Assessments of genetic and reproductive health in Canada's endangered Oregon Spotted Frog (*Rana pretiosa*)

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ReNewZoo

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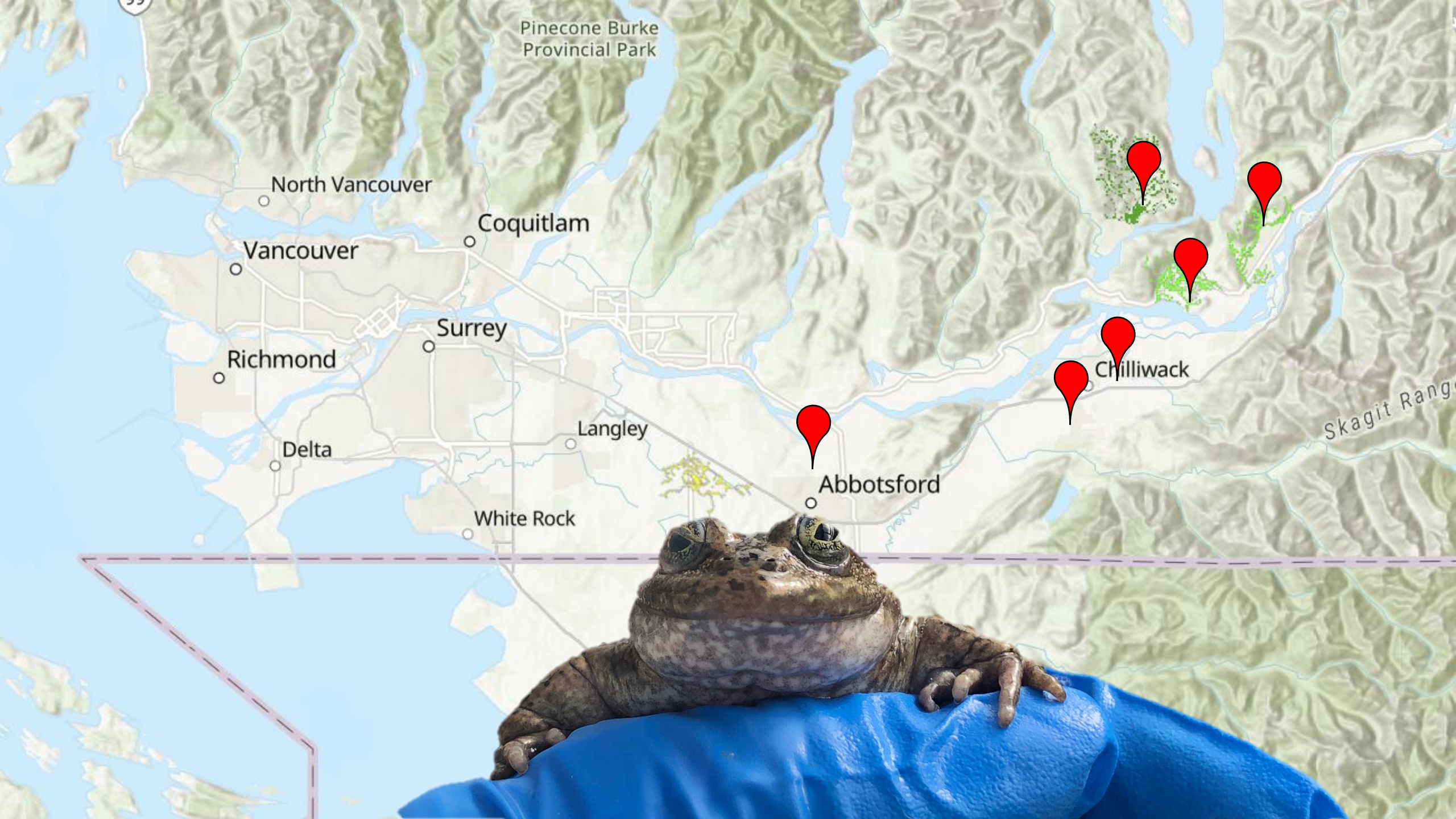
Ministry of Water, Land and Resource Stewardship

The Oregon Spotted Frog


Pinecone Burke
Provincial Park
North Vancouver
Coquitlam
Vancouver
Surrey
Richmond
Chilliwack
Langley
Delta
Abbotsford
White Rock

Capture-Mark-Recapture

Established in 2011 at two OSF populations
Added a third site in 2019

Fraser Valley Conservancy
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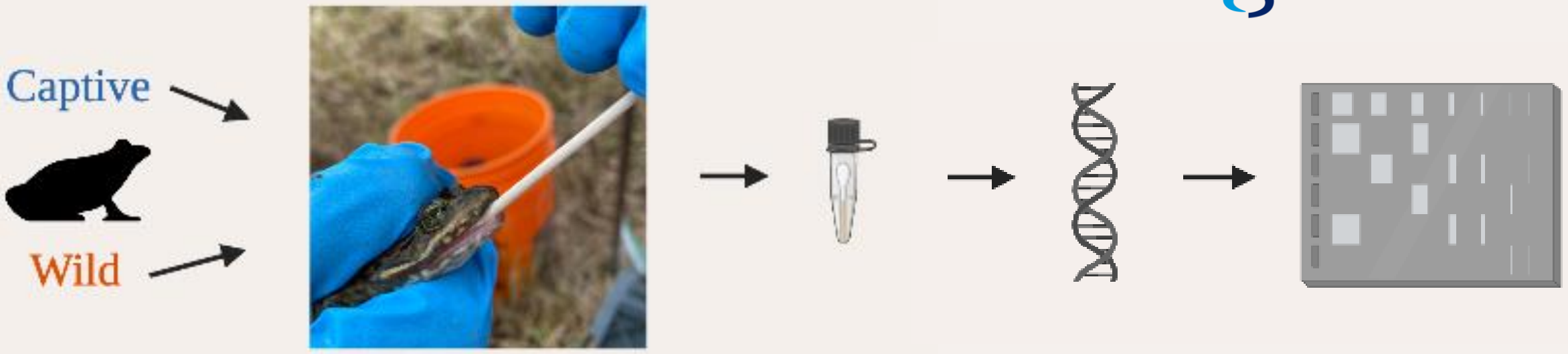
ZOO

