosis is based on serology only on the other compartments.

Low pathogenicity AI H5 was also detected on an **ostrich** compartment in the **Oudtshoorn** area. The compartment was classified as exposed to H7 AI based on antibodies detected in August but tracheal swab samples taken as part of a second round of follow-up sampling in September tested PCR positive for H5 AI. Sequencing of the HA cleavage site at OVR identified a low pathogenic H5 AI virus.

One **ostrich** compartment in the **Riversdale** area, which tested AIV sero-positive at the end of August, has been classified as exposed to **H6 AIV**, based on serology.

A **bat-eared fox** was found dead on a farm near **Wellington** in an area where a flock of sheep grazes. It subsequently tested positive for **rabies**. No wounds were found on the sheep, and they will be kept under observation for any abnormal behaviour. All 28 dogs and cats on the farm were vaccinated in response, as well as 277 additional dogs and cats in the surrounding area.

A farmer from the **far north of the province** reported that an unvaccinated **dog** had recently died after showing clinical signs suspicious of **rabies**, including increased salivation, paralysis in its hind legs and whining and chewing on its cage and bedding. The dog had been in contact with a bat-eared fox that appeared ill some time ago. Unfortunately the dog was buried in an undisclosed location after it died and could not be sampled. No human contacts were reported. Dogs and cats in the area were vaccinated in response.

Emaciation occurring over time was noticed in a flock of dorper **sheep** near **Worcester**. A post-mortem was done and **Johne's disease** was diagnosed. The last introduction into the flock was five years previously. The farm was placed under quarantine and the owner plans to vaccinate the flock.

Brucella ovis was reported in **rams** on two properties near **Bitterfontein**.

After recent introductions to the flock, **sheep** on a farm near **Stellenbosch** were seen itching and biting, with large patches of wool loss (fig 4). Sheep scab was diagnosed. The sheep were treated twice under official supervision.

Autogenous vaccine was prepared for **sheep** in the **Beaufort West** area to combat an outbreak of **orf** (contagious pustular dermatitis).

Mange was detected in newly purchased **pigs** near **Melkbosstrand**.

Geeldikkop (secondary photosensitivity caused by ingestion of *Tribulus terrestris*) was reported in **sheep** near **Vanrhynsdorp**.

Five **ewes** died of **acidosis** in the **Beaufort West** area after they were fed maize ad lib.

Lambs in the **Beaufort West** area were diagnosed on post mortem as having died of **starvation** owing to their mothers not having enough milk in the drought conditions.

Many suspect cases of **Witstorm** poisoning were reported from the **Beaufort West** area.

Lumpy skin disease was reported in dairy **cattle** near **Caledon**.

Figure 4: A sheep showing lesions caused by sheep scab (Photo: M Fourie)

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EPIDEMIOLOGY REPORT

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COVID-19 highlights the risk of an anthroponosis

Lesley van Helden

SARS-CoV-2 causing COVID-19 has been detected in farmed mink in many countries, including Denmark, Greece, Italy, the Netherlands, Spain, Sweden, Poland and the USA since the virus began to spread globally earlier this year. American mink (*Neovison vison*) are farmed in many countries for their fur, and this practice is economically significant in several regions of the world. In Europe, there are currently approximately 2750 mink farms producing 27 million mink pelts annually.

Large numbers of farmed mink are routinely kept in close proximity in cages with dusty bedding– all of which create ideal opportunities for the spread of respiratory pathogens. Experiences in Europe have shown that once SARS-CoV-2 enters a mink herd, it is difficult to stop transmission. On one studied farm in Denmark, seroprevalence increased from 4% to more than 95% in the space of eight days.

Outbreaks of COVID-19 can have a devastating effect on a mink herd. For instance, at least 11 000 minks were reported to have died from COVID-19 on two farms in the USA.

On several farms where the source of infection has been investigated, it has been traced to a member of the farm staff. However, recently released research from the Danish National Institute of Public Health provided evidence that the virus had then spread from minks back into the human community. In seven countries so far, including South Africa, cases of COVID-19 in humans have been typed as variants that have occurred in minks, showing not only the potential for strains to be transmitted from humans to minks and back again, but also the potential for new strains to spread quickly around the world.

The spike protein of SARS-CoV-2 is necessary to allow the virus to bind to human cells, and is therefore a target for vaccines and other therapeutics. Some mutations in the spike protein gene have been detected in viruses transmitted from minks back to humans. Preliminary evidence suggested that this mutation of the virus was more resistant to neutralisation by antibodies of people who had been infected by a non-mutant variant of SARS-CoV-2. There were therefore concerns that circulation of the mink variant of SARS-CoV-2 in the human population may negatively affect the effectivity of vaccines being currently developed. The mink variant had apparently last been detected in people in Denmark in September.

Concern regarding the large scale infection of mink is not only based on the mutation potential of the virus. Large populations of infected mink create a large reservoir for SARS-CoV-2, which can spill back into people– as has happened on numerous occasions with mink farm workers. Additionally, mink frequently escape from farms and this poses a risk of introducing SARS-CoV-2 into wild mink populations in Europe, Asia and North America. Other wild animals could also be exposed to the virus, allowing potential for further mutations or reassortment with other viruses. The establishment of a reservoir in wild animal populations presents a serious threat to the potential eradication of any disease.

