

CLADOCERAN INVESTIGATIONS IN A POND WITH MACROPHYTES AND ALGAL BLOOMS

M. B. RAGHUNATHAN

Zoological Survey of India
Western Ghat Regional Station, Calicut.

INTRODUCTION

Kovur pond is rectangular with an area of 0.5 ha. and an average depth of 0.75 M. The pond has only one inlet on the northern side and no outlet. It mainly depends on the rain water besides the flow from the inlet coming from Chambarambakkam tank. Kovur is 20 km west of Madras city and fringed with fields. During the period of investigation aquatic macrophytes such as *Pistia* and *Neptunia* were noted. There is no regular fishing in this pond and occasional hook and line catches reveal the following species namely *Puntius* sp. *Channa* sp. and *Mystus* sp.

MATERIAL AND METHODS

Studies were undertaken from October 1979 to March 1982 by collecting monthly samples. For plankton collection 0.25 M. nylon net (0.3 mm. mesh size) was utilised. The net was thrown so that the attached rope (2.55 M.) was in the water and in this manner plankton was collected (Hebert, 1977). For each sample four throws were made. The collected samples were preserved in 5% formalin and made upto 250 ml. From this a subsample of 2 ml. was examined in Sedgewick-rafter cell, for counting purposes. Total number of specimens collected were given for 500 litres of water filtered assuming the filtration efficiency of the net is 100% (Rawson, 1956). For taxonomic studies cladocerans were separated and identified.

Surface water samples collected were analysed for dissolved oxygen and pH. Dissolved oxygen was estimated by Winkler method with azide modification. pH was measured in the field by using wide and narrow range BDH papers. The values were again corroborated in the laboratory by using Philip's pH meter. Transparency values were noted by using a Secchi disc. Further other parameters like depth, air temperature, water temperature and weather conditions were noted.

RESULTS

Physico-Chemical parameters (Table - 1, Page 84)

The air temperature range was between 23.0° and 32.0°C with minimum during December 1981 and maximum in March, 1980. Water temperature range was between 23.5° and 31.5° C with minimum in December 1981 and maximum in April 1980. Depth of water was in the range of 0.60 to 1.20 M. The transparency value could be taken only

upto October 1981. Subsequent to that pond surface was completely filled with *Pistia* and *Neptunia*. The transparency values were in the range of 0.10 to 0.50 M. with minimum in April 1980 and maximum in September 1981. The pH values were in the range of 6.8 to 9.0 with minimum in February 1982 and maximum in March 1980. The dissolved oxygen values were in the range of 0.7 to 7.5 mg/l, with minimum in October 1981 and maximum in March 1980.

Biological factors (Table - 2, Page 85)

The pond can be divided into different periods depending on algal blooms and macrophytes. The first period is between Oct. 1979 to Jan. 1980 during which water was clear without macrophytes and algae. The cladoceran species noted during this period are *Ceriodaphnia cornuta*, *Moina micrura* and *Alona guttata*. During the second phase between Feb. 1980 to July 1980, *Microcystis* bloom was noted. During this period *Ceriodaphnia cornuta* and *Moina micrura* were noted. The third phase from August 1980 to October 1980 during which no bloom was noted. Only these two species of cladocerans namely *Ceriodaphnia cornuta* and *Moina micrura* continued with maximum of *M. micrura* (102375) and maximum of *C. cornuta* (31844). The next phase was noted between November 1980 to January 1981 with algal blooms. During this period also both the species of cladocerans continued to be noted in good numbers. From Feb. 1981 to April 1981, the whole pond was covered with *Pistia* sp. Both the species of cladocerans namely *C. cornuta* and *M. micrura* started diminishing in numbers with *C. cornuta* completely disappearing. On the other hand *Diaphanosoma excisum*, *D. sarsii*, *Chydorus reticulatus*, and *Alona guttata* started appearing. The sixth phase from June 1981 started with contamination of water with many fishes floating. *Pistia* was completely removed. Again after this *Microcystis* started increasing upto July 1981. In this period *C. laticaudata* started appearing in good numbers. *M. micrura* also recorded an increase in numbers and *D. excisum* and *C. reticulatus* continued to occur. In the next seventh phase from Aug. 1981 to March 1982, the pond was completely covered with *Pistia* and *Neptunia*. *C. laticaudata* continued to occur with maximum in Aug. 1981. *M. micrura* showed a decline with absence from Jan. 1982. *D. excisum*, *C. reticulatus* and *A. guttata* were continued to occur. *Macrothrix spinosa* started appearing in the samples.

