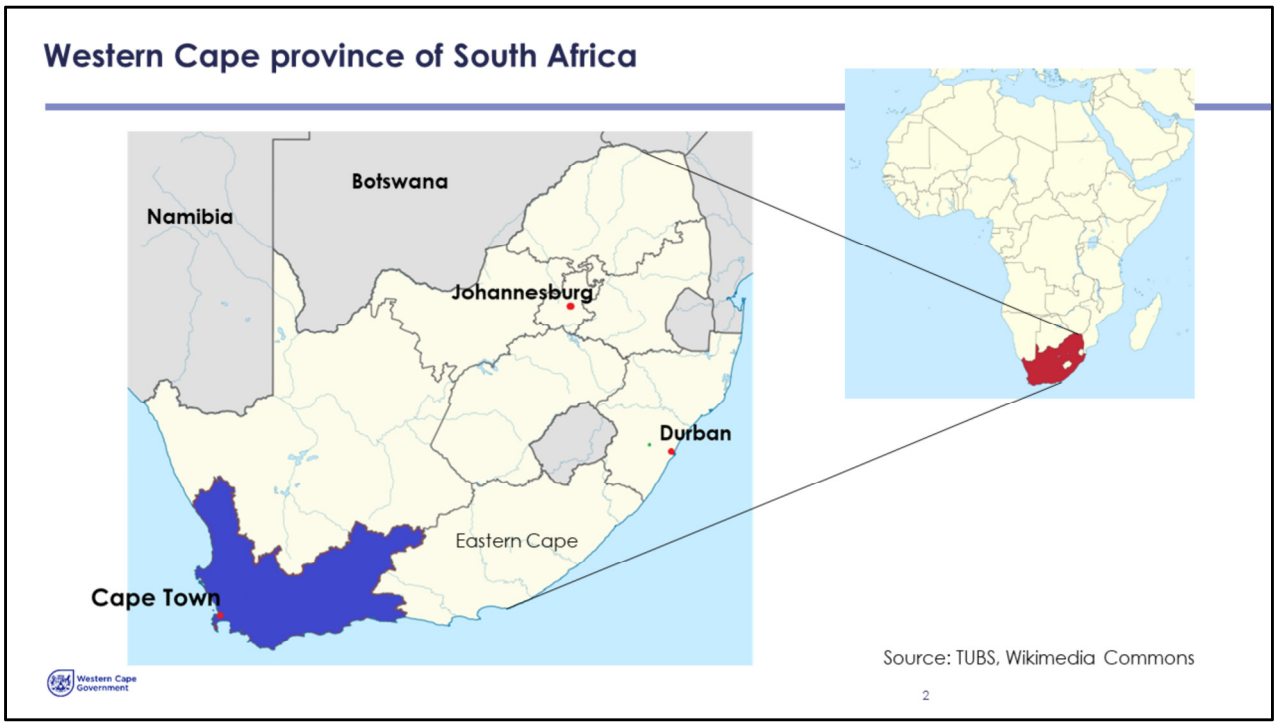
Broad over view of HPAI in South African seabirds and what we've learnt over the last 6 years or so.
But I first need to stress that I represent a wide variety of government departments and NGOs, who have all played important roles



We're here!

[To orient you: Africa- South Africa at southernmost tip- The Western Cape province in the south west. And most seabird breeding colonies are there, and all mass mortality events occurred there so I'm comfortable representing South Africa]

