

Status of Plankton in Impoundments in Major Reservoirs of Andhra Pradesh

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Seasonal variations in the composition and distribution of plankton of some selected reservoirs in Andhra Pradesh are reported. Zooplankton was dominant in all the nine reservoirs surveyed while phytoplankton was, in general, poor. Post-monsoon samples had maximum standing crop and it was minimum during monsoon. The reservoirs showed two pulses of plankton during post-monsoon and pre-monsoon periods.

Key words : Plankton, impoundment, reservoir, oligotrophic, mesotrophic

The state of Andhra Pradesh is having a number of reservoirs (area : 2.8 lakh ha) intended for irrigation and power generation. They offer ample scope for fish culture and fishery development in the state. There is a tremendous scope for enhancing inland fish production in these water bodies through scientific management. Studies on reservoir ecosystems in Andhra Pradesh are limited (David *et al.*, 1969; Sugunan, 1980; Ghosh & George, 1989). As a part of integrated project work, survey of fishery and ecology of nine reservoirs from different agro-climatic conditions belonging to different river system was undertaken. The qualitative and quantitative distribution of plankton of these reservoirs is reported in this communication.

Materials and Methods

The survey was conducted during three seasons, viz., pre-monsoon (April-May), monsoon (August-September) and post-monsoon (October-November). Morphometric and hydrological data were collected from the respective dam authorities. Samples of water, soil and biotic communities were collected from the lentic zone covering both the banks and analysed (APHA, 1992). The nine reservoirs surveyed were Nagarjunasagar, Srisailem, Musi and Wyra under Krishna river system; Singur, Kadam and Lower Manair Dam (LMD) under Godavari river system; Mid Penna Dam (MPD) and Somasila under Penna river system (Fig. 1).

Manair Dam (LMD) under Godavari river system; Mid Penna Dam (MPD) and Somasila under Penna river system (Fig. 1).

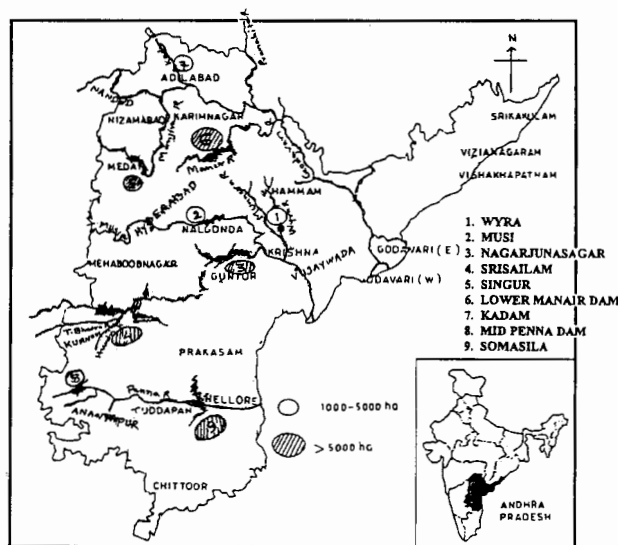


Fig. 1. Distribution of reservoirs in Andhra Pradesh

Results and Discussion

Morphometric and other details of the reservoirs are presented in Table 1. The soil in all the reservoirs was alkaline with pH ranging from 7.2 (Musi) to 8.1 (Somasila). Average water temperature (Table 2) ranged from 27.3 (Singur) to 29.5°C (LMD and Somasila). Water transparency varied from 70 (Musi) to 198 cm (Nagarjunasagar). Most of the reservoirs showed clear water with mean transparency above 1 m showing the euphotic

