

Synopsis of the thesis entitled ‘Fishery Resource Potential of Manimala River, Kerala, India’

Manimala River of Kerala, India, is a small mountainous river originating from the Thattamalai hills of the Western Ghats mountain ranges at an elevation of 1156 m above MSL between the north latitudes 9° 20’- 9° 40’ and east latitudes 76° 25’- 77° 0’. It is with a length of about 90 km and a catchment area of about 847 km² flowing through Idukki, Kottayam, Pathanamthitta and Alleppey districts of the state. Even though a few surveys and biodiversity studies were conducted on the fishery of this river, serious research works conducted on taxonomic potential of fin fish resources of Manimala River are scanty.

Studies were conducted on the diversity, distribution, dynamics and potential of fish resources of the Manimala River. The topographic details and selection of study area of Manimala River were studied using map received from The Kerala State land Use Board. Different stations and snanghats (Kadavus) of the river were visited many times and an understanding of the fishery potential was gained by direct observation and also from competent fishermen engaged actively in fishing. After this preliminary survey, 20 different locations were selected for fish collection. Places with 4- 5 kilometers apart were selected for this purpose; care was taken to include stations of high level, mid level and low level areas of the river. Elankadu, Yendayar, Koottikal, Velanilam, Mundakkayam, Vallakkadavu, Orumkal, Chenapady, Manimala, Kottangal, Kulathurmoozhy, Thelapuzha, Kavanalkadavu, Keezhvaipur, Komalom, Karuthavadasserikara, Manackachira, Kuttoor, Kallumkal and West Venpala were the areas selected for the study. Experimental fishing operations were carried out in these areas in every months round the year 2011-2012. The diversity of fishes of the river was studied from the above selected stations of the Manimala River using different types of gears. Selection of these gears is based on its fishing efficiency in a running water body. From each station sampling was carried out using appropriate gears of required mesh size; cast net and gill net were mainly used for collecting fishes. Gill nets were found to be the common and efficient fishing gear. Scoop net was used in certain areas; employed handpicking method in some high level areas with rocky bottom. Preference was given to the type of habitat from where fishing operation has to be conducted. After fishing, nets were

brought to shore at once and entangled fishes were carefully taken out. Fishes were cleaned with water and kept in 10% formalin. After fixation they were taken out and identified with standard text books. Local names, common names, English names, synonyms and status of fishes were prepared. Standard procedures were adopted for sampling the fishing villages, number of fishermen and their gears required for the study. For the preservation of the fish, live fishes were killed and fixed in nine percent formalin as they die in solution with all the fins expanded. Smaller specimens (less than 10 cm long) were directly put in formalin solution, while medium sized (10- 30 cm long), prior to the fixation were given a longitudinal incision along the abdomen, without injuring the alimentary canal. Large forms (fishes longer than 30 cms), were injected ten percent formalin in to the muscle and the abdomen, where the abdomen is not rounded but with a keel, the incision was made on the left side of the fish. Studies on indigenous fishing methods were carried out by direct observation of various local fishing methods. Details of different fishing methods were collected from various sites of Manimala River. Frequent visits were conducted on areas with peculiar fishing methods. Many indigenous and efficient fishing methods like Float nets (urivala), Mukkalivala (tripod net), Undavala / theenvala, Madavala, Chavittuvala, Vattavala, Vellaveli, Virali were found to be some of the fishing methods of Manimala River. For conducting taxonomic studies on the fish, each and every fish species were examined for its meristic and metric features. Fishes which are having characters unseen in other existing fishes were kept in separate containers. Photos of the specimens in fresh and preserved condition are taken in finely focused condition. After fixation, fishes were taken out for examination. They were analyzed for meristic and morphometric characters. Examination was conducted to trace out any difference in major meristic character present in the unidentified specimen and which was lacking in its related species. Whenever a major difference was met, selected fishes were subjected to detailed analysis. All related species of the new fish species were collected from the aquatic bodies. As far as possible, they were caught from their type localities. Details of type localities were gathered from original description of the fishes. For collecting topotypic fishes, many sites of Karuvannor River of Irinjalakkuda, Mananthavady River and Bavalipuzha of Wayanad were visited; some fishes were collected from River Ganges at Kolkata. Fishes which could not been collected from its natural habitat were searched in the reputed national museums of Zoological Survey of India at Calicut, Chennai and Kolkata. A few specimens from KFRI Peechi were also examined. Meristic and

