

Pabda-Seed Production & Culture



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FOREWORD

During the last two and half decades of journey, the Central Institute of Freshwater Aquaculture, Kausalyaganga, Bhubaneswar, has developed several technologies for enhancement of production of finfish and shell fish through the enhancement of productivity per unit area and through incorporation of new variety of fish species into our regular culture system. Pabda is a non-air breathing catfish commonly known as butter catfish. Due to its delicacy and less spine content it has high demand and consumer preference and fetches high market price. Steep decline in wild catches, restricted distribution, and lack of knowledge of culture practices are among the major impediments facing the species and it has been enlisted as an endangered species of India. After a long untiring effort success has come in mass seed production through hypophysation, rearing and culture technology of pabda at Kaliyani center of CIFA.

Pabda can be cultured in confinement with other conventional fish species in the same eco-system which will help the farmers to increase productivity in aquaculture systems. Further, from the conservation angle also this would be a welcome step. I would like to convey my sincere thanks to the P.I, Co-PIs and the support personnel of the pabda project.


(P. JAYASANKAR)
DIRECTOR

Acknowledgement

At the outset we express our heartfelt gratitude and deep regards to Dr. S. Ayyappan, the Secretary, DARE , Govt. of India and Director General, ICAR for his kind and great vision about the fate of vulnerable and endangered fish species of India and the way to protect it. With an aim to conserve those species he was kind enough to entrust the responsibility for the development of culture technology of pabda in confinement to the Kalyani center of CIFA when he was director of CIFA. We are grateful to him for his encouragement and rendering all sort of guidance and cooperation at all times.

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We express sincere gratitude to all the supporting staff members of the Kalyani Centre, without whose untiring efforts the development of this new technology would not have been possible.

The background of the page is a collage of various fish species, including what appear to be loaches and similar small fish, swimming in clear water. The fish are arranged in a way that they seem to be looking towards the center of the page, where the title is located. The overall tone is light and naturalistic.

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Introduction

Ompok pabda, a non-air breathing catfish widely known as *Pabda*, is considered as a delicacy among the consumers. However, the species is on the verge of extinction and has been listed under endangered category due to over exploitation of their habitat and human interference. Effort should be made to propagate this species and incorporate in the culture system to retrieve it from the edge of extinction.

Traits of Pabda

- ◆ Unique taste and flavour
- ◆ Shiny appearance and soft flesh
- ◆ Less spine content and easily digestible
- ◆ High nutritional value
- ◆ High Price in the market
- ◆ Hardy for transportation and handling
- ◆ High consumer preference
- ◆ Suitable to incorporate this species under regular culture system.

Distribution

The fish has an extensive geographical distribution covering Afghanistan, Bangladesh, Myanmar, Pakistan (Indus plains and adjoining hill areas) and several states of India including North-eastern States, Orissa, Bihar and West Bengal. During early seventies, Pabda supported strong fishery in North Bihar and West Bengal by contributing about 10% and 6%, in the total catch from beels and mauns respectively. Since early eighties, a distinct fall in catch has been observed due to the loss of population which attributes to indiscriminate fishing during the breeding season, destruction of habitat, extensive use of pesticides and insecticides in agricultural fields. In addition, non judicious land use pattern and planning resulted in subsequent decrease in the area of beels and mauns and also the loss of breeding grounds of this species.

Habits and habitat

Open *beels* and the flood plain wetland like *mauns* that remain connected with river during rainy season are found to be their natural habitats. These water bodies particularly where plenty of submerged and floating aquatic weeds grows are the most suitable area for their habitats as the weeds are the place of shelter and hiding. The aquatic weeds also act as harbour of many aquatic insects. The insects and their larvae are one of the natural food of *pabda*.

Food and Feeding habit

Pabda fry (up to about 40 mm in length) is observed to feed exclusively on zooplankton specifically cladocerans, copepods, rotifers and protozoan in natural condition. Soft and smaller insect larvae serve as preferred food items for them. They exhibit high cannibalistic behavior during 2nd to 5th day after hatching and hence, survival during this stage is very much crucial. However, the cannibalistic tendencies gradually diminish after the above period. Fishes above 70 mm in length feed on insect larvae, small insects, nematode worms, annelids, small minnows, shrimps and detritus.

Breeding habit

The species attains maturity at the end of the first year. The males mature earlier than females, with the size range of 20-40g. Spawning occurs during pre-monsoon to monsoon (June-August) with a peak period in July. During the breeding season both males and females move in shoal and migrate from *beels* to river. Breeding occurs in inundated shallow areas, particularly in the mouth region of the *beels* adjoining to rivers.

During November- January fishes attain stage I and II of maturity where as most of them attain stage III of maturity in March. Males mature by late April, while the females are found at stage IV. Fully ripe females are seen from late May to the end of July. Breeding season extends from early June to late July

Fecundity

The mature ovary contains different sizes of eggs and the fully ripe ova are dull yellowish/greenish in colour in fresh condition depending on the species and it measures from 0.760 to 0.875 mm in diameter. It has been estimated that the average weight of the ovary per 100 g fish is 25 ±5g and the number of eggs per g of ovary is 1200±200. The number of eggs in the ovary per kg body weight ranges from 2-2.5 lakh.



Fig.1 : A view of Kalyani, CIFA farm



Fig.2 : A haul of pabda

The background of the page is a collage of various fish species, including tilapia and catfish, swimming in water. The fish are depicted in a somewhat faded, artistic style, creating a textured, aquatic backdrop for the text.

Captive breeding Brood stock management

Proper care and maintenance of the brood fish is an important step for successful breeding. Male and female brood fishes (40 g and above) are stocked in earthen ponds (0.01-0.04 ha) and manured with raw cow-dung @ 10 tones / ha / yr and liming @ 250 kg / ha before releasing the fishes. Water hyacinth is kept in the pond to simulate the natural condition of their habitat. The plants also act as shelter as well as source of periphytic food. The water depth is maintained in between 1.0 - 1.5m. The brood fishes are fed daily with boiled chicken viscera and other fish wastes @ 5% of the total weight.