Table 1. Location, morphometric and hydrological features of A. P reservoirs

Reservoir River	Krishna River System			Godavary River System			Penna River	
	Wyra Wyra	Musi Musi	N. Sagar Krishna	Srisaillam Krishna	Singur Manjira	LMD Mannair	Kadam Kadam	MPD Penna
Latitude (N)	17° 11'	17° 14'	16° 34'	16° 50'	17° 45'	18° 24'	19° 18'	14° 52'
Year of construction	1930	1963	1969	1984	1989	1986	1958	1964
Elevation (m) MSL	95.8	196.6	179.8	269.7	523.6	280.5	213.4	365.7
Maximum depth (m)	18.6	15.3	106.7	102.1	23.6	21.9	28.4	30.4
Mean depth (m)	3.9	5.2	40.5	14.2	5.1	8.4	8.9	8.5
Area at FRL (ha)	1626	2507	28474	61404	16534	8103	2474	1703
Catchment (km ²)	707	9056	215194	205247	16035	6475	2580	1354
Catchment area	43	361	756	334	97	80	104	79
Average area (ha)	1074	1400	18429	33689	8700	4833	1842	889
Annual inflow (10 ⁶ m ³)	193.7	87.7	42358	36449.9	595.8	661	773.1	373.8
Shore Dev. Index	5.6	3.6	7.9	12.9	8.4	4.7	8	3.5

zone to be more than 2 m throughout the year. High turbidity during monsoon was observed only in Wyra, Musi and Somasila.

Alkaline pH of the water (Table 2) reached higher values during pre-monsoon. Dissolved oxygen (DO) was well marked within the limit (6.8 to 8.4mg/l). Higher concentration of DO occurred during pre- and post-monsoon months. Total alkalinity (TA) in all the reservoirs was above 100 mg/l except in MPD (95mg/l). Free carbondioxide was not recorded in surface waters in any reservoir. Conductivity and total dissolved solids showed similar trend in seasonal distribution.

Nutrient status of the reservoirs was very poor. However, the level of nutrients improved during post-monsoon months which may be attributed to the allochthonus inputs received by the reservoir.

The variations in the concentrations of plankton are shown in Table 3. Zooplankton was found to predominate in Wyra, Musi, Singur and MPD. Post-monsoon months showed maximum density of plankton. In general, two plankton pulses occurred, during post-monsoon and pre-monsoon seasons. Phytoplankton was generally poor in all the reservoirs. However, diatoms occurred significantly in Musi, *Myxophyceae*

Table 2. Physico-chemical characteristics of water (mean value) in reservoirs of A.P.

	Wyra	Musi	N. Sagar	Srisaillam	Singur	LMD	Kadam	MPD
Temperature (°C)	29.4	29.3	28.7	28.2	27.3	29.5	29.3	27.9
Transparency (cm)	74	70	198	136	136	145	100	128
pH	8.8	8.8	8.7	8.3	8.6	8.7	8.8	8.5
DO (mg/l)	6.8	8	8.4	8	7.3	7.5	8	7.6
CO ₂ (mg/l)	24	27	17	27	24	27	27	15
HCO ₃ (mg/l)	170	188	95	80	108	99	123	80
TA (mg/l)	194	225	112	107	132	126	150	95
Sp. condu (uS/cm)	610	1240	516	543	333	383	406	316
Hardness (mg/l)	139	183	107	102	112	102	124	80
NO ₃ -N (mg/l)	Tr-0.68	0.07-0.82	Tr-9.86	Tr-0.60	Tr-0.82	Tr-0.74	Tr-0.56	0.05-0.62
PO ₄ -P (mg/l)	Tr-0.01	Tr-0.02	Tr-0.01	Tr-0.02	Tr-0.02	Tr-0.01	Tr-0.01	Tr-0.02
SiO ₂ -Si (mg/l)	11.8	8.9	8.8	7.9	9.2	8.5	13.9	7.8

