MedCrave
Step into the World of Research

Journal of Aquaculture & Marine Biology

Review Article

Open Access

Aquaculturable fishery resources in wetlands of West Bengal

Abstract

The State of West Bengal supports a wide variety of wetlands covering freshwater, brackish water, and coastal wetlands, both natural and manmade wetlands. The Directorate of Fisheries, Government of West Bengal estimated at 3,111,92.52 ha which include river, canal, *beel/ baor*, and reservoir. A list of a total of 61 cultivated and culturable species occurring in freshwater and brackish water wetlands of West Bengal is provided. Another list of 21 crustacean fishery species occurring in coastal wetlands is added in this communication along with their local names, size, occurrence, and utilization from coastal areas of West Bengal. Export of a freshwater prawn species, *Macrobrachium rosenbergi* (De Man) and a brackish water prawn species, *Penaeus monodon* (Fabricius) are highlighted. It is suggested that relevant Government agencies, local administration, educational institutions, individual experts and NGOs need to act closely on various approaches and issues of mutual interest towards aquacultural development and better management of larger wetlands of West Bengal.

Keywords: impounded water areas, freshwater resources, fishery resources, cultivable species, introduced species, export items, West Bengal

Volume 12 Issue 1 - 2023

N C Nandi
Social Environmental and Biological Association, India

Correspondence: N. C. Nandi, Social Environmental and Biological Association, Kolkata, India,
Email nepalchandra.nandi@gmail.com

Received: March 24, 2023 | **Published:** April 03, 2023

Introduction

Wetlands assume an extremely wide range of forms and include a wide spectrum of habitats. To layman wetlands are lands where people get their feet wet. In fact, wetlands are diverse assemblage of wet and watery habitats which share several common features of both aquatic and terrestrial ecosystems. Wetlands in the State of West Bengal in India comprise a unique assemblage of different and diversified types of fresh, brackish, and coastal wetlands. These wetlands are distributed under three major landforms, *viz*., Mountains and Hills, Highlands and Plateau, and Plains. These landforms can be fairly divided into eight physiographical units, such as, i) The Darjiling Himalaya, ii) The Terai Duars, iii) North Bengal Plains, iv) Western Rolling Uplands and Plateau, v) Rarh Plain, vi) The Ganga Delta Plain, vii) The Sundarban, and viii) The Sandy Coastal Plain. The geology, ecology, soil characteristics, climate, rainfall, drainage, natural vegetation, and human interferences interplay in defining diversity, distribution, and richness of faunal diversity including economically significant aquacultural fishery resources in this state of West Bengal.[1–12]

Distribution of wetlands

West Bengal is in the geographical coordinates at 22° 32′ north latitude and 88° 44′ E longitude in India. According to the Directorate of Fisheries, Government of West Bengal, culturable, semi-derelict and derelict impounded water area encompasses a total of 295464.80 ha. The district-wise distribution of these waterbodies is shown in Table 1.

Freshwater wetlands

The district-wise distribution of freshwater resources is presented in Figures 1 & 2 and Table 2. It is evident that highest and lowest running water resource is in the districts of Murshidabad (36,283.23 ha.) and Haora (1007.36 ha.) respectively while highest and lowest standing water resource is in North and South 24-Parganas (26,815.13 ha.) and Medinipur (404.1 ha.) respectively. The table, however, does not reflect figure for Kolkata but it is estimated that there are about 220.00 ha. of water bodies which have been frequently surveyed by researchers of the Zoological Survey of India, universities, and other institutes.

Brackish water wetlands

According to Central Marine Fisheries research Institute, Cochin, brackish water wetlands of India extend over 1.19 million ha of which 0.88 million ha are under culture distributed within ten maritime states / union territories. Of these, West Bengal has a total brackish water wetlands area of 4,05,000 ha of which 33,918 ha are under culture. These wetlands are in three districts (East Medinipur, North 24-Parganas and South 24-Parganas) of West Bengal. Saha et al.[13] made an inventory survey of brackish water *bheries* of undivided 24-Parganas district which reveals that there were 1334 brackish water *bheries* covering an area of 32929.56 ha under three saline zones viz., low saline zone, below 10 ppt (387 *bheries* of 9844.11 ha, ranging 2-200 ha), medium saline zone, 10-20 ppt (458 bheries of 15613.25 ha, ranging 2-267 ha) and high saline zone, above 20 ppt (489 *bheries* of 7472.20 ha, ranging 2-120 ha). More than 90% of the first two categories are seasonal *bheries*, while more than 90% of the third high saline ones are perennial.

