

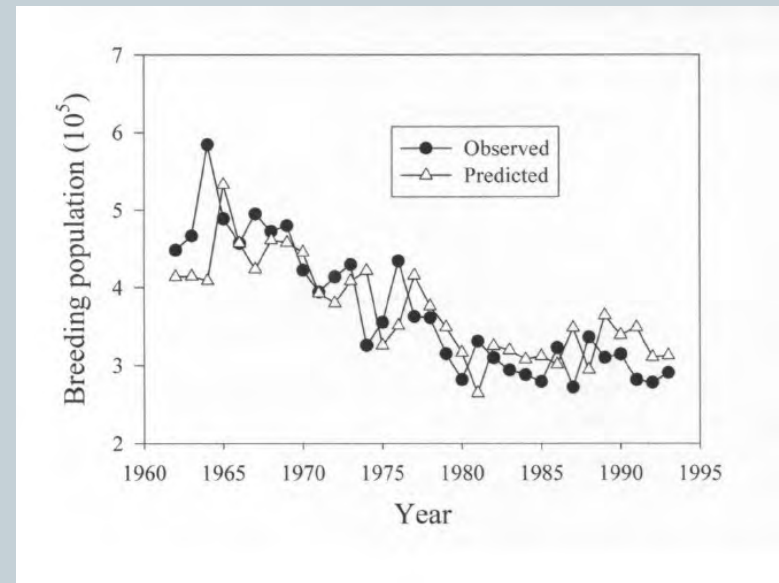
Surveillance for various pathogens and lead in American Black Ducks (*Anas rubripes*) from the northeastern and mid-Atlantic United States

**Whitney Kistler, Samantha, E. J. Gibbs,
David E. Stallknecht, and Michael J.
Yabsley**

American Black Ducks



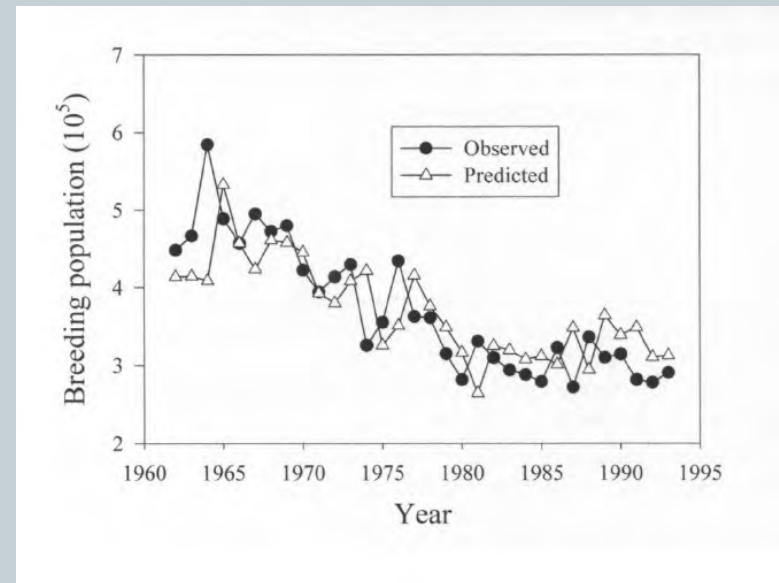
- Once the most common duck species in the eastern US and Canada
 - Population peaked in the 1950's reached a low in the 1980's
- Decline attributed to
 - Loss of habitat
 - Hybridization with Mallards (*Anas platyrhynchos*)
 - Hunting pressure (Compensatory vs. Additive mortality)



American Black Ducks



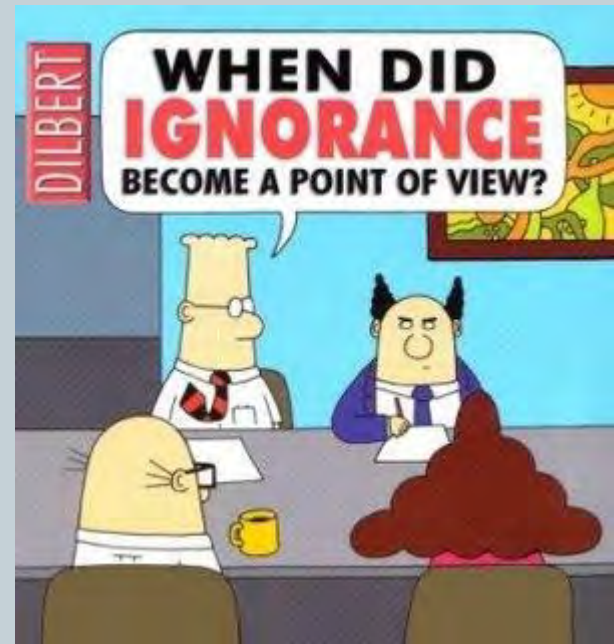
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General Health of ABDU



