



Waterfowl Propagation at the Central Park Zoo 2011-2018: Successes, Challenges, and Research Directions

Susan Cardillo, Animal Curator
Allison Bailey, PhD, Curatorial Science Fellow

WCS's Parks

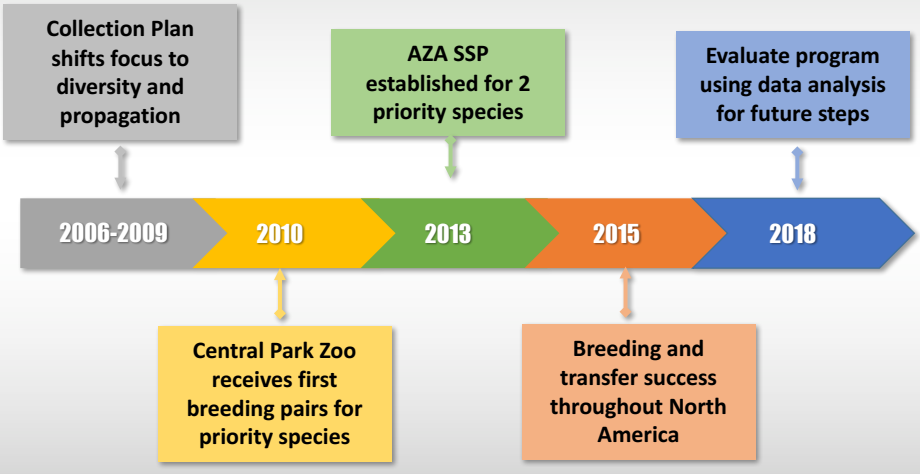
- Bronx Zoo
- New York Aquarium
- Central Park Zoo
- Queens Zoo
- Prospect Park Zoo

4 million visitors annually



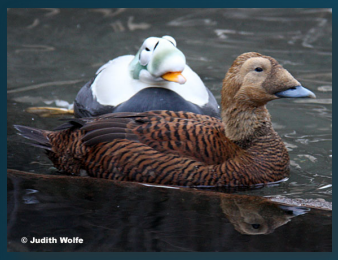


Waterfowl Program at CPZ



Goals

- ✓ Leaders in aviculture in zoos for sea ducks
- ✓ Advance skills in propagation techniques
- ✓ Share and publish data on ideal parameters
- ✓ Champion priority species through education and collaboration



Through the Years

Year	# Species	# Hatches
2009	22	38
2010	28	26
2011	37	134
2012	30	10
2013	27	49
2014	27	36
2015	28	24
2016	28	95
2017	26	10
2018	25	24

Significant Changes:

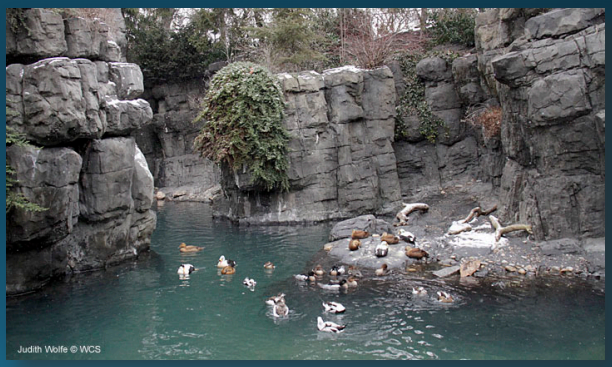
- Number of Ponds
- Incubation Room
- Filtration
- Staff Expertise
- Pest Predation
- Climate Control

Priority Species at CPZ

Scaly-sided merganser

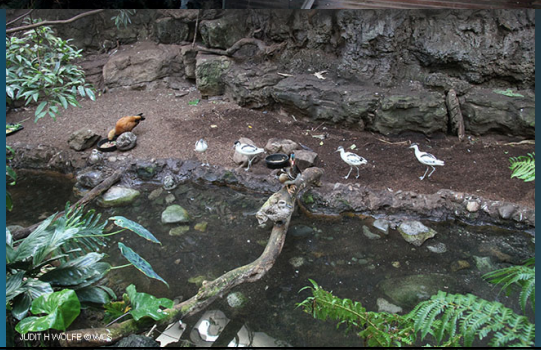
Baer's pochard

Harbor seal

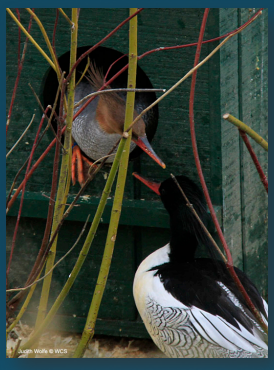


Stork and Temperate Streams

Tropic



Nestbox Options



CPZ Egg Management

Priority Plan:

