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Life history patterns of some selected endemic freshwater fish species inhabiting two major river basins of Sri Lanka

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Abstract Life history information on six endemic fish species namely *Belontia signata, Pethiya cumingii, P. nigrofasciata, Puntius titteya, Rasboroides vaterifloris* and *Garra ceylonensis* inhabiting the Kalu Ganga and Kelani Ganga river basins in Sri Lanka was evaluated. The growth constant of the fish species showed a positive relationship with the river order where they inhabited. The length at 50% maturity (L_m) significantly correlated with the asymptotic length and growth constant indicating that fishes with slow growth become sexually mature late in their life cycles. The optimal lengths for sustainable exploitation of the fish species studied were significantly ($p<0.01$) correlated with asymptotic lengths and lengths at 50% maturity whereas negatively correlated with natural mortality. This analysis indicated that L_m was a foremost function of size of fish apart from maximum length observed (L_{max},) and that L_m and L_{max} can be used as deterministic variables for quantifying optimal size of exploitation for sustainability and conservation of fish populations.

Keywords: biodiversity conservation, growth parameters, mortality parameters, length at 50% maturity, natural mortality

INTRODUCTION

Life-history patterns of fish that include species-specific growth, mortality and reproductive effort are evolved as a result of complex array of selective forces that are imposed on a species by its environment (Breder and Rosen 1966; Wootton 1998; King 2007). In tropical fish communities, life history patterns are extensive due to their high diversity in morphological and ecological attributes (Kortmulder 1987; Welcomme 2001). In some species, life-history patterns significantly vary in different populations, including those living at different latitudes (Jonsson and L'Abee-Lund 1993; Baker 1994; Baker et al. 2015).

Apart from the attempts to evaluate the relationships between life-history patterns of fish and environmental conditions (Southwood 1988; Roff 1992; Stearns 1992; Charnov 1993), several empirical relationships have been developed for many exploited fish stocks mainly to quantify important population parameters required for stock assessment (Taylor 1958; Beverton and Holt 1959; Beverton 1963; Pauly 1980; Vetter 1988; Jensen 1996; Hart and Russ 1996; Ault et al. 1998; Jennings et al. 1998).

Since it is a fact that many tropical riverine fish communities are under threat due to various natural and anthropogenic factors (Dudgeon 2003), conservation strategies are imperative in many countries in tropical Asia. In countries like Sri Lanka, where many endemic freshwater riverine fish species are under threat due to habitat degradation and unrestrained exploitation for ornamental fish trade (Amarasinghe et al. 2006; MOE 2012) as well as damming of rivers and streams for hydropower development (Silva and Silva 2015), empirical relationships between life history parameters and optimal exploitation levels are useful for introducing effective conservation strategies. In the present study, an attempt was therefore made to evaluate life history relationships in growth and maturity of selected endemic riverine fish species in Sri Lanka.