ASSURE 2023: Gambusia vs. Blackspot Disease Study

By: Garrett Bohrnstedt

Harris, K. (2023). *Gambusia holbrooki* [Photograph]. Unpublished.

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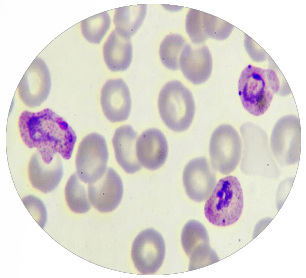
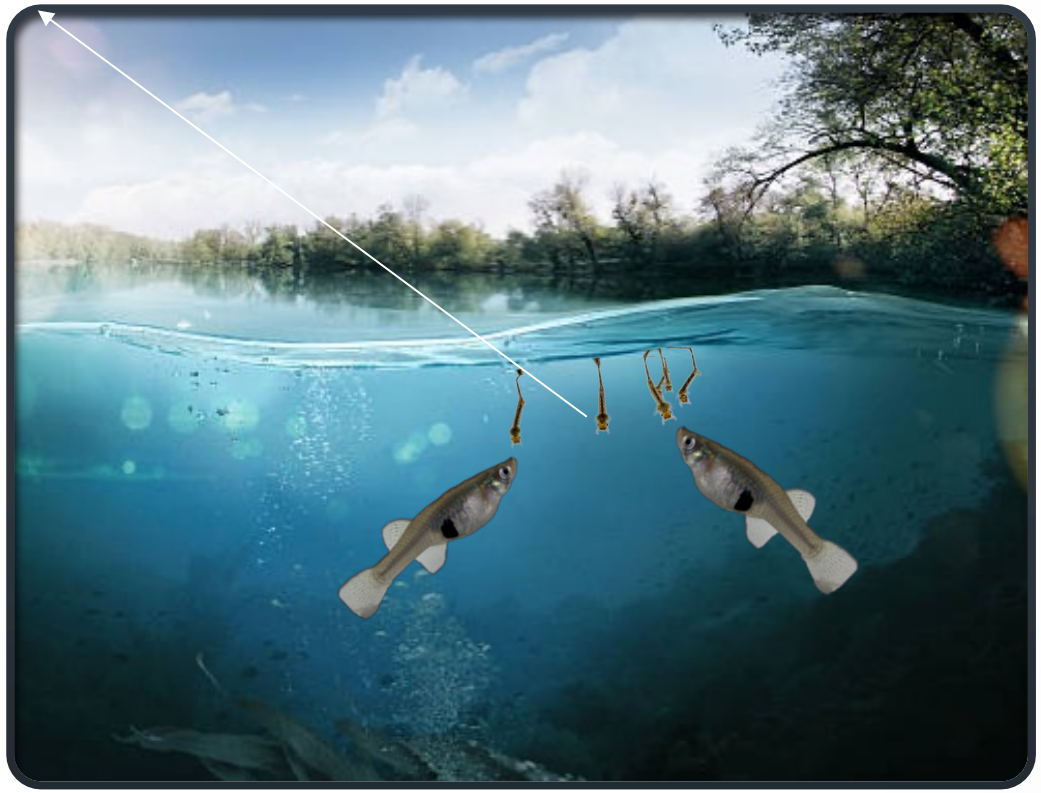
Background



Science News. (2020). *Malaria parasites*. https://www.sciencenews.org/article/malaria-parasites-may-have-their-own-circadian-rhythms

Vecteezy. (2017). *Mosquito*. https://www.vecteezy.com/png/24077679-bloodsucker-mosquito-isolated-on-transparent-background-png-file

- Gambusia are also known as mosquito fish
- Important bio control; eat mosquito larvae; helps eliminate vectors for diseases malaria.



Huff, G. (2023). *Gambusia holbrooki* [Image]. Created using Biorender.