- Hen or foster hen incubates
- Eggs pulled to incubator just prior to pip
- Chicks hatch and reared with similar aged chicks

Plan B:

- Eggs are pulled/dummied and placed in cooler to set in incubator with rest of clutch when hen is done
- Eggs are candled twice weekly, weighed and managed for weight loss trend


OHAUS
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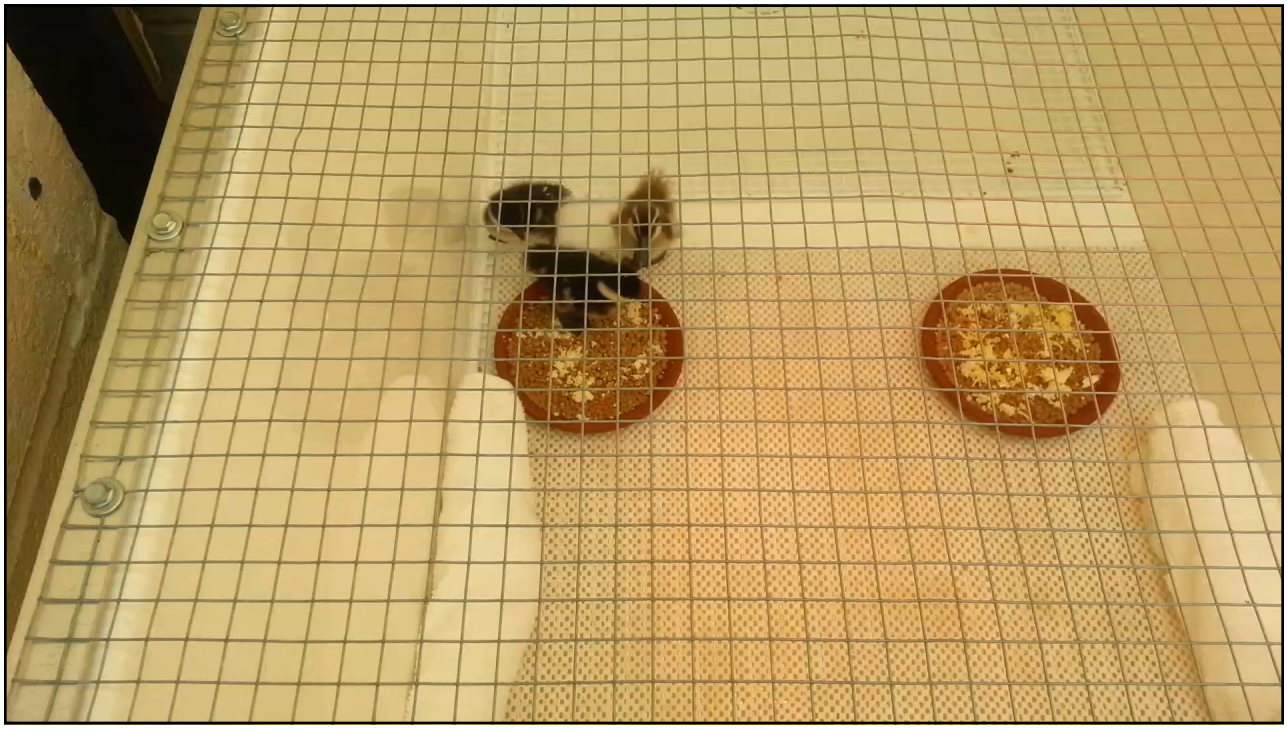


Challenges for CPZ

- SPACE!!
- Pest Control
- Disease
  - Aspergillosis
  - TB
  - Malaria
  - Open umbilicus/Infection
  - Foreign bodies

