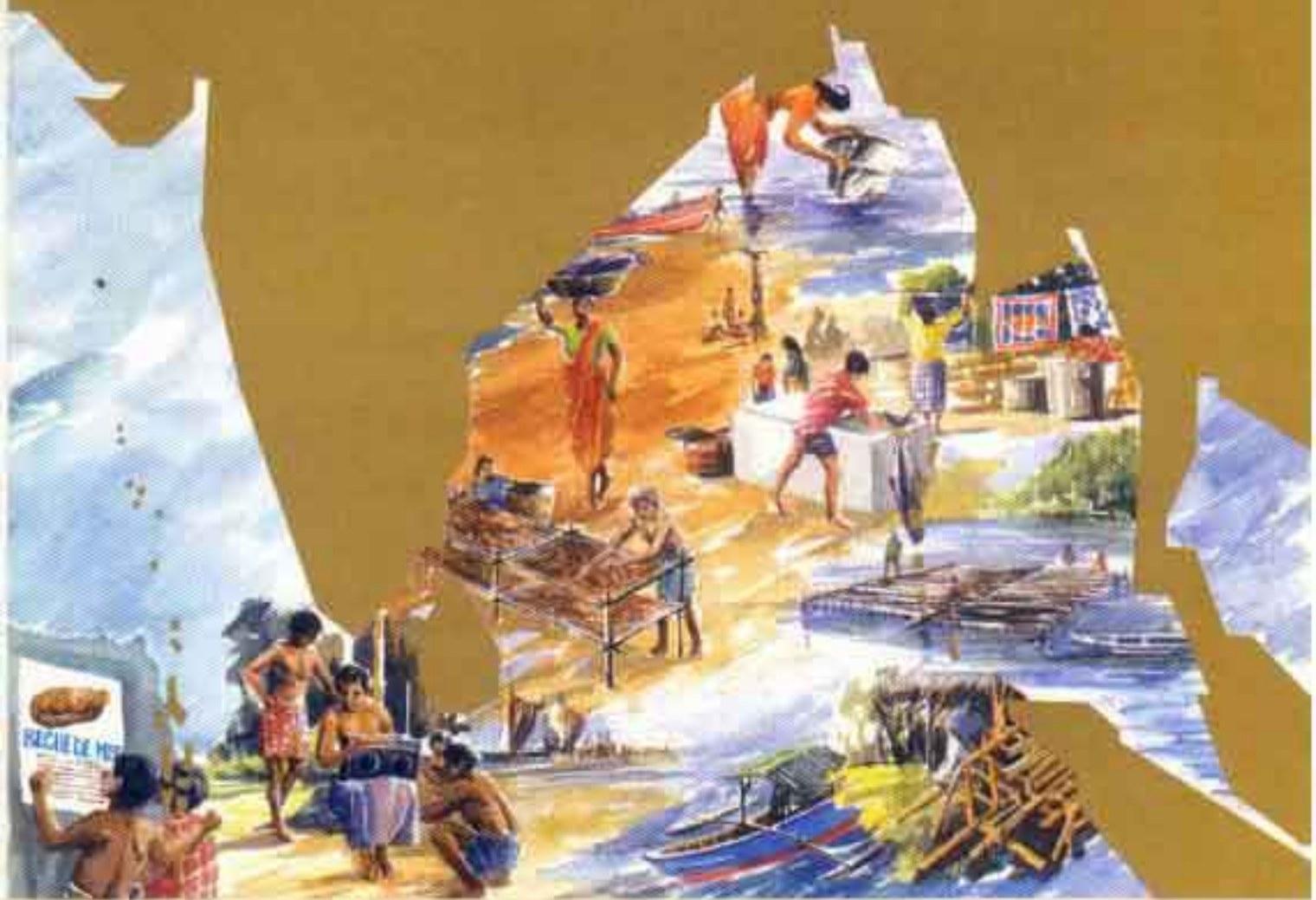


**BOBP/WP/87**



# **Market study of tiger shrimp fry in West Bengal, India**



BAY OF BENGAL PROGRAMME  
Small-Scale Fisherfolk Communities

BOBP/WP/87  
GCP/RAS/1 18/MUL

**Market study of tiger shrimp fry in West Bengal, India**

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Rice-fish polyculture in *bheries* (enclosed paddyfields) has been a tradition in the West Bengal (India) delta. Fish are seeded naturally with the water let into the paddyfields. With the growing shrimp export market, shrimp culture in the *bheries* has proved economically attractive and the supply of tiger shrimp fry to the *bheries* is, now, a burgeoning business in West Bengal.