Objectives

1. Assess the genetic makeup of zoo (*ex situ*) and wild (*in situ*) populations to determine genetic sustainability

2. Investigate potential causes of egg binding

1. Genetic Health

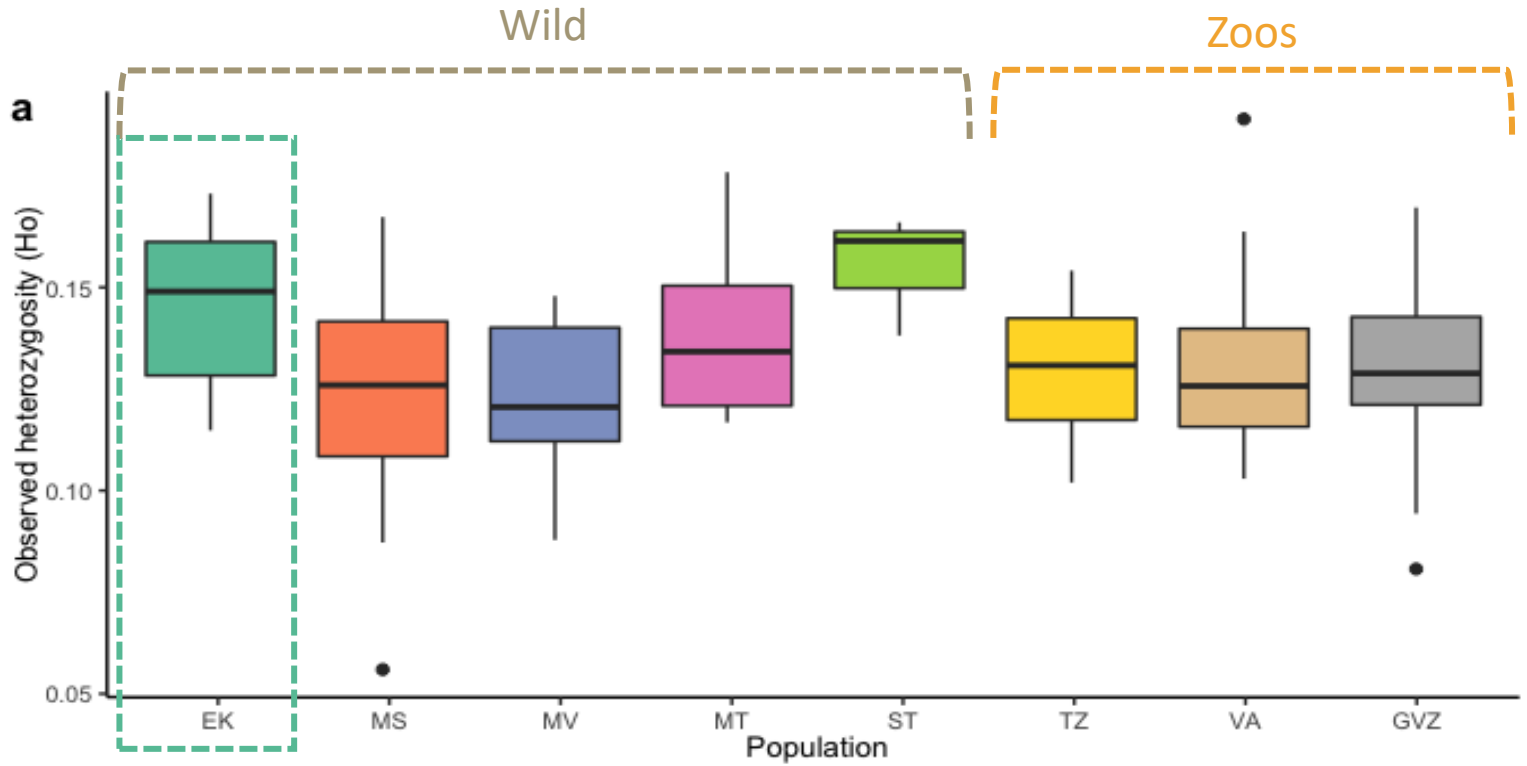


406 DNA samples

from 5 wild & 3 zoo populations

Graphic by Biorender

Genetic Diversity



No significant differences in wild *vs.* zoo

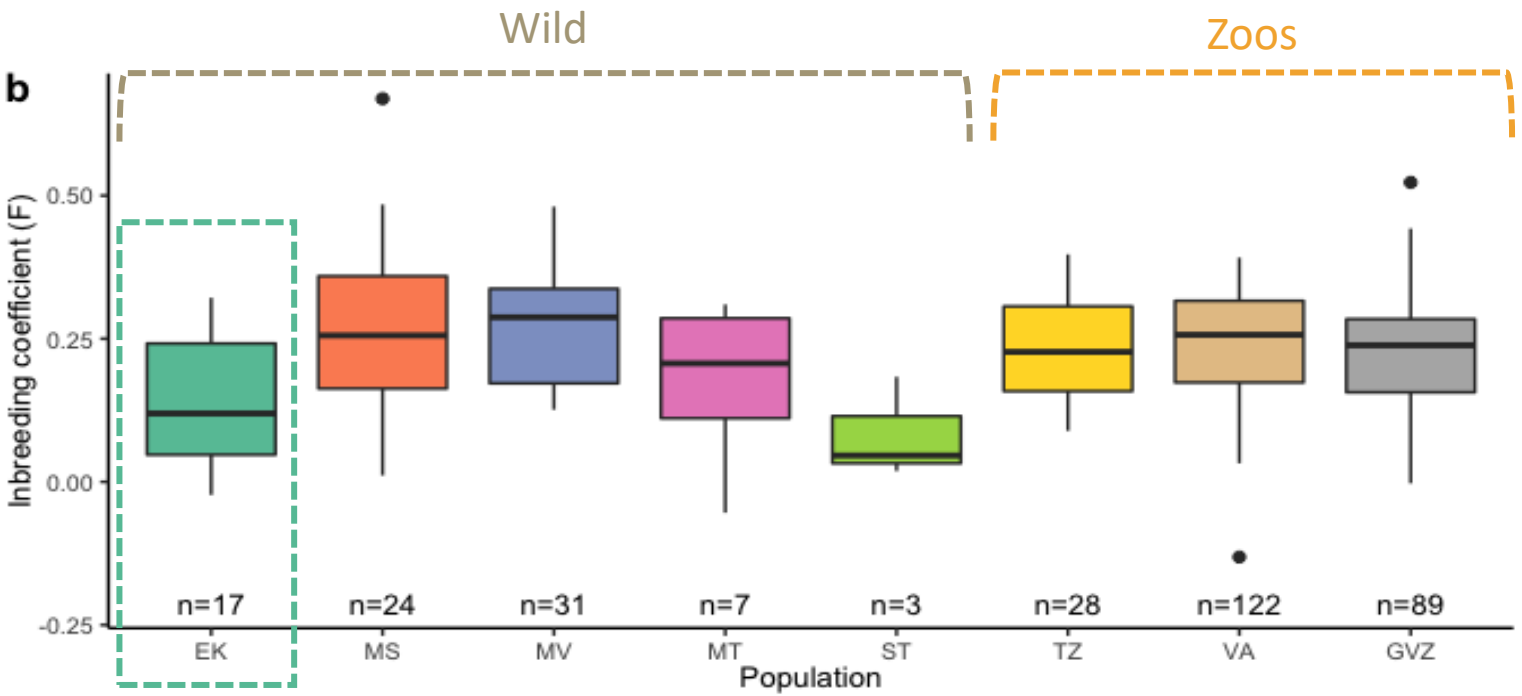
EK has significantly higher Ho than: MS, MV, VA, GVZ

No other significant differences.

