STEP Early Undergraduate Research – Report 2007

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Effect of Population Density and Body Size on Brood Size and Offspring Size

Participating Students: Melissa Gwatney (Psychology major), Michael McGuire (Biology major), and Jason Space (Environmental Science major)

Results

Brood size significantly decreased with increasing population density ($\chi^2 = 21.75$; d.f. = 3; $p < 0.0001$; Fig. 1). Supporting the predicted trade-off between brood size and offspring size due to the limited food resource, average mass of larvae increased as population density increased ($F_{3, 133} = 3.78$; $P = 0.012$; Fig. 1). Variation in larval mass of broods did not change with increasing population density ($F_{3, 133} = 0.23$; $P = 0.9$; Fig. 1).

Small beetles reared larger broods ($\chi^2 = 3.94$; d.f. = 1; $P < 0.047$; Fig. 1) with smaller larvae ($F_{1, 133} = 12.05$; $P = 0.0007$; Fig. 1). The variation in larval mass of broods of small females was larger than the variation in larval mass of broods of large beetles ($F_{1, 133} = 4.33$; $P = 0.039$; Fig. 1). Contrary to our predictions, the differences in brood size and larval mass between large and small beetles did not increase with increasing population density (all interactions between population density and body size were non-significant; Fig. 1).

These results corroborate earlier findings that burying beetles adjust brood size and offspring size in relation to strength of competition (David Bodnar and Adam Yeh STEP 2004; Andria Bethelmie, Laureen Opere, Amberle Pariseau, LaFonda Tanner, and John Harnisch Step 2006). These results also show that large and small beetles pursue different reproductive strategies in regard how they solve the trade-off between brood size and offspring size.

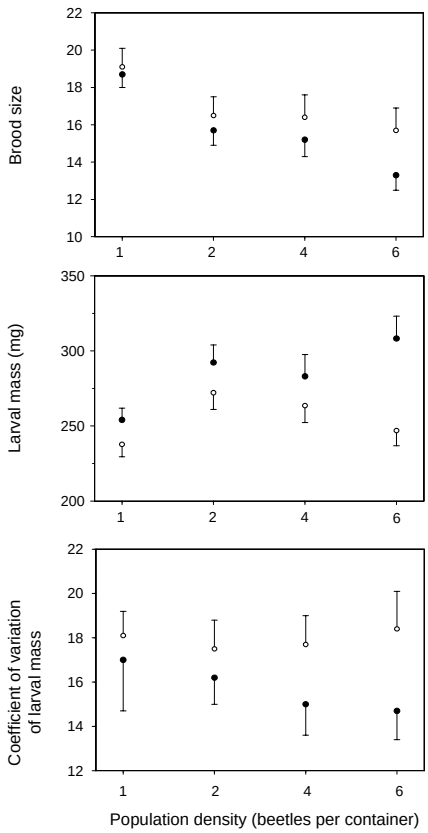

Figure 1: Brood size, larval mass, and coefficient of variation of larval mass in relation to population density and female body size. Filled circles: Large female beetles. Open circles: Small female beetles. Means and standard errors are shown.

Student Involvement and Assessment of Success

All three students were involved in data collection and data entry as well as maintenance of the beetle colony that provided the beetles for the experiment. All three students performed very well.