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WETLAND FAUNAL RESOURCES OF WEST BENGAL-3. BIRBHUM DISTRICT

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INTRODUCTION

The present study on wetland faunal resources of Birbhum district is the third instalment of the series from West Bengal. The earlier two papers deal with faunal diversity of some wetlands in North and South 24-Parganas districts (Nandi *et al.*, 1993) and Haora and Hugli districts (Nandi *et al.*, 1999). This district has a wide assemblage of aquatic or semi-terrestrial wetland habitats which are usually covered by shallow water. It includes freshwater ponds, beels, barrage, dighies, foodplains, etc. In all, 10 such wetland habitats, both permanent and temporary, have been surveyed during the years 1993 and 1994. Faunal inventories indicating occurrence of the species in the wetlands surveyed are communicated.

A review of literature (Nandi *et al.*, 1993, 1999) shows that there is no specific publication on wetland fauna of Birbhum district. However, Bhattacharya *et al.* (1979), Bhattacharya and Chattopadhyay (1984), Chattopadhyay and Bhattacharya (1986), Saha *et al.* (1992) have made some interesting contributions on Indian Blackback, Spotted Deer and other wildlife of Ballavpur Wildlife Sanctuary for which Ballavpur freshwater wetland within the sanctuary is famous in West Bengal.

LOCATION AND PHYSIOGRAPHY

Location

Birbhum district which lies between 23°33' and 24°35' North latitude and 87°10' and 88°2' East longitude, is located in the western part of West Bengal. It extends about 4,545 sq. km. with a population of 25,56,105 inhabitants (1991 census). It is bounded by Santhal Parganas of Bihar State on the North and West, Murshidabad and Barddhaman districts on the East and also by Barddhaman district on the South, demarcated by the river Ajoy.

Climate

In accordance with the regional variations in the structure of the plains, Birbhum district comes under Rarh plain. The Birbhum plain is characterised by humid and warm climate in the summer and dry and cold condition in winter. The average summer temperature is 30°C and that of winter is 15°C. The annual average rainfall ranges between 130 cm and 140 cm. The rainy season usually lasts from

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the middle of June to the middle of October while hot weather from the middle of March to the middle of June and the cold weather from the middle of October to the middle of March. Cyclones are rare in this district.

Soil

The Rarh plain of Birbhum is the land of red soils. They belong to old alluvial type. Pebbles and sand predominate in these soils. The western part shows the presence of laterite soils. Along the river banks the soil is sandy and loamy. In general, the soils of this region contains iron and lime and very small quantity of humus not helpful for agriculture.

Wetland Profile

The district is well drained by rivers and rivulets, *viz.*, Mor, Ajai, Hingla, Bakreswar, Brahmani Bansloi, Pagla and Kopa. During dry weather, even the bigger rives like the Mor and Ajai expose their beds as broad expanses of sand with small streams trickling down the centre. But most of these rivers during rainy season grow broader and deeper, occasionally overtopping their banks especially at Rajgaon and Kirnahar areas creating flood plains and beels. Man-made wetlands include ponds and dighies as well as a barrage, *viz.*, Tilpara barage. Besides these wetlands, a hot water spring is located at Bakreswar wherein water temperature ranges 60–70°C. In general, water temperature, p^H, Dissolved oxygen of the wetlands surveyed varied from 9–35°C, 6.5–8.5 and 5.0–9.0 respectively.

Vegetation

The natural vegetation of Birbhum district is dry deciduous type. Trees, like sal (*Shorea robusta*), mahua (*Bassia latifolia*) and palas grow to the western part. Thorny shrubs, palm and mango trees are present throughout. Wetland plant species include floating hydrophytes, namely, water hyacinth, water lettuce and duck weeds; suspended hydrophytes, like *jhanji* (*Ceratophyllum*) and anchored hydrophytes such as *Patashaola* (*Vallisneria* sp.), *Padma* (*Nelumbo nucifera*), *Paniphal* (*Trapa* sp.) *Panchuli* (*Nymphoides* spp.), *Shapla* (*Nymphaea* spp.), *Hydrilla*, *Ottellia*, *Najas*, etc. Most of these hydrophytes were abundant in Datindighi, about 4 km. west of Dubrajpur, which is said to have been excavated by Khagaditya Raja (O'Malley, 1910). Similar aquatic or palustrine genera are available in wetlands of Ballavpur and Rampurhat along with sedge (*Cyperus* spp.) and emergent amphibious hydrophytes (*Marsilea*, *Aponogeton*, *Enhydra*, *Potamegeton*, *Paspalsum*, *Aeschynomene*, etc., especially in the Nagalhata beel. However, man-made ponds of domestic use were turned into green colour during summer due to algal blooms caused by *Microcystis* sp. and Tilpara barrage was dominated by filamentous algae (*Spirogyra*).

MATERIALS AND METHODS

During 1993 and 1994, a total of 10 freshwater wetlands (Table 1, Fig. 1) were surveyed for studying the faunal diversity of wetlands in Birbhum district. Of these, only four wetlands, *viz.*,