Of the approximately 1200 mink farms in Denmark, 288 (24%) have already been confirmed to be infected. In light of this, the government of Denmark made the decision to order a mass cull of all 17 million farmed mink in the country. The cull is currently underway, but it will take time for such a large numbers of animals to be humanely killed and disposed of.

Several other European countries have begun or accelerated the process of phasing out fur farming over the next few years. The Netherlands originally planned to phase out fur farming by 2024, but has moved its deadline forward to 2021. France has decided to ban fur farming by 2025.

Although the effect that COVID-19 has had on the agricultural sector seems dramatic, this is by no means the first time that humans have caused significant effects on domestic or wild animals by infecting them with their pathogens.

Wild mink in the northern hemisphere have the potential to become a reservoir of SARS-CoV-2 if infected.

Many cases of anthroponotic tuberculosis have been recorded in companion animals, livestock and wildlife. Humans have also caused outbreaks of methicillin-resistant *Staphylococcus aureus* in several species of domestic animals. In Tanzania, outbreaks of human respiratory illness in wild chimpanzees caused a mortality rate of up to 47%. Chimpanzees have also been affected by outbreaks of poliovirus from humans, while mountain gorillas in Uganda and Rwanda have suffered outbreaks of measles, *Sarcoptes scabei* and *Giardia duodenalis*. *Giardia duodenalis* of human origin has been found in multiple species of wild and domestic animals, including endangered populations of African wild dogs.

Strains of *Giardia* that likely originated from humans have been found in populations of endangered African wild dogs.

During the pandemic of H1N1 influenza in 2009, numerous occurrences of anthroponotic infection of pigs were recorded, as well as sporadic infections of several other domestic and wild animal species. These events can substantially increase the risk of reassortment of different influenza viruses to generate viruses that could cause further threats to both people and other species. Additionally, it is believed that reassortment of pig, bird and human strains of influenza resulted in the origination and emergence of pandemic H1N1 influenza in the first place.

In order to minimise anthroponotic and zoonotic transmission of SARS-CoV-2, the OIE has released guidelines on preventing and controlling SARS-CoV-2 infection in farmed animals. The guidelines summarise the risk of infection and amplification in farmed species based on currently available evidence. Fur animals, including minks, ferrets and raccoon dogs, are considered at high risk. The risk of transmission of SARS-CoV-2 through the transport of these live animals is high. In addition, transmission risk from frozen pelts from infected animals is considered medium.

The OIE has also produced guidelines for people working with wild mammal populations. Strategies to reduce the risk of exposure of wild animals to SARS-CoV-2 are necessary. These practices are in line with good biosecurity practice when working with wildlife as, in addition to the risk of creating a wildlife reservoir of disease, human pathogens pose a threat to vulnerable populations of wild animals.

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Outbreak events

Three suspect H7 **avian influenza** (AI) outbreaks were detected in **ostriches** in September and reported in October. Two affected compartments are in the **Heidelberg** area and one is near **Oudtshoorn**, all within a few kilometres of previously-diagnosed H7 seropositive compartments. Another four compartments were detected with H7 AI antibodies in October: one each in the Oudtshoorn, **Riversdale**, **Albertina** and **Beaufort West** areas. There is still no associated increase in mortality rates or clinical signs reported from compartments affected by the H7 AI virus. These seven compartments are classified based on the presence of antibodies; no AI virus was detected.

Wild **doves** in **Graafwater** were noticed showing signs of diarrhoea, emaciation and death. Laughing doves (*Spilopelia senegalensis*) submitted to the Stellenbosch Provincial Veterinary Laboratory tested positive for **pigeon paramyxovirus**. Owners of domestic pigeons in the area were advised to vaccinate their birds.

Pigs on a farm near **Citrusdal** showed signs of fever, inappetence and raised, red areas on the skin. The outbreak affected only one pen on the farm, in which three pigs died and the remaining five recovered from the illness. A diagnosis of **erysipelas of swine** was made based on clinical signs and history of the farm. Samples were also taken to exclude African swine fever, classical swine fever and porcine reproductive and respiratory syndrome. The farmer plans to start a vaccination programme against erysipelas in the future.

A **bat-eared fox** near **Piketberg** was seen behaving abnormally and was shot by the farmer. It subsequently tested positive for **rabies**. Dogs and cats in the surrounding area were vaccinated in response.

On a farm near **Wellington**, the farm dogs chased a **bat-eared fox** and made contact with it before it got away. The next morning a bat-eared fox was found dead on the farm and tested positive for **rabies**. It is not known if it was the same fox, but the dogs will be kept under observation. All had been previously vaccinated and were vaccinated again after contact with the fox. Approximately 190 other dogs and cats in the surrounding area were also vaccinated.

A **sheep** farmer near **Moorreesburg** noticed some of his older ewes becoming thin over the past year. Samples taken from one of the ewes tested positive for **Johne's disease**. The farm was placed under quarantine.

Brucella ovis was detected in **rams** near **Bitterfontein**.

Colibacillosis was reported in Boer **goat** kids near **Beaufort West**.

Sand impaction occurred in **sheep** near **Vanrhynsdorp**.

Red lice infestation was detected in merino **sheep** near **Beaufort West**.

Pig mange outbreaks were reported near **Atlantis** in Empolweni, Chatsworth and Silwerstroom.