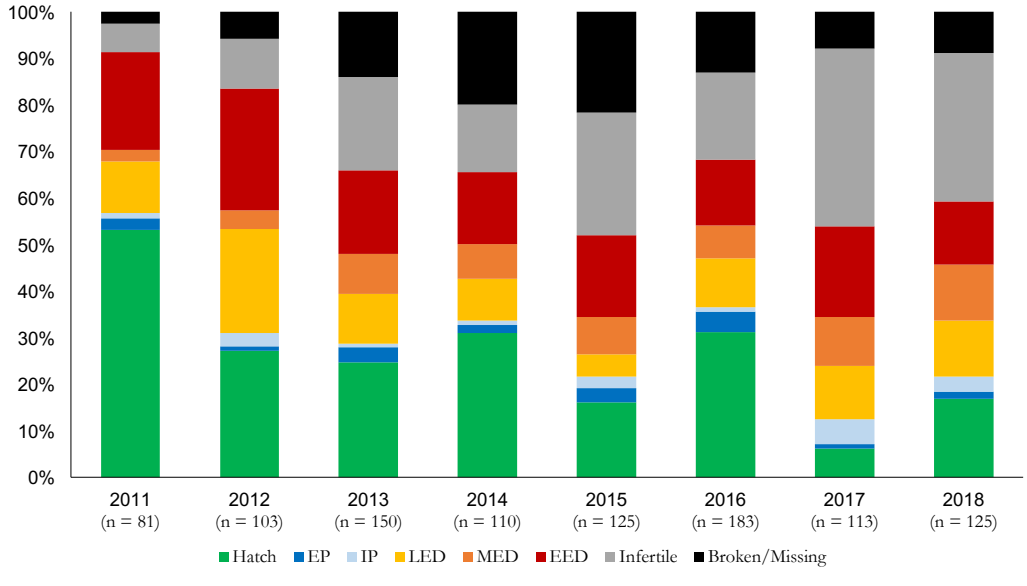
Historical data analysis

- Overview of egg outcomes

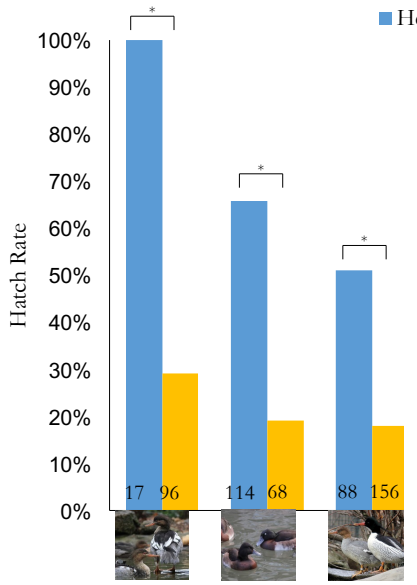
- Comparison of natural vs. artificial incubation success

- Natural incubation: dams vs. fosters, length of natural incubation prior to incubator transfer

Eight years of egg outcomes

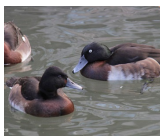


Most successful incubation method varies by species

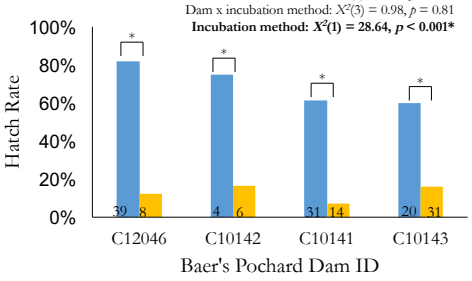


Species: $X^2(7) = 71.54$, $p < 0.001$*
Species x incubation method: $X^2(7) = 102.54$, $p < 0.001$*
Incubation method: $X^2(1) = 5.94e^{-7}$, $p = 0.9994$

Within some species, incubation method success varies by dam

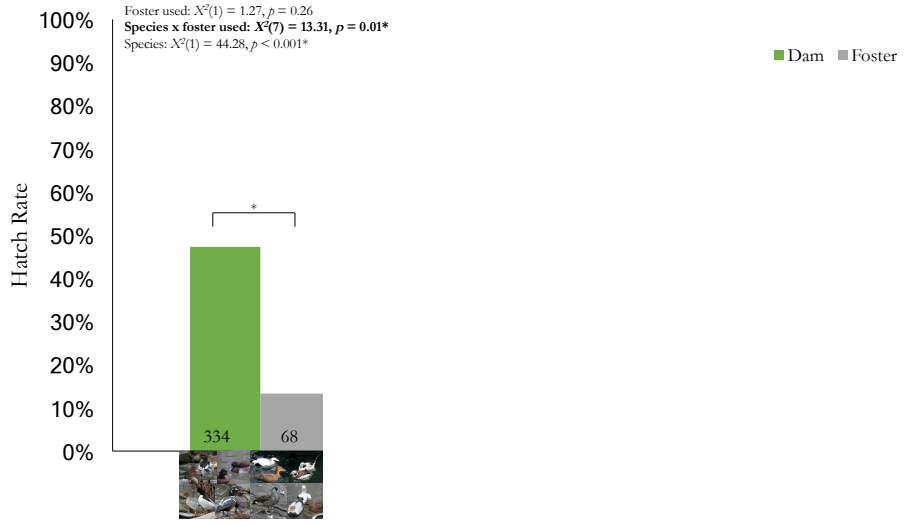


Dam: $X^2(3) = 1.03$, $p = 0.79$
Dam x incubation method: $X^2(3) = 0.98$, $p = 0.81$
Incubation method: $X^2(1) = 28.64$, $p < 0.001$*