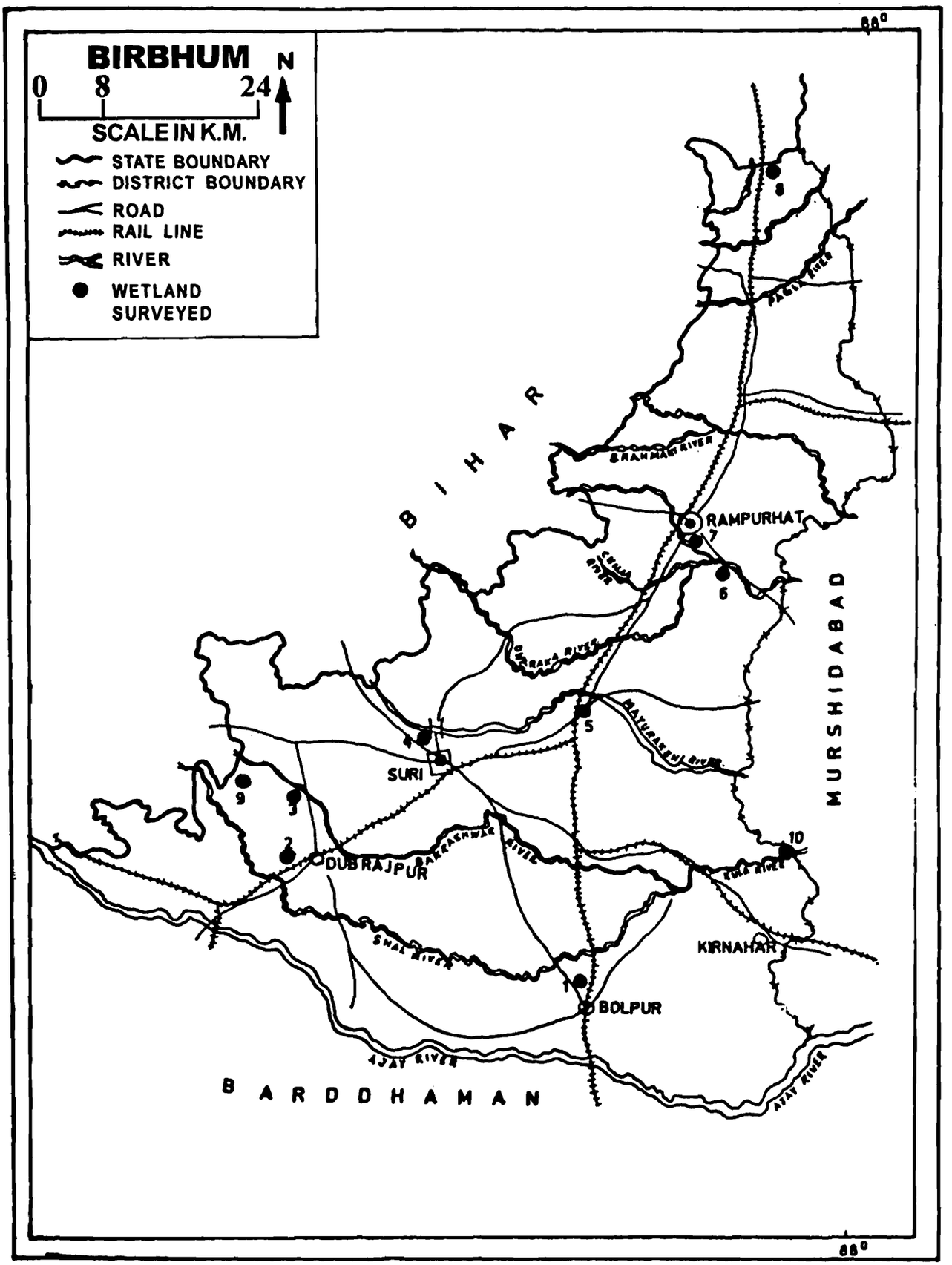

Fig. 1. Map of Birbhum district showing the wetlands (1–10) surveyed. 1 = Ballavpur wetland; 2 = Datindighi; 3 = Bakreswar pond; 4 = Tilpara barrage; 5 = Sainthia beel; 6 = Karkaria dighi; 7 = Goldighi; 8 = Gnorsha beel; 9 = Protappur bundh; 10 = Langalhata beel.

Table 1. List of wetlands surveyed from Birbhum district.

Sl. No.	Name of the wetland	Name of the nearest village-town	Approximate area (ha)	Ecological characteristics
1.	Ballavpur wetland (BW)	Bolepur	202	Permanent, freshwater ponds – a wildlife reserve and deer park.
2.	Datindighi (DD)	Dubrajpur	21.6	Permanent, freshwater macrophyte dominated pond surrounded by agricultural fields.
3.	Bakreswar pond (BP)	Bakreswar	0.6	Permanent, freshwater fish pond at the pilgrim site.
4.	Tilpara barrage (TB)	Suri	–	Permanent, freahwater barrage on Mayurakshi river.
5.	Sainthia beel (SB)	Sainthia	48	Permanent, uncultivated, freshwater beel with agricultural fields around.
6.	Karkaria dighi (KD)	Tarapith	6.2	Permanent, freshwater impoundment in the rural area.
7.	Goldighi (GD)	Rampurhat	5.0	Permanent freshwater pond in the urban set up –a recreational park site.
8.	Gnorsha beel (PB)	Rajgram	–	Temporary freshwater flood plain wetland.
9.	Protappur bundh (PB)	Protappur	7.8	Permanent, freahwater impoundment in the rural settings.
10.	Langalhata beel (LB)	Kirnahar	1080	Temporary, freshwater beel a flooded riverine meadow.

Ballavpur wetland, Datindighi, Tilpara barrage and Goldighi were surveyed thrice during the course of study. Field observation, water quality analysis and collection of specimens were made from most of these wetlands using a drag net and plankton net as well as hand picking. The collected specimens were identified by these authors and other scientists of this department. Most of the vertebrates and macro-invertebrates were observed, while some were informed during the course of investigation. Their presence (+) or absence (–) from the wetlands during survey was indicated in Tables 2–8. The occurrences of some species marked with asterisks are based on local information from a few wetlands.

