

Phenotypic senescence and multilevel variation in different body sizes in a natural insect population

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Abstract

1. Senescence seems to be universal in living organisms and plays a major role in life-history strategies. Phenotypic senescence, the decline of body condition and/or performance with age, is a largely understudied component of senescence in natural insect populations, although it would be important to understand how and why insects age under natural conditions. 2. We aimed to a) investigate how body mass and thorax width change with age in a natural population of the univoltine Clouded Apollo butterfly (*Parnassius mnemosyne*, Lepidoptera: Papilionidae) and b) to assess the distribution of body mass, thorax width, wing and proboscis length in the population within/between flight periods. 3. We studied a population 2014–2020 using mark-recapture during the whole flight period each year. Repeated measurements on body mass and thorax width and single measurements on wing and proboscis length were performed on marked individuals. We analysed body mass and thorax width change with age (days since marking) and initial body mass, thorax width, wing and proboscis length with time since the flight period's first day. 4. Both body mass and thorax width declined significantly with age in all years. Individuals appearing earlier in the season had significantly higher initial body mass, thorax width, wing and proboscis length than those appeared later in several years. Initial body mass varied little among years, while initial thorax width showed high annual variation. Moderate annual variation and no sexual difference were found in wing and proboscis length. 5. This is the first study that revealed phenotypic senescence in a natural butterfly population, using in vivo measurements. Despite their different initial body sizes, the rate of senescence was similar in males and females, indicating general life-history constraints. Annual variation in body sizes and rate of senescence highlights the important role of environmental factors, which should be further investigated.

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Aim: Uncover variation in body sizes within / among individuals and among generations.

in vivo measurements



body mass
(repeated measures)



thorax width



wing length



proboscis length















