HABITAT BASED INSTREAM FLOW ASSESSMENT USING PHABSIM IN THE SURMA RIVER, BANGLADESH

A.T.M. HASAN ZOBEYER[1], M FAZLUL BARI[2] and NASREEN JAHAN[3]

[1]Assistant Professor, Department of Water Resources Engineering, Bangladesh University of Engineering and Technology, Dhaka 1000, Bangladesh
(e-mail: zobeyer@wre.buet.ac.bd)
[2] Professor, Department of Water Resources Engineering, Bangladesh University of Engineering and Technology, Dhaka 1000, Bangladesh
(e-mail: bari@wre.buet.ac.bd)
[3]Lecturer, Department of Water Resources Engineering, Bangladesh University of Engineering and Technology, Dhaka 1000, Bangladesh
(e-mail: nasreenjahan@wre.buet.ac.bd)

Various uses of river water through diversion or storage have created significant impact on the natural flow regimes of the affected rivers. These changes in flow regimes have in turn caused changes in the dynamics of the aquatic system often with adverse impact on the ecological and environmental conditions in the rivers. A common approach to addressing this problem has been to specify flow conditions (requirements), which need to be met in terms of the minimum flows, which will maintain the ecological balance. Importance of instream flow assessment has been realized in Bangladesh only recently due to the fact of diminished dry season flow and negotiation for water sharing with riparian countries. This research aims to investigate the quantity of optimum flow requirement for the dominant fish species in the Surma River in Bangladesh and hence set instream flow requirement in the river. This has been achieved through habitat modeling using Physical Habitat Simulation (PHABSIM) model. PHABSIM model allows the quantification of ecological species preference for the range of flow within a river. This is achieved on the basis that fish species exhibit preferences for certain habitat types, represented by physical variables, such as depth, velocity and substrate, which vary with discharge.

For the application of the model three fish species Ghagot, Baghair and Bacha were selected as dominant fish species in the Surma River. A periodicity chart for these fish species showing their seasonal availability was constructed. The suitability indices (SI) for depth and substrate were developed through interview of the fisherman and SI for velocity was developed from the information in literature. Cross section data were collected to represent each of the available mesohabitat such as riffles, pools and deep pools in the river. Hydraulic simulation was performed to calculate water level at the selected cross sections and mean velocity at a number of verticals in each cross sections for the discharge range of 5 to 2400 m^3/s. In habitat simulation, these hydraulic variables were combined with fish habitat preference data i.e. suitability indices to calculate an index of Weighted Usable Area (WUA) for the selected range of discharge giving a relationship between WUA and discharge for each of the selected fish species (Fig. 1).

The WUA vs. discharge curve for the selected fish species indicates the variation of suitable habitat with discharge for the particular species. A comparison between optimum flow requirement for the fish species and monthly median flow shows that monthly median flow is well below the optimum water requirement for the fish species in the dry

season although water is available in the wet season. This situation restricts us to set monthly median flow as instream flow requirement for dry season (November to April). For wet season optimum flow requirement for the fish species is set as instream flow in the river. Such habitat-flow relationship permits the negotiation and setting of flow regimes optimal for ecological management and hence helps the planners in water resources development activities without affecting the river ecology.

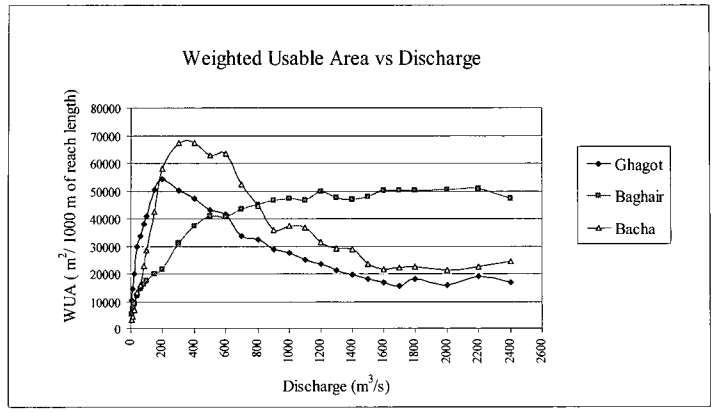

Fig. 1 Weighted Usable Area at different discharge values for selected fish species