Brood stock selection for breeding operation

Both male and female weighing 40g and above are most suitable for breeding operation. During breeding, fully ripe females and males are selected and used for induced breeding. Males and females are easily identified with the secondary sexual characters developed during the breeding season (June - August).

In mature males, the genital papilla is elongated and pointed or somewhat conical in shape. The spines on the pectoral fins are relatively larger and thicker in males than those in female where the spines are very feeble or absent. However, males are slender, usually smaller in size, more translucent and less pigmented than females. The abdomen in a gravid female is soft, round and bulged. Genital papilla is somewhat fleshy, round and large in size with reddish vent.



Fig.3 : Advanced fingerling of pabda at kalyani CIFA



Fig.4 : One Year old pabda at Kalyani, CIFA

Hypophysation

Induced breeding could be done both through stripping method or in *hapa* like carps. Ovaprim @ 1- 1.5 ml /kg body weight of female and 0.5 ml/kg body weight of male are administrated in a single injection schedule for spawning.

The females are stripped for spawning by gentle pressure over the abdomen after a gap of 8-10 hours of hormone injection. The eggs are collected in a dry enamel / plastic tray where as the abdomen of the males are cut open, testes are removed, chopped and macerated to prepare sperm suspension for fertilizing the collected eggs and mixed thoroughly with a feather by adding a little amount of freshwater to activate the sperm. The fertilized eggs are then washed with fresh water, cleaned and transferred to a specially designed pabda hatchery.

In the event of large scale seed production, the spawn are distributed in rearing tanks provided with proper shelters, preferably submerged aquatic weeds, date palm leaves etc.

Egg incubation and hatching

A simple flow through system comprises a stand on which a row of plastic tubs (30cm diameter and 15 cm height) is placed. Water supply is provided to all the tubs from individual control taps. Each tub is provided with an outlet at a height of above 4 cm. The fertilized eggs are distributed uniformly in the plastic tubs and a feeble current of water is provided. Water temperature between 27 - 30° C is ideal for hatching. Low hardness and alkalinity is conducive for better embryonic development leading to better hatching rate. Hatching takes place within 22 - 24 hours of fertilization. The newly hatched larvae are cylindrical in shape, transparent, devoid of mouth, having pectoral fin and body pigments. Yolk sac is pale greenish in colour and gets absorbed in three days. Rudiment of one pair of maxillary and two pairs of mandibular barbels appear.



Fig.5 : Hormone injection to pabda brooder



Fig.6 : Mixing of eggs with sperm suspension

Embryonic development

Hours	Observations
Upto 2	Blastodisc is fully formed about thirty minutes after fertilization as a crescentic lighter area over one end of the massive yolk, which is characteristically green and granular. Eight minutes later, the second cleavage (second cell division) takes place, followed by third cleavage in another eight minutes. Fourth cleavage occurs in next seven minutes of the third cleavage, followed by fifth cleavage in another five minutes. Thus sixty four celled stage is found in seventy minutes after fertilization. Morula stage attains in two hours.
3	The blastoderm cells began involution over the yolk and about a third of which covered, when the embryo is three hours old.
5	The yolk plug stage is attained by the embryo.
6	A slight thickening of the embryo at one end takes place which is the indication of cephalic region. The blastoderm cells completely enclose the yolk and starts elongation. The embryo measures 1.003- 0.960 mm
7	The rudiment of notochord appears which measures 1.223- 0.969 mm and 1 - 2 myotomes appear.
8	The embryo acquires kidney shaped and three more myotomes are observed to have been added.
9-10	The embryo enlarges in size and measures 1.308 to 1.020 mm and ten myotomes appears in all. The cephalic and caudal ends become further differentiated. The rudiments of optic vehicle are observed to have formed. The kuffers vesicle appears at the base of caudal region, as an oval area.
12	The cephalic end was observed to become more prominent and caudal end hade got freed from the yolk mass. Fourteen to fifteen myotomes were seen to have been differentiated.
14	Eighteen myotomes in all appeared and were distinctly visible, embryo made occasional twitching movements. The lens was found to have been formed in optic vesicle and heart was observed to have appeared.
16	The number of myotomes increased to twenty two, the embryo made frequent movements within egg membrane.
18	The caudal region became very much elongated and the number of myotomes went up to a total of twenty eight to thirty myotomes. The gut was faintly indicated posterior to yolk sac leading to anus. The heart started pulsating. The olfactory vesicles appeared anterior to optic vesicles. The embryo executed active movement within egg membrane.

20	The cephalic region was well formed and became free from yolk mass which measured about 1.480 x 1.259 mm. About thirty four to thirty six myotomes altogether were visible. The rudiments of barbells appeared as buds.
24	The embryo hatched out and the period of incubation at water temperature of 25.5 to 29°C was between twenty two to twenty four hours. The newly hatched larva was slender, transparent and devoid of mouth pectoral fin and body pigmentation. The yolk sac was oval in shape and pale greenish in colour.