No significant differences in wild *vs.* zoo

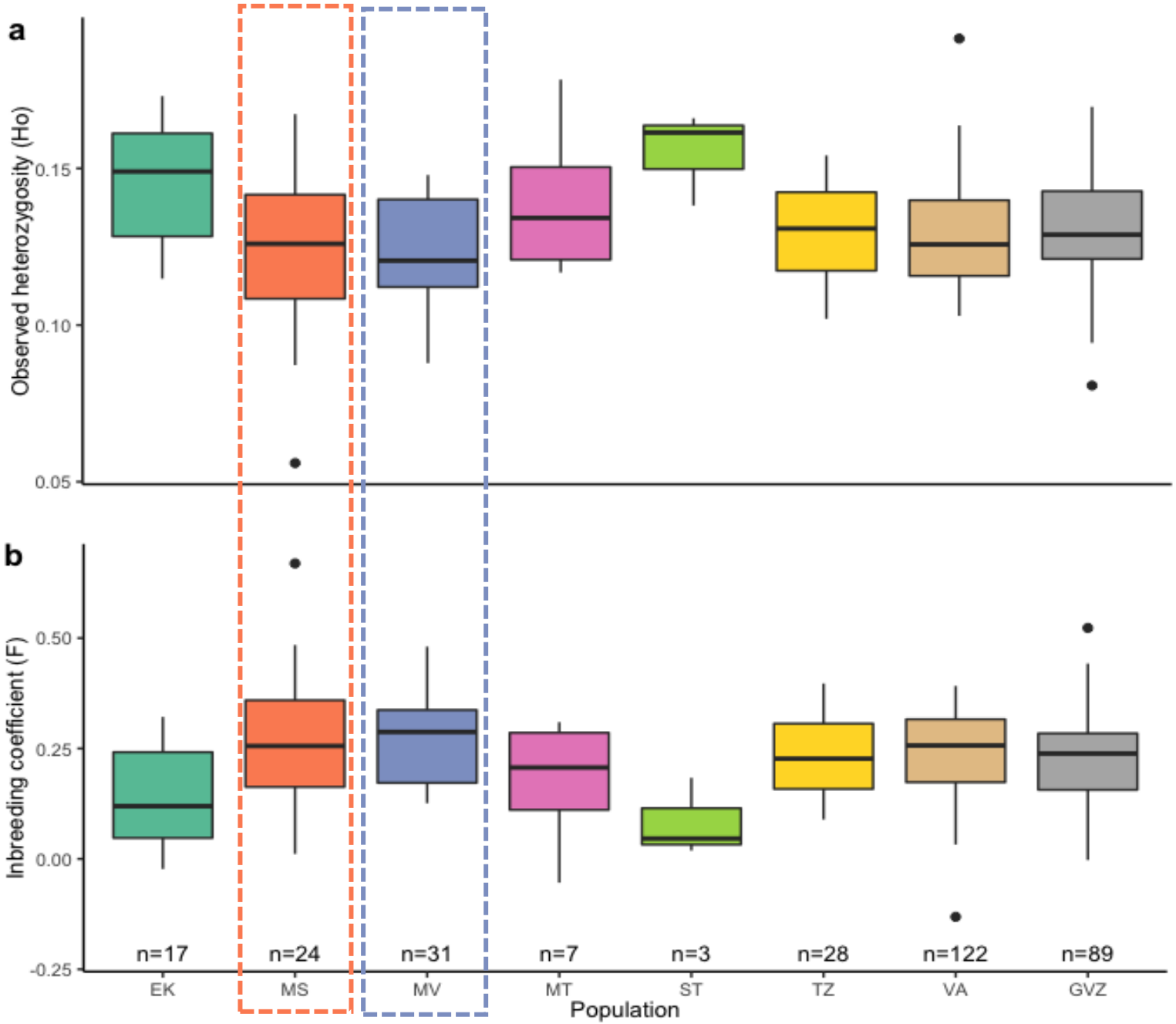
EK significantly lower than all populations except MT and ST.

