Abstract

Anthropogenic impacts, mainly due to construction of a groyne covering part of the lagoon mouth, on the aquatic biota of the Koggala lagoon were studied. A brackish water body existed in the lagoon before the construction of the groyne, which later was transformed to a high saline one due to perennial opening of the lagoon mouth to the sea. Changes in the water quality, due to construction of the groyne, on *Etroplus suratensis* and *Scylla serrata* populations were studied mainly.

Bathymetric data were collected using a combination of standard depth gauge and a GPS navigator in January, 2012. The final bathymetric map was created using post-processed data with GIS based software (ArcGIS 9.3).

Two habitats of the lagoon, main water body of the lagoon (A) and upper small part (B) separated by an anicut from the main water body were recognized. The lagoon proper has a surface area of approximately 5.52 km^2 with a mean depth of 1.62 m and the much smaller upper region (0.22 km^2) showed a mean depth of 0.78m. The maximum depth of the lagoon was recorded as 3.20 m. Most of the regions in Koggala lagoon were shallower than 2.0 m with irregular bottom topography.

Daily rainfall of the area was measured by fixing a rainfall gauge from January, 2009 to December, 2011. Field surveys were arranged in 2010 with reference to rainfall data and tidal conditions. Salinity and temperature data of different depths at some selected stations longitudinally from the mouth of the lagoon to the upper region were collected in each survey.

The highest surface salinity reported in the lagoon proper was nearly 24 ppt in the dry season and the lowest was nearly 17 ppt in the rainy season. There was a high saline (> 27 ppt) bottom layer remains in the deep area of the lagoon proper without concerning rainfall or tidal conditions. But salinity in the upper region was lower than 16 ppt throughout the year. Depending on the weather conditions, Koggala lagoon exhibits an entirely different mixing states. The lagoon became a brackish and salinity stratified water body in the rainy period. That salinity stratified nature turn into mixed state with high salinity in the dry period.

Effects of salinity on the fish species, *Etroplus suratensis,* were studied over one year using replicated laboratory experiments with different salinities (4 ppt, 8 ppt, 12 ppt, and 24 ppt salinity concentrations to simulate different salinity regimes). The results showed that there was a significant difference in growth depending on the salinity level and more than 80% of the fish that were in 24 ppt salinity level died within 255 days without attaining reproductive maturation. Mean lifetime of a fish in 16 ppt salinity was the highest (362 days) while that of 24 ppt was the lowest (233 days).

Food quality analysis, in terms of different preferred species revealed that the total numbers of preferred food items in a unit area of the two regions of the lagoon were significantly different ($\chi^2 = 8.683$, df =3, $P < 0.05$). So the prevailing high salinity of the lagoon has a significantly negative effect on the *E. suratensis* population.

Scylla serrata, the dominant crab species in the lagoon encountered 93.10% and 89.86% of the total catch of crab pots and nets, respectively. The mean carapace width of crabs in both sexes caught by crab pots is larger than that of crabs caught by crab nets. The carapace width (CW)-body weight (BW) relationship for male and female crabs was computed as:
$BW = 0.1503\ CW^{3.020}$ ($R^2 = 0.9738$; n = 63) and $BW = 0.5158\ CW^{2.533}$ ($R^2 = 0.9722$; n = 53), respectively. Female crabs caught were larger and heavier than males in both gears. There was a significant difference between the carapace width of crabs caught by crab pots and the crab nets ($P<0.05$). The mean carapace width of crabs caught by crab nets was 10.14 cm and that of crab pots was 11.20 cm.

The size at maturity of female crabs of *S. serrata* was 12.17 cm. Only 4% of the catch of male crabs exhibited mating scars. Immature females, which had CW less than the calculated size at first maturity of *S. serrata* comprised approximately 72% of the catch by crab pots and 85.7% of the catch by the crab nets respectively. Therefore newly introduced crab nets deplete the immature mud crab population more than traditional crab pots.

Finally, it is concluded that lagoon environment can be restored by lowering high salinity disturbing prolong sea water intrusion into the lagoon.