Aquaculturable animal species

Nandi et al.,[4] had made an inventory of wetland faunal resources of West Bengal, comprising 2928 species under 23 phyla including 331 endemic species belonging to 14 phyla. Herein, an attempt is made to evaluate the cultivated and culturable aquatic animal species occurring in wetlands of West Bengal. A total of sixty-one animal species has been listed from both freshwater and brackish water wetlands of West Bengal (Table 3). Most of these species are endogenous, while some are exotic species. Eight exotic fish species are widely cultivated in this State. Two coastal crustacean species are included under items of export such as the highly priced tiger prawn *Penaeus mondon* (Fabricius) and the mud crab, *Scylla serrata* (Forskal) which are exported frozen, canned, or alive from West Bengal.

Table 1 District-wise distribution of impounded water area (in hectares)

Sl. No.	Name of the district	Culturable area	Semi-derelict area	Derelict area	Total area
1	Darjiling	210.29	-	-	210.29
2	Koch Bihar	567.86	990.76	327.44	1886.06
3	Jalpaiguri	2404.53	3068.00	527.47	6000.00
4	Uttar Dinajpur	2910.80	978.00	816.00	4704.80
5	Dakshin Dinajpur	10237.20	1056.00	1294.00	8260.03
6	Malda	1958.32	3055.42	3557.23	8570.97
7	Murshidabad	16161.76	646.29	-	16808.05
8	Nadia	4709.76	900.13	508.23	6118.12
9	North-24 Parganas	25960.69	1068.76	277.80	27307.25
10	South-24 Parganas	47485.85	1389.87	361.28	49237.00
11	Haora	7721.10	415.70	898.45	5554.60
12	Hugli	9224.22	4545.76	2498.03	16268.01
13	Purba Medinipur	17472.47	5282.31	1350.27	24105.05
14	Paschim Medinipur	16736.44	6667.30	1827.52	25231.26
15	Bankura	18367.40	3810.75	1332.70	13894.86
16	Puruliya	18205.79	9229.64	4947.37	32382.80
17	Bardhaman	20618.79	7386.63	3189.49	31194.91
18	Birbhum	15720.62	1596.57	413.54	17730.73
	Total	**236668.90**	**52087.89**	**24126.82**	**295464.80**

Source: Directorate of Fisheries, Government of West Bengal.

Table 2 Freshwater resources in West Bengal (in ha)

District	River/Stream	Canal/Khal	Beel/Baor	Reservoir	Total
Kolkata	NA	NA	NA	NA	-
Haora	1007.36	2,019.82	118.28	-	3,145.46
24 Parganas (North & South)	32,003.98	22,204.47	14,610.66	-	68,819.11
Medinipur (Purba & Paschim)	12,774.12	8,766.07	404.01	-	21,944.20
Hugli	4,358.74	3,714.94	3,884.76	-	11,958.44
Nadia	4,191.28	2771.75	4,271.61	-	11,234.64
Bardhaman	11,316.64	5,991.36	1,939.91	-	19,247.91
Birbhum	7,995.00	5,695.85	632.16	13,138.80	27,461.81
Bankura	15,930.15	11,711.04	1673.00	3,600.00	32,914.19
Puruliya	3,707.29	NA	NA	-	3,707.29
Murshidabad	36,283.23	10,013.88	3,790.69	-	50,087.80
Malda	6,497.60	2,511.42	4,551.55	-	13,560.57
Uttar Dinajpur	4,023.08	1,774.30	3,548.59	-	9,345.97
Jalpaiguri	16,006.44	562.29	504.38		17,073.11
Koch Bihar	13,095.82	1,664.58	1,168.11	-	15,928.51
Darjiling	3,395.63	683.94	683.94	-	4,763.51
Total	**1,72,586.36**	**80,085.71**	**41,781.65**	**16,738.80**	**3,111,92.52**

Source: Directorate of Fisheries, Government of West Bengal (NA = Not available)