HPAI in Southern African seabirds

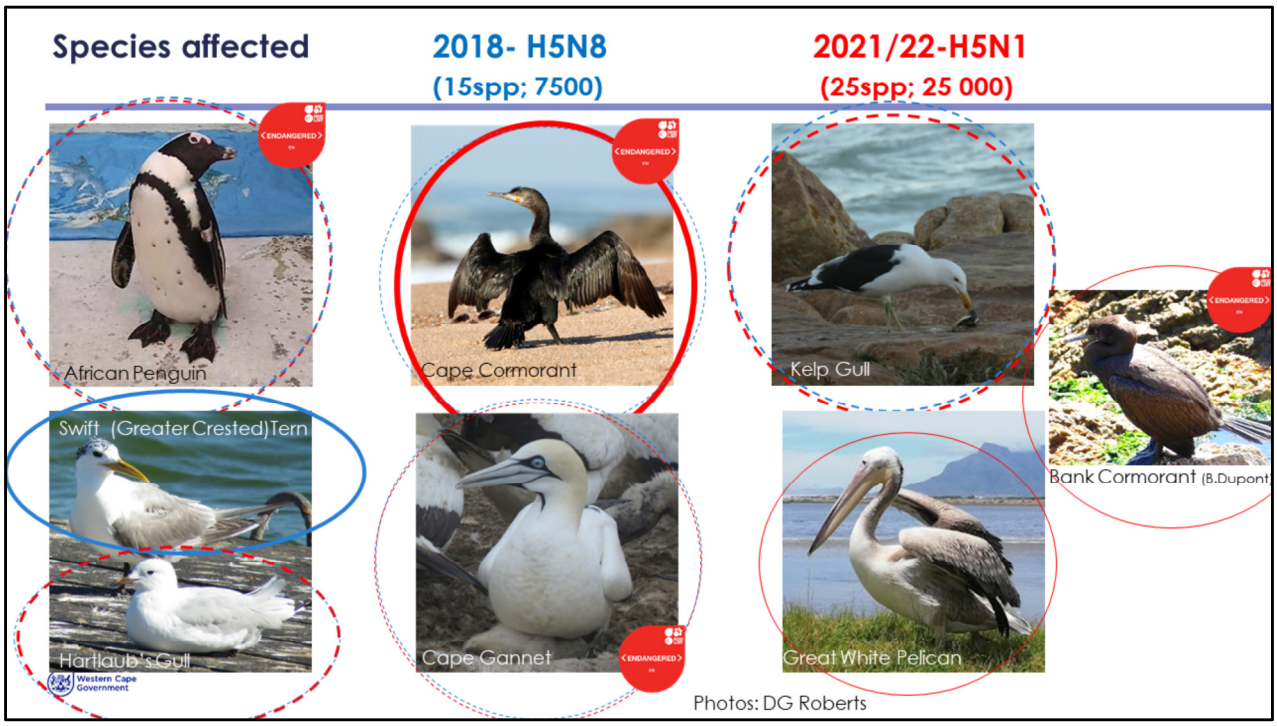
2018: HPAI clade 2.3.4.4 group B H5N8
(Namibia in 2019)

2021-23: HPAI clade 2.3.4.4 group B H5N1
(Namibia in 2022)

J Kemper

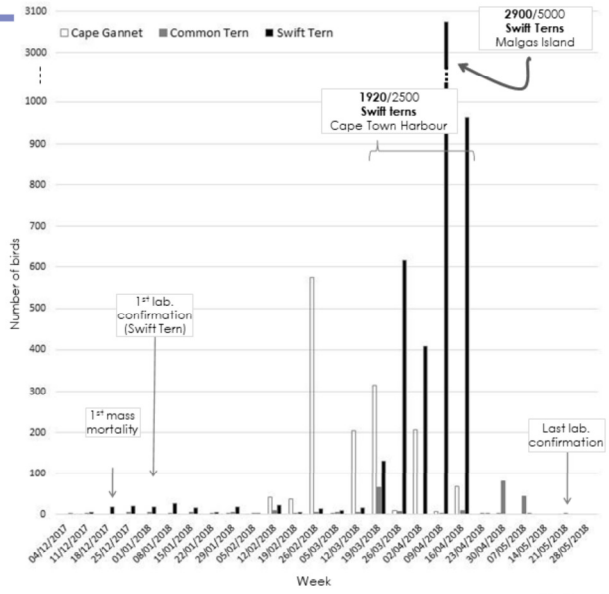
Western Cape Government

We've had two major HPAI virus incursions in Southern Africa in the last 6 years- the 2017 H5N8 virus that affected seabirds in 2028 and caused mass penguin mortality in Namibia in 2019
And the 2021 H5N1 virus that has persisted, and spread to Namibia in 2022



