Chapter 4

Present scenario and existing threats of Clarias batrachus in Bankura district, WB with reference to freshwater fish diversity

4.1 Introduction

There is growing awareness about the use of beneficial probiotic as a biological entity for sustainable development of aquaculture. However, the application of probiotics requires advanced scientific understanding of water bodies. It is essential to ensure that the probiotic organism must thrive in the aquatic environment and remain functional for a sustained period. A thorough knowledge regarding the fish habitat, seasonal variation, limnological parameters and their co-relations are imperative. It is again important to know the natural distribution pattern of a fish as the nature has established the fish according to its most optimized region. The modern scientific approach of probiotic application in those ecological establishments with the co-dwellers of a particular species would be a healthy practice for higher production and *in situ* conservation. Therefore surveys on the freshwater fish diversity to study the habitat ecology of fishes are required to make an effective fish conservation strategy.

In this perspective, an effort was taken to study the available freshwater fish diversity in Bankura district with special emphasis on indigenous *Clarias batrachus* (Linn.). The district of Bankura (22°38′ to 23°38′ N and 86°36′ to 87°46′ E), occupies a wide geographical area (6,881 km^2). It contains considerably large forest areas and combines plain of Bengal with undulating plateau of Chota Nagpur ecoregion. The soil is red ferruginous and lateritic in nature.

Damodhar-Dwarkeshwar-Shilabati-Kangsabati riverine network is the main source of freshwater in this district. The rivers are fed with monsoon rains. A good number of reservoirs and ponds are also found in this region. The aquaculture sector holds about 14400 ha area. Tropical dry humid climates reign here with an annual rainfall of 1100 to

1400 mm (Anonymous 2016). This combination of seasonal streams, rain-soaked natural ponds, lakes, aquaculture farms, rivers and their tributaries are the rich sources (52341 ha) of indigenous freshwater fishes.

Small indigenous fishes (SIFs) constitute a major portion of fish diversity. The SIFs (which attain a maximum length of 25-30 cm in mature stage) are profile breeders and thrive in backyard ponds, derelict waterbodies, wetlands that are common habitats of rural sector. They are thus traditionally being connected to the general well being of the rural mass. It has been reported that SIFs supply a good source of vital proteins (*Clarias batrachus*, *Xenentodon cancila*, *Ailia coila* etc.), vitamins (*Amblypharyngodon mola*, *Esomus danricus*, *Osteobrama cotio*, *Parambassis ranga* etc.), fatty acids (*Amblypharyngodon mola*, *Channa punctata* etc.), Calcium (*Chanda nama*, *Puntius sophore*, *Gudusia chapra* etc.), Zinc (*Mystus tengra*, *Chela bacaila*), iron (*Esomus danricus*, *Osteobrama cotio*, *Mystus vittatus*) and other micronutrients (Mohanty et al. 2013). However, very little attention has been paid so far on the conservation of SIFs at their natural habitats. Consequently, they have become more threatened and endangered.

Clarias batrachus (Linn.) is a widely recognized small indigenous fish by virtue of its nutritional richness. It is presently thriving in Southern Asia at a merely vulnerable state despite its high consumer preference. The species is now in the way of extinction due to the disturbed condition of habitat. *C. batrachus* (‘Dēśī Māgur’) is often been substituted with invasive African catfish *C. gariepinus* (Khedkar et al. 2015). Illicit farming of *C. gariepinus* has made the condition more hostile. The frenzied feeding behavior of *C. gariepinus* has become a potential threat to indigenous aquatic diversity in the countries like South China, Brazil and India (Radhakrishnan et al. 2011; Khedkar et al. 2015). The

conservation of *C. batrachus* in its natural habitats must be prioritized to overcome the present vulnerable condition. Focus on fish diversity areas by geographical mapping can give a bird's eye view to fix the strategy for conservation of the fish species in indigenous habitats.

Study of the ichthyofaunal diversity of Bankura district was the main objective of the present investigation. Threatened, endemic and vulnerable species were also recorded. Special emphasis was given on the present distribution status of *C. batrachus*. The biological invasion of African catfish *C. gariepinus* in local water bodies was also verified.

4.2 Materials and Methods

4.2.1 Field survey

A simple random survey was conducted for acquisition of data from the local fish markets and waterbodies covering twenty-two blocks of Bankura district (Fig. 4.1). The primary data was retrieved from the fish farmers, traders and store-houses through interactive approach. Special emphases were conferred on the status of habitat quality, breeding operation, stocking density, production cost, market demand and subsequent prices of indigenous *C. batrachus*. The uprising problems and major issues were also dealt with.

4.2.2 Collection of fishes

Fishes were captured with traditional fishing gears from the study area with the help of fish-farmers. The images of various samples were precisely photographed (Coolpix B500; Nikon, India). The specimens were immediately transferred in 4-6% formalin and subsequently preserved for further recognition (Roy et al. 2013).