FAUNAL RESOURCE

The species which are habitually found, dependent or associated with wetlands as defined by Nandi *et al.* (1993, 1999, 2001) are reported herein leaving aside terrestrial components and/or 'Occasional visitors'

A. VERTEBRATES

Mammals

Two species of wetland dependent mammals, *viz.*, *Bandicota indica* (Bechstein) from Ballavpur wetland, Datindighi and Goldighi and *Lutra perspicillata* (Geoffroy) from Langalhata beel were encountered in Birbhum district. However, several species belonging to Chiroptera, Carnivora and Rodentia were observed as terrestrial and arboreal components. The Indian Blackbuck, *Antilope cervicapra* Linnaeus and Spotted Deer, *Axis axis* Erxleben are important dryland components of Ballavpur wetland complex.

Avifauna

A total of 36 avian species belonging 10 families comprising of water birds, marsh birds and kingfishers have been observed (Table 2). Of these, 25 species were resident and 11 species were migratory birds. The migratory ducks were observed in the Ballavpur wetlands and Tilpara barrage. These two wetlands as well as Nagalhata beel exhibit greater avian diversity in this district. However, Ballavpur wetland, Datindighi and Goldighi were found to be inhabited by some resident anatid birds, *viz.*, *Nettapus coromandelianus* throughout the year. The jheels at Ballavpur sanctuary attract a large number of migratory birds. So far, a total of 65 species of birds were recorded from this area of which 27 species are wetland dependent or associated including 9 species of winter migrants (Haldar *et al.*, 1999), but their population has recently been reduced to a few thousands indicating unsafe refuge to wintering waterfowl. This may be due to gradual disappearance of the fencing structure and the changed situations in the protection status of the wetlands. The occurrence of Comb duck, Brahmini duck and geese in large flocks was reported earlier in Birbhum district (O' Malley, 1910).

Table 2. List of resident and migratory birds recorded in wetlands of Birbhum district.

Family and species	Avifauna occurring in wetlands									
	BW	DD	BP	TB	SB	KD	GD	GB	PB	LB
A. Resident species :										
Family : PODICIPETIDAE										
Podiceps ruficollis (Pallas)	+	+	–	+	–	–	+	–	–	+
Family : PHALACROCORACIDAE										
Phalacrocorax niger (Vieillot)	+	+	+	+	+	+	+	–	+	+
Family : ARDEIDAE										
Ardea alba (Linnaeus)	+	–	–	–	+	–	–	+	–	+
Ardea grayi (Sykes)	+	+	+	+	+	+	+	+	+	+
Ardea purpurea Linnaeus	+	+	–	–	–	–	–	+	–	+
Bubulcus ibis (Linnaeus)	+	+	–	+	+	+	+	+	+	+
Egretta garzetta (Linnaeus)	+	+	–	+	+	–	–	+	–	+
Egretta intermedia (Wagler)	+	–	–	–	+	–	–	+	–	+
Nycticorax nycticorax (Linnaeus)	+	+	–	–	+	–	+	+	+	+
Family : CICONIIDAE										
Anastomus oscitans (Boddaert)*	–	–	–	+	+	–	–	+	–	+
Family : ANATIDAE										
Dendrocygna javanica (Horsfield)	+	+	–	+	+	–	+	+	–	+
Nettapus coromandelianus (Gmelin)	+	+	+	–	+	+	+	+	+	+
Family : ACCIPITRIDAE										
Haliastur indus (Boddaert)*	+	–	–	+	–	–	+	+	–	+
Circus aeruginosus (Linnaeus)	–	–	–	–	–	–	–	+	–	+
Family : RALLIDAE										
Amaurornis phoenicurus (Pennant)	+	+	–	–	+	–	+	–	+	+
Gallinula chloropus (Linnaeus)	+	+	–	–	+	–	+	–	+	+
Porphyrio porphyrio (Linnaeus)	–	–	–	–	–	–	–	–	+	–
Fulica atra (Linnaeus)	–	+	–	+	–	–	–	–	–	–

Table 2. *Contd.*

Family and species	Avifauna occurring in wetlands									
	BW	DD	BP	TB	SB	KD	GD	GB	PB	LB
Family : JACANIDAE										
Metopidus indicus (Latham)	+	+	+	–	+	–	+	–	+	+
Family : ALCEDINIDAE										
Alcedo athis (Linnaeus)	+	+	–	+	+	+	+	–	+	+
Ceryle rudis (Linnaeus)	–	+	–	–	–	–	–	–	+	–
Halcyon smyrnensis (Linnaeus)	+	+	+	+	+	–	+	+	+	+
Pelargopsis capensis (Linnaeus)	+	+	–	–	–	–	–	+	–	–
Family : CHARADRIIDAE										
Vanellus cinereus (Blyth)	–	+	–	–	–	–	–	–	–	–
Vanellus indicus (Boddaert)	+	+	–	–	+	–	+	+	–	+
B. Migratory species :										
Family : ANATIDAE										
Anser anser (Linnaeus)	+	–	–	+	–	–	–	–	–	–
Anas acuta Linnaeus	+	–	–	+	–	–	–	–	–	–
Anas crecca Linnaeus	+	–	–	+	–	–	–	–	–	–
Anas clypeata Linnaeus	+	–	–	+	–	–	–	–	–	–
Anas poecilorhyncha Forster	–	–	–	+	–	–	–	–	–	–
Netta rufina (Pallas)	–	–	–	+	–	–	–	–	–	–
Aythya fuligula (Linnaeus)	+	–	–	+	–	–	–	–	–	–
Family : CHARADRIIDAE										
Tringa nebularia (Gunner)	+	–	–	+	+	–	–	+	–	–
Tringa ochropus Linnaeus	–	–	–	+	–	–	–	+	–	–
Tringa hypoleucos Linnaeus	+	+	–	+	–	–	+	+	–	+
Gallinago stenura Bonaparte	+	+	–	–	+	–	+	+	+	+

Note : 1. Abbreaviations of the wetlands as in Table 1.

