Population Dynamics of Vermiculated Sailfin Catfish, *Pterygoplichthys Disjunctivus*, Weber 1991 (Family Loricariidae) in Victoria Reservoir, Sri Lanka

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Abstract

Invasive alien species are one of the major causes of biodiversity loss in freshwater. The *Pterygoplichthys disjunctivus* is native to South America. It had been accidentally introduced through ornamental fish industry to Sri Lanka and is one of the main environmental concerns. To effectively manage this exotic species in the future, it is essential to study the population characteristics within the invaded local habitats. In this study population dynamics were investigated based on the fish landings at the landing site of Haragama of Victoria reservoir. Fish samples were measured once a month, January to December 2015 and standard length frequency data (LFD) were collected. The length frequencies were analysed for fitting von Bertalanffy growth model for growth according to the following equation.

$$L_t = L_\infty[1- e^{-K(t-t_o)}] \quad (1)$$

For this purpose, an initial estimate of asymptotic standard length (L_∞) was obtained using the Powell-Wetherall method as implemented in the FiSAT II (version 1.2.2) software package. The estimates of asymptotic standard length and growth constant (K,yearly basis)were then determined by ELEFAN routine of FISAT II software. In ELEFAN I, von Bertalanffy growth model is fitted by a non-parametric method where the optimum growth curve that passes through the highest number of peaks in the length frequency samples which are sequentially arranged with time. Total mortality (Z) was calculated using original LFD by the length-converted catch curve method. In this method, the slope of the linear regression line fitted to the right hand descending part of the catch curve, starting from the second highest data point, gives an estimate of Z.

$$\ln (C_i/\Delta t) = C - Zt$$

where $\Delta t = (1/K) \ln (L_\infty - L_i) / (L_\infty - L_{i+1})$

Natural mortality (M) was estimated using the following empirical equation derived by Pauly (1980).

$$\text{Log}_{10}(M) = -0.0152 - 0.279\ \text{Log}_{10}(L_\infty) + 0.6543\ \text{Log}_{10}(K) + 0.4634\ \text{Log}_{10}(T)$$

Relative yield-per-recruit as a function of exploitation ratio at present levels of age at first capture was also determined using FISAT II software. Relative yield-per-recruit analysis indicated that there would be a great potential to optimize the fishery by increasing exploitation ratio from the present level of 0.5 to 0.8, while increasing length at first capture from the present level of 9.5 cm to 22 cm.

Table 1. Growth and mortality parameters and length at first capture of *Pterygoplichthys disjunctivus* in Kalawewa reservoir.

Parameter	Value
Powell-Wetherall method	
Asymptotic standard length (cm)	35.2
Total mortality/growth constant ratio (Z/K)	1.939
ELEFAN I	
Asymptotic length (cm)	35.1
Growth constant (yr-1)	0.40
Total mortality (yr-1)	1.26
Natural mortality (yr-1)	0.92
Fishing mortality (yr-1)	0.36
Exploitation ratio	0.5
Length at first capture (cm)	9.5

Although this species has a potential to exploit, the issue is lack of market demand at present to establish a fishery. As such, potential strategies to utilize the available stock should be identified for this species and it will indirectly create an additional income for fishers.

Abbreviations and symbols used in the text

t_o Theoretical age at zero length (years)
T Mean annual water temperature in degrees Celsius
Y'/R Relative yield-per-recruit
Ci Catch in numbers in i^{th} length class
L_i, L_{i+1} Lower and upper limits of the i^{th} length class

Keywords: Invasive species; Growth parameters; Fish stock assessment; Vermiculated sailfin-catfish