The Bay of Bengal Programme (BOBP), at the request of the Government of West Bengal, studied the problems connected with the supply of tiger shrimp fry to the *bheries*. The problems were seen as a constraint to the development of the mainly export-oriented shrimp culture industry. BOBP looked into both natural collection and hatchery-reared supply of shrimp fry. It also helped the West Bengal Department of Fisheries to establish a small hatchery at Digha and it worked with some of the fry catchers of Medinipur District through a local NGO. The study of all these activities as well as the marketing process was seen as a step towards a better understanding of the existing tiger shrimp fry market and the fisherfolk involved in it. This, it was hoped, would lead to an elimination of some, if not all, the problems associated with the business. The BOBP study was undertaken under the 'Small-scale Fisherfolk Communities' project (GCP/RAS/I 18/MUL).

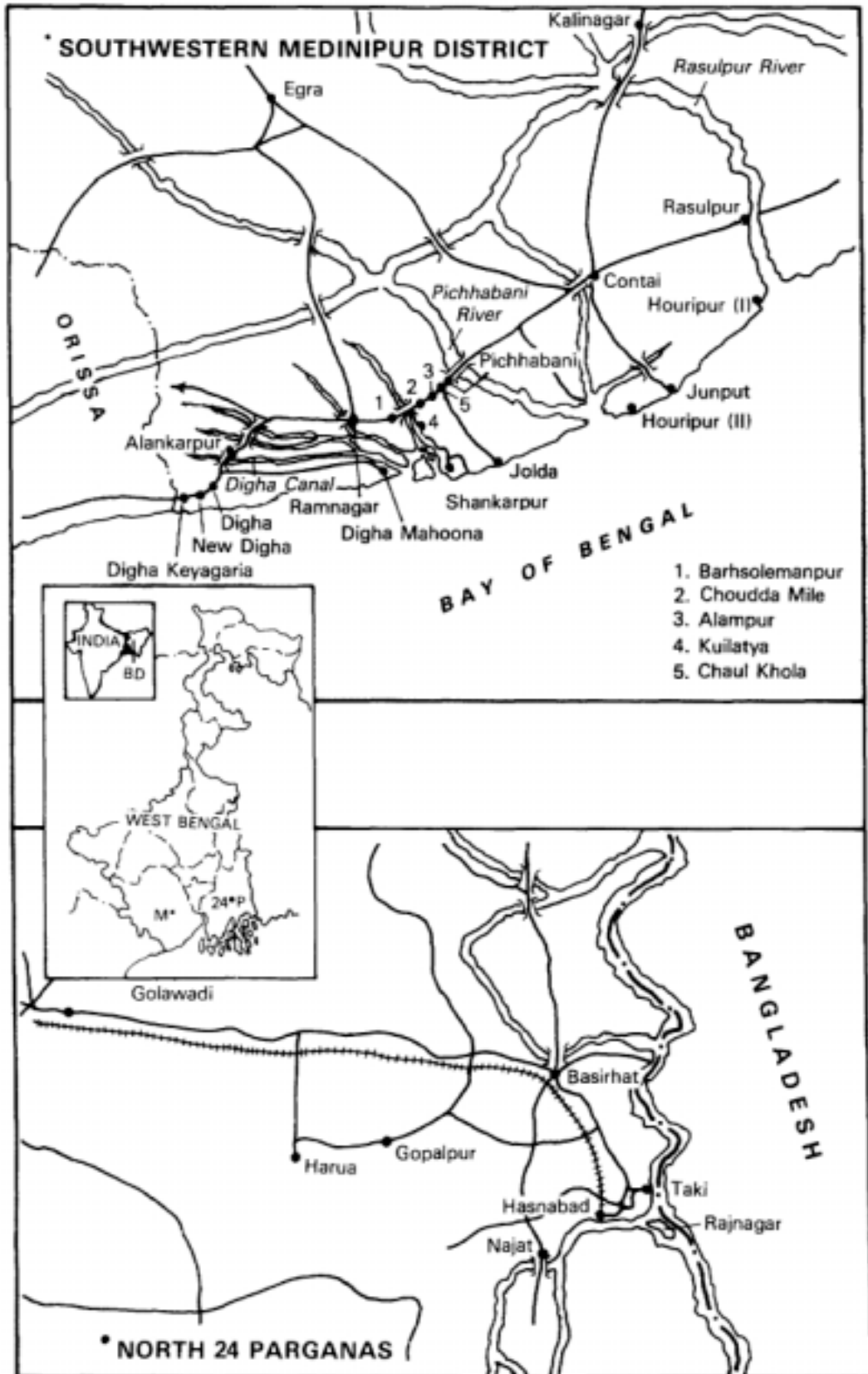
The Bay of Bengal Programme (BOBP) is a multiagency regional fisheries programme which covers seven countries around the Bay of Bengal – Bangladesh, India, Indonesia, Malaysia, Maldives, Sri Lanka and Thailand. The Programme plays a catalytic and consultative role: it develops, demonstrates and promotes new technologies, methodologies and ideas to help improve the conditions of small-scale fisherfolk communities in member countries. The BOBP is sponsored by the Governments of Denmark, Sweden and the United Kingdom, and also by UNDP (United Nations Development Programme). The main executing agency is the FAO (Food and Agriculture Organization of the United Nations).

