International Journal of Research in Agricultural Sciences
Volume 3, Issue 2, ISSN (Online): 2348 – 3997)

Prevalence of Parasitic Diseases in Four Blocks of Bankura District, West Bengal

Debapriyo Mukherjee, Koel Bhattacharya Sanyal, Debajit Chakraborty, Avijit Patra and *Gadadhar Dash
Department of Aquatic Animal Health , Faculty of Fishery Sciences, West Bengal University of Animal and Fishery Sciences 5, Budherhat Road, Chakgaria, Kolkata-700094, West Bengal, India

***Abstract* – The present work was conducted to isolate and identify different parasites from Indian Major Carps (IMC). During the study period the Severity of Infection and Parasitic Frequency Index (PFI, %) were also estimated in relation to months, seasons and developmental stages of fishes. For investigative purpose 4 different blocks namely Simlapal, Bishnupur, Taldangra and Onda of Bankura districts of West Bengal were selected considering the potential of fishery resources. Approximately 500 fishes were observed during the entire period of observation between January 2014 to December 2015. The parasite infested fishes were found to suffer mainly from respiratory manifestations, blackness of the skin and mortalities. The parasitic infestations were found to be the major problem and the most prevalent disease causative agents among cultured fish spp. All parasites were isolated from gill, fins and body surface of the fishes. The isolated parasites were *Myxobolus* sp., *Thelohanellus* sp., *Dactylogyrus* sp., *Argulus* sp. *and Lernea* sp. During the study period, among these parasites *Myxobolus* sp. showed the highest severity and prevalence (PFI, 33%) in winter months compared to it's zero prevalence in summer. Fry and fingerlings were more susceptible to *Dactylogyrus* sp., may be due to poor immune power compare to adult fishes. Severity and prevalence of *Dactylogyrus* sp. is high (PFI, 31.2 %) in summer and rainy season. Remaining all parasites were found throughout the year and adult fishes were found to be more infested with these parasites compare to fingerlings.**

***Keywords* – IMC, Parasite, PFI, Prevalence.**

I. INTRODUCTION

In West Bengal aquaculture is one of the most economically important applied strategies. Freshwater aquaculture mainly depends on carp culture practices that account 80% of total inland fish production and have proved sustainability at different levels of production over the years. Though the country possesses a large number of potential cultivable carp species, it is only the three Indian Major Carp i.e. catla (*Catla catla*), rohu (*Labeo rohita*) and mrigal (*Cirrhinus mrigala*), that contribute a lion's share with production of over two million tonnes. West Bengal being a 'rice-fish society', the State is highly significant historically, geographically and strategically since long past. It is important to mention here that the parasitic infestations are reportedly playing a major role in disease occurrences (78%) in Indian freshwater aquaculture. There are around 21% production loss due to diseases, poor farm management practices and impaired growth. Huge amounts of hazardous substances, heavy metal, sulphide, grease, oil originated from different industries of the surroundings, domestic waste water and industrial effluent pollute the aquatic environment. That can leads to stress on the fishes, under the stress condition fish can prone to so many parasitic diseases. Although fish suffered bacterial, fungal diseases, the prevalence of different parasites in the fish farm might be due to improper stocking density. These findings are in agreement with a previous study by Saha *et al*, (2009) [1]. According to Poulin (1992) and Oldewage (2002) [2], [3] parasitic infections often give an indication of the quality of water since parasites generally increase in abundance and diversity in more polluted waters. So the objectives of the present study were to isolate and identify different parasites from Indian Major Carp (IMC) and to find out Severity of Infection and Parasitic Frequency Index (PFI, %) in terms of months, seasons and length groups from 4 different blocks namely Simlapal, Bishnupur, Taldangra and Onda of Bankura districts of West Bengal.

II. MATERIALS AND METHODS

The present study was conducted to find out the severity and prevalence of parasites in major cultivable fish species in West Bengal. An investigation was made on Catla (*Catla catla*), Rohu (*Labeo rohita*) and Mrigal (*Cirrhinus mrigala*), from Bankura district of West Bengal. Approximately 500 fishes were observed in between January 2014 to December 2015. The samples were collected from 4 different blocks namely Simlapal, Bishnupur, Taldangra and Onda of Bankura district of West Bengal, India. The places were selected in such a way that the four blocks at different locations represent the whole district. Live host or freshly dead specimen were randomly sampled and collected. The fishes were examined immediately after collection. The age of fishes, date and site of collection of host specimens were recorded. External symptoms and health conditions of each specimen were recorded. The gills, fins, skin and operculum were removed with least damage and placed on separate petri-dishes containing filtered water and examined. Each of the four gills of both sides was examined separately. The gills and body surface were checked thoroughly for any attached parasites. The dorsal, pectoral, pelvic, anal, and caudal fins were placed in separate petri-dishes. Each fin was thoroughly examined. Scales of each side were scrapped out along with the mucus and taken separately for examination. The first microscopic examinations were done for observing ectoparasites and identifying any cysts, ulceration and scars. Skin, gills and fins were examined, the gill filaments were dissected out of the branchial cavity and placed in a

