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WATER QUALITY STUDIES RELATED TO FISHES OF KONDAKARLA LAKE, ANDHRA PRADESH

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INTRODUCTION

Studies on pisciculture of different water bodies in India were carried out by Das (1945), Alikunhi (1957), Banerjee (1967), Swingle (1967), Sreenivasan (1967), Sharma and Dutta Munshi (1995) ... *etc.* Jhingran (1991) dealt with the ecological aspects of water bodies for pisciculture. As nothing is known on the suitability of water quality for pisciculture in Kondakarla lake, the present investigation was undertaken to ascertain the same.

MATERIAL AND METHODS

Kondakarla lake is situated about 50 km south-west of Visakhapatnam in Andhra Pradesh between latitudes 17°35'30" and 17°36'02" N and longitudes 82°59'27" and 83°01'0" E. It covers an area of 6.5 sq. kms. Water samples were collected from the lake during three different seasons of the year 1997 and their analysis was done with the help of A.P.H.A. (1989). Fish fauna of the lake was collected from fishermen's catches.

RESULTS AND DISCUSSION

The physico-chemical parameters of the lake water and the ranges for fish growth are given in Table-I. According to Jhingran (1991) a depth of about 2 metres is congenial for fish productivity in a pond. In shallow ponds, sun light penetrates upto the bottom, warms up the water and facilitates the increase in productivity. This proved true in the case of Kondakarla lake which is a shallow with a depth of about 2 metres with light penetrating to the bottom. Das (1945) stated the upper lethal temperatures for fishes like *Anabas testudineus, Channa punctatus, Heteropneustes fossilis, Clarius batrachus, Puntius ticto, Rasbora daniconius* and *Glossogobius giuris* lying between 39°–41°C. All these fishes are also found in Kondakarla lake, with the water temperatures ranging between 22° and 32°C. The suggested ranges of this parameter for fish growth is 20°–14°C.

Table I. Physico–Chemical Parameters of Kondakarla Lake.

Ser no.	Parameter	Cheemanapalle			Avasomavaram			Rajam			Centre Point			Kondakarla Village			Vadrepalle			Haripalem			Ranges in which fish grows
		S	M	W	S	M	W	S	M	W	S	M	W	S	M	W	S	M	W	S	M	W	
1	Temperature Air (°C)	32	31	23	32		25.5	32	31	26	32	31	26.5	31	31	23	32	31	28	32	31	29	
2	Temperature Water (°C)	29	29	22.5	29		24	29	29	24	29	31	24	29	29	22	29	30	25	29	30	25	20 – 41
3	pH	7.5	8.5	7.5	7.2		7.5	7.4	8.5	7.5	6.9	8.5	7.0	7.3	8.9	7.0	7.2	8.5	7.0	7.1	8.5	8.0	6.5 – 8.5
4	E. Conductivity (m. mhos/cm)	840	1340	780	730		630	810	860	540	520	1640	80	560	960	830	430	1090	510	960	720	830	430 – 1200
5	Turbidity (NTU)	6	60	8	540		6	5	50	8	6	60	6	5	50	8	20	10	8	4	60	8	5 – 300
6	Dis. Oxygen (mg/litre)	7.5	8.2	3.2	7.2		5.8	7.9	12.2	6.6	9.4	16.2	0.8	2.4	5.6	3.0	2.8	9.2	6.0	3.4	9.8	5.0	4 – 9
7	Total Alkalinity (mg/litre)	190	185	295	200		135	155	255	230	120	160	165	430	290	300	235	210	80	280	315	350	100 – 300
8	Total Hardness (mg/litre)	140	80	165	125		155	135	210	155	110	145	110	185	430	200	120	230	150	175	295	270	15 – 250
9	Calcium (mg/litre)	46	17	48	38		40	40	34	42	31	32	27	59	92	61	40	52	40	36	50	59	25 – 80
10	Magnesium (mg/litre)	7	10	12	9		15	10	31	13	9	17	11	11	51	13	6	38	13	22	38	32	5 – 40
11	Chloride (mg/litre)	149	170	110	142		80	142	175	75	146	115	45	184	210	70	156	145	55	160	185	70	70 – 180
12	Nitrate N (mg/litre)	1	2	2	1		2	1	1	2	1	2	2	1	4	3	1	3	3	1	5	3	0.2 – 4.0
13	Phosphorus (mg/litre)	NIL	15	10	Traces		15	NIL	10	5	Traces	5	5	NIL	5	10	Traces	40	5	Traces	10	10	0.5 – 4.0

S = SUMMER M = MONSOON W = WINTER

Turbidity forming a limiting factor in the productivity of a water body, varies with the nature of the basin of the water body, degree of exposure, nature of inflowng sediments...*etc*. Lakes with clay bottom are likely to have more turbidity, restricting the penetration of sun light and reducing the photosynthetic activity, which in turn influence the productivity of water mass. Turbidity tolerance of different cultivable fishes have not anywhere been studied systematically, but it is found that fish grows between the range of 5–300. Indian major carps and other culturable plain-dwelling fishes are known to tolerate the prevailing high ranges of turbidty (Jhingran, 1991).