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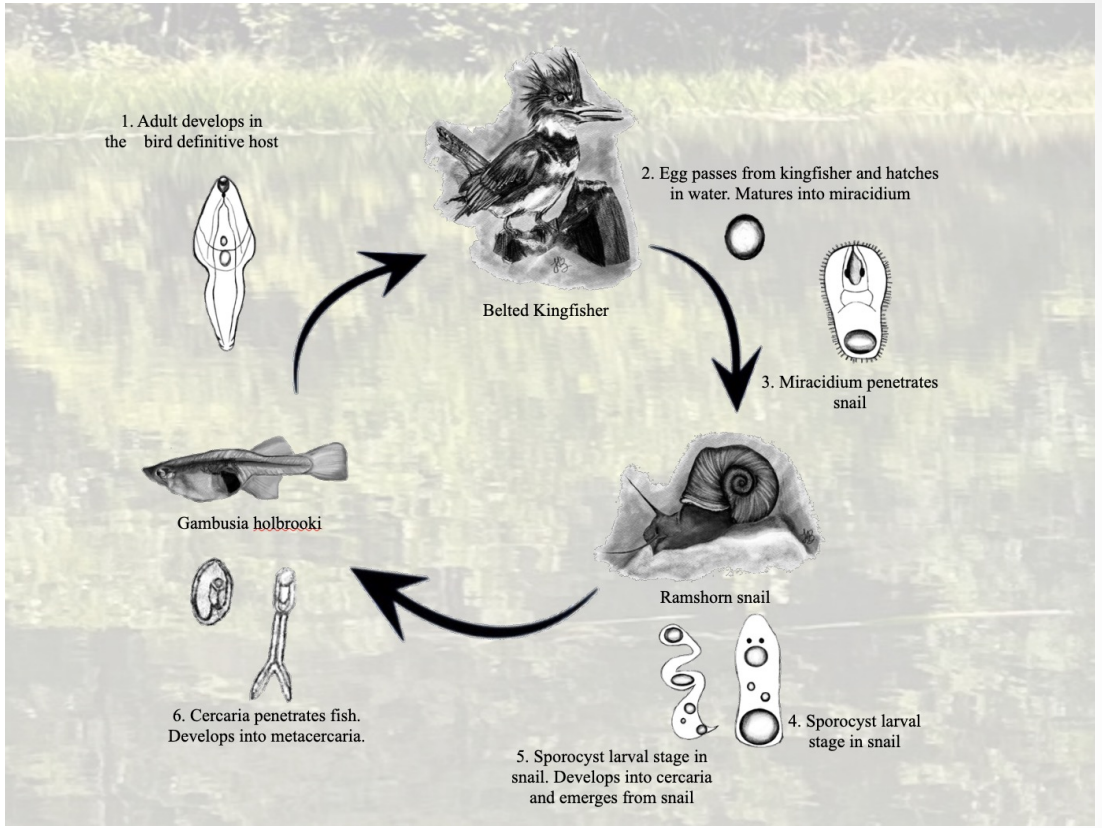
Background

- Blackspot disease is visualized when the *Uvulifer ambloplitis* cercariae (released by ramshorn) bore into the muscle of fish and forming cysts
- Melanin forms around these cysts and gives it this “blackspot” look

Effects:

- shoal less (group together)

- Decrease in mating (female prefers male with no blackspot)



Bohrnstedt, H. (2023) *Life cycle of Uvulifer Abloplitus* [image]. Unpublished.

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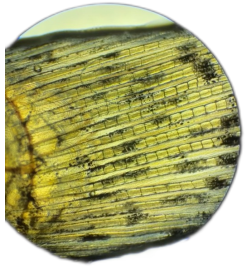
Hypothesis

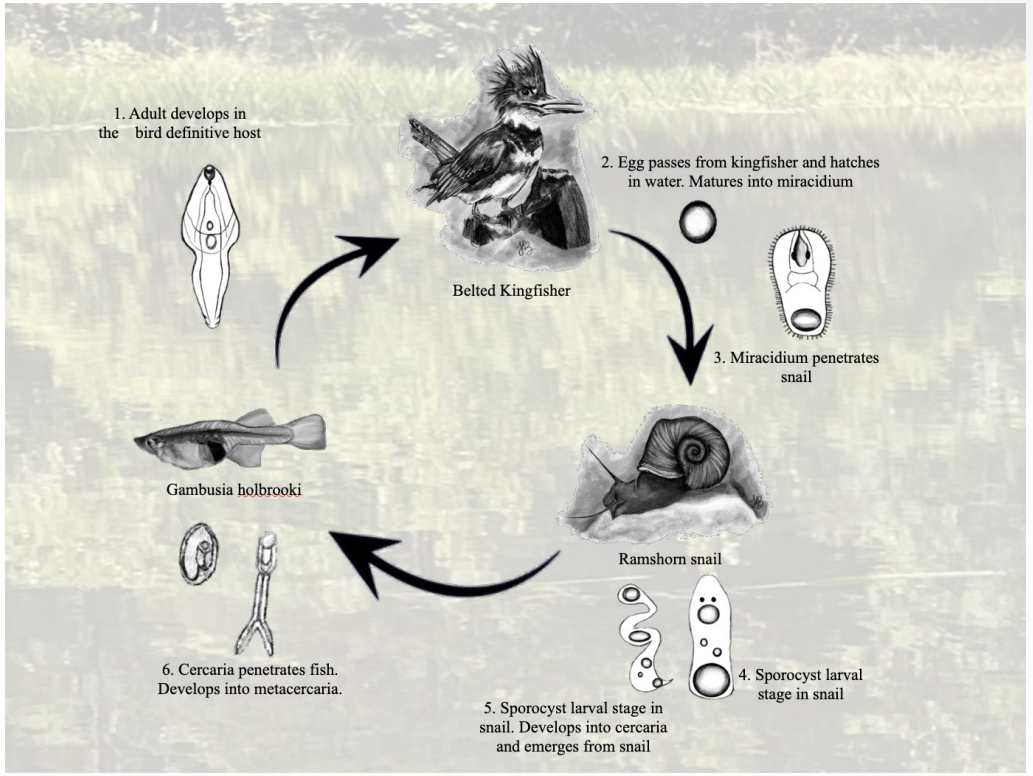
- The presence of Blackspot cysts will result in a substantial decrease in red blood cells navigating through each capillary.



Huff, G. (2023). *Gambusia holbrooki blood circulation with/without blackspot disease* [Image]. Created using Biorender.

