Bathymetric and interspecific variability in maternal reproductive investment and diet of eurybathic echinoderms

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1. Introduction

A relatively large number of marine macrobenthic species are known to occur across a wide range of depths (Gage and Tyler, 1992), yet, only a few studies have been made on the adaptations that underlie this ability (e.g. Féra et al., 1990). Compared with surface waters, the deep sea below 200 m is generally colder and more saline; receives little or no sunlight and is characterized by a gradient of increasing hydrostatic pressure (Stein, 2007; Townsend et al., 2006). Differences in environmental conditions between the shallow sub-littoral and bathyal depths are likely to influence the life histories of eurybathic taxa, including various aspects of their reproduction. The ability of a species to colonize different environments, including the deep sea, follows a gradient from (1) areas where fully functional reproductive populations are maintained, to (2) the establishment of adult, but sterile, populations to (3) areas where larvae may occur but are unable to recruit (Bhaud, 2000). Food supply and temperature are among the key variables susceptible to modulate these reproductive processes (Giese et al., 1991; Mercier and Hamel, 2009).

A commonly studied effect of temperature on life-history traits is the inverse relationship between temperature and oocyte size (Moran and McAlister, 2009) initially documented by Thorson (1950) and Rass (1986). Thorson attributed the increased oocyte size to decreasing food availability with increasing latitude and depth, while Rass attributed the increased oocyte size to physiological changes in development due to temperature. Laptikhovsky (2006) hypothesized that colder temperatures induce a non-proportional deceleration of different oogenesis stages, leading to a larger species-specific oocyte size. At colder temperatures yolk accumulates in greater amounts, in different oogenesis stages, leading to a larger species-specific oocyte size. At colder temperatures yolk accumulates in greater amounts, in different oogenesis stages, leading to a larger species-specific oocyte size. At colder temperatures yolk accumulates in greater amounts, in different oogenesis stages, leading to a larger species-specific oocyte size. At colder temperatures yolk accumulates in greater amounts, in different oogenesis stages, leading to a larger species-specific oocyte size.