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# The importance of egg size for variation in metabolism, growth and behaviour of individuals in a polymorphic fish

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## Abstract

Arctic charr (*Salvelinus alpinus*) is a species of great interest, particularly because of its high level of intra-specific diversity, its Arctic distribution, and its commercial value. Great phenotypic and genetic diversity have been observed among and within lakes and rivers. In lakes, two sympatric morphs are commonly found: a benthic and a pelagic morph. These morphs have evolved repeatedly through natural selection and show clear adaptation for harvesting different resources (termed resource polymorphism). Differences in morphology, behaviour and life history traits have been studied in a number of lakes, furthermore, relationships have been seen between the size of the eggs, growth rates, rate of development and behaviour. However, little is known about how individual differences (in egg size and correlated traits) may generate a hereditary phenotypic diversity among and within morphs of fishes. The aim of this project is to study, at the individual level, the relationships between egg size, metabolism, growth rate, and foraging behaviour, throughout early development in several Arctic charr populations. These populations were selected along a gradient of differentiation between two morphs found within a lake/river (from an ancestral anadromous population to a reproductively isolated benthic and pelagic morphs). The results of this study highlight how a maternally derived trait, such as egg size, can promote phenotypic diversity of offspring within and among females, and within and among morphs. Understanding factors that shape phenotypic diversity, which is the raw material for natural selection to act upon, may ultimately increase our understanding of evolution of natural populations.

**Keywords:** egg size, metabolic rate, phenotypic diversity, resource polymorphism, foraging behaviour, Arctic charr

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