

## STRATEGY OF PRAWN AND FISH CULTURE IN SALINE SUB-SOIL WATERS OF SEMI ARID ZONE IN HARYANA

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### ABSTRACT

Experiments on the culture of marine prawn (*Penaeus monodon*) and fishes (*Mugil cephalus*, *Etroplus suratensis*, and *Cyprinus carpio*) were conducted in saline sub soil waters of semi-arid zone in Haryana, during September, 1983 to February, 1985, and encouraging results were obtained. It has been proved that intensive culture of marine species can be taken up on commercial scale in barren lands of saline sub-soils in semi-arid zone of Haryana, Rajasthan, Uttar Pradesh and Punjab to enhance production potential and employment.

*Key-words* : Prawn culture, saline-soil, semi-arid zone.

### INTRODUCTION

Saline soils generally called "User lands" are spreading in some states of India like Uttar Pradesh, Rajasthan, Haryana and Punjab. Vast areas covered with saline soils have become unfit for agriculture and are posing problem to the planners and agriculturists. Late Prime Minister, Smt. Indira Gandhi stated in 1982 that when science is taken to rural areas for solving existing problems, new problems are created (Annon, 1982). In our efforts to develop irrigation facilities, large areas have become water logged and soils have become saline in Uttar Pradesh, Rajasthan and Haryana. Hence the present investigation was taken up. This is the first available information on the 'Studies on the culture aspects of marine prawn and fishes in the saline sub-soil waters of semi-arid zone in Sultanpur, Haryana'.

### MATERIAL AND METHODS

At Sultanpur (Haryana) ponds have been dug in saline soils and water is provided from the tube well. The salinity of tube well water ranges between 12-16‰. Whenever required the salinity was lowered by addition of fresh water. Seeds of Tiger Prawn, *Penaeus monodon* (20 mm) and mullet *Mugil cephalus* (25 mm) were transported from Central Institute of Fisheries Education's (CIFE) Brackish Water Fish Farm, Kakinada, Andhra Pradesh while seeds of Pearl spot *Etroplus suratensis* (65 mm) and common carp *Cyprinus carpio* (150 mm) were procured from State Fisheries Departments of Goa and Haryana respectively. Culture experiments were conducted following the procedure described by Bradach,

Ryther and Mac Larney (1972). Physico-chemical parameters were analysed by standard methods (Strickland & Parsons, 1968 and Lind, 1974). Fishes were acclimatised in aquaria and plastic pools for the period of one week during summer and two or three months during winter, to the local environmental conditions.

## RESULTS

Observations on temperature and salinity were made from January to December, 1984 and results are presented in Table I. Minimum temperature (4°C) and maximum temperature (36°C) were recorded in January and June respectively. Salinity also followed the increasing trend of temperature from January (7.74‰) to June 1984 (16‰). Later in July both the salinity and the temperature decreased. Range of pH was 7.02 to 8.75. Dissolved oxygen content was high and ranged from 5.80 to 10.26 ppm. Variations in total alkalinity and water loss in ponds are also presented in Table I.

Initial trial experiments for culture of marine prawn and fishes (*Penaeus monodon*, *Mugil cephalus*, *Etroplus suratensis*) and fresh water fish (*Cyprinus carpio*) were conducted from September-October 1983 till December 1984 for their ecology and tolerance of aquatic environment which contains potassium salt and causes salinity. During winter months (December & January) Tiger Prawn *Penaeus monodon* could not survive due to low temperature (4°C), and were maintained under the controlled environment in aquarium and tanks.

Feeding habits of these species were studied. It was observed that *M. cephalus* was phytoplankton feeder, whereas *C. carpio* was omnivorous. During acclimatization, the prawn juveniles were fed with egg-custard, chironomid worms, while fish seeds were fed with zooplankton, viz *Calanus*, *Brachionus* and *Moina* spp. Later on in ponds, no artificial feed was given since live feed in pond was sufficient to provide nutritional requirements of fish and prawn. The ponds were manured with cowdung, groundnut oil cake and superphosphate (in the ratio of 16 : 1 : 1), regularly.

Final experiments were set up in January, 1984 and results upto December 1984 are presented (Table II, Fig. 1) *P. monodon* were stocked successfully. *M. cephalus*, in January 1984 and *E. suratensis* in April 1984 were stocked in natural ponds. Stocking densities of *P. monodon*, *M. cephalus*, *E. suratensis* & *C. carpio* were 196; 90, 85 and 40 respectively since it was a trial experiment. During this period osmo-regulation studies were also conducted to find out the adaptability of these species to sub-soil waters of the region. Since the sub-soil waters were rich in potassium salts, ordinary unrefined common salt (NaCl) which contains sodium, was added. *M. cephalus*, *E. suratensis* and *P. monodon* were gradually acclimatised. Initial experiments have been successful and it has been possible to culture *P. monodon* from January 1984 to December 1984. Sampling in December 1984 indicated that Tiger Prawn in 12 months, attained

Table I: Ecological parameters during 1984.

