How does nutrition during the larval stage influence growth in the adult stage in a damselfly?

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The human fetus develops inside the uterus of its mother until it is finally born. When the fetus changes habitat from the uterus of its mother to the outside world, the amount of nutrition the fetus received and how much it was able to grow while in the uterus will influence the subsequent growth rate and health of the person. Therefore, inadequate nutrition and/or gestation time can bear important consequences. For example, scientists showed that following the Dutch hunger winter (1944-1945) when the Germans cut off food and fuel to the western provinces of the Netherlands, children of Dutch women pregnant during this time grew up to be smaller and more susceptible to diabetes, obesity, and cardiovascular disease. What is even more surprising is that, when these children grew up and had children, their children were smaller than average as well.

Are organisms that were malnourished during their first developmental stage able to compensate with a higher growth rate during adulthood? I tested this question by examining the body size and mass of the emerald damselfly, *Lestes sponsa*, across life stages. Body size and mass have a direct impact on factors contributing to successful mating, such as male-male competition and female fecundity. Moreover, body size remains fixed after damselflies metamorphose from the larval stage into the adult stage. Once they enter the adult stage, body mass increases depending on how much they feed. Thus, I conducted a capture-mark-recapture study in a pond near Svartbäcken in Uppsala, Sweden, in which I captured newly emerged adults and, after measuring and marking them, released them back into the field and recaptured any individuals that were seen again to assess how much mass they gained during the adult stage.

My results show that the damselflies that emerged at a lower mass gained more mass during the adult stage than those individuals that emerged at a higher mass; however, even then, individuals that emerged at a lower mass were still lighter than the individuals that emerged at a higher mass from the beginning. This suggests that compensation for larger mass gain in the adult stage is possible, but not complete. The larval stage of this damselfly might be the stage during which most of the important growth happens, which subsequently determines mating success during the adult stage. Thus, future studies should focus more on the link between feeding in the larval stage and consequent growth in the adult stage. Across the animal kingdom, including mammals and insects, many organisms experience a drastic change in habitat during their development. Elucidating the relationship between body size and condition in the larval and adult stage thus remains a fertile area for future research.

Degree project in biology, Master of science (2 years), 2014
Examensarbete i biologi 30 hp till masterexamen, 2014
Biology Education Centre and Department of Evolution and Genetics
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