Scientific Paper:

Integration of physiology, behaviour and life history traits: personality and pace of life in a marine gastropod

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Abstract:

Attempts to unravel the proximate and ultimate causes of individual behavioural and life history variation have often pointed to predicted correlations between behavioural, physiological and life history traits, forming pace-of-life syndromes (POLS). The POLS hypothesis predicts that high levels of production (growth, fecundity) require high levels of foraging effort and risk taking, supported by high metabolism. Despite tremendous interest in this topic, the POLS hypothesis still has limited empirical support, which has led to calls for more stringent empirical tests of the hypothesis and its assumptions. To that end, we examined the associations between risk-taking behaviour (boldness), resting metabolic rate (RMR) and somatic growth rate in a marine gastropod, *Littoraria irrorate*, under controlled laboratory conditions using a longitudinal repeated measures design. After accounting for the effects of sex, size and time (trial number), a multivariate mixed model revealed that bolder individual had higher RMR, and grew faster, whereas RMR and growth were not strongly correlated. Further, if individuals were bolder than their average on a given day, then their RMR was also higher. Our study represents rare and compelling support for the POLS hypothesis, simultaneously studying its three key components (behaviour, energetics and life history), the success of which we attribute to careful control, concurrent sampling of each trait, and rigorous analysis of the among — and within-individual patterns of variation and covariance.

Keywords: animal personality, boldness, growth rate, *Littoraria irrorate*, metabolic rate, multivariate mixed effect models, pace-of-life