

Trends in Avian Influenza at Howard Slough

Aguilar R., Antonio A., Balkow N., Dehoney T., Ling D., Saenz J., Urlie L., Cline T.Ph.D
California State University, Chico



Introduction

The avian influenza A (H5N1) virus has been found to infect humans, with a total number of 856 cases and 452 deaths¹ worldwide since 2003. The virus is spread by the dispersal of saliva, mucous and feces of infected birds. If enough virus has accumulated in the eyes, nose or mouth of a human, infection can occur².

While avian influenza does not normally infect humans², researchers, such as Dr. Troy Cline and the World Health Organization's Global Influenza Programme (GIP), are monitoring trends in influenza transmission in aims to prepare against possible pandemic influenza threats. Analyzing Dr. Cline's data on specific aspects of waterfowl such as species and gender, will help aid in early detection of factors that may increase susceptibility to avian influenza. This research project investigates the question of whether or not a bird's gender or species affects the likelihood of contracting avian influenza.

Methods

A swabbing station was set up at the entrance of Howard Slough where hunters voluntarily allowed Dr. Cline and his research team to swab their game for avian influenza. The researchers used a cloacal swab to obtain a gut sample from the bird which was then analyzed using real time PCR to identify any viral gene components. Birds who tested positive were then marked as having avian influenza. Data was compiled and structured using Microsoft Excel. The statistical program R³ was used to conduct exploratory data analyses and statistical analyses such as Chi-squared tests of independence. R and RStudio⁴ were used to interpret the data and view relationships between variables, create tables, graphs and figures.

Results

Table 1. This table shows the frequency and percentages for each variable.

Variable	Levels	Frequency	Percent
Collection Date	2015-10-24	58	7.8%
	2015-10-27	59	7.9%
	2015-10-31	55	7.4%
	2015-11-14	8	1.1%
	2015-12-05	65	8.7%
	2015-12-13	64	8.6%
	2016-01-13	15	2.0%
	2016-01-16	72	9.7%
	2016-10-22	106	14.3%
	2016-10-29	85	11.4%
	2016-11-05	48	6.5%
	2016-11-12	29	3.9%
	2016-11-19	79	10.6%
Species	American Wigeon	177	23.9%
	Gadwall	62	8.4%
	Green-winged Teal	82	11.1%
	Mallard	103	13.9%
	Northern Pintail	67	9.0%
	Ring-necked Duck	46	6.2%
	Wood Duck	50	6.7%
	Shoveler	123	16.6%
	Other	32	4.3%
Gender	Female	318	42.8%
Age	After Hatching Year	142	37.2%
Disease	Positive	119	16.0%
Hunting Season	Winter 2015-16	396	53.3%

Of the 123 Northern Shovelers that were tested, 26.8% (the highest proportion) tested positive for avian influenza. None of the 50 Wood Ducks studied tested positive for avian influenza. The results of the χ^2 test suggests that the species of waterfowl at Howard Slough and its probability of contracting avian influenza are dependent ($p=.001$).

Table 2. This table shows the frequency and percentages of waterfowl that tested positive for avian influenza by gender.

	Female	Male
Negative	265 (83.3%)	359 (84.5%)
Positive	53 (16.7%)	66 (15.5%)

Out of 396 observations recorded in the 2015/16 season, 79 (19.9%) tested positive for avian influenza. Of the 347 observations recorded in the 2016/17, 40 (11.5%) tested positive for avian influenza. The results of the χ^2 test suggest that the probability of a bird contracting avian influenza is dependent on the season ($p = 0.003$).

The number of birds recorded per species range from 46 (Ring-necked Duck) to 177 (American Wigeon). Of the 743 waterfowl that were tested, 119 (16.0%) tested positive for avian influenza. There are 318 (42.8%) female waterfowl recorded in the data. There were 396 (53.3%) samples collected in the 2015/2016 duck hunting season.

