Conclusion And Summary

Conclusions:

THE RESERVIORS developed for the prime purposes of irrigation and water supply needs attentions for its fishery potentials also. Except large reservoirs other small and medium reservoirs with their perennial water retention capacity must be covered under capture and culture fishes. This fisheries activity will not only fetch local market but also may have significant role in district level economy.

The reservoirs for their fishery potential require to be checked for their ecology. The physico-chemical nature of water and soil are very essential parameters to be assessed for stocking of Indian Major Carps. Here in this project we have thoroughly assessed Nyari – II reservoir for its environmental condition both for abiotic and biotic parameters. The water quality was studied for two years and depending upon first year analysis, soil quality was also examined for one year along with second year water quality. All the required parameters were tested according to international standards and were found to be within permissible ranges for aquaculture practices in this reservoir. Biotic component was analyzed in the form of available wild fishes, plankton diversity, macrophytes diversity, molluscan diversity etc. for justify their role in fisheries.

The fishery potential of this reservoir was calculated on the basis of physico-chemical status using appropriate formulae. The potential found to be good at prevailing status of the reservoir; this can be enhanced by good environmental management practice. The fisheries status of reservoir Nyari – II for last decade has proved to be considerably good. Both capture fisheries for native and wild fishes as well as for stocking of Indian Major Carps and its hauling results in to economical gain from this reservoir.

Over all observation indicates good prospects for fisheries for Nyari – II reservoir.

SUMMARY

A RESERVOIR may be defined as a natural or manmade water sheet where water accumulates and stored for uses, especially for supplying a community, irrigation land, hydropower generation etc. Prehistoric man used to dam streams by putting sticks or bamboos across a stream or channel. They have been classified as per their area. However, no uniform classification criteria were set for reservoirs, generally the reservoirs are classified as small (< 1000 ha), medium (1000 to 5000 ha) and large (>5000 ha) as per the records of Government of India. As per present status of Indian reservoirs, total number of 19370 reservoirs covers approximately 3153366 ha surface area. Generally the reservoirs developed for the purpose of irrigation and civil water supply. Fisheries aspect has never been given importance for the reservoirs. But for the economic gain it is essential to incorporate fisheries element may be capture and/or culture fisheries.

The fish production potential of a reservoir is determine by its key environmental parameters, especially the water and soil quality which, in turn, is the functions of the geo-climatic conditions under which it exists. Thus, the geography, climate, topography and a number of physiographic parameters play a vital role in the productive potential of the reservoir. Nutrient budget of the reservoir contributes to its biological potential as well as fisheries sustainability along with several abiotic factors. The three Indian major carps are stocked extensively in reservoirs all over the country results in 82 to 90 % contribution in total catch and the native ichthyofauna contributes to approximately 10 to 20 % of total yield.

Present status of literature reveals notable study of reservoirs for fisheries purpose also. Several limnological parameters, edaphic parameters and reservoir morphology have been used in estimating potential fish yields from reservoirs. The environmental variability of reservoirs strongly influences fish population inhabiting the same.

The water quality of reservoir and the productivity status are to a large extent controlled by the quantity and quality of external nutrient loading. Similarly bottom soil plays a significant role in maintaining chemical and biochemical condition of overlying water which in turn contributes in maintaining productivity of the reservoir. Such maintained ecology and productivity are very significant element of potential

yield in the form of fisheries. The soil, "Chemical laboratory of fish pond" play significant role in maintaining productivity of reservoir. There is increasing evidence that the condition of the bottom and the exchange of substances between soil and water strongly influence water quality.

Ichthyofauna is unique as well as centered component of reservoirs that are exercised for economic gain. Piscean diversity of a reservoir at a given time is the result of the impact of a series of manmade and natural changes in the native fauna of the parent river. The original fauna changes and hardy fish species take advantage in newly generated niches in many reservoirs, transportation of fishes from other basins and introduction of exotic species have led to radical changes in the species set up.

Gujarat state is the 7^{th} largest state in India and comprises 3 distinct geographic regions. Larger area of this state is semi arid and water scarcity prone zone. Few big and several small rivers forms their basin in this state. The network of small rivers and undulating terrain creates ideal conditions for water resource development projects and thus, 5 districts of Saurashtra among themselves share nearly half of the reservoirs in the state. Even though, few major and several small reservoirs are located in Gujarat, the status of reservoir fisheries – Inland fisheries is very poor and needs proper scientific attention.

Exploration of reservoirs for economical gain – fisheries – requires to be estimated for standing fish stock and its potential efficiency to increase the reward by fishing. Good fisheries sustenance is possible only if the water and soil quality is maintained. The ideal approach in such cases is to select a sample reservoir and thoroughly analyze it for ecological conditions. Inland reservoir in this case will be treated as a unit of ecosystem and the quality estimation would be done for physico–chemical properties of water and soil, the biological condition and finally fisheries aspects.

Nyari – II is one of such reservoirs of Saurashtra region that has received attention not only for irrigation purpose but also stocking of Indian Major Carps. Regular fisheries activities have been established for Nyari – II and the stock yield is either transported to northern part of India after primary preservation on the site itself or marketed fresh at Rajkot city fish market.

Assessment of reservoir fisheries of the state and recent literature the necessity of caring out detailed scientific analysis was felt. The main aim of this research work is to establish scientific link between reservoir ecology and estimation of fishery potential of the same. The work was planned to address the major components *viz.*

1 Ecological assessment of reservoir, and
2 Assessment of fisheries status of the reservoir

To develop fisheries component in the reservoir following components are required to be addressed, (1) Water budget and water quality status, (2) Soil quality status, and (3) Organic status of the reservoir. Apart from water supply management if the ecological assessment of the reservoir is made regular activity then such reservoir will prove economically worth also. On analyzing fishery potential of inhabiting fishes and employed capture fishery, local market supply and basic preservation methods can be executed.