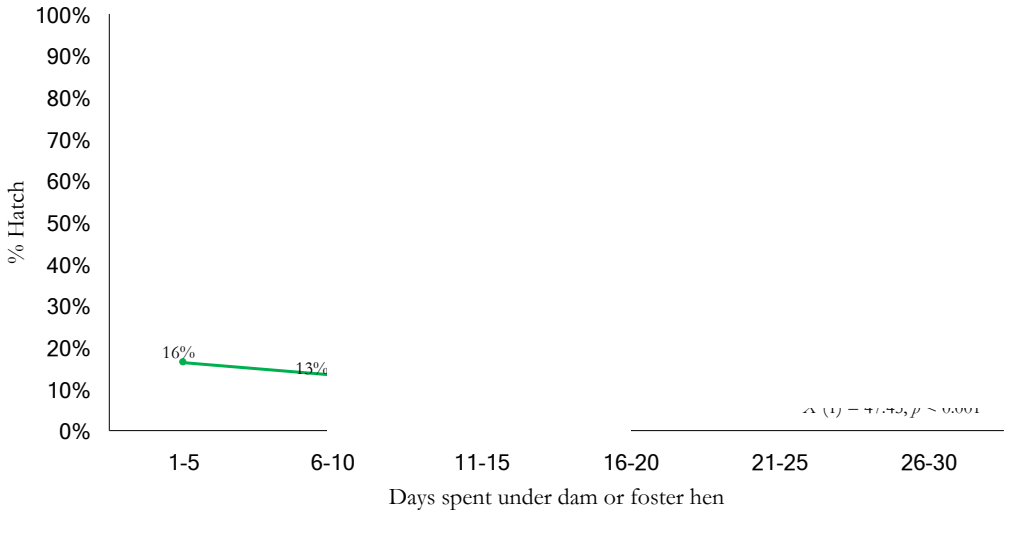


Dam: $X^2(8) = 23.08$, $p = 0.003$*
Dam x incubation method: $X^2(8) = 13.99$, $p = 0.08$
Incubation method: $X^2(1) = 1.86e^{-6}$, $p = 0.999$

Dam vs. foster hen success varies by species

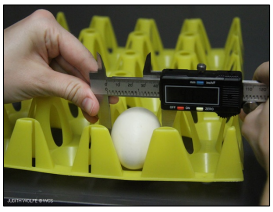


Hatch rate significantly increases with more time under hen



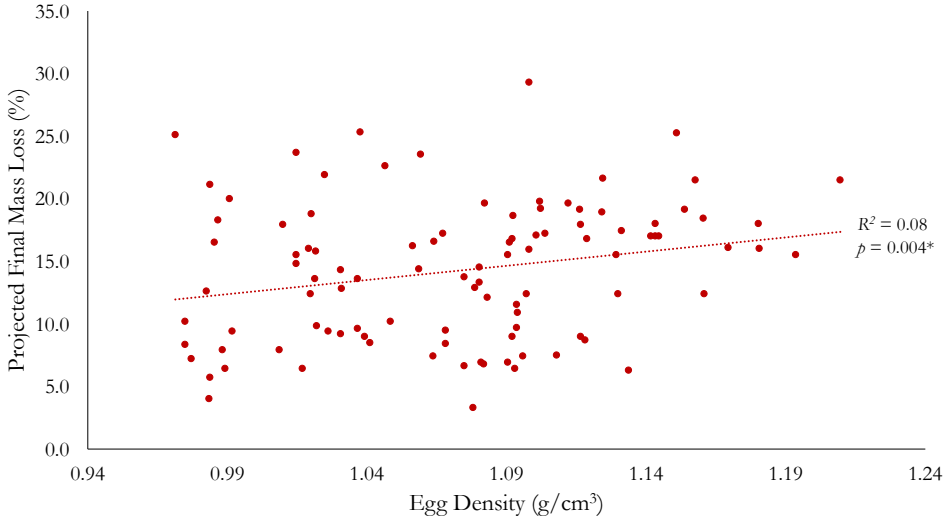
New research directions

- Predicting optimal relative humidity (RH) setting for individual eggs
  - Hypothesis: more dense eggs require lower RH to lose optimal mass (15%)
    - Egg density will correlate negatively with weight loss
  - Egg volume = $(0.452 + 0.069*L/W)*L*W^2$ (Narushin 2005)

