

A review of the black clam (*Villorita cyprinoides*) fishery of the Vembanad Lake

P. LAXMILATHA AND K.K. APPUKUTTAN

Central Marine Fisheries research Institute, Cochin - 682 014, India.

ABSTRACT

The black clam, *Villorita cyprinoides*, is an important fishery of the Vembanad Lake and contributes to over 70% of the total fish production from the Lake. Factors which affect the sustainability of this fishery are indiscriminate exploitation of small-sized clams, closure of the Thaneermukham Barrage, frequent dredging, pollution due to retting, effluents from shrimp processing plants / factories and swarming of weeds. The present status and management options for this important fishery are discussed.

Introduction

The Vembanad Lake, is one of the major estuaries in India. It is situated between latitudes 9°28' and 10°10' N and longitudes 76°13' and 76°31'E in southern Kerala. It has a length of about 90 km and extends from Alleppey to Azhicode with water spread area of 300 sq.km. The Vembanad Lake supports a rich fishery of clams of which *Villorita cyprinoides*, the black clam, contributes to over 70% and the monthly average production was 2619 t during 2000. Rasalam and Sebastian (1976) reviewed the lime shell fisheries of Vembanad Lake highlighting the various management issues. Achary (1988) studied the characteristics of the clam resources in Vembanad Lake. The present status of this important fishery of the Lake is reviewed in this paper. The effect of fishing pressure on this important resource,

which supports the lime and cement industry in Kerala and Tamil Nadu, is analysed. The need for management and conservation measures to develop and sustain this valuable resource is highlighted.

Materials and methods

Observations on the fishing activities during peak fishing season were made. The detailed information on the black clam production over the past decade, the fishery trend, post harvest processing, utilization, socio-economic factors, the problems and factors affecting the black clam production and management issues were collected from the seven black clam lime shell cooperative societies operating along the Vembanad Lake. Enquiries were made with the local people in the major black clam fishing areas for further details.

TABLE 1. Details of black clam fishery in the Vembanad Lake

Name of Black Clam Lime Shell Cooperative Society	Villages	Fishing area (Ha)	No.of registered clam fishers	No. of active fishers	No.of canoes	Average fishing days/ Month	Average catch/canoe /day (Tins) 1 Tin=20 kg
Kuthiathode	Aroor	200	710	300	155	12	4
	Kundanoor			300			
Thycattussery	Panangad	300	1000	350	200	19	8
	Thuravoor south			350			
	Pallipuram			300			
Muhamma	Panavally	350	1000	600	300	15	5
	Kokothamangalam			600			
Komalapuram	Thaneermukham	400	900	378	300	18	6
	Kumarakom			378			
Vechoor	Thaneermukham	500	236	125	100	15	7
	Kumarakom			125			
Vaikom	Vaikom	94.5	500	300	300	15	25
	Pallipurathussery			300			
Chembu	Chembu	10	187	95	90	15	3
	Kattikunnu			95			

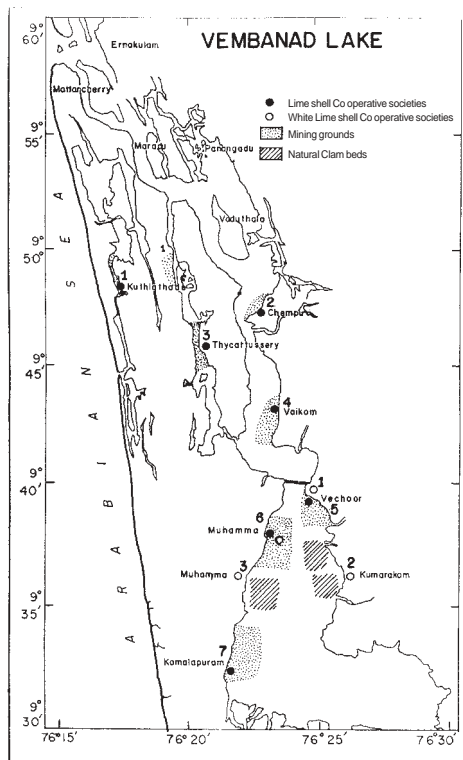


Fig.1. Vembanad Lake: Black clam fishing areas and Cooperative societies

Results and discussion

Fishing areas

The black clam fishing in Vembanad Lake extends from Komalapuram in the south to Panangad in North. Fishing for the black clam is done essentially for the shell rather than the meat. The fishing rights and licenses for fishing in the lake are issued by the State Department of Mining and Geology which has, to some extent, helped to organize the lime shell fishing activities. The license is issued to seven black clam lime shell cooperative societies situated along the various fishing areas of the Vembanad Lake which in turn issue license for fishing to their members. Selected areas (villages) are demarcated for each society (Table 1, Fig. 1). The total fishing area leased out to societies extends to about 1855 ha.