Note: Presently, West Bengal is divided into 23 districts, recent water areas not available

Table 3 List of cultivated and culturable species occurring in freshwater and brackish water wetlands of West Bengal

Faunal groups	Cultivated and Culturable species of West Bengal
Mollusca: Gastropoda (Four species)	*Bellamya bengalensis* (Lamarck), *B. dissimilis* (Mueller), *Pila globosa (*Swainson), *Brotia (Antimelania) costula* (Rafinesque).
Mollusca: Bivalvia (Six species)	*Anadara granosa* (Linnaeus), *Crassostrea graphoides (*Newton and Smith), *Lamellidens marginalis* (Lamarck), *L. corrianus* (Lea), *Meretrix meretrix* (Linnaeus), *Parresia (Radiatula) caerulea* (Lea).
Crustacea: Macrura (Ten species)	*Caridina gracilipes* (DeMan), *Exopalaemon styliferus* (H.Milne-Edwards) *Macrobrachium dayanum* (Henderson), *M. lamarrei* (H. Milne-Edwards), *M. rosenbergii* (DeMan), *M. rude* (Heller), *Arachnochium mirabilis* (Kemp), *Metapenaeus brevicornis* (H. Milne-Edwards), *M. monoceros* (Fabricius), *Penaeus monodon* (Fabricius).
Crustacea: Brachyura (Five species)	*Sartoriana spinigera* (Wood-Mason), *Spirotelphusa hydrodromus* (Herbst), *Scylla serrata* (Forskal), *S. tranquebarica* Fabricius), *Varuna litterata* (Fabricius).
Pisces: Indigenous (Twenty-eight species)	*Catla catla* (Hamilton), *Labeo rohita* (Hamilton), *L. bata* (Hamilton), *L. calbasu* (Hamilton), *Cirrhina mrigala* (Hamilton), *C. reba* (Hamilton), *Puntius sarana* (Hamilton), *P. sophore* (Hamilton), *Amblypharyngodon mola* (Hamilton), *Anabas testudineus* (Bloch), *Clarias magur* (Hamilton), *Heteropneustes fossilis* (Bloch), *Wallago attu* (Bloch & Schneider), *Mystus bleekeri* (Day), *M. gulio* (Hamilton), *M. tengara* (Hamilton), *M. vittatus* (Bloch), *Channa marulius* (Hamilton), *C. punctatus* (Blotch), *C. striatus* (Blotch), *Notopterus notopterus* (Pallas), *Liza parsia* (Hamilton), *Liza tade* (Forsskal), *Ompak bimaculatus* (Bloch), *O. pabda* (Hamilton), *Lates calcarifer* (Bloch), *Eleutheronema tetradactylum* (Shaw), *Chanos chanos*.
Pisces: Exotic (Eight species)	*Cyprinus carpio carpio* Linnaeus, *Ctenopharyngodon idella* (Valenciennes), *Hypothalamicthys molitrix* (Valenciennes), *H. nobilis* (Richardson), *Oreochromis mossambicus* (Peters), *O. niloticus_niloticus* (Linnaeus). *Carassius auratus auratus* (Linnaeus), *C. carassius* (Linnaeus).
Total = Sixty-one spp.	61 species (Conservative enumeration)

Citation: Nandi NC. Aquaculturable fishery resources in wetlands of West Bengal. *J Aquac Mar Biol.* 2023;12(1):80–84.
DOI: 10.15406/jamb.2023.12.00359