DISCUSSION

From the results it is probable that *Moina micrura* and *Ceriodaphnia laticaudata* can exist and increase in enormous numbers even at low dissolved oxygen values. Krishnamurthy (1967) also observed that dissolved oxygen values so low as 0 to 2.0 mg/l. were more suitable for the increase of *M. micrura*. On the other hand *C. cornuta* can increase in numbers only at slightly higher dissolved oxygen values from 4.0 mg/l. Raghunathan (1984) has recorded *C. cornuta* in more numbers when the dissolved oxygen values were between 4.0 to 8.1 mg/l. from Chingleput tank. *D. excisum* can increase in numbers in a wide range of dissolved oxygen values from 2.9 to 7.7 mg/l. Other Cladocera such as *C. reticulatus*, *A. guttata* and *M. spinosa* were present in the samples only when the water was covered with macrophytes like *Pistia* and *Neptunia*.

Among the cladocerans few genera are planktonic which live in the open water while a vast majority of them are littoral and live among the weeds and some of them even live on the bottom mud (Michael, 1973). Among the eight species of Cladocerans collected *Moina micrura* and *Ceriodaphnia cornuta* are the two species which are noted to survive during *Microcystis* blooms. *D. excisum* was also noted in small numbers during algal blooms. On the other hand after the spread of macrophytes *C. cornuta* could not survive and *M. micrura* started diminishing. But *C. laticaudata*, *M. spinosa*, *C. reticulatus* and *A. guttata* were noted only along with the macrophytes.

SUMMARY

Cladoceran investigations were carried out in an eutrophicated pond near Madras from October 1979 to March 1982. Eight species of Cladocerans were noted. Composition of Cladocerans varied in accordance with algal blooms and macrophytes. Other parameters like transparency, temperature, pH and dissolved oxygen were also recorded.

ACKNOWLEDGEMENTS

The author is grateful to the Director, Zoological Survey of India, Calcutta, to Dr. R. S. Pillai, Joint Director, Southern Regional Station, Zoological Survey of India, Madras and to Dr. G. U. Kurup, Officer-in-Charge, Western Ghat Regional Station, Zoological Survey of India, Calicut for encouragement and facilities.

REFERENCES

- Hebert, P.D.N. 1977. A revision of the taxonomy of the genus *Daphnia* (Crustacea : Daphnidae) in south eastern Australia. *Aust. J. Zool.* 25 : 371-398.
- Krishnamurthy, K.P. 1967. Studies on *Moina dubia* Gurney and Richard (Daphnid : Microcrutacea) from Oxidation ponds at Nagpur India. *Symposium on crustacea part II CMFRI, Cochin.*
- Michael, R.G. 1973 Cladocera. In a guide to the study of fresh water organisms. *J. Madura Univ. Suppl.* 1 : 71-85.
- Raghunathan, M.B. Studies on freshwater Cladocerans of Tamil Nadu. 2. Chingleput tank. (*Bull. zool. Sur. India.*)
- Rawson, D.C. 1956 The net plankton of Great Slave lake. *J. Fish Res. Bd. of Canada*, 13 : 53-127 .

Table 1 : Physicochemical data. Air temperature, Water temperature, transparency, pH and dissolved oxygen.

