ABSTRACT

The reservoir capture fishery of Sri Lanka is characterised by the dominance of two exotic cichlid species, *Oreochromis mossambicus* and *O. niloticus*. However, high abundance of small-sized indigenous cyprinid species is evident in reservoirs of Sri Lanka. Previous studies revealed that diversification of the fishery to exploit presently untapped fish resources in Sri Lankan reservoirs, would result in significant increase of inland fisheries production in the country. The present study was carried out with the overall objective of investigating optimal fishing strategies for unexploited and under-exploited fish resources in three reservoirs of Sri Lanka viz. Minneriya (8° 01' N; 80°53' E), Udawalawe (6° 21' N; 81°13' E) and Victoria (7° 14' N; 80°46' E). Experimental fishing with multi-mesh mono-filament gillnets (12.5, 16, 20, 25, 33, 37, 50, 60, 76 and 90 mm stretched mesh) and shore seine nets of three mesh sizes (7 mm, 5 mm and 1 mm stretched mesh) was carried out at approximately two-month intervals. Sampling was carried out from August 1998 to January 2001 in Minneriya, from August 1998 to May 2000 in Udawalawe and from August 1998 to June 2000 in Victoria.

The efficiencies of shore seining and gillnetting were quite different for catching individual species. *Hyporhamphus limbatus*, which is an under-exploited fish resource occurring in Minneriya and Udawalawe reservoirs, was effectively caught in shore seine nets, but gillnetting was not effective for catching this species. Occurrence of *H. limbatus* schools in shallow littoral areas of the reservoir might have facilitated the increased catch efficiency of shore seine nets for this species. On the other hand, the opposite was true for small-sized indigenous cyprinids; they were not effectively caught in shore seine nets but in small mesh (12.5 mm to 37 mm) gillnets. As gillnets are passive gear which can be set in the depths greater than the height of net, free-swimming small cyprinids can be exploited using small mesh gillnets. As the juveniles of the two exotic cichlid species

which form the mainstay of the reservoir fishery of the country occur in shallow areas (< 1.5 m depth) of the littoral zone of reservoir, small-sized indigenous cyprinids can be differentially exploited without harming juveniles of exotic cichlids.

As a measure of relative abundance and commonness of each species, an index of relative importance (IRI) was used. The estimated IRI indicated that *Amblypharyngodon melettinus*, *Puntius chola* and *P. filamentosus* were the most abundant fish species among the unexploited fish species in all three reservoirs. According to gillnet selectivity studies, *A. melettinus* was found to be effectively caught in the gillnets of stretched mesh sizes 16 mm and 20 mm whereas effective mesh sizes for *P. chola* and *P. filamentosus* were 33 mm and 37 mm. Although gillnets of 50 mm stretched mesh size is effective for catching *P. dorsalis*, another unexploited fish species, due to its low abundance and potential danger of catching juvenile cichlids in gillnets of this mesh size, use of gillnets of mesh sizes greater than 37 mm is not advocated for exploiting small-sized indigenous cyprinids.

Length frequency data (LFD) of *H. limbatus* caught in shore seine nets and those of *A. melettinus*, *P. chola* and *P. filamentosus* caught in gillnets of effective mesh sizes were analysed using FiSAT software. The LFD of gillnet catches were corrected for gillnet selectivity before analysis. *A. melettinus*, *P. chola* and *P. filamentosus* in the three reservoirs studied and *H. limbatus* in Minneriya and Udawalawe reservoirs registered high mortality rates. As total mortality rate of fish is essentially production per biomass (P/B) ratio or turnover rate, these fish species can withstand heavy fishing pressure. Hypothetical fishing strategies were assumed using gillnets of the effective mesh sizes for individual species and the relative yield-per-recruit (Y'/R) analyses were performed incorporating probabilities of capture of gillnet selection curves. The results of these analyses indicate that all three species are capable of withstanding high exploitation rates (> 0.70) which result in optimal Y'/R. Even when the precautionary levels or sub-optimal levels of E that corresponding to 10% of the maximum rate of increase of Y'/R, termed as $E_{0.1}$ are

considered which would allow fishers to increase fishing mortality without exceeding the E value corresponding to optimal Y'/R (E_{opt}), all fish species can withstand exploitation rates greater than 0.55.

Establishment of a subsidiary fishery for small indigenous cyprinids in Sri Lankan reservoirs and exploitation of under-exploited fish resources such as *H. limbatus* in lowland reservoirs where they are abundant at a moderate exploitation level which does not undermine the existing cichlid fishery are therefore meaningful strategies for enhancing inland fisheries production in the country. Furthermore, small-sized cyprinids are rich with micronutrients, especially Vitamin A so that introduction of a subsidiary fishery to exploit this untapped resource is further justifiable as regards to human health and their contribution to food security.