# I N T R O D U C T I O N

TO MY GRANDMOTHER

Limnology is the study of fresh or saline waters which are contained within continental boundries (Goldman, 1983). Sometimes limnology is discribed as "hydrobiology" or "aquatic biology". The former word was more in vogue a few decades ago than now. It's meaning is too narrow unless we emphasis, the general ecology and study of habitat are considered to be part of biology. According to Edgardo Baldi, a prominent Italian ecologist, "Limnology" is the science dealing with interrelations of processes and methods where by matter and energy are transformed within the lake."

Although limnological observations have a long history, they only evolved into distinct discipline during the last two centuries. For the first defination of limnology, one we owe to F.A. Forel (1892), a Swiss professor, who has been called the father of Limnology. His poineer investigations were focussed on Le Leman (Lake Geneva). He published three volumes on Lake Geneva in 1892, 1895 and 1904. In the first 40 years of the 19th century, E.A. Birge and C. Juday worked on Wisconsin lake to become the first American forelian limnologists.

The International Association of limnology was formed in 1922 by Thienemann and Naumann. Later important literature appeared in many languages such as Macon and Warthington (1951), Welch (1952), Treatise on limnology by Hutchinson (1957, 1967, 1975); Reid (1962); On tropical Limnology by Beedle (1974), Wetzel (1975), and Cole (1983).

At present limnology plays an important role in the decision making processes for problems of dam construction, pollution control, fish enhancement and aquaculture. Applied limnology has great scope in healthy existance of natural and man made water bodies and the intelligent use of them to harvest the natural resources at sustainable level.

Today most of the countries from the third world are facing shortage of food to support the ever increasing demand for it, because of a growing human population. According to F.A.O. report (1962) the diet of the populations of these countries is insufficient and nutritionally imbalance, in which animal protein deficiency is a serious dietary lack. As proteins from the vegetables do not have all the essential aminoacids required for human growth; the proteins of animal origin therefore become essential. The conventional sources of animal protein available in the form of milk, meat, pork, poultry, eggs etc. are beyond the means of common man. Therefore, perhaps the only alternative is fish protein. Fish protein is not only complete but it is cheaper in price and easier to digest.

In most of the developing countries, especially in India it may be unwise and prohibitive to use the limited land even now for raising the livestock for proteins of animal origin. Since it is well known that animals yield much less nutritional energy than plants/ha. Further, it is also known that in the energy transformation from plants to animals about 9/10 of the energy is lost. Therefore the production of the animal proteins of terrestrial origin may be even less in future than it is now.

The increasing demand for proteinaceous food has made it necessary to exploit more completely and efficiently the water available, especially those from inland. Inland waters throughout the world comprise about 500 million hect. yet the total production of this area is only 7 million tonns of fish or 15 % of the total fish catch of the world.

In India we have great domain of fresh water. In the fight against hunger and malnutrition, harvesting of this water domain and increasing the fish production from it, therefore, becomes a must.

According to Bhimachar (1975) no development programme has been effectively initiated in all these perennial and seasonal tanks in India at present, except that, the fishermen take out from these water bodies, whatever fish that may be naturally stocked during the monsoon floods, when tanks overflow. There is an immense scope for stepping up fish production in these tanks, if suitable measures are undertaken. In order to utilize fresh-water bodies successfully for fish production, it is very important to study the biotic and abiotic factors influencing the biological productivity of fresh water body. Research in this field is no doubt of indirect assistance, but it will serve as a guide line to maximise the use of productivity of water.

The efficacy of pond fisheries is confirmed by following examples : To obtain 7.5 tonns meat from 100 hect. of arable land or 1.6 tonns of meat from 100 hect. of agricultural holdings a high expenditure is incurred, but to obtain 20 tonns of fish (carp) from 100 hect. of pond area very little expenditure is required. This quantum of fish can be obtained because of natural food already available in the pond, with a moderate level of intensification and expenditure on supplymentary feeding and fertilizers it is possible to obtain 6 to 150 tonns of fishes (carps) even more from 100 hect. of area (Martyshev, 1983).