- Very little work on pathogens in ABDU
 - 6 avian influenza virus studies
 - No studies on exposure
 - No haemosporidian studies since 1980's
 - Little information of avian paramyxoviruses, *Pasteurella multocida*, and duck viral enteritis
- One study on lead exposure since 1991 lead shot ban



Major Pathogens of Waterfowl



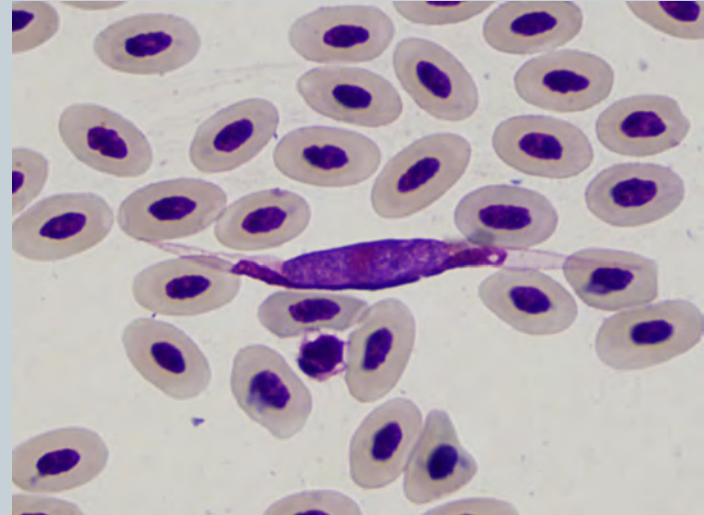
- *Pasteurella multocida*
 - Several strains
 - Highly contagious
 - High mortality
- Duck Viral Enteritis
 - Duck enteritis virus
 - ABDU one of most affected species
 - Started in NE US
 - 1973 – Largest outbreak in waterfowl



Major Pathogens of Waterfowl



- Avian Influenza viruses and Avian Paramyxoviruses
 - Not known to have population effects
 - May have impact on individual birds
 - Both important to poultry industry
 - H5, H7, and Newcastle Disease Virus
- Avian haemosporidian parasites
 - Mortality in goslings
 - Breeding selection in passerine birds
 - New techniques (Molecular)



Objectives and Hypothesis



- **Objective**

Determine what pathogens are circulating and determine blood lead levels in ABDU from the eastern US

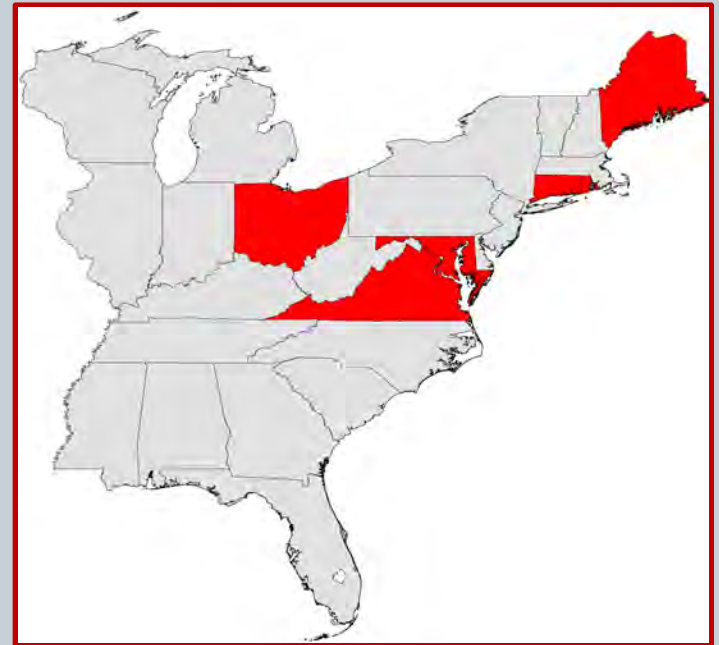
- **Hypotheses**

- We do not expect to detect either *Pasteurella multocida* or DEV
- We expect to detect both AIVs and APMVs
- We expect to detect high levels of avian haemosporidian parasites
- We expect to detect low exposure to toxic levels of lead