These are the main seabird species affected by HPAI, colour-coded to compare the main species and relative numbers affected by the different viruses.
Our 4 endangered seabird species have all been affected, the worst being over 24 000 Cape cormorants in 2021, which could have been up to 30% of breeding adults.
African penguins were affected by both viruses, more by the H5N1 in South Africa though the H5N8 mortalities in Namibia were high for H5N8.
Besides the differences in species affected, there's also been a difference in the time the viruses have been detected…

HPAI (H5N8) 2018



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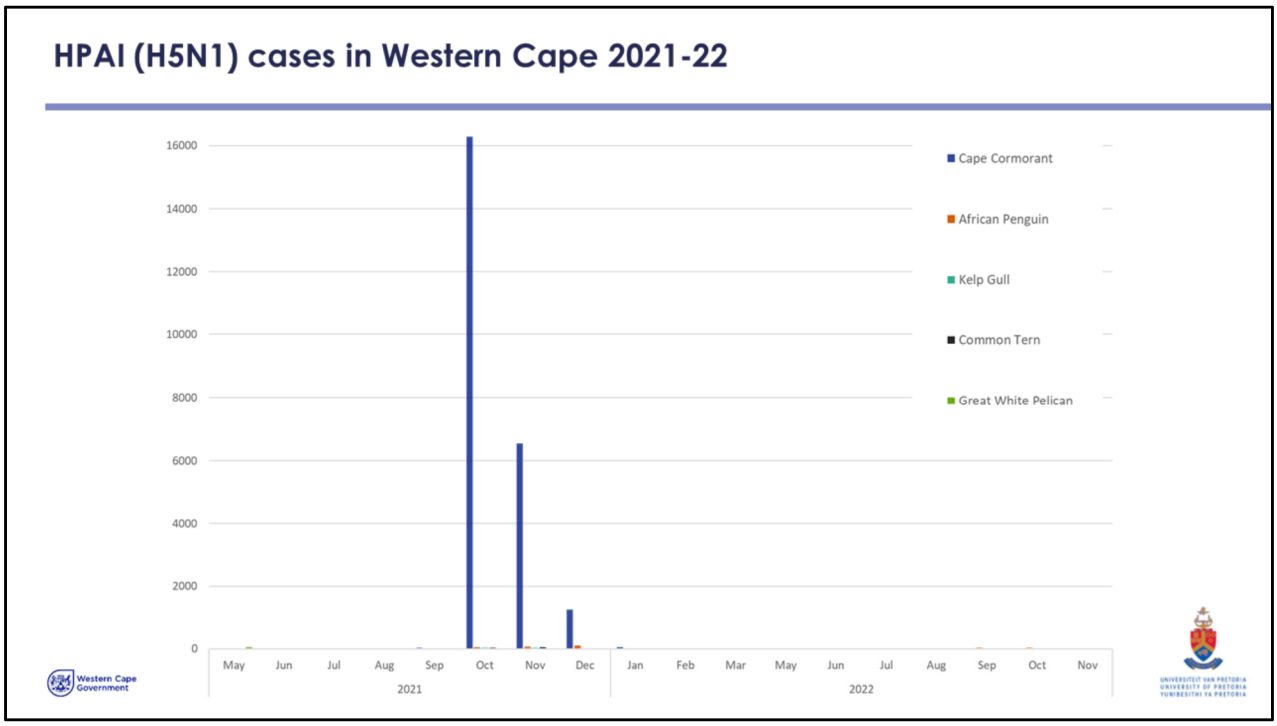
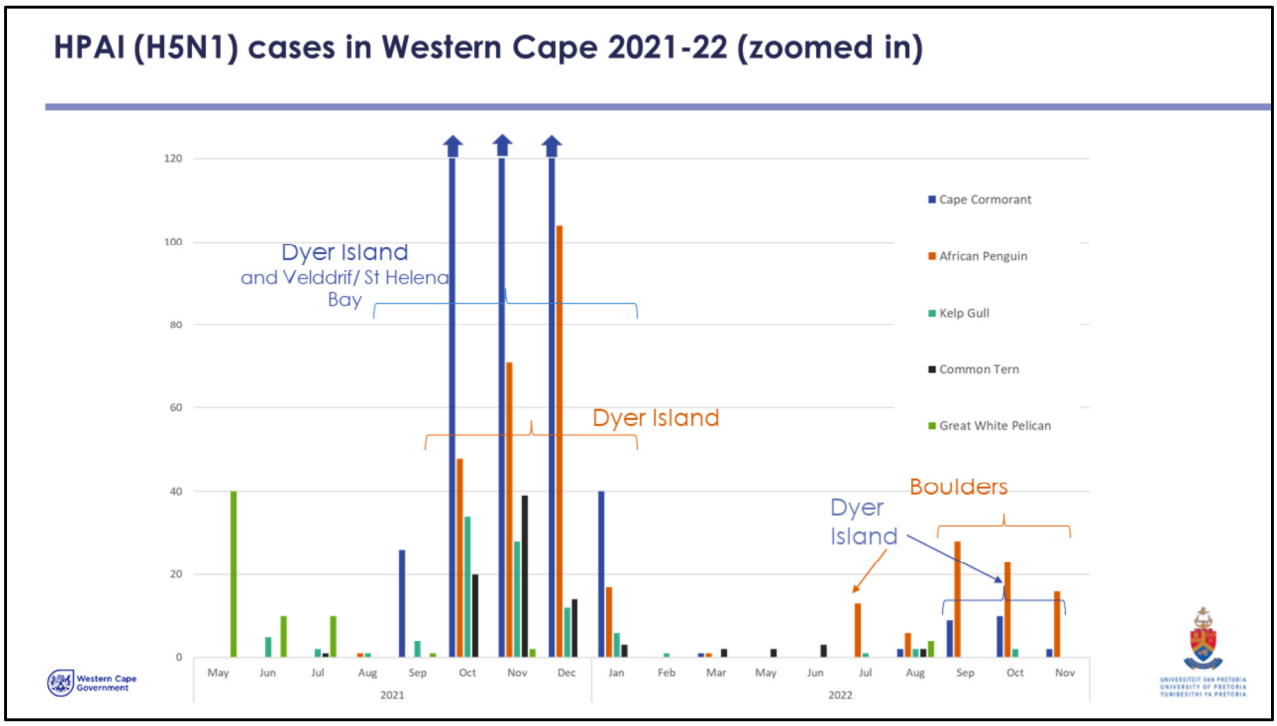
Roberts *et al.* (2023) Peyrot *et al.* (2022)

… we detected the H5N8 virus in sick seabirds for about 5 months, after the chickens had mostly stopped dying. We now know the seabird virus originated from a poultry virus in around October but seems to have taken time to start killing large numbers of birds



For H5N1, the worst was over 3 months when most of the cormorants died but the virus has persisted and specialised…



The H5N1 virus was different in that the first cases in seabirds were detected at the same time as with poultry. But the virus also persisted until at least July last year.
with the worst penguin mortalities on dyer island with most cormorant mortalities. The virus was detected on the island the next year but the mortality rate stayed low. Instead the highest mortalities in 2022 were at the boulders colony.

Risk factors?

Density?

