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SURVEY REPORT No. 6

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IN THE COLLAIR LAKE

By

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The large Collair lake in Andhra Pradesh was surveyed by a team of two scientists of the Freshwater Fish Culture Division of the Central Inland Fisheries Research Institute during September, 1976 with the object of ascertaining the fish culture possibilities based on the environmental suitability with particular reference to the salinity regime of the lake and possible effects of pesticide washings on the fish fauna.

The help rendered and facilities provided during the survey by the Director of Fisheries, Andhra Pradesh and his officials particularly of Krishna and West Godavari districts are gratefully acknowledged. Thanks are also due to the Collectors of Krishna and West Godavari districts and the Block Development Officials at Kaikalur Taluk for their help in the successful completion of the survey.

Description of the Lake :

The Collair lake is located in the Krishna and West Godavari districts of Andhra Pradesh at 16.6°E lat. and 81.2°N long. The lake is connected to the sea through a tide-influenced 62 km. long natural drain called 'Upputeru'. As the inflow of water through large number of drains scattered all over the natural low-lying area situated between the Krishna and Godavari rivers is greater during monsoon months than the discharge through Upputeru, shallow bays are formed due to inundation of vast areas of land. The extent of the lake at the minimum lake level of + 0.91 m (m.s.l.) is 349.7 sq. km and at the maximum level of + 3.04 m (m.s.l. reached in the flood season of 1964) is recorded as 901.3 sq. km. At the time of survey, the lake level was between +1.82 m and + 2.13 m (m.s.l.), the water spread covering an area of about 647.50 sq.km. Further inflow was expected.

Prospects of Fish Culture based on Environmental Suitability :

A. Hydrological considerations :

Water samples, 35 in number were collected from different parts of the lake. Of these, 16 were from the lake proper, 3 from Upputeru canal and the rest from the ponds of sizes 4-16 ha besides one from demonstration pond of 1 ha area. Details of water analyses are given in the annexure.

The transparency of the lake water was high due to abundance of vegetation present all over the lake. However, turbidity ranging from 20-75 ppm was recorded in ponds, the maximum being in the smallest pond.

The water pH ranged from neutral to fairly alkaline reaction (7.0 - 8.6). Electrical conductivity varied from lower to higher side (0.239 - 1.305 milli mho/cm). The values at Kalakaru and Monagudem were high (over 1000 milli mho/cm) indicating the water therein to be rich in dissolved salts.

Total alkalinity, being on the higher side (87.20 - 174.40 ppm) was observed conducive for obtaining higher fish productions.

Of the two major nutrients, nitrogen and phosphorus, the concentration of the latter was low (traces - 0.08 ppm). As compared to nitrate nitrogen (traces - 0.04 ppm), ammonical nitrogen was more (traces - 0.25 ppm). The above nutrients, however, are bound to be low in the lake water since these are utilized by the vegetation.

The dissolved oxygen content in the lake water was fairly high being 5.40 - 13.64 ppm.

The salinity ranged from 0.099 to 0.471 ‰ during the month of September '76. The values were within the freshwater limit. In the smaller pond of 1 ha area, it was slightly more.

B. Biological considerations :

- 1) Vegetation : The lake abounds in a rich variety of aquatic vegetation belonging to submerged, floating and emergent groups. While the floating and emergent vegetations cover the lake surface all over, the submerged vegetation virtually blankets almost the entire bottom of the lake except the areas around Upputeru mouth and in Upputeru drain proper. The following were the weeds encountered during the survey.

- Eichhornia speciosa, Salvinia cuculata, Pistia stratiotes, Typha elephantina, Scirpus grossus, Cyperus spp., Ipomea aquatica, I. cornea, Limnanthemum spp., Nymphaea sp., Nelumbo nucifera, Marsilia quadrifoliata, Hydrilla verticellata, Ceratophyllum demersum, Nitella sp., Aponogeton monostachyon, Potamogeton crispus, Vallisneria spiralis, Chara sp., Najas spp., Spirogyra sp.

- 2) Plankton : Weeds taking away much of the nutrients from the medium, plankton was poor quantitatively (20 to 280 units/l ; less than 1.0 ml/cu.m. of lake volume) at the time of the survey. Zooplankton dominated over phytoplankton. Qualitatively, plankton composition remained more or less the same all over the lake as observed by the analyses of plankton from 20 stations. The common plankters encountered were as follows.

Phytoplankton - Oscillatoria sp., Nostoc sp., Spirulina sp., Phormidium sp., Lyngbya sp., Navicula sp., Asterionella sp., Gyrosigma sp., Synedra sp.

Zooplankton - Diffugia sp., Arcella sp., Euglypha sp., Paranema sp., Cyclops, Calanus, Diaptomus, Nauplii sp., Keratella sp., Brachionus sp., Hexarthra, Triarthra sp., Euchlanis sp., Daphnia sp., Chydorus sp., Diaphnosoma sp.

