A Geographic Information System (GIS) approach in identification of the potential reservoirs for Giant Freshwater prawn (*Macrobrachium rosenbergii*) culture: A case study in Moneragala district, Sri Lanka

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Introduction

Culture Based Fishery (CBF) is a better approach to overcome poverty and malnutrition in Moneragala District since the district is enriched with 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. Current practice of stock enhancement of *Macrobrachium rosenbergii* in reservoirs has resulted 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 by developing a map.

Methodology

Nineteen minor perennial reservoirs distributed over nine divisional secretariat 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. Data were collected from field surveys and responsible government institutes. Water quality parameters were tested on site and the university laboratory. In order to generate thematic layers for above each factors Interpolation techniques were applied for climate, elevation and water quality data; Population and poverty were considered in respective 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. Land use types in the district land use map 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 potential map.

Results

According to the resulted map (Figure 1) unsuitable areas occupy about half of the extent of the district. If potential reservoirs for *Macrobrachium rosenbergii* culture were indicated in respective to DS divisions, Badalkumbura, Moneragala, Wellawaya, Medagama and Sevanagala divisions were resulted as highest potential areas. Thanamalwila, Bibile, Madulla, Buttalaand Siyambalanduwa divisions were resulted as Suitable areas and Latter part of Madulla was indicated as Moderately suitable area.The district can gain more benefits by stocking *M. rosenbergii* in reservoirs that fall in most suitable areas.Since the water quality parameters were given the highest weight final result has high influence by water quality factor. Results are basically applicable to the dry season which is the period that water quality data were collected.

According to the field observations dry season is not favorable for CBF. Application of CBF at present is not in a satisfactory level with compared to the existing number of reservoirs.Potential areas resulting from multi-criteria evaluation (MCE) are mostly associated around the reservoirs where the optimum water quality for *M. rosenbergii* culture exists. Results could be advanced by tallying the obtained results with catch data of Giant Prawn as some reservoirs are already practicing prawn culture, but lacking of accurate catch data was a limitation for the research. Suitability of the reservoirs included in the sample could be concluded as follows (Table 1).

Table 3: Suitability of Selected Reservoirs

DS Division	Reservoir	Surface Area (ha)	Potential
Sevanagala	HabaraluWewa	80	Most Suitable
Thanamalwila	MahaWewa	80	Suitable
	DemodaraWewa	100	Suitable
	HambegamuwaWewa	210	Suitable
Kataragama	GestupanaWewa	80	Suitable
	MilegamaWewa	80	Suitable
Siyambalanduwa	SugalaDewi	50	Unsuitable
	DoserWewa	50	Suitable
	HeekaduAra	50	Suitable
	New HeekaduAra	30	Suitable
	Kotiyagalawewa	120	Suitable
Moneragala	MeepanaAra	10	Most Suitable
	Thambalawinna	15	Most Suitable
Bibile	MeegahaAra	120	Suitable
	NagalaWewa	15	Most Suitable
Badalkumbura	Katugahagalge	10	Most Suitable
Buttala	AmbakolaWewa	66	Suitable
	Yudaganawa	60	Suitable
Wellawaya	Handapanagala	226	Most Suitable

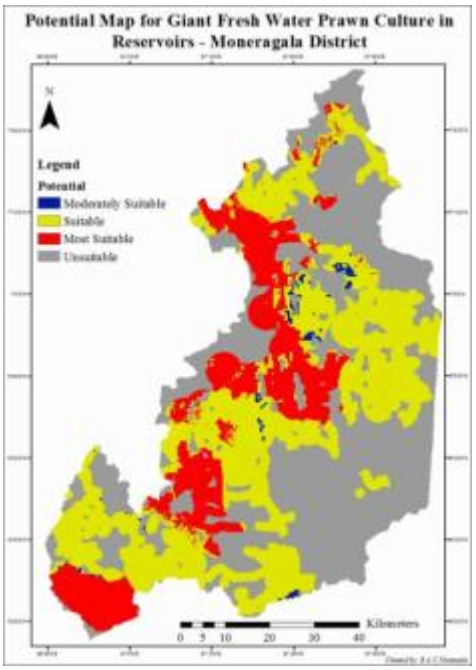

Figure 1: Potential Map for Giant Fresh Water Prawn (M. rosenbergii) culture in reservoirs – Moneragala district

Conclusion

Application of CBF at present is not in a satisfactory level with compared to the existing number of reservoirs.The district can gain more benefits by stocking *M. rosenbergii* under CBF in reservoirs falls in most suitable areas.

The result of study is very dependent on weighting, classifying suitability scores and ranking. Different weighting, rating, and classification methods could generate a variety of results.

Overall, the results of this study demonstrates that the 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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