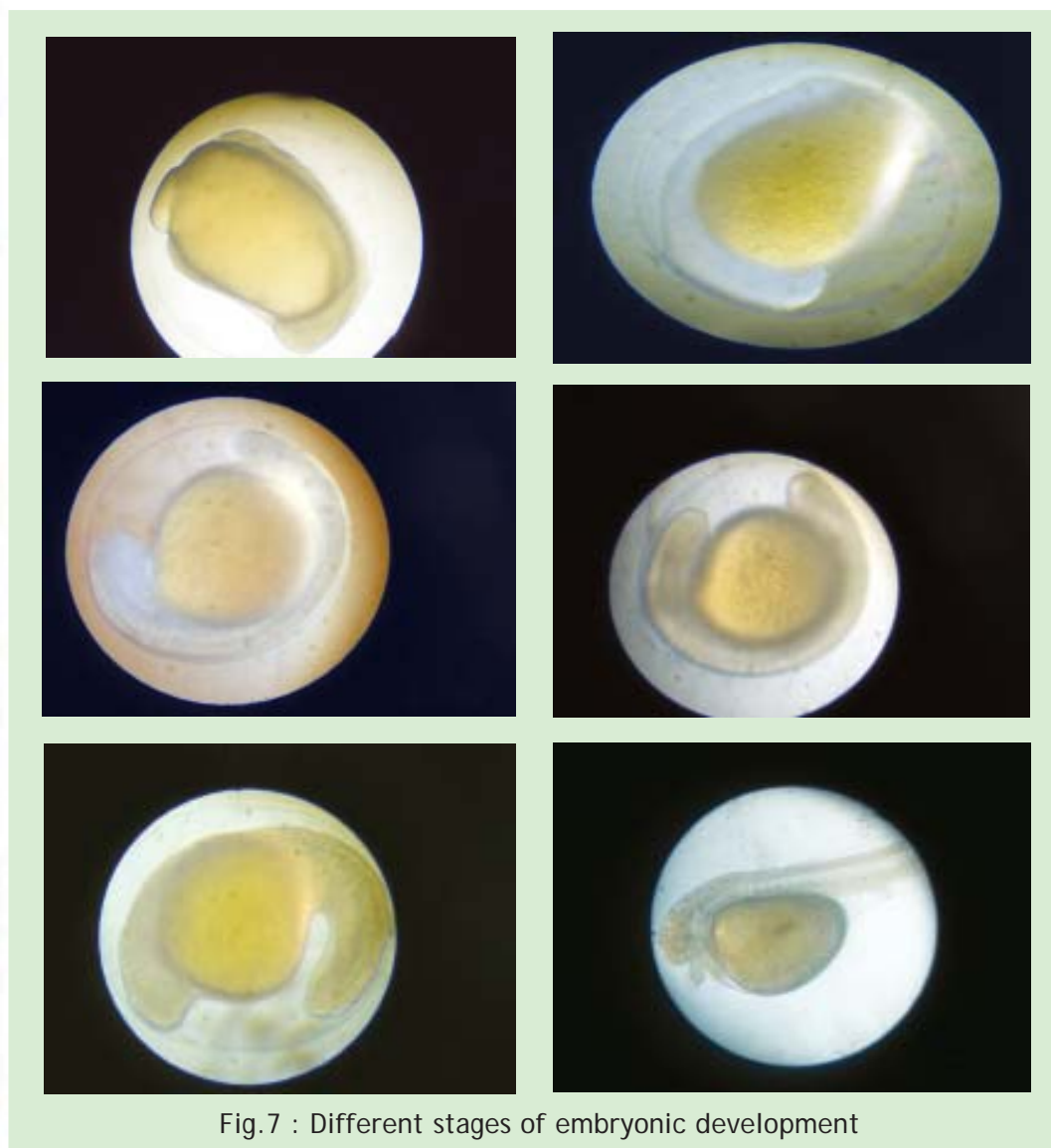


Fig.7 : Different stages of embryonic development

Spawn rearing and fry production

The spawns are reared for 15 days till they grow into fry stage when they resemble with adult in respect of contour and pigmentation. The caudal, dorsal and ventral fins are fully formed whereas the mandibular barbels are almost atrophied. Fry of pabda can be reared at an density of 5-7 lakh / ha to produce fingerlings.

Larval development and feed requirement

The yolk sac gets absorbed in about 3 days. Since mouth opens by 2nd day, little quantity of feed should be provided to them from 2nd day onwards. Water is drained through siphon to remove the left over food and replenished regularly. Fish are fed *adlibitum* with heterogenous mixture of feed viz., live zooplankton and grinded up to 7h day and finely chopped tubifex to be supplied from 7th day onwards.

In the event of cannibalistic behavior developed during early spawn stage, segregation of the stocked spawn based on their size is highly necessary and is done by nets of different mesh size.

Mixed zooplankton, tubifex worm, egg custard may be provided as larval feed. However, grinded tubifex worm along with finely sieved zooplankton is the best food for them to control their cannibalistic habit. They prefer dark place. So hiding place should be provided for better survival. The above feed is provided up to 15 days to obtain better survival and growth of fry. Plankton, rich in zooplankton provided thrice in a day @ 8-10 cc/50L water Tubifex was provided twice in a day about 25% of the bodyweight of spawn up to 15 days.

After 15 days they are provided with nutritious and balanced formulated diets comprising with egg custard, fish meal and silk worm pupae powder. In addition, they are also fed with boiled and finely chopped chicken viscera and/or any kinds of animal protein particularly low cost trash fish, Bombay duck etc. The feed should be provided daily in feeding tray @ 3-5% of the body weight. The feeding frequency should be 2-3 times a day including once in the evening. Fry attain fingerling size (5.0 - 6.0 cm and 3.0 - 4.5g) within a rearing period of 40-45 days with 80% survival. These fingerlings are ready for stocking in well prepared stocking ponds (0.1 - 0.4 ha) for grow out culture.



Fig.8 : Fry of pabda



Fig.9 : Hideout for shelter of pabda fry, fingerlings

Composition of formulated Feed

Formulated feed mainly consisted of good quality fish meal, corn powder, soya bean oil, mineral and vitamin premix. The final size of the fish was recorded as 73.72mm/ 2.33g in 92 days, 4.5 g in 45 days by feeding chicken viscera. Studies revealed the carcass composition of *Ompok pabda* as C. P.- 67.23, Lipid- 7.13 and Ash 19.31. The acceptance of the feeds was found better when mixed with tubifex and boiled trash fish than that of formulated feeds supplied alone. The *Ompok pabda* fry requires 34% crude protein and 6.5% lipid in their feed. The formulated feed contained fish meal, soybean meal, corn powder, sunflower oil, and fish oil and vitamin mineral mixture.