To fulfill the above set aim and objectives inland reservoir Nyari – II considered as work site. Nyari – II, is located in the Rajkot district of Gujarat state. This perennial reservoir is rain fed, receives flood water through Nyari River and normally gets filled up in monsoon. Primarily the water resource is identified to utilize for irrigation and community water supply to RUDA (Rajkot Urban Development Area). This long seasonal reservoir has the storage capacity of 88.50 meters FRL and the mean depth is ~ 45 meters, which is used for capture fisheries. Government of Gujarat Fisheries Department has considered this reservoir for stocking of Carp seeds due to its good quality and quantity of water.

To assess the ecosystem status of the reservoir, physico-chemical analysis of water and soil samples was carried out for the various samples collected monthly from the sampling site. The biotic component was analyzed through estimation of productivity and biodiversity of aquatic resources on the reservoir. The potential for fishery was calculated and present status of fisheries activity has been documented.

The water samples were collected from the reservoirs on each month in the morning hours. These samples were processed, preserved etc. for further detailed analysis in the laboratory. All the quality parameters were analyzed as per standard methods. Physical characteristic of the sampled water were estimated for surface temperature, turbidity, electric conductivity and solids, the chemical parameters like pH, DO,

BOD, COD, Free CO_2 Hardness, Nitrate, Phosphate, Sulphate, and Chloride etc. were analyzed as per standard methods. As a Biological parameters Chlorophyll and Productivity (NPP and GPP) estimated and analyzed by standard methods. The water samples were collected for year 2006 to 2008; all the parameters analyzed were within the required standards for normal water quality and aquaculture quality criteria. Many parameters have shown significant relationship with different parameters. The state of dissolved gases and their demand for balanced ecosystem was estimated and the same falls within all normal ranges. Due to varied environmental conditions during different seasons few abiotic parameters related to salts and solids have shown variability. The organic productivity of the reservoir depends upon its nutrient content and chlorophyll. Ratio of GPP:NPP was indicator of good health of the reservoir and its better capacity to sustain fisheries.

The diversity of biota was a component studied with perception of its possible role in ecosystem management as well as fishery potential. The phytoplankton were represented by various algae like, chlorophyceae, diatoms as bascillariophyceae, cyanophyceae etc. Zooplankton were represented by four different groups viz., protozoa, rotifera and arthropoda. Percentage compositions of these planktonic forms were indicative of its richness and possible contribution in organic productivity as well as trophic status maintenance. Aquatic weeds were present in moderate amount and their diversity was significant. Two distinct varieties of molluscans were found present in this reservoir, the gastropoda and bivalvia.

Native fishes were represented by major families like Cyprinidae, Siluridae, Gobidae, Channidae and Cichlidae. The regular and organized fishing activities are going on in this reservoir and good amount of inland fish catch have been regularly reported from Nyari–II reservoir. Regular stocking of Indian Major Carps like Rohu, Catla and Mrigal is done by the government fisheries department considering the water budget of the reservoir. Total fish yield return of this group has been reported well and since 2004 – 05 the yield has increased, the catch of Catla and Rohu was above 10,000 kg in the year 2005-06. The past records revealed good state of fisheries in Nyari–II reservoir was one of the important key factors to select the site for ecological analysis. Data collected for ecological analysis and fish catch were subjected to appropriate statistical analysis to arrive to necessary conclusion.

The soil samples were collected from the periphery of the reservoir. The soil samples were collected in triplicate and were carried in polythene bags to the laboratory for further analysis. Prior to analysis all the soil samples were dehydrated, grinded and sieved to prepare the proper sample. Soil physico-chemical parameters were analyzed by standard methods, Bulk density, Particle density, Porosity and Maximum Water Holding Capacity were done as a physical parameters and pH, Electrical conductivity, Organic Carbon, Organic Matter, Available Potassium, Available Phosphorous, Available Nitrogen and Total Nitrogen were examined as a chemical parameters.

This reservoir has been utilized for capture fisheries as well as for stocking of fish seeds of Indian Major Carps. The data for fish catch and other fisheries activity were collected from local fishermen and from the local fisheries office of the Department of Fisheries, Government of Gujarat.

Depending upon the existing literature, execution strategies and exploiting methodologies, Indian reservoirs were utilized for irrigation and potable water supply. Only few large reservoirs were covered under the umbrella of scientific investigations leading to their ecological and economical status. The concept of utilizing reservoir resources for fisheries purpose required to be enhanced. Most important aspect in this regards is to estimate fishery potential of the reservoir in the subject. Depending upon the limnological parameters especially pertaining to salt and solids related component, reservoir morphometry etc. requires to be taken in to account for the calculation of potential of fish yield for the reservoir. According to Ryder, 1965, Morpho-Edaphic Index (MEI) represents most widely accepted method for estimation of potential yield from the reservoirs. Here in case of reservoir Nyari – II fishery potential and possible yield capacity was calculate as 35 kg/ha for year 2006 – 07 and 43 kg/ha for year 2007 – 08. If the conductivity value which is a function of total solids (TS) increases and low average depth of the reservoir is taken in to account than high potential yield can be projected. The conductivity of water increases and depth decreases will lead to better fish production. This hypothesis was coined on the bases of African tropical shallow reservoirs as well as for some small reservoirs of Asia. In order to ensure the high potential fish yield, the reservoir should be managed effectively on the scientific basis. After the estimation of possible fishery potential, the fish stocking activity must be carried out and be followed by proper fishery management.