Fishing methods

Fishing for live clams in Vembanad Lake is done by 1) hand picking by women and children in shallow areas,

TABLE 2. Fishery details of *Villorita cyprinoides* during 2000

Month\length (mm)	Length frequency in percentage												Meat%	Production (t)				
	10	12	14	16	18	20	22	24	26	28	30	32			34	36	38	42
January			3.92	1.96	5.88	5.88	15.7	11.8	19.6	17.7	7.84	3.92	1.96	1.96		1.96	9.22	3906.14
February			1.67	10	6.67	15	33.3	18.3	10		1.67		1.67	1.67			10.00	2710.70
March				8.93	19.6	23.2	30.4	12.5	3.57	1.79							10.00	3429.52
April				3.33	11.7	30	20	10	6.67	10		1.67	1.67	1.67	3.33		14.07	1654.61
May			1.67	13.3	15	15	10	16.7	16.7	6.67	3.33		1.67				8.86	3290.88
June				5.08	8.47	30.5	18.6	8.47	3.39	8.47	8.47	6.78			1.69		11.86	3407.46
July				8.47	18.6	17	8.47	10.2	10.2	20.3	1.69		50.8				11.20	2857.96
August			3.51	8.77	19.3	14	29.8	14	3.51	3.51	1.75						12.80	3100.95
September			8.62	19	25.9	22.4	3.45	12.1	5.17	3.45							13.23	1104.62
October	42			3.33	10	11.7	11.7	6.67	3.33	10	1.67						9.33	1946.83
November		1.75		7.02	29.8	12.3	22.8	12.3	7.02	3.51		3.51					11.65	2233.95
December			1.82	1.82	14.6	29.1	14.6	14.6	14.6	1.82	3.64		1.82	1.82			9.19	1786.92
Total																		31430.54
Average																		2619.21

where the depth is less than half a metre, during low tides. About 1-2 baskets are collected by this method. 2) Fishing is practiced by women in slightly deeper areas of less than 1.5 m without diving- the women feel and detect the clam bed by their feet and remove the clay over the buried clams by their feet to accumulate the clams to a particular spot and guide the collected clams to their bamboo or aluminium baskets ("unda"). Nearly 3-4 baskets (6-8 kg) per women are collected by this process. 3) Fishing is also done from a canoe, mostly by men, by using a hand operated dredge locally known as "Kolli" or "Varandi".

The black clam fishery

Clam fishing is carried out for 15-16 days a month involving roughly 2148 active fishers. The average catch per canoe per day is highest (25 kg) from the Vaikom - Pallipurathussery area registered with Kuthiathode society (Table 1).

The site of clam fishing varies every year, due to changes in the spat fall pattern owing to various environmental reasons. The fishers have therefore, adopted the practice of transplantation / semiculture wherein they collect the spat from areas where dense settlement has occurred and transplant them to places (near their homes/homesteads) where no spat fall has occurred. This is more prevalent in certain areas such as Nettoor, Kumblangi, Cheppanam and Arookutty. This facilitates the harvesting/ picking at a more appropriate time. This practice is also carried out to prevent the destruction of the baby clams due to the effluents released from shrimp peeling sheds and areas where fishing is hampered by clogging of weeds. Fish-

ery for the black clam, extends from October to March with the peak during December to March (Table 2).

Clams of 20-24 mm length support the fishery with the dominance of 20-22 mm group during April. The wet meat weight percentage which varied from 9.2 to 14.07% was maximum during April. Males were dominant in the population throughout the year with sex ratio of 80:20. *V. cyprinoides* is a continuous breeder, with peaks in February-April and November-December. Seed clams occurred from October - November onwards.

Production

The total annual production of *Villorita cyprinoides* from Vembanad Lake, over the last sixteen years is indicated in Fig. 2. The monthly average pro-

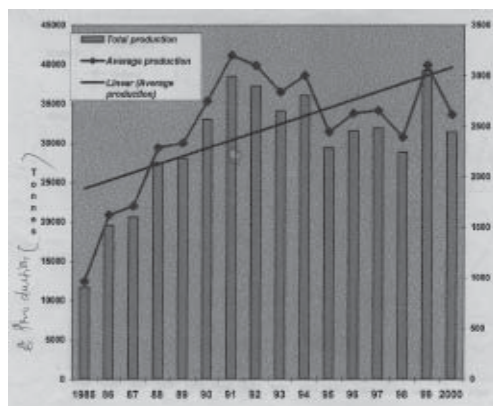


Fig. 2. *Villorita cyprinoides*, Total production in Vembanad Lake, during 1985-2000

duction has increased from 971 t in 1985 to 3106 t in 1999. However, a significant increase during the period 1990 - 1994 followed by a drastic decline in the total production during 1995 - 1998 indicates probably, a cyclic trend in the clam seed settlement pattern. In 1999, again a significant increase in the total production was noticed, followed by 20% decrease in 2000.