This document is a working paper and has not been cleared by the Governments concerned or the FAO.

**July 1993**

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Fig 1. Maps of Southwestern Medinipur and North 24 Parganas Districts, West Bengal



## 1. SUMMARY

The tiger shrimp fry trade, the life blood of shrimp culture in West Bengal, offers extra earning opportunities to 50,000 families in the state, mainly poor fisherfolk and landless agricultural labour, both young and old, male and female. These fry catchers receive a generous portion of the retail price as their remuneration. What they receive is unusually high for the fisheries or agricultural sector. In most cases, the volatile prices are similar between villages of the same district on the same day, reflecting healthy competition between purchasing agents. Markets in North 24 Parganas also reflect a healthy relationship between buyers and sellers, with concurrent prices uniform and middlemen margins minimal.

## 2. INTRODUCTION

Rice-fish polyculture has been a tradition in the Bengal delta area, very likely since the first construction of a *bheri*, a paddyfield enclosed by a bund. The saline soils permit only an annual crop of salt-tolerant rice known as *aman* paddy. During the rest of the year, the dry season from February to May, the *bheries* are flooded with tidal brackishwater. Fish are seeded naturally with the intake of water to the paddyfield; they had never been stocked as such. In recent decades, shrimp culture in the *bheries* of southern West Bengal has become economically attractive as a result of the growing shrimp export market; there is a much greater demand for tiger shrimp (*Penaeus monodon*) than what nature provides the farmer by chance. For this reason, a new, burgeoning business has evolved in West Bengal: the supply of tiger shrimp fry to the *bheries*.

The Bay of Bengal Programme (BOBP), at the request of the Government of West Bengal, studied the problems connected with this supply. These problems were seen as a constraint to the development of the mainly export-oriented shrimp culture industry.

BOBP looked into both natural collection and hatchery-reared supply of shrimp fry. With the assistance of BOBP, the West Bengal State Department of Fisheries established a small hatchery at Digha. At the same time, BOBP began work with some of the fry catchers of Medinipur District through a local NGO, SANLAAP. The study of these activities is seen as a step towards a better understanding of the existing tiger shrimp fry market and the fisherfolk involved in it.

### 2.1 Geographic limitations of study

The West Bengal tiger shrimp fry industry is concentrated within the Hugli-Matla estuarine zones and nearby culture areas in three districts, Medinipur (collection), South 24 Parganas (collection) and North 24 Parganas (markets and culture). This study, due to time limitations and BOBP's specific involvement in Medinipur, has restricted itself to field data collection in Medinipur and North 24 Parganas districts only (see maps on facing page). References made to South 24 Parganas are drawn from secondary sources.