Fig. 4.1: Geographical map of the study area (Bankura district with twenty-two blocks).

4.2.3 Identification of fishes

The primary identification and taxonomic classification of specimens were based on traditional morphometric analysis (Talwar and Jhingran 1991). The photographic images were further testified through FishBase, 2016 (http://www.fishbase.org/search.php). The global conservation status of collected fishes was evaluated through IUCN database.

4.2.4 Representation of spatial distribution of fishes

The GPS navigation device (eTrex Vista Hcx; Garmin® International, Inc., USA) was utilized to obtain specific location status. The geospatial data was further analyzed through GIS-based Inverse-distance weighting (IDW) spatial interpolation method using ArcGIS 10.2 (http://www.esri.com) software. The field data was processed, tabulated and graphically represented through Microsoft Excel software.

4.3 Result and Discussion

4.3.1 Ichthyofaunal diversity

Bankura has come up as a sustainable resource of inland fisheries through this study. The enriched ichthyofaunal diversity (92 freshwater fish species) was explored through sampling and identification. The Cypriniformes (42.39%), Siluriformes (20.65%) and Perciformes (21.74%) have dominated the study area whereas Anguilliformes and Tetraodontiformes were relatively fewer (Fig. 4.2). The study revealed a good variety of fishes under the Cyprinidae family. The study identified *Labeo dero*, *Nandus nandus*, *Gagata cenia*, *Crossocheilus latius*, *Batasio batasio*, *Hara hara* and *Cirrhinus reba* as the locally threatened fish that were obtained in narrow ranges. Bankura-I, Bankura-II, Bishnupur, Barjora, Saltora, Mejhia, Raipur, Hirbundh and Sarenga blocks harbors a wide variety of aquatic fishes (Table 4.1). The remote sensing GIS-based study identified 11 different regions with high species richness throughout the district (Fig. 4.3). The result was in accordance to Roy et al. (2013) who studied the fish diversity of Bankura and Purulia district.

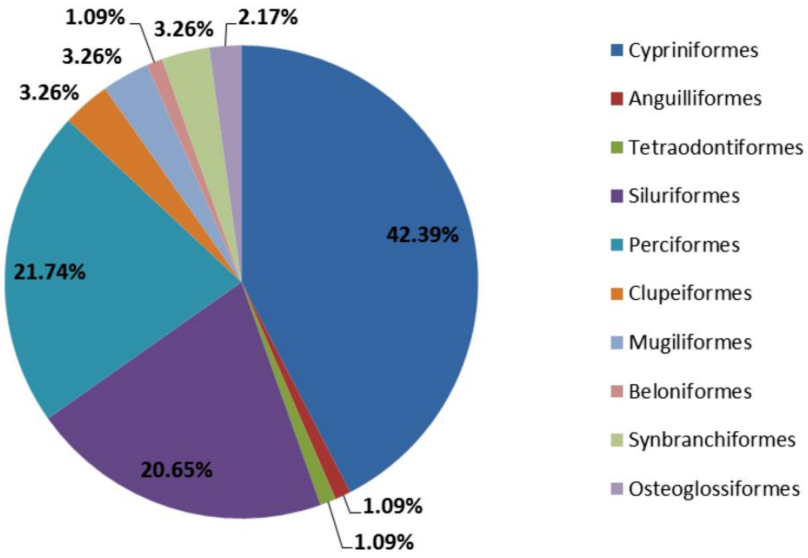

Fig. 4.2: Taxonomic order-wise occurrence of fishes in Bankura district.

Table 4.1 Freshwater fish diversity of Bankura district.

Species	**Blocks of Bankura district**																						
	Bankura-I	**Bankura-II**	**Barjora**	**Bishnupur**	**Chhatna**	**Gangajalgh**	**Hirbundh**	**Indus**	**Indpur**	**Joypur**	**Khatra**	**Kotulpur**	**Mejhia**	**Onda**	**Patrasayer**	**Raipur**	**Ranibundh**	**Saltora**	**Sarenga**	**Simlapal**	**Sonamukhi**	**Taldangra**	**Total**
Labeo rohita	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	22
Labeo bata	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	22
Labeo dero	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	+	–	01
Catla catla	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	22
Cirrhinus mrigala	+	+	+	+	+	+	+	–	+	+	+	+	+	+	+	+	+	+	+	+	+	+	21
Securicula gora	+	+	–	–	–	–	–	–	–	–	–	–	–	+	–	–	–	–	–	–	+	–	04
Esomus danricus	+	–	+	+	+	+	+	+	+	+	+	+	+	–	+	+	+	+	+	–	+	+	19
Danio rerio	–	–	+	+	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	02
Labeo fimbriatus	–	–	–	–	–	+	–	–	–	–	–	–	+	–	–	–	–	+	+	–	–	–	04
Labeo ariza	–	–	+	–	–	+	–	–	–	–	–	+	–	–	–	–	–	–	–	–	–	–	03
Labeo calbasu	+	–	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	21
Labeo gonius	–	–	+	–	–	–	+	–	–	–	–	–	–	–	+	+	–	–	–	+	+	+	07
Puntius sophore	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	22
Puntius sarana	+	+	+	+	+	+	–	–	+	–	+	+	+	+	+	+	+	+	+	+	+	+	19
Puntius ticto	+	–	+	+	–	+	–	–	–	–	+	+	+	–	–	+	+	+	+	+	+	–	13
Barbonymus gonionotus	+	–	–	+	–	+	–	–	–	+	–	–	+	–	+	+	–	+	–	+	–	–	08
Cirrhinus reba	–	+	+	–	–	–	+	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	03
Amblypharyngodon mola	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	22

