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Modeling, Estimation, and Control Related Issues in Physical and Biological Applica- tions

Modeling and Estimation Approaches to Quantify the Impact of a Recent Invasive Species, Pomacea maculata

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Abstract: *Pomacea maculata* is a relatively new invasive species to the Gulf Coast region and poses a potential threat to local sugar and rice crops. The processes that determine the population dynamics of *Pomacea maculata* have largely been unquantified. We discuss insights gained regarding the applesnails growth dynamics from a closed population in a laboratory setting. Due to large intra- and inter-individual variability, direct measurement of these rates was possible, but did not yield estimates with reasonable statistical support. However, estimating parameters in growth functions within a size-structured population model, proved to be a successful approach, and estimates were obtained with reasonable standard errors. Further, we were able to use a model comparison statistic to determine distinct growth stages, assuming a piecewise constant growth function. These stages, along with other size characteristics, notably differed between males and females, which were present at an approximately 1:2 ratio in the observed population. Ongoing work includes efforts to design and carry out experiments to quantify other processes that affect the population size and dynamics of these snails both in the laboratory and in the field. Simulation studies can then be used to make predictions regarding the potential spread of this species, and to make projections regarding its population size under various proposed management scenarios.