Water management

Spawn rearing can be carried out in FRP tank and cement cisterns. The water temperature and dissolved oxygen level are to be maintained in between 28°C -32°C and >5 mg/l, respectively. Initially the water level of the container should be 7-10 cm, which can be gradually raised up to 15-20cm after a period of one week. The water level is adjusted in accordance with different stages of larval development so as to minimize stress on the larvae. The container used for larval rearing are provided with a soil base of 5 - 6 cm thick. Periodically water exchange is essentially required. It is always better to use pond water after filtration during larval rearing. Provision of maintenance of feeble water current or flow of water in the container / fiberglass tank is necessary for obtaining better survival. Non chlorinated Water having lower alkalinity and hardness in carbon rich base is conducive for better spawn growth. In a better management practice, stocking density may be as high as 10-20 larvae / liter of water.



Fig. 10 : Rearing of Pabda fry in cemented tank



Fig. 11 : Checking of Water quality for better management

Pond management for grow out culture

Influence of simulation as much as natural aquatic environment like shading, organic load in bottom sediment, etc. are favourable on growth and survival of pabda spawn to fingerling as;

- ◆ Hatching possibility and survival of spawn up to 3 days being optimal within alkalinity of 100-150 mg/l
- ◆ Survival of fry beyond 3 days old in respect of tolerance to higher alkalinity stress but their growth was retarded
- ◆ Effect of shading by means of aquatic submerged, rooted floating and free floating vegetation for maintenance of hideouts suitable for pabda growth
- ◆ Provision of hideouts by aquatic vegetation useful for production of zoo-plankton and other periphytons which serve as food organisms for pabda spawn
- ◆ Natural organisms like zooplankton and other periphyton considered as critical inputs for growth, survival and gonadal maturity throughout life stage of pabda
- ◆ Requirement of at least 25 percent coverage of shade

Some important tips for successful rearing of hatchlings

Rearing

- ◆ Spawn should not be directly stocked in nursery pond; rather it is necessary to raise them for 30-45 days in control system by providing vegetative shades/hides for better survival.
- ◆ Fiber glass tank (4 X 2 X 2 ft.) 400L capacity is suitable for spawn rearing.
- ◆ Initially sieved live zooplankton may be fed daily in two installments in morning and evening.
- ◆ Screening in different sizes and keeping same sizes of fry in same containers up to 15 days is beneficial.
- ◆ Early fry stage can also be fed with supplementary feeding.
- ◆ The quality and depth of the water rearing container plays a pivot role in obtaining high rate of survival and water column of 8-10 cm is maintained initially and should be increased subsequently depending on the size of early fry.
- ◆ Aeration of the container is absolutely necessary.



Fig.12 : Fry of Pabda



Fig.13 : Advanced fingerlings of Pabda

Culture

In recent past culture of *pabda* was not taken up in confined water bodies since seed of this species was not available in adequate quantities. Even, no definite culture system was practiced for this species. But later on some systems have been identified, followed by development of techniques on extensive (wild) and semi-intensive culture practice based on their habit and habitats.

Extensive culture system

Systematic culture of the species under extensive system was never practiced. Nevertheless, in *beels*, *jheels* or large sheet of water bodies this species breed, hatch spawn, increase progenies and grow by its own, wherein controlled feeding is not adopted. This condition of species growth may be termed as extensive culture system.

Semi-intensive culture system

Controlled seed production of *pabda* was not possible earlier due to the lack of knowledge on induced breeding of the species. Experimental trial, however, on grow out culture of *O. Species* has successfully been attempted at farms of Kalyani Centre of CIFA, few ponds at nearby progressive farmers' field and Government fish farms at Tripura.

Directorates of fisheries, Govt. of Tripura have distributed more than 50,000 fingerlings to the private entrepreneurs during breeding season of 2011. Scientific knowledge gained so far with regard to breeding, spawning, rearing and culture practices are as; follows :

- ◆ Culture of *pabda* should be undertaken in ponds each ranging from 0.05 to 0.1ha with water depth of 0.75 - 1.0m.
- ◆ The pond to be simulated as their natural habitat with submerged and floating aquatic macrophytes at least 25% of the pond area. These aquatic vegetations not only serve as hide out and shelter of the fish but also act as harbor of the aquatic insects. These insects and their larvae are the ideal natural food of the *pabda*.
- ◆ Polyculture of *pabda* along with 3-5 species of carp is found yielding better return than monoculture of the species alone
- ◆ The stocking density of fingerlings can be maintained @ 25000 - 30000 no /ha in mixed culture.
- ◆ Cheap and balanced diet comprising 30% protein may be used incorporating locally available feed ingredients as supplementary feeding.

Adoption of *pabda* culture by the Govt. department and private entrepreneurs

Since last three years Kalyani center of CIFA have trained few interested progressive fish farmers of this locality about induced breeding, rearing and culture of *pabda* in confinement. As requested by the Director of fisheries, Govt. of Tripura al the officer deputed by him was also trained. By adopting the technology about *pabda* culture evolved by this center and *in situ* training one progressive fish farmer of this locality have produced more than 1.5 lakhs of *pabda* fingerlings on commercial basis for the first time. Directorate of fisheries, Govt. of Tripura, has already initiated commercial seed production of *pabda*. They have distributed more than 50,000 fingerlings to the several interested farmers in 2011. This experience and regular increasing demand of *pabda* seeds indicate that in near future *pabda* will be an important component of our regular culture system. It also contributes some percentage to bridge between the gap of present demand and supply.



Fig.2 : Dr. P. Jayasankar, Director, Dr. A.K. Sahoo, HOD, APED & Dr. K. Kumar observing newly constructed Pabda hatchery of CIFA, Kalyani



Fig. 15 : Stockable Pabda fingerlings



Fig. 16 : Sampling of Pabda at farmers field



Fig.17 : Removal of testes



Fig.18 : A view of natural habitat of Pabda

Culture of Tubifex as larval feed for Pabda

Tubificid worm (commonly known as Bottom-dwelling worm or Sludge worm)

Sc. Name : *Tubifex tubifex*
Family : Tubificidae
Order : Oligochaete
Phylum : Annelida

HABIT AND HABITATS OF TUBIFEX

Habit

Length: 2.5-3.0cm

It is very sensitive, though it is a hardy biological organism

If disturbed from outside, it will go down into deep of soil bed

It remains in colony, which looks reddish in colour

Habitat

It inhabits in sewage drain enriched with organic substances

It may survive at BOD level in the range of 40-50 ppm

It grows in such habitats where water flow continues so that required DO level for survival of tubifex is maintained.