India has rich inland water resources in the form of rivers and rivulets which run to about 29,918 kms. (Jhingran, 1983), and all over India there are about 117,000 small and large fresh water bodies; among which few are natural and others are man made. The water spread area of reservoirs and lakes is about 3.0 million hect. where as tanks and ponds, measure more than 1.5 million hect. (India, 1983). Every year there is an addition of hundreds of hectares in the total water spread area, in the form of percolation tanks, city water supply tanks, irrigation tanks, flood control reservoirs etc. No accurate figures of these water spread areas in the country are available at this moment. Many new river valley projects are being developed to create more reservoirs. Specially in Maharashtra under the Employment Gaurantee Scheme small tanks are constructed by minor irrigation divisions. So in our country man made water spread area is therefore fast changing, It is estimated that the present culturable water spread area of our country is about 2.3 million hect. (Shrivastava _et al._, 1983), (Jain, 1984).

In Maharashtra state, out of the 1,51,114.71 hect. total fresh water bodies, 89 % are constituted by small tanks and ponds (Jhingran, 1983) like Rajaram tank (23 hect.). Such small and shallow fresh water masses have been found to be much more productive than the larger impoundments (Holt, 1966). Therefore, real prospect of future increase in fish production appears to lie in the exploitation of these small water bodies, where factors involved in the production of fish can be properly regulated or manupulated.

Several research workers, all over the world have made contribution in the field of limnology. Their study is mainly based on large man made reserviors and lakes of North America, Canada, Europe etc. They have studied in detail some of the hydrobiological aspects of fresh water bodies. Notable among these workers are Juday (1932), Beeton (1963), Fish (1969, 1975), Burchart et al., (1982), Reinertsen (1982), Maehl (1982), Toyama, (1982), Steintzkannam, (1983), Overbeck et al., (1982), Conzonno et al.,(1983), Schiavone Jr. (1983). But very little work seems to have been done on the small water bodies from the tropical and subtropical regions.

In India workers like Chacko (1949, 1950), Ganapati (1940, 1956, 57, 62), Vijayaraghavan (1971, 73) have done some hydrobiological work on shallow water bodies, temple tanks, moats and village ponds, Sreenivansan (1964, 69) has worked on Bhavanisagar,

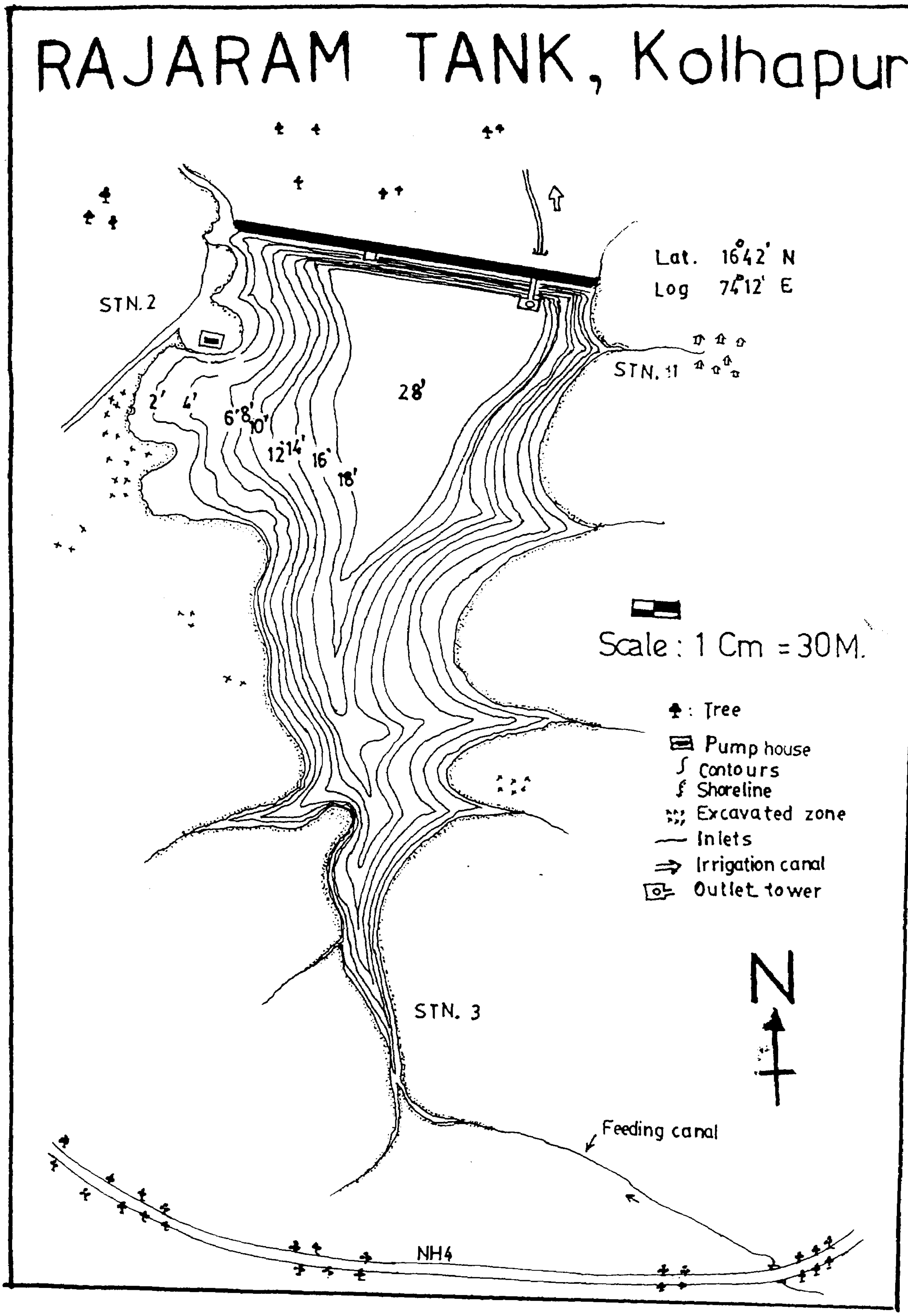
RAJARAM TANK, Kolhapur
Lat. 16°42' N
Log 74°12' E
STN. 2
STN. 1
STN. 3
2'
4'
6'
8'
10'
12'
14'
16'
18'
28'
Scale : 1 Cm = 30M.
Tree
Pump house
Contours
Shoreline
Excavated zone
Inlets
Irrigation canal
Outlet tower
N
Feeding canal
NH4