Month	A. Temp. °C	W. Temp. °C	Transp. M	pH	D. O. mg. / l.
Oct. 1979	27.0	29.0	0.30	8.5	4.1
Nov. 1979	26.0	27.0	0.40	8.0	3.7
Dec. 1979	28.0	27.0	0.35	8.5	4.4
Jun. 1980	26.0	25.5	0.30	8.3	0.8
Feb. 1980	26.5	27.5	0.30	8.2	2.3
Mar. 1980	32.0	29.5	0.20	9.0	7.5
Apr. 1980	30.0	31.5	0.10	8.5	3.9
May 1980	28.5	31.0	0.20	8.0	1.3
Jan 1980	27.0	29.5	0.30	8.0	6.5
Jul. 1980	30.0	29.0	0.20	8.0	5.7
Aug. 1980	29.0	29.6	0.19	7.8	2.35
Sept. 1980	31.0	30.5	0.30	7.9	6.2
Oct. 1980	27.0	28.0	0.20	7.7	5.1
Nov. 1980	26.0	26.0	0.25	7.3	3.7
Dec. 1980	24.0	24.7	0.25	7.7	6.9
Jan. 1981	23.5	25.0	0.30	7.2	6.5
Feb. 1981	24.0	26.5	0.35	7.5	5.2
Mar. 1981	27.0	29.0	0.25	7.3	4.6
Apr. 1981	29.0	29.0	0.35	7.4	1.5
May 1981	29.0	30.0	0.30	7.3	2.9
June 1981	30.0	29.5	0.15	7.6	2.1
July 1981	27.0	27.5	0.15	7.2	1.9
Aug. 1981	28.5	29.5	0.20	6.9	1.4
Sept. 1981	28.5	29.5	0.50	7.0	1.6
Oct. 1981	28.5	27.0	0.30	7.0	0.7
Nov. 1981	26.0	26.5	—	6.9	1.7
Dec. 1981	23.0	23.5	—	6.9	1.2
Jan. 1982	24.5	24.0	—	7.0	0.9
Feb. 1982	26.0	24.5	—	6.8	1.9
Mar.. 1982	29.5	27.0	—	6.9	1.1

Table 2, Biological factors : Cer. c.-*Ceriodaphnia cornuta*., C. lat.-*Ceriodaphnia laticaudata* M.m-*Moina micrura*., D. ex.-*Diaphanosoma excisum*., D. sar-*Diaphanosoma sarsi*, Mac.s.-*Macrothrix spinosa*., Chy.r.-*Chydorus reticulatus*., Al.g.-*Alona guttata*.

Month		Cer.c.	C. lat.	M. m.	D. ex.	D. sar	Mac. s.	Chy. r.	Al. g.	Remarks
Oct.	79	125		250	-	-		-	125	CLEAN
Nov.	79	5875		4125	-	-		-		"
Dec.	79	250	-	500				-		"
Jan.	80	1000		1125	-	-		-	125	"
Feb.	80	8625		5875				-		Microcystis
Mar.	80	500	-		-			-		"
Apr.	80			16250			-	-		"
May	80	-		24000	-			-		"
Jun.	80	10500		31750	-	-		-		"
Jul.	80	1125	-	15750			-	-		"
Aug.	80	8250		102375				-		CLEAN
Sep.	80	15042		20625		-	-	-		"
Oct.	80	31844		9458	-	-	-	-		"
Nov.	80	5833	-	39758	-		-	-		Microcystis
Dec.	80	4875	-	25708				-		"
Jan.	81	4375		6250				-		"
Feb.	81	958	-	1000	375		-	-		Pistia
Mar.	81	560		875	281	344		-		"
Apr.	81			335	2792	-		125	625	"
May	81			1906				-		Waterspoil
Jun.	81		37187	2406				500		Microcystis
Jul.	81		7915	21542	125			920		"
Aug.	81		43969	4092	1031		-	-		Pistia
Sep.	81		7156	2469	2312			125		"
Oct.	81	-	2844	125	406			1031		"
Nov.	81	-	14125	594	200			250		"
Dec.	81		562	250	300		375			"
Jan.	82		594				532	601		"
Feb.	82	-	814		125		1312	125	281	"
Mar.	82		625		125		125	200	125	"