Lime shell cooperative societies

The black clam exploitation from the Vembanad Lake is more or less organized by seven black clam lime shell cooperative societies. The cooperative societies buy the shell from their members at the rate of Rs. 600-700 per ton. They are also required to pay a royalty of about Rs. 20-30/ton to the Government. The shell is sold to agents from Kerala and Tamil Nadu at an average rate of Rs. 800-1000/ton. The shell in turn is sold to local limekilns, cement, pharmaceutical and carbide industries.

Each society has registered clam fishers of which only 50% may be regular fishers. The level of black clam exploi-

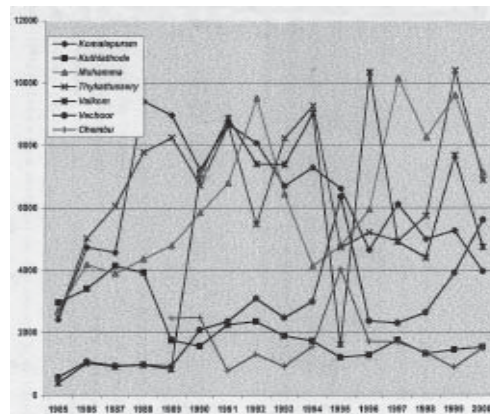


Fig. 3. *Villorita cyprinoides*, Society wise production, during 1985-2000

tation from Vembanad Lake by the societies from 1985 to 2000 is depicted in Fig. 3. These societies, besides organising the sale of lime shell for the clam pickers, also implement several welfare schemes. Since the societies are governed by the State Department of Mining and Geology, the welfare schemes of the Government open to other coastal fishing populations are not available to these clam fishers. However, the cooperative societies have made relentless efforts to extend some of the rural development

schemes to these clam fishers. Educational loans, disaster aids, emergency loans etc. are granted to them.

The cooperative societies are also involved in providing supportive measures to the clam fishers to increase the clam production. For instance, the Komalapuram society organises the fishing activity of their members in a rather unique manner. There has been no seed settlement in the south Aryad region extending from Muhamma to Komalapuram. This has been due to closure of the Thaneermukham barrage and dredging. Added to this, the heavy infestation of the African weed *Salvinia auriculata* and the water hyacinth, *Eichhornia crassipes* also affected the fishing activities, especially during the monsoon and post-monsoon months. The society has, two hired mechanized boats (hiring charge Rs. 650/boat) and the clam fishers are transported along with their canoes and fishing gears to the more potential clam beds of the Kumarakom waters (Kottayam District), 12 km from south Aryad. The canoes of the clam fishers are tugged to the fishing area in the early hours (at about 0500 Hrs) and allowed to fish up to noon and are tugged back to south Aryad. The fishers pay a nominal fee of Rs. 20/- towards tugging charges and Rs. 15/- for hiring of the canoe. The fishers are able to fish about 10-16 tins /day/canoe as against 4-5 tins/day earlier. This is almost double the catch compared to the earlier years, when fishing was done in the nearby areas within Aryad. Also, this reduces the effort expended for fishing in the weed-infested areas.

Sub-fossil exploitation

The lime shell, is classified into black shell and white shell. The black shell are by-products from the black clam after extraction of the meat while, white shell are

found as sub-soil deposits over large areas, upto several feet below the surface of the soil. The sub-fossil deposits are formed as a result of smothering of large live clams by the mud and silt carried into the lake by the floodwaters during monsoons. The sub-fossil lime shell are utilized as raw material by various industries such as lime kilns, cement, carbide, medicine, pharmaceutical, fertilizer, pesticide etc. The Vembanad Lake is rich in sub-fossil lime shell deposits accumulated through centuries of accretion.

There are five white lime shell cooperative societies engaged in lime shell exploitation and fishery. Large scale commercial dredging is also in vogue in the lake. It is estimated that an average of 40,290 tonnes of fossil shells are dredged annually from 586 hectares of water area. The average annual consumption of the lime shell for cement production is 40,219 tonnes. The meat extracted by heat shucking, is used for local consumption and as a feed in shrimp farm.

Factors affecting sustainability

Indiscriminate exploitation of under-sized clams due to the high demand, resulted in depletion of the stock. The use of hand-dredge with narrowly spaced, large rakes and small mesh (5-20 mm) size of the scoop net, cause the destruction of the clam beds through harvest of under-sized clams.