2. The species marked with an asterisk are based on local information from some wetlands.

Herpetofauna

Eleven species of herpetofauna, six reptiles and five amphibians belonging to seven families were encountered from wetlands of Birbhum district (Table 3). Of these, two species of snakes *viz.*, *Enhydis enhydris* (Schneider) and *Xenochrophis piscator* (Schneider) and four amphibian species, *viz.*, *Rana cyanophlyctis* Schneider, *R. limnocharis* Wiegman and *R. tigerina* Daudin and *Bufo melanostictus* Schneider were common in occurrence. Chakraborty and Chakraborty (1987) reported hunting of yellow monitor, *Varanus flavescens* by some tribals of Birbhum district.

Table 3. List of herpetofauna associated with wetlands of Birbhum district.

Family and species	Herpetofauna occurring in wetlands									
	BW	DD	BP	TB	SB	KD	GD	GB	PB	LB
A. Reptiles :										
Family : TRIONYCHIDAE										
Lissemys punctata (Bonaterre)*	+	+	–	–	+	–	–	–	+	+
Family : VARANIDAE										
Varanus bengalensis (Daudin)	+	–	–	+	+	–	–	+	+	+
Varanus falvescens (Gray)	+	+	–	–	–	–	+	+	–	–
Family : COLUBRIDAE										
Enhydris enhydris (Schneider)	+	+	+	+	+	+	+	+	+	+
Xenochrophis piscator (Schneider)	+	+	+	+	+	+	+	+	+	+
Family : ELAPIDAE										
Naja naja kaouthia (Lacepede)*	+	+	–	–	+	–	–	+	+	+
B. Amphibians :										
Family : RANIDAE										
Rana cyanophlyctis Schneider	+	+	+	+	+	+	+	+	+	+
Rana limnocharis Wiegmann	+	+	+	+	+	+	+	+	+	+
Rana tigerina Daudin*	+	+	+	+	+	+	+	+	+	+
Family : MICROHYLIDAE										
Microhyla ornata (Dumeril & Bibron)	+	+	+	+	+	–	+	–	–	–
Family : BUFONIDAE										
Bufo melanostictus Schneider*	+	+	+	+	+	+	+	+	+	+

Note : Abbreviations and asterisks as indicated in Table 2.

Fish fauna

Forty five species of fishes belonging to 19 families have been recorded from different wetlands of Birbhum district (Table 4). Of these, 41 species were encountered in Nagalhata beel, a flood plain wetland, followed by another, *viz.*, Gnorsha beel (36 species). These two wetlands exhibit greater fish faunal diversity due to overflooding of the adjoining rivers which has resulted in occasional availability of hilsa fish, *Hilsa ilisha* (Hamilton) in these two beels.

Table 4. List of fish fauna inhabiting wetlands of Birbhum district.

Family and species	Fish fauna occurring in									
	BW	DD	BP	TB	SB	KD	GD	GB	PB	LB
Family : ANGUILLIDAE										
Anguilla bengalensis (Gray & Hardw.)	–	+	–	–	+	+	–	+	+	+
Family : CLUPEIDAE										
Hilsa ilisha (Hamilton)*	–	–	–	–	–	–	–	+	–	+
Family : NOTOPTERIDAE										
Notopterus chitala (Hamilton)*	–	–	–	+	–	–	–	+	–	–
Notopterus notopterus (Pallas)	–	+	+	–	+	+	+	+	+	+
Family : CYPRINIDAE										
Salmostoma bacaila (Hamilton)	+	+	–	+	–	+	–	+	–	+
Hypophthalmichthys molitrix (Valenciennes)	–	–	+	–	–	+	+	–	+	–
Amblypharyngodon mola (Hamilton)	+	+	+	–	+	+	+	+	+	+
Esomus danricus (Hamilton)	+	+	+	+	+	+	+	+	+	+
Cyprinus carpio Linnaeus	–	–	–	–	–	+	+	–	–	+
Catla catla (Hamilton)	+	+	+	+	+	+	+	–	+	+
Labeo rohita (Hamilton)	+	+	+	+	+	+	+	+	+	+
Labeo bata (Hamilton)	+	+	+	+	+	+	+	+	+	+
Labeo calbasu (Hamilton)	+	+	+	–	+	–	+	–	+	+
Cirrhinus mrigala (Hamilton)	+	+	+	+	+	+	+	+	+	+
Brachydanio rerio (Hamilton)	–	–	–	+	–	–	–	–	–	+
Puntius sophore (Hamilton)	+	+	+	+	+	+	+	+	+	+
Puntius sarana (Hamilton)	–	–	+	+	–	+	+	+	+	+
Puntius ticto (Hamilton)	+	+	+	+	+	+	+	+	+	+
Puntius phutunio (Hamilton)	+	+	+	+	+	+	+	–	+	+

