Latitudinal variation in maternal investment traits of the kelp crab Taliepus dentatus along the coast of Chile

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Abstract

Maternal investment (MI), the energy allocated by mothers to offspring, has important effects on the life-history traits of marine organisms. Variation in such traits shows strong correlation with latitude for several marine taxa (Thorson's rule). Large-scale latitudinal variation in MI within a single species suggests population genetic divergence, while temporal changes in MI, rather, reflect plasticity. At higher latitudes (i.e., colder waters), traits associated with MI (brood weight, fecundity, egg volume, and energy content) increase. To identify phenotypic plasticity along a latitudinal gradient in MI traits (brood weight, egg volume, density number, and egg lipid composition), five populations of the kelp crab Taliepus dentatus along the coast of Chile (30°S–42°S) were investigated during the summer (December–February) and winter months (June–August) of 2015–2016. Despite this wide latitudinal range, the sea surface temperature (SST) difference between the northernmost and the southernmost sites was only approximately 2.0 °C in winter and 5.5 °C in summer. In summer, when latitudinal variation in SST was highest, brood weight, egg density, fecundity, and egg lipids increased with latitude, while egg volume decreased. No trends in MI were observed in winter when the SST gradient was almost non-existent. These results suggest that the relationship between MI and latitude is shaped by temperature rather than being site-specific. The seasonality of latitudinal MI traits also suggests a trade-off between the costs of female maintenance and/or brooding behaviours and MI. When investigating latitudinal and temporal variation in marine brooder MI, the effect of temperature on life-history traits and the associated costs of female brooding should be quantified..