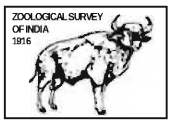

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WETLAND FAUNAL RESOURCES OF WEST BENGAL. 5. BANKURA AND PURULIYA DISTRICTS

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INTRODUCTION

The present paper on wetland faunal resources of Bankura and Puruliya districts is the fifth report of the series from West Bengal. The earlier reports relate to faunal diversity of some wetlands of North and South 24 Parganas districts (Nandi *et al.*, 1993), Haora and Hugli districts (Nandi *et al*., 1999), Birbhum district (Nandi *et al*., 2001b) and Darjiling and Jalpaiguri districts (Nandi *et al*., 2005). Besides these reports, studies on wetlands of West Bengal, mostly pertaining to plankton and benthos, were made from Calcutta and it's surrounding areas of South Bengal (De *et al.*, 1989; Ghosh, 1990; Venkataraman and Das, 1993; Sinha and Khan, 2000; Nandi *et al.*, 2001a, Mukherji and Nandi, 2004). However, very little is known on overall freshwater fauna and/or wetland fauna of western highland and plateau region of lower West Bengal (Sen, 1992; Thakur *et al.*, 1992; Pattanayak, 1999; Mukhopadhyay, 1999; Sharma, 1999; Chandrasekhar, 2003; Nandi *et al.*, 2004). Thus, the present study was taken up to deal with wetland faunal resources of Bankura and Puruliya districts representing the Rarh (*Raktim* or red) plain (RP) and the undulating highland and plateau (HP) regions respectively.

PHYSIOGRAPHY

The districts of Bankura and Puruliya fall under the physiographic division, the central Rarh Plain and the entire Western Highland and Plateau regions of West Bengal. Bankura district excluding the narrow Western Highland portion lies on the slightly undulating Rarh Plain, while the whole of Puruliya district constitutes the highly undulating highlands, dotted with a number of rounded steep-sided hills called 'monadrocks' (O' Malley, 1908; Bhattacharya *et al.*, 1985; Banerjee, 1968).

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Bankura district lies between 22°38' and 23°38' North latitude and 86°36' and 87°46' East longitude, and is located on the western part of West Bengal. The district extends over the right bank tributaries (*viz.*, Damodar, Dwarakeswar, Silai and Kangasbati) basin of Bhagirathi Hooghly river covering a geographic area of 6,882 sq. km., with a population of 31.91 lakhs (as per 2001 census) *i.e.*, having 464 persons per sq. km. Puruliya district is located between 20°43' and 23°12' North latitude and 85°49' and 86°54' East longitude at the extreme western fringe of West Bengal, covering a geographic area of 6259 sq. km. with a population of 25.35 lakhs (as per 2001 census) *i.e.*, having 405 persons per sq. km. This region underwent a process of erosion and denudation through ages. It has now taken the landform of a rolling plain region called peneplain. Owing to excessive erosion and denudation, high hills are totally extinct and even the plateau has been transformed into smooth rolling barren upland. Low hills locally called Dungri or Tila (*pahar*) such as Ayodhya, Jabarban, Belasu, Panchet, Ramkenali, Bansha, Chunta, Parasha, Bagmundi, Daldungri, Gurma and Bhandara stand here and there in Puruliya district. Gorgaburu of Ayodhya hills is the highest peak (677 m) of the rolling upland region. The arid rugged part of the plateau of South Puruliya is locally called Barabhum. The Rarh plain of Bankura district appears to be even plain in some parts and rolling plain in other parts. It has very gentle slope to the east having its contour to the extent of 50 metres on the western border. The Bankura Rarh comprises of Damodar, Dwarakeswar Doab and Dawarakeswar Kasai tract. The river valleys are low lands but the doab lands are comparatively high. The physiographic features including population figures of these two districts are given in Table 1.

Climate :

The rolling uplands of Puruliya district experience an extreme climate with high range of temperature. The climate of these two districts is characterised by oppressive heat in summer and high humidity nearly all the year round. During summer the average daily maximum temperature varies between 26°C and 39°C and that during winter between 12°C and 25°C. Rainfall is scanty even though comparatively good rainfall occur on the eastern part of the district. Winter is dry. The Rarh plain of Bankura district in summer is humid and warm, while the winter is dry and cold. The annual average rainfall range between 130 cm and 140 cm. The average winter temperature is 15°C and the average summer temperature is about 30°C. Unlike Puruliya district, the annual range of temperature is not so high in Bankura district. Relative humidities are generally high throughout the year. Average percentage of humidity varies from 50 in April to 82 in August.

Soil :

Bankura district is the land of red soils belonging to old alluvial type. Pebble and sand predominate in these soils. The western part shows the presence of laterite soils. They are not suitable for agriculture and contain iron and lime, and very small quantity of humus. In general, the soils of Puruliya district are of laterite type, red in colour, unfertile and gravel-mixed, coarse textured, well-drained with low water holding capacity. Soils of Damodar and Kangsabati river banks are to some extent fertile (Roychaudhuri *et al.*, 1963).

Table 1. : Physiographical features of Bankura and Puruliya districts, West Bengal.

Parameters	Bankura district	Puruliya district
Area (in sq. km.)	6882	6259
Altitude	50–150 m	150–300 m
Latitude	22°38'–23°38' N	20°43'–23°12' N
Longitude	86°36'–87°46' E	85°49'–86°54' E
Highest hills	Susunia (440 m)	Chamta (699 m); Gorgaburu (677 m)
Population (2001 census)	31, 91, 822	25, 35, 233
Population density	464	405
Temperature (°C) Summer Winter	 26–38 15–24	 26–39 12–25
Rainfall	140 cm	137.5 cm
Humidity	50–82%	50–65%
Landscape type	Slightly undulating Rarh plains	Low hills, highlands and plateau
Soil type	Laterite—gravel mixed red soil	Western part—laterite Major part—old alluvial and sand mixed red soil
Vegetation type	Dry deciduous type (sal, mahua, palas, thorny shrub, palm, mango, etc.)	Dry deciduous type (predominated by sal, palas and mahua)
Gross cropped area (ha)	4,69,181	3,26,333
Forest cover (ha)	98,598	Reserve forest : 10,760 Protected forest : 56,264
Water resource (ha)	29,314.19	3,707.29

Note : Water resource includes areas of lentic and lotic waterbodies (rivers and canals). In case of Puruliya district this figure includes riverine area only. In Bankura district rivers and canals extend to 27,641.19 ha and lentic waterbodies spread over 1,673.00 ha.

Natural vegetation :

The natural vegetation of Rarh plain is dry deciduous type. Trees like sal, mahua and palas grow in the western part of Bankura district, while thorny shrubs, palm and mango trees are present throughout the rarh plain. In the uplands and plateau region of Puruliya district forest is widespread. But it is not so dense and the trees are generally of small height. They are deciduous and predominated by sal, mahua and palas.

The ponds, beels and bundhs, either natural or man-made, include wetland plants : (i) floating hydrophytes such as water hyacinth, water lettuce, duck weeds; (ii) suspended hydrophytes *viz.*, *Ceratophylum*; (iii) anchored hydrophytes *viz.*, *Nelumbo*, *Nymphaea*, *Nymphoides*, *Trapa*, *Vallisneria*, *Hydrilla*, *Ottelia*, *Najas*, *etc.*, and (iv) emergent amphibious hydrophytes like *Cyperus*, *Ipomoea*, *Marselia*, *Enhydra*, *Potamegeton*, *Paspalum*, *Aeschynomene*, *etc.*

Wetland profile :

The Damodar, the Dwarakeswar, the Silabati (Silai) and the Kangsabati (Kasai) are the four major rivers of Bankura and Puruliya districts. These rivers with their distributaries constitute the main drainage system of these two districts. All these rivers originate more or less within the western uplands of Puruliya district flow in south-southeast direction and fall in the Bay of Bengal. Though the summer dries up these rivers, the rains bring flood in almost all these rivers as their beds become elevated by deposition of pebbles, stones and sands. Both major and minor dams are constructed all over this region for irrigation purpose. The Directorate of Agricultural Engineering has commissioned 19 and 33 numbers of Surface Minor Irrigation Schemes in Bankura and Puruliya districts respectively. The Kangsabati dam (3,600 ha) is a major dam constructed on the river at Mukutmanipur of Bankura district in order to arrest flood and to provide irrigation facilities. Some wetlands named as Saheb bundhs are excavated as reservoirs water during British periods.