Ostriches on an ostrich farm in the Western Cape (Photo: L Roberts)

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EPIDEMIOLOGY REPORT

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Beyond our borders: H5N8 HPAI in the Northern Hemisphere

Lesley van Helden

In June 2017, H5N8 highly pathogenic avian influenza (HPAI) broke out in South Africa, spreading quickly across the country and causing devastating losses on many poultry farms. The virus moved south across Africa following its spread in Europe and Asia in the Northern Hemisphere autumn and winter of 2016/17. Its long distance spread is believed to be facilitated by the movement of migratory wild birds.

There were sporadic detections of H5N8 HPAI in wild birds in Europe from January until June 2020. However, genetic sequence analysis shows that a new variant of the virus was introduced to Europe via Iraq, Russia and Kazakhstan in May 2020, and in October 2020 to Western Europe likely by wild birds migrating there for autumn and winter.

Between 27 October and 28 November 2020, 552 outbreaks of H5N8 HPAI have been reported in Europe in domestic and wild birds. The vast majority of cases have been reported in wild birds that were found dead or moribund. This apparently represents a small proportion of the wild bird mortalities observed in the field. Several dozen poultry establishments have also been infected by the virus and the birds had to be culled in response.

New strains of H5N5 and H5N1 viruses were also detected in wild birds, with sequencing indicating that they originated from the same common ancestor as the current strain of H5N8 and went through several viral reassortment events.

The new variant of H5N8 HPAI has also been detected recently in both wild birds and domestic poultry in several Asian countries, including Russia and China.

The OIE recognises the detection of HPAI in wild birds as the cause of increased risk of outbreaks of HPAI in countries along the flyways used by wild birds for seasonal migration.

This situation should be of concern to us in Southern Africa after our experiences with avian influenza in 2017. Many species of wild birds migrate between Eurasia and the African continent, bringing with them the potential of introducing new avian influenza viruses.

Increased vigilance is necessary to detect any sign of a new incursion of highly pathogenic AI into South Africa. Poultry farmers and veterinarians should use this opportunity to ensure that biosecurity protocols are in place to prevent entry of pathogens onto farms.

In 2021, all producers should be on the lookout for unusual increases in mortality rates, as well as typical clinical signs of avian influenza, including respiratory signs, swollen wattles and facial skin, diarrhoea and decreased egg production.

Any unusual mortalities in wild birds should be reported to the local state veterinarian as soon as possible. Surveillance for avian influenza in wild birds is a good early warning system. However, it is far more effective when samples are taken from very fresh carcasses or ill birds that are still alive.

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Wild water birds such as the Eurasian wigeon have been implicated in the spread of highly pathogenic avian influenza in the Northern Hemisphere.

Outbreak events

Two Dorper **sheep** farms near **Beaufort West** reported outbreaks of **bluetongue** after some rain fell in the area in October. Severe coronitis was seen in the affected sheep.

A Nguni **calf** near **Malmesbury** was seen appearing to be disorientated and staggering in the veld. It died shortly afterwards and tested positive for **rabies**. There have been several reported cases of bat-eared fox rabies on this farm in previous years, as well as one reported case of rabies in a cow in 2018.

Two more **ostrich** farms in the **de Rust** area were detected as **avian influenza** (AI) seropositive in early November. No virus was detected. One farm, approximately 5km west of Stompdrift Dam, had serology indicative of the low pathogenic AI (H7N1) virus that was first detected near Mossel Bay in July. It became the twenty-seventh ostrich farm (of approximately 280 in the Western Cape) to be reported to the OIE as H7-infected. The other farm had antibodies that reacted to a variety of different test antigens, making subtyping difficult.

Skin lesions of **swine erysipelas** were seen after slaughter on three pigs from farms near **Moorreesburg** and **Eendekuil**. The farmers were advised on vaccination against erysipelas.

Brucella ovis was detected in **rams** in the **far north of the province**.

Blackleg (sponssiekte) caused the acute death of **cattle** near **Murraysburg**.

Pasteurellosis was diagnosed in **sheep** on two properties near **Vredendal**. The affected sheep were treated with antibiotics and anti-inflammatories.

Red lice infestation was diagnosed in **sheep** near **Atlantis**.

Sarcoptic mange was seen in **pigs** on four properties surrounding **Atlantis,** during veterinary visits to farmers by the South African Pork Producers' Organisation in collaboration with local animal health technicians. Treatment of mange using pour-on products was demonstrated.

Many cases of ***Ornithogalum thyrsoides*** (chincherinchee) **poisoning** were reported from the area around **Beaufort West**. The plants are consumed by livestock when there is nothing else to eat in the veld.

Contagious opthalmia was seen near **Beaufort West** in a feedlot and on another property where 40% of animals were affected. The environment is currently dry and dusty, which can exacerbate the problem.

Demonstrating treatment of pigs for sarcoptic mange (Photo: M. Fourie)

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2020 in review

2020 was a memorable year for many reasons, but thankfully not for any extraordinary occurrences of animal diseases in the Western Cape. Controlled and notifiable animal diseases that were reported in the province in the last year are summarised in this report.

Surveillance/ field activities

Our field officials made over 12 000 visits to properties where animals are kept in 2020 in order to do surveillance for animal diseases as well as animal census, farmer education, primary animal health care and disease control activities.

Small stock (fig 1)

The drier regions of the province reported 38 outbreaks of bluetongue this year, with the majority occurring between April and June in the Beaufort West State Vet area.

Nine outbreaks of sheep scab were reported between April and September. Sheep scab is more commonly detected in the cooler winter months when *Psoroptes* mites become more active. The affected flocks were treated under official supervision.