Table 4. *Contd.*

Family and species	Fish fauna occurring in									
	BW	DD	BP	TB	SB	KD	GD	GB	PB	LB
Family : COBITIDAE										
Lepidocephalus guntea (Hamilton)	+	–	+	+	+	+	+	+	+	+
Family : BAGRIDAE										
Aorichthys aor (Hamilton)	–	–	–	–	–	–	–	+	–	+
Mystus cavasius (Hamilton)	+	+	–	+	+	+	–	+	–	+
Mystus vittatus (Bloch)	–	–	+	+	+	+	+	+	+	+
Mystus bleekeri (Day)	–	–	–	–	–	–	–	+	–	+
Family : SILURIDAE										
Ompok pabda (Hamilton)	–	–	–	+	+	–	–	+	–	+
Wallago attu (Schneider)*	–	+	–	+	+	–	–	+	+	+
Family : CLARIIDAE										
Clarias batrachus (Linnaeus)*	+	+	+	+	+	+	+	+	+	+
Family : HETEROPNEUSTIDAE										
Heteropneustes fossilis (Bloch)*	+	+	+	+	+	+	+	+	+	+
Family : CYPRINODONTIDAE										
Aplocheilus panchax (Hamilton)	+	+	+	+	+	+	+	+	+	+
Family : CHANNIDAE										
Channa marulius Hamilton*	+	+	–	+	+	–	–	+	+	+
Channa striatus (Bloch)*	+	+	+	+	+	+	+	+	+	+
Channa orientalis (Schneider)	+	+	+	–	+	–	–	–	–	–
Channa punctatus (Bloch)	+	+	+	+	+	+	+	+	+	+
Family : SYMBRANCHIDAE										
Monopterus cuchia (Hamilton)*	+	+	–	+	+	–	–	+	+	+
Family : CHANDIDAE										
Chanda nama Hamilton	+	–	–	+	+	+	–	+	+	+
Chanda ranga Hamilton	+	+	+	+	+	+	+	+	+	+

Table 4. *Contd.*

Family and species	Fish fauna occurring in									
	BW	DD	BP	TB	SB	KD	GD	GB	PB	LB
Family : NANDIDAE										
Badis badis (Hamilton)	+	+	+	–	+	+	+	–	+	+
Family : CICHLIDAE										
Oreochromis mossambica (Peters)	+	–	+	+	+	+	+	+	+	+
Family : GOBIIDAE										
Glossogobius giuris (Hamilton)	+	+	+	+	+	+	+	+	+	+
Oligolepis acutipinnis (C.V.)	–	–	–	–	+	–	–	+	–	+
Family : ANABANTIDAE										
Anabas testudineus (Bloch)	+	+	+	+	+	+	+	+	+	+
Family : BELONTIDAE										
Colisa fasciata (Schneider)	+	+	+	+	+	+	+	+	+	+
Family : MASTACEMBELIDAE										
Macrognathus aculeatus (Bloch)	+	+	+	+	+	+	+	–	+	+
Mastacembelus armatus (Lacepede)	–	–	–	+	–	–	–	+	–	+
Mastacembelus pancalus (Hamilton)	+	+	+	+	+	+	+	+	+	+

Note : Abbreviations and asterisks as indicated in Table 2.

A wide variety of cyprinids, as well as 'jeol fish', *viz.*, *Anabas testudineus* (Bloch), *Clarias batrachus* (Linnaeus) and *Heteropneustes fossilis* (Bloch) are extensively grown in ponds, bundhs and dighies in this district. About seven species of major, minor and exotic carps are mostly cultivated in man-made wetlands yielding 200-500 kg/ha/annum under traditional and semi-intensive practices, (Misra, 1987). Although Hora (1943) offered his observations on the fisheries of the improved tanks in Birbhum district, it is found that fish culture in this district, in general, is practised in a very neglected and arbitrary manner as reported by Misra (1987). As a result weed fishes belonging to the genera *Esomus, Puntius, Colisa, Chanda, Badis,* etc., are available in considerable numbers at the periphery of the wetlands.

B. INVERTEBRATES

Macroinvertebrates

Macrocrustaceans : Four species of prawns and three species of crabs have been identified from freshwater wetlands of Birbhum district (Table 5). A species of prawn, *Macrobranchium lamarrei*

Table 5. List of macrocrustaceans identified from wetlands of Birbhum district.

Family and species	Prawns and crabs occurring in									
	BW	DD	BP	TB	SB	KD	GD	GB	PB	LB
MACRURA : Prawns										
Family : PALAEMONIDAE										
Macrobrachium rosenbergii (de Man)	–	–	–	+	–	–	–	+	–	+
Macrobrachium dayanum (H. M. Edwards)	+	–	+	+	–	+	+	+	+	+
Macrobrachium lamarrei (H. M. Edwards)	+	+	+	+	+	+	+	+	+	+
Family : ATYIDAE										
Caridina sp.	+	+	+	–	–	+	+	–	+	+
BRACHYURA : Crabs										
Family : POTAMONIDAE										
Paratelphusa hydrodromus Herbst	–	–	–	+	+	+	–	–	–	+
Sartoriana spinigera Wood Mason	+	+	+	–	+	+	+	–	–	+
Family : GRAPSIDAE										
Varuna litterata (Fabricius)	–	–	–	–	–	–	–	+	–	+

(H. M. Edwards) was common in occurrence in all the wetlands, while a species of crab, *Varuna litterata* (Fabricius) was reported from flood plain wetlands of Gnorsha beel and Nagalhata beel.

Insects : A total of over 53 species of entomofauna comprising of hemipterans (25 species), coleopterans (22 species), ephemeropterans (1 species), odonate larvae (3 species) and dipteran larvae (2 species) have been recorded from different wetlands of Birbhum district (Table 6). Among hemipterans, water bug (*Diplonychus* species) and water scorpions (*Ranatra* species) were quite common and among coleopterans *Canthydrus laetibilis* was widely distributed. A single species of ephimeropteran, *viz.*, *Ephemera annandalei* Chopra was recorded from Tilpara barage. However, besides larval odonates, five species adult odonates, *viz.*, *Ceriagrion coromandelianum* (Fabricius) belonging to the family Coenagrionidae and *Crocothemis servilia servilia* (Drury), *Diplacodes trivialis* (Rambur), *Rhyothemis variegata variegata* (Linne) and *Orthetrum sabina sabina* (Drury) of the family Libellulidae were collected from Datindighi and Ballavpur wetlands.

Molluscs : In all 13 species belonging to 8 families have been identified (Table 7). Of these, four species, *viz.*, *Bellamya bengalensis* (Lamarck), *Pila globosa* (Swainson), *Indoplanorbis exustus* (Deshayes) and *Gyraulus labiatus* (Benson) were common in occurrence, while species like *Brotia*

Table 6. List of entomofauna recorded from freshwater wetlands of Birbhum district.

