



Variable modes of larval development in the *Polydora cornuta* complex (Polychaeta: Spionidae) are directly related to stored sperm availability

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Abstract

Reproductive crosses between geographically separated populations of the nominal species, *Polydora cornuta*, support the hypothesis that the Florida/ Gulf of Mexico populations represent a single, potentially interbreeding lineage that is reproductively isolated from West Coast (California) and East Coast (Carolinas to Maine) populations. Previous research has indicated that California populations are reproductively compatible with worms from North Carolina but reproductively isolated from Maine populations. In spite of these species-level differences, all populations of this nominal species deposit egg capsules inside the female's tube that usually develop into three-chaetiger planktonic larvae measuring about 200 µm in length. Although adelphophagy (feeding upon unfertilized eggs within an egg capsule) has been reported in some populations of *P. cornuta* and in numerous other spionid polychaetes, the relationship between stored sperm in the female parent and the size of larvae within capsules has not been explored. We raised isolated female *P. cornuta* from three genetically and reproductively distinct populations (Florida, California and Maine) over a period of about 16 weeks and determined percent fertilization and larval size in successive spawnings over time until the females ran out of stored sperm. As each female used up stored sperm during successive spawnings, the percent of fertilized eggs per capsule declined and larval size at release increased. In some cases, the largest larvae produced by an isolated female were 114% larger than the smallest larvae produced by the same female. Larvae inside capsules containing unfertilized eggs fed upon these eggs and grew larger than larvae that did not have unfertilized eggs to feed upon. The effects of producing larger larvae following stored sperm depletion were completely reversed by transfer of fresh spermatophores to the isolated females. Variable larval size produced by a single female worm (poecilogony) may therefore be a result of stored sperm limitations rather than a genetically determined reproductive strategy in this species complex.

Key words: variable larval development, reproductive isolation, cryptic species, sperm storage

Introduction

Cryptic species complexes are well known among the polychaetes (Hoagland & Roberts 1988) and continue to be discovered through studies of comparative genetics and reproductive biology (Rice et al. 2008). Here we report the results of reproductive crosses between populations of the widely distributed cryptic species complex, *Polydora cornuta* Bosc and summarize the known distributions of these species in North America. In addition, we have documented the occurrence of variable modes of larval development in several North American populations and present results identifying a contributing proximal cause of variable larval size within single broods of larvae.

Reproductive isolation between North American populations of the morphological species, *P.*