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Reproductive biology of galatheoid and chirostyloid (Crustacea: Decapoda) squat lobsters from the Gulf of Mexico

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Abstract

Reproductive timing, fecundity, and average egg sizes were examined for galatheoid and chirostyloid squat lobster collections from the Gulf of Mexico. While congeners did not always significantly differ in egg size or timing, each genus had a unique average egg diameter size which may indicate whether the developing embryos will be lecithotrophic or planktotrophic larvae. The eggs of Eumunididae, Galatheidae, and Munididae were more numerous and smaller than the larger and less abundant eggs of Chirostylidae and Munidopsidae. With the exception of members of the Munididae, members of genera within the same family had distinct egg diameters. Ovigerous females were significantly larger than non-ovigerous females in some species (i.e., *Uroptychus nitidus, Munida forceps, Galacantha spinosa, Munidopsis abbreviata, M. alaminos, M., erinacea, M. robusta, M. sigsbei,* and *M. simplex*). *Munidopsis erinacea* and *Munida affinis* males were significantly larger than females; the reverse was true for *Munidopsis robusta* and *Munidopsis simplex*. All other species studied did not have a significant difference between males and females. The spatial and bathymetric ranges for many species are extended in this study from prior reports. Seasonality of reproduction was evident in few species, but this may be a result of limited sample sizes.

Key words: Galatheoidea, Chirostyloidea, reproduction, egg size

Introduction

Galatheoids and chirostyloids are commonly known as squat lobsters and are well represented in habitats found in the deep-sea, herein defined as depths >200 m. Both lecithotrophic and planktotrophic larvae occur within the two superfamilies (Boyd 1960; Boyd & Johnson 1963; Gore 1979; Wenner 1982; Van Dover & Williams 1991; Baba *et al.* 2011). Because of the variety of larval types, squat lobsters are ideal for studying deep-sea dispersal mechanisms. However, basic information about timing of reproduction is unknown and models to predict periodicity, distance, and influence of settlement substrate on dispersal do not exist.

All species of *Munida* are proposed to have an annual reproductive cycle (Vinuesa 2007); however, most species within the genus remain unstudied and only three publications on species with ranges in the Gulf of Mexico are available concerning reproductive cycles (Wenner 1982; Van Dover *et al.* 1985; Van Dover & Williams 1991). Ovigerous females of the genus *Munida* have been collected in most months (Wenner 1982; Palma & Arana 1997; Gramitto & Froglia 1998; Tapella *et al.* 2002; Company *et al.* 2003). *Munidopsis* spp. have been relatively ignored with respect to reproductive biology (Samuelsen 1972; Van Dover *et al.* 1985; Van Dover & Williams 1991). For the superfamily Chirostyloidea, reproductive biology of species in the Gulf of Mexico remains virtually unstudied, with only *Eumunida picta* Smith, 1883 (Eumunididae) from the Gulf of Mexico having been examined (Van Dover & Williams 1991) and specimens examined from the Mid-Atlantic Bight (Wenner 1982).

In some galatheoid and chirostyloid species, ovigerous females are significantly larger than males, but this is not necessarily true even among congeners (Wenner 1982). Because of recent reassignment of species to new

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and reproductive activities; however, there is not one time of year where squat lobsters will have reproduction affected more than at other times of the year. Most species did not have samples that indicated seasonal reproduction. These results are inconsistent with other reports of galatheoids that have seasonal reproduction (e.g., *Pleuroncodes monodon*, Palma & Arana 1997; *Munida gregaria,* Vinuesa 2007) or other deep-sea organisms, which have reproduction linked with seasonal organic detritus (Hudson *et al.* 2004). Another limitation of our analyses was the lack of differentiation for multiple clutches per year or biennial reproduction. However, with continued efforts and exploration of the deep-sea, these questions may be answered. Specimens of Chirostyloidea were collected in every month, though more were collected in the summer months (June, July, and August) than in other months (Fig. 3); ovigerous specimens were collected in all months except February (except *U. uncifer*) and December. For the families Munidopsidae and Munididae, ovigerous specimens were collected in every month. The family Galatheidae had ovigerous specimens collected in every month except September, November, and December. The family Eumunididae had ovigerous specimens collected only in March and October, but this was based on only five ovigerous individuals and only 20 collected specimens. While differences in timing of reproduction may occur in the proportion of ovigerous specimens of galatheoids and chirostyloids in the Gulf of Mexico over the year (Figs. 3, 6, 8, 9, 12, 13 & 15), there was no one particular time of year when they were more susceptible to disturbances than other times with regard to reproduction. Unlike other deep-sea organisms, such as holothurians, which have seasonal reproduction linked to surface productivity (Hudson *et al.* 2004), galatheoids and chirostyloids do not appear to have seasonal reproduction but more rigorous sampling is warranted.

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