

A Method for Estimating Egg Numbers in Egg Clutches of The Exotic Apple Snail *Pomacea maculata* Without Affecting Clutch Viability

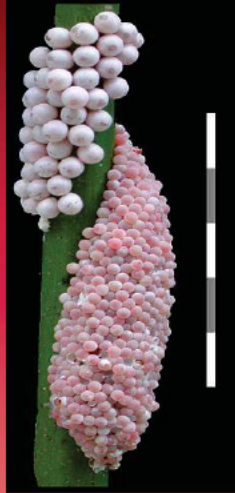
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Introduction

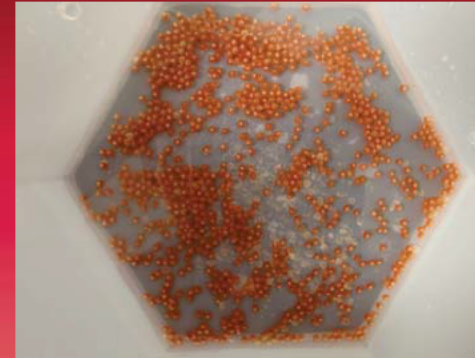
- The exotic apple snail, *Pomacea maculata*, has been rapidly increasing its range and density throughout south Florida's aquatic ecosystems, presenting a significant problem for state agencies. *P. maculata* is one of the largest species of apple snail, having presumably come to Florida via accidental introduction from South America.
- P. maculata*'s success in its new environment can be attributed to many factors, including but not limited to: its large size compared to its native counterpart, *Pomacea paludosa*; its increased consumption rate, and its ability to lay up to several thousands of eggs per clutch on emergent vegetation.
- Compared to the natives, *P. maculata* lays smaller, but significantly more eggs in large multilayered clutches. The sheer number of eggs in addition to the 3D structure of the clutches yields the counting of these eggs impossible without first breaking up the adhesive matrix holding the clutch together. In order to effectively estimate the number of eggs in each clutch without affecting viability, an algorithm was established that directly relates egg clutch mass to number of eggs per clutch.

Methodology

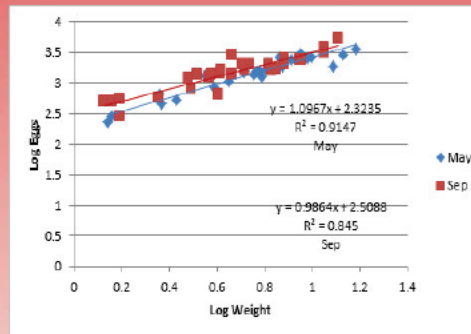
- We began by collecting a total of 70 *P. maculata* egg clutches in areas of high density in Lake Okeechobee over the course of much of the breeding season (May-September). Careful removal of the egg masses from their substrate was vital in avoiding the destruction of eggs. Upon weighing the egg masses, each clutch was designated a number and placed in a plastic cup halfway filled with 1.0 M NaOH. The cups were then covered with parafilm and placed on a shaker table in order to speed up the disaggregation process.
- After one week the eggs have broken up into individual eggs to be counted. Photographs were taken of each clutch using a digital camera and counts were done on a computer using ImageJ software for accuracy.



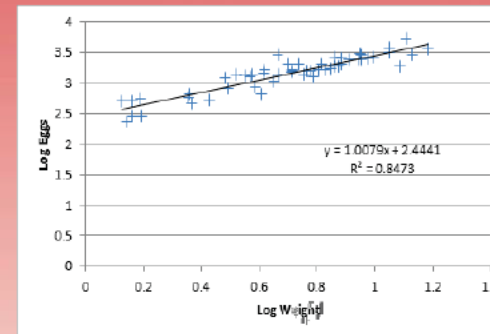
Pomacea maculata vs
Pomacea paludosa:
Egg mass comparison



Screenshot of disaggregated egg mass with markers using ImageJ



Log transformed graphs of goodness of fit line for May and September data (left) and all data (right)



Results

- The use of a regression analysis resulted in an R^2 value of .8473 for the common slope of May and September's data. This indicates a strong correlation of our data points to our regression line. Using the equation of the slope of the plotted data, we were able to derive the equation for number of eggs: $y = 1.0079x + 2.4441$ (log transformed). This algorithm will give us a good estimate of the number of eggs in a clutch by simply inputting the egg clutch mass.

Discussion

- Results of this study will aid in the broader, ongoing research project involving *P. maculata* that aims to understand these invasive apple snails widespread impact on south Florida's aquatic systems. The equation derived by this method will open the door to studies of fecundity as well as life history. These further studies can reveal what proportion of eggs in each clutch actually hatch, which can be helpful to researchers and managers alike.
- Using this equation, researchers will get a better idea of what areas *P. maculata* is selecting for by looking at fecundity rates at different locations of lake Okeechobee. Managers would also have this information available in order to make more informed decisions on control measures.

References

- Burlakova, Lyubov E., Padilla, Dianna K., Karatayev, Alexander Y., Hollas, David N., Cartwright, Leah D., Nichol, Kevin D (2009) Differences in population dynamics and potential impacts of a freshwater invader driven by temporal habitat stability
- Burks, Romi L., Kyle, Colin H., Trawick, Matthew K. (2010) Pink eggs and snails: field oviposition patterns of an invasive snail, *Pomacea insularum*, indicate a preference for an invasive macrophyte
- Barnes, Matthew A, Fordham, Rebecca K., Burks, Romi L., Hand, Jennifer J. (2008) Fecundity of the exotic applesnail, *Pomacea insularum*