IMPORTANCE OF TUBIFEX

It is required as live foods for rearing of spawn, fry and fingerlings of catfishes, specifically to Pabda (*Ompok pabda*), apart from other fishes such as murrels, climbing perch and feeding of ornamental fishes.

Food value of Tubifex

Nutritive value: 5.57 kcal g⁻¹ on dry weight basis

Proximate composition of tubifex samples (% w/w basis)

Parameters/culture condition	RCD	DS	RMS
Dry matter	79.73	78.61	77.86
Crude protein	4.02	5.87	6.38
Crude lipid	0.85	1.29	3.02
Ash	2.43	2.58	2.98

(RCD, Raw Cattle Dung; DS, Dairy Sludge; RMS Rice Mill Sludge - all are used as food resources for production of tubifex in captivity)

This worm is used throughout the world as food for aquarium fishes. Significantly, larvae of *Clarius batrachus* (Magur) feeding upon tubifex showed higher survival rate and ten times more additional growth than those fed formulated fry feed.

Why culture of Tubifex is required?

Tubifex is hitherto supplied from collection of its population growing naturally in sewage-fed water channel. However, supply of Tubifex from natural environment lags behind the present day demand due to expansion of aquaculture.

Besides, there are certain problems of collection as it hides inside the natural environment. As of growth, other aspects of tubifex are :

- ◆ Tubifex is not available in the market round the year as and when required for spawn rearing
- ◆ Sometimes, market value of tubifex reaches in such a high scale of price common fish farmers are unable to afford it
- ◆ More and above, collection of tubifex is the most cumbersome task which particular community and skilled people can do it from very difficult zone with high risk of skin infection

Advantages of Tubifex culture

Culture of tubifex may bring additional benefit for utilization of useful waste substances emanating from agro-industries, since tubifex is accustomed at growing in sewage water with high level of B.O.D. (Chapman & Brinkhurst, 1987).

Considering its survival in the high level of BOD, there is ample scope to utilize various types of waste which have potential organic nutrients to support the growth of tubifex.

Dairy Sludge (DS) and Rice Mill Sludge (RMS) are a few such wastes of agro-industrial origin, which have potential organic nutrient but are not put to any use.

TECHNIQUES FOR TUBIFEX CULTURE

Preparation of base media

Earth mud, enriched with sand (> 50%), silt, clay and organic manures are used for preparation of base media. Mud soil requires to be sieved through fine mesh nylon net/ cloth in order to eliminate coarse & rough material and allow passing fine sand, silt & clay particles deposited in media.

Application of Inoculums

Tubifex biomass @ 50 g/m² is to be inoculated uniformly in each FRP tank covering entire area. After 2 hours of inoculum application, food substances are to be given in each tank.

Water flow

Continuous water flow @ 1.2 litre/minute over the culture media is to be maintained culture.

Application of food substances

The optimum amount of food substances @ 4.0g/g of tubifex is to be applied daily basis. For example, for 10 days culture period, 4.0 kg (4g waste × 100g inoculums × 10 days) of each waste needs to be applied.

HARVEST OF TUBIFEX

Cleaning of media

Water of each tank is to be drained out through outflow system. The base media needs to be segmented into 5 to 6 parts as per convenience. Then, the entire content of each part is to be put in mesh nylon net/cloth and washed with water flash through pipe.

Parameter	Value of different treatment		
	Cow dung	Dairy sludge	Rice mill sludge
Dissolved oxygen(ppm)	2.5-5.6	3.0-5.8	3.2-5.9
Total Alkalinty (ppm)	250-360	260-340	270-380
Total ammonium nitrogen, NH ₄ N (ppm)	0.2-0.5	0.25-0.5	0.22-0.5
Total phosphate, P ₂ O ₅	0.05-0.1	0.05-0.15	0.05-0.18
B.O.D	20-40	25-45	22-42
pH	6.5-7.0	6.2-7.2	6.0-7.1
Temperature	30-32	30-32	30-32

Segregation and collection of Tubifex biomass

In the process, base media needs to be sieved through the nylon net/ white cloth, leaving behind tubifex biomass within net/cloth. Biomass is then to be collected and put in container with fresh water. This process is to be continued unless the entire biomass of each tank is harvested. To soak extra water, the entire amount of fresh biomass needs to be put in blotting paper. Afterwards, the entire amount is to be collected.



Fig.19 : A view of Tubifex colony



Fig.20 : Pabda with other Aquarium fishes

Review

Current status of research and development of pabda

Ompok pabda, commonly known as butter fish, is a minor catfish available in fairly large number in West Bengal along with *O. bimaculatus* and the allied species from beels, swamps flooded area adjacent to rivers and constitute a minor fishery during monsoon and post-monsoon months in the state of West Bengal and Tripura. The life history of *O. bimaculatus* have been described by Rao (1919) and Choudhury (1962) and biology has been studied by Quayyum and Quasim (1964) and Parameswaran *et. al.* (1971). Although the bionomics and life history of *O. pabda* have been reported by Parameswaran *et. al.* (1971), but studies pertaining to the larval development and rearing of the species is meager. Breeding of *O. pabda* and *O. bimaculatus* was reported to be successful by some workers like Sridhar, 1998; Bhowmik. *et al.*, 2000; Mukherjee and Das, 2001; Chakrabarti *et al.*, 2006-07; Hussain, 2006. But success in mass scale breeding could be achieved at Regional Centre of CIFA, Kalyani in breeding of *Ompok* spp (Chakrabarti *et al.*, 2005, 2006, 2007, 2008, 2009).

Embryonic development of pabda was also reported in detail by Chakrabarti *et. al.* They (2009) also studied comparative morphometric and meristic characters of embryonic larval development of *Ompok bimaculatus* and *Ompok pabda*.