MATERIAL AND METHODS

During September 1998 and January-February, 2000, a total of 19 wetlands, 11 from Bankura district and 8 from Puruliya district (Table 2, Figs. 1 and 2), were surveyed for faunal inventory of wetlands of these two districts. It includes 3 dams, 1 daha and 15 bundhs from these two districts. Field observation, water quality analysis and collection of specimens (frogs, fishes, insects and other invertebrates including zooplankton) were made from these wetlands using a drag net and plankton net as well as hand picking. Higher vertebrates and cultivable fishes were observed in the field. Birds were counted by direct count method. Major faunal groups are listed in Tables 3–9 indicating the occurrence of species in specific wetlands under Bankura and Puruliya districts as numbered in Table 2. The collected specimens were identified by authors or in consultation with expert scientists of this department.

FAUNAL RESOURCE

The freshwater wetlands of Bankura and Puruliya districts are inhabited by a wide diversity of vertebrate and invertebrate faunal components. Only those species which are truly aquatic or those associated with or directly dependent upon the wetlands were included in the survey.

Table 2. : List of wetlands surveyed from Bankura and Puruliya districts, West Bengal.

Sl. No.	Name of wetland	Name of the nearest town / village	Approximate area (in ha)	Ecological category
	BANKURA DISTRICT			
1.	Ambikanagar Bundh	Gorabari	18	FW, SP, F
2.	Bagjobra Bundh	Gorabari	5.0	FW, SP, RR
3.	Jumuna Bundh	Bishnupur	25	FW, P, RR
4.	Kakila Daha	Kakila	4.4	FW, SP, RP
5.	Krishna Bundh	Bishnupur	25	FW, P, RR
6.	Kulaijurir Bundh	Bankadah	18	FW, SP, RR
7.	Lal Bundh	Bishnupur	12	FW, P, UR
8.	Rani Bundh	Sonamukhi	3.0	FW, SP, RR
9.	Saheb Bundh	Khatra	2.2	FW, SP, RR
10.	Sarenga Bundh	Ranibundh	1.4	FW, T, RR
11.	Sutan Dam	Ranibundh	6.5	FW, P, RR
	PURULIYA DISTRICT			
12.	Birshar Bundh	Dubra	1.5	FW, P, RR
13.	Chhatni Dam	Ajodhya	2.5	FW, P, UR
14.	Datta Bundh	Santaldih	4.0	FW, P, UR
15.	Hatinada Dam	Ajodhya	0.7	FW, SP, RR
16.	Indra Beel	Indrabeel	80	FW, P, OL
17.	Rani Bundh	Joypur	15	FW, SP, RR
18.	Saheb Bundh	Adra	50	FW, P, UR
19.	Saheb Bundh	Puruliya	30	FW, P, UR

Abbreviations : FW = Freshwater; P = Permanent wetland; SP = Semi-permanent wetland; T = Temporary wetland; F = Fishery; OL = Oxbow lake; RR = Rural reservoir; UR = Urban reservoir; RP = Rural pond.

Note : 1. A number of freshwater reservoirs in these two districts are named as Saheb Bundh as these waterbodies were excavated during British period under the augies of some Britishers ruling the area. However, Saheb Bundh of Adra is also well known as Adra reservoir or Adra Lake.

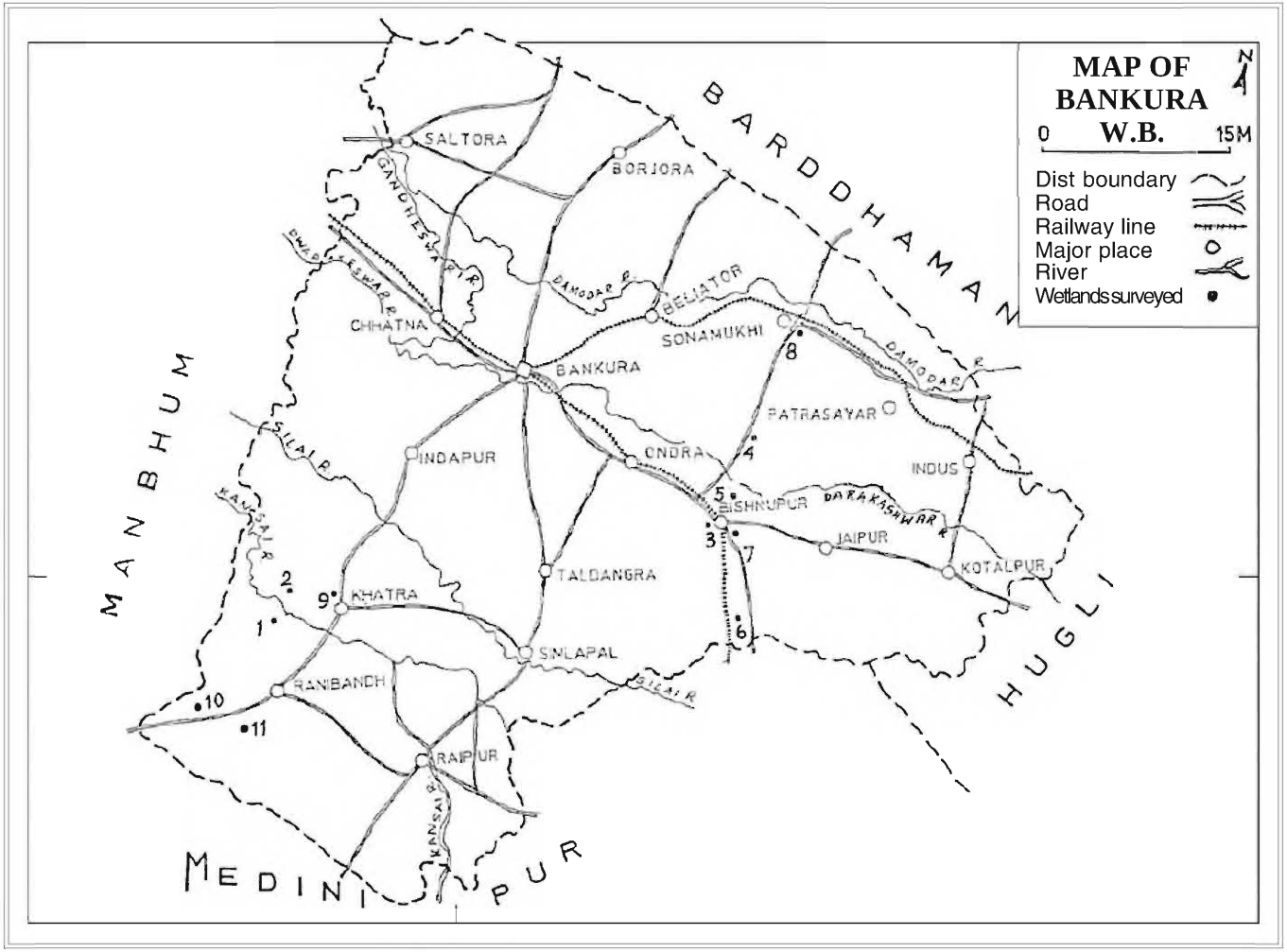

Fig. 1. : Map of Bankura district showing wetlands (1–11) surveyed. 1 = Ambikanagar Bundh; 2 = Bagjobra Bundh; 3 = Jamuna Bundh; 4 = Kakila Daha; 5 = Krishna Bundh; 6 = Kulaijurir Bundh; 7 = Lal Bundh; 8 = Rani Bundh; 9 = Saheb Bundh (Khatra); 10 = Sarenga Bundh; 11 = Sutan Dam.