If the Hypothesis is True…

- lower blood circulation, worse body condition
- Increase in predation (Bluegill)
- Less effective biocontrol



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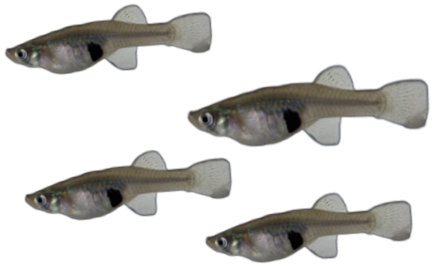

Huff, G. (2023). *Gambusia holbrooki and bluegill* [Image]. Created using Biorender.

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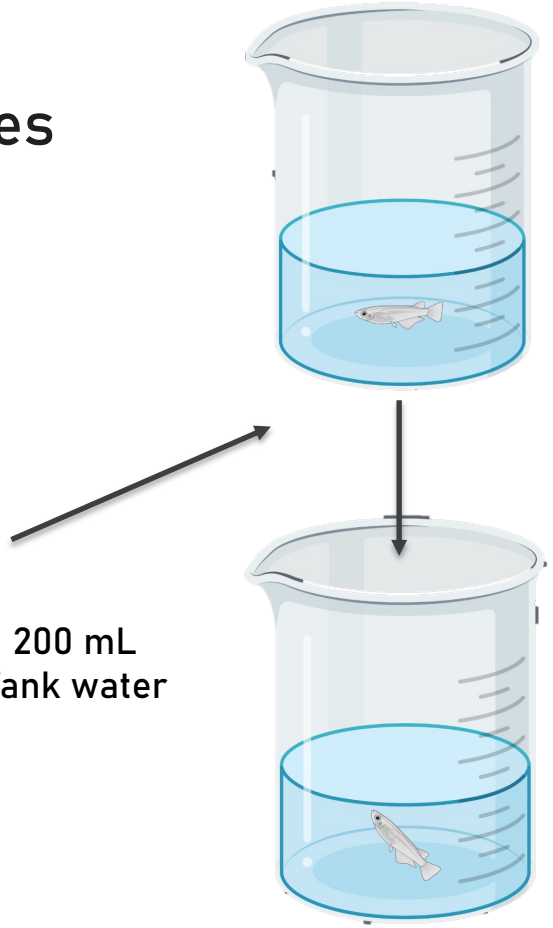
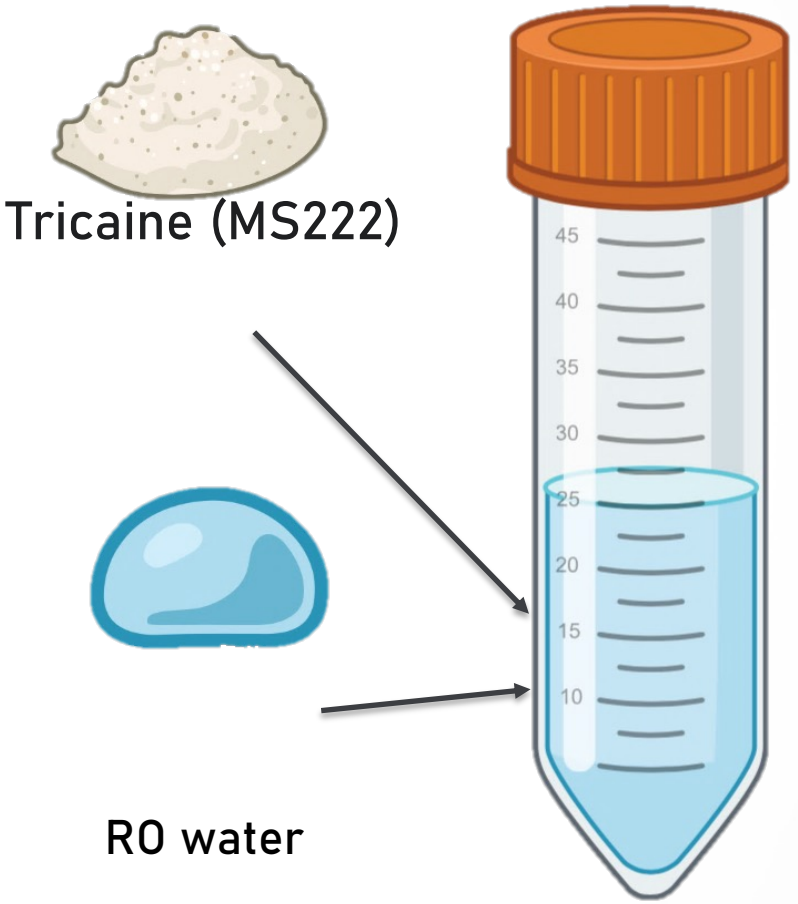
Methods

- 46.99 mg/mL for males
- 27.348 mg/mL for females





Huff, G. (2023). *Gambusia holbrooki drug concentrations* [Image]. Created using Biorender.