Light penetration depends on the intensity of light which varies with geographic location of the water body between latitudes, while the shade provided by the surrounding vegetation, however, affects the incidence of light on the water body (Jhingran, 1991). Kondakarla lake being a shallow one, light penetrates to the bottom. Sreenivasan (1967) studied electric conductivity of a number of fish ponds and reported that above 400 micromhos'/cm. The range of this parameter in Kondakarla lake water varied from 430–1640 micromhos'/cm, favouring productivity. A good fish growth in a water body, occurs between 430–1200 of the factor.

Lake water receives oxygen either by absorption from atmosphere at the surface or from photosynthesis of chlorophyll bearing organisms inhabiting the water body (Jhingran, 1991). The animal community inhabiting the water body requires dissolved oxygen for respiration and releases carbon-di-oxide as catabolic product. Oxygen is consumed by respiration of animal and aquatic plants as well as the putrefication of organic mater and other cuases. The dissolved oxygen at Kondakarla lake ranged from 0.8 to 16.2 mg/lit. Dissolved oxygen between 4–9 is favourable for fish production as the ecosystem is able to support the development of large fishes with high metabolic rate in this range. Low dissolved oxygen level is responsible for abundance of small sized weed fishes with low metabolic rate. In the case of Kondakarla lake, dissolved oxygen was noticed within this range at majority of the spots investigated yielding fishes of larger size.

Swingle (1967) stated that waters having pH range of 6.5 to 8.5 as recorded before day-break are congenial for pisciculture, while those having pH values more than 9.5 are unsuitable due to non-availability of carbonates. Fish mortality generally takes place at about 11 pH. Most of the pH values of Kondakarla lake water recorded during morning hours were found in the above range, favouring fish production.

According to Alikunhi (1957), highly productive waters will have alkalinity more than 100 mg/ lit., but is found that 100–300 is favourable for its augmentation. Total alkalinity of Kondakarla lake water varied between 120 and 430 mg/lit., indicating its suitability for pisciculture.

The total hardness in the lake water recorded from 80 to 430 mg/lig., is suitable for satisfactory growth of fishes. Swingle (1967) observed that more than 15 would be congenial for the purpose. The author suggests that upto 250 mg/lit. of this factor is permissible for fish growth and in majority of the spots of the ecosystem, the value is found with in this range.

Banerjee (1967) reported tha 0.2 mg/lit. of Nitrate is required for fish production. Nitrate component in the ecosystem was recorded from 1 to 5 mg/lit., indicating favourable condition for fish production. Proper fish growth rate needs 0.2 to 4.0 mg/lit. of this parameter in any water body.

Phosphorus is also stated to be an important factor for pond fertility, eventhough it occurs in a small quantity. It varied from 0 to 15 (exceptionally 40) in the present study. Sreenivasan (1967) stated that phosphorus less than 0.5 mg/lit. is indicative of poor productivity. According to the author, the factor between 0.5 to 4.0 is congenial for fish production.

From the above discussion, it is evident that most of the water properties of Kondakarla lake are favourable for fish production, while other factors as phosphorus do not have any inhibitory effect on pisiculture.

Out of the 17 species of fishes recorded from the lake (Table-II), *Notopterus noptopterus, Mystus vittatus, M. bleekeri* and *Salmostoma bacaila* are larvivorus and can suitably be employed for pest and vector control. *Rasbora daniconius* and all the *Puntius* species have ornamental value and suitable for aquaria. *Clarius batrachus* is a food fish and can also be used as a test animal for

Table II. Fishes recorded from Kondakarla lake.

1. *Notopterus notopterus* (Pallas)
2. *Salmostoma bacaila* (Ham-Buch)
3. *Rasbora daniconius* (Ham.)
4. *Puntius* sp.
5. *P. ticto* (Ham-Buch)
6. *P. sophore* (Ham.)
7. *Mystus vittatus* (Bloch)
8. *M. bleekeri* (Day)
9. *Clarius batrachus* (Linn)
10. *Heteropneustes fossilis* (Bloch)
11. *Channa punctatus* (Bloch)
12. *Ambassis* sp.
13. *Chanda nama* (Ham.)
14. *Glossogobius giuris* (Ham.)
15. *Oreochromis mossambica* (Peters)
16. *Anabas testudineus* (Bloch)
17. *Mastacembalus pancalus* (Ham.)

the biological assay of pituitary harmones. *Heteropneustes fossilis* is commercially important due to its invigorating quality of flesh. Although *Ambassis* is not suitable for eating, some of its species are used as a manure, while others are of ornamental value for aquaria. *Chanda nama* is used not only as food but also in the control of guinea worms for malaria control. It also contributes largely to the artisinal fish catches in some states. *Glossogobius giuris* forms minor fishery in some places like Hooghly estuary in West Bengal. Eventhough *Oreochromuis mossambica* is a good food fish in India, it is unsuitable for aquaculture along with other major carps due to its depredation on carp fry. *Anabas testudineus* is regarded as highly esteemed for its fine flavour, restorative values and prolonged freshness when kept out of water. It can also be cultured single or in combination with *Heteropneustes fossilis*, which is also suitable for cultivation in ponds and reservoirs. Hence a composite fish culture (also called as **Polyculture**) is suggested for the lake, as its main objective is to grow more number of species with varied feeding habits, utilising all types of food available in the water body.

SUMMARY

Water quality and fish composition were studied in Kondakarla lake during the three seasons of the year 1997 to ascertain suitability of the lake for pisciculture. The ichthyofauna of the water body comprises 17 species of fishes promising rich aquacultural potential. Suitability of the water quality for piscuculture and economic importance of fishes have been discussed.

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