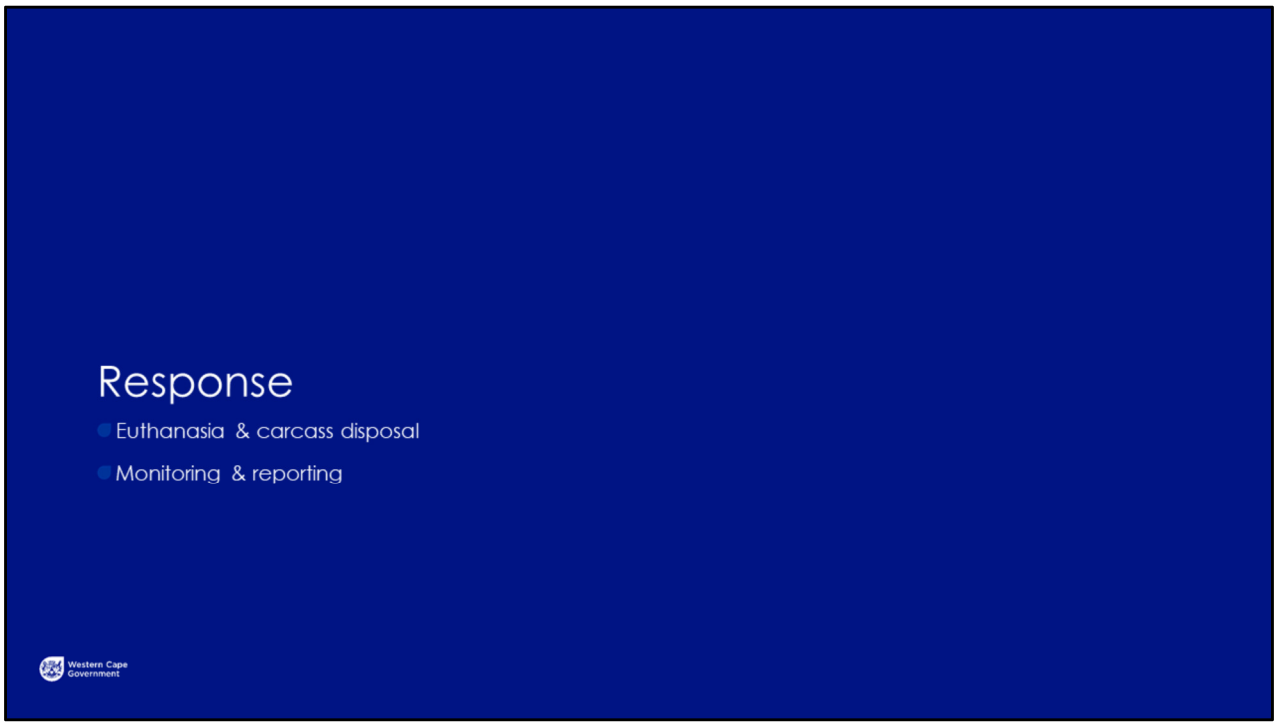
Dose?

Foxy Beach at Boulders, Simon's Town

Dyer Island

Halifax Island, Namibia

Looking at the worst affected penguin colonies, it seems likely that nest density and dose play a role. Halifax island in Namibia has the highest nest density overall in southern Africa and foxy beach at boulders looks similar. Even though nests are distributed widely in the boulders reserve, most cases were detected on foxy beach.
Dyer has a more intermediate nest density but the proximity of the thousands of dying cape cormorants, producing high doses of virus is expected to have been overwhelming
…SO NEED TO BE MAKING SURE THESE BIRDS HAVE SPACE



These are the main components of our HPAI response in wild birds and there is a huge need for more contingency planning and budgeting

Response

Remove sick and dead birds

- Avoid disturbance
- Euthanasia
- Carcass collection & disposal

Biosecurity (humans)