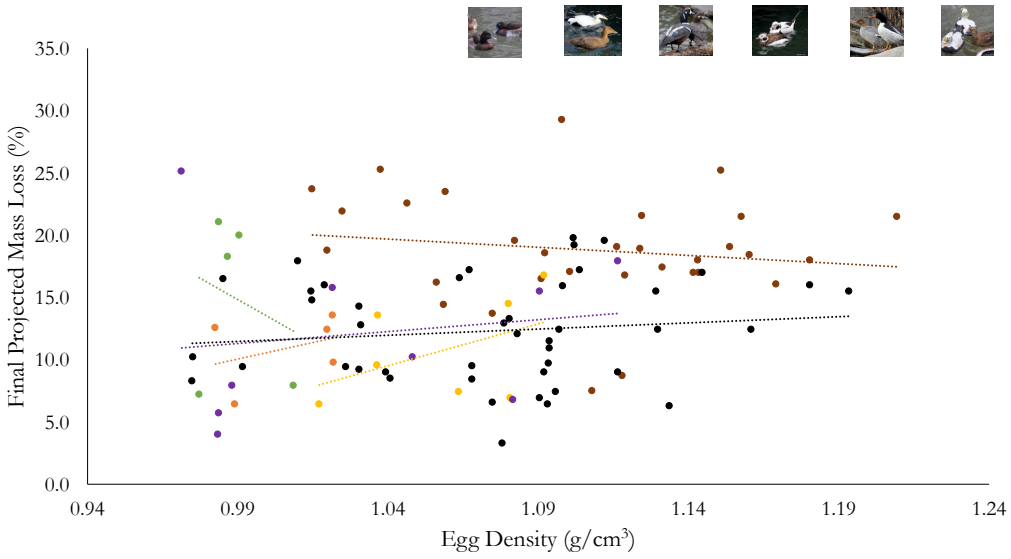


- Egg Buddy tool for measuring embryonic heart rate
- Monitoring "endogenous" egg temperature throughout incubation
  - Correlation of temperature change with certain egg outcomes?
- Tracking temperature and RH within nests
  - HOBO MX2302 external temperature/RH data logger

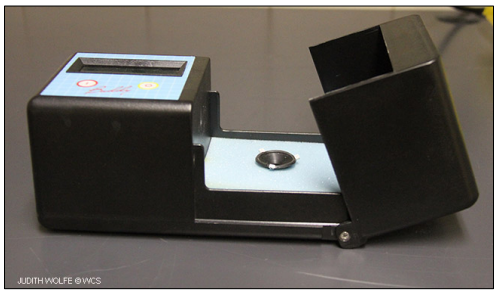
Egg density is **positively** correlated with mass loss…

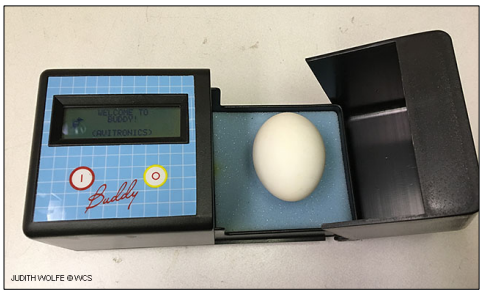


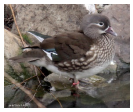
…But the effect is lost when considering individual species, and even dams