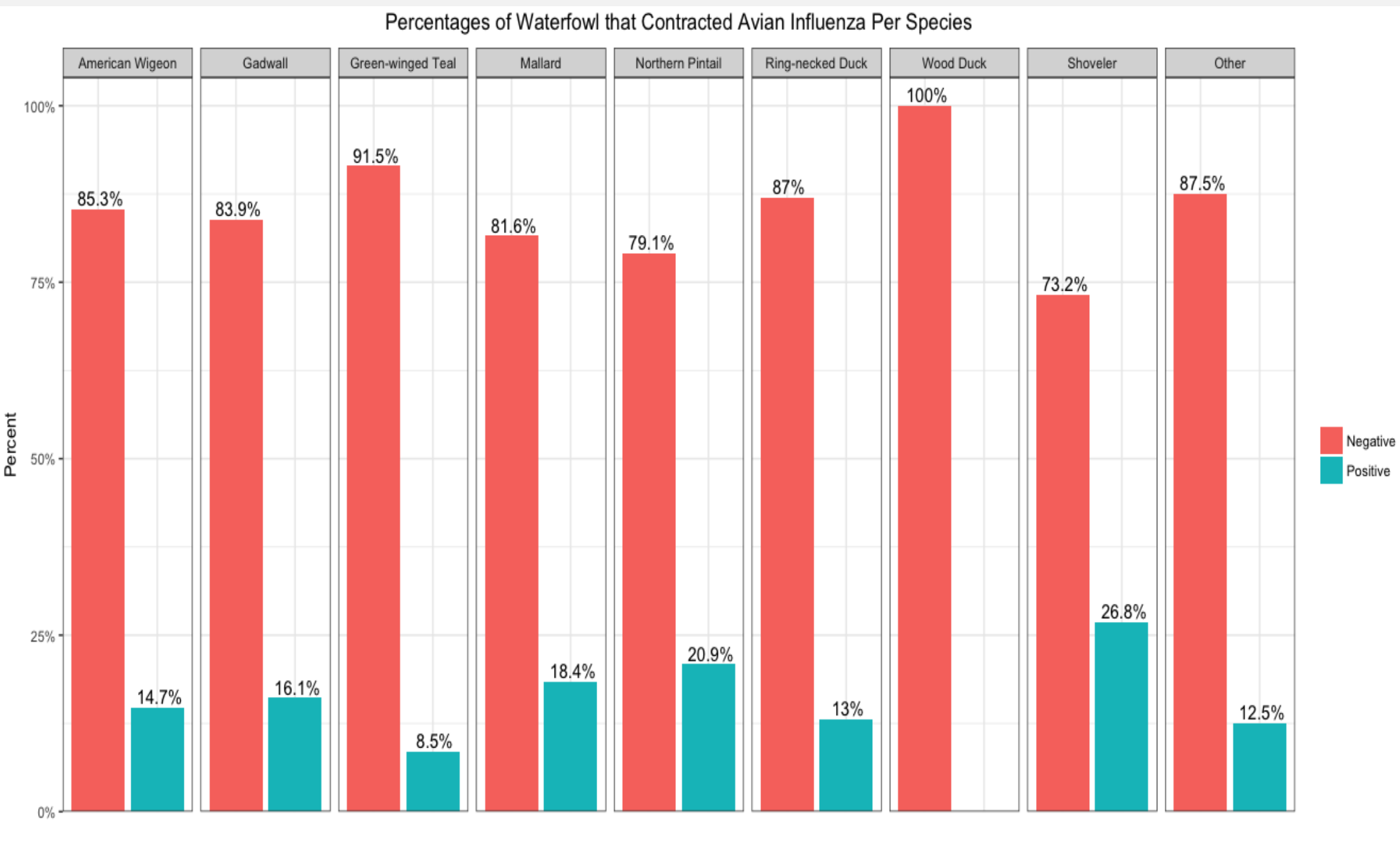


Figure 1. This bar chart shows the proportion of waterfowl, by species, that tested positive for avian influenza.