- Conservation authority staff
- Researchers
- Public

The aim was to remove sick and dead birds as a source of virus, but with the proviso that the removal process didn't cause more damage than the disease.
We arranged for vets to euthanise sick birds where possible but also did refresher training for conservation staff to be confident with manual euthanasia. And we collected and disposed of carcasses where possible. There is still an ongoing global debate about whether this is worthwhile but there's agreement that it depends on the situation
We also tried to ensure that people didn't contribute to virus spread, though we believe bird-to-bird spread plays a much larger role. Both field staff and researchers were educated about biosecurity and the use of PPE and disinfectants. We also tried to make the public aware of the risks of handling sick and dead birds. We have not yet focussed much on the zoonotic rusk, but will have to improve.

Monitoring & Reporting

Sampling

- Funding
- Sampling strategy- confirm new sites and species

Reporting

- Templates
- App

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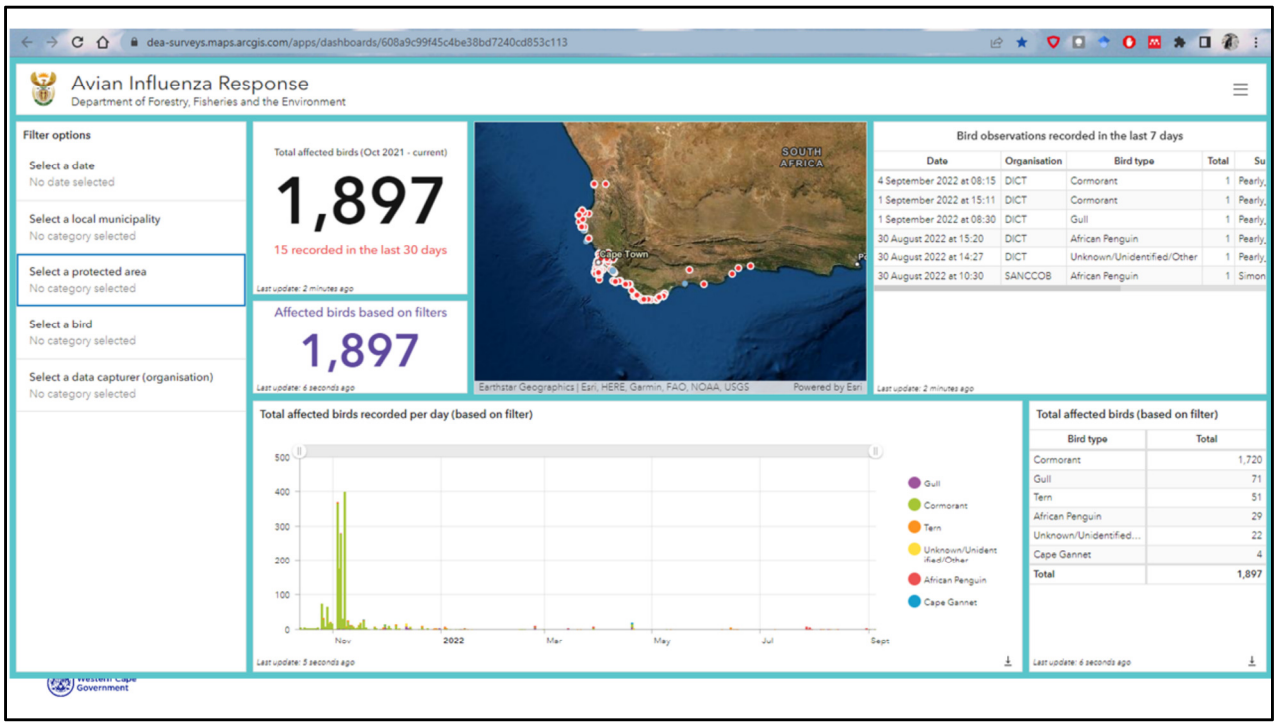
Monitoring involved both sampling for laboratory testing but also trying to record as many observed suspected cases as possible.
We managed to do more laboratory testing in 2021 and 2022, with funding obtained for research and monitoring programs
But funding still had to be carefully used on new species, sites and we'd like to do more systematic sampling and more sampling of healthy birds, to better understand virus spread.

