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Stranding and mass mortality in humboldt penguins (*Spheniscus humboldti*), associated to HPAIV H5N1 outbreak in Chile

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Highlights

- Historical data about strandings of Humboldt Penguin (*Spheniscus humboldti*) in Chile, between 2009 and 2023.
- A significant increase in mortality started in early 2023 coinciding with the introduction of HPAIV H5N1 in Chile.
- 37 massive mortality events were recorded; ranging from 11 to 98 deceased penguins each, mostly in the North of Chile.
- 4 out of 181 penguins were positive for HPAIV H5N1, published data indicates different introductions.

- Spatial analysis validates the correlation between mass mortality events and outbreaks of HPAIV in Chile.

Abstract

The highly pathogenic Avian Influenza virus (HPAIV) H5N1 has caused a global outbreak affecting both wild and domestic animals, predominantly avian species. To date, cases of the HPAIV H5 Clade 2.3.4.4b in penguins have exclusively been reported in African Penguins. In Chile, the virus was confirmed in pelicans in December 2022 and subsequently spread across the country, affecting several species, including Humboldt penguins. This study aims to provide an overview of the incidents involving stranded and deceased Humboldt penguins and establish a connection between these events and HPAIV H5N1. Historical data about strandings between 2009 and 2023 was collected, and samples from suspected cases in 2023 were obtained to confirm the presence of HPAIV H5N1. Between January and August 2023, 2,788 cases of stranded and deceased penguins were recorded. Out of these, a total of 2,712 penguins deceased, evidencing a significative increase in mortality starting in early 2023 coinciding with the introduction and spreading of HPAIV H5N1 in the country. Thirty-seven events were categorized as mass mortality events, with the number of deceased penguins varying from 11 to 98. Most cases (97%) were observed in the North of Chile. One hundred and eighty-one specimens were subjected to HPAIV diagnosis, four of which tested positive for HPAIV H5N1. Spatial analysis validates the correlation between mass mortality events and outbreaks of HPAIV in Chile. However, the limited rate of HPAIV H5N1 detection, which can be attributed to the type and quality of the samples, requiring further exploration.

Introduction

Currently, the Highly Pathogenic Avian Influenza Virus (HPAIV) H5N1 is causing a panzootic that exerts its impact on both, wildlife, and domestic animal populations across the globe. This viral outbreak has generated significant animal mortality, with a particular emphasis on avian species, but also affected a variety of mammal species (Kandeil et al., 2023). In Chile, HPAIV H5N1 was confirmed in December 2022 (Ariyama et al., 2023), serving as a pivotal marker in time. Following this confirmation, the virus rapidly disseminated across the country, from north to south, impacting a diverse range of animal species. Also, an increase in stranding and mortality events has been observed coinciding with the outbreak of HPAIV H5N1 in Chile, and most species have been confirmed positive for the virus.

The most frequently stranded species reported was the Humboldt Penguin (*Spheniscus humboldti*), whose habitat extends from Isla Foca (5° 12'S) in the north of Peru down to Isla Guafo (43° 32'S) in the south of Chile. Humboldt Penguins are listed as vulnerable by the IUCN, with a total population of 23,800 mature individuals, 10,200 in Chile and 13,600 individuals in Peru.

Penguin species are known to be susceptible to Influenza A viruses. Indeed, HPAIV H5 Clade 2.3.4.4b was confirmed in African penguins (Molini et al., 2020). Recognizing the significance of penguins in marine environments and their crucial role in maintaining ecosystem stability (Xavier and Trathan, 2022), they are currently acknowledged as bioindicators of marine environmental well-being (Barbraud et al., 2020). Understanding the effects of HPAIV H5N1 on penguins is crucial for species preservation, ecological balance, and prevention of zoonotic diseases. Consequently, interventions are necessary to minimize repercussions for penguins, their habitats, other susceptible animal species, and human health.

This study conducts a comprehensive analysis of the stranding and mortality events and their potential link with HPAIV H5N1 on Humboldt penguin populations in Chile during the panzootic outbreak.

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Section snippets

Data collection

The dataset on penguin mortality and stranding was obtained from Chile's Fisheries and Aquaculture Service (SERNAPESCA). It encompasses a time span from January 2009 to August 31, 2023, and essential variables, including date of report, species, location, number of stranded penguins, reproductive status, and whether they were discovered deceased or alive. Penguins were classified as a stranding (for fewer than 10 birds) or mass stranding (>10 birds) if found in coastal or shallow waters,...

Stranding and mortality of Humboldt penguins in Chile

The overall results of stranding in Humboldt penguins by year are shown in Table 1., where an increase in stranded animals was observed during 2023. Between 2009 and 2022, historical records showed 1035 stranding events involving 1266 Humboldt penguins, with an annual average of 90.4 affected individuals (ranging from 36 to 137). Most of these incidents (979) were single strandings representing 77 % of cases while 6 events involving more than 10 penguins, with the highest count being 61 animals ...

Discussion

The global impact of HPAIV H5N1 has highlighted its threat to biodiversity and animal health, particularly in avian species. The recent confirmation of the HPAIV H5 Clade 2.3.4.4b virus in Chile (Ariyama et al., 2023), has extended its impact to various animal species. In this report, we confirmed the HPAIV H5 Clade 2.3.4.4b in Humboldt penguins and aimed to establish a link between the increasing incidents of stranded and dead penguins and the virus.

In 2023, in only 8 months, there was a...

CRedit authorship contribution statement

Victor Neira-Ramirez: Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Resources, Project administration, Methodology, Funding acquisition, Formal analysis, Conceptualization. **Hugo Araya:** Resources, Funding acquisition, Conceptualization. **Mauricio Ulloa:** Writing – original draft, Validation, Supervision, Conceptualization. **Gabriela Muñoz:** Writing – original draft, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Carolina ...**

Declaration of Competing Interest

The authors declare no conflict of interest....

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References (32)

C. Abolnik *et al.*

The molecular epidemiology of clade 2.3.4.4B H5N1 high pathogenicity avian influenza in Southern Africa, 2021–2022

Viruses (2023)

N. Ariyama *et al.*

Highly pathogenic avian influenza A(H5N1) Clade 2.3.4.4b virus in wild birds, Chile

Emerg. Infect. Dis. (2023)

C. Barbraud *et al.*

Population trends of penguins in the French southern territories

Polar Biol. (2020)

G.P. Barriga *et al.*

Avian influenza virus H5 strain with North American and Eurasian lineage genes in an antarctic penguin

Emerg. Infect. Dis. (2016)

Bennison, A., Byrne, A.M.P., Reid, S.M., Lynton-Jenkins, J.G., Mollett, B., Sliva, D.D., Peers-Dent, J., Finlayson, K.,...

BirdLife International., 2020. *Spheniscus Humboldtii*. The IUCN Red List of Threatened Species 2020....

K.J. Campbell *et al.*

Local forage fish abundance influences foraging effort and offspring condition in an endangered marine predator

J. Appl. Ecol. (2019)

B. Culik *et al.*

Humboldt penguins outmanoeuvring El Nino

J. Exp. Biol. (2000)

N.J. Hamel *et al.*

SYMPOSIUM PAPER: bycatch and beached birds: assessing mortality impacts in coastal net fisheries using marine bird strandings

Mar. Ornithol. (2009)

C. Hays

The Humboldt penguin in Peru

Oryx (1984)



View more references

Cited by (1)

[Avian influenza overview March–June 2024 ↗](#)

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1 Equally contribution

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