Inbreeding Coefficient

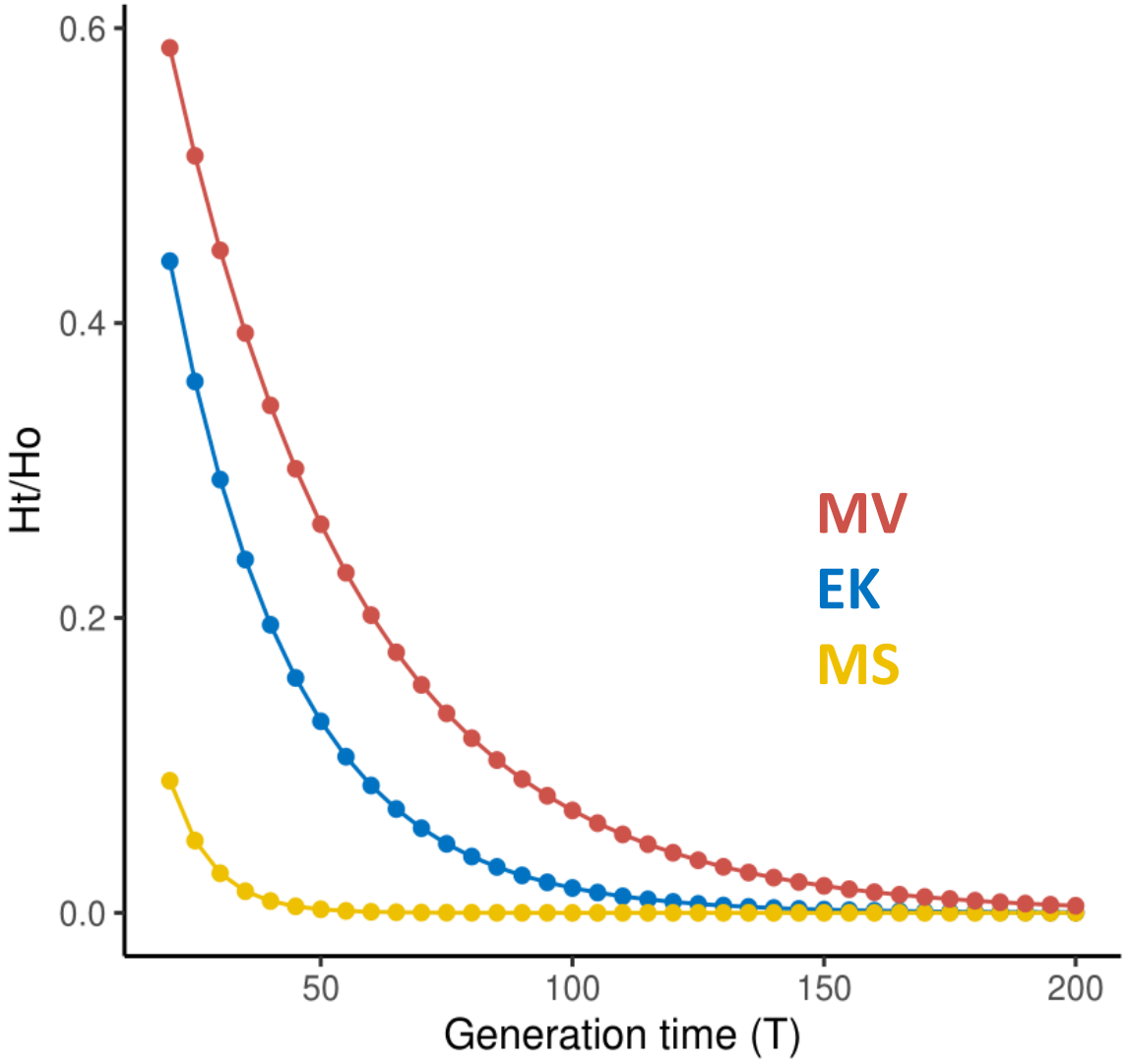


Similar population trends

MS and MV are primary source populations for the zoos



Predicted declines in genetic diversity



Population Structure

MS shows a lot of admixture

EK and ST show recent or ongoing connectivity

Zoos are harbouring frogs with ancestral genetics

Discussion

Wild populations may have existed with poor genetic health (low Ho, high F) for generations

The lack of clear genetic declines points to the effectiveness of current *ex situ* management

Breeding programs may be essential to combat the loss of genetic diversity predicted in coming generations

External supplementation should be diversified (more EK / ST, less MS / MV)

2.Reproductive Health

Egg Retention

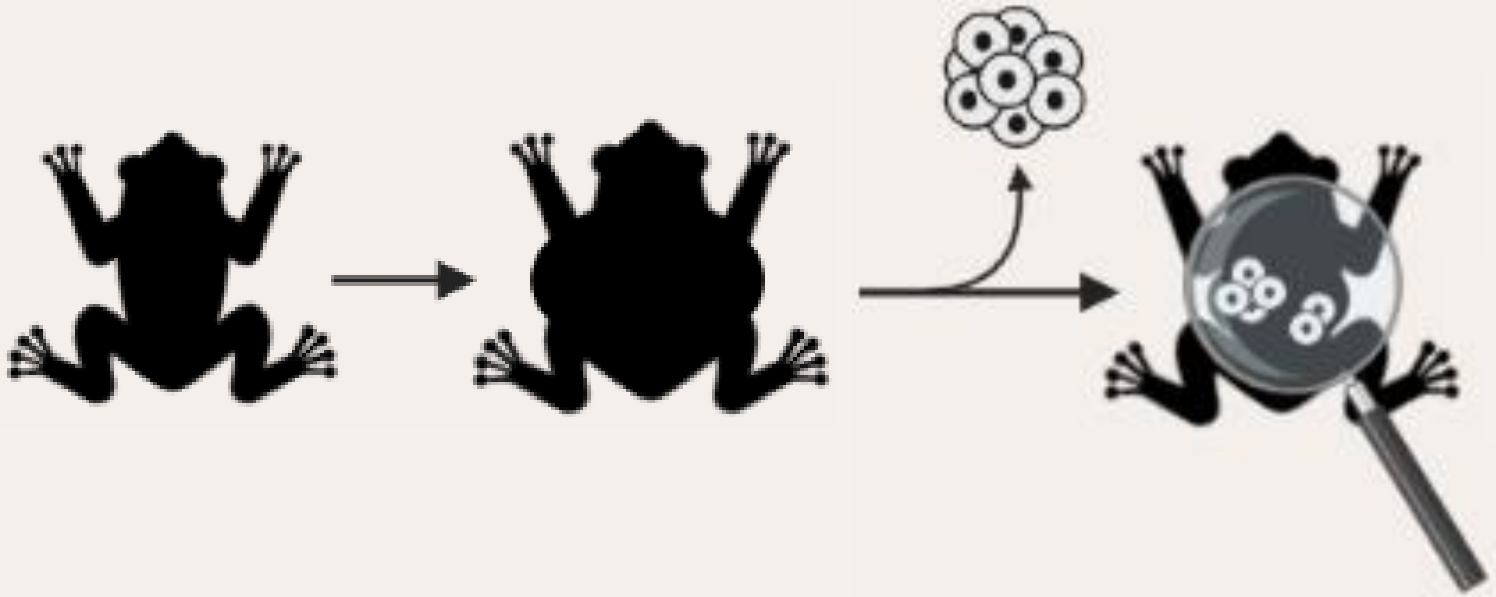
A bearded dragon (Pogona vitticeps) with postovulatory egg retention.

Untreated egg retention can lead to inflammation, infections, and death

Efendic M, Samardzija M, Capak H, Bacic G, Zaja IZ, Magas V, Macesic N (2019) Induction of the oviposition in bearded dragon (Pogona vitticeps) with postovulatory egg retention (dystocia) - a case report. *Veterinarski Arhiv* 89: 133–143.