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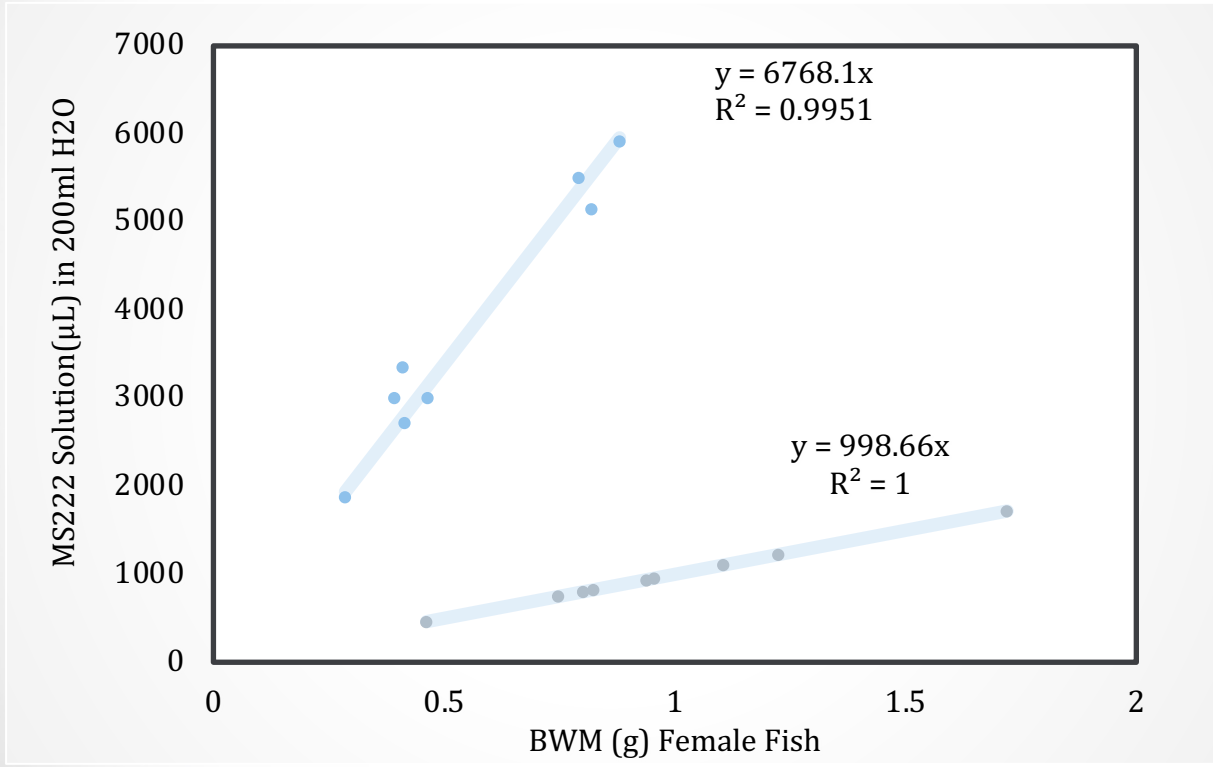
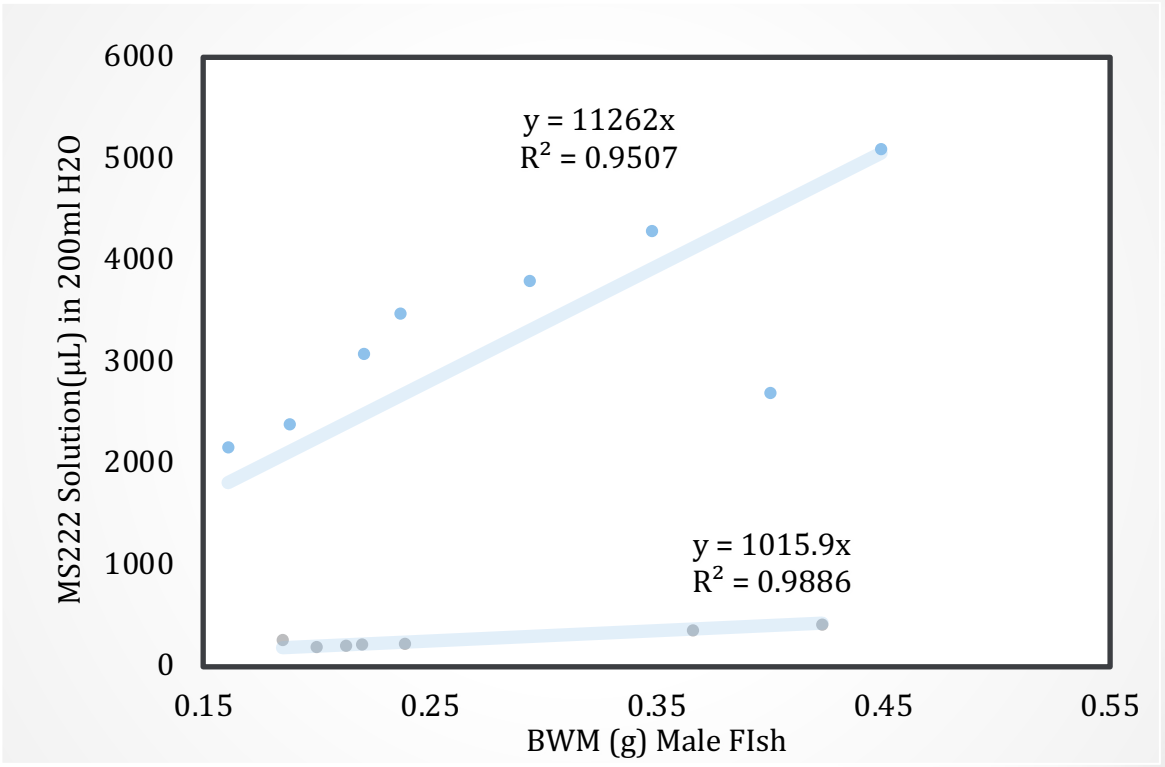
Tricaine (MS222) Solution (µL) in 200 mL H2O vs. BWM (g) for both Female and Male fish (Gambusia)



Piddock, A. (2023). *Gambusia holbrooki drug concentration trial and error graphs* [Image]. Created using Excel.



