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Does Size-assortative Mating Improve Fertilization Success in Grey Treefrogs?

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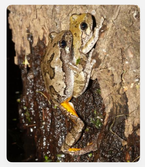
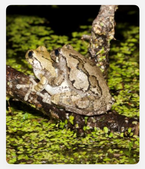
Background

Eastern Grey Treefrogs, *Hyla versicolor*, have external fertilization during amplexus. Amplexus is when a male frog grabs onto a female's back and fertilizes her eggs as they are released. Success of external fertilization may be improved by the closeness of egg and sperm release[3]. Partners that are well size-matched during fertilization should, in theory, have higher percentages of fertilized eggs[1]. Partners may achieve a good size match by pursuing size-assortative mating (where partners resemble each other more in body size than expected by chance)[2].


Hypothesis

Size-assortative mating improves fertilization success

Predictions

Within-pair size differences should be correlated with fertilization success

The majority of mated pairs observed in nature should show an optimal size ratio

Methods

- 84 pairs captured during the natural breeding season of *H. versicolor*
- Body length (snout-vent length, SVL) measured using calipers
- Male/female size ratio calculated (male SVL/female SVL); ratio values <1 indicate that the male was the smaller sex
- 20 pairs randomly selected to lay eggs
- Unfertilized and fertilized eggs were distinguished using photographs four days post-oviposition
- Number of fertilized/unfertilized eggs were counted using the TapCount app (Andrew Moore)

Results

- Fertilization success is positively related to male/female SVL ratios (Fig 1.)
- Male/Female SVL ratios below 0.9 are associated with low fertilization success (Fig 1.)
- Many pairs in nature (48%) fell below the 0.9 SVL ratio, which should result in sub-optimal fertilization success (Fig 2.)

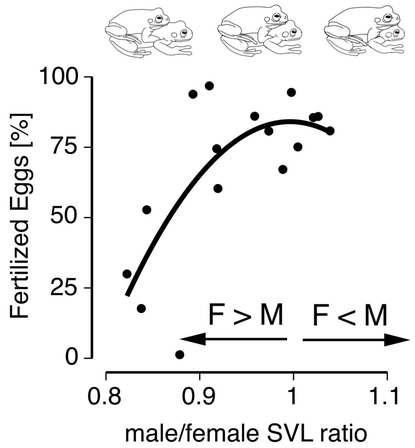


Figure 1. Percentage of fertilized eggs in each clutch compared to the SVL ratios of amplexus pairs.

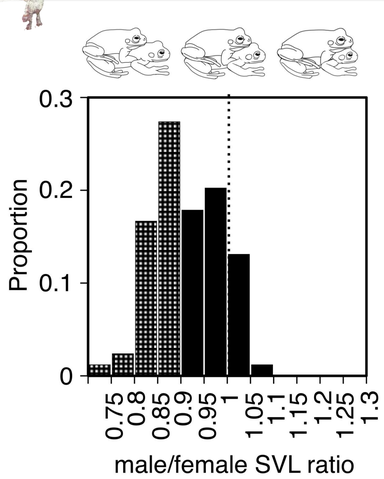


Figure 2. Proportions of amplexus pairs in each SVL ratio-category. Bolded bars indicate pairs with size ratios with predicted optimal fertilization success. Patterned bars indicate pairs with size ratios that should result in low fertilization success. The dashed line indicates a 1:1 SVL ratio.

Conclusion

Previous studies found that male body size affects fertilization for some anuran species but not for others[4]. Our study found that there is an ideal SVL ratio of 0.9 and above for *H. versicolor* pairs. Nevertheless, there does not seem to be size-assortative mating, as almost half of our study population had SVL ratios below this optimum. The high rate of sub-optimal pairs, where females are paired with males that are too small, may be the result of the sexual size-dimorphism present in this species: males are on average 4.2 mm smaller than females. This increases the likelihood that females only have relatively small males available to choose from.

Resources

1. Chajma, P., & Vojar, J. (2016). The effect of size-assortative mating on fertilization success of the common toad (*Bufo bufo*). Amphibia-Reptilia, 37(4), 389-395.
2. Robertson, J. (1990). Female choice increases fertilization success in the Australian frog, *Uperoleia laevigata*. 39(4), 639-645.
3. Vojar, J., Chajma, P., Kopecký, O., Puš, V., & Šálek, M. (2015). The effect of sex ratio on size-assortative mating in two explosively breeding anurans. Amphibia-Reptilia, 36(2), 149-154
4. Xiao-Li Fan, Z. (2013). Male size does not correlate with fertilization success in two bufonid toads that show size-assortative mating. Current Zoology, 59(6), 740-746.

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