Eight flocks of sheep were confirmed to be infected with Johne's disease and the farms were placed under quarantine.

No controlled or notifiable diseases were reported in goats in 2020.

Cattle

There were several outbreaks of lumpy skin disease

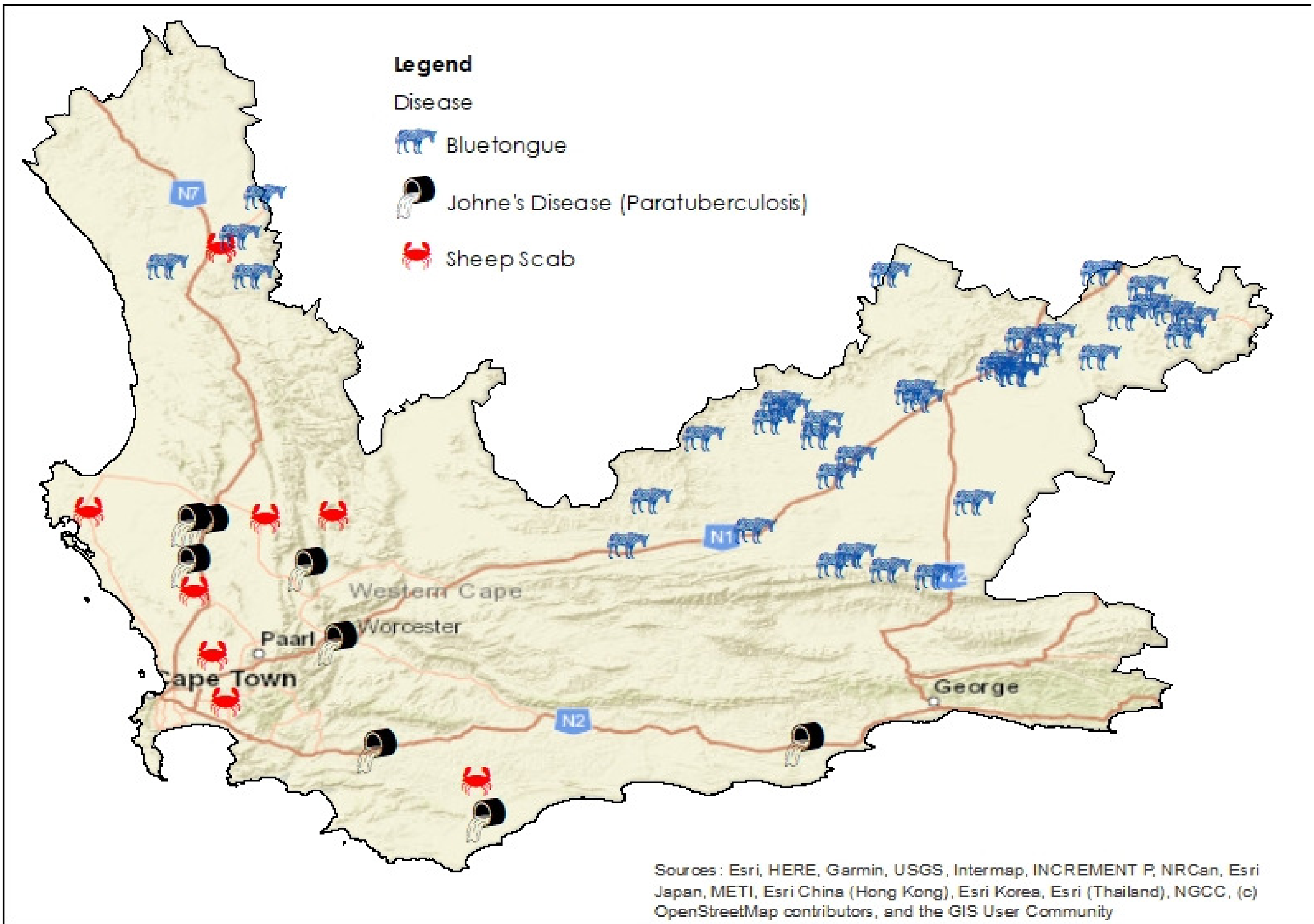

Figure 1: Distribution of controlled and notifiable diseases of sheep in the Western Cape during 2020

reported in cattle throughout the year, with over half being reported in the months of July and August. In the Malmesbury area, a case of rabies was detected in a calf in November and a case of bovine malignant catarrhal fever was reported in April.

Pigs

Sporadic cases of erysipelas of swine were reported throughout the year, with the vast majority of cases being detected after slaughter. Faint skin lesions become clearly visible after pig carcasses have been through the scalding tank at the abattoir. Erysipelas cases were reported from the Malmesbury and Boland State Vet areas, which contain the majority of pig farms in the province owing to their proximity to Cape Town.

Horses

A single case of African horse sickness was detected in the province this year, and was identified as genotype 7. In April, a horse in the Beaufort West area showed severe acute swelling of the ocular mucous membranes and supraorbital fossae and died overnight. Increased surveillance in the area and forward and backward tracing from the property identified no further cases.

Rabies (fig 2)

Thirteen cases of rabies were reported in the Western Cape this year. Twelve of these cases were clustered in the south-western part of the province where bat-eared fox rabies is endemic. Ten of the reported cases were in bat-eared foxes and one in a yellow mongoose. The twelfth case occurred in a Nguni calf that had undoubtedly had contact with a rabid wild animal.