Ctenopharyngodon idella	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	−	+	+	+	+	+	+	21
Hypophthalmichthys molitrix	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	−	21
Aristichthys nobilis	+	+	+	+	−	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	−	20
Cyprinus carpio	−	+	+	+	−	+	−	−	+	+	+	+	+	+	+	−	−	+	+	−	+	+	15
Barilius tileo	+	+	+	−	−	+	−	−	−	−	−	−	+	+	−	+	−	+	+	−	−	−	09
Parluciosoma daniconius	+	−	+	−	+	+	−	−	+	+	+	−	+	−	+	+	+	+	+	+	−	−	14
Barilius vagra	−	−	+	−	−	+	+	−	−	−	−	−	+	−	+	+	−	−	+	+	−	−	08
Colossoma macropomum	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	22
Osteobrama cotio	+	−	+	−	−	+	−	−	−	+	−	+	−	+	−	−	−	−	−	−	−	−	06
Salmostoma bacaila	+	+	+	+	+	+	+	−	+	+	+	+	+	+	+	+	−	+	+	+	+	+	20
Aplocheilus panchax	+	+	−	−	−	−	+	−	−	−	−	−	−	+	−	−	−	−	+	−	+	−	06
Aspidoparia morar	−	+	+	−	−	−	−	−	+	−	−	−	+	+	−	+	−	−	+	+	−	−	08
Aspidoparia jaya	+	−	+	+	−	+	−	−	+	+	+	+	+	+	−	−	−	+	+	−	+	+	14
Crossocheilus latius	−	−	−	−	−	+	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	01
Labeo nandina	+	−	−	−	−	−	−	−	−	−	−	−	+	+	−	−	−	−	−	−	−	−	03
Salmophasia bacaila	+	+	+	+	+	−	−	−	+	−	−	−	+	+	+	+	+	+	+	−	+	−	14
Barilius barna	+	+	+	+	−	−	+	+	+	+	+	+	−	+	−	+	+	+	+	+	−	−	16
Tor khudree	−	+	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	+	−	02
Bagarius bagarius	+	−	+	+	−	+	+	−	+	−	−	−	−	−	−	+	−	−	−	+	−	−	08
Glyptothorax dorsalis	+	+	−	−	−	−	−	−	−	+	−	+	−	−	−	+	−	+	−	−	−	−	06
Gagata cenia	−	+	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	01
Hara hara	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	+	+	−	−	−	−	−	02
Glossogobius giuris	+	−	+	+	−	−	+	−	−	+	+	+	+	−	+	+	+	+	+	+	−	+	15
Anguilla bengalensis	−	−	+	+	−	+	+	−	−	−	−	−	−	−	+	−	+	−	−	+	−	−	07
Schistura corica	−	−	−	+	−	−	+	−	−	+	−	−	−	−	+	+	−	−	−	−	−	−	05