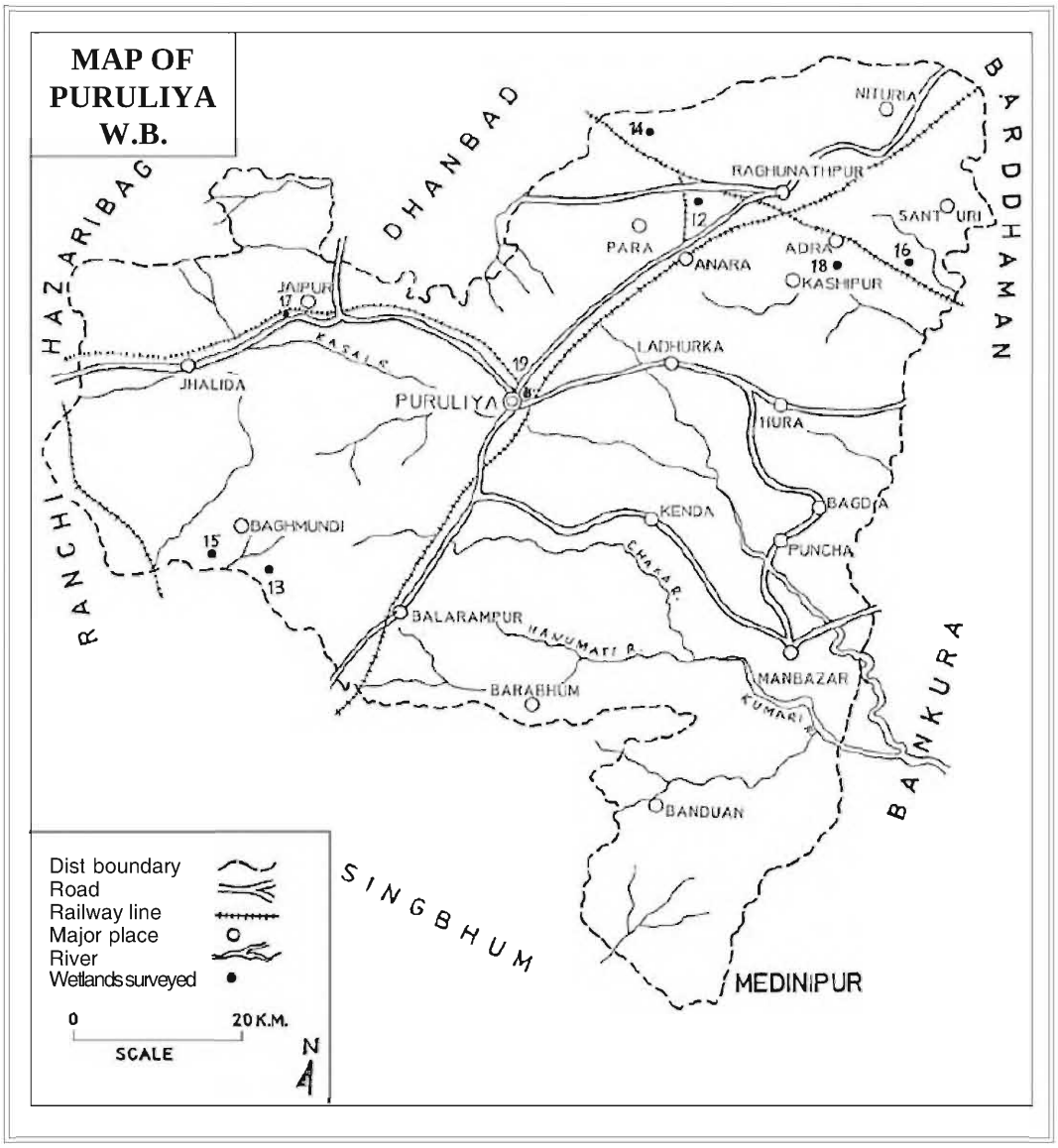

Fig. 2. : Map of Puruliya district showing wetlands (12–19) surveyed.

12 = Birshar Bundh; 13 = Chhatni Dam; 14 = Datta Bundh;
15 = Hatinada Dam; 16 = Indra Beel; 17 = Rani Bundh;
18 = Saheb Bundh (Adra); 19 = Saheb Bundh (Puruliya).

VERTEBRATES

***Mammals* :**

Aquatic or wetland dependent mammals could not be observed in and around wetlands surveyed from these two districts. However, the occurrence of Common Otter, *Lutra lutra* was reported earlier from Bankura district (Banerjee, 1968). The associated dryland species occurring around wetland habitats and adjoining forests of these two districts are Asiatic Jackal (*Canis aureus*), Bengal Fox (*Vulpes bengalensis*), Small Indian Civet (*Viverricula indica*), Palm Civet (*Paradoxurus hermaphroditus*), Jungle Cat (*Felis chaus*), Leopard Cat (*Felis bengalensis*), Leopard (*Panthera pardus*), Rhesus Macaque (*Macaca mulatta*), Hanuman Langur (*Presbytes entellus*), Indian Pangolin (*Manis crassicaudata*), Wolf (*Canis lapus*), Small Indian Mongoose (*Herpestes auropunctatus*), Indian Grey Mongoose (*Herpestes edwardsi*), Hyaena (*Hyaena hyaena*), Indian Elephant (*Elephas maximus*), Wild Boar (*Sus scrofa*), Spotted Deer (*Axis axis*, mainly in the parks around Adra and Kangsabati resorvoirs), Rufous-tailed Hare (*Lepus nigricollis*), Indian Crested Porcupine (*Hystrix indica*), Lesser Bandicoot Rat (*Bandicota bengalensis*) and Five-striped Squirrel (*Funambulus pennanti*) (O'Malley, 1908; Bhattacharya *et al.*, 1985; Banerjee, 1968; Agarwal *et al.*, 1992). These terrestrial mammalian species are listed herein to indicate the overall ecology of the area surrounding the wetlands of these two districts.

***Birds* :**

A total of 41 species of resident and migratory birds belonging to 10 families comprising of water birds, marsh birds and kingfishers have been encountered in the wetlands of these two districts (Table 3 & 4). Besides general faunistic study, a mid-winter waterbirds survey was conducted in eight selected wetlands of these two districts. These waterbirds were comprised of 34 species representing 11 resident (R), 12 resident migrant (RM) and 9 migrant (M) species (Table 4). All these migrant species representing ducks and geese were recorded from Puruliya district only. Large flocks of Lesser Whistling Teal, a resident anatid duck, *Dendrocygna javanica*, were, however, observed in both the districts, specially in Jamuna bundh and Krishna bundh of Bishnupur in Bankura district and also in both the Saheb bundhs of Adra and Puruliya proper of Puruliya district. During mid-winter survey the highest diversity of waterbirds (29 species) was recorded in Saheb bundh, Adra of Puruliya district. In an inventory of waterbirds from Saheb bundh of Puruliya town, NEWS (1998) reported 24 species without any count data. The higher diversity of wetland birds in Saheb bundh, Adra (*i.e.*, Adra reservoir) may be related to size, safe-refuge, availability of food and suitability of habitat concerned and also for its location along migratory pathways of the migrant species. It is worth mentioning that as per Asian Waterfowl Census 1994–1996, Lopez and Mundkur (1997) reported the occurrence of 22,274 birds in 1996 at Kangsabati Dam of Bankura district. Despite lacking any legal protection Kangsabati reservoir of Bankura district qualifies for designating it as a site of international importance (Ramsar Site) for hosting more than 20,000 waterfowl.

***Reptiles* :**

So far, four species of reptiles belonging to three families comprising of one species of pond turtle (*Lissemys punctata*), one species of monitor lizard (*Varanus bengalensis*) and two species of colubrid snakes (*Enhydris enhydris* and *Xenochrophis piscator*) have been recorded from wetlands of Bankura and Puruliya districts (Table 5).

***Amphibians* :**

Eight species of toads and frogs belonging to three families have been recorded (Table 6) from wetlands of these two districts. Of these, three ranid frogs *viz.*, *Rana cyanophlyctes*, *R. tigerina* and *Lemnectes limnocharis*, are more or less common in these two districts in and around waterbodies and also in roadside ditches. The bufonid and microhylid species are encountered mainly from moist shady places around wetlands. However, amphibian species are least explored from this part of West Bengal (Sarkar *et al.*, 1992).

***Fishes* :**

A total of 42 species belonging to 17 families have been recorded from various wetlands of Bankura and Puruliya districts (Table 7). Of the 17 families, the Family Cyprinidae is represented by 17 species including Indian major and minor carps (*Labeo*, *Catla* and *Cirrhinus*) and weed fishes (*Puntius*, *Esomus*, etc.). Some catfishes belonging to the genera *Clarias*, *Heteropneustes*, *Wallago*, *Mystus*, *Ompak* as well as murrels (*Channa* species) and mud eels (*Mastacembelus* and *Monopterus* species) are quite common in occurrence in wetlands of these two districts. Fish fauna in wetlands of these two districts have not been documented so far (Sen, 1992).

INVERTEBRATES

The aquatic invertebrate faunal elements comprising 84 species of macroinvertebrates and 36 species of zooplankton (Table 8 & 9) are reported herein mainly based on the specimens collected from the selected wetlands of Bankura and Puruliya districts. Macroinvertebrates belonging to five major groups, *viz.*, macrocrustaceans, insects, arachnids, annelids and molluscs, and zooplankton comprising of Copepoda, Ostracoda, Cladocera, Conchostraca and Rotifera have been recorded. It may be mentioned that Pattanayak (1999) reported 3 species of freshwater sponges from these two districts.

***Macrocrustaceans* :**

Seven species of macrocrustaceans comprising of 5 species of prawns and 2 species of crabs belonging to two families have been recorded from wetlands of Bankura and Puruliya districts. A perusal of literature indicates that prawns and crabs remain unexplored from region.