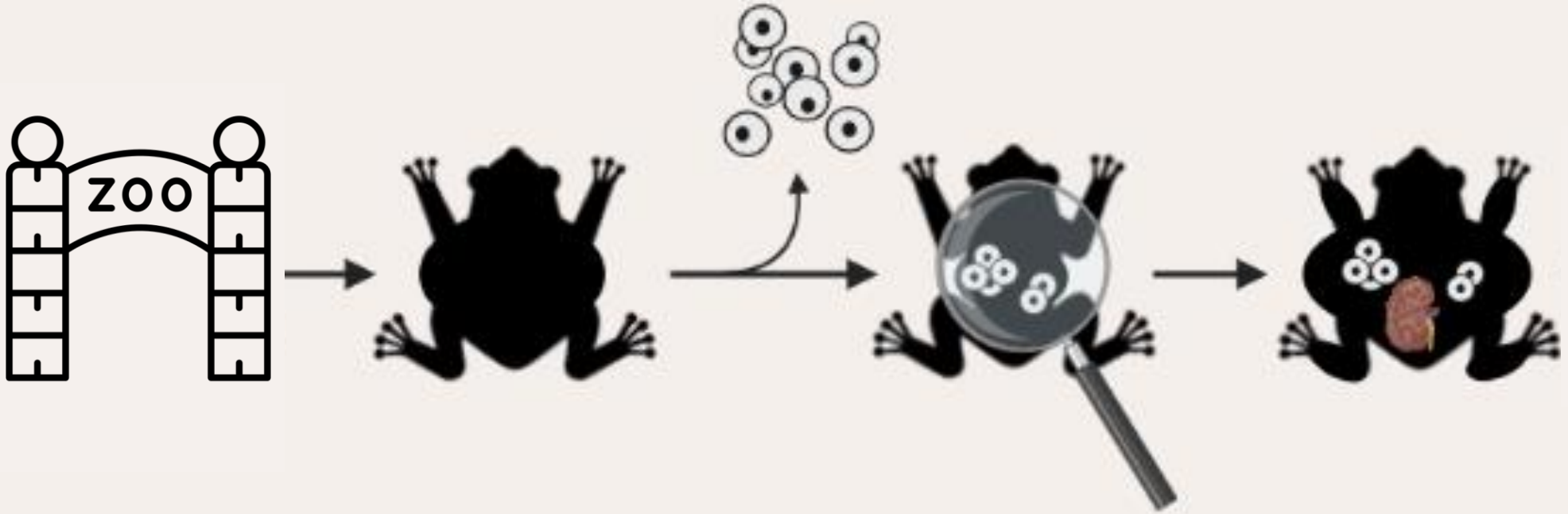
Egg retention

Reabsorption



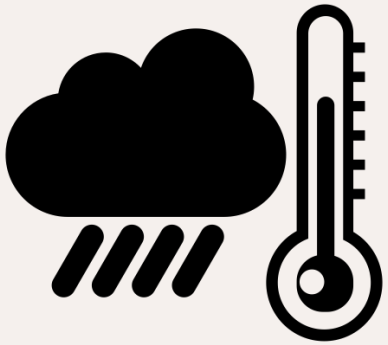
Frog by Bismillah
Graphic by Biorender

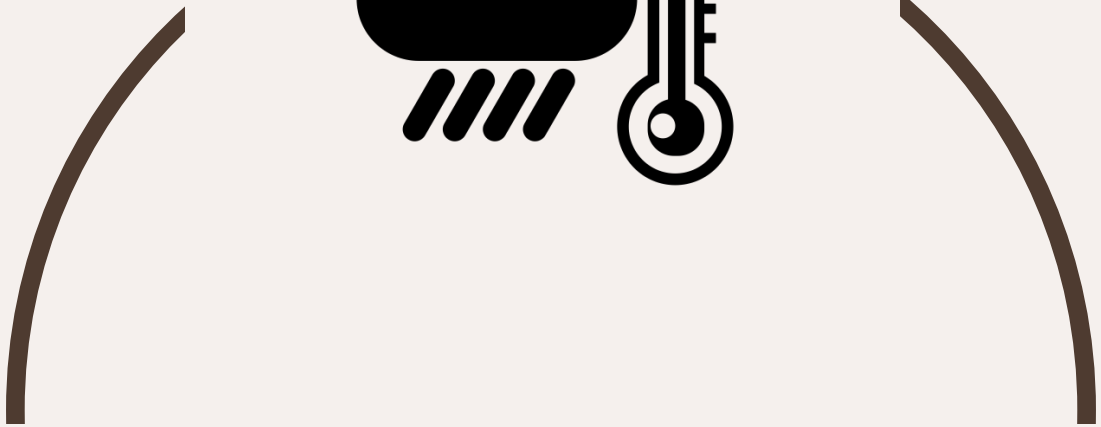
“Egg Binding”



Zoo by Made
Skull by Freepik
Graphic by Biorender

Environment / Stimuli





Body Condition

Age / Maturity

Do egg bound frogs display a higher body condition than others in their population?

Can we predict egg binding based on physiological attributes (age, egg development) or amplexus behaviours?

Body Condition

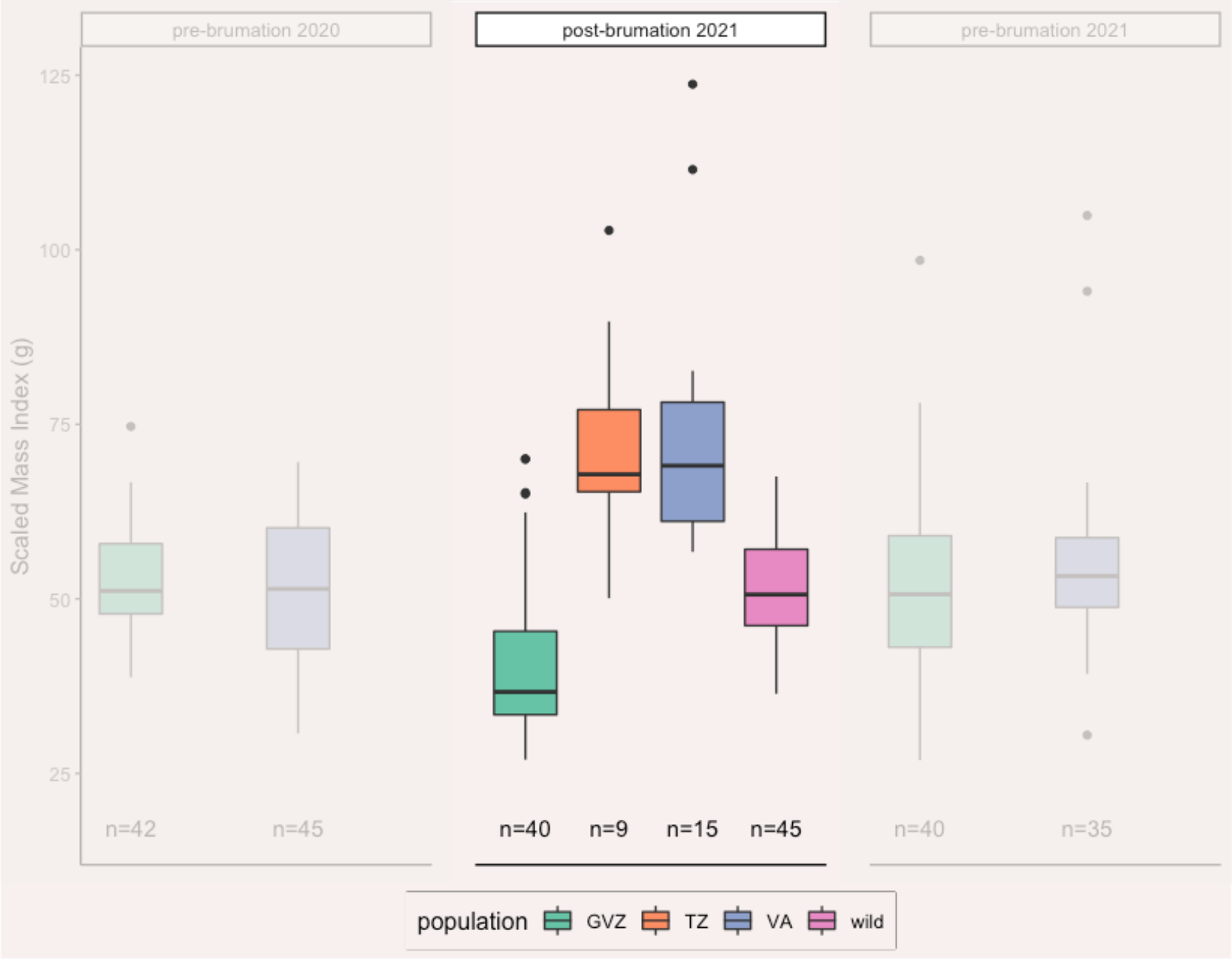
via Scaled Mass Index (SMI)

