

STUDIES ON SOME ECOLOGICAL IMPACTS OF THE REDUCTION IN THE FLOW OF WATER, BELOW THE IDUKKI DAMS, IN THE PERIYAR RIVER IN KERALA

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INTRODUCTION

Idukki project in Kerala is one of the major hydro-electric projects in India. The Idukki reservoir is formed by the construction of three dams across Periyar and its tributary Cheruthoni rivers (Fig. 1). The commissioning of the project in 1976 has led to the stoppage of the flow of water, below the dams, along a stretch of Periyar river, the most important of the 41 rivers flowing through Kerala. The tailrace waters that leave the power generators at Moolamattom enter the Muvattupuzha river.

Apart from the reservoir inundating 59.8 sq. kms of forest land and thereby altering the ecosystem of the area and its environs, the diversion of the waters of one river system to another naturally affects the biotic and abiotic factors of both the rivers. Not much is known from the world over, and practically nothing from India, of the cumulative ecological impacts of such major changes brought about by a hydel project. An attempt, therefore, has been made to assess some of the ecological impacts of the curtailment in the flow caused by the diversion of the waters of Periyar river.

MATERIAL AND METHODS

Data on the quantum of tailrace waters discharged into the Muvattupuzha river, which in reality is equal to the loss of water of Periyar river, since the commissioning of the project, were collected from the Kerala State Electricity Board (KSEB) and the average loss was calculated on the basis of such data. Besides data on changes in the chloride content of the Periyar river in its lower reaches during the summer seasons of the last 11 years (1973 - 1983) were procured from the records, based on daily measurements taken, of the Fertilizers and Chemicals of Travancore (FACT). These data were verified with those collected and maintained, on a daily basis, by the Travancore Cochin Chemicals (T.C.C.). Information on the major biotic life of the river for the pre-project period was gathered by systematically questioning 30 longtime inhabitants and fishermen who reside along the banks of the river in its lower reaches. Data on the year round representation, for the period from 1980 to 1983, of some of the major forms of aquatic life, were collected by making collections from the river waters and also examining catches made by fishermen. Information on the quality of water supplied to Cochin city is based on the records of the Public Health Engineering Department (PHED) of Kerala State.