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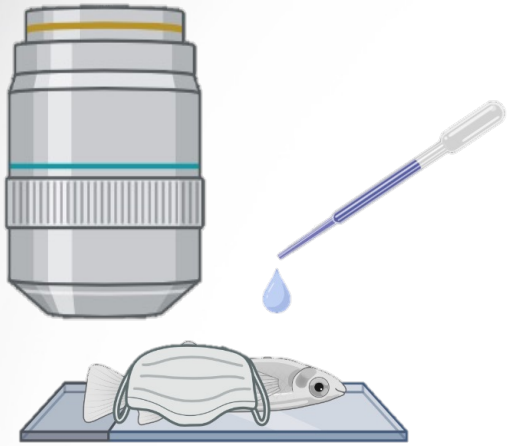
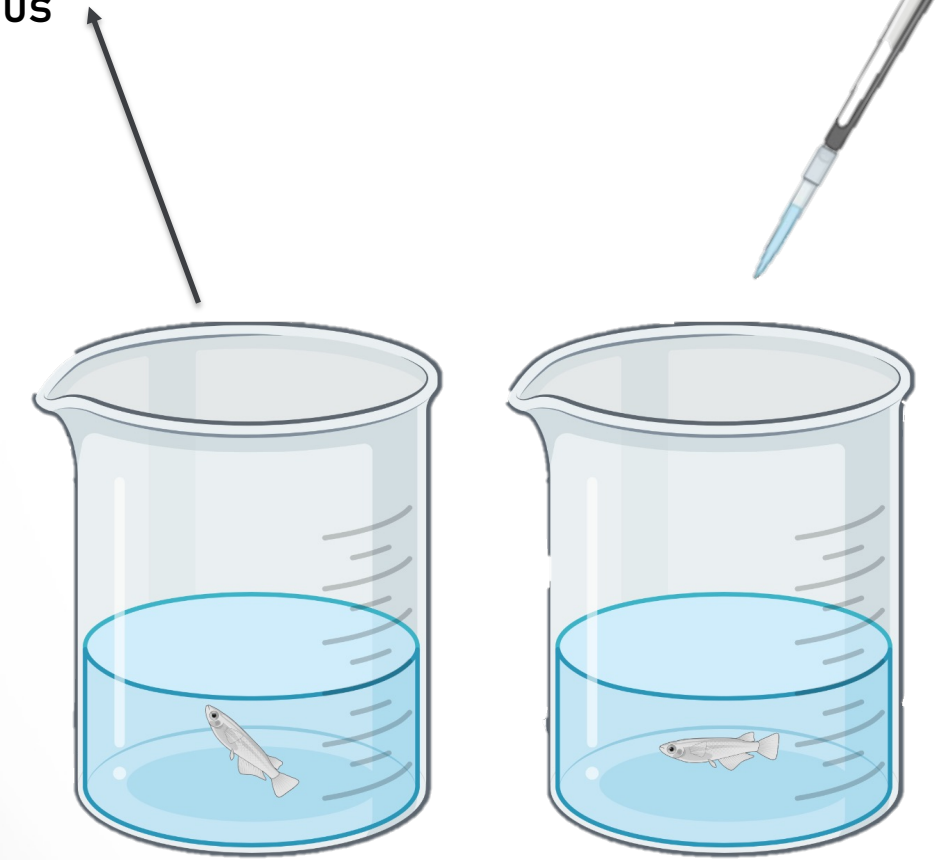
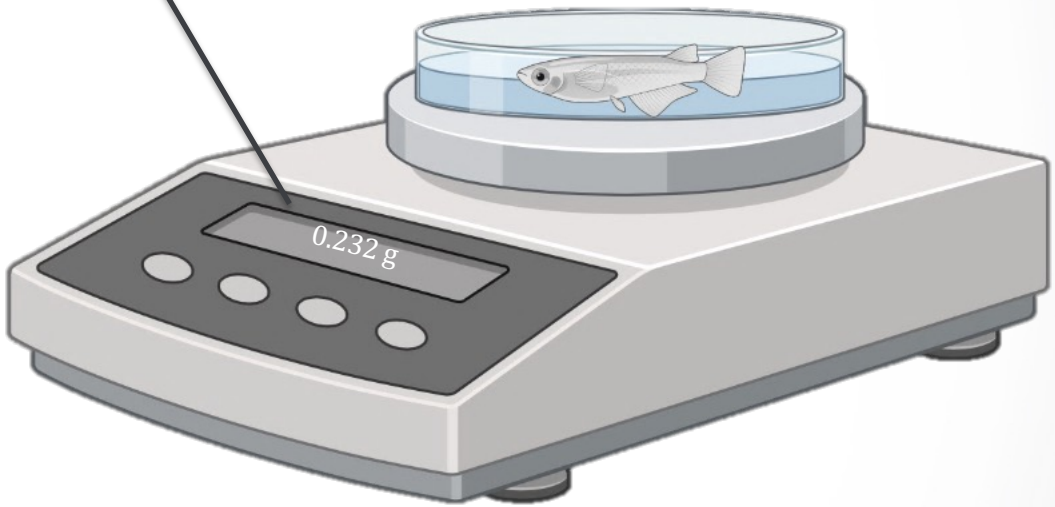
Method:



