Use of geographical information systems as a tool for fish yields prediction in tropical reservoirs: case study on Sri Lankan reservoirs

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ABSTRACT

Use of geographical information systems (GIS) in inland fisheries has hitherto been by and large restricted to evaluation of site suitability for aquaculture development, and assessment of limnological changes with time and space in individual water bodies. In the present study, GIS analysis was conducted on the land use pattern of the catchments of nine reservoirs in Sri Lanka, for which detailed fishery data. viz, yield, fishing intensity, landing size of major constituent species together with selected limnological data such as conductivity, chlorophyll-a (Chl-a) were available. Potential statistical relationships of fish yield (FY) to different land-use patterns such as forest cover (FC in km^2), shrub-land (SL in km^2), etc. either singly, or in combination, and/or the ratio of each land use type to reservoir area (RA in km^2) and reservoir capacity (RC in km^3) were explored.

Highly significant relationships were evident in fish yield (kg $ha^{-1}yr^{-1}$) to SL/RC, FC+SL/RC, FC/RC i.e.,

$$FY = 0.009 \, SL/RC + 85.297 \, (r = 0.70; P < 0.05)$$
$$FY = 0.007 \, FC + SL/RC + 81.729 \, (r = 0.73; P < 0.05)$$
$$FY = 0.027 \, FC/RC + 72.860 \, (r = 0.81; P < 0.01) \text{ and}$$
$$FY = 10.972 \, FC/RC + 56.134 \, (r = 0.81; P < 0.01).$$

Similarly, the above land use types to RA and RC ratios were significantly related to limnological features of the reservoirs. Examples of some such relationships are: $MEl_c = 4.537 \, SL/RA + 30.686 \, (r = 0.91; P < 0.001)$, $MEl_a = 0.003 \, SL/RC + 26.038 \, (r = 0.84; P < 0.01)$ and Chl-a $= 0.785 \, SL/RA + 16.079 \, (r = 0.79; P <$

0.02), where MEI_c is the morphoedaphic index (Conductivity to mean depth) and MEI_a is the radio of alkalinity to mean depth.

The above relationships of fish yield to various parameters obtained in this study are much better correlated than those relationships of fish yield to linmological and biological parameters used in the yield-prediction in lacustrine waters, tropical and temperate, previously. It is, therefore suggested that utilisation of GSI may provide a far superior indicator of yield prediction in reservoirs.

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