There were 318 female ducks tested, 53 (16.7%) tested positive for avian influenza (Table 2). Out of 425 male ducks that were tested, 66 (15.5%) tested positive for avian influenza. The results of the χ^2 Test of Independence suggest that the gender of a duck and its likelihood of contracting avian influenza are independent ($p=.751$).

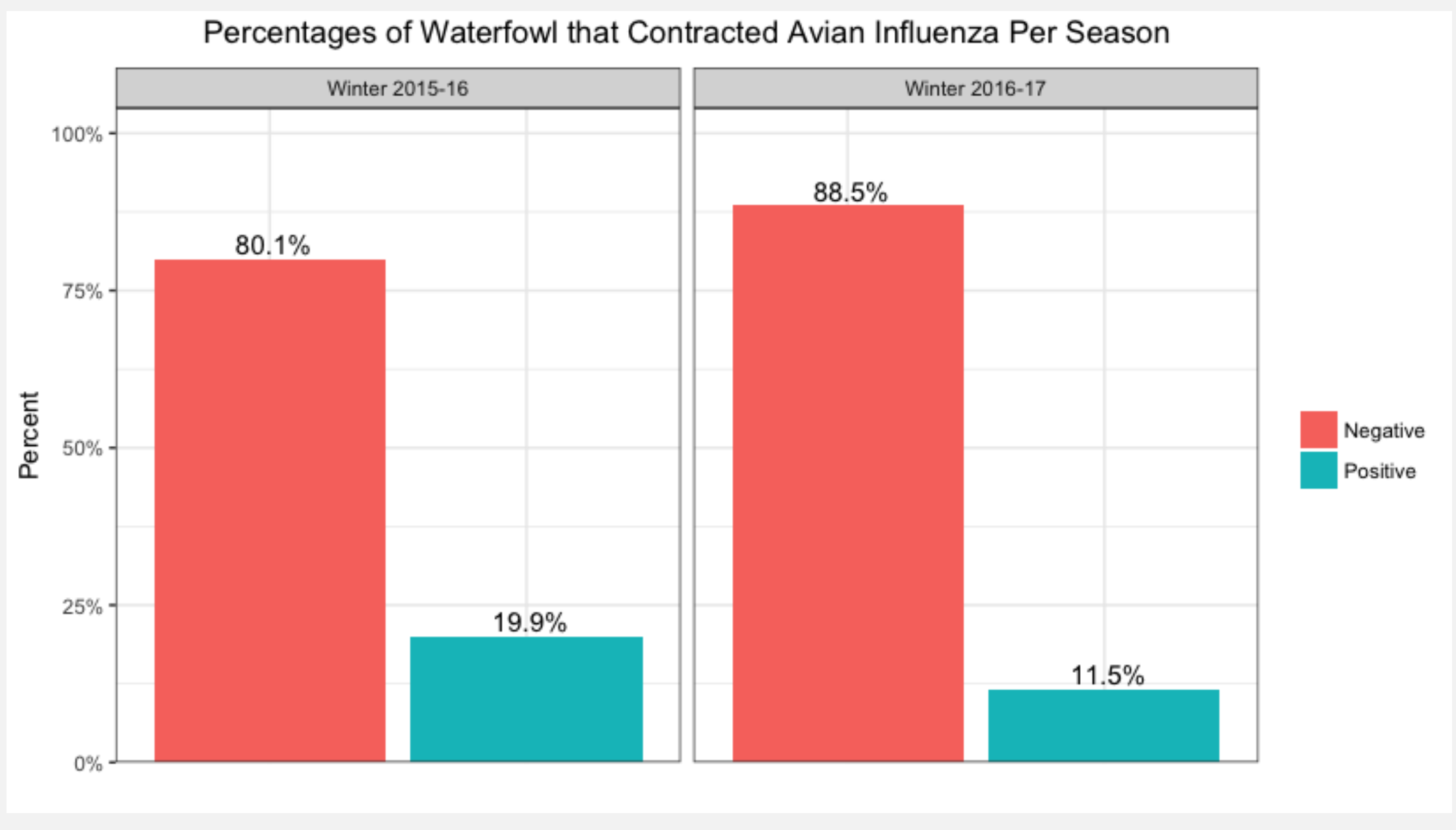


Figure 2. This bar chart shows the proportion of waterfowl that tested positive for avian influenza by hunting season.