30s - 60s





Huff, G. (2023). *Gambusia holbrooki sedation method* [Image]. Created using Excel.

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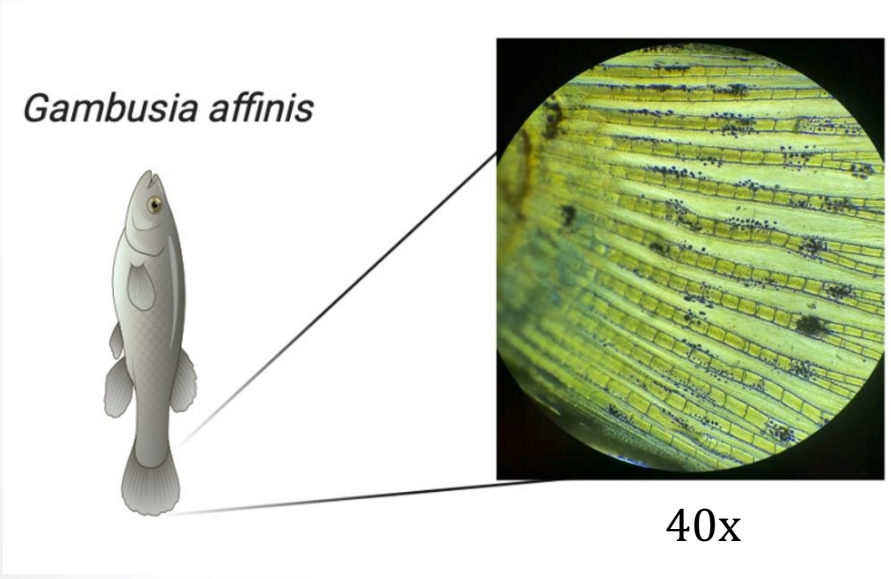
1. 40x for 4 seconds (heavy/light pigment)
2. 100x for 15 seconds (filmed)
3. RBCs counted in capillaries (15s -> 60s)



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Huff, G. (2023). *Gambusia holbrooki sedation method* [Image]. Created using Excel.

Piddock, A. (2023). *Gambusia holbrooki sedation method* [photo]. Unpublished.