Family and species	Entomofauna occurring in									
	BW	DD	BP	TB	SB	KD	GD	GB	PB	LB
A. Hemipteran insects (25 species) :										
Family : BELOSTOMIDAE										
Diplonychus annulatus (Fabr.)	+	+	–	+	+	+	+	–	+	–
Diplonychus sp.	+	+	+	+	+	+	+	–	+	+
Lethocercus indicus (Lep. & Serv.)	–	+	+	–	+	–	–	–	+	–
Family : CORIXIDAE										
Corixa spp. (2 species)	+	+	–	–	+	–	–	–	+	–
Micronecta spp. (2 species)	+	+	+	+	+	–	+	–	–	–
Family : GERRIDAE										
Limogonus nitidus (Mayr)	+	+	–	–	+	+	+	–	–	–
Limnogonus spp. (2 species)	+	+	–	+	+	+	+	–	–	–
Rhagadotarsus sp.	–	–	–	–	–	+	+	–	–	–
Family : HYDROMETRIDAE										
Hydrometra sp.	+	+	–	+	+	–	–	–	–	+
Family : NEPIDAE										
Laccotrephes griseus (Guerin)	–	+	–	–	+	–	–	+	–	–
Laccotrephes sp.	+	+	+	–	–	–	–	–	+	+
Ranatra filiformis Fabr.	–	–	+	+	–	–	+	+	–	–
Ranatra sordidula Dahrn	+	+	+	+	+	+	+	–	+	–
Ranatra sp.	+	+	–	–	+	+	–	–	+	+
Family : NOTONECTIDAE										
Anisops bouvieri (Krik.)	–	–	+	–	–	–	+	–	–	–
Anisops spp. (2 spp.)	–	+	+	–	+	+	+	+	–	–
Family : MESOVELIIDAE										
Mesovelia vittigera (Horvath)	–	–	–	+	–	–	–	–	–	–
Mesovolia spp. (2 spp.)	+	–	–	+	–	–	+	–	–	–
Family : PLEIDAE										
Plea spp. (2 species)	–	+	–	–	+	–	+	–	–	–

Table 6. *Contd.*

Family and species	Entomofauna occurring in									
	BW	DD	BP	TB	SB	KD	GD	GB	PB	LB
B. Coleopteran insects (22 species) :										
Family : DYTISCIDAE										
Canthydrus laetabilis (Walker)	+	+	+	+	+	+	+	–	+	–
Canthydrus morsbachi (Wehnkee)	+	+	+	–	+	–	–	–	–	–
Canthydrus ritsemai (Regimbert)	+	+	–	+	–	–	–	–	–	–
Canthydrus sp.	+	–	–	–	–	–	–	–	+	–
Cybister sp.	–	+	–	–	–	–	–	–	–	–
Clypeodytes sp.	–	–	–	+	+	–	–	–	–	–
Hydrocoptus fabricii MacLeay	–	–	–	+	–	–	–	–	–	–
Hydrocoptus subvitulus Mots.	+	+	–	–	+	–	–	–	–	–
Hydrocoptus sp.	–	–	+	–	+	–	–	–	–	–
Hydrovatus sp.	–	+	+	+	+	–	–	–	–	–
Laccophilus sp.	+	+	+	–	+	+	–	–	+	–
Hyphophorus sp.	–	+	–	–	–	+	+	–	–	–
Family : HYDROPHILLIDAE										
Sternolophus rufipes (Fabricius)	–	–	–	–	–	–	–	–	+	–
Helochares anchoralis Sharp	–	–	+	–	–	–	–	–	–	–
Helochares pallons (MacLeay)	–	–	–	+	–	–	–	–	–	–
Berosus indicus Mots.	–	+	–	+	–	–	–	–	–	–
Regimbertia attenuata (Fabricius)	+	+	+	–	+	–	–	–	–	–
Globaria leachi (Hope)	–	+	–	–	+	–	–	–	+	–
Globaria sp.	+	+	+	–	+	+	+	–	–	–
Amphiops sp.	+	+	+	–	–	–	–	–	–	–
Family : HALIPLIDAE										
Haliplus sp.	–	–	–	–	–	+	+	–	–	–
Family : GYRINIDAE										
Orectochilus sp.	–	–	–	+	–	–	–	–	–	–

Table 6. *Contd.*

Family and species	Entomofauna occurring in									
	BW	DD	BP	TB	SB	KD	GD	GB	PB	LB
C. Miscellaneous insects :										
Odonate larvae (3 spp.)	+	+	+	+	+	+	+	–	+	–
Mosquito larvae (>1 sp.)	+	+	+	+	+	+	+	–	+	–
Chironomid larvae (>1 sp.)	+	+	–	+	+	+	+	–	+	–
Mayfly nymph (1 sp.) (*Ephemera annandalei* Chopra)	–	–	–	+	–	–	–	–	–	–

Table 7. List of molluscan species recorded from wetlands in Birbhum district.