Fig.21 : Dr. (Mrs.) B. Meenakumari DDG (Fy) obser using Pabda at CIFA, Kalyani



Fig.22 : Pabda seeds are distributed to a farmer from CIFA, Kalyani

Economics

Table A : Fixed Cost

Sl.no	Item	Amount (in ₹)
1	Hatchery with Shade	55,000
2	Electrical Expenses	5,000
3	Rearing Tanks	2,0000
4	Aerator (10 nos)	1,000
5	Operational Equipments	2,000
6	Overhead tank	3000
7	Electric Pump (2 nos)	5,000
	Sub- Total	91,000

Table B : Variable Cost

Sl.No	Item	Amount (in ₹)
1	Pond maintenance, preparation etc.	5,000
2	Brood Stock (10 Kg @ 300)	3,000
3	Feed	15,000
4	Inducing Agent (Ovaprim)	2,000
5	Wages (one @ 3000 for 3 months)	9,000
6	Miscellaneous	1,000
	Sub- Total	35,000

Table C: Total Cost

1	Variable Cost	35,000
2	Interest on Fixed Capital @13. 5 % per annum	12,285
3	Depreciation on fixed Capital @ 10 % per annum	9,100
	Grand Total	56,385
	Gross Income	
	Sale of pabda Fry (@ Rs 2 per fry 100000)	2,00,000
	Sale of male (@ Rs. 200 for 5 kg)	1,000
	Total	2,01,000
	Net Income (Gross Income- Total Cost)	1,44,615

Economics of monoculture of Pabda in 1 ha pond

Table d : Variable Cost

Sl	Item	Amount(in ₹)
1	Pond lease Value	15,000
2	Fry(100000 @ Rs. 2 / Fry)	2,00,000
3	Fertilizers	5,000
4	Feed (5 Tones @ 20/ kg)	1,00,000
5	Wages(Rs 3000 / month for 1 year)	36,000
6	Miscellaneous	4,000
	Sub total	3,60,000

Table : Gross Income

Sl	Items	Amount(In ₹)
1	Sale of Pabda (@ 300/Kg for 3 tons)	9,00,000
	Net Income(Gross Income- Variable Cost)	5,40,000

Pabda is a compatible component with carp poly culture. In such mixed culture, the estimated economics is as below.

Table Variable Cost of Poly Culture

Sl	Items	Amount(In ₹)
1	Advanced Fingerlings(10,000 @ 3/Fingerling)	30,000
2	Feed(1000 Kg @ 20/ kg)	20,000
3	Miscellaneous	5,000
	Sub Total	55,000

Gross Income

Sl	Items	Amount(In ₹)
1	Sale of Pabda (@ 300/ kg)	1,20,000
2	Net Income (Gross Income- Variable Cost)	65,000

It reveals from the above estimate that the fish seed producers may earn ₹1,45,000 in monsoon season by selling of seed from 10 Kg brood stock of Pabda. From mono culture of Pabda, farmers can earn Rs. 9,00,000 through a mere investment of Rs. 3,60,000, with a net profit to the tune of Rs. 5,40,000 in a year. However, Pabda can also be reared with carp poly culture where farmers may get an additional income of Rs. 1, 20,000 by investing Rs. 55,000 only. Net Income of Rs. 65,000 by selling of marketable size Pabda in one year from 1.0 ha water body apart from the income of carp from the same water body.

Success Stories

Name: Bablu Ghosh

Age: 50

Address: Rajendrapur, 24 Pgs (N)

About the Farmer:

Bablu Ghosh is a successful fish farmer from Battala, Naihati 24 Pgs (N), West Bengal. His father Mr. Nilratan Ghosh, was the first person to adopt the induced breeding technology of fishes as his profession in the area and got a huge success subsequently. After watching the success of Mr. Ghosh many unemployed youth of the locality get inspired and subsequently their successes created a new dimension in the fish seed production industry. Mr. Bablu Ghosh had keen interest in fishery from his childhood. His ambition was to be a successful pisi-culturist like his father. At the age of fourteen he initiated his first venture with ornamental fishes and later on shifted towards food fishes. He is now a success full renowned, and expert fish farmer of West Bengal. Presently he is engaged to produce table size fishes in commercial scale and he is also producing seeds of some high value fish species like pabda and others. He has received several awards offered by various fishery universities, directorate of fisheries Govt. of west Bengal and I.C.A.R institution namey C.I.F.R.I. and C.I.F.A

Year of adoption of Pabda: 2008

His achievements in pabda:

In 2008, he was supplied 5000 spawn of pabda due to improper pond condition and lack of proper maintenance survival rate was very poor, only a few fishes survived.

Again in 2010 he was again supplied with 500 fingerlings of pabda, and was told the aspects to culture the fish species, and he did so.

In 2011 the fingerlings attained the length of 12-15 cms /40-60g, which were not ready to breed.

In 2012, the fingerlings have attained 16-90/75-90g are ready to be breed, Mr. Ghosh has successfully breed and produced pabda spawns

His view on Pabda :

“ I was very much interested, to know the culture technique of pabda a very high valued fish in the market, The CIFA, Kalyani has given full support and has taught me

amount culture and seed production of pabda. CIFA, Kalyani has also given me spawns of pabda initially I could not rear due to some improper management but later on the centre, taught me the ideal way to culture this fish and now I have no problem, and I am confident enough now to produce at mass scale.



Fig.24 : Supply of Pabda seed to Bablu Ghosh



Fig.25 : Releasing of Pabda seed by Bablu Ghosh in his pond

Name: Babul Majumder

Age: 52

Address: Sibdaspur, 24 Pgs (N)

About the Farmer:

Bablu Majumder is one of the leading fish seed producers in India. He stated his career as an amateur pisi-culturist jointly with another person. Within a very short time his intelligence, keenness of learning and foresight about business trend he became a skilled and knowledgeable pisi-culturist and thus he paved his way to be a successful fish seed producer also. He came from a very poor family, and could not complete his graduation degree for dearth of money. He started his business by selling gold ornament of his mother. In the early stage of his fish culture venture he was compelled to stay during night under the shed of fish feed beside the pond bank where he used brick as his pillow and gunny bag to cover himself during cold season. Now he maintaining his life lavishly with his own bungalow and car also hundreds of people come to him to learn the technique of breeding of fishes various fishery university regularly invite him to deliver lecture about pisciculture. He has received several awards offered by various fishery universities, Directorate of fisheries Govt. of west Bengal and I.C.A.R institution namely C.I.F.R.I. and C.I.F.A. He is very much fond of introducing various new fish species in culture system. He is very much successful in seed production of pangas, and he is successful too in culture and seed production of some other high value fish species like pabda.