Table 3. Plankton abundance (No/l) in A. P reservoirs

	Wyra	Musi	N. Sagar	Srisailam	Singur	LMD	Kadam	MPD
Volume ml/m ³	1.03	2.08	0.12	0.41	0.13	0.33	0.44	0.76
Myxophyceae	22	16				10		
Chlorophyceae	6	21	1	12	24	2	6	32
Bacillariophyceae	27	63	8				3	
Protozoa	22	5		11	1	4	1	19
Rotifera	40	67	70	12	63	6	32	102
Cladocera	179	300	23	33	117	41	64	194
Copepoda	111	195	73	84	85	51	72	212
Total plankton	407	667	175	152	290	114	178	559

in Somasila and *Chlorophyceae* in Singur (Table 3). *Microcystis* occurred in Musi and Somasila, *Anabaena* in Wyra. Desmids were recorded in all the reservoirs except in the eutrophic Musi. Diatoms were represented by five species in Musi of which *Gyrosigma* was more prevalent.

Despite their considerable depth Nagarjunasagar and Srisailam showed no marked thermal stratification. Temperature difference between the surface and bottom strata was rather small. In monsoon months, almost isothermal condition prevailed in the water column. Presence of Pennales and comparatively low nutrients in most of the reservoirs indicate that they are tending towards oligotrophic conditions (Pathak, 1979). Blooms of *Microcystis* and *Elosira* are indicators of eutrophic waters. The reservoirs studied, however, had no blooms. According to Rawson (1956) *Ceratium* is mesotrophic form and represents an intermediate stage in the evolution from oligotrophy to eutrophy. In Wyra and Musi the high alkalinity and thermal stratification suggest that these two reservoirs are passing through eutrophic phase (Pathak, 1979). These conditions coupled with heavy drawal of water for irrigation and drinking purposes inhibit plankton growth, making them oligotrophic.

Plankton crop in the reservoirs increased with decrease in water level (Hynes and Anthony, 1964). During pre- and post-monsoon seasons the standing crop of

plankton was high. In the monsoon, when the fluvial condition prevails, plankton population declines (Sugunan, 1980). Zooplankton was abundant during the three seasons in all the reservoirs especially in Wyra, Musi and MPD. In LMD, Kadam and Srisailam, however, the maximum was in pre-monsoon and in others in post-monsoon months. The fluctuations might be due to influence of season on the food of plankton (Armeno, 1965). *Arcella* is the common species of protozoa occurring in all the reservoirs. *Brachionus* was the most dominant form representing Rotifers which occurred in all the reservoirs. *Diaphanosoma* and *Daphnia* occurred in small numbers mainly during summer. Among Copepoda, Calanoid (*Diaptomus*) were prevalent followed by Cyclopoid (*Cyclops*) and larval copepods.

Drawdown from the reservoir for agricultural purposes mainly determines the depth of reservoir which influences the shrinkage of waterspread and loss of plankton. The significant increase in nitrate and phosphate during post-monsoon months in Kadam and Nagarjunasagar may be attributed to the allochthonous inputs received by the reservoir. MPD and Musi had higher densities of plankton followed by Wyra, Singur and Somasila. Rotifers were lesser in LMD and Kadam reservoirs.

It is significant that relatively shallow reservoirs had higher concentration of

zooplankton. The present study thus provides some useful guidelines in formulating management packages to augment fish production in such water bodies.

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References

- APHA (1992) 18th edn., American Public Health Association, New York
- Arnemo, R. (1965) Report No. 46, Institute of Freshwater Research, Drottingholm
- David, A., Rao, N.G.S. and Rahman,

M.F. (1969) *Survey report*, Central Inland Fisheries Research Institute, Barrackpore, 5, 36p.

- Ghosh, A. and George, J.P. (1989) *Indian J. Environ.Hlth.*, **31**, pp 49-53
- Pathak, V. (1979) *J. Inland Fish Soc. India*, **11**, pp 49-56
- Sugunan, V.V. (1980) *J. Inland Fish Soc. India*, **12**, pp 79-85
- Sukumaran, P.K. and Das, A.K. (2002) *Environ. & Ecol.*, **20**, pp 873-880
- Wishard, S.K. and Mehrotra, S.N. (1988) *J. Inland Fish Soc. India*, **20**, pp 42-50