(Peig & Green 2009)

Zoos *vs* Wild

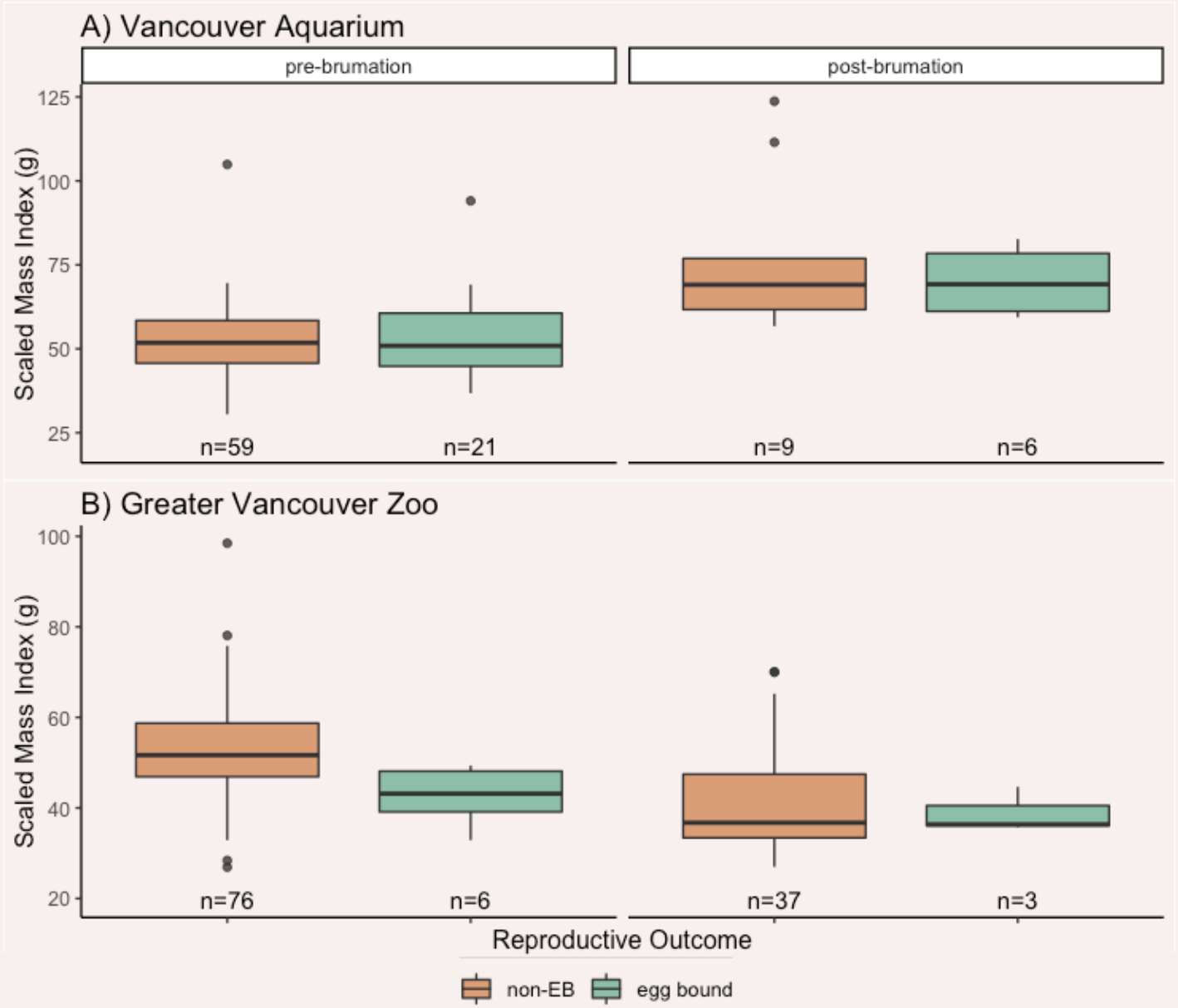
GVZ has **significantly lower** SMI than wild

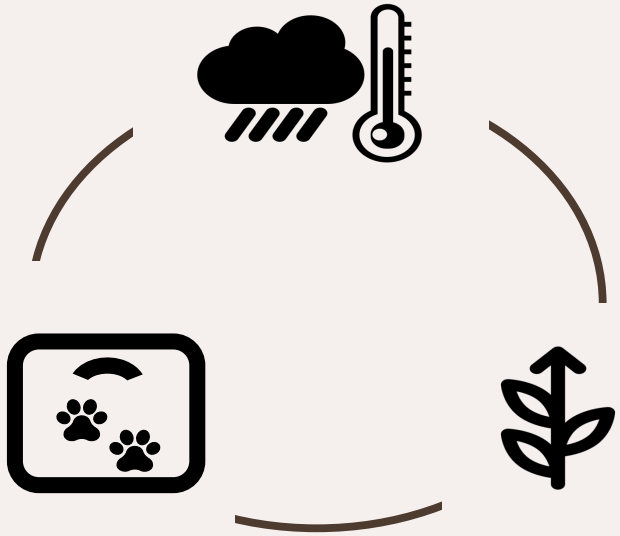
TZ and VA have **significantly higher** SMI than wild