***Insects* :**

A total of 54 species of insects belonging to 6 orders and 17 families have been observed/ obtained from wetlands of these two districts. Among these, 47 species of aquatic adult insects belong to the orders Hemiptera (27 species) and Coleoptera (20 species), 5 species of aquatic larval forms representing orders Odonata (3 species) and Diptera (2 species), one species of ephemeropteran nymphs and a single species of wetland associated gryllotalpid, *Gryllotalpa africana* (Order Orthoptera) have been recorded. Of the six insect orders, Hemiptera represents the highest diversity of 27 species, followed by Coleoptera (20 species) and Odonata (3 species).

As per records, in the State Fauna of West Bengal, it is revealed that aquatic hemipterans and coleopterans are not thoroughly explored from Bankura and Puruliya districts (Bal and Basu, 1994a, b; Biswas *et al.*, 1955a, b, c). Bal and Basu (1994a, b) reported a total of 7 species of aquatic and semi-aquatic Hemiptera *viz.*, *Ptilomera laticauda* (Hardwicke), *Limogonus nitidus* (Mayr), *L. parvulus* (Stal), *Gerris adelaidis* Dohrn, *Diplonychus annulatum* (Fabricius), *D. rusticum* (Fabricius) and *Lethocercus indicus* (Lepeletier and Serville) from Bankura and Puruliya districts, while in the present paper 27 species have been encountered from some selected wetlands of these two districts. Biswas *et al.*, (1995a) recorded 10 species of dytiscid coleopterans such as *Laccophilus chinensis inefficiens* Walker, *Hydrovatus fusculus* Sharp, *Hyphoprus asper* Sharp, *Peschetius quadricostaius* (Aube), *Eretes sticticus* (Linnaeus), *Hydaticus* (*Guidnotites*) *fabricii* Macleay, *Hydaticus* (*Guidnotites*) *luczonicus* Aube, *Cybister* (*Meganectes*) *Confusus* Sharp, *Cybister (Meganectes) limbatus* (Fabricius) and *Cybister (Meganectes) ventralis* Sharp from Puruliya district only. In another paper, Biswas *et al.*, (1995c) recorded 2 species of hydrophilid coleopterans *viz.*, *Sphaeridium cameroni* d'Orchymont and *Sternolophus rufipes* (Fabricius) only from Puruliya district.

Chaudhuri and Chattopadhyay (1997) recorded some chironomid species such as *Clinotanypus fuscosiqnetus* (Kieffer), *C. novempunctatus* (Kieffer), *C. vomerus* Chaudhuri and Debnath, *Tanypus bilibatus* (Kieffer), *Eukiefferiella oryza* Chattopadhyay and Chaudhuri, *Chironomus javanus* Kieffer, *Kiefferulus incerdus* Chattopadhyay *et al.*, and *Polypedilum annulatipes* Kieffer from this region. Srivastava (1993) reported 4 species of Ephemeroptera *viz.*, *Cloeon bengalensis*, *Cloeon bicolor*, *Cleon kimminsi*, *Caenis perusilla*, from these two districts. Srivastava and Sinha (1993) recorded 26 species of adult Odonata from these two districts.

***Arachnids* :**

Three species of spiders belonging to three genera and two families, and one undetermined species of water mites were found to be associated/inhabited in wetlands of Bankura and Puruliya districts. These three genera of spider fauna *viz.*, *Lycosa*, *Pardosa* and *Tetragnatha* are reported from this region (Biswas and Biswas, 1992).

***Annelids* :**

Three species of annelids comprising of one species of freshwater oligochaete, *Limnodrilus* sp. and two species of aquatic leeches, viz., *Hellobdella nociva* and *Glossiphonia* sp. have been recorded from wetlands of Bankura and Puruliya districts. However, Mukhopadhyay (1999) reported 12 species of freshwater oligochaetes and Ghosh (1999) recorded 9 species of leeches from these two districts.

***Molluscs* :**

Twelve species of gastropod and 4 species of bivalve molluscs belonging to 9 families have been observed from freshwater wetlands of Bankura and Puruliya districts (Table 8). However, Thakur *et al.*, (1992) recorded 10 species of freshwater gastropod molluscs, *viz., Bellamya bengalensis, Bellamya dissimilis, Digoniostoma pulchella, Gobbia orcula, Thiara tuberculata, Thiara granifera, Lymnaea acuminata, Lymnaea luteola, Indoplanorbis exustus, Gyraulus convexiusculus* and 8 species of bivalve molluscs *viz., Lamellidens corrianus, Lamellidens marginalis, Parreysia corrugata, Parreysia favidens, Parreysia rajahensis, Parreysia sikkimensis, Parreysia caerulea* and *Corbicula striatella* from these two districts. Most of the wetlands of these two districts are dominated by thiarid gastropod species particularly in areas with sandy substratum.

***Zooplankton* :**

Thirtysix species of zooplankton belonging to Copepoda, Ostracoda, Cladocera, Conchostraca and Rotifera have been recorded from freshwater wetlands of Bankura and Puruliya districts (Table 9). Of these, cladocerans are represented by 27 species, ostracods by two species and three species each of copepods and rotifers, while one species *viz., Cyclestheria* sp. belongs to Conchostraca. Of the five different groups of zooplankton, cladocerans represent highest diversity of species inhabiting littoral vegetation. It is mentioned that Sharma (1999) reported 129 species of rotifers from West Bengal of which 28 species *viz., Branchionus angularis, B. budapestiensis, B. falcatus, Euchlanis dilata, Dipleuchlanis propatula, Colurella obtusa, Lepadella acuminata, L. ovalis, L. patella, L. triptera, Lecane aculeata, L. crepida, L. hornemanni, L. luna, L. papuana, L. inopinata, L. lunaris, L. quadridentata, L. sinuata, Cephalodella mucronata, Trichocerca pusilla, Asplanchna brightwelli, Dicranophorus forcipatus, Hexarthra mira, Pompholyx sulcata, Testudinella patina, Filinia longiseta* and *F. opoliensis* were recorded from Bankura district only and no collection was made by him from Puruliya district. Chandrasekhar (2004) reported thirteen species and subspecies of cladocean zooplankton from Adra Lake in Puruliya district, *viz., Diaphanosoma excisum, Moina brachiata, Bosmina longirostris, Macrothrix spinosa, Echinisca triserialis, Chydorus sphaericus, Chydorus parvus, Chydorus barroisi, Alona quadrangularis, Alona rectangula rectangula, Alona rectantula richardi* and *Acropus harpae,* and also stated that Adra Lake water is becoming mesotrophic and can not be directly used as drinking water.

Table 3. : List of birds recorded in wetlands of Bankura and Puruliya districts, West Bengal.

Family and species	Occurrence in wetlands of	
	Bankura district	**Puruliya district**
A. Resident birds (including resident migratory birds)		
Family PODICEPETIDAE		
Tachybaptus ruficollis (Pallas)	(3, 5–9, 11)	(16–19)
Family PHALACROCORACIDAE		
Anhinga rufa (Daudin)	(3, 5, 7, 9)	(16, 18)
Phalacrocorax carbo (Linnaeus)	(1, 3, 6)	(–)
Phalacrocorax fusicollis Stephens	(3, 11)	(18)
Phalacrocorax niger (Vieillot)	(1–11)	(12–19)
Family ARDEIDAE		
Ardea alba J.E. Gray	(1, 3, 6, 10)	(16, 18)
Ardea cinerea Linnaeus	(5, 6)	(–)
Ardeola grayii (Sykes)	(1–10)	(12–19)
Ardea purpurea Linnaeus	(3, 5–7)	(16, 18, 19)
Bubulcus ibis (Boddaert)	(1–11)	(12–19)
Egretta garzetta (Linnaeus)	(1–9)	(12, 14, 16, 18, 19)
Egretta intermedia (Wagler)	(1–11)	(12–19)
Ixobrychus cinnamomeus (Gmelin)	(1, 3, 5, 6)	(12, 18, 19)
Family CICONIIDAE		
Anastomus oscitans (Boddaert)	(3, 5, 6)	(16, 17)
Family RALLIDAE		
Amaurornis phoenicurus (Pennant)	(1–6, 9, 10)	(12, 13, 18, 19)
Fulica atra Linnaeus	(1, 6, 11)	(16, 18, 19)
Gallicrex cinerea (Gmelin)	(3, 5)	(18, 19)
Gallinula chloropus (Linnaeus)	(2, 3, 5, 7)	(18, 19)
Porphyrio porphyrio (Linnaeus)	(1–3, 5)	(12, 18, 19)
Family JACANIDAE		
Hydrophasianus chirurgus (Scopoli)	(2, 3, 5)	(12)
Metapidius indicus (Latham)	(1–3, 5)	(12, 16–19)

Table 3. : *(Cont'd.)*.