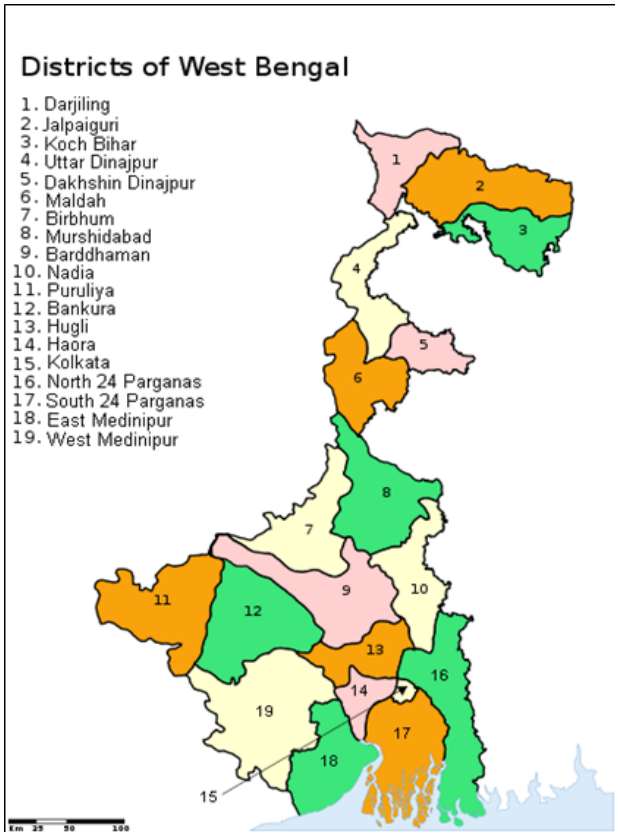

Figure 1 Map of West Bengal showing 19 districts (now 23 districts).

Figure 2 Physical map of West Bengal showing river systems.

Introduced fish species

Introduction of exotic fish species in West Bengal wetlands include several species of fishes, *viz.,* tilapias (*Oreochromis mossambica* (Peters) and *O. niloticus niloticus* (Linnaeus), silver carp (*Hypothalmichthys molitrix* (Valenciennes), grass carp (*Ctenopharyngodon idella* (Valenciennes), cyprinus carp (*Cyprinus carpio carpio* Linnaeus), gouramy *(Osphromenus goramy* Lacepede), bighead carp (*Hypothalamichthys nobilis* (Richardson), etc. These fishes are introduced in the country from Africa, Europe, and other parts of the world. The Gold fish, *Carassius auratus auratus* (Linnaeus) and *C. carassius* (Linnaeus), have been introduced in India as well as West Bengal as aquarium pet from China, Korea, Japan Taiwan, Europe, Siberia, East Asia, Vietnam.

Coastal crustacean fishery resources

In coastal wetlands of West Bengal crustacean fishery resources are rich the inshore coast including estuaries and mangroves.[3,6] The commercially important crustacean fishery resources are listed in Table 4. A list of economic species of fishes, prawns and crabs occurring in coastal and estuarine waters of Sundarban, West Bengal has been listed by Pramanik and Nandi[6] which include 15 species of cartilaginous fish, 119 species of bony fish, 4 species of stomatopods, 16 species of prawns, 10 species of crabs and 3 species of molluscs. The commercially exploited prawns and shrimps consist of 21 species, amongst which penaeids form the bulk of the catch contributing to more than 50% of the total production. *Metapenaeus brevicornis* (H. Milne-Edwards) is abundant in inundated brackish water and in low lying paddy fields during and after rains. *Metapenaeus monoceros* (Fabricius) and *M. lysianasa* (DeMan) occur plentifully in estuaries and brackish waters of Ganga delta. *Penaeus semisulcatus* De Haan is abundant all over the deltaic region and is the commonest naturally occurring large sized penaeid prawn of West Bengal. This species is usually found in freshwater but it can withstand brackish water to some extent and occurs extensively in rivers, canals, *beels* and tanks of coastal West Bengal. It grows to more than 30.0 cm in length. The weight of a single specimen may exceed even 500 gm (Table 4).[14]

Export items

Amongst the crustacean export items, a freshwater prawn species, *Macrobrachium rosenbergi* (De Man) and a brackish water prawn species, *Penaeus monodon* (Fabricius) are highly priced. *Penaeus monodon* (Fabricius) locally known as "*bagda*" is often referred to as the "living dollars" of Sundarban coast. This prawn species is extensively cultured in the coastal districts of the State. Large number of men, women, and children (well over 50,000) are engaged in the collection of "*bagda*" seed from coastal waters and estuaries throughout the coastal belt of this State. The juveniles of this species are reared in pools and brackish water *bheries* of the Ganga delta. Two palaemonid species, *Exopalaemon styliferus* (H. Milne-Edwards) and *Nematopalaemon taenuipes* (Henderson) occur in abundance and support important fisheries in the deltatic areas of Sundarban. Large quantities of these two species are landed and sold for domestic consumption and export. In the last three decades, crabs have emerged as an important commodity of export. Among the crab species, only two species, namely, *Scylla serrata* (Forskål) and *S. tranquibarica* (Fabricius) are highly valued and have entered export markets from West Bengal coast. Item-wise marine product export is presented in Table 5.