Fig. 1.

Amaravathy and other 16 reservoirs from South India. David et al. (1969), Govind (1969), worked on the Tungabhadra dam from Karnataka. Ganpati (1969) on Sayaji sarovar, the man made water body from Gujarat. Tripathy (1969) on Rhiand lake, Kaliyamurthy (1973) on Pulikat lake, Bohara et al., (1976) on Takht Sagar, Samant (1978) on Kalamba reservior, Ayyappan (1980) on Ram Samundra tank, Sharma (1982) on Jaismund lake and Kaul (1983) on Lalapani talab.

There are about 229 tanks and reserviors in Kolhapur district (213 village and Zilha Parishad tanks, 14 minor irrigation tanks and 2 reserviors) covering 3569 hect. of water spread area. Among 213 tanks, 86 tanks are perennial having maximum water spread area 3362 hect., minimum 958 hect. and average water spread area is 2016 hect. Around the Kolhapur city, about 10 tanks are present of varing sizes (5 hect. to 200 hect.) which are used for minor irrigation, washing and bathing purpose, As a representative of these tanks "Rajaram tank" was selected for the hydrobiological investigations.

The Rajaram tank (23 hect.) is situated on the University campus at the South east edge of Kolhapur city (Latitude 16°42' East, Longitude 74°14' north) at the height of 631 meters from mean sea level. The construction of this tank was started in 1921 by His Highness Shahumaharaj of Kolhapur State for the purpose of irrigation and city water supply. The construction was completed in 1923. The cost of construction at that time,

Plate 1 : Rajaram Tank at maximum water level, photograph taken from South catchment.

including water supply channel and feeders channel was Rs.80,000/-.

To study the hydrobiology of Rajaram Tank, the following parameters were investigated such as shape and contour configuration, observations of physical parameters like temperature, humidity, rainfall, water level, water colour, turbidity, light penetration, chemical parameters like pH, dissolved oxygen, free carbondioxide, hardness of water and important nutrients like phosphates, nitrates and effect of pollution if any. In biological investigations study of micro flora and fauna always provides the clear picture of ecological status of existing water bodies.