Medinipur District covers the area between the lower portion of the Hugli estuary and the Orissa border and is responsible for 15-20 per cent of the state's fry trade. The landscape is extremely flat and near sea-level. Canals for transportation and water drainage criss-cross the district, which is also characterized by flood protection dykes near the coast. Rice production is the mainstay of the economy.

South 24 Parganas is often referred to as the Sundarbans due to the deltaic islands that constitute much of the area between the Hugli-Matla estuary and the Bangladesh border. Mangrove forests, Bengal Tigers and saltwater crocodiles combine to protect an important tiger shrimp fry habitat. Tiger shrimp fry are much more abundant in South 24 Parganas than in Medinipur District.

Fry collection is not carried out on the remote islands where there are no permanent human settlement or transportation links. Bydyadhari, Roy Mangah Matla, Ichavathi, Kalini (Neyat) Dhasa, Saraswati, Gotihara and Goureswar are rich sources of shrimp fry.

To the north, the district of North 24 Parganas forms a transition between the island-dotted Sundarbans delta and the mainland. The district is crossed by several major rivers flowing southward into the delta and is bordered by Bangladesh to the east and Calcutta (and the Hugli River) to the west. The district is the main tiger shrimp production area in the state and has the chief centres for tiger shrimp fry marketing. Some fry collection is also carried out.

## 2.2 Methodology

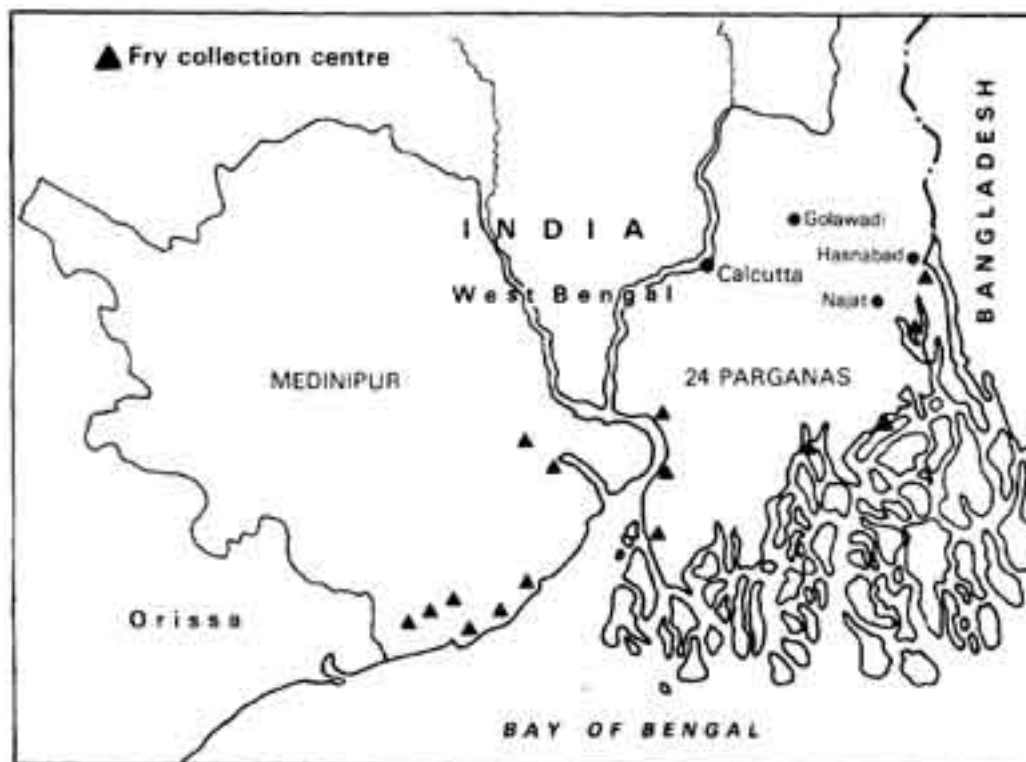
This study is based to a great extent on the information collected from the fisherfolk, traders and farmers involved in the business. The information was collected during an intensive ten-day mission (8-18.3.92) when informal interviews were conducted in the field with the aid of two field workers from SANLAAP familiar with the market. Further information was collected on a visit (23-27.3.92) to Medinipur District in conjunction with the monitoring of BOBP's tiger shrimp fry nursery rearing trials. The collected data was subsequently analyzed and compared with secondary sources.