A suspect case of rabies in a domestic dog was reported from the far north of the province. The dog showed clinical signs highly consistent with rabies and died within a few days. Unfortunately no samples were available for laboratory confirmation of the diagnosis by the time the case was reported.

State-sponsored rabies vaccination campaigns take place where there is a lack of access to veterinary care, including rural areas and indigent communities. Mass rabies vaccination is also done in response to positive cases to protect animals, and therefore also people, in the area surrounding an outbreak. Just over 77 500 animals were vaccinated against rabies by Veterinary Services in 2020.

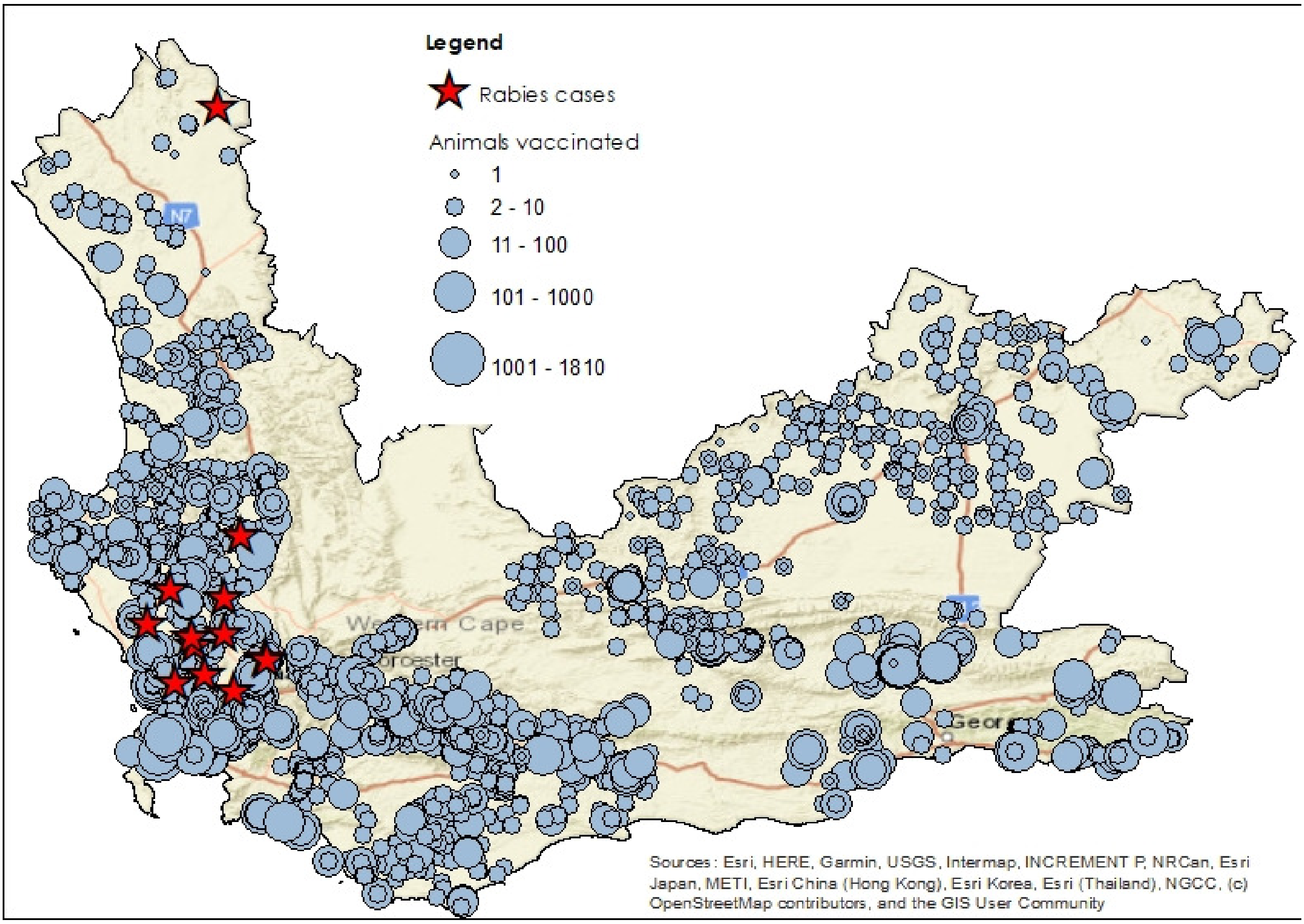

Figure 2: Rabies cases and vaccinations in the Western Cape in 2020

Avian diseases (fig 3)

Epidemiological investigations were done on 42 ostrich farms after routine serological surveillance test results were positive for avian influenza (AI). The results of these investigations are described in detail in the article on avian influenza surveillance that follows on page 4 of this report.

Other than ostriches, avian influenza was detected twice in wild birds in the Western Cape. In March a kelp gull in Melkbosstrand that died with several comorbidities tested positive. A sample taken from yellow-billed ducks near Stellenbosch that experienced a mass mortality event in May also tested positive. In both cases, polymerase chain reaction (PCR) testing for H5 and H7 AI was negative and the influenza viruses detected have not been identified further.

Outbreaks of pigeon paramyxovirus were reported in 2020 from several parts of the province. Two outbreaks occurred in flocks of domestic pigeons and six were detected in wild doves and feral pigeons. Wild dove mortalities are often reported by members of the public several days after they have occurred, when collection of samples is no longer possible.