Family and species	Molluscan fauna occurring in									
	BW	DD	BP	TB	SB	KD	GD	GB	PB	LB
A. Gastropod molluscs :										
Family : VIVIPARIDAE										
Bellamya bengalensis (Lamarck)	+	+	+	+	+	+	+	+	+	+
Family : PILIDAE										
Pila globosa (Swainson)	+	+	+	+	+	+	+	+	+	+
Family : BITHYNIIDAE										
Gabbia orcula Frauenfeld	+	+	+	+	–	+	+	–	–	–
Digoniostoma cerameopoma (Benson)	–	–	+	–	–	–	–	–	–	+
Family : THIARIDAE										
Thiara granifera (Lamarck)	–	–	–	+	–	+	+	–	–	–
Thiara tuberculata (Muller)	–	–	+	+	–	–	–	+	–	–
Brotia costula (Rafinesque)	–	–	–	+	–	–	–	–	–	–
Family : LYMNAEIDAE										
Lymnaea acuminata Lamarck	+	–	–	+	–	+	+	–	+	–
Lymnaea luteola Lamarck	–	–	+	–	+	–	+	–	–	–

Table 7. *Contd.*

Family and species	Molluscan fauna occurring in									
	BW	DD	BP	TB	SB	KD	GD	GB	PB	LB
Family : PLANORBIDAE										
Indoplanorbis exustus (Deshayes)	+	+	+	+	+	+	+	–	+	–
Gyraulus labiatus (Benson)	+	+	+	+	+	+	+	–	+	–
B. Bivalve molluscs :										
Family : UNIONIDAE										
Lamellidens marginalis (Lamarck)	+	+	+	–	–	+	+	–	+	–
Family : CORBICULIDAE										
Corbicula striatella Desheyes	–	–	–	+	–	–	–	–	–	–

costula (Rafinesque) and *Corbicula striatella* Deshayes were encountered in Tilpara barrage only. The highest molluscan diversity was also observed in Tilpara barrage. *Gyraulus labiatus* is omnipresent in wetlands of Birbhum district with conspicuous absence of *Gyraulus convexiusculus*. Similar observation was recorded earlier by Mitra and Dey (1992).

Zooplankton

Fifty three species of zooplankton belonging to Copepoda (6 species), Ostracoda (5 species), Cladocera (35 species), Conchostraca (1 species) and Rotifera (6 species) have been recorded from various wetlands of Birbhum district (Table 8). Of these, cladocerans exhibited greatest diversity representing 35 species belonging to five families. Among cladocerans, *Ceriodaphnia cornuata* occurs in all the wetlands sampled for zooplankton, while *Daphnia similis* occurred only in the flood plain wetland of Gnorsha beel. However, in general, littoral species such as chydorids were dominant over limnetic species since most of these wetlands are used for pisciculture. The scarcity in representation of limnetic cladocerans belonging to the families Daphnidae, Moinidae and Bosminidae is suspected due to the predation pressure by insects and fishes as suggested by Venkataraman and Das (1993) and Venkataraman *et al.*, (2000).

Copepods appear to be the next dominant group in which predaceous cyclops predominate amongst zooplankton population in a number of wetlands surveyed.

UTILIZATION SCENARIO OF THE WETLANDS

The wetlands of Birbhum district are utilized in various ways, *viz.*, reservoir of water, recreation, waterfowl habitat, religious purposes, etc. The diversified uses of four important wetlands of Bolepur

Table 8. List of zooplankton species recorded from wetlands in Birbhum district.

Family and species	Zooplankton species occurring in							
	BW	DD	BP	TB	SB	KD	GD	GB
CRUSTACEA : COPEPODA								
Family : DIAPTOMIDAE								
Diaptomids (3 spp.)	+	–	+	–	+	+	–	–
Family : CYCLOPIDAE								
Mesocyclops (2 spp.)	+	+	+	–	+	+	–	–
Family : HARPACTICOIDAE								
Harpacticoids (1 sp.)	–	–	–	–	–	–	–	+
Nauplius larvae	–	–	+	–	–	–	–	+
CRUSTACEA : OSTRACODA								
Family : CYPRIDAE								
Cypris subglobosa Sowerby	+	–	–	–	–	–	–	–
Stenocypris major (Baird)	–	–	–	+	–	+	–	–
Other ostracods (3 spp.)	+	+	–	+	+	+	–	–
CRUSTACEA : CLADOCERA								
Family : SIDIDAE								
Pseudosida bidentata Herrick	–	+	–	–	–	–	+	–
Latonopsis australis Sars	+	+	–	+	–	+	+	–
Diaphanosoma excisum Sars	–	–	–	–	–	+	+	+
Diaphanosoma sarsi Richard	–	–	–	–	–	+	–	–
Family : DAPHNIIDAE								
Daphnia similis Claus	–	–	–	–	–	–	–	+
Simocephalus vetulus (O. F. Mullar)	+	+	+	–	+	+	+	–
Simocephalus exspinosus (Koch)	–	–	–	–	+	+	+	–
Simocephalus serrulatus (Koch)	+	+	–	–	–	–	+	–
Cereodaphnia cornuta Sars	+	+	–	+	+	+	+	+
Scapholeberis kingi Sars	+	+	–	+	+	+	–	–

Table 8. *Contd.*

Family and species	Zooplankton species occurring in							
	BW	DD	BP	TB	SB	KD	GD	GB
Family : MOINIDAE								
Moina micrura Kurz	–	–	+	–	–	+	+	+
Family : MACROTHRICIDAE								
Macrothrix spinosa King	+	+	–	+	+	+	+	–
Macrothrix triserialis (Brady)	+	+	–	+	–	+	–	–
Macrothrix laticornis (Jurine)	–	–	–	+	–	–	+	–
Ilyocryptus spinifer Herrick	+	+	–	+	+	+	+	–
Family : CHYDORIDAE								
Pleuroxus similis Vavra	–	+	–	–	–	–	–	–
Alonella excisa (Fischer)	+	+	–	+	–	+	–	–
Chydorus sphaericus (O. F. Muller)	–	+	+	+	+	+	+	–
Chydorus barroisi (Richard)	+	+	–	+	+	+	+	–
Chydorus reticulatus Daday	+	+	–	–	+	+	+	–
Chydorus ventricosus Daday	+	+	–	+	–	+	–	–
Dadaya macrops (Daday)	+	–	–	–	–	–	–	–
Dunhevedia crassa King	+	–	–	–	–	+	–	–
Alona karua (King)	+	–	–	–	–	+	+	–
Alona pulchella Sars	–	+	–	+	+	+	–	–
Alona verrucosa Sars	+	+	–	+	–	+	–	–
Alona costata Sars	+	+	–	–	–	+	–	–
Alona kwangsiensis Chiang	–	–	–	–	–	–	+	–
Alona davidi Richard	+	–	–	–	–	–	–	–
Alona rectangula Sars	–	–	+	–	+	+	+	–
Alona affinis Leyding	–	–	–	+	–	–	–	–
Kurzia longirostris (Daday)	–	–	–	–	–	+	–	–
Oxyurella singalensis (Daday)	+	–	+	–	–	+	+	–
Notalona globulosa (Daday)	+	–	–	–	+	+	–	–
Leydigia acanthocercoides (Fischer)	–	–	–	–	+	–	–	–