Citation: Nandi NC. Aquaculturable fishery resources in wetlands of West Bengal. *J Aquac Mar Biol.* 2023;12(1):80–84.
DOI: 10.15406/jamb.2023.12.00359

Table 4 Crustacean fishery resources in coastal wetlands with their local names, size, occurrence, and utilization from coastal areas of West Bengal

Name of the species	Local name	Max Size (mm)	Occurrence	Utilisation
Family Penaeidae				
Fenneropenaeus indicus (H.Milne-Edwards)	Chapda chingri	170	Common	Edible, Export
F. japonicus (Bate)	Chingri	120	Occasional	Edible
F. merguiensis (De Man)	Chingri	140	Common	Edible, Fishmeal
F. penicillatus (Alcock)	Chingri	150	Common	Edible
Penaeus monodon (Fabricius)	Bagda chingri	195	Abundant	Edible, Export
P. semisulcatus De Haan	Hede bagda	240	Common	Edible, Export
Metapenaeus affinis (H.Milne-Edwards)	Chingri	85	Abundant	Edible, Fishmeal
M. brevicornis (H.Milne- Edwards)	Dhanbone/ Chamne chingri	90	Abundant	Edible
M. lysianasa (De Man)	Chingri	85	Abundant	Edible, Fishmeal
M. monoceros (Fabricius)	Koraney chingri / Honey chingri		Abundant	Edible
Parapenaeopsis sculptilis (Heller)	Rangi chingri	170	Abundant	Edible, Fishmeal
P. stylifera (H.Milne-Edwards)	Chingri	75	Common	Edible, Fishmeal
Family Palaeomonidae				
Exopalaemon styliferus (H.Milne-Edwards)	Ghora/ Rushna chingri	90	Abundant	Edible, Fishmeal
Arachnochium mirabilis (Kemp)	Chingri	50	Occasional	Edible,Fishmeal
Macrobrachium equidens (Dana)	Chingri	90	Common	Edible, Fishmeal
M. lamarrei (H. Milne-Edwards)	Kucho chingri	40	Occasional	Edible, Fishmeal
M. rosenbergii (De Man)	Golda chingri	135	Common	Edible, Export
M. rude (Heller)	Goda chingri	95	Common	Edible
Nematopalaemon taenuipes (Henderson)	Chingri	60	Abundant	Edible
Family Sergestidae				
Acetes erythraeus Nobili	Phool chingri	30	Common	Edible, Fishmeal
A. indicus H.Milne-Edwards	Bhuri chingri	35	Abundant	Edible, Fishmeal
Total = 21 crustacean species belonging to three families				

Table 5 Item-wise export of marine products from West Bengal (Q=Quantity in tons;V=Value in Crore Rs.)

Item	Q/V	2003-04	2004-05	2005-06	2006-07	2007-08	2009-10(Provisional)
Frozen shrimp	Q	1352	13585.43	13237.92	17456.16	17102.79	18550.46
	V	489	462.36	471.49	585.64	573.15	686.57
Frozen fish	Q	2135	2709.34	3381.47	4402.09	7759.60	7637.38
	V	23.8	24.32	35.32	48.47	67.79	87.03
Frozen cuttle fish	Q	558	1201.58	364.93	650.55	940.45	1588.01
	V	4.23	9.49	2.54	5.64	9.96	13.15
Dried item	Q	171	296.36	362.95	3343.57	5228.58	4141.84
	V	7.86	11.39	9,42	16.76	23.82	23.63
Live items	Q	353	407.74	478.90	600.35	819.22	1260.57
	V	5.49	7.83	7.57	9.72	15.78	24.06
Chilled items	Q	408	403.50	905.04	1110.91	1625.92	13314.71
	V	8.45	9.90	12.87	21.50	28.06	53.72
Others	Q	-	0.91	16.21	86.68	148.67	384.19
	V	-	0.02	0.18	0.89	1.80	3.24
Grand Total	**Q**	**17157**	**18605**	**18356.96**	**27650.31**	**33625.23**	**46877.17**
	V	**538.83**	**525.30**	**539.68**	**688.62**	**720.36**	**891.79**