Two outbreaks of psittacosis were detected. The first occurred in March in Cape Town in a wild ring-necked dove found dead in a suburban garden. The second outbreak, in July near Malmesbury, occurred in breeding eclectus parrots. A possible zoonotic case of the disease occurred in the owner, who was treated by a doctor.

Salmonella enteritidis was cultured numerous times in the past year from routine environmental samples taken on broiler chicken farms in the Boland, Malmesbury and Worcester State Vet areas. No clinical signs or unusual mortality rates were seen in any of the flocks from which positive cultures were obtained.

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.

We would also like to acknowledge Lugen Govender, whose work ensuring the accurate capturing of data keeps the Epidemiology Section running smoothly.

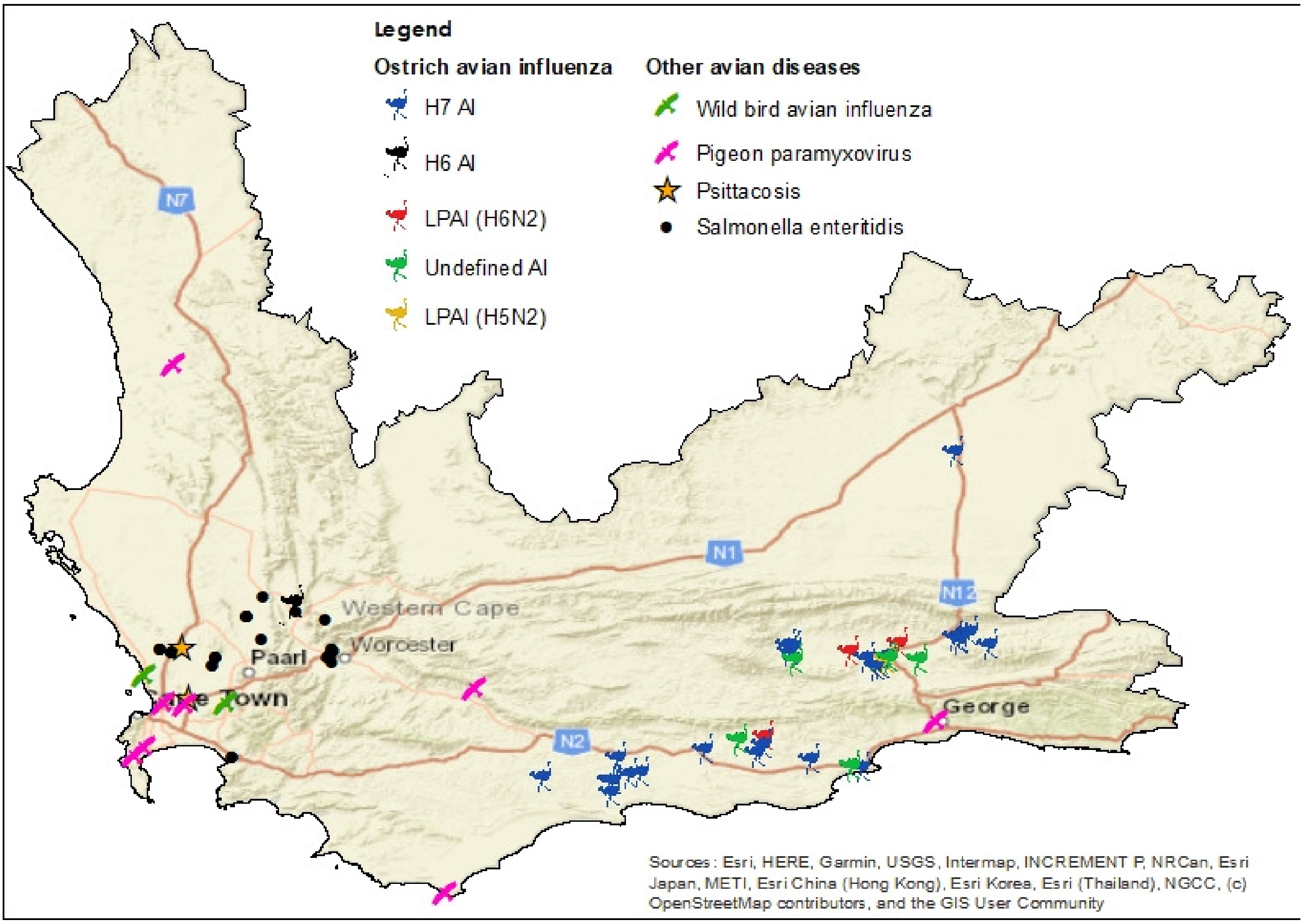

Figure 3: Controlled and notifiable diseases of birds that were reported in the Western Cape in 2020

Avian influenza surveillance in poultry and ostriches: 2020

Ostriches

Out of the 292 registered ostrich compartments (excluding hatcheries) in the province, 221 were tested for avian influenza virus (AIV) using serology in 2020. Of those that were not tested, 46 have breeders only, 21 were empty and five only recently received birds.

New AI antibody detections were made on 42 ostrich compartments but eight proved negative on follow-up, leaving 34 positive (15.4%). The haemagglutination inhibition (HI) assay was H5, H6 and H7 seronegative on follow-up, indicating an **unknown LPAI** infection.

Three compartments tested between January and March had conflicting laboratory results that progressed, through follow-up testing, from serology suggesting an H5 infection to either H5 and H7 negative or completely seronegative. There was no detection of virus on PCR tests. One of these compartments was reported to the OIE as infected with **H5N8 highly pathogenic avian influenza** (HPAI).

