EMBRYOLOGICAL DEVELOPMENT OF THE AUSTRALIAN AMPHIPOD,  
*MELITA PLUMULOSA* ZEIDLER, 1989 (AMPHIPODA, GAMMARIDEA,  
MELITIDAE)

BY

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ABSTRACT

*Melita plumulosa* is an epibenthic estuarine amphipod that has recently been adopted in Australia as a test organism for the evaluation of estuarine-sediment toxicity. In this study, the embryological development of *M. plumulosa* was observed following the mating of individuals reared in laboratory cultures. Intra-marsupial development until hatching was completed within seven days, and five distinct stages of development were recognized that closely resemble those described previously for gammarid amphipods. There was no distinct relationship between the size of females and the number of embryos.

INTRODUCTION

The recently described gammarid amphipod, *Melita plumulosa* (Zeidler, 1989) is an epibenthic amphipod found in estuarine habitats along the eastern coast of

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Australia (www.crustacea.net/crustace/amphipoda/melitidae/www/plumulo.htm). It is a species that has recently been adopted in Australia as a test organism for the evaluation of estuarine-sediment toxicity. The merits of this particular species for toxicity testing are threefold: (1) it is a free-ranging scavenger, obtaining food by ingesting detritus materials within sediments rather than a filter-feeder obtaining food from the surrounding water column; therefore, it provides a trophic link for the remobilization of sediment-bound contaminants. (2) *M. plumulosa* has been demonstrated to be a particularly sensitive species compared to other benthic amphipods found in Australia and New Zealand when exposed to metal-contaminated sediments in acute toxicity tests (King et al., 2006). (3) *M. plumulosa* can be readily cultured in the laboratory (Hyne et al., 2005).

A full life cycle toxicity test employing *M. plumulosa* (cf. Gale et al., 2006) can provide various effects data for amphipods exposed to contaminated sediments, including survival data in the form of LC50s, growth, and fecundity. Of the sub-lethal endpoints, Gale et al. (2006) demonstrated that fecundity was the most sensitive bioindicator for toxicity among amphipods exposed to zinc- and copper-spiked sediments and metal contaminated (predominantly zinc, copper, lead, and cadmium) field-sediments. Indeed, among crustaceans, fecundity has been demonstrated to be particularly sensitive to dietary metal exposure (Hook & Fisher, 2001a, b). However, full-life cycle tests require six weeks to run, and with a view to substantially shortening the test, we are developing a test that concentrates exclusively on the reproductive stages.

Crucial to any assay of reproductive toxicity in *M. plumulosa* is an understanding of its embryological development. Fecundity, or the number of offspring produced by an individual, is determined by numerous factors, but at its simplest can be summarized as the frequency of successful mating events, the number of oocytes produced and available for fertilization, and the rate and/or successful completion of embryonic development. This study documents the stages of embryological development that can be used as part of a rapid assessment of reproductive toxicity in *M. plumulosa*.

**MATERIALS AND METHODS**

Cultures of *Melita plumulosa* were established with animals collected from the northern shores of the Hawkesbury River near Brooklyn, NSW, Australia (salinity, 27.0-33.8‰). The cultures were maintained under the conditions recommended by Hyne et al. (2005; see table I) on silty sediments collected from Bonnet Bay, in the lower Woronora River (Sydney, Australia). The subsurface layer (depth, 2-4 cm) of sediment was collected using hand shovels and was press-sieved (mesh size,