Food and sex-specific growth strategies in a spider

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ABSTRACT

Growth patterns are expected to differ between environments and between the sexes if there is sexual dimorphism, the general view being that male growth strategies are primarily sexually selected whereas female growth strategies are fecundity selected. We investigated the effects of food on sex-specific growth in the cellar spider Pholcus phalangioides, a sexually dimorphic spider with larger males than females. In a full sib design, 1164 offspring of 39 once-mated females were reared to sexual maturity under two feeding regimes. Food level had strong positive effects on (1) offspring body size, with males growing larger than females, and (2) offspring mass, with females maturing heavier than males; it had negative effects on (3) development time for males but not females. Males matured before females under unlimited food conditions. Analysing the entire ontogeny revealed that until the last instar, both sexes were equally retarded in development by food limitation, males lagging behind females. During the last instar, the picture reversed: development time of males was equally long at high and low food, while females had extremely long development at high food and abbreviated development at low food. We conclude that females are selected to increase mass and hence fecundity, while sexual selection apparently favours larger males but at the same time earlier maturity (i.e. protandry). Achieving both was only possible when food was plentiful, and is facilitated by a low genetic correlation between development time and body size. We found high genetic variation, as well as genotype-environment interactions, for size, mass, development time and growth rate, and consequently high full-sib but lower parent-offspring (size only) heritabilities. Genetic variation was not greater under food stress but genetic covariation was.

Keywords: body size, development time, environmental stress, food limitation, genetic correlation, heritability, life history, sexual selection, sexual size dimorphism.

INTRODUCTION

In life-history theory, an individual’s age and size at maturity is pivotal, as fitness is generally more sensitive to changes in these traits than to changes in any other trait (Roff, 1992; Stearns, 1992). Early maturation increases the probability of surviving to maturity
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