Conclusion

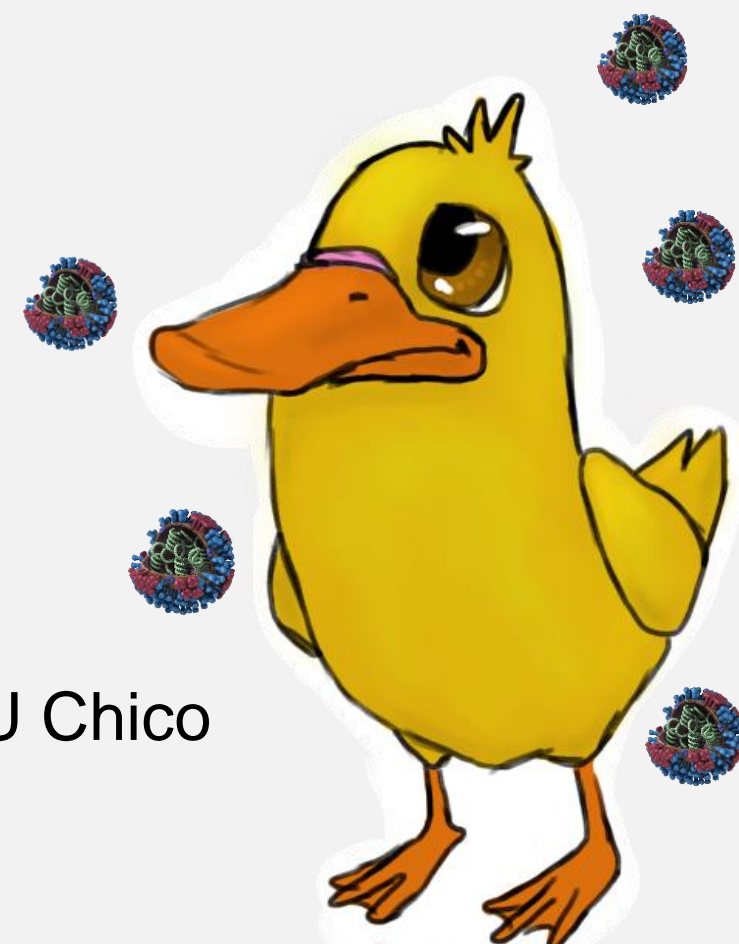
- The Northern Shoveler had the highest proportion of avian flu, inferring that this species may be the most likely to carry avian influenza.
 - An implication of this would be to encourages emphasis on the Northern Shovelers as their reproduction and migration patterns may be key factor of increased exposure to avian influenza to humans.
- Species of waterfowl affects its probability of getting avian influenza.
- There was no significant relationship between gender and whether the waterfowl tested positive for avian influenza.
- From the data we have, the 2015/16 season had a significantly greater proportion of waterfowl that contracted avian influenza.
 - This could be due to the fact that the data we have from 2016/17 represents less than half of the current hunting season.
- None of the Wood Ducks in the data provided tested positive for avian influenza.
 - This could lead to an interesting follow-up research in which Wood Ducks are exclusively studied to see if they can contract avian influenza, and if their traits can be replicated in other birds.

References

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Acknowledgements

- Everyone who worked at the swabbing station
- Dr. Cline for allowing us to use his data
- Hunters who allowed Dr. Cline's research team to swab their birds



Sponsored by:
Dr. Robin Donatello, CSU Chico