Methods



- Sampled 119 ducks from wintering locations in CT, ME, MD, OH, and VA and 87 ducks from breeding areas in ME
- Collected blood and paired cloacal/oropharyngeal swabs
- Blood samples were sent to Michigan State University for blood lead testing



Methods

Pathogen

Sample

Test

AIVs

Oropharyngeal/cloacal
swabs

Virus Isolation and RT-PCR
(Matrix)

Serum

bELISA for antibody
detection

APMV_s

Oropharyngeal/cloacal
swabs

Virus Isolation,
Hemagglutination
inhibition, RT-PCR (Fusion)

Haemosporidian
parasites

Blood

PCR (Cyt *b*)

DEV

Oropharyngeal/cloacal
swabs

PCR (UL6)

Pasteurella multocida

Blood and
Oropharyngeal/cloacal
swabs

PCR (KMT1)

Results

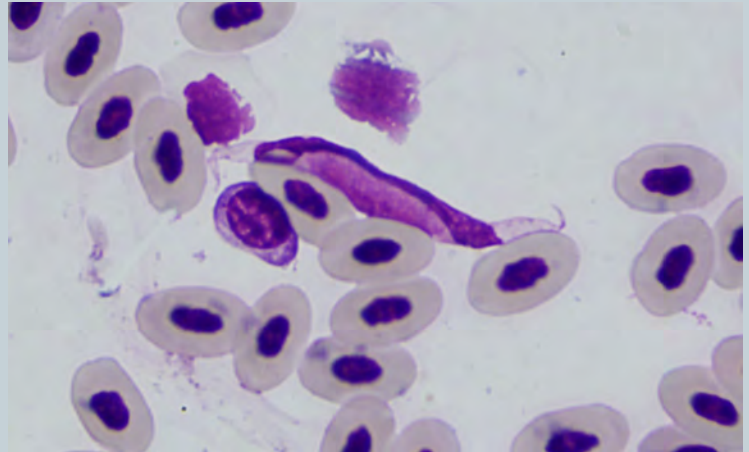
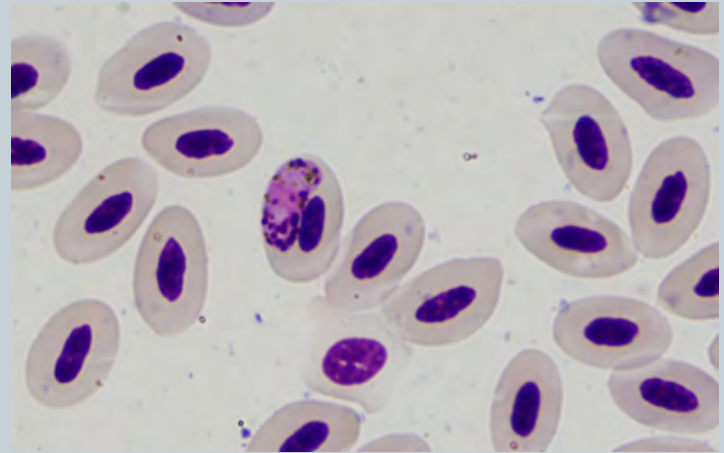


- We did not detect either *Pasteurella multocida* or DEV in any of the collected samples
- We isolated AIVs from 6/206 (3%) ducks
 - No H5
- 85/204 (42%) had antibodies to AIVs
- We isolated APMV-1 in 6/206 (3%) and APMV-4 in 1/206 (0.5%)
 - All APMV-1 were consistent with low pathogenic viruses
 - All APMVs were isolated from ME