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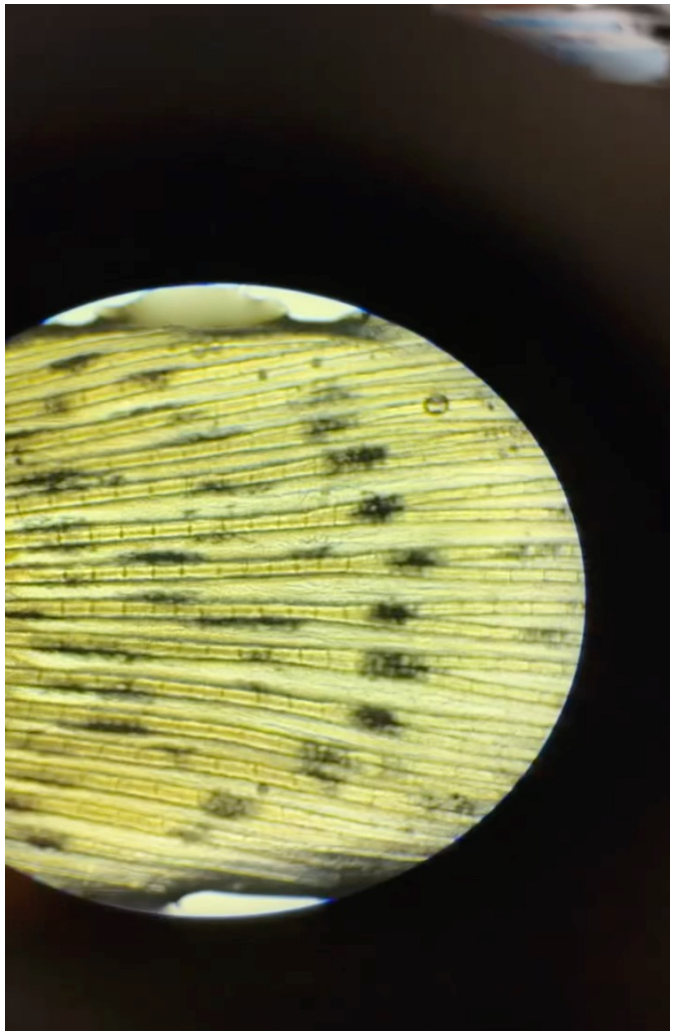
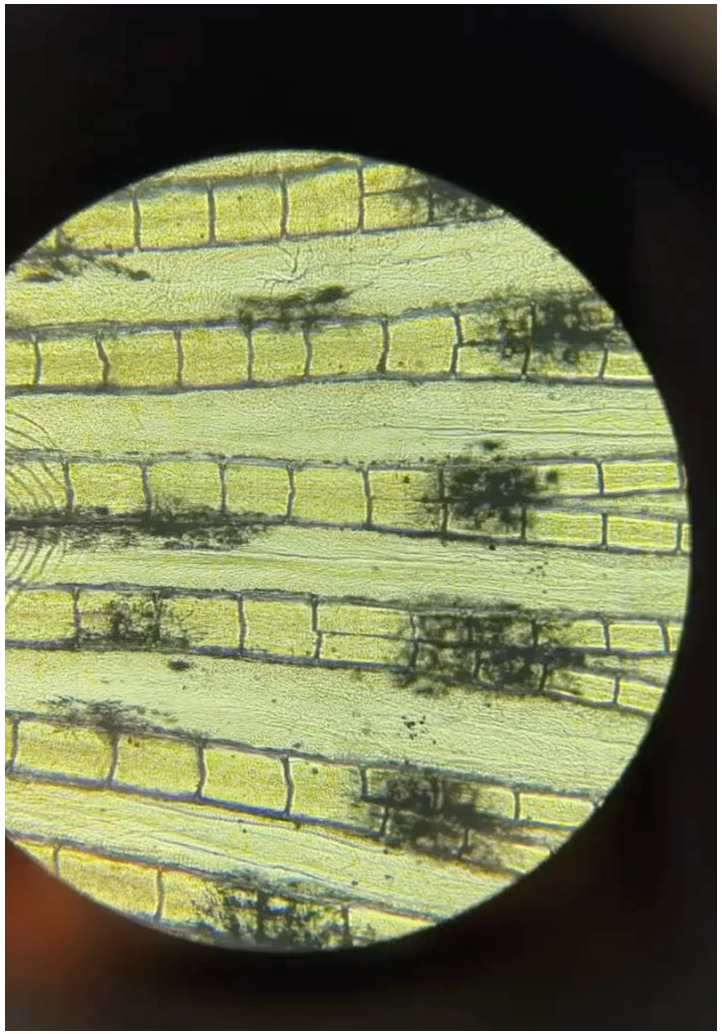
40x and 100x video examples



Bohrnstedt, R. (2023). *Gambusia holbrooki blood circulation* [Image]. Unpublished.



Bohrnstedt, R. (2023). *Gambusia holbrooki blood circulation* [Image]. Unpublished.

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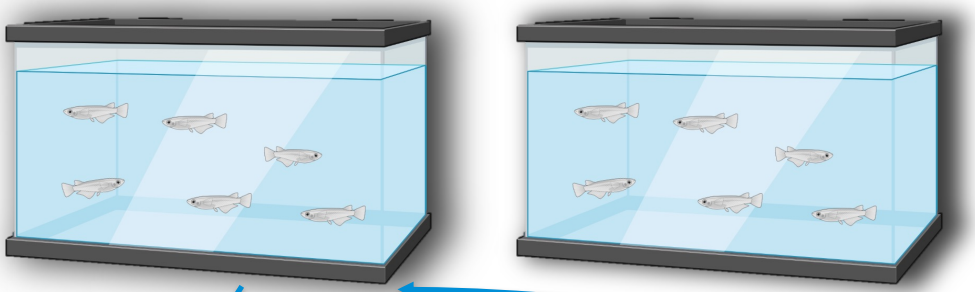
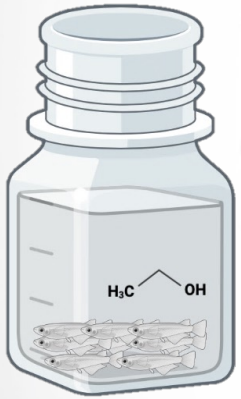
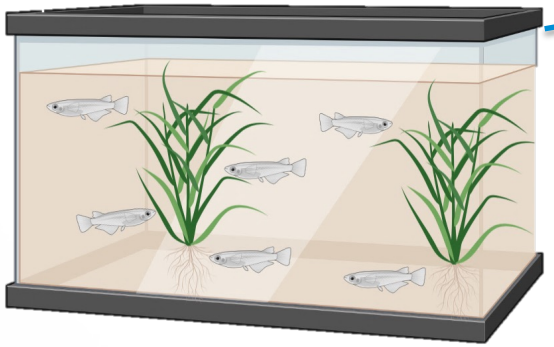
Recovery tanks





