Abstract No: BO-03 **Biological Sciences**

Impact of irrigation on reservoir fisheries: Antagonistic or supportive?

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Although reservoirs represent lacustrine ecosystems, they are drastically different from natural lakes for the main reason of prominence of anthropogenic perturbations, which affect ecosystem functioning. Many reservoirs in Sri Lanka are primarily used for irrigation of agricultural lands and are secondarily utilized for inland fisheries production. Effects of hydrological regimes on the biological productivity in reservoirs are therefore expected to have a significant bearing on the fish yield. Aim of this study is to investigate the influence of hydrological regimes on fish yield. In the present study, twelve limnological characteristics of 10 irrigation reservoirs in the Kala Oya river basin of Sri Lanka were investigated from June 2013 to February 2016. Fish yield data in these reservoirs were obtained from the log-book records of fisheries societies. Hydrological data were obtained from the irrigation authorities. Relative water level fluctuation (RWLF), defined as the ratio of amplitude of mean water level fluctuation to mean depth, showed a third order polynomial relationship with chlorophyll-a content (Chl-a) according to, $Chl\text{-}a = -2.4046\ RWLF^3 + 18.732\ RWLF^2 - 39.487\ RWLF + 44.052$ ($R^2 = 0.4351$). There was also significant third order polynomial relationship of Chl-a, with fish yield (FY) as: $FY = -0.047\ Chl\text{-}a^3 + 2.689\ Chl\text{-}a^2 - 45.186\ Chl\text{-}a + 328.54$ ($R^2 = 0.410$). As some of the reservoirs in the Kala Oya river basin are terminal reservoirs (e.g., Rajanganaya, Angamuwa, Siyambalangamuwa) from which water is released mainly for irrigation while some are, in addition to irrigation water supply, feeder reservoirs of several downstream reservoirs (e.g., Ibbankatuwa, Kalawewa), effect of hydrological regimes on the biological productivity were possibly represented by polynomial relationships. There was a positive linear relationship between RWLF and FY according to the equation, $FY = 27.222\ RWLF + 66.729$ ($R^2 = 0.586$). This indicates that through manipulation of hydrological regimes, reservoir fish yield can be optimized. As such, an effective dialogue should be in place between irrigation authorities responsible for controlling hydrological regimes and authorities responsible for inland fisheries development.

Keywords: Hydrological regimes, Inland fisheries, Irrigation reservoirs, Limnological parameters