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# Maintenance of androdioecy in the freshwater shrimp, *Eulimnadia texana*: field estimates of inbreeding depression and relative male survival

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## ABSTRACT

Androdioecy is a rare form of reproduction, only found in a few plant and animal species, wherein males co-exist with hermaphrodites. This particular form of mixed mating (mixtures of outcrossing and self-fertilization) is predicted to be evolutionarily unstable, with most androdioecious populations thought to be in a transition from hermaphroditism to dioecy, or vice versa. One well-studied androdioecious species is the freshwater clam shrimp *Eulimnadia texana*. A model by Otto *et al.* (1993), exploring the stability of this androdioecious system, predicts that males can co-exist with hermaphrodites when males fertilize an average of over twice the number of offspring that an average hermaphrodite produces in a lifetime. This value proportionally increases if males survive less well than hermaphrodites, and proportionally decreases with increased inbreeding depression. In the present study, we measured relative male longevity and inbreeding depression using laboratory-produced selfed and outcrossed eggs reared in the field. Males had lower survival than hermaphrodites in both mating treatments, but the survival difference was greater in the outcrossed relative to the selfed mating treatments (19 vs 9% difference). Inbreeding depression ( $\delta$ ) was estimated at 0.58–0.69, depending on the level of selfing among the parents in the outcrossed treatments. Both estimates of relative male viability and inbreeding depression corresponded well with earlier laboratory estimates of these parameters. Thus the within-pond dynamics outlined in the model of Otto *et al.* (1993), which are driven by high inbreeding depression and high relative male fertility, may still explain the maintenance of androdioecy in these shrimp. Field estimates of male mating effectiveness are required as a final test of the accuracy of this model.

*Keywords:* branchiopod crustaceans, evolution of mating systems, genetic load, hermaphrodites.

## INTRODUCTION

Androdioecy (populations comprising males and hermaphrodites) is an exceptionally rare mating system (Charlesworth, 1984; Jarne and Charlesworth, 1993; Pannell, 2002), with only a maximum of 53 androdioecious species described in the plant and animal kingdoms

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