SUMMARY

Conservation of biodiversity requires an understanding of the processes involved in the structure and function of biotic communities. Biodiversity defines the structure and function of an organism, community etc., in a particular ecosystem. The interactive process of species in relation to the environment and the biotic interactions are important for the conservation of habitats. Fishes are important group of vertebrates in determining the trophic structure of an aquatic ecosystem in lotic community, the diversity, community structure and species assemblages are influenced by biotic and abiotic factors such as water current, depth, substrate, nutrients and riparian cover.

Habitat structure and resource in Western Ghats streams vary in ecoregions of Tamil Nadu, Kerala and Karnataka states in Peninsular India. Relationship between habitats from different biomes in the resource availability to fish assemblage has not been documented in Indian streams/ rivers. Therefore, the present study is an attempt to document the fish assemblages composition, assemblage structure and function in selected
streams/rivers of Western Ghats. The present study forms of three parts
1. fish assemblage composition and structure, 2. inventory of habitat
features 3. fish assemblage function by the differential uses of food and
habitats.

In fish species inventory, 73 species of fishes were recorded from
fifteen study streams in Western Ghats, of which 48 species were recorded
from streams of Kerala, 29 species from Tamil Nadu and 33 species from
Karnataka. Cyprinids were the dominant members in the assemblage
structure (45.5 to 87.5 %). Maximum species richness were encountered
in streams of southern part of Western Ghats such as Thalayani (S = 18),
Kallar (S = 17), Achankoil (S = 17) and Gugalthurai (S = 15). The presence
of big sized barbs like Hypselobarbus curmuca, H. dobsori, H. dubius, H.
kolus and Tor khudree malabaricus in Thalayani stream and the newly
described species Puntius kannikattiensis from Karaiyar stream and
Homaloptera santhamparaiensis and Horalabiosa arunachalami from
Panniyar stream were new inovations of the present study. Out of 73
recorded species, 44 species are endemic to Western Ghats streams, of
which 23 species are in threatened categories. In regional endemism 8
species are strictly endemic to Kerala region.

In species distribution, five species such as Danio aequipinnatus,
Garra mullya, Noemacheilus triangularis, Puntius filamentosus and P.
conchonius are common and abundant in Western Ghats streams. Patchy
distribution was noted in big sized barbs and in some specialised groups. From this study the range of distribution of hill stream loaches *Bhavania australis, Noemacheilus denisonii, N. guentheri, N. denisoni, N. semiarvensis, N. triangularis* and *Garra hughii* is wide in Western Ghats streams.

Water quality studies showed that the Western Ghats streams were generally poor in dissolved ions. However, high conductivity values were recorded in Thunga river (0.62 μ/mhos) and Ganeshpal (0.67 μ/mhos). The Canonical correlation analysis of water quality variables against fish density showed that the conductivity and temperature had strong association with fish density.

In each stream reach, the major habitat types (pool, riffle, run and cascade) were identified. Samikuchi, Thalayanai, Karaiyar and Gugalthurai streams had more diverse habitat types in 100 m reach. Large and deeper habitat was recorded in Thunga river. Based on the habitat utilisation coefficient, five habitat use guilds (pool, mid-pool, riffle, cascade and generalist) are proposed in Western Ghats streams. The specialised forms such as *Glyptothrax Madraspatanum, G. trewavasae, Homaloptera santhamparaiensis, Bhavania australis* and *Balitora mysorensis* were member of riffle or/ cascade guild. The larger fishes *Hypselobarbus curmuca, H. dubius, H. dobsoni, H. jerdoni, H. kolus, H. kurali, H. micropogon and Tor khudree malabaricus* are in mid-pool guild. The small cyprinids, *Danio aequipinnatus, Rasbora daniconius, Barilius bakeri, B. bendelisis, B.*
canarensis, Puntius arenatus P. bimaculatus P. conchonius P. narayani, P. fasciatus, P. melanampyx and P. pulchellus used pool habitats. Puntius filamentosus, H. joshuai are members of generalist guild.

The macrohabitat features such as habitat diversity (depth, current and substrate), habitat area, habitat volume, instream cover and percentage of pool-riffle were used for the fish assemblage pattern in Western Ghats streams. The regression analysis between habitat characteristics and fish density were highly significant (p > 0.01) in Western Ghats Streams.