- 3) Periphyton : Good growth of periphyton comprising both the biotic and the abiotic constituents of seston was observed attached to the vegetation. Besides the normal constituents (i.e. diatoms, desmids, dipteran insects, rhizopod protozoans), colonies of Nostoc sp. were observed in plenty all over attached to the stalks of Limnathemum spp., Nymphaea sp., Nelumbo nucifera, Potamogeton crispus, Aponogeton monostachyon.
- 4) Biota : Biota encountered with were those that are associated with weeds. In view of the bottom being blanketed by dense submerged vegetation, bottom biota could not be examined. However, insects and their larvae (Diptera and Coleoptera), molluscs (gastropods and bivalves) and smaller fishes (cyprinids, cyprinodontids and perches) were observed abounding amidst the vegetation.
- 5) Fish and Fishery : Carps (Catla catla, Labeo rohita, L. calbasu, L. fimbriatus, Cirrhinus mrigala - termed 'white fishes') and 'Live' fishes (Anabas testudineus, Clarias spp., Heteropneustes fossilis, Channa spp., termed 'black fishes') constitute the lake fishery which is reported to yield annually about 7,500 tonnes of fish. Other fishes observed in the catches of a few traps and cast nets in operation (the 'closed' fishing season

having been over) as also in the market were : Puntius sarana, P. stigma, Oryzias melastigma, Ompok bimaculatus, Wallago attu, Rhinomugil corsula and Anguilla bengalensis.

Carp are known to be available in all the three areas mainly fished, they being (i) the lake proper, a freshwater zone, (ii) the zone between the lake and Upputeru which is influenced by the lake water from its northern end and by the tidal water from its southern end, and (iii) the tide-influenced 'Upputeru' stretching to the sea.

Carp spawn and fry find entry into the lake from the Krishna and Godavari rivers through channels traversing fields in the deltaic areas during monsoon and stay in the lake till the peak of summer. By late summer, almost the entire stock of auto-replenished carps is fished out. The carps are reported to attain 1.0-1.5 kg indicating their growth potential in the lake, a fact substantiated by the attainment of 200-250 g by catla, rohu and mrigal within a month and a half after their entry into the lake as fry.

The swampy condition of the lake favours the breeding of 'live' fishes which are reported also to grow well.

Inferences :

- i) The results of water analyses indicated that the hydrological conditions existing in the lake at the time of the survey were favourable to freshwater fish culture.
- ii) At the time of the survey, insecticides and pesticides were not being applied in the agricultural fields around the lake margin. It is reported that no large scale mortality of fish has been observed even when insecticides and pesticides are used in the fields and their washings drained into the lake. The ponds, any way, will not be affected by these washings in view of their being located within the lake away from the lake margins and their being protected by dykes all around.
- iii) The fact that carps occur all through the year at all points of the lake including Upputeru and its lower reaches (upto Laxmipuram down stream) where the water is reported to become brackish indicates that salinity remains well within the tolerance limit of carps.

- iv) The good performance of carp species as reported and observed, points to the vast scope the lake offers for their growth in the form of space, food (decaying vegetation, periphyton etc.) and shelter. The fauna associated with weeds (insects and weed fishes) serve as a rich pasture for predatory 'live' fishes. The unutilized resources of the lake could perhaps be exploited by the introduction of (a) grass carp for converting aquatic vegetation into fish flesh, and (b) malacophagous fishes such as Pangasius pangasius, Puntius dubius for converting the abundantly available molluscs such as Melanoides sp., Gyraulus sp., Planorbis sp., etc. (Pila being the dominant species, sustains a very good duck farming) into fish flesh. The 'seed' of prawns of commercial varieties available in areas around Upputeru and in Upputeru could also be tapped for culture purposes.
- v) Immediately after the monsoon season, portions of the lake may be cordoned off for allowing the trapped fishes to grow within confined areas so that they could be harvested as the water level recedes.
- The Andhra Pradesh Government has already embarked upon a project which envisages cordoning off areas between contour levels + 5 and + 7 into ponds with dykes at points selected by a special team consisting of Revenue Divisional Officers, Assistant Engineer (P.W.D.) and Assistant Director of Fisheries. The disposition of these ponds is such that each one caters to the needs of fishermen of a particular village. The team has selected 71 points and 26 ponds have already been constructed. While the ponds on Krishna district side of the lake are 16 ha each in area, the ponds on West Godavari side of the lake are 4 ha each in extent. These ponds have already been stocked with carp species at a combined stocking density of 5000 fish/ha.

Planned aquaculture through intensive culture of carps with emphasis on fertilization (both organic and inorganic) and supplementary feeding would yield substantially higher productions from these ponds. Best results in composite fish culture are obtainable in waters which does not exceed 2 1/2 ha in extent since it is not practicable to manure & fertilize larger sheets of water. The order of yield/ha/yr that can be expected is somewhat negatively correlated with water area. It may not be possible to attain production more than 2 t/ha/yr in larger water bodies.

Table 1 - Analytical data of water samples collected from the Collair lake/ponds.