metric characters of the closely related species were analyzed in detail and it was compared with the characters of the unknown species. If any major difference was found in the valid characters, detailed studies conducted on it. Meristic characters such as scales counts, fin ray counts, position of eyes, fins, shape of mouth, lips, extent of barbels, median fontanel, occipital process etc. were taken in to consideration. Various body measurements were taken from many similar specimens of different sizes, sexes and also from different locations as possible. Numbers of characters used, set of measurements and counts were different for different group of fishes; it was different for barbs, bagrids and perches. Studies were also conducted for understanding the dynamics and potential of fishes in the river. A total number of 97 fishes belonging to 11 orders, 33 families and 57 genera were obtained during the period of study. Of the 11 orders, Cypriniformes became the largest order with 39 species of fishes, followed by Perciformes with 22 species and then Siluriformes with 21 species. More number of fishes were collected from Middle level and low level regions of the river; even though high level regions show lesser species diversity, these were found to be the dwelling places of many rare hill stream fishes.

Detailed taxonomic studies conducted on each fishes to search for unknown and unnamed fishes in the river. Followed procedures to name unnamed fishes. All the collected fishes were identified, examined, analyzed and detailed taxonomic accounts of all these fishes were prepared. 12 new fishes were discovered from this river; they are *Puntius nelsoni*, *P. viridis*, *Systemus rufus*, *S. chryseus*, *Mystus heoki*, *M. menoni*, *M. indicus*, *M. keralai*, *Macrogathus fasciatus*, *M. albus*, *Glyptothorax elankadensis* and *Horabagrus melanosoma*. It is interesting to note that, it was the first time a new species of *Mystus*, *Macrogathus* and *Systemus* was described from Kerala after one and a half century. *Glyptothorax elankadensis* was the first species of this genus described from a place south of Trichur in Kerala. All these were preserved in alcohol and deposited in the museum of Zoological Survey of India at Kolkata, West Bengal and Kozhikode; names given to these fishes were approved by International commission of Zoological Nomenclature and were received zoo bank registration numbers. Of the twelve fishes named during this study, names of seven were taken from Latin and Greek languages. Four fishes were rediscovered after one and a half century; they are *Pristolepis marginata*, *P. malabarica*, *Mystus armatus* and *Mastacembelus malabarica*. *Pristolepis marginata* was described by Jerdon in 1949; he presented it as a fish with 4 anal spines and 15 dorsal spines; but scientists after him could not find a species with these characters; so they believed that

Jerdon was wrong in his findings; so researchers misunderstood that *Pristolepis* with 3 anal spines and 14 dorsal spines might be *P. marginata*; but during this study original *Pristolepis marginata* with the characters as mentioned by Jerdon was collected; scientists had believed that *Pristolepis malabarica* was a synonym of *P. marginata*; during this research, many specimens of *P. malabarica* were collected from various sites of Manimala River; taxonomical studies on these specimens proved that *P. malabarica* is a valid species. *Mystus armatus* was considered as a synonym of *M. oculatus*; it was because of the similarities between these two; but during this research *Mystus armatus* was resurrected from its synonymy with *M. oculatus*; for this purpose both these species were collected from their type localities and taxonomically analyzed; it led to the conclusion that *Mystus armatus* is a distinct species. In this manner *Mastacembelus malabaricus* was also redescribed during this study. One of the major hurdles in studying local fish species in India is the non-availability of molecular markers. Therefore during these study mt DNA (Cyt b) marker sequences of some fish species of Manimala River was developed. For this, 417 bp long Cytochrome b sequences from 16 common fishes found in the Manimala River were successfully amplified. The universal primer pair used in this study was efficient to amplify the target region without any deletions or insertions. NJ tree was prepared showing the genetic relationship between species.