Microhabitat analysis showed that, in Tamil Nadu the Thalayanai stream had broad range of microhabitat variables compared to poor microhabitat variables in Hanumannadhi stream. In Kerala, Kallar and Achankoil also had great amount of substrate heterogeneity. Low stream velocity was recorded in Panniyar (stagenent flow 70 %) and Bavalipuzha (stagenent flow 60 %). In Karnataka, Thunga river had more deeper area (26.3 %), dominant substrate type was gravel (80 %) with poor cover complex (no cover area was 66 %). In Kigga falls the dominant substrate type was bedrock (70 %) and also had good amount of cover complex.

Based on the Principal Component Analysis, the streams Thalayani, Kallar and Samikuchi had the high velocity, more deeper habitats and greater amount of substrate heterogeneity and cover complex. The Achankoil river had turbulent flow, deeper habitat, greater amount of
erosional substrates (gravel and sand) and poor cover complex. Comparatively poor habitat characteristics were recorded in Thunga river.

The PCA of microhabitat utilization of cyprinid species explained specific water velocity, depth, substratum and cover used by individual cyprinid species in Western Ghats streams. The patterns of spatial resource used in assemblage members were generally similar among Western Ghats streams. The small species *Danio aequipinnatus, Danio (Brachydanio) reiro, Barilius bakeri, B. bendelisis, B. gatensis, B. canarensis, Salmostoma clupeoides, S. poobis and Puntius denisonii* had occupied microhabitat far from substratum with higher velocity. *Garra mullya, G. mclellandii, G. hughi, G. gotyla stenorhynchus, Puntius amphibius, P. conchonius, P. dorsalis, P. fasciatus, P. melanampyx, P. bimaculatus, P. kannikattiensis, P. narayani, P. sophore, P. ticto, Hypselobarbus curmuca, H. dubius, H. micropogon, H. kurali, Tor khudree and T. khudree malabaricus* were found closer to the substratum and shelter at low velocity and greater water depth. *Rasbora daniconius, R. caverii, Horalabiosa joshuai, H. arunachalmi, H. dobsoni, H. jerdoni, Osteochilichthys nashii, O.thomassi, Barbodes carnicicus, B. sarana, P. arenatus, P. filamentosus, P. parrah and P. pulchellus* occupied medium depth with moderate flow.

Gut analysis of 25 most common cyprinid species showed that the Western Ghats fish assemblages exhibited a broad range of feeding habits. The great majority of fishes (14 species) primarily consumed animal matter
consisting of fallen terrestrial insects and benthic invertebrate larvae. *Garra mullya* and *Puntius narayani* showed some feeding specialisation as they had in their diets largely of periphytic filamentous algae and diatoms. *Puntius melanampyx, P. fasciatus* and *P. parrah* fed mainly on detritus.

Based on the microhabitat utilization and feeding habit four trophic guilds (surface dweller, bottom dweller, column dweller and generalist) are proposed for Western Ghats fishes. *Danio aequipinnatus, Salmostoma clupeoides, S. poobis, Barilius bakeri, B. bendelisis, B. gatensis, B. canarensis, Puntius denisonii* are member of surface guild. *Rasbora daniconius, R. caverii, H. jerdoni, Osteochilichthys nashii, O. thomassi, Barbodus cannaticus, B. sarana, P. arenatus, P. parrah* and *P. pulchellus* are members of column dweller. Bottom guild members are *Garra mullya, Garra mcclellandi, H. gotyla stenorhynchus, Puntius amphibius, P. conchonius, P. dorsalis, P. fasciatus, P. melanampyx, P. bimaculatus, P. kannikattiensis, P. narayani, P. sophore, P. ticto, Hypselobarbus curmuca, H. dubius, H. micropogon, H. kurali, Tor khudree and T. khudree malabaricus. Horalabiosajoshuai, Hypselobarbus dobsoni, P. arulius tambrapariniei and P. filamentosus* were generalist.

In the present study, the man-made alterations in the Western Ghats streams were identified. The major disturbance like sand mining, removal of riparian vegetation, channelization and pilgrimage activities were identified in the streams Bavalipuzha, Thalipuzha, Ekachi, Thunga, Sirkuli, Ganeshpal and Samikuchi.
From this study it can be concluded that the altered habitats supported less diverse fish assemblages and undisturbed streams have more diverse and more endemic forms. The species distribution and endemism in southern part of Western Ghats might be explained by altitudinal variations, forest types and land setting. The microhabitat and microhabitat approaches used in this study provided supplemental information about the habitat requirements of fish assemblages.