## 3. SUPPLY

An estimated 90 million fry are being collected from the Sundarbans and Medinipur District every year. There is, however, a potential for 400 million fry, as, currently, only about a third of the Sundarbans area is fished (see figure 2), the rest being out of bounds due to conservation measures and the presence of the Bengal Tiger (R C Sengupta, DOF, personal communication).

Production in Medinipur District depends both on the status of the natural supply and the demand for fry in North 24 Parganas. Though the fry catchers are not very sensitive to price, as they have

Fig 2 Main tiger shrimp fry collection centres in West Bengal.



few alternative employment opportunities, it is the middlemen or transporters who cannot afford to move small quantities. While supply from the fry catchers is inelastic, the middlemen have a cut-off point at which they cease to trade in fry, making the supply elastic or price sensitive.

Supply from nature is dependent on numerous variables, of which, the more important are discussed in the pages that follow.

### 3.1 Temporal variables

**Season :** Tiger shrimp fry can be found at any time of the year in Medinipur, but the catch per unit effort varies greatly. April to June are the peak months for fry availability in the canals and estuaries where they are mostly collected. With the arrival of the monsoon in mid-June and into July, the canals and estuaries drop in salinity to the point where few fry survive. The natural supply recuperates by September. From October, the natural supply builds up to the April peak.

**Temperature** The low temperatures of water during the Bengal winter inhibit fry growth and may keep fry closer to the warmer Bay of Bengal. Shallow canals, ditches and backwaters experience both low winter temperatures as well as greater daily temperature variations that hinder a steady year-round supply of fry. November to February is the cold period in West Bengal.

**Timings :** Fry catching can be carried out as long as there is light enough to identify the fry. Collection is carried out during different times of the day, depending on the gear used. *Chakni* catchers (see Section 3.3) normally collect fry early in the mornings (low tide), while shootnet operators work mainly during the late morning, high tide or *bhonna*, and early afternoon ebb tide.

**Lunar phases :** Spring tides associated with the New and Full Moon periods attract and concentrate fry in the estuaries. Thus, approximately five days around New Moon and five days around Full Moon allow for ten days of good collection every month.

### 3.2 Spatial variables

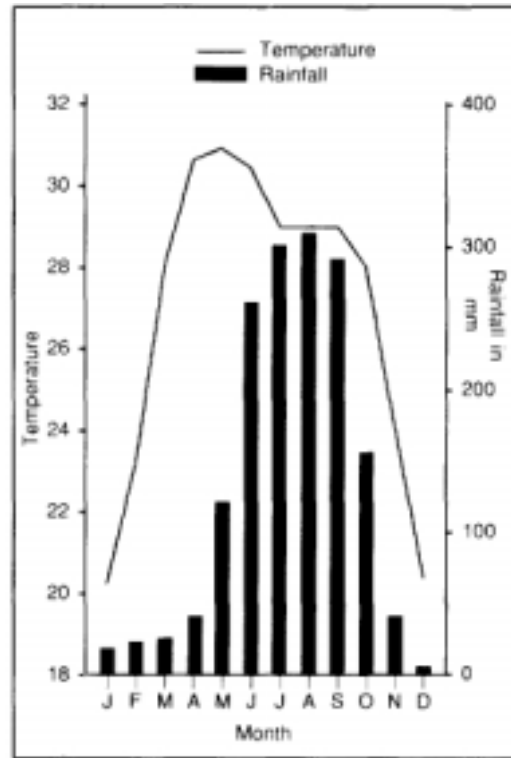
Adult penaeid shrimp are known to spawn in the sandheads region of the Bay of Bengal at 20-40 m depths. The larvae then drift towards the shallow coastal backwaters and estuarine areas, including river mouths and mangrove areas, which are their nursery grounds.

The fry when collected are about 25-30 days old. Tiger shrimp fry differ from other shrimp fry by the conspicuous brownish red stripe found on their dorsal sides.