Parameters observed	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Salinity (‰)	7.74	12	14.2	15.3	15.5	16	15.8	15.5	14.2	13	10	6.50
Temperature (°C)												
Min.	4	6	15	20	26	26	26	22	18	15	10	6
Max.	17	19	24	30	34	36	34	30	5	28	21	18
pH	7.02	8.00	8.12	8.33	8.25	8.75	8.35	8.40	8.50	8.12	8.01	8.02
Total Alkalinity phenolphthalein (ppm)	13	13	11	10	14	12	12	46	16	14	20	13
Methyl orange (ppm)	74	40	43	133	119	108	107	125	109	80	79	63
Dissolved oxygen (ppm)	9.03	9.64	10.16	6.54	9.01	9.33	5.98	6.43	8.04	5.80	7.2	8.63
Water loss in ponds (cm /day)	5	6	8	10	20.8	25	22	20.5	19.2	18.5	12	7

Table II: Stocking, growth and recovery of fish & prawn at Sultanpur fish farm during 1984.

Species	Pond area (ha)	Date	Stocking No.	Avg. length (mm)	wl. Avg. (g)	Duration of culture (months)	No. or % age of recovery	Aveg. length (mm)	Aveg. wt. (g)
<i>Penaeus monodon</i>	0.03	6-1-84	196	20	0.5	12	16	240	125
<i>Mugil cephalus</i>	0.05	6-1-84	90	25	1	12	50	522	950
<i>Europlius suratensis</i>	0.03	6-4-84	85	65	35	8	90	150	80
<i>Cyprinus carpio</i>	0.03	18-10-83	40	150	100	12	50	350	800