We have tried to record a standard dataset for all suspected cases. It was first done via an Excel sheet template that was completed for each site, collated per organisation and sent to me, but we launched a web-based form in 2021 that is also accessible via mobile phone app…



…and the data can be viewed online on a dashboard.
We still need to encourage more use if the application and provide an app to the public, but we get good records when mortality rates increase

Research

- African Penguin AIV survey
- Vaccine trial

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My PhD research…

African Penguin Avian Influenza Survey

SANCCOB saves seabirds

n= 917

Namibia (n=153)

- adults
- No virus detected: <2% prevalence

South African colonies (n=382)

- Adults
- No virus detected (<0.8% overall)
- 5 serum samples H5 antibody positive : est. prevalence 1%

Rehabilitation centre admissions (SA) (n=382)

- 40% adults & juveniles, 60% chicks & fledglings
- 12 virus-positive
  - 8 adults (P=0.007), 3 juveniles, 1 chick
  - 10 with clinical signs
  - 8 from Simon's Town (Boulders)

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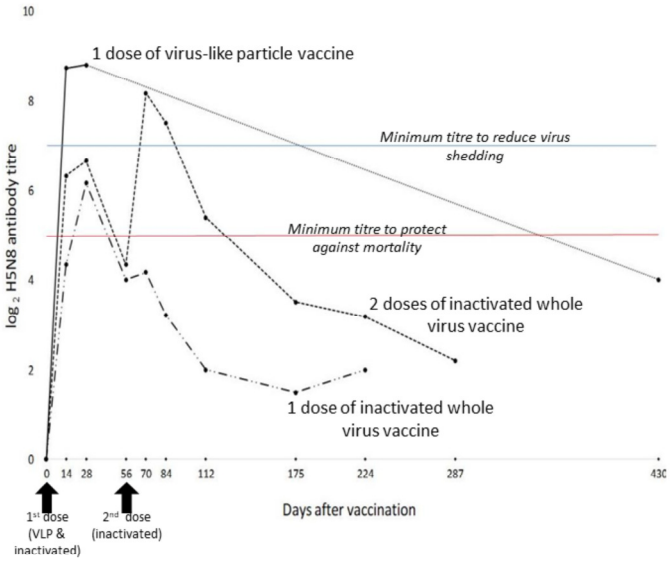
We sampled 917 birds overall: 153 in Namibia on two of the 4 main islands and 382 in South African colonies and another 382 admitted to the SANCCOB rehab centre in Cape Town.
All the birds sampled in the colonies were adults and no virus was detected. From that, we can conclude that, if virus was present, there was a less than 2% prevalence in the sampled Namibian colonies and <1% in South African colonies. From antibody detections we estimate that up to 1% may have been previously infected with an H5 virus and survived.
The birds sampled at the rehab centre comprised only 40% adults and juveniles but of the 12 that tested positive most were adults or juveniles, were clinically affected, and came from around Boulders, during it's peak mortality. …
Conclusion?

Vaccination



Roberts et al. 2024.

Another of my PhD projects was a vaccine trial in African penguins, comparing a traditional killed virus vaccine with a virus-like particle vaccine produced in plants.
We confirmed findings of previous studies that demonstrated the safety of the killed vaccines in penguins but also that the antibodies produced do not last more than a few months, even with a booster vaccination. A single dose of the VLP vaccine produced much higher antibody levels and it looks like they could last a lot longer which indicates much more realistic option. Vaccines with similar properties should be considered and vaccination may be the only real mitigation tool we have. However, the logistics of a vaccination campaign in seabirds will be the most challenging a part and should be carefully planned.

Thank you to our funders and research partners

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Epidemiology & Research

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Thank you

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