Family and species	Occurrence in wetlands of	
	Bankura district	**Puruliya district**
Family ROSTRATULIDAE		
Rostratula bengalensis (Linnaeus)	(1, 3, 5)	(16, 18)
Family CHARADRIIDAE		
Hoplopterus indicus (Boddaert)	(5)	(–)
Tringa nebularia (Gunnerus)	(–)	(16, 18, 19)
Vanellus malabaricus (Boddaert)	(–)	(16, 17)
Family ALCEDINIDAE		
Alcedo atthis (Linnaeus)	(1–3, 5–7, 9)	(13, 14, 18,19)
Ceryle rudis (Linnaeus)	(1, 3, 5, 7)	(13, 16, 18)
Halcyon smyrnensis (Linnaeus)	(1–3, 5–7)	(16, 18, 19)
Pelargopsis capensis (Linnaeus)	(1)	(16)
Family ANATIDAE		
Dendrocygna javanica (Horsfield) (R)	(3, 5, 6, 11)	(16–19)
Nettapus coromandelianus (Gmelin) (R)	(1–7, 11)	(12–14, 16–19)
Sarkidiornis melanotos (Pennant) (R)	(–)	(19)
B. Migratory birds		
Family ANATIDAE		
Anas acuta Linnaeus (M)	(–)	(16, 18, 19)
Anas crecca Linnaeus (M)	(–)	(16–19)
Anas penelope Linnaeus (M)	(–)	(18, 19)
Anas querquedula (M)	(–)	(16, 18)
Anser anser (Linnaeus) (M)	(–)	(16)
Aythya ferina (Linnaeus) (M)	(–)	(16, 18)
Aythya fuligula (Linnaeus) (M)	(–)	(17)
Netta rufina (Pallas) (M)	(–)	(16, 18, 19)

Table 4. : Mid winter count data of waterbirds in some selected wetlands of Bankura and Puruliya districts, West Bengal.

SL. No.	English name	Scientific name	Number of birds counted in wetlands of							
			Bankura district				Puruliya district			
			JB	KB	LB	KJB	SBP	SBA	RB	IB
		A. WATERFOWL								
		Order PODICIPEDIFORMES								
		Family PODICIPEDIDAE								
1.	Little Grebe,	*Tachybaptus ruficollis* (R)	25	7	31	16	86	48	28	49
		Order PELECANIFORMES								
		Family PHALACROCORACIDAE								
2.	Cormorant,	*Phalacrocorax carbo* (R)	1	–	–	2	–	–	–	–
3.	Indian Shag,	*Phalacrocorax fuscicollis* (RM)	1	–	–	–	–	2	–	–
4.	Little Cornorant,	*Phalacrocorax niger* (RM)	21	15	18	10	12	32	2	60
5.	Darter,	*Anhinga rufa* (RM)	2	1	1	–	–	1	–	1
		Order CICONIFORMES								
		Family ARDEIDAE								
6.	Grey Heron,	*Ardea cinerea* (RM)	–	1	–	–	–	–	–	–
7.	Purple Heron,	*Ardea purpurea* (RM)	3	4	–	2	1	5	–	6
8.	Pond Heron,	*Ardeola grayi* (R)	12	6	2	5	8	3	2	5
9.	Cattle Egert,	*Bubulcus ibis* (RM)	18	3	6	2	8	4	9	3
10.	Larger Egert,	*Ardea alba* (RM)	6	2	–	–	–	2	–	3
11.	Smaller Egret,	*Egretta intermedia* (RM)	4	2	2	1	–	–	5	2
12.	Little Egret,	*Egretta garzetta* (R)	3	9	5	1	5	16	–	11
13.	Chestnut Bittern,	*Ixobrychus cinnamomeus* (RM)	2	1	–	1	18	3	–	–
		Family ANATIDAE								
14.	Greylag Geese,	*Anser anser* (M)	–	–	–	–	–	–	–	4
15.	Pintail,	*Anas acuta* (M)	–	–	–	–	89	26	–	7
16.	Common Teal,	*Anas crecca* (M)	–	–	–	–	74	85	10	6
17.	Gadwall,	*Anas strepera* (M)	–	–	–	–	–	11	–	6

Table 4. : *(Cont'd.).*

SL. No.	English name	Scientific name	Number of birds counted in wetlands of							
			Bankura district				Puruliya district			
			JB	KB	LB	KJB	SBP	SBA	RB	IB
18.	Wigeon,	*Anas penelope* (M)	–	–	–	–	53	15	–	–
19.	Garganey,	*Anas querquedula* (M)	–	–	–	–	10	7	–	4
20.	Common Pochard,	*Aythya ferina* (M)	–	–	–	–	–	14	–	8
21.	Tufted Pochard,	*Aythya fuligula* (M)	–	–	–	–	–	–	24	–
22.	Redcrested Pochard,	*Netta rufina* (M)	–	–	–	–	55	322*	–	21
23.	Cotton Teal,	*Nettapus coromandelianus* (R)	50	27	15	17	69	71	15	13
24.	Lesser Whistling Teal,	*Dendrocygna javanica* (R)	1520*	255	–	55	2500*	3504*	67	71
25.	Comb Duck,	*Sarkidiornis melanotos* (R)	–	–	–	–	47	–	–	–
	Order GRUIFORMES									
	Family RALLIDAE									
26.	Whitebreasted Waterhen,	*Amaurornis phoenicurus* (R)	5	8	–	3	4	2	–	–
27.	Indian Mooreehen,	*Gallinula chloropus* (RM)	9	8	11	–	103	22	–	–
28.	Purple Moorehen,	*Porphyrio porphyrio* (R)	16	11	–	–	72	14	–	–
29.	Coot,	*Fulica atra* (RM)	–	–	–	4	7	115	–	10
30.	Watercock,	*Galicrex cinerea* (R)	4	7	–	–	–	–	–	–
	Order CHADRIIFORMES									
	Family JACANIDAE									
31.	Pheasant-tailed Jacana,	*Hydrophasianus chirurgus* (R)	2	2	–	–	–	–	–	–
32.	Bronzewinged Jacana,	*Metapidius indicus* (R)	75	24	–	–	24	13	6	2
	B. WADERS									
	Order CHARADRIIFORMES									
	Family CHARADRIIDAE									
33.	Yellow Wattled Lapwing,	*Venellus malabaricus* (R)	–	–	–	–	–	–	1	1
34.	Green Shank,	*Tringa nebularia* (M)	–	–	–	–	2	12	–	4

Note : R = Resident, RM = Resident migrant < M = Migrant, * = Not representing total count, JB = Jamuna bundh, KB = Krishna bundh, LB = Lal bundh, KJB = Kulaijurir bundh, SBP = Saheb bundh, Puruliya, SBA = Saheb bundh, Adra, RB = Rani bundh, IB = Indra beel.

Table 5. : List of reptilian species occurring in wetlands of Bankura and Puruliya districts.

Family and species	Occurrence in wetlands of	
	Bankura district	**Puruliya district**
Family TRIONYCHIDAE		
Lissemys punctata (Bonaterre) Indian Flap-shelled Turtle	(1–3, 5–7)	(14, 17–19)
Family VARANIDAE		
Varanus bengalensis (Daudin) Bengal Monitor	(2, 3)	(18)
Family COLUBRIDAE		
Enhydris enhydris (Schneider) Smooth Water Snake	(1–10)	(16–19)
Xenochrophis piscator Checkered Keelback	(1–11)	(12–19)

Table 6. : List of amphibian species occurring in wetlands of Bankura and Puruliya districts.

Family and species	Occurrence in wetlands of	
	Bankura district	**Puruliya district**
Family BUFONIDAE		
Bufo melanostictus Schneider Common Indian Toad	(1–11)	(14, 16–19)
Bufo stomaticus Lutken Marbled Toad	(2, 5)	(–)
Family MICROHYLIDAE		
Microhyla ornata (Dumeril and Bibron) Ornate Frog	(1, 5, 10)	(14, 18, 19)
Kaloula pulchra Gray Painted Frog	(2)	(14)
Family RANIDAE		
Rana crassa Jerdon Jerdon's Bull Frog	(6)	(–)
Euphlyctis cyanophlyctis Schneider Skipping Frog	(1–11)	(12–19)
Limnonectes limnocharis Boie Cricket Frog	(1–9)	(12, 16–19)
Rana tigerina Daudin Indian Bull Frog	(1–8)	(12–19)

Table 7. : List of fishes occurring in wetlands of Bankura and Puruliya districts.