Sl. Nos.	Places	Lake/pond	Temp. (°C)	Turbidity (ppm)	pH	Specific conductance m.mho/cm	Total alkalinity	as ppm			D.O.	Salinity ‰
								Phosphate (P ₂ O ₅)	Ammonia (NH ₃ -N)	Nitrate (NO ₃ -N)		
			(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1.	Bhujabhalapatnam	Lake	31.5	Clear	8.1	0.480	161.32	0.05	0.08	0.04	5.40	0.139
2.	"	"	31.2	Clear	8.1	0.528	156.96	0.04	0.07	traces	-	0.173
3.	Nathagullapedu	Pond(16ha)	32.0	Clear	8.5	0.660	161.32	0.01	0.18	0.01	7.56	0.225
4.	"	Pond (3 ha)	-	-	8.1	0.587	165.68	0.05	0.20	0.01	-	0.213
5.	"	Lake	31.2	Clear	8.6	0.587	170.04	0.01	0.15	traces	-	0.225
6.	Chinttapadu	Pond (16 ha)	32.2	27	7.3	0.587	143.88	traces	traces	traces	6.14	0.216
7.	"	Lake	31.9	Clear	7.4	0.528	143.88	0.01	0.25	0.03	-	0.171
8.	Upputeru canal	Akkividu Bridge	-	Clear	8.2	0.435	152.60	0.01	0.03	traces	3.24	0.142
9.	"	4 miles away	-	Clear	8.1	0.330	148.24	0.01	0.08	0.01	-	0.114
10.	"	6 miles away	-	Clear	8.2	0.377	148.24	0.01	0.05	traces	10.12	0.135
11.	Pandiripalligudam	Lake	-	Clear	8.2	0.370	143.88	0.02	0.20	0.01	10.12	0.126
12.	Gymmallappadu	Pond (16 ha)	31.0	22	7.7	0.583	174.40	0.01	0.08	0.01	10.12	0.471
13.	"	Lake	-	Clear	8.1	0.525	174.40	0.01	0.20	0.02	-	0.471
14.	Srügavarappadu	Pond (16 ha)	33.0	32	8.1	0.583	170.04	0.05	0.18	0.01	8.8	0.231
15.	Gokarnapuram	Lake	32.0	Clear	8.1	0.404	152.60	traces	0.01	traces	-	0.128
16.	"	Pond (16 ha)	33.1	29	7.4	0.583	165.68	0.01	0.07	traces	-	0.307
17.	"	Lake	-	Clear	7.5	0.656	165.68	traces	0.08	traces	-	0.307
18.	Dayampadu	Pond (16 ha)	32.0	37	7.1	0.528	143.88	traces	0.2	0.01	13.64	0.171
19.	Pratikollänka	Pond (16 ha)	30.9	20	8.1	0.239	148.24	0.03	0.04	0.01	-	0.135
20.	Fisheries Bunglow	Lake(centre)	31.5	Clear	7.0	0.350	130.80	0.08	0.01	traces	10.12	0.099

Sl. Nos.	Places	Lake/ area/pond	1	2	3	4	5	6	7	8	9	10
21.	Kovvalanka	Pond(16 ha)	32.8	30	7.1	0.525	148.24	0.01	0.02	traces	-	0.292
22.	Kalakurru	Pond(4 ha)	32.0	55	7.5	0.875	139.52	0.04	0.04	0.01	9.24	0.278
23.	"	Pond (1 ha)	32.2	75	7.3	1.305	87.20	traces	0.03	0.04	-	0.742
24.	Sripurra	Pond (4 ha)	31.8	35	7.3	0.746	117.72	traces	0.01	traces	11.00	0.242
25.	"	Lake	31.5	35	7.1	0.402	152.60	traces	0.02	traces	-	0.124
26.	Morogundam	Lake	-	Clear	7.1	0.402	143.88	traces	0.01	traces	-	0.132
27.	"	Lake	-	Clear	7.3	1.044	135.16	0.01	0.10	traces	-	0.332
28.	Haripuram	Lake	-	Clear	7.1	0.373	126.94	traces	0.07	0.02	-	0.114
29.	Ponang	Pond	32.2	50	7.3	0.290	148.24	traces	0.03	traces	8.36	0.106
30.	Jaypuram	Lake	-	Clear	7.3	0.373	139.52	traces	0.01	0.01	-	0.128
31.	Agadalanka	Pond(4 ha)	31.5	50	7.3	0.870	126.94	traces	traces	0.01	7.48	0.299
32.	"	Lake	-	-	7.3	0.475	148.24	traces	0.05	0.01	-	0.164
33.	Chettannapadu	Pond(4 ha)	Collected at night	-	7.5	0.875	170.04	traces	0.03	0.01	-	0.271
34.	"	Lake	"	-	7.7	0.435	152.60	0.01	0.05	0.04	-	0.142
35.	"	Lake	"	-	7.1	0.435	148.24	traces	traces	traces	-	0.135