**Waterbodies :** Collection can take place in river estuaries, canals, ditches and on the open sea coast. Medinipur offers them all. Current and tidal activity can be utilized, especially by shootnets (see Section 3.3), for efficient collection.

**Habitat :** Tiger shrimp fry, unlike other shrimp fry, are attracted to substrate which they cling to. This serves to protect them against cannibalism and predators. While the habitat in the Sundarbans has considerable debris and mangrove roots, the fry habitat in Medinipur is more exposed, with an open coast in parts. Locations with good fry habitats are more 'productive' for collectors, but gear selection is limited to the use of the *chakni* (see Section 3.3).

**Fig. 3 Average monthly rainfall and temperature**





Fry—catchers create artificial environments with branches and brush to attract the fry. Likewise, BOBP has worked with ‘lurelines’, which are merely an attempt to create a more congenial habitat by introducing substrate tied to a line between two poles.



*Fry-collectors among artificial habitat in Dubda Canal*

**Salinity:** Salinity in the fry collecting areas changes according to rainfall and to the proximity to the saline seawater and the freshwater runoff. Even the tidal flux will change salinity in some locations, as the high tide flows inland and riverwater pushes the saltwater out at low tide.

While tiger shrimp fry can be found alive in any salinity of water of 0-30 parts/1000 (ppt), their number and mortality rate due to stress is sensitive to salinity. For this reason, fry congregate where they find an appropriate salinity, swimming against the salinity gradient to reach such areas. A salinity of 8-25 ppt is what is normally required for fry, but 12-15 seems to be ideal to ensure growth and low mortality. During the Monsoon, salinity in the collection areas gets too low and, consequently, affects natural supply and farmer demand.

**Light:** As previously mentioned, tiger shrimp fry are attracted to light (phototaxis). Thus, there is a tendency to move to the surface of the water in whatever waterbody they are in. This is especially so during the lunar phase that produces the most light. Sunlight is the main attraction, but the moonlight keeps them at the surface. For this reason, most gear used is meant for surface collection.

### **3.3 Modes of collection**

Fry collection, cutting across all social categories, backgrounds, castes and professions, involves around 50,000 families in the state. Poverty and lack of alternative employment are characteristics shared by most fry-catchers, be they traditional fisherfolk or landless agricultural labourers. Some are seasonally full-time collectors, but most are seasonally part-time collectors.

Few depend solely on fry collection for the family income. Within the family, collecting is not restricted to one sex or age but is done by all. The three main collection gear are described below. Brief descriptions of the gear operators are given as well.



*Woman catching fry at Dubda levy gate*

### **CHAKNI OR SCOOPNET**

The *chakni* is the main gear used in the smaller canals and ditches of Medinipur. It is a gear used almost entirely by women and girls, who operate it for a few hours every morning. The equipment comprises of an 80 cm diameter wooden ring with 1 mm synthetic mesh netting loosely stitched on with cord. An aluminium pot, or *hundi*, floating next to the point of collection serves as a storage container for the captured fry.

This is the experience of a typical young fry collector who uses a *chakni*:



*Samonto poses with her chakni in Dubda Canal*

**Name:** *Shakuntala Samonto*

**Age:** *12 years*

**Place:** *Dubda Canal, Ramnagar*

*She operates the chakni for about 2 to 3 hours/day. She says she collects 100-200 fry a day during the peak season (March-May). We observed her collect 20 fry during 30 minutes. She had a collection of 36 fry on the previous day (9.3.92).*

### **SHOOTNET**

The shootnet, or *beenjal*, whose origins are said to be in Bangladesh, is similar to a stownet or set bagnet. It is a 5 m-long, fine mesh sock with a 3 m wide opening. The opening of the net is held afloat by a 3 m long pole. Smaller stakes are used to hold the pole and net in place.

In deeper waters, a barrel or drum is used in place of one of the stakes and the net pivots with the current.

The net is emptied every 10-15 minutes during the roughly three hours of *bhonna*. The fry are removed from the 'cod end'. The gear is not selective, capturing large amounts of other post-larvae and fingerlings. The cost of each shootnet is Rs. 300-350.