Year of adoption to Pabda: 2010

His achievements in pabda:

In 2010: He was given brood stock (more than 100 pcs. including male and female) and taught him about breeding and seed rearing of pabda.

In 2011: He himself produced seed of pabda in commercial scale where he 50-60 thousand fry

In 2012: He has raised a very good number of broodstock, and in the process of raising seed of pabda in commercial scale

His view about Pabda

"Pabda being a high value, highly priced fish in the market, I certainly had the urge of knowing technology of its breeding rearing and culture. When I came to know about CIFA, Kalyani I immediately went to the centre for help. The centre helped, more than I could think. They gave me hands on training at their place and also at my firm, gave me brood-stock and valuable suggestions when ever required"



Fig.26 : Babul Majumder learning Pabda breeding technology at his farm



Fig.27 : Releasing of Pabda fingerlings at Babul Majumder farm

Name: Mafizul Haque Mondal

Age : 40 years

Address : Wad No-14, P.O.- Guskara, P.S. Aushgram,
Dist -Burdwan, Pin: 713128

About the Farmer:

Mr. Mafizul Haque Mondal is a successful fish breeder, he is so much passionate about fish farming that he left his job from Railways Protection Force and started his own farm at his native place. He has set up a modified hatchery at his farm. He has also set up a catfish hatchery on the roof top of his residence. Apart from raising seed of IMC and exotic carp he is very much interested to produce seed of magur (*Clarius batracus*) he was very much eager to rear pabda and some other high value Small indigenous fish species (SIFS). To have knowledge about such culture he came to the Kalyani Centre of CIFA during 2011 for receiving training about culture and seed production of pabda and some other high value SIFS. Considering the availability of infrastructural facilities of his own, and the interest and experience CIFA, Kalyani gave him fingerlings of pabda for further rearing in his farm and some brood fish also for conducting seed production trial.

Year of adoption for Pabda culture : 2011

His achievements in pabda:

In 2011: He received 100 nos. of fingerling from CIFA, Kalyani

After 1 year, 2012: The fingerlings gained wt of did not mature well, again he collected brooder from CIFA, Kalyani and breded and got good result

Remarks:

"I took training from CIFA, Kalyani centre learned every details about pabda culture, I also got hands on practical training from Dr. P. P. Chakrabarti and Mr. Subash Ch. Mondal, and they were of immense help and support. The centre provided me with fingerlings and brood stock and most importantly with technical guidance when ever required and have also promised me to do so in future. Now I am confident enough"



Fig.28 : Giving of Pabda brood fish by Kalyani CIFA to Mr. Mondal



Fig.29 : Mr. Mondal with other trainees during his training period at Kalyani, CIFA

Name of the office : State fish seed farm, Lembuchera

Address: Pabda hatchery, Lembuchera (Fish Seed Production Centre)
Superintendent of Fisheries, Sadar, Tripura
Govt. of Tripura

About the Firm:

Pabda hatchery and State fish seed production centre, Lembuchera farm is situated about 23 km away from Agartala, Tripura. It is an ideal fish seed production centre having natural water resources and scope for establishment of hatchery in low cost. The firm is engaged for raising seeds of various carp species. They also collect seeds of Chitala (*N. chitala*) seed as the nearby water body is the natural breeding ground of chitala. Besides, their first priority is to produce pabda seed in commercial scale since pabda is the state fish of Tripura. Prior to 2010, they tried producing seeds of pabda through induced breeding but could not succeed. They also faced the same problem as Melaghar faced. In June, 2011 Dr. P. P. Chakrabari, Pr.scientist and Mr. S.C.Mandal, technical officer visited the farm, analysed pond water quality and suggested the remedial measures to improve spawn survivability, breeding protocol, proper feeds etc. CIFA arranged a training programme on breeding and culture of pabda at Melaghar and the In-charge of the Lembuchera firm attended the training also. After receiving the training from CIFA by the in charge of lembuchera firm success in commercial seed production of pabda came in that year onwards.

Year of adoption for Pabda culture : 2011

Achievements in pabda after CIFA's intervention:

2011: Breeding done, total number of fingerling raised was 36,000

2012: Breeding done, total number of fingerling raised was 19,000 up to 25.06.12

Remarks:

" In spite of our untiring effort on pabda breeding and culture, we were not be able to rear the spawns beyond third day onwards, faced problem in larval mortality especially from the 3rd to 11th day, we tried many ways but could not find out any proper way, after receiving training from the experts of CIFA, Kalyani, which was possible due to fruitful effort made by our Director Mr. S. Riyan and Dr. M. Sinha, advisor of Fisheries, Govt of Tripura, learnt all tit and bits about pabda breeding and culture, and easily found out where we were going wrong. Now we are confident enough and we are ever grateful to CIFA"



Fig.30 : Showing of Pabda fry at Lembuchera farm



Fig.31 : Dr. P.P. Chakrabarti explaining about Pabda to Hon'ble Chief Minister of Tripura Sri Manik Sarkar

Name of the Office: Office of the Superintendent of Fisheries

Address: Office of the Superintendent of Fisheries,
Govt. of Tripura, Melaghar, West Tripura

About the office :

The climatic condition of Tripura is very much congenial for fish seed production and culture. The scenic beauty of the state is superb, full of big and small water bodies; Rudrasagarh at Melaghar is one of them. The Office of the Superintendent of Fisheries, Govt. of Tripura is situated beside the Rudrasagar Lake and the lake is abode of various carps and small indigenous freshwater fish species (SIFFS) including pabda. It is worthy to mention that pabda is considered as the state fish of Tripura. The Melaghar fish farm of Tripura is engaged for seed production of pabda successfully. They distribute these seeds to the farmers with technological support for rearing and culture in various stages along with other carp species since 2010 under the guidance of Kalyani centre of C.I.F.A

Year of adoption for Pabda culture : 2010

Achievements in pabda after CIFA's intervention:

As desired by the Director of Fisheries, Tripura and the Advisor of Tripura state Fishery Department one officer from their Melaghar fish farm was deputed to CIFA, Kalyani centre for receiving overall training on pabda seed production and culture for a period of 10 days during 2010

In 2011, the Melaghar office could produce 37,279 nos fingerling of pabda successfully by applying the technology received from the Kalyani centre of CIFA.