Table 8. *Contd.*

Family and species	Zooplankton species occurring in							
	BW	DD	BP	TB	SB	KD	GD	GB
CRUSTACEA : CONCHOSTRACA								
Family : CYCLESTHERIDAE								
Cyclestheria hislopi Baird	+	+	–	–	–	+	–	–
ROTIFERA								
Family : ASPLANCHIDAE								
Asplancha sp.	–	–	+	–	–	–	–	+
Other rotifers (5 spp.) (*Branchionus, Keratella* and *Filinia* spp.)	–	+	–	+	–	–	–	+

(Ballavpur wetland), Dubrajpur (Datindighi), Suri (Tilpara barrage) and Rampurhat (Goldighi) are summarised in Table 9.

From Table 9 it is clear that most of the major uses are available from these four wetlands. However, Ballavpur wetland and Tilpara barrage have high value as waterfowl habitat and Goldighi has high recreational as well as reservoir of water value for domestic purposes. On the other hand, Datindighi is an important religious site for the local people. Ghosh *et al.* (1992) reported archaeological domestic mammalian remains from a pond of chalcolithic Kotasur village of this district.

DISCUSSION

The wetlands of Birbhum district are, in general, small and man-made excepting the natural flood plain wetlands, *viz.*, Gnorsha beel and Nagalhata beel and one artificial wetland, namely, Tilpara barrage. These three wetlands as well as Ballavpur wetlands (202 ha) though qualify for inclusion in the "Directory of Wetlands in India" (Anonymous, 1988), being more than 100 hectares in area, are not listed except Nagalhata beel (23°45' N and 87°45' E; 2000 ha). All the four aforesaid wetlands of Birbhum district represent the freshwater wetlands of the Rarh plain dominated by red soils.

The faunal diversity in freshwater wetlands of Rarh plain represents low diversity of wetland fauna especially avifauna (36 species) when compared with that of Gangetic delta plains *viz.*, (i) Active delta or Coastal plain of North and South 24-Parganas districts (67 species; Nandi *et al.*, 1993) and (ii) Mature delta plain of Haora and Hugli districts (54 species; Nandi *et al.*, 1999). The reed dwelling birds were conspicuously absent from these wetlands of Birbhum district. In overall, the wetland fauna of Birbhum district represent 220 species (94 vertebrates and 126 invertebrates,

Table 9. Utilization status of four important wetlands in Birbhum district.

Types of utilization	Status of utilization			
	Ballavpur wetland	Datin dighi	Tilpara barrage	Goldighi
A. Wetland use				
1. Reservoir of water				
a. Domestic (Bathing, washing, etc.)	VL	VL	L	VH
b. Agricultural	–	L	H	L
2. Waterfowl habitat	H	M	VH	H
3. Fisheries	VL	VL	L	L
4. Tourism	M	L	L	M
5. Nature conservation	M	M	M	H
B. Dryland use				
6. Gardening and greenery	M	L	VL	H
7. Recreation	M	L	M	H
8. Children's park	–	–	–	M
9. Defaecation/Waste disposal	L	L	L	M
10. Religious site	–	M	–	–

Abbreviations : VH = Very high; H = High; M = Medium; L = Low; VL = Very low.

while Haora and Hugli districts were represented by 276 and 261 species repectively (Nandi *et al.*, 1999). However, among wetlands of Birbhum district, littoral species collected around knee-dip water showed highest representation of entomofauna in fallow wetlands of Datindighi (33 species) and Sainthia beel (27 species), lowest in floodplain wetlands of Gnorsha beel (4 species) and Langalhata beel (4 species) and moderate in man-made wetlands, *viz.*, Ballavpur wetland (25 species), Goldighi (23 species), Tilpara brrage (24 species), etc. Field observation in these wetlands indicate higher diversity of entomofauna associated with macrophyte diversity of these wetlands. Among zooplankton, five species of Cladocera, *viz.*, *Chydorus reticulatus, Dadaya macrops, Macrothrix laticornis, Notalona globulosa* and *Simocephalus serrulatus* were not recorded from earlier studies in the districts of lower West Bengal (Nandi *et al.*, 1993; 1999). However, these species excepting *Macrothrix laticornis* were encountered in the pond and lake ecosystems of the Indian Botanical Garden suggesting dependency of zooplankton diversity with that of plants/macrophytes (Nandi *et al.*, 2001).

SUMMARY

1. A faunal inventory of 10 wetlands in Birbhum district dealing with 94 species of vertebrates and 126 species of macroinvertebrate and zooplankton is communicated.
2. The vertebrate species include 2, 36, 6, 5 and 45 species of mammals, birds, reptiles, amphibians and fishes repecteively. The macro-invertebrate fauna include macrocrustaceans (7 species), insects (53 species) and molluscs (13 species) and zooplankton comprise of a total of 53 species.
3. The utilization scenario of four important wetlands of this district is depicted.

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