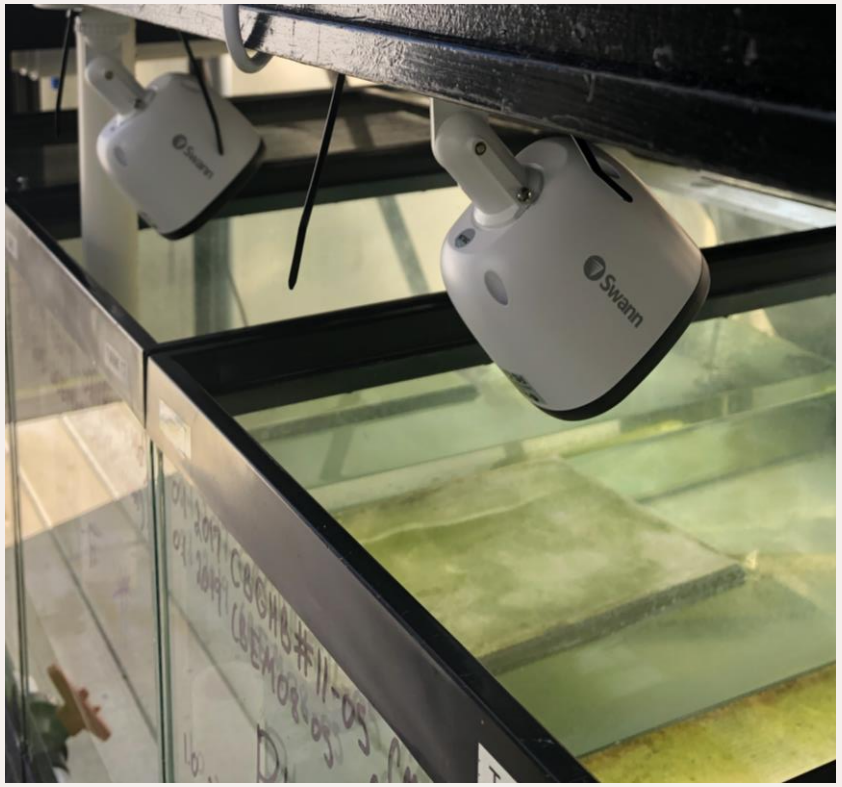
Egg bound *vs* Not

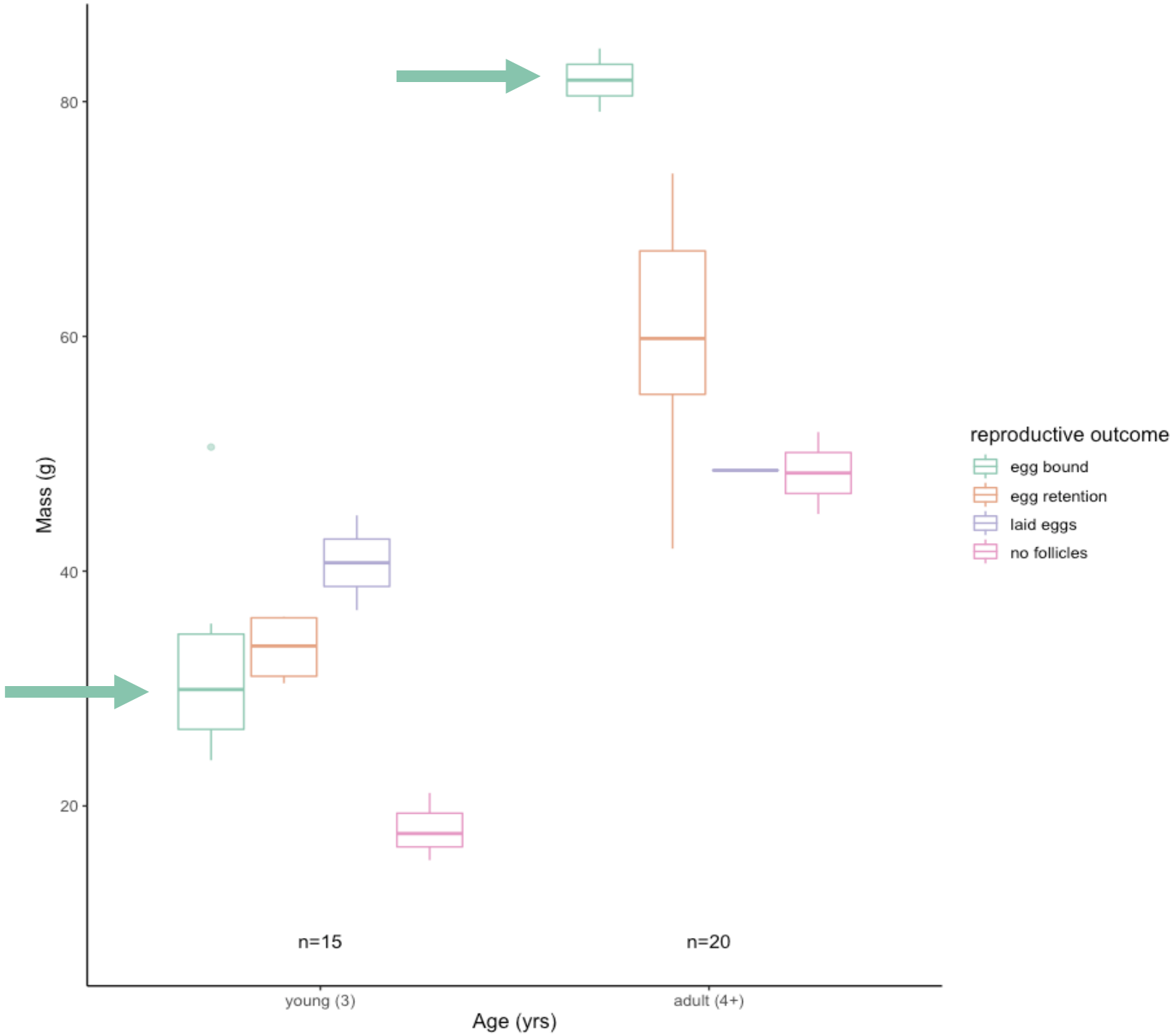
No significant differences





Vancouver Aquarium 2022





Young egg bound females had lower mass than egg retention females.

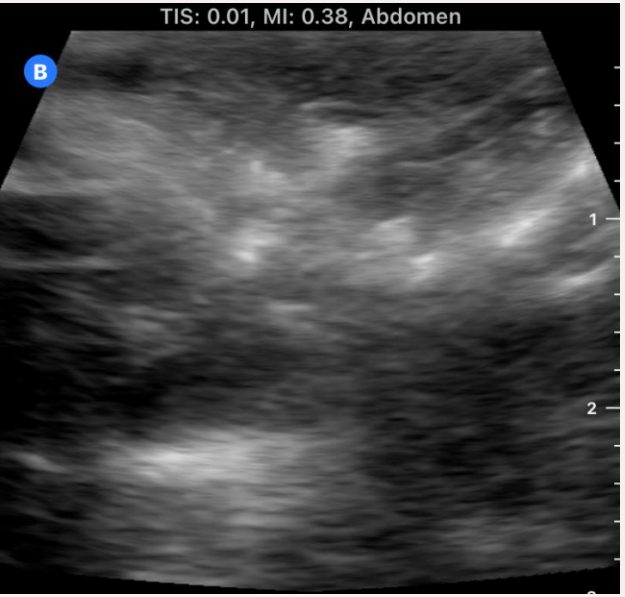
Older egg bound females had significantly higher mass than all others.

Egg/Follicular Development

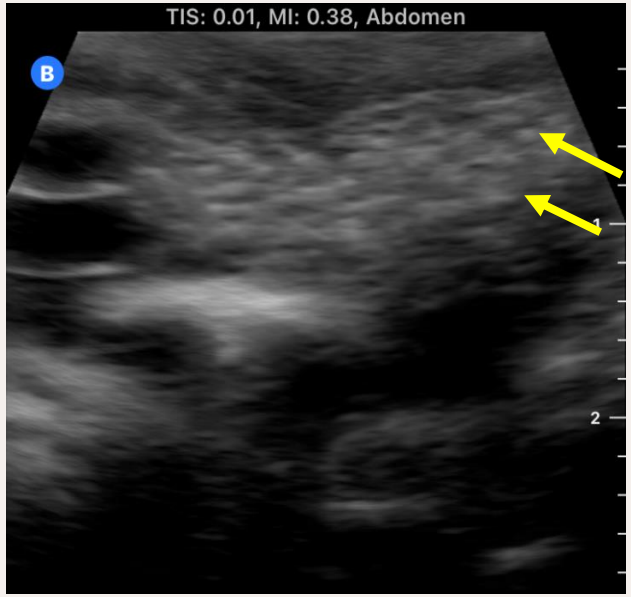
Calatayud NE, Stoops M, Durrant BS (2018) Ovarian control and monitoring in amphibians. *Theriogenology* 109: 70–81.