Results: Haemosporidian Parasites



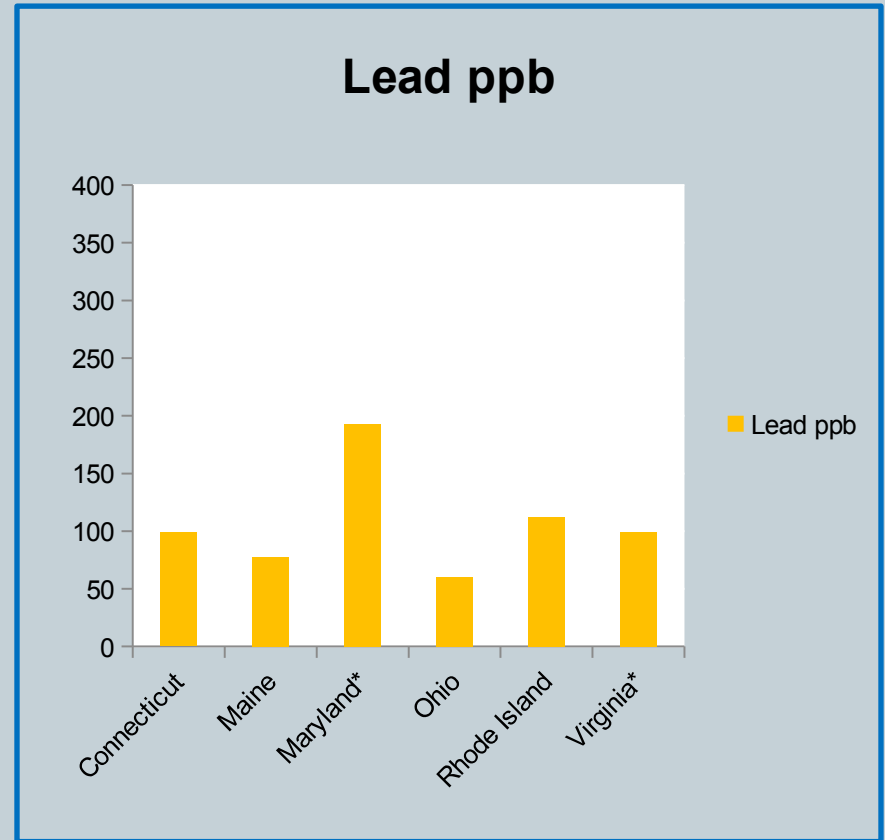
- *Haemoproteus* spp. and/or *Plasmodium* spp. were detected in 151/206 (73%)
 - Birds sampled in ME during the fall had significantly higher infection rates than those sampled in winter ($\chi^2 = 23.4$, $p < .005$)
- *Leucocytozoon* spp. were detected in 108/206 (52%) and there was no difference in prevalence between seasons ($\chi^2 = 0.7$, $p = 0.4$)
- We detected DNA from both in 87/206 (42%)



Results: Lead



- A total of 23/206 (11%) ducks had lead blood levels >200 ppb
 - 15 from MD
 - 2 ducks 10x toxic amount
 - 5 from ME
 - 2 from CT
 - 1 from VA
- Lead exposure did not increase risk of infection with haemosporidians
 - *Haemoproteus/Plasmodium* ($\chi^2=0.4$, $p>0.5$)
 - *Leucocytozoon* ($\chi^2= 0.41$, $p>0.5$)
 - Dual infection ($\chi^2= 0.41$, $p>0.7$)



Discussion



- The high number ($n=23$) of ducks with lead blood levels ≥ 200 ppb was surprising
 - Only other study had $<7\%$ (Samuel et al., 2002)
 - 15 ducks were from 1 location in MD
 - Common source?
- Historically, lead accounted for $\sim 3\%$ yearly mortality in waterfowl species
 - Chronic exposure can lead to weight loss and neurologic affects
 - Could increase non-hunting mortality
 - Predation
 - One pellet can cause mortality

Discussion



- Detecting >50% of ducks infected with avian haemosporidian parasites was expected
 - Traditional blood smear analysis detected >70% in some populations
 - Probably low on dual infection due to PCR assay
- Increase detection of *Haemoproteus* spp. and/or *Plasmodium* spp. in the fall probably related to increase in vectors
- Population effects of haemosporidians poorly studied in waterfowl
 - *Leucocytozoon simondi* is known to cause mortality in Canada goose goslings
 - Reported mortality in ducks

Discussion



- Our low prevalence of AIV shedding (3%), was surprising
 - 87 samples were collected in August when viral shedding peaks
 - 42% had antibodies
 - Maybe related to species composition and density
- Avian influenza viruses are not known to have adverse affects on waterfowl
 - No detection of H5 viruses important to poultry
- Detection of APMVs was similar to previous studies of waterfowl
 - All NDV isolates lentogenic

Take Home



- Overall, lead was the only known significant health threat found
 - May play a role in population decline even after ban
- Further work needs to be done on other pathogens
 - ALVs have been shown to adversely affect Bewick's Swans in Europe
 - Cause hatch-year mallards to spend more time in stop-over areas
 - Haemosporidian parasites cause mortality in Canada goose goslings

Future Work



- Comparison of morphology and molecular data for haemosporidians
- Subtypes for AIVs

Acknowledgements



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Questions