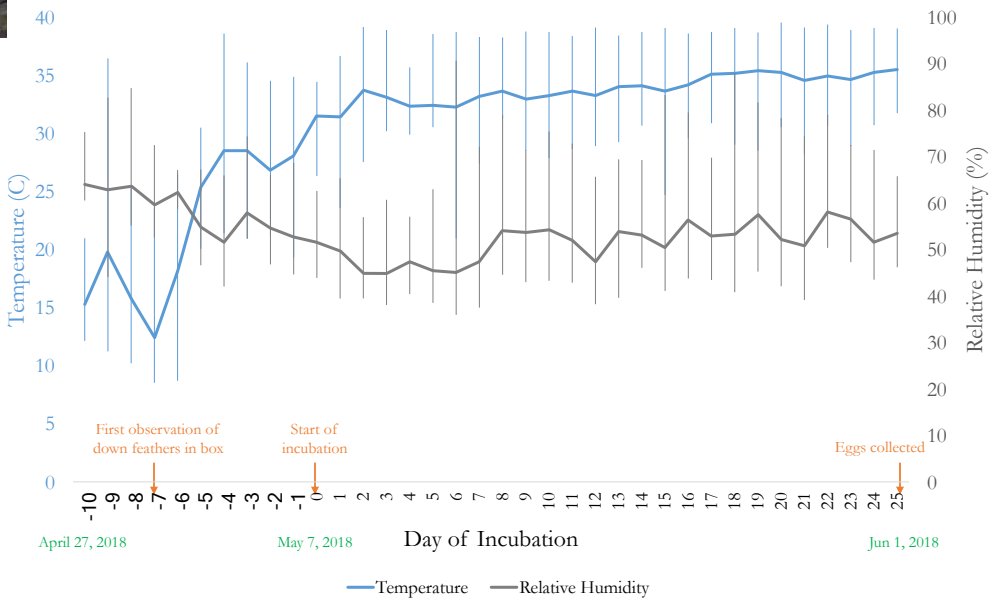
Egg Buddy: not reliable enough to get clear data



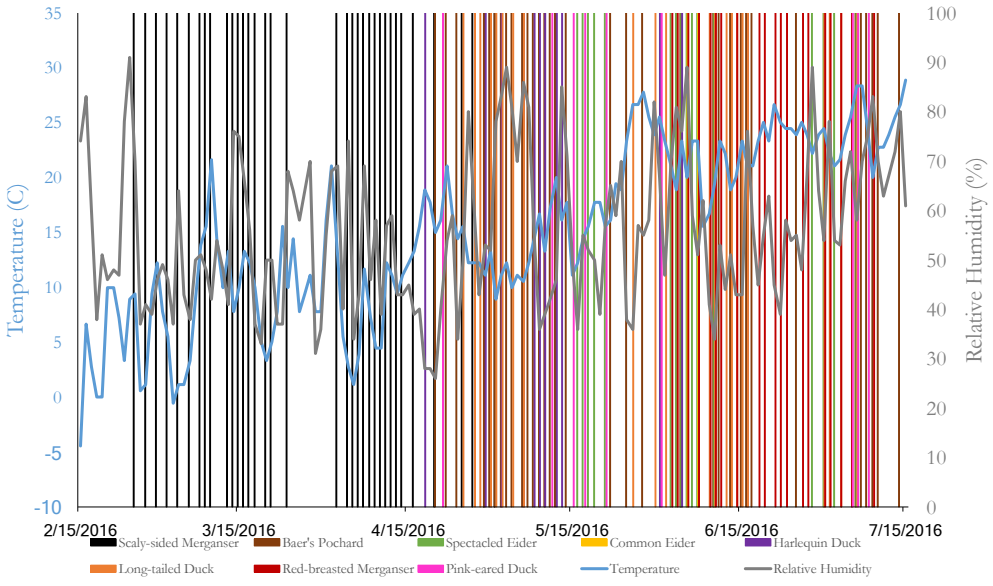




Mandarin hen incubation May 7 – Jun 1, 2018: 3 real/4 dummy eggs



2016 breeding season: Local conditions



CPZ Challenges

- **Environmental**
  - Unpredictable NYC weather patterns
  - Too hot for arctic birds to incubate
  - Local pest predation
- **Coordinating foster dams**
  - Bigger priority in future?
  - Space needed for broody chickens
- **Artificial incubation priorities**
  - How helpful is it really to monitor egg weight loss?
  - Is the time investment making a difference in success rates?
- **Why such a high mortality rate?**
  - We see a wide range of mortality stages, compare and collaborate with other facilities

Acknowledgments

Zoo Staff

- Current CPZ staff that has been instrumental in supporting the program: Director Craig Piper, Collections Manager Mary Iorizzo and Senior Keeper Melissa Mason.
- Previous CPZ staff that made this program possible and its early stages of success Jeff Sailer, Chuck Cerbini, Jamie Toste and Rob Gramzay.

Collaborators/Advisors

- Mike and Ali Lubbock at Sylvan Heights Bird Park
- Susie Kasielke for the Incubation Workshops
- Arnold Schouten at Dry Creek Waterfowl
- Jacob Kraemer at Pinola Waterfowl Conservancy

Resources

Data analyzed using JMP 14

Questions?

Wildlife Conservation Society