Graham KM, Langhorne CJ, Vance CK, Willard ST, Kouba AJ (2018) Ultrasound imaging improves hormone therapy strategies for induction of ovulation and in vitro fertilization in the endangered dusky gopher frog (Lithobates sevosa). *Conservation Physiology* 6.

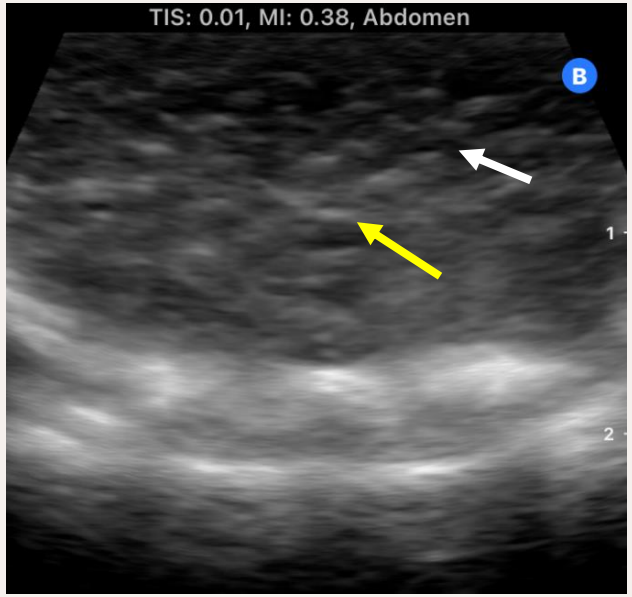
Follicular development grading scheme for the Oregon Spotted Frog



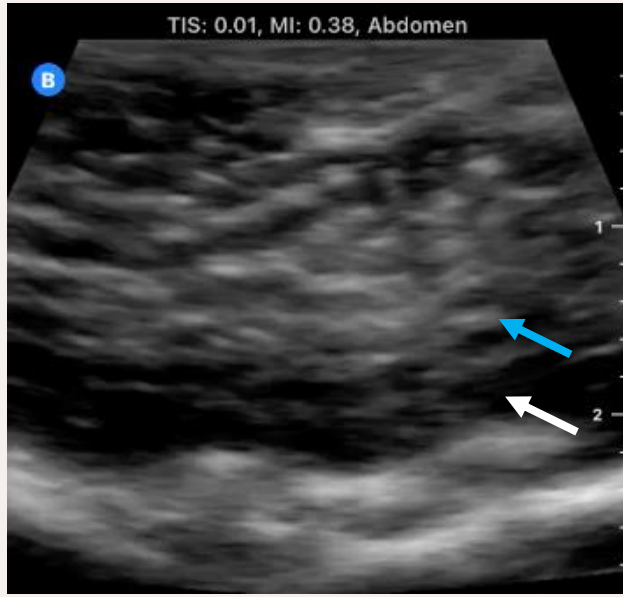
Grade 0 - Non-gravid ovary



Grade 1 - Early gravid



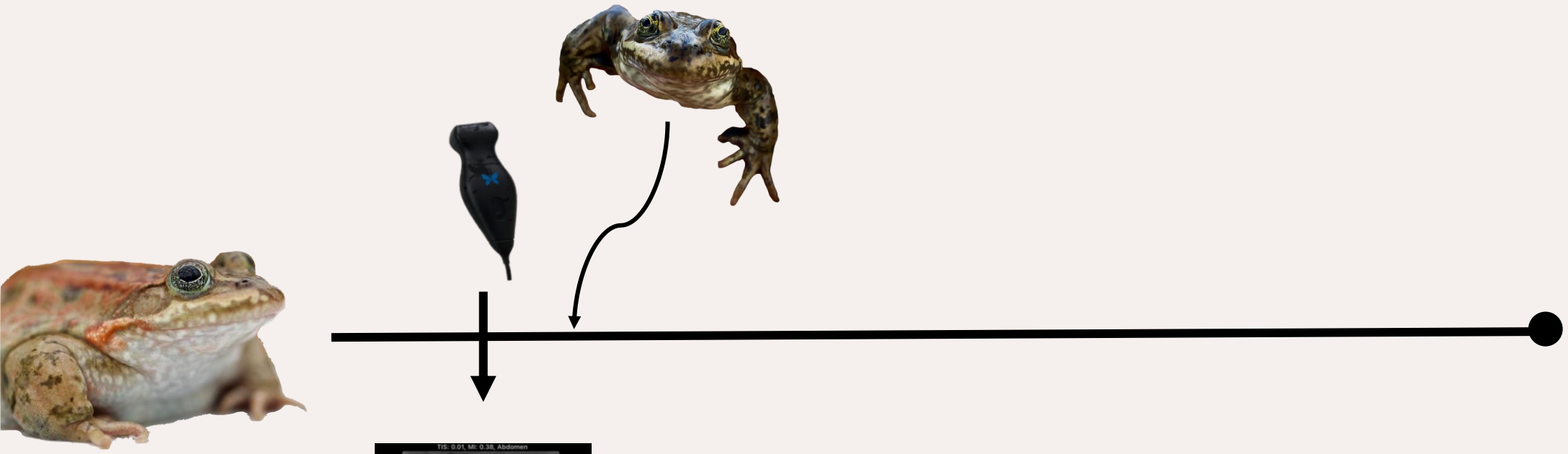
Grade 2: Mid-gravid

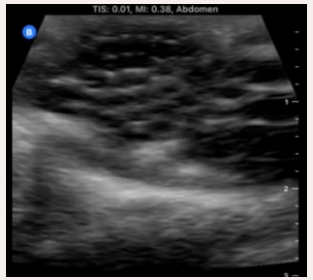


Grade 3: Late-gravid

(Calatayud et al. 2018; Graham et al. 2018)

Initial follicular grade was the only significant predictor of egg binding in a Generalized Linear Model of life history characteristics





Initial Grade

Increasing follicular grade increased the chance of egg binding

Discussion

We need standardized measurement methodology across organizations

Increased body condition increases the risk of egg binding for older frogs but not first-time breeders

Egg binding risk in first-time breeders should be further investigated

Mature eggs (grade 3) are more difficult to reabsorb if retained – retention due to unsuitable conditions?

Where do we go from here?

(Re-)Assess

Breeding and reintroduction programs

- Consider supplementing declining wild populations
- Move towards communal, naturalized breeding tanks

CMR programs

OSF Recovery Strategy


Collaboration
is critical!

Sts'ailes

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THANK YOU!

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Placing lands in trust for our future

My supervisors:
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Gabriela Mastromonaco

WPC

NSERC
CRSNG

SFU
SIMON FRASER UNIVERSITY

Thank you!
Questions?

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