Remarks:

"Though we could breed pabda which produced considerable amount of spawn in captivity, we were unable to bring them up to fry level. Mass mortality of fry in the rearing stages between 3rd and 10th day was a major set back for us. We were in dark to find any clue. In this distressed condition, Dr. Riyan, Director, Dept of Fisheries, Tripura and Dr. M. Sinha, Advisor Fisheries, Tripura came forward to help us, they sent us to the Kalyani centre of CIFA for its solution. We got hands on training there, learned a lot about breeding and in post management like maintenance of male and female ratio, standardized dose of hormone, techniques of large scale breeding and proper feeding after hatching and for latter stages too. As a result male population increased, major reduction of quantity of injectable hormone & thereby decreasing cost of production, higher recovery of male milt, drastic reduction of cannibalism, increased survival of fry and decreased period of sellable fingerlings due to fast growth of fry (more than seven days) is our direct impact from training of RRC, CIFA, Kalyani. Now we can rear pabda with 90 % fertilization rate, by adopting CIFA, technologies. We have full regards to the Director, CIFA and experts of Kalyani centre CIFA"



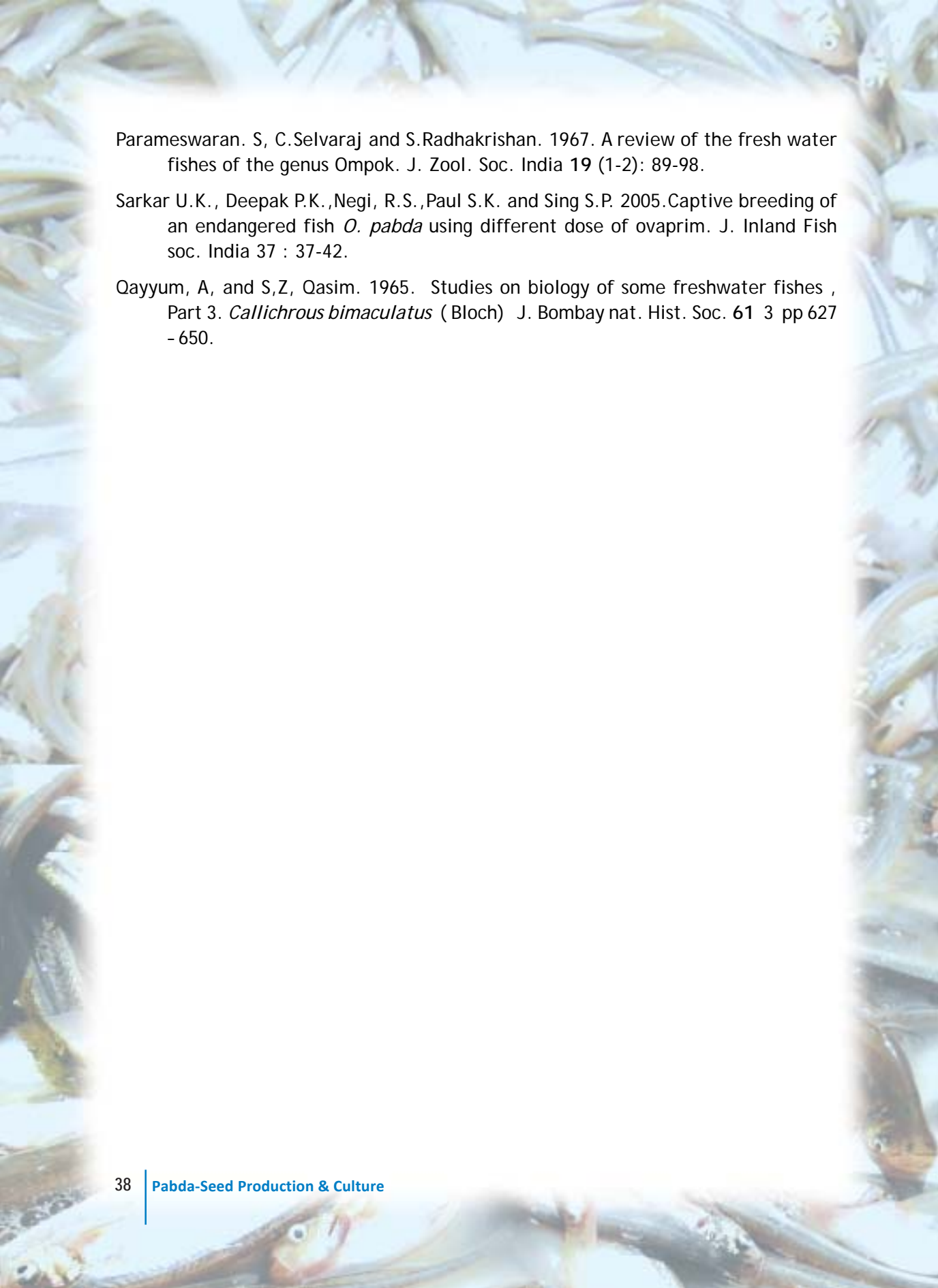
Fig.32 : Release of Pabda fingerlings



Fig.33 : Distribution of Pabda seed at Melaghar, Tripura

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