Xenentodon cancila	+	+	+	+	−	−	−	−	−	+	−	−	+	−	+	+	−	−	−	+	+	−	10
Anabas testudineus	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	22
Gudusia chapra	+	+	+	+	−	+	+	+	+	+	−	+	+	+	+	+	+	+	+	+	+	−	19
Tenualosa ilisha	+	+	+	+	+	+	+	−	+	+	+	+	−	+	+	+	+	+	+	+	+	+	20
Mastacembelus armatus	−	+	+	−	−	+	+	+	+	−	+	+	+	+	+	+	+	+	+	+	+	+	19
Mastacembelus pancalus	+	+	+	+	−	+	+	+	−	−	+	+	+	+	−	+	+	+	+	+	+	−	17
Channa orientalis	+	+	+	+	+	+	+	+	+	+	+	+	+	−	+	+	+	+	+	−	+	+	20
Channa gachua	+	−	+	−	+	+	+	+	+	−	+	+	+	−	+	−	+	+	−	−	+	+	15
Channa stewartii	−	−	−	−	+	+	+	+	−	−	−	−	−	−	+	−	+	+	−	+	−	−	08
Channa marulius	+	+	+	+	+	+	−	−	+	+	+	+	+	+	+	−	+	+	+	+	+	+	19
Channa striata	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	22
Channa punctata	+	−	+	+	+	+	+	+	+	+	+	+	+	−	+	+	+	+	+	+	+	+	20
Setapinna phasa	+	−	+	+	−	+	−	−	+	+	+	−	+	+	+	+	+	+	+	+	+	−	16
Chitala chitala	+	+	+	+	+	+	+	+	+	+	+	+	+	−	+	+	+	+	+	+	+	+	21
Notopterus notopterus	+	−	+	+	+	+	+	+	+	+	+	+	+	−	+	+	+	+	+	+	+	+	20
Monopterus cuchia	+	−	+	+	+	−	+	−	+	−	+	+	+	−	+	+	+	+	+	+	+	+	17
Heteropneutes fossilis	+	+	+	+	−	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	21
Wallago attu	+	+	+	+	−	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	21
Ompok pabda	+	−	+	+	−	+	+	−	−	+	+	+	+	+	+	+	+	+	+	+	−	−	16
Clarias batrachus	+	+	+	+	−	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	21
Clarias gariepinus	+	+	+	+	+	+	+	−	+	+	+	+	+	+	+	+	+	+	+	+	+	+	21
Mystus tengra	+	+	+	+	−	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	21
Rita rita	+	−	+	+	−	−	−	−	−	−	−	−	+	−	−	+	+	+	+	+	+	−	10
Aorichthys aor	+	+	+	+	−	−	+	−	+	+	+	+	+	+	+	+	+	+	+	+	+	+	19
Batasio batasio	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	+	−	−	01

Chanda nama	+	+	+	+	+	−	+	+	+	+	−	+	+	−	+	+	+	+	+	+	+	+	19
Parambassis ranga	−	−	−	+	+	−	+	+	−	−	−	+	−	−	−	+	+	+	+	+	−	+	11
Parambassis lala	+	+	+	+	−	−	−	−	−	−	+	+	+	−	+	+	+	−	+	+	−	+	13
Badis badis	+	+	−	−	+	+	+	−	−	+	−	+	+	−	+	+	+	−	+	+	−	−	13
Dario dario	+	+	+	−	−	+	+	−	−	−	−	−	+	−	+	+	+	+	+	+	+	+	14
Oreochromis mossambicus	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	22
Oreochromis niloticus	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	−	+	+	+	21
Amblyceps mangois	+	+	−	−	−	−	−	−	−	−	−	−	−	−	−	+	+	+	+	−	−	−	06
Nandus nandus	−	−	−	+	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	01
Trichogaster chuna	+	+	−	+	+	+	+	−	+	−	+	−	+	+	−	+	+	+	+	+	−	−	15
Trichogaster lalius	+	+	+	+	−	−	+	+	−	+	−	+	−	−	+	+	−	+	+	−	+	−	13
Trichogaster fasciata	−	+	+	−	−	−	+	+	−	+	−	+	+	−	+	+	−	+	+	−	−	−	12
Pangasius pangasius	+	+	+	+	+	−	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	21
Ailia coila	+	+	−	+	−	−	+	−	+	−	−	−	−	+	+	+	+	+	+	+	−	+	13
Clupisoma garua	+	+	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	02
Eutropiichthys vacha	+	−	+	−	−	−	+	−	−	−	+	−	+	−	+	+	+	+	+	+	+	−	12
Liza parsia	+	+	−	+	−	−	+	+	−	+	−	+	−	+	+	+	+	+	+	+	+	+	16
Mugil cephalus	−	+	−	+	−	−	+	+	−	+	−	+	−	+	−	−	+	+	+	+	−	+	12
Rhinomugil corsula	+	+	−	−	−	−	+	−	−	−	+	−	−	−	−	+	−	+	+	−	−	−	07
Lates calcarifer	+	+	+	+	−	+	+	+	+	+	−	+	+	+	+	+	+	+	+	+	+	−	19
Lepidocephalus guntea	+	+	+	+	−	−	+	+	−	−	−	−	−	+	−	+	−	+	+	−	+	−	11
Botia birdi	−	−	+	+	−	−	−	−	−	−	−	−	−	−	−	+	+	−	−	−	−	−	04
Pterygoplichthys multiradiatus	+	−	−	+	−	+	−	−	−	−	−	−	−	+	−	−	+	−	−	−	−	+	05
Leiodon cutcutia	+	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	+	−	02