Twenty-six compartments were reported to the OIE as infected with **H7** virus between July and December and one is pending. Six were reported as low pathogenic avian influenza (LPAI), based on genetic sequencing and 21 as an undefined pathotype. Next generation sequencing later identified a LPAI (H7N1) virus.

The first detection of H7 was in Mossel Bay on samples from slaughter-age birds, taken on 15 July. The second was on samples from a farm near Oudtshoorn on 20 July, mostly from breeder ostriches tested pre-slaughter.

The H7 outbreak peaked in August (fig 4) with twelve more compartments found to be affected, including some in the Calitzdorp and Heidelberg areas. Intensified surveillance, using serology and PCR tests, was completed within a 3km radius of farms detected in August, and led to the detection of seven of the cases. No clinical signs were observed except for green urine on one compartment.

One compartment, found to be seropositive in November, had antibodies that reacted to both H5 and H7 test antigens, making subtyping difficult. A co-infection may provide an explanation and it is within 3km of two compartments known to have been infected with LPAI (H7N1) and LPAI (H5N2) respectively.

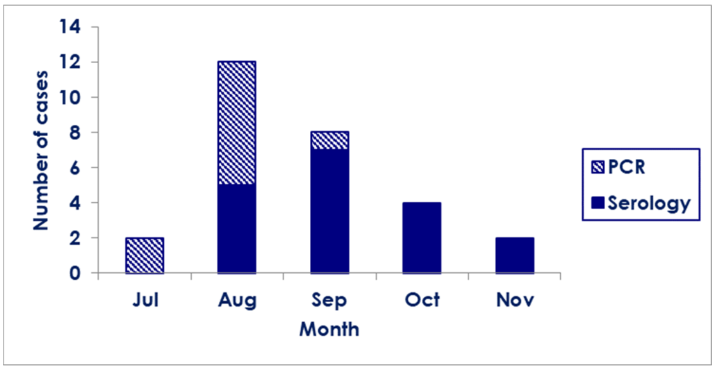

Figure 4: Epidemic curve of H7 avian influenza on ostrich compartments in the Western Cape in 2020

LPAI (H5N2) was detected in the Oudtshoorn area in September. The compartment was classified as exposed to H7 AI based on antibodies detected in August but later tracheal swab samples contained virus sequenced as LPAI H5.

Six compartments were found to be positive for **LPAI (H6N2)** between June and September. Three also had H7 virus sequenced and two had been AI seropositive for some time without any idea of the AIV subtype. On only one were there clear H6 antibody reactions, without any evidence of a co-infection. A seventh compartment tested H6 seropositive in late December. Follow-up is in progress.

Backyard chickens

Serology

Laboratory results are available for 134 properties with backyard chickens, sampled for AI serology, which meets the national six-monthly target of at least 100 units per province per year.

One property in Strand tested seropositive at the end of July but was H5, H6 and H7 negative and no abnormal mortality or clinical signs were reported on the day of sampling or during the investigation. One of 40 follow-up serum samples tested ELISA positive but HI negative and PCR tests were also negative. In October, three properties were ELISA positive, though HI negative. Two were followed up and were ELISA and PCR negative. The one not followed up had no history of disease.

Clinical surveillance

A total of 296 properties with backyard chickens were visited for clinical surveillance in 2020. Six reported signs of disease (2%), though on one only wild ducks were affected. Avian influenza virus was detected in the ducks, though typing is still pending.

One property had chicken seropositive for Newcastle disease virus (NDV) and respiratory signs, but NDV PCR and AI serology were negative and no more deaths occurred after antibiotic treatment. One property in Philippi had problems with chicks dying with difficulty breathing in August. AI PCR tests of carcasses were negative and post mortem examination suggested a septicaemia but an avirulent NDV was detected via PCR. One property had chickens with nasal and ocular discharge but they were seronegative and PCR negative for AIV. Two other properties reported a history of deaths but one was AI seronegative and the other both AI and NCD seronegative.

Commercial chickens

AI surveillance data was obtained for nine poultry companies, including all the largest enterprises. This accounts for an estimated 85% of commercial poultry in the Western Cape, based on available census data. Testing took place on 115 sites.

In 36 separate events, 23 sites (20%) tested ELISA positive (some sites tested positive repeatedly). Twenty-four events were followed up with serology and PCR testing. Six positive ELISA tests preceded seronegative follow-ups and eleven were HI negative. There were no positive PCR results from swabs taken at follow-up sampling events so no virus was detected or identified.

Nine sites had H6 HI positive results. Seven were positive on routine surveillance and one was a follow-up to positive surveillance in December 2019. One was positive on follow-up. On two sites, serology indicated only HxN2 or H6Nx and no conclusions can be drawn on the remainder.

Of the events that were not followed up, one was on a farm with three previous events that had been followed up, one event was associated with normal production and mortality data and four occurred in November and December and follow-up is pending. Six positive tests were follow-ups to positive tests in 2019.

SARS-CoV-2: veterinary implications of the pandemic

If there is one disease that has dominated the year 2020, it has been COVID-19. Very little was known about the virus, SARS-CoV-2, and its implications for the veterinary community when it first emerged, but much has been learned in the past year, and new knowledge continues to be gained every day. While transmission of SARS-CoV-2 occurs predominantly from human to human, there is evidence that it can be transmitted to animals and from some species back to humans. The virus can additionally potentially be transmitted through some animal products, all of which has implications for veterinary professionals.

