

## **A GIS Approach in Identification of the Potential Reservoirs for *Macrobrachium rosenbergii* Culture in Moneragala District, Sri Lanka**

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### **Abstract**

With a low literacy and high vulnerability to malnutrition, Moneragala District needs to be introduced with novel employment opportunities which are capable of alleviating poverty while ensuring the food security. Culture Based Fishery (CBF) is the best approach to overcome this problem since the district is enriched with a large number of village tanks and minor perennial reservoirs. Introducing a valuable, high demanding and protein rich species such as *Macrobrachium rosenbergii* through CBF is the best way to get the maximum utilization of these natural resources. Current practice of stock enhancement of *Macrobrachium rosenbergii* in reservoirs results in heavy loss of stock and it needs a careful selection of potential reservoirs prior to stocking of post larvae.

As a tool in decision making, Geographic Information System (GIS) is a new concept for CBF in Sri Lanka for aquaculture planning. The main intent of this study was to highlight the role of GIS in identifying potential reservoirs for stock enhancement of *Macrobrachium rosenbergii* under inland CBF in Moneragala District, Sri Lanka. Thematic layers were generated for: climate factors (Rainfall, Temperature), Bio-physical factors (Elevation), Water quality of reservoirs (pH, Temperature, Hardness, Alkalinity, Dissolved Oxygen, transparency) and Socio-economic factors (proximity to roads and village, land use, poverty and population) and these were assigned the weights according to their relative influence using the method of "Rank Sum". Finally, all thematic layers were integrated in a GIS environment to generate potential map. Thus, four categories of culture potential zones were identified in respective to DS divisions of the district are; Highly Suitable – (Badalkumbura, Moneragala, Medagama, Wellawaya and Sevanagala), Suitable – (Thanamalwila, Bibile, Madulla, Buttala, Siyambalanduwa), Moderately Suitable – (Latter part of Madulla), Not Suitable – (Northeast, West and Southeast area of District).

The study thus demonstrates that GIS is a very useful tool for demarcating CBF potential zones.

**Keywords:** *Macrobrachium rosenbergii*, GIS

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### **Introduction**

Moneragala District is enriched with a large number of village reservoirs and minor perennial reservoirs. Introducing a valuable, high demanding and protein rich species

such as Giant Fresh Water Prawn (*Macrobrachium rosenbergii*) through CBF is the best way to get the maximum utilization of these natural resources and to overcome poverty and malnutrition. Current practice of stock enhancement of *Macrobrachium rosenbergii* in reservoirs has resulted in a heavy loss of stock and low returns. Therefore, it needs a careful selection of potential reservoirs prior to stocking of post larvae.

As a tool in decision making, Geographic Information System (GIS) is still a new concept for CBF in Sri Lanka for aquaculture planning. The main intent of this study was to highlight the role of GIS in identifying potential reservoirs for stock enhancement of *Macrobrachium rosenbergii* under inland CBF in Moneragala District, Sri Lanka.

### **Materials and Methods**

Nineteen minor perennial reservoirs distributed over nine DS divisions in Moneragala District were visited during the dry season as the sample. Climate (Rainfall, Temperature), Bio-physical (Elevation) and Water quality (pH, Temperature, Hardness, Alkalinity, Dissolved Oxygen, transparency) and Socio-economic factors (proximity to roads and village, land use, poverty and population) were identified as influential factors for *Macrobrachium rosenbergii* culture based fishery (De Silva, 2006). In order to generate thematic layers for each factor, interpolation techniques were applied for climate, elevation and water quality data. Population and poverty were considered in respect to DS divisions; multiple ring buffers were created for the proximity factors. Each factor was classified according to four suitability scales; very suitable, suitable, moderately suitable and unsuitable (Aguilar-Manjarrez and Nath, 1995). Land use types in the district were classified according to their suitability. Factors were ranked according to their relative influence on *Macrobrachium rosenbergii* fishery and weights were assigned according to their relative influence using the method of "Rank Sum". Finally, all thematic layers were integrated in ArcGIS 10.1 (Esri, 2012) environment to generate the suitability map.

### **Results and Discussion**

According to the resultant map unsuitable areas occupy about half of the extent of the district. The potential reservoirs for *Macrobrachium rosenbergii* culture were indicated with respect to DS Divisions. Badalkumbura, Moneragala, Wellawaya, Medagama and Sevanagala divisions were identified as the highest potential areas. Thanamalwila, Bibile, Madulla, Buttala and Siyambalanduwa divisions were identified as suitable

areas and latter part of Madulla was indicated as a moderately suitable area. Results are basically applicable to the dry season which is the period for water quality data were collected. According to the field observations dry season is not favorable for CBF. Potential areas are mostly associated with the reservoirs where the optimum water quality for *M. rosenbergii* culture exists.

### **Conclusion**

Application of CBF at present is not at a satisfactory level when compared to the existing number of reservoirs. The district can gain more benefits by stocking *M. rosenbergii* under CBF in reservoirs which fall in most suitable areas. GIS-based approach is a useful tool for assessing potential reservoirs for culturing *M. rosenbergii* under culture based fishery especially in data-scarce conditions.

### **References**

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