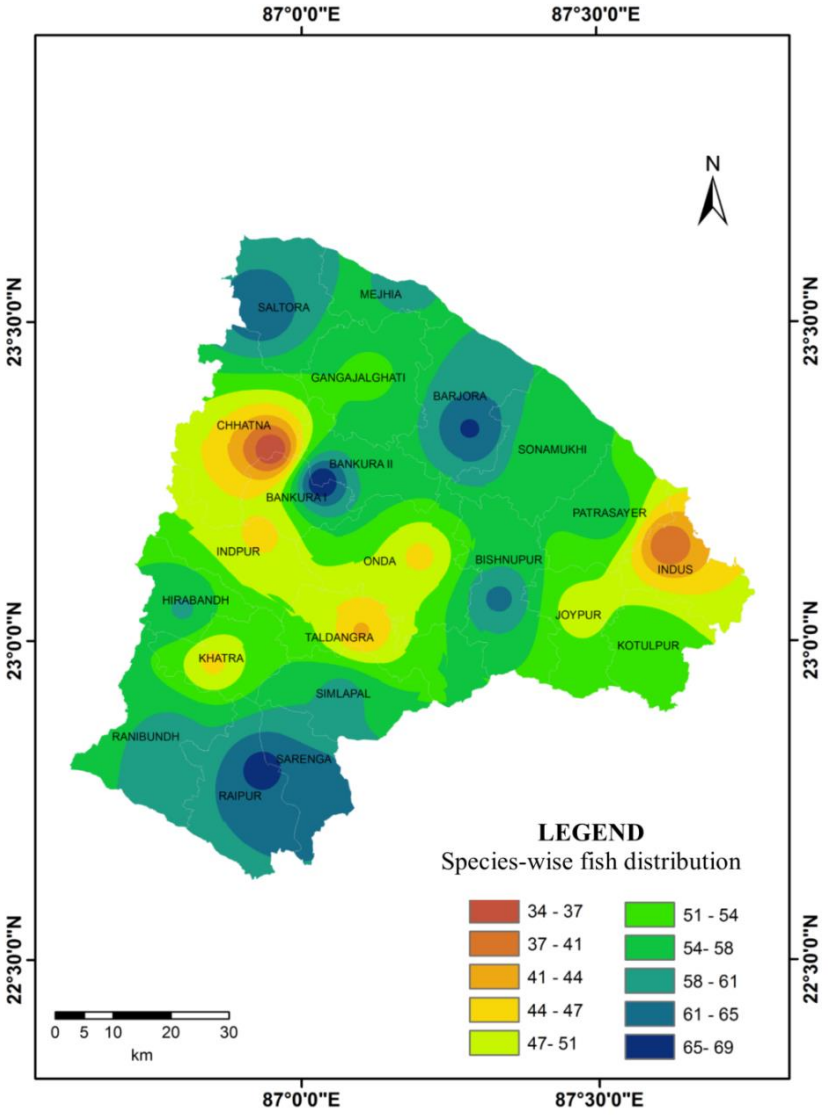

Fig. 4.3: Spatial distribution of fish diversity of Bankura district (colours of the legend indicate the number of fish species found in the corresponding places).

4.3.2 Small indigenous fishes

A good variety (53 species) of SIFs was observed in the study area (Table 4.2). They were mostly been found in local fish markets near the river basin. *Gudusia chapra*, *Puntius sophore*, *Salmophasia bacaila*, *Mystus tengra*, *Clarias batrachus*, *Heteropneustes fossilis*, *Channa punctata*, *Trichogaster lalius* and *Lepidocephalus guntea* were most commonly obtained. The SIFs was found to play a major role in community nutrition and rural

economy in Bankura district where a large section of people is thriving under poverty. Rural people live on SIFs which they procured from natural habitats through catching. Indeed, it has become a staple food which fulfils the daily-dietary requirement of rural people. On the contrary, urban people rely much on major carps and SIFs were occasionally been consumed. Mohanty et al. (2013) stated the nutritional and economic perspective of small indigenous fishes on rural sector. Hossain et al. (1999) also reported the nutritional significance of twenty-three small indigenous fishes of Bangladesh.

Table 4.2: Small indigenous fishes of Bankura district.

Sl. No.	Scientific name	Local name
1	*Esomus danricus* (Hamilton, 1822)	Dārkē
2	*Danio rerio* (Hamilton, 1822)	Zebra fish
3	*Puntius sophore* (Hamilton, 1822)	Puṁṭi
4	*Puntius ticto* (Hamilton, 1822)	Ciṯpuṁṭi
5	*Amblypharyngodon mola* (Hamilton, 1822)	Mauralā
6	*Barilius tileo* (Hamilton, 1822)	Pērā
7	*Parluciosoma daniconius* (Hamilton, 1822)	Dārkē
8	*Barilius vagra* (Hamilton, 1822)	Hōldē pērā
9	*Osteobrama cotio* (Hamilton, 1822)	Dēlā/ kaṭi
10	*Salmostoma bacaila* (Hamilton, 1822)	Chuẏā
11	*Aplocheilus panchax* (Hamilton, 1822)	Tēcōkhā
12	*Aspidoparia morar* (Hamilton, 1822)	Ciṛā
13	*Aspidoparia jaya* (Hamilton, 1822)	Chuẏā
14	*Crossocheilus latius* (Hamilton, 1822)	Simsuṁṭi
15	*Salmophasia bacaila* (Hamilton, 1822)	Cēlā
16	*Barilius barna* (Hamilton, 1822)	Bhōlā
17	*Securicula gora* (Hamilton, 1822)	Ghōṛācēlā
18	*Glyptothorax dorsalis* (Vinciguerra, 1890)	Tēlsuṁṭi
19	*Hara hara* (Hamilton, 1822)	Kōsihārā
20	*Gagata cenia* (Hamilton, 1822)	Juṅgalā
21	*Glossogobius giuris* (Hamilton, 1822)	Bhalkōrā/Bēlē
22	*Schistura corica* (Hamilton, 1822)	Sālgēṭō
23	*Botia birdi* (Chaudhuri, 1909)	Bāgyāgēṭō/Birdi Loach