Companion animals

Infection with SARS-CoV-2 has been confirmed in cats and dogs in several countries around the world after having had contact with their owners who had COVID-19. Recently, a pet ferret in Slovenia was also found to be infected. Infected pets do not commonly show clinical signs of COVID-19 and there have been no recorded cases of infection being transmitted from infected pets to people or other animals.

Captive carnivores

Large outbreaks of COVID-19 have occurred in herds of American mink kept in Europe and North America for fur farming. Cases of zoonotic transmission of SARS-CoV-2 back to humans from infected mink have been recorded, resulting in new variants of the virus in the human population. As a result, those mink in infected herds that have not died of the disease have been culled to prevent its spread.

Figure 5: Endangered black-footed ferrets in the USA have received an experimental SARS-CoV-2 vaccine (Photo: J Michael Lockhart)

Captive big cats in zoos in several countries, including South Africa, have been diagnosed with COVID-19 after contact with infected zoo keepers. Affected species include tigers, lions, a snow leopard and a puma.

Free-ranging wild animals

After surveillance was conducted in wild mammals in the areas surrounding infected mink farms in the USA, SARS-CoV-2 was found in an asymptomatic wild American mink in Utah. The virus was found to be indistinguishable from that infecting a nearby mink farm, indicating that the virus had spread from farmed to wild mink. However, no other mammals sampled during the surveillance tested positive. There is thus no indication at the moment that SARS-CoV-2 has established itself in any wild animal population.

Animal products

The OIE considers the risk of transmission of SARS-CoV-2 through the transport of infected mink pelts to be medium. There have been no recorded cases of transmission by products from infected mink, as all infected farms have had their mink culled and the pelts destroyed.

China has suspended import of some frozen food products after traces of SARS-CoV-2 were found in samples of the packaging. Subsequently, viable virus was isolated from samples taken from the packaging of imported fish. However, only a tiny fraction of samples taken tested positive and there is currently no evidence of any infection resulting from contaminated packaging. The OIE does not recommend any precautions to be taken regarding the packaging of animal products other than basic hygiene measures.

Animal testing in South Africa

Animals can be tested for infection with SARS-CoV-2 using the same PCR assay used for human testing. However, as testing resources are limited, animal testing in South Africa is allowed only with permission from the National Director of Animal Health after a risk assessment has been performed. Permission for testing of animals for research purposes must also be obtained from the National Department of Agriculture, Land Reform and Rural Development (DALRRD) by means of an application for research approval in terms of Section 20 of the Animal Diseases Act.

Vaccination in animals

While several vaccines for humans are in various stages of development and manufacturing, biotechnology companies are also looking into the possibility of SARS-CoV-2 vaccines for animals. The effect of COVID-19 on the mink farming industry has stimulated efforts to develop a vaccine for mink. The Rosselkhoznadzor (Russian Federal Service for Veterinary and Phytosanitary Surveillance) is currently developing a vaccine for use in farmed mink and domestic cats. Zoetis USA is also developing a mink vaccine, which they claim could be adapted to be used in dogs and cats.

Despite the concerns of some pet owners, there is currently no indication that there is a need for a vaccine for domestic dogs and cats as there is a lack of evidence that they play a role in transmission of the disease or experience severe disease when infected.

There are, however, concerns regarding the impact of COVID-19 on some endangered species whose populations may be vulnerable to collapse if infected with SARS-CoV-2. Of particular concern are populations of great apes and discussions are underway about whether vaccination for these species should be considered in the future.

In the USA, a captive breeding population of endangered black-footed ferrets (fig 5) have received an experimental vaccine developed by wildlife research scientists. There are currently only 370 black-footed ferrets in existence in the wild.

Outbreak events

A severe case of **lumpy skin disease** was seen in a **cow** in the **Heidelberg** area (fig 6).

An **ostrich** farm near **Albertinia** tested seropositive for **avian influenza**. HI test results indicated that the birds were possibly infected with the low pathogenic H7N1 virus that has been previously identified in ostriches in the province. All birds on the property were slaughtered.

A wild **laughing dove** found dead in **Montagu** tested positive for **pigeon paramyxovirus**.

Salmonella enteritidis was cultured from routine environmental dust samples from several broiler **chicken** houses in the **Worcester** State Vet area on day 26 of the grower cycle. No clinical signs of disease were seen in any of the chickens.

An outbreak of **mange** was seen in all the **pigs** in a herd near **Darling**.

Krimpsiekte, caused by the ingestion of plants containing cardiac glycosides, was seen in **goats** in **Matjiesfontein** and on two properties in the **Laingsburg** area.

Sheep were affected by **rumen acidosis** in the **Vanrhynsdorp** area.

Goats became ill as a result of **pasteurellosis** in **Lutzville**.

Figure 6: Severe lumpy skin disease seen in a cow in the Heidelberg area (Photo: P Kloppers)

In the **Beaufort West** area, three cases of suspect **clostridial disease** were investigated after several **sheep** and **goats** died. Malignant oedema and haemorrhagic enteritis indicative of clostridial infection was seen, despite the fact that the affected farmers routinely vaccinate their animals with multiclostridial vaccines.

Several angora **goat** kids died of "swelsiekte" (severe subcutaneous oedema) in the **Beaufort West** area. Infestation with **brown stomach worm** was seen on post mortem examination.

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