

Distribution and growth of brown trout in pristine headwaters of Central Europe

Research Article

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Abstract: The majority of stream-dwelling salmonid populations in Europe are affected by artificial stocking and the fragmentation of riverine ecosystems. The present study was performed in the unique pristine headwaters of the Otava River in the Elbe catchment area of the Czech Republic. The aim was to investigate the spatial distribution and individual growth pattern of brown trout, *Salmo trutta*, populations. Twenty sites in two main streams and their tributaries were sampled twice a year (spring and autumn) during the period 2005–2011. The sampling sites were grouped into fourteen so-called synchronised population units within the boundaries of three populations, according to analyses of synchrony in population abundance. The individual growth of juveniles (age-0, age-1) varied between all three spatial units (sampling sites, synchronised population units and populations), while the individual growth of adults (age-2 and older) did not. The distinctiveness regarding individual growth and demographic independence among the synchronised population units and populations indicates their suitability for use as population units for management purposes.

Keywords: Demographic synchrony • Salmonid fish • Body length increment • Ontogeny • Metapopulation

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1. Introduction

In poikilothermic organisms, body size, as a direct consequence of individual growth, is strongly correlated with many physiological traits [1]. The key role of individual growth as a driver of population dynamics in stream-dwelling salmonids has been widely reported [2–6]. Individual growth influences brown trout, *Salmo trutta*, populations beginning in the early ontogenetic phases, as demonstrated by the positive correlation between juvenile survival and body size [7]. However, this relationship is highly variable across seasons and populations [8]. In the later phases of the life cycle, individual growth affects the fertility of individuals, as the number and weight of eggs increase with female body size [2], and individuals that grow faster achieve

earlier sexual maturation than their conspecifics [9]. Throughout their life span, the growth of trout has an influence on their competitive ability, which increases with body size [10], and migration behaviour, as larger and faster growing individuals show higher mobility [11,12]. Generally, growth has an essential influence on the fitness of individuals [13], and variations in growth trajectories can have a substantial effect on brown trout population dynamics [5].

Stream-dwelling salmonids often exhibit a high level of population differentiation [14,15]. Partially isolated brown trout populations have been observed at local geographical scale in streams fragmented by migration barriers [16,17] as well as in streams with free migration corridors, where the populations has been isolated by distance [18,19]. Isolation among populations or among

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