24	*Anabas testudineus* (Bloch, 1792)	Dēśī kō'i
25	*Gudusia chapra* (Hamilton, 1822)	Khaẏarā
26	*Mastacembelus pancalus* (Hamilton, 1822)	Pyaṁkāl
27	*Channa orientalis* **(**Bloch & Schneider, 1801)	Cyāṁ
28	*Channa gachua* (Hamilton, 1822)	Śiśircyāṁ
30	*Channa stewartii* (Playfair, 1867)	Tēlcyāṁ
31	*Channa punctata* (Bloch, 1793)	Lyāṭā
32	*Setapinna phasa* (Hamilton, 1822)	Phāsā
33	*Eutropiichthys vacha* (Hamilton, 1822)	Bāchā
34	*Heteropneustes fossilis* (Bloch, 1794)	Śiṅgī
35	*Ompok pabda* (Hamilton, 1822)	Pābdā
36	*Clarias batrachus* (Linnaeus, 1758)	Dēśī Māgur
37	*Mystus tengra* (Hamilton, 1822)	ṭyānrā
38	*Batasio batasio* (Hamilton, 1822)	Bātāsī
39	*Chanda nama* (Hamilton, 1822)	Cāṁdakōṁṛā
40	*Parambassis ranga* (Hamilton, 1822)	Cāṁdakōṁṛā
41	*Parambassis lala* (Hamilton, 1822)	Lāl Cāṁdakōṁṛā
42	*Badis badis* (Hamilton, 1822)	Kalōpuṁṭi
43	*Dario dario* (Hamilton, 1822)	Lālapuṁṭi
44	*Amblyceps mangois* (Hamilton, 1822)	Jiẏā /Chiṭkā
45	*Nandus nandus* (Hamilton, 1822)	N'yādōs
46	*Trichogaster chuna* (Hamilton, 1822)	Cūnā
47	*Trichogaster lalius* (Hamilton, 1822)	Khōlsē
48	*Trichogaster fasciata* (Bloch and Schneider, 1801)	Khōlsē
49	*Ailia coila* (Hamilton, 1822)	Bāṁśapātā
50	*Liza parsia* (Hamilton, 1822)	Pārśē
51	*Mugil cephalus* (Hamilton, 1822)	Pārśē
52	*Lepidocephalus guntea* (Hamilton, 1822)	Guṭē
53	*Xenentodon cancila* (Hamilton, 1822)	Gāntāṛā

4.3.3 The conservation status of obtained freshwater fishes

The present conservation status of obtained freshwater fishes was evaluated through IUCN database. A huge variety of SIFs was obtained from the study area. The study area contains 12 globally endangered (Near Threatened= 10; Vulnerable= 1; Endangered= 1) freshwater

fish species (Table 4.3). Among them, *Hypophthalmichthys molitrix*, *Chitala chitala*, *Wallago attu* and *Oreochromis mossambicus* were abundantly been observed throughout the region whereas *Labeo nandina*, *Tor khudree*, *Bagarius bagarius* and *Anguilla bengalensis* were extremely rare in appearance. The occurrence of globally endangered fish *Tor khudree* at Bankura-II and Sonamukhi blocks is the first-time report from West Bengal. The National Bureau of Fish Genetic Resources, India has identified the *Tor khudree* in freshwater habitat of Kerala, Karnataka and Maharashtra (NBFGR 2010). Immediate measure should be taken to conserve the species before their extinction. Sarkar et al. (2008) stated that the freshwater resources of India are facing a rapid decline and put emphasis on the restoration of aquatic species in their natural habitats.

Table 4.3: Taxonomic position and conservation status of some threatened fishes of Bankura district.