70% ethanol solution

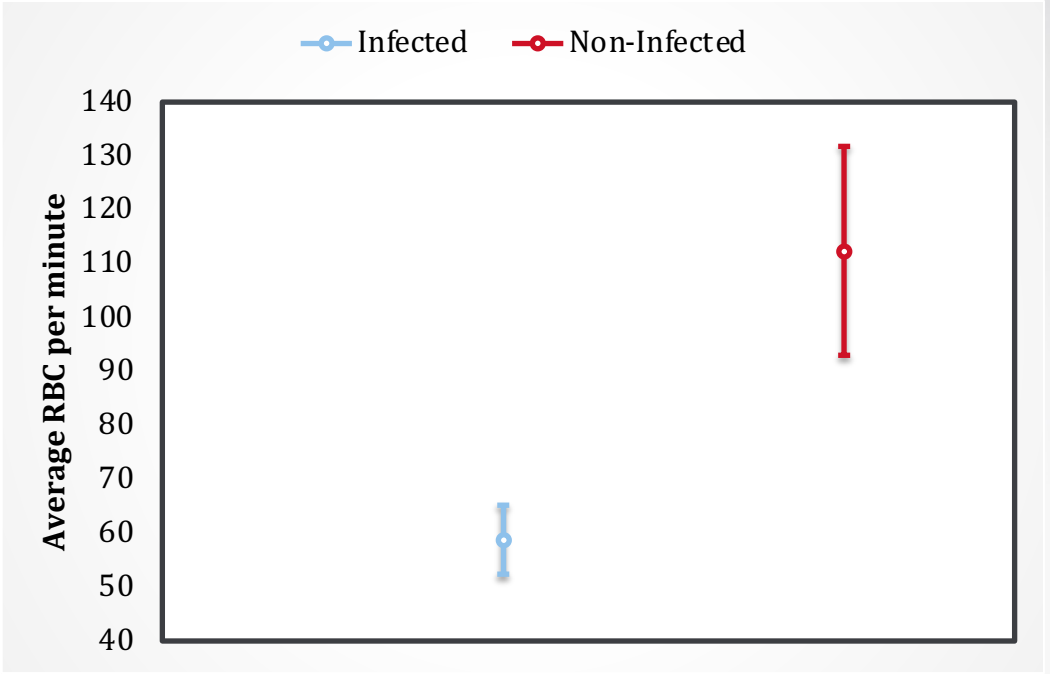
Kingfisher tank



Huff, G. (2023). *Gambusia holbrooki recovery tanks* [Image]. Created using Excel.

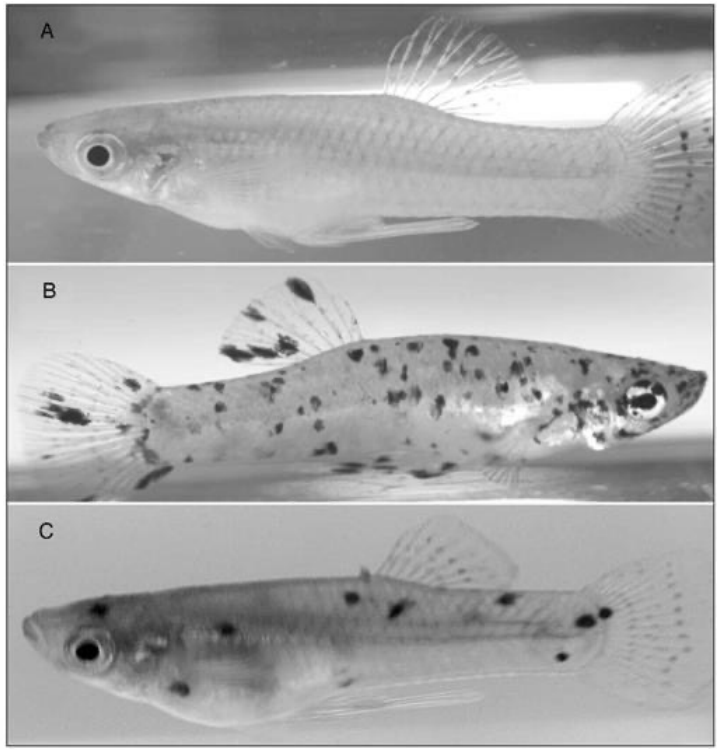
Limitations and Future Research

- Gambusia from kingfisher pond only showed pigment and no 100% confidence of actual blackspot



Piddock, A. (2023). *Gambusia holbrooki healthy versus infected graph* [Image]. Created using Excel.

Blackspot



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Non-blackspot (pigmented)

Vs

Harris, K. (2023). *Gambusia holbrooki* [Photograph]. Unpublished.

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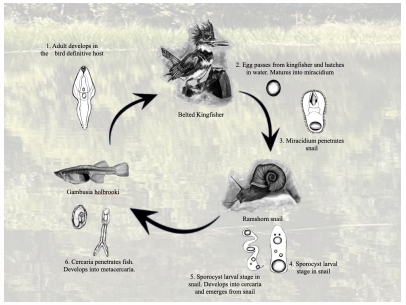
Limitations and Future Research

Harris, K. (2023). *Ramshorn snail* [Photograph]. Unpublished.



Bohrnstedt, H. (2023) *Life cycle of Uvulifer Abloplitus* [image]. Unpublished.

Harris, K. (2023). *Ramshorn snail* [Photograph]. Unpublished.

- Future research will be adding a multitude of snails (ramshorn) to the kingfisher tank for the release of cercariae
- 21-day cycle of blackspot will occur, giving more confidence of it and hopefully visuals
- Data set will be compared to this data set of non-blackspot fish or new set later

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Resources

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Additional Figure Development by the authors in support of Biorender and drawings of black spot life cycle and ramshorn snails by Hazel Bohrnstedt