*Shootnets and fry-catchers awaiting the fry at Junput*

The shootnets are a men's domain, whether the men are 15 or 60 years old. Normally, one family will own more than one shootnet. These can be set up one after the other and operated simultaneously. The fry are sorted immediately they are collected from the net and retained in small



*Debankar Maithi returning home with his catch*

tanks built of clay. They are also retained in 40 l aluminium vessels. The water is frequently changed (once every 1-2 hrs) depending on the number of fry. Sampling indicated the presence of juveniles (about 5-10 per cent of the catch) as well as post-larvae, measuring 14 mm on an average.

Seven agents purchase fry from the collectors in Junput. The collectors are paid less than the actual market price; they attribute this to the fact that most of them are indebted to the agents. Indebted collectors are, on an average, paid Rs. 10 less than the market price for their fry. Agents collectively gather about 50,000 fry/day from the Junput area during the lean season and about 200,000 fry/day each during peak season.

The experiences of a few fry collectors using shootnets are narrated below.

**Name:** *Debankar Maithi*

**Age :** *65 years*

**Place :** *Dubda Canal,  
Ramnagar*

*He operates shootnets and has been collecting tiger shrimp fry for the past 5-6 years. He states that more than 100 shootnets are in operation in the Dubda Canal. The lowest catch/net/day is 300-500 fry and the highest 8,000-10,000.*

*Maithi sells his fry to a middleman and currently (as on 9.3.92) gets 100 IRs'/thousand. He gets only 20-30 Rs/thousand during peak season and 200 Rs/thousand when the catch is low.*

*He says that out of the 100 net operators in Dubda Canal, at least 60 of them are 'commercially' tied to agents or middlemen, having borrowed money from them (locally known as dadun).*

**Name:** *Chakradhar Sahoo*

**Place:** *Shankarpur*

*Sahoo is an agent and fry collector. He along with three brothers as partners, also operates seven shootnets. They operate the nets for about three hours/day, the timing depending on the tide. They generally operate when the high tide sets in. Their maximum catch per shootnet is 10,000-12,000 and the minimum is 200-500.*

*He buys fry from over 100 collectors. His current purchase price from the fry collectors is 100 Rs/thousand (as on 10.3.92) and he sells to a middleman at Alampur, Shankardas, at (see Section 5.2) about Rs 120. As an agent he collects between 70,000 and 100,000 fry a day. Nearly 40 fry collectors are commercially bound to him as he has loaned them money (dadun). He says most of them fail to repay the dadun and, hence, payment for purchase is made after deducting part of the loan.*

**Name:** *Nanigopal Dingal*

**Age:** *15 years*

**Place :** *Rasulpur on 11.3.92*

*Dingal's family consists of seven members (five children) and owns two shootnets. He has been collecting fry for the past three years. On 11.3.92 he had set his net at 6.30 a.m. and caught 30 fry by 9.30 a.m. Catches per net can be as low as 25 fry, but can also reach 1000 in his area of operation.*

*Agents bought fry from him on 1.3.92 at 200 Rs/thousand. The rate on 11.3.92 was 120 Rs/thousand.*

**Name:** *Sajjak Ali Shah and Shaik Manjur*

**Place :** *Junput on 11.3.92*

*Junput fry collection is on a mud flat about 3 km<sup>2</sup> in extent. Over 300 shootnets were seen in operation. Shaik Manjur claims to have pioneered fry collection activity here after seeing it in Bangladesh. He has been operating in this area for the past 7-8 years. He owns six shootnets.*

*The fry-collectors of Junput devote about four months in a year to this activity; the rest of the year they work as crew on fishing vessels or as labour in dry fish processing. During the lean season, each beenjal is said to land around 100 fry/day, whereas during peak season each lands between 15,000 and 20,000 fry a day. During peak season, the fry generally sell at 70-80 Rs./thousand, but at times prices can drop to as low as 10 Rs/thousand.*

## **PUSHNETS AND DRAGNETS**

*These two gear are basically quite similar, the pushnet being pushed by its handle across the bottom in shallow waters and the dragnet being drawn by ropes.*

*Pushnets are, however, normally smaller than dragnets and can be used even by children. Dragnets are mainly used by older boys or men. Both gear were not seen during the field visit in Medinipur and are said to be relatively rarer than the chakni and shootnet.*

US \$1 = IRs 29 appx.