Order	Family	Scientific name	Local name	IUCN Status
Cypriniformes	Cyprinidae	*Hypophthalmichthys molitrix*	Silver Carp	NT
		Cyprinus carpio	Common carp	VU
		Labeo nandina	Nāndin	NT
		Tor khudree	Pātharchōṭā	EN
Osteoglossiformes	Notopteridae	*Chitala chitala*	Citala	NT
Siluriformes	Sisoridae	*Bagarius bagarius*	Kānāghōgaṛ	NT
	Siluridae	*Wallago attu*	Bōẏāla	NT
		Ompok pabda	Pābdā	NT
	Schilbeidae	*Ailia coila*	Bāṁśapātā	NT
Anguilliformes	Anguillidae	*Anguilla bengalensis*	Maulā	NT
Perciformes	Ambassidae	*Parambassis lala*	Lāl Cāṁdakōṁṛā	NT
	Cichlidae	*Oreochromis mossambicus*	Tēlāpiẏā	NT

NT= Near Threatened; VU= Vulnerable; EN=Endangered

4.3.4 Present scenario of *C. batrachus* cultivation

4.3.4.1 Habitat

The commercial cultivation of *C. batrachus* in Bankura district is vastly been ignored. The species is still been captured by farmers from natural ponds, swampy or paddy fields, low-land, streams and even from brackish water. Local people use to capture them during mass migration of the species at spawning phase and supply them to the market. Talwar and Jhingran (1991) also have reported about the wide range of habitats of *C. batrachus*.

4.3.4.2 Induced breeding

The semi-intensive mode of cultivation is been operated for farming of *C. batrachus*. The non-availability of quality seeds from natural sources often promotes fish-farmers to opt for induced breeding. A healthy brood stock (Stocking density: 2-4/m^2) is been maintained purposefully in an adjacent pond and subsequently transferred to Hapa during breeding season. The synthetic hormones have been administered intramuscularly around the caudal peduncle region in both female (Dose level: 0.8 to 2.0 ml kg^{-1} body weight) and male (Dose level: 0.4 to 0.8 ml kg^{-1} body weight) brooders. The testes have been macerated; milt suspension has been prepared; added to eggs and fertilized. The fertilized eggs have been uniformly distributed in the trays under continuous aeration and water flow. Several hatcheries at Ramsagar (Onda block; Bankura) perform induced breeding and supply quality spawns all over the district.

4.3.4.3 Stocking density in culture pond

The developing fish has been reared (stocking density: 300-400/m^2) until first two months in outdoor cement cistern maintaining 20-30 cm water level. However, most of the production loss occurs during this earlier phase. *C. batrachus* fingerlings are then

introduced to the culture pond with an average stocking density of 40-50 fry/m^2. Harvesting is accomplished by complete dewatering of the pond at the end of the season.

4.3.4.4 Production cost

The commercial cultivation of *C. batrachus* is financially profitable. It is a hardy, air-breathing catfish that can be cultured even in shallow earthen ponds or cemented cisterns and thus generates substantial contribution towards rural economy. The farmers of Raipur, Ranibundh, Hirbandh, Barjora and Patrasayer blocks are making a considerable profit margin through cultivation of this indigenous fish.

4.3.4.5 Market demand

C. batrachus is widely recognized in Indian subcontinent for enriched nutritional profile and delicious taste. It maintains a consistent market value (INR 400-600/ Kg) throughout the district with an average weight of 150-200 g (Table 4.4). It is majorly been obtained once or twice in a week in the local fish markets and fetches higher price than the major carps. The GIS-based analysis further revealed the distribution pattern of *C. batrachus* with higher occurrence in Ranibundh, Hirbundh and Patrasayer blocks (Fig. 4.4). On the otherhand, Chhatna, Saltora, Sarenga and Sonamukhi blocks face an infrequent supply of the species. It has high consumer preference hence been sold within a brief time. However, the supply is extremely deficient comparing to the demand.

Table 4.4: Survey on *C. batrachus* of Bankura district with reference to availability, economy and average weight.

Sl. No.	Blocks	Frequency	Price (INR/Kg)	Average Weight (g)
1	Bankura-I	Seasonal	550-600	200-250
2	Bankura-II	Seasonal	600-650	130-150
3	Barjora	Once or twice in a week	600	100-120
4	Bishnupur	Once in a week	550-600	100-150
5	Chhatna	Rare	600	230-250
6	Gangajalghati	Weekly	500	230-250
7	Hirbundh	Available	400-500	200-250
8	Indus	Seasonal	650-700	200-250
9	Indpur	Weekly	400-450	250-300
10	Joypur	Seasonal	500-550	150-200
11	Khatra	Infrequent	500-550	250-300
12	Kotulpur	Infrequent	550	150-200
13	Mejhia	Once in a month	600-800	200-250
14	Onda	Weekly	400-450	150-180
15	Patrasayer	Regular	400-450	150-180
16	Raipur	Seasonal	500-600	250-300
17	Ranibundh	Regular	400	150-250
18	Saltora	Infrequent	500	100-150
19	Sarenga	Infrequent	600	250-300
20	Simlapal	Seasonal	450	200-250
21	Sonamukhi	Rare	300-400	100-150
22	Taldangra	Seasonal	500	200-250

