

# Influence of hydrology on water quality and trophic state of irrigation reservoirs in Sri Lanka

Nadarajah, S.; Wijenayake, W.M.H.K.; Amarasinghe, U.S.

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## Abstract

Many reservoirs provide multiple benefits to people around the world, in addition to primary uses such as irrigation. Thus, reservoir management should address their multiple uses. The water quality of ten irrigation reservoirs in Sri Lanka was examined in the present study with the objective of better understanding the effects of hydrological regimes on reservoir water quality and trophic state. Basic limnological parameters pertinent to the nutrient loads to, and trophic state of, the reservoirs were collected from June 2013 to February 2016. The sampling period was arbitrarily divided into two periods of approximately similar duration (period 1 = June 2013-September 2014; period 2 = October 2014-February 2016) to investigate whether or not there was a seasonal variation in the water quality parameters. Although temporal and spatial variations were observed, most water quality parameters were within the levels acceptable for drinking water standards. The 10 reservoirs were also ordinated by principal component analysis (PCA) on the basis of the water quality parameters of the two sampling periods in a two-dimensional score plot. Reservoirs in the first principal component (PC1) axis were represented by negative scores attributable to the dissolved oxygen concentration and pH and, to a lesser extent, by electrical conductivity and chlorophyll-*a* concentration. Positive scores in PC1 were represented by reservoirs with a score loading attributable to alkalinity, nitrate concentration, Secchi depth, temperature and seston weight and, to a lesser extent, from the total phosphorus concentration. There was a significant negative correlation of PC1 scores with relative reservoir water-level fluctuation (*RRLF*; the ratio of mean reservoir waterlevel amplitude to mean reservoir depth). Furthermore, Carlson's trophic index also were influenced by *RRLF*, although not by hydraulic retention time (*HRT*), indicating allochthonous nutrient inputs into the irrigation reservoirs were mainly governed by *RRLF*, but not by *HRT*. Thus, the results of the present study provide useful insights into achieving desirable reservoir water quality through the manipulation of the hydrological regime.

## KEYWORDS

allochthonous nutrients, eutrophication, multiple reservoir uses, reservoir water-level fluctuation, tropical reservoirs