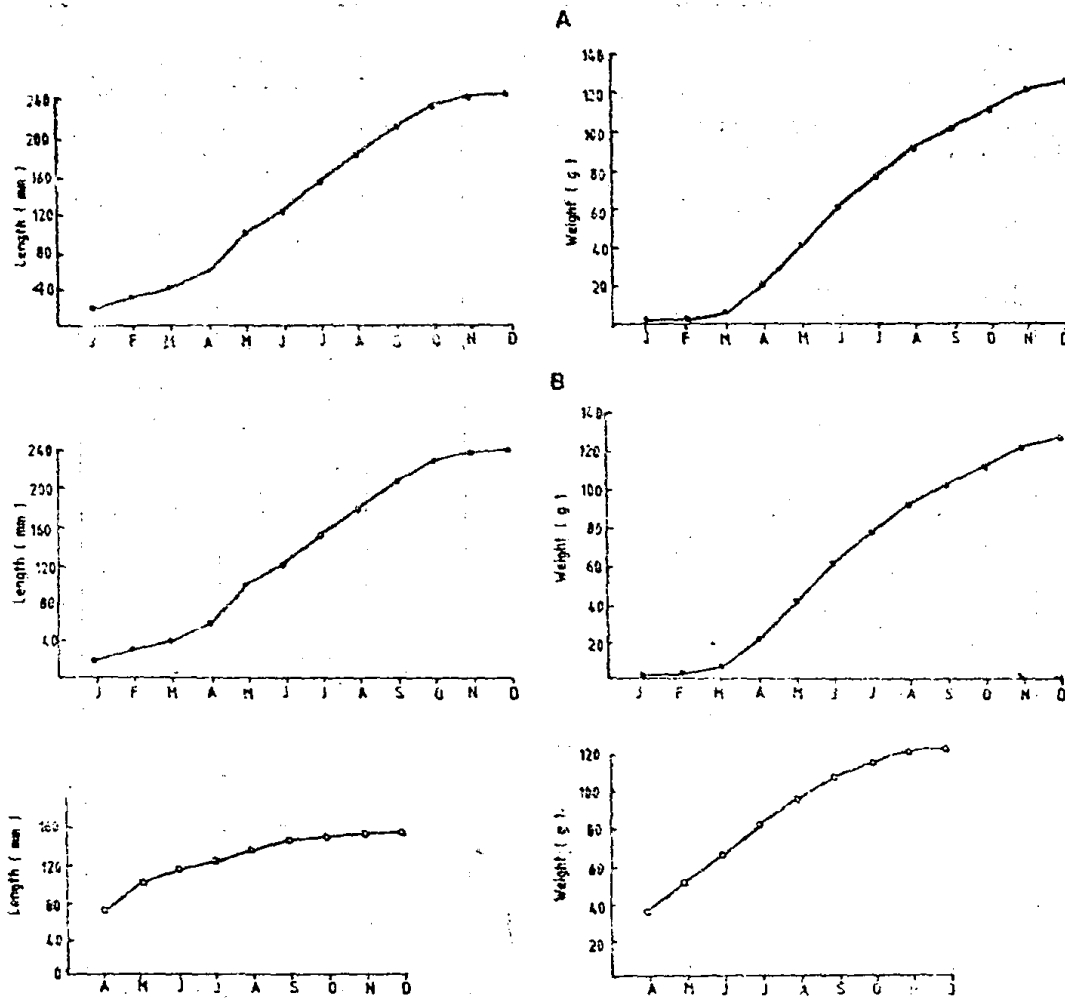


Fig. 1. Growth rates of (A) *P. monodon*, (B) *M. cephalus* and (C) *E. suratensis*.

the size of 240 mm and weighed 125 g, *M. cephalus* attained 422 mm size and an average weight of 950 g, *E. suratensis* which was also stocked in fry stage had grown to a size of 150 mm with an average weight of 80 g and *C. carpio* grown upto 350 mm and weighed 800 g. Apart from culture, experiments were conducted to breed *E. suratensis* under the new environment. These have also been successfully bred during the months of July-August 1984.

#### DISCUSSION

Result indicate that in saline soils the salinity increases with the increase in temperature, due to evaporation and precipitation. Dissolved oxygen contents remained above 5 ppm due to high wind action and photosynthetic activity in the ponds.

After initial studies and acclimatizing to the local environmental conditions, the species under culture showed very good growth. *P. monodon* grew from 20 to 240 mm size and *M. cephalus* from 25 to 422 mm in a period of one year, while *E. suratensis* grew from 65 to 150 mm and *C. carpio* from 150 to 350 mm in a period of 8 and 12 months, respectively. Few, one year old *C. carpio* attained maturity also.

Prawn species of *P. monodon*, has a large demand in the export trade, and fetches foreign exchange and hence can be taken up for commercial culture in barren lands of semi-arid areas.

The success in culture and breeding of *Etrophus* sp. has opened up new dimensions. A highly relished fish, very popular in Kerala, can now be domesticated for intensive culture in saline soils with sub-soil waters in Uttar Pradesh, Rajasthan, Haryana and Punjab which otherwise remain unutilised.

The above experiments indicate a new direction for the use of saline waters for culture of *P. monodon* and *M. cephalus* from February to September and during this period they attain marketable size and Common carp can be cultured from July to March-April. Based on the present observations a calendar for the culture period has been prepared and presented in Fig. 2.

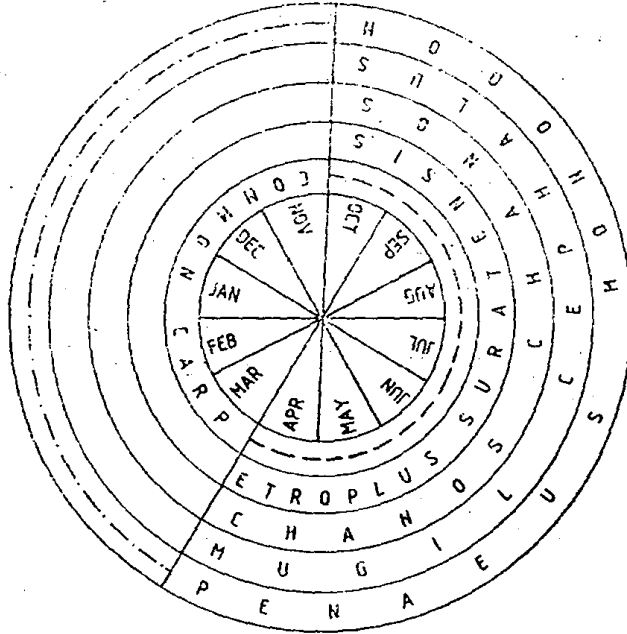


Fig. 2. Calendar showing fish and prawn culture schedule.

(period showing suitable - - - , and - . - . unsuitable temperatures for culture)

Based on the present results it has been observed that if one can control the environment during the extreme winter and summer season, then it is possible to culture on commercial scale, and also breed some of these fishes successfully.

Studies on the period of culture of brackishwater species were conducted. It has been observed that temperature during April to October is suitable for the culture of *P. monodon*, *M. cephalus*, *E. suratensis*, *C. chanos*, while November to March for common carp (*C. carpio*). During August to January short term common carp culture can be practised. Thus, through fish culture one can easily produce about 2 tones of fish and earn upto Rs. 20,000 per ha/year. Further, experiments are in progress and with intensive culture much higher production will be possible. Such culture can also be taken up in Middle East countries also where due to scarcity of rainfall the lakes become brackish.

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