Source: Directorate of Fisheries, Govt. of West Bengal

Concluding remarks

The State of West Bengal supports a rich commercially important finfishes and shellfish species. People particularly user groups and stakeholders need to know the values of local wetlands and how to protect, preserve and promote their values minimizing encroachment and threats. Towards this goal the quantity and quality of information on local wetlands, their economic values be increasingly understood and communicated. Relevant Government agencies should collaborate closely with educational institutions, individual experts as well as NGOs on issues of mutual interest, so that wetland conservation, aquacultural development, and appropriate management are achieved. It is desirable that the wisdom and ideas of knowledgeable representatives of the local panchayats and Fishermen cooperatives are heard and incorporated in future policies and plans for local larger wetlands. Furthermore, economic incentives, measures to strengthen local control over resources and more effective management practices be targeted prioritizing the fishery production of larger wetlands. To facilitate this, essential information needs to be made available to the local Land and Revenue departments as well as Fisheries departments concerned.

Acknowledgements

None.

Citation: Nandi NC. Aquaculturable fishery resources in wetlands of West Bengal. *J Aquac Mar Biol.* 2023;12(1):80–84.
DOI: 10.15406/jamb.2023.12.00359

Conflicts of interest

The author declares no conflict of interest.

References

1. Saha KC. *Fisheries of West Bengal*. West Bengal Govt. Press, Alipore. 1970:138.
2. Chatterjee SP. *An introductory Regional Geography: West Bengal*. Orient Longman, Calcutta. 1977.
3. Dev Roy MK, Nandi NC. Crustacean fishery resources of coastal West Bengal and their conservation issues. *J Environ Sociobiol*. 2004;1(1–2):71–80.
4. Nandi NC, Das AK, Dey A. *Wetland Faunal Diversity of West Bengal*. WBBB and NBI, Kolkata. 2013:1–256.
5. Nandi NC, Das SR, Bhuinya S, et al. Wetland Faunal Resources of West Bengal. 1. North and South 24 - Parganas Districts. *Rec Zool Surv India.* 1993;150:1–50.
6. Nandi NC, Pramanik, SK. 1994. *Crabs and Crab Fisheries of Sundarban.* Hindusthan Publishing Corporation (India), Delhi. 1994;110(7):1–192.
7. Nandi NC, Venkataraman K, Das SR, et al. Wetland Faunal Resources of West Bengal-3. Birbhum District. *Rec Zool Surv India.* 2001;99(1–4):135–156.
8. Nandi NC, Venkataraman K, Das SR, et al. Wetland Faunal Resources of West Bengal- 4. Darjiling and Jalpaiguri Districts. *Rec Zool Surv India.* 2005;104(1–2):1–25.
9. Nandi NC, Venkataraman K, Das SR, et al. Wetland Faunal Resources of West Bengal. 2. Some selected wetlands of Haora and Hugli Districts. *Rec Zool Surv India.*1999;97(4):1–43.
10. Nandi NC, Venkataraman K, Das SR, et al. Wetland faunal resources of West Bengal-5. Bankura and Puruliya districts. *Rec Zool Surv India*. 2007;107(2):61–91.
11. Pramanik SK, Nandi NC. *Dry fish Production Profile of Indian Sundarban*. Classical Publishing Company, New Delhi, 2004:247.
12. Chaudhuri AB, Choudhury A. *Mangroves of the Sundarbans Volume One: India.* IUCN, Bangkok, Thailand. 1994;1–247.
13. Saha GN, Thakurta SC, Laha GC, et al. Ecology and fishery management of brackish water bheries in West Bengal. *Bulletin* No. 1986;46:1–23.
14. Chopra B. Some food prawns and crabs of India and their fisheries. *J Bombay Nat Hist Soc*. 1939;41(2):221–234.

Citation: Nandi NC. Aquaculturable fishery resources in wetlands of West Bengal. *J Aquac Mar Biol.* 2023;12(1):80–84.
DOI: 10.15406/jamb.2023.12.00359