Family and species	Occurrence in wetlands of	
	Bankura district	**Puruliya district**
Family NOTOPTERIDAE		
Notopterus notopterus (Pallas)	(1, 2, 5–9)	(14–19)
Family CYPRINIDAE		
Salmostoma bacaila (Hamilton)	(1, 3, 5–11)	(14, 16–19)
Hypophthalamichthys molitrix (Valenciennes)	(1, 3–9)	(14, 17–19)
Amblypharyngodon mola (Hamilton)	(1–11)	(12–19)
Esomus danrica (Hamilton)	(1–11)	(12–19)
Rasbora daniconius (Hamilton)	(1–11)	(12–19)
Catla catla (Hamilton)	(1, 3, 5–11)	(13–19)
Cirrhinus mrigala (Hamilton)	(1, 3, 5–11)	(13–19)
Cyprinus carpio Linnaeus	(1, 3, 5–9)	(14, 16–19)
Ctenopharyngodon idella (Valenciennes)	(1, 3, 5–9)	(14, 16–19)
Labeo bata (Hamilton)	(1, 3, 5–9)	(14, 16–19)
Labeo calbasu (Hamilton)	(1, 3, 5–11)	(13–19)
Labio rohita (Hamilton)	(1, 3, 5–11)	(13–19)
Puntius chola (Hamilton)	(1–7)	(12, 18, 19)
Puntius conchonius (Hamilton)	(1–7)	(12, 18, 19)
Puntius phutunio (Hamilton)	(1–7)	(12, 18, 19)
Puntius sophore (Hamilton)	(1, 3, 5–9)	(14, 17–19)
Puntius ticto (Hamilton)	(1–11)	(12–19)
Family COBITIDAE		
Lepidocephalus guntea (Hamilton)	(1–3, 5–10)	(15–19)
Family BAGRIDAE		
Mystus vittatus (Bloch)	(1–9)	(14–19)
Mystus tengara (Hamilton)	(1, 3, 5)	(14, 16–19)
Family SILURIDAE		
Ompak bimaculatus (Bloch)	(1, 3, 11)	(16)
Wallago attu (Schneider)	(2, 5, 6)	(12, 15, 16, 19, 19)
Family CLARIIDAE		
Clarias batrachus (Linnaeus)	(1–11)	(12–19)

Table 7. : *(Cont'd.).*

Family and species	Occurrence in wetlands of	
	Bankura district	**Puruliya district**
Family HETEROPNEUSTIDAE		
Heteropneustes fossilis (Bloch)	(1–11)	(12–19)
Family CYPRINODONTIDAE		
Aplocheilus panchax (Hamilton)	(1–11)	(12–19)
Family CHANNIDAE		
Channa striatus (Bloch)	(1–11)	(12–19)
Channa orientalis (Schneider)	(1–11)	(12–19)
Channa punctatus (Bloch)	(1–11)	(12–19)
Family SYMBRANCHIDAE		
Monopterus cuchia (Hamilton)	(1–11)	(12–19)
Family CHANDIDAE		
Chanda nama Hamilton	(1, 3, 5–11)	(12–19)
Chanda ranga Hamiton	(1–11)	(12–19)
Family GOBIIDAE		
Glossogobius giuris (Hamilton)	(1–11)	(12–19)
Oligolepis acutipennis (C. V.)	(1, 3, 5–11)	(14–19)
Family NANDIDAE		
Badis badis (Hamilton)	(1–11)	(12–19)
Nandus nandus (Hamilton)	(1–11)	(12–19)
Family ANABANTIDAE		
Anabas testudineus (Bloch)	(1–11)	(12–19)
Family CICHLIDAE		
Oreochromis mossambica (Peters)	(1, 3, 5–9)	(14, 18, 19)
Family BELONTIDAE		
Colisa fasciatus (Schneider)	(1–11)	(12–19)
Family MASTACEMBELIDAE		
Macronathus aculeatus (Bloch)	(1–11)	(12–19)
Mastacembelus armatus (Lacepede)	(1, 3, 5–9)	(14, 16–19)
Mastacembelus pancalus (Hamilton)	(1–11)	(12–19)

Table 8. : List of macroinvertebrates recorded in wetlands of Bankura and Puruliya districts, West Bengal.

Family and species	Occurrence in wetlands of	
	Barıkura district	**Puruliya district**
Macrocrustaceans (Decapoda)		
Family PALAEMONIDAE		
Macrobrachium rosenbergii (deMan)	(1, 5, 11)	(16, 18, 19)
Macrobrachium lamarrei (H.M. Edwards)	(1–3, 5, 6, 11)	(16, 18, 19)
Macrobrachium sp.	(1–3, 5–11)	(13, 14, 16–19)
Palaemon styliferus Milne Edwards	(1–3, 5, 6, 11)	(14, 16, 18, 19)
Family ATYIDAE		
Caridina sp.	(1–11)	(12–19)
Family POTAMONIDAE		
Sartoriana spinigera Wood Masoon	(1, 5, 6)	(18, 19)
Paratelphusa hydrodromus Herbst	(1, 3–6)	(13, 17–19)
Insects		
INSECTA HEMIPTERA		
Family BELOSTOMIDAE		
Diplonychus rusticum (Fabricius)	(2, 11)	(–)
Diplonychus annulatus (Fabricius)	(1–11)	(12, 16–19)
Diplonychus sp.	(1, 2, 4, 10)	(12, 14, 15, 18, 19)
Lethocercus indicus (Lep. & Serv.)	(2–4)	(12)
Family NEPIDAE		
Laccotrephes elongatus Montadon	(1, 6)	(15, 19)
Laccotrephes sp.	(1)	(12, 13, 16)
Ranatra sordidula Dohrn	(6, 10)	(18, 19)
Ranatra filiformis Fabricius	(1–5, 9, 11)	(12, 17–19)
Ranatra varipes Stal	(6)	(18)
Ranatra sp.	(1–4, 7–11)	(12–16, 19)
Family CORIXIDAE		
Corixa spp. (2 species)	(1, 2, 10)	(12, 17)
Micronecta merope	(2)	(–)
Micronecta sp.	(1–4, 8)	(12, 16–19)
Family NOTONECTIDAE		
Anisops breddini Krikaldy	(1, 6, 8, 10)	(13, 14, 17)
Anisops barbata Krikaldy	(1, 6)	(–)
Anisops sp.	(1–11)	(12–19)

Table 8. : *(Cont'd.).*

Family and species	Occurrence in wetlands of	
	Bankura district	**Puruliya district**
Family MESOVELIDAE		
Mesovelia vittigera Horvatch	(2, 11)	(–)
Mesovelia sp.	(2–4)	(12)
Family HYDROMETRIDAE		
Hydrometra greeni Kirkaldy	(1, 2, 4, 10)	(17)
Family GERRIDAE		
Gerris spinolae Leth. & Surv.	(–)	(14)
Gerris sp.	(1–3, 5–11)	(12–19)
Limnogonus parvulus (Stal)	(6)	(14)
Limnogonus sp.	(3, 9)	(15, 16)
Rhagadotarsus kraepelini Breddin	(2)	(14)
Family PLEIDAE		
Plea sp.	(1, 2, 4, 6, 9)	(19)
Family VELIIDAE		
Microvelia sp.	(2, 9)	(12, 17)
INSECTA COLEOPTERA		
Family DYTISCIDAE		
Canthydrus laetabilis (Walker)	(1–10)	(12, 16, 18, 19)
Canthydrus morsbachi (Wel.)	(2–4, 10)	(16, 19)
Canthydrus sp.	(1, 4, 9)	(12, 17, 18)
Cybister limbatus (Fabricius)	(4, 6)	(12)
Cybister sp.	(2, 4)	(19)
Hydrovatus sp.	(3, 8, 9)	(12)
Laccophilus anticatus Sharp	(1, 3, 5, 6)	(17)
Laccophilus sp.	(1–6, 9)	(19)
Hydrocoptus subvittulus Motschulsky	(1, 2, 4)	(18, 19)
Hydrocoptus sp.	(2–4, 7)	(12)
Family HYDROPHILIDAE		
Regimbartia attenuata Fabricius	(1–3, 10)	(12, 19)
Sternolophus rufipes Fabricius	(2–5, 8, 10)	(19)
Berosus indicus Motsculsky	(2, 7, 9)	(17)
Berosus sp.	(1–4, 8, 10)	(12)
Hydrophilus sp.	(1, 3–5)	(–)
Helochares sp.	(2, 4, 6, 9)	(18)
Amphiops sp.	(2)	(16, 18, 19)
Globeria sp.	(2–4)	(16, 18)

