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Inbreeding effects on sperm production in clam shrimp (*Eulimnadia texana*)

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ABSTRACT

Hypothesis: Inbreeding depression is manifest in lower sperm production.

Organism: Freshwater crustaceans (clam shrimp – *Eulimnadia texana*), from the southwestern United States, which have high levels of inbreeding.

Methods: Comparisons of semi-thin sections of the male gonad among selfed and outcrossed siblings from four families.

Results: There was a twofold reduction in sperm production in inbred relative to outcrossed males. Inbreeding depression in males was higher than previous estimates from hermaphrodites.

Conclusions: Inbreeding markedly reduces sperm production. The observed low levels of sperm production can explain both the low average outcrossing rates as well as the variation in these rates reported in previous studies of these crustaceans.

Keywords: androdioecy, branchiopod crustacean, inbreeding depression, mating system, Spinicaudata.

INTRODUCTION

The process of mating between close relatives (termed ‘inbreeding’) leads to reduced genetic diversity, both within individuals (i.e. reduced heterozygosity) and between individuals (Wright, 1969). It has long been recognized that inbreeding is associated with a reduction of fitness among the offspring resulting from the inbreeding event (Darwin, 1876; Schemske and Lande, 1985; Husband and Schemske, 1996; Crnokrak and Roff, 1999). Such fitness reduction affects all aspects of the life histories of both plants and animals, including hatching success, juvenile survival, ability to mate, gamete production, and adult survival (Crnokrak and Roff, 1999). Thus, inbreeding has often been suggested to be inferior to outcrossing: ‘cross-fertilisation is generally beneficial, and self-fertilisation injurious’ (Darwin, 1876).

Interestingly, in both plants and animals, reports on the effects of inbreeding on gamete production have been primarily limited to egg/ovule production (Byers and Waller, 1999; Crnokrak and Roff, 1999). In animals, this is likely due to the difficulty of documenting overall sperm

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