The closure of Thaneermukham Barrage from January to May every year changed the salinity profile and resulted in drastic ecological changes in the lake, particularly south of the barrage, affecting the distribution and survival of the living resources, especially depletion of the black clam in several parts (Pillai, 1991). Areas, which were highly productive about fifteen years ago, have become barren now and caused severe dislocation

of thousands of clam fishers. Frequent dredging (mechanized fishing) activities, has resulted in suspension of silt causing smothering of clam beds and affecting settlement of seed in these areas.

The fact that the license for clam fishing in Vembanad Lake, issued by the Mining and Geology Department has severely restricted the development of the clam fishing community. Since they do not come under the purview of the Fisheries Department, they are denied the rights and benefits available to other coastal fishing communities. Fishing is carried out by licensed as well as non-licensed fishers, leading to social tensions.

Dumping of clams, (especially seed clams which do not have high meat content), for the decomposition of meat and subsequent retrieval of shell for the lime industry leads to pollution as well as waste of enormous quantity of clam meat. Also the environmental/health hazard as a result of incompletely putrefied meat is a matter of grave concern. Pollution due to retting of husks, effluent discharged from industries and environmental hazards caused by the effluent released from shrimp peeling sheds in and around the Vembanad Lake has become a major reason for the decrease in clam production.

The swarming/clogging of several areas of the Lake by the African weed *Salvinia auriculata* and the water hyacinth, *Eichhornia crassipes* hampers the fishing activities of the clam fishers for nearly 2-3 months.

Lack of awareness regarding the nutritive value of the clam meat, absence of an organized marketing system, unexplored potential for the export market etc. are other factors limiting the black

clam production levels.

Fishery management

Enforcement of conservation and management measures such as closed seasons, mesh size regulation for the hand dredge to prevent indiscriminate exploitation of under-sized clams are proposed together with promotion of a system of relaying and culture of clams in Vembanad Lake. This system is already in vogue in some parts of the Vembanad Lake viz; Nettoor, Kumblangi, Cheppanam. These practices must be promoted on a more scientific basis adopting proper site selection, stocking densities, protective measures etc. For the maintenance and conservation of broodstock clam sanctuaries/parks may be established at suitable areas.

Issues for intervention

Sub-fossil shell extraction may be restricted to deeper areas of the Lake and allotment of smaller areas to be made only after clearance by the Fisheries Department through proper licensing system. Policy change by the State Government may include clam fishing under the Fisheries Department and extend all rights and benefits to the clam fishers, similar to the coastal fishing communities. Also, extend welfare measures to the clam fishers who have been traditionally involved in this practice. To enhance the value of meat, market promotion and extension activities may be made by the State Fisheries Departments and Export Promotion Department.

Alternative uses such as clam pickle, clam curry, clam soup and also for use as poultry feed, fish feed etc. may be promoted. Some effective control measures may be adopted to prevent pollution as well as clearance of weed to rejuvenate the Vembanad Lake as a whole.

The black clam fishery in Vembanad Lake does not show any sign of over-exploitation at present. However, there are clear signs of non-sustainability of this resource in the long run as indicated above. Evaluation through extensive surveys of the total standing stock of the black clam in the lake, the potential stock, the sustainable levels of exploitation and the socio-economic impacts of the factors affecting the clam exploitation from the lake are the urgent need of the hour. Policy changes and management measures could be developed based on these evaluations. It is also necessary to create awareness among the clam fishers, on the depletionary effects of over-fishing, indiscriminate exploitation of seed clams, value-added products etc. Fishery management measures such as relaying, mixed farming with shrimps, establishment of clam sanctuaries and strict legislative measures to control pollution, illegal transport of shell, indiscriminate exploitation of seed clams, illegal fishing of live and fossil clams will provide the impetus for the long-term sustained de-

velopment and management of this valuable fishery of Vembanad Lake.

Acknowledgements

The authors are thankful to the Secretaries of the Clam Co-operative Societies and the private dredging companies for providing necessary information. The assistance rendered by Shri P.S. Alloysious in the collection of data for the preparation of this review is acknowledged.

References

- Achary, G.P.K. 1988. Characteristics of clam resources of Vembanad Lake - a case study. *Bull. Cent. Mar. Fish. Res. Inst.*, **42** (10): 10-13.
- Kunjukrishna Pillai, V. 1991. *Studies on the hydrobiology and pollution of the Vembanad Lake and adjacent waters*. Ph. D.thesis, Cochin Univ. Sci. and Technol., 148 pp.
- Rasalam, E.J. and M.J. Sebastian 1976. The lime shellfisheries of the Vembanad Lake, Kerala. *J. Mar. Biol. Ass. India*, **18** : (2) 323-355.