Table 8. : *(Cont'd.).*

Family and species	Occurrence in wetlands of	
	Bankura district	**Puruliya district**
Family GYRINIDAE		
Dineutes sp.	(1)	(–)
Family CURCULIONIDAE		
Bagous sp.	(1)	(–)
INSECTA ODONATA		
Family LIBELLULIDAE		
Urothemis sp.(1–3, 5, 10)	(12, 16, 18)	
Brachythemis sp.	(1–4, 9)	(16–19)
Family COENAGRIONIDAE		
Enallagma sp.	(1–4, 8–10)	(16–19)
INSECTA EPHEMEROPTERA		
Family BAETIDAE		
Cloeon sp.	(6)	(13, 16, 18)
INSECTA DIPTERA		
Family CULICIDAE		
Mosquito larvae	(1–5, 7)	(12, 14, 18, 19)
Family CHIRONOMIDAE		
Chironomid larvae	(1–4, 9, 10)	(12, 16–19)
INSECTA ORTHOPTERA		
Family GRYLLOTALPIDAE		
Gryllotalpa africana Beauvois	(1, 3, 4)	(16)
Arachnids		
Family LYCOSIDAE		
Lycosa sp.	(2, 10)	(–)
Pardosa sp.	(2, 4)	(12)
Family TETRAGNATHIDAE		
Tetragnatha sp.	(2, 4, 9)	(17)
Order ACARINA		
Water mites	(1–4, 8)	(12, 18)
Annelids		
Family TUBIFICIDAE		
Limnodrilus sp.	(1–4)	(12, 17, 18)

Table 8. : *(Cont'd.).*

Family and species	Occurrence in wetlands of	
	Bankura district	**Puruliya district**
Family GLOSSIPHONIDAE		
Glossiphonia sp.	(2, 3, 5)	(15, 17)
Family RHYNCHOBDELLIDAE		
Hellobdela nociva Harding	(5, 10)	(–)
Molluscs		
MOLLUSCA GASTROPODA		
Family THIARIDAE		
Thiara tuberculata (Muller)	(1–3, 5, 6, 11)	(14, 16, 18, 19)
Thiara lineata (Gray)	(6, 11, 16)	(16)
Family VIVIPARIDAE		
Bellamya bengalensis (Lamarck)	(1–10)	(12, 14–19)
Bellamya dissimilis (Mueller)	(5, 6)	(15, 17, 18)
Family PILIDAE		
Pila globosa (Swainson)	(1–10)	(12, 13, 16–18)
Family BITHYNIDAE		
Digonistoma pulchella (Benson)	(1–10)	(13–19)
Gabbia orcula (Frauenfeld)	(3, 6)	(16, 18)
Family PLANORBIDAE		
Indoplanorbis exustus (Deshayes)	(1–10)	(12–19)
Gyraulus convexiusculus (Hutton)	(1–11)	(12, 14, 16–19)
Gyraulus labiatus (Benson)	(3, 6)	(16, 18)
Family LYMNAEIDAE		
Lymnaea acuminata Lamarck	(1–10)	(12–19)
Lymnaea luteola Lamarck	(1–5, 7–9)	(12, 17–19)
MOLLUSCA BIVALVIA		
Family UNIONIDAE		
Lamellidens corrianus (Lea)	(3, 6)	(16)
Lamellidens marginalis (Lamarck)	(5, 6, 9)	(12)
Family AMBLENIDAE		
Parreysia sp.	(6)	(14)
Family CORBICULIDAE		
Corbicula striatella Deshayes	(1, 5, 6)	(–)

Table 9. : List of zooplankton species occurring in wetlands of Bankura and Puruliya districts, West Bengal.

Family and species	Occurrence in wetlands of	
	Barıkura district	**Puruliya district**
CRUSTACEA : COPEPODA		
Family DIPTOMIDAE		
Diaptomus sp.	1–5, 7–9	12, 14, 18, 19
Heliodiaptomus sp.	1–5, 7–9	12, 14, 15, 18, 19
Family CYCLOPIDAE		
Mesocyclops sp.	1–5, 7–9	12, 14, 15, 18, 19
CRUSTACEA : OSTRACODA		
Family CYPRIDAE		
Cypris sp.	1–5, 7–9	12, 15, 18, 19
Stenocypris sp.	3, 4	12, 18
CRUSTACEA : CLADOCERA		
Family SIDIDAE		
Diaphanosoma excisum Sars	1–4, 8, 9	12, 15, 18, 19
Diaphanosoma sarsi Richard	1, 3–5, 7, 9	12, 14, 15, 19
Diaphanosoma sp.	1–4, 5, 7, 9	12, 18, 19
Latonopsis australis Sars	2–5, 7, 8	12, 18, 19
Pseudosida bidentata Herrick	2–4, 8	12, 14, 18, 19
Family DAPHNIIDAE		
Ceriodaphnia cornuta Sars	1, 3–5, 7, 9	12, 14, 18, 19
Simocephalus exspinosus (Koch)	1, 3–5, 7, 9	12, 18, 19
Simocephalus vetulus (O.F. Muller)	1, 9	12, 18
Simocephalus sp.	2–4, 8	14, 15, 19
Family MOINIDAE		
Moina sp.	2–5, 7, 8	14, 15
Family MACROTHRICIDAE		
Macrothrix spinosa King	1, 5, 7, 9	12, 14, 18
Macrothrix triserialis (Brady)	3, 4	12, 18
Macrothrix sp.	3, 4	12, 18
Ilyocryptus sp.	2, 8	14
Family CHYDORIDAE		
Alona costata Sars		2, 8 14
Alona davidi Richard	1, 3, 4, 9	12, 18, 19
Alona karua (King)	1, 3–5, 7, 9	14, 15
Alona pulchella Sars	1, 3, 4, 9	12, 14, 18, 19

Table 9. : *(Cont'd.).*

Family and species	Occurrence in wetlands of	
	Bankura district	**Puruliya district**
Alona rectangula Sars	2, 5, 7, 8	12, 18, 19
Alona sp.	3, 4	12, 18
Alonella excisa (Fischer)	1, 9	15
Chydorus barroisi (Richard)	2–4, 8	15
Chydorus reticulatus Daday	1, 3, 4, 9	14, 15
Chydorus sphaericus (O.F. Muller)	1, 3–5, 7, 9	12, 15, 18, 19
Dunhevedia crassa King	3, 4	19
Kurzia sp.	1, 3, 4, 9	12, 14, 15, 18
Pleuroxus similis Vavra	1, 9	12, 18
CRUSTACEA : CONCHOSTRACA		
Family CYCLESTHERIDAE		
Cyclestheria sp.	3, 4	12, 18, 19
ROTIFERA		
Family ASPLANCHIDAE		
Asplanchna sp.	1, 3–5, 7, 9	12, 14, 18, 19
Family BRACHIONIDAE		
Brachionus sp.	1, 2, 5, 7–9	12, 14, 18
Family FILINIDAE		
Filinia sp.	1–4, 8, 9	12, 15, 18, 19
Total (= 36 species)	**36**	**36**

CLUSTER ANALYSIS

Since the present paper is the fifth and probably the last instalment of the series on wetland faunal resources of West Bengal, it is felt to compare the degree of similarities amongst all these wetlands of different eco-regions using cluster analysis programme incorporating data from the other four papers in the series. For this purpose Sorensen's (1948) index of similarity is herein used as a basis of quantifying similarities between the faunal diversities of wetlands of different eco-regions. The index of similarity or quotient of similarity (Qs) between two samples as proposed by Sorensen (1948) is calculated as follows :

$$Q = \frac{2c}{a+b}$$

where, a = number of species in sample one,

b = number of species in sample two,

c = number of species common to both.

It measures the similarity in the species composition of the sample and the value of Qs ranges between 0 and 1. The value zero indicates complete dissimilarity, whereas the value 1 denotes maximum similarity between the samples (or faunal composition). The scores are multiplied by 100 to represent a percentage scale. Mountford's (1962) technique was followed to classify the percentage similarity values and for construction of dendrogram.