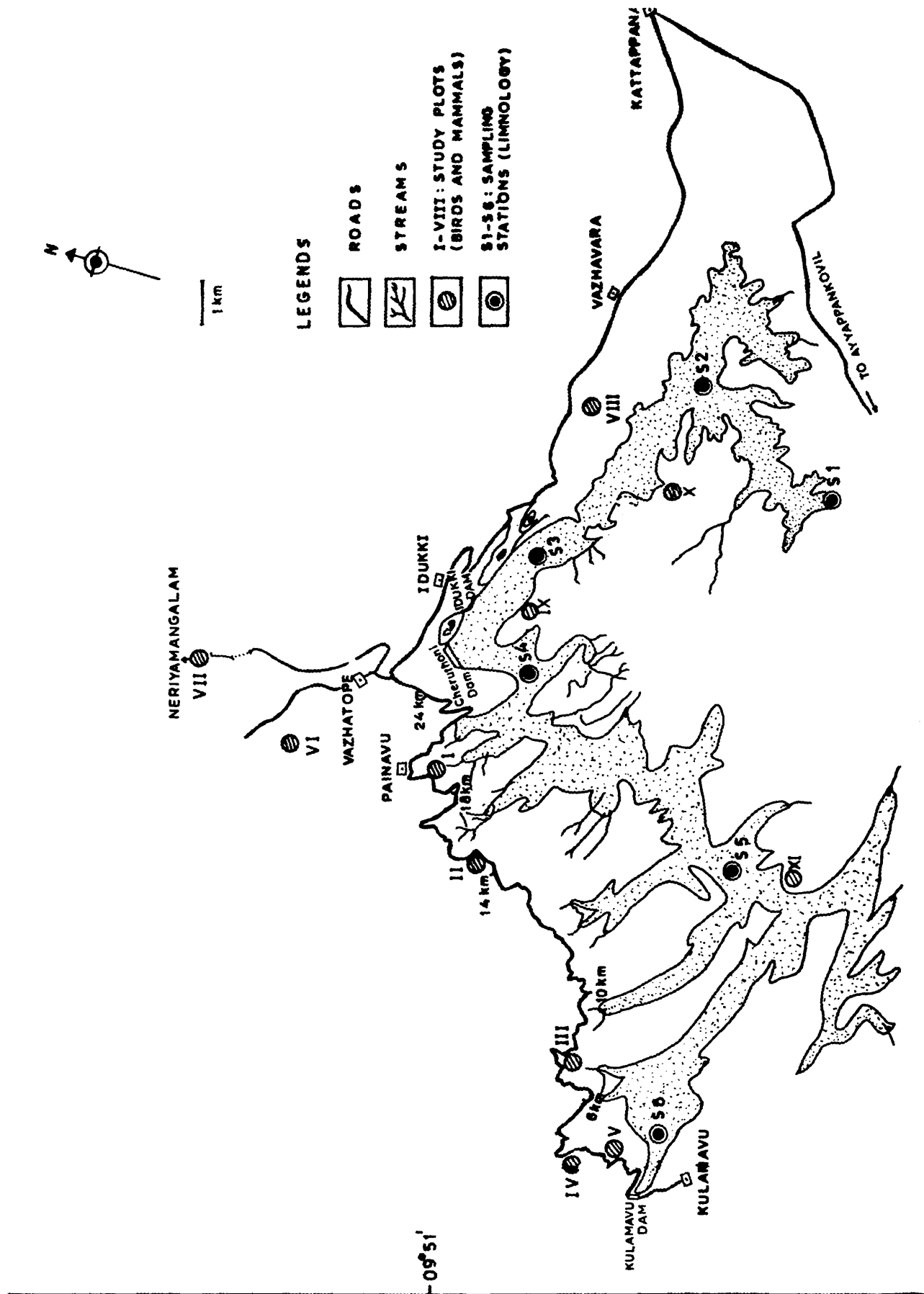


Fig. 1. Area showing Periyar and Cheruthoni the three dams and the idukki reservoir.

RESULTS AND DISCUSSIONS

A. *Reduction in the flow and its impact on the chloride content of Periyar river*

KSEB reports that since the commissioning of the project in 1976, 200 M. cft of water, on an average, is entering the Muvattupuzha river as tailrace and hence the flow of water in a day in the Periyar river, below the Idukki dams, on an average is reduced by 200 M. cft. This average loss may not correctly represent the loss of flow in summer months as part of it would have flowed away, but for the reservoir, through floods in the rainy seasons. But the nature of the flow in this river in its upper reaches during the summer seasons even today indicates that the flow in the past would have been excellent. Since the coming up of the project the water that enters the river, below the dams, is only a negligible quantity resulting from very little seepage and what is generally called the 'sweat' of the dams. The canals and rivulets which empty their waters into Periyar, below the dams, carry only a small quantity of water during the summer months which renders the river bed dry, but for some puddles, for six months in a year, along a stretch of more than twenty kms. This obviously lowers the water table along this stretch of the river and its banks, resulting in the depletion of the flora of this area and the gradual migration and practical disappearance of much of the wild life which reportedly flourished in the area before the initiation of the project. The influx of people from the plains into this area and the resultant deforestation and habitation has only worsened the situation. The drying up of the river bed in summer also results in the disappearance of all the aquatic life from this stretch. Coconut and other plantations have come up in some stretches of the former river bed.

Earlier, a good flow used to be maintained by the river thereby helping in flushing down the brackish water received from Vembanad lake in summer. But since the commissioning of the project in 1976 the chloride content of the river from its mouth upto Malayattoor (a stretch of over 20 kms) or a little beyond has been steadily going up in the summer months.

The perusal of the data for the period from 1973 to 1975 (Table - I) indicates that the maximum chloride content of the river during summer at Alwaye (the point from which water is drawn into the FACT for industrial purposes) before the commissioning of the project was only 32 ppm (observed in April 1974) while it reached 3500 ppm on a day in February, 1983. According to the data collected by the T.C.C. it was 5000 ppm on a day in February, 1983. The extreme drought conditions that prevailed in Kerala in 1983 may partly account for this sudden increase in the chloride content in 1983 but even in April 1982 on a day it was as high as 400 ppm with an average of 370 ppm for the whole month. The comparison of the data for the April months of 1975 and 1976 (i.e. a year before and the one in which the project was commissioned) reveals that in 1975 the maximum was 15 ppm while in 1976 it was 205 ppm. The chloride content of the river for the summer seasons of the postproject period was the lowest in 1978 showing only some marginal increases when compared with the data of the preproject period, but in

TABLE - I

Table showing the Chloride content (in ppm) of the Periyar river at Alwaye during the summer months for the period from 1973-1983.*