INR= Indian Rupee

4.3.5 Major challenges

The major issues encountered by the catfish-farmers of Bankura district were shrinkage of natural breeding grounds, inadequate supply of fingerlings, lack of technical expertise, abrupt use of pesticides in adjacent paddy fields, industrial effluents, illicit fishing of juveniles and disease outbreak. The farming of exotic *C. gariepinus* was another cause of

productivity constraint. Some farmers often substitute *C. batrachus* with invasive alien catfish *C. gariepinus* due to their morphological resemblance (Fig. 4.5). It has found to be more prevalent in Bishnupur, Raipur, Bankura-I and Sarenga blocks. Khedkar et al. (2015) reported about the bulging risk of exotic alien catfish *C. gariepinus* in destroying biodiversity. These cumulative factors often confuse and discourage farmers about the financial risks of cultivating indigenous *C. batrachus*. Under such circumstance, they mostly prefer traditional cultivation of major carp instead of catfish.

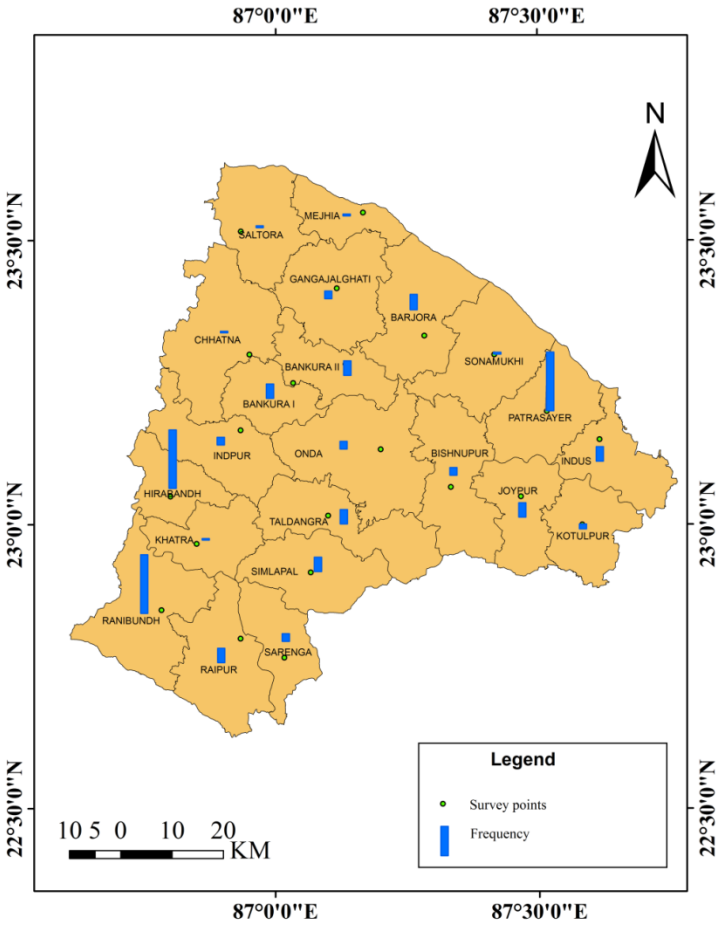

Fig. 4.4: Spatial distribution map of Bankura district based on availability of *C. batrachus*.

Fig. 4.5: Substitution of *C. batrachus* with *C. gariepinus* in local fish markets: (A) Bankura-II; (B) Sarenga; (C) Ranibundh; (D) Bishnupur; (E) Raipur; (F) Bankura-I blocks.

4.4 Conclusion

The study on the ichthyofaunal diversity of Bankura district in West Bengal, India, has revealed the fact that the district is a potential indigenous fish producer. A total of 92 freshwater fish species were obtained through the district. A large number of people rely upon this sector for their earning and livelihood. The freshwater fisheries are thus making considerable contribution towards community nutrition, rural economy and women empowerment. However, the restoration of endangered fishes has often been overlooked.

The biology, ecology and economy of *C. batrachus* were more critically studied during this survey. The GIS-based approach revealed the predominance of the species in Ranibundh, Hirbundh and Patrasayer blocks. *C. batrachus* is a highly-valued commodity throughout the district; holds a good demand but suffers with inadequate supply. This thorough survey has predicted that the semi-intensive mode of cultivation in small ponds can be an effective strategy for conservation of the species. The water bodies should be free from pesticides, chemical fertilizers, and industrial outlets. Moreover, the rural involvement and social awareness for cultivation of *C. batrachus* in proper sustainable manner would be a better choice to restore the species. The local people should have the knowledge to differentiate Dēśī Māgur from its allied cousin *C. gariepinus*. A strong legal action must be taken to restrict the massive infiltration of alien catfish in local fish markets. Government is distributing quality seeds and proving financial subsidy to catfish farmers in recent time to promote the cultivation of indigenous *C. batrachus.* Dissemination of knowledge regarding application of probiotics in *C. batrachus* cultivation should be another step towards increased production. The study also recommends training and capacity building program for farmers on scientific management of catfishes.