The faunal similarity index values between pairs of sampling sites (or eco-regions), showing the extent of affinities between the samples, have been analysed and presented in the form of dendrogram (Fig. 3). The dendrogram shows one prominent cluster (A) formed between the wetlands of Rarh plain of Bankura district (RP) with highland and plateau of Puruliya district (HP)

Faunal similarity index between pairs of sampling sites

	GP	DH	TD	RP	HP
CP	0.53	0.22	0.39	0.51	0.58
GP		0.23	0.44	0.54	0.54
DH			0.62	0.36	0.31
TD				0.60	0.52
RP					0.93

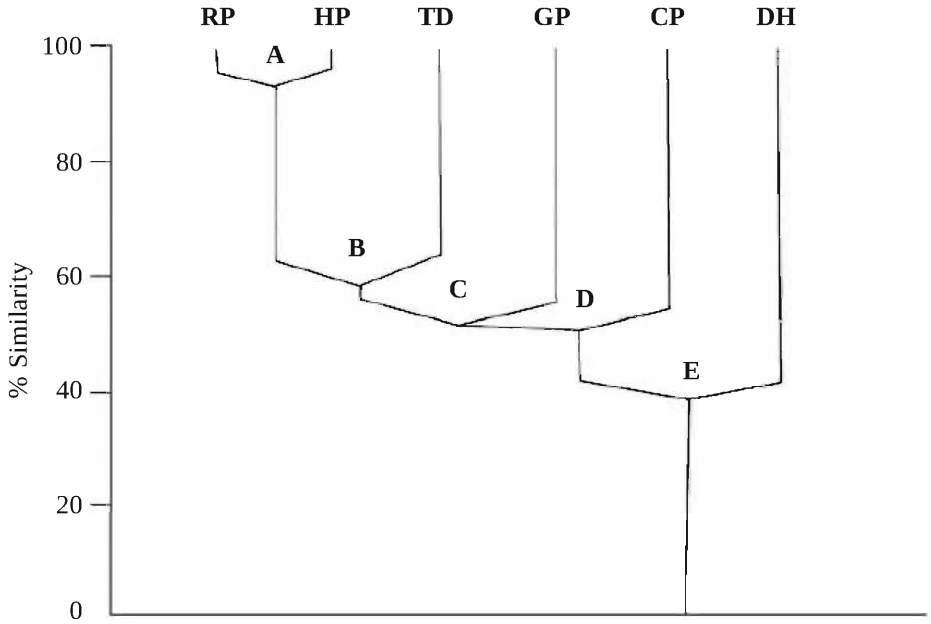

Fig. 3. : Dendrogram showing percentage similarity values of the six selected eco-regions of West Bengal.

(**Note :** CP = Coastal plain of North and South 24-Parganas districts; GP = Gangetic plain of Haora and Hugli districts; DH = Darjiling Himalaya of Darjiling district; TD = Terai Duars of Jalpaiguri district; RP = Rarh plain of Bankura district and HP = Highland and plateau of Puruliya district)

representing greatest similarity (93%) probably for their close proximity and similar climatic conditions and habitat types, followed by three intermediate clusters viz., cluster (B) between faunal elements of cluster A with that from wetlands of Terai Duars of Jalpaiguri district (TD); cluster (C) between cluster (B) with wetlands of Gangetic plain of Haora and Hugli districts (GP) and cluster (D) between cluster (C) with wetlands of Coastal plain of North and South 24-Parganas districts (CP), showing similarities of 58%, 51% and 50% respectively. The least similarity of 38% is revealed from cluster (E), which is formed between cluster D with wetlands of Darjiling Himalayas (DH) of Darjiling district. This may be due to cold climatic condition and dearth of diversified wetlands of this part of West Bengal.

UTILIZATION OF THE WETLANDS

The wetlands of Bankura and Puruliya districts are utilized in various ways. The worthwhile uses of eight selected wetlands of these two districts, four wetlands from each district, are shown in Table 10. Most of the wetlands of these two districts are used for irrigation purposes. Some important wetlands are excavated during preindependence period as reservoir of water. Both the Saheb bundhs of Adra and Puruliya town of Puruliya district have high recreational value. All these eight wetlands of these two districts (Table 10) are important waterfowl habitats, while all the four wetlands of Puruliya district are important migratory bird habitats as well.

Table 10. : Utilization scenario in important wetlands of Bankura and Puruliya districts, West Bengal.

	Name of district	**Bankura district**				**Puruliya district**			
	Name of wetland	**JB**	**KB**	**LB**	**KJB**	**SBP**	**SBA**	**RB**	**IB**
1.	Reservoir of water a) Domestic use	L	L	M	M	H	M	L	M
	b) Irrigation/agricultural use	M	M	L	H	M	H	H	H
2.	Waterfowl habitat	H	M	M	M	H	H	M	H
3.	Fisheries	L	L	M	M	M	M	L	M
4.	Tourism	L	L	L	L	H	H	L	L
5.	Nature conservation	M	M	M	M	H	H	M	M
6.	Recreation	M	M	M	M	H	H	L	L
7.	Flood control	H	M	M	H	M	M	M	H

Abbreviations :

1. Name of wetland : JB = Jamuna Bundh; KB = Krishna Bundh; LB = Lal Bundh; KJB = Kulaijurir Bundh; SBP = Saheb Bundh, Puruliya; SBA = Saheb Bundh, Adra; RB = Rani Bundh; IB = Indra Beel.
2. Wetland use value : H = High; M = Medium; L = Low.

DISCUSSION

The faunal diversity of the freshwater wetlands surveyed from Bankura and Puruliya districts represents a total of 215 species of 12 major groups. A comparison of the freshwater wetlands (Table 11) representing the coastal plains of North and South 24-Parganas districts, Gangetic plains of Haora and Hugli districts, and Hill and Terai Duars regions of Darjiling and Jalpaiguri districts reveals that these regions were inhabited by 235 species (Nandi *et al.*, 1993), 286 species (Nandi *et al.*, 1999) and 207 species (Nandi *et al.*, 2005) respectively. Among the two districts, wetlands of both Bankura and Puruliya districts are inhabited by 202 species, though representing variance in diversity of different groups. The variation in diversity of species among the two districts and also among the regions may be due to habitat ecology and water quality of wetlands and also due climatic condition of this region.

Table 11. : Faunal diversity (major groups) of freshwater wetlands of West Bengal representing coastal plains, Gangetic plains, Hills and Terai Duars as well as Rarh plains and highlands and plateaus.

Major groups	Faunal diversity of					
	Coastal plains	Gangetic plains	Hills and Terai Duars	Rarh plains (Bankura)	Highland and plateaus (Puruliya)	Total wet-land fauna of Bankura and Puru-liya district
Mammals	3	1	6	0	0	0
Birds	67	54	20	29	38	41
Reptiles	6	6	6	4	4	4
Amphibians	6	6	7	8	6	8
Fishes	56	48	54	42	42	42
Decapod crustaceans	7	7	7	7	7	7
Hemipterans	20	27	30	26	23	27
Coleopterans	24	35	11	20	17	20
Miscellaneous insects	–	–	12	7	7	7
Arachnids	8	6	6	4	3	4
Annelids	9	6	3	3	2	3
Molluscs	12	15	13	16	15	16
Zooplankton	17	55	45	36	36	36
Total	**235**	**286**	**220**	**202**	**202**	**215**

Habitat ecology of eight important wetlands of these two districts is depicted in Table 12. While surveying mid-winter water bird population of these two districts, Nandi *et al.*, (2004) suggested that the richness and diversity of waterbirds perhaps dependent on the size, availability of food and safe refuge of the wetlands. The richness and faunal diversity particularly macroinvertebrate and zooplankton species appear to be dependent on the habitat condition and macrophyte density and diversity of the wetlands. However, in general, the undulating highlands and plateau regions of Rarh plain of Bankura and Puruliya districts are faunistically very little explored and there is scope for further exploration.

Table 12. : Habitat ecology of eight important wetlands of Bankura and Puruliya districts, West Bengal.

Name of district	**Bankura district**				**Puruliya district**			
Name of wetland	**JB**	**KB**	**LB**	**KJB**	**SBP**	**SBA**	**RB**	**IB**
Nearest town/village	Bish-nupur	Bish-nupur	Bish-nupur	Ban-kadah	Puru-liya	Adra	Joypur	Indrabil
Locality type	Semi-Urban	Rural	Semi-Urban	Rural	Urban	Semi-Urban	Rural	Rural
Approximate area (ha)	25	45	12	18	30	50	15	80
Vegetation cover	70%	60%	50%	40%	80%	70%	50%	60%
Wetland use	M	L	M	H	H	H	M	M
Protection	M	L	M	L	H	H	Nil	L
Poaching	Rare	Rare	Rare	Rare	Nil	Nil	Low	High

Abbreviations :
1. Name of wetland : JB = Jamuna Bundh; KB = Krishna Bundh; LB = Lal Bundh; KJB = Kulaijurir Bundh; SBP = Saheb Bundh, Puruliya; SBA = Saheb Bundh, Adra; RB = Rani Bundh; IB = Indra Beel.
2. Wetland use value : H = High; M = Medium; L = Low.

SUMMARY

1. A faunal inventory of 19 freshwater wetlands comprising of 11 wetlands from Bankura district and 8 from Puruliya district dealing with a total of 215 species of wetland fauna belonging to 95 species of vertebrates and 84 species of macroinvertebrates and 36 species of zooplankton is communicated.
2. The vertebrate fauna comprises of 41, 4, 8 and 42 species of birds, reptiles, amphibians and fishes respectively, while invertebrate elements include 84 species of macroinvertibrates and 36 species of zooplankton.
3. Nine species of migratory anatid ducks are recorded from wetlands Puruliya district only.
4. The diversity of wetland fauna is discussed with reference to wetlands in different eco-regions of West Bengal.

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