	January			February			March			April			May		
	Maxm	Mnm	Monthly Average	Maxm	Mnm	Monthly Average	Maxm	Mnm	Monthly Average	Maxm	Mnn	Monthly Average	Maxm	Mnn	Monthly Average
1973	9	4.5	7.3	11	5	4.7	16	7	10.7	25	3	13.4	15	5	9.9
1974	13	8.5	10.5	13	9.5	11.3	15	10.5	12.2	32	13	20.1	22	18	19.5
1975	Data not available			16	9	11.1	30	10	19.6	15	12	13.6	15	8	9.6
1976	15	7	11.3	17.5	12.5	14.2	16	12.5	14.4	205	15	60	37.5	15	24.6
1977	30	25	27.5	17	11	13.5	23	12	17.5	29	12	20.7	25	7	14.6
1978	15	10	12.5	16	11	12.4	16	12.5	13.4	21.5	13	16.2	23	6.5	14.4
1979	12	10	10.7	14	12	13	15	12	13.4	40	13	24	24	11	15.5
1980	25	12	15	85	12	28.5	20	11	15	32	21	23.5	Data not available		
1981	9.5	7	8	12.5	8	9.8	55	18	45.6	36	32.5	33.8	Data not available		
1982	Data not available			19	17	18.2	38	35	274	400	370	385	Data not available		
1983	310	10	62.4	3500	360	1403	1850	660	1083.5	720	460	566.7	380	25	72.4

* The data are based on the measurements taken daily by the Fertilizers and Chemicals Travancore, Alwaye.

1978 Kerala had the highest rainfall (4524.6 mm) of the decade, commencing with the year 1973, and that many account for the reduction in the chloride content during that year.

B. Impact of the increase in the chloride content on some aquatic fauna in the lower reaches of Periyar river.

The entry of brackish water into the lower reaches of Periyar has led to the entry of some brackish water prawns, molluscs and fishes into the river during the summer season. A ray fish was observed during April 1983 at Kalady, about 20 kms upstream from the mouth of the river. Similarly *Liza macrolepis* (Smith), *Hyporhamphus xanthopterus* (Valenciennes), *Caranx sexfasciatus* Quoy & Gaimard and *Gerres filamentosus* Cuvier, all brackish water species of fishes, were available in plenty at the Alwaye stretch of the river (10 kms upstream from the estuary) in the summer months of 1982 and 1983. But *Channa striatus* (Bloch), *Nandus marmoratus* (Hamilton) and *Channa orientalis* (Schneider), the common freshwater species of fishes that were reportedly available in the area in fairly good number all the year round before 1976, if the reports of the fishermen who used to fish in this area for years are to be believed, are not seen here during the summer months in recent years. None of these species were represented in the catches made by fishermen at Alwaye in March-April, 1982–1983 from this stretch of the river. Specimens brought to the Alwaye market during the season also did not reveal the presence of these species. Similarly a species of *Perreysia*, a freshwater bivalve, that used to be available in these waters in good number all the year round before 1976, could not be collected during the summer seasons of the years from 1980 to 1983 though their dead shells were present.

Eloore-Varapuzha stretch of Vembanad lake, i.e. the area where Periyar river empties its water into the lake, and the lower reaches of the river along a stretch of nearly 2 kms have already turned into nearly barren areas for fishes during the pre-monsoon months. Mortalities were observed in summer during the period from 1980 to 1983 among the fish species of anchovies, cat fishes, pearl spot, glassy pirchlets, barbs, silver biddies, sprats and half beaks. Reduction in the discharge of the river with the result that the effluents from the factories at Alwaye entering the river do not get diluted, as in the pre-project period, can be the only possible reason for this high mortality rates among the fish species. Detailed studies conducted by Kurup (1983) on the dead specimens from these waters during the period from 1980 to 1983 revealed that they had died due to toxicity.

C. Impact of increase in the chloride content of Periyar on the industrial establishments at Alwaye.

The extraordinary rise in the chloride content of the river in the Alwaye stretch, which is the most important industrial belt of Kerala, has resulted in the total closure

and the resultant loss in production, running into crores of rupees, in factories like the F.A.C.T., T.C.C. etc. at least for some weeks in the summer months as the water could not be drawn from the river for industrial purposes due to its high chloride content. Some essential units in these factories were only run using freshwater brought from a distance of over 18 kms.

Construction of temporary bunds and the release of precious water from Bhuthathan Kettu reservoir did not entirely solve the problem, as chloride content even afterwards went upto 3000 ppm on some days in 1983.

D. Influence on the supply of water to Cochin

The increase in the chloride content of Periyar had its impact on the water supplied to Cochin city which has a population of over 6 laksh. For more than two weeks in February 1983 the chloride content of water supplied was over 500 ppm and on a day it touched 1250 ppm. The situation was partly brought under control by the release of water from the Bhuthathan Kettu reservoir. Before the chloride content was controlled the Health Department of Cochin Corporation had even considered warning people against the use of water supplied without treatment.

The Edamalayar project, proposed partially to offset the increase in the Salinity content of Periyar river brought about by the commissioning of the Idukki hydel project, is still at the take off stage and years will roll by before it is commissioned. It is yet to be seen how far the commissioning will redeem the situation.

SUMMARY

Curtailment in the flow of Periyar river caused by the Idukki hydro-electric project and some of its ecological impacts are discussed.

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