petridish containing saline solution (0.85% NaCl). Parasites were collected and preserved in 70 % alcohol, and identification was performed as proposed by Malmberg (1962) and Harris (1982) [4], [5]. They were fixed in glycerin alcohol (90 parts of 70% ethyl alcohol and 10 parts of glycerol), stained in Geimsa and finally mounted in glycerin jelly.

Determination of Severity of infection (Table I & Fig 1) was estimated as proposed by Margolis *et al* (1982) and Bush *et al* (1997) [6], [7]. The Parasitic Frequency Index (PFI) was calculated (Fig 2) by taking the percentage of the number of hosts infected by an individual parasite species against the total number of hosts examined in a particular area under investigation. The frequency index were further classified into rare (0.1 – 9.9%), occasional (10-29.9%), common (30 – 69.9%) and abundant (70-100%) as per Srivastava (1980) [8].

Prevalence was estimated following the formula by Margolis *et al* (1982) and Bush *et al* (1997) [6], [7] as:

$$\text{Prevalence\%} = \frac{\text{Total number of infected fish}}{\text{Total no of fisht host observed}} \times 100$$

Table I: Determination of Severity of infection: Generalized scheme for assigning numerical qualitative value to severity grade of infections, surface infestations and disease syndrome severity followed by Lightner (1993) [9].

Numerical qualitative value	Severity grade of infections
0.5	Non infective
1	Mild
2	Moderate
3	Infective
4	Excessive

III. Result

The isolated parasites were *Myxobolus* sp., *Dactylogyrus* sp., *Thelohanellus* sp., *Argulus* sp. *and Lernea* sp. It was observed that among IMCs *Labeo rohita* highly susceptible species to the parasites (Fig. 6). The Parasitic Frequency Index (PFI %) was calculated and severity of parasites in all fish species were recorded (Fig. 1 & Fig. 2) for these parasites in Indian Major Carps. During the study period, among these parasites *Myxobolus* sp. showed the highest severity and prevalence (PFI 33%) in winter months compared to its zero prevalence in summer (Fig 1 & 2). In our study *Lernea* sp. was found only in rainy season of the year 2014 (Table II). Remaining all parasites was found throughout the year (Table II). Prevalence (PFI, %) of *Dactylogyrus* sp., *Thelohanellus* sp., *Argulus* sp. *and Lernea* sp. were 31.2%, 22.4%, 26.8% and 17.8% respectively. Parasitic Frequency Index in case of *Myxobolus* sp. and *Dactylogyrus* sp. was common type and in other parasites it was of occasional type. Severity Grade in *Myxobolus* sp. and *Dactylogyrus* sp. was moderate and in others it was mild.

Prevalence and severity of the infestation were also found to be related in different stages (Age groups) of *Catla catla* (Table.III), *Labeo rohita* (Table.IV) and *Cirrhinus mrigala* (Table.V). A total number of 190 *Catla catla* were observed, in which the prevalence of *Myxobollus* sp. were 1.1% and 11.1 % in fry and fingerling stages, while highest prevalence found (14.7 %) in adult fishes. In *Dactylogyrus* sp. prevalence was 1.6% in adults, while in fry and fingerling the prevalence were 10 % and 13.7 % respectively. A total number of 226 *Labeo rohita* were observed, in which the prevalence of *Myxobollus* sp. was 23% in adults, lowest prevalence in fry and fingerlings (4% & 6.6%). Out of 226 fishes *Dactylogyrus* sp. prevalence was recorded 10.2%, 12.4% and 4.4% in fry, fingerling and adults respectively. While observing a total of 84 numbers of *Cirrhinus mrigala*, *Myxobollus* sp. prevalence was recorded 0% in fry stage, highest prevalence (32.1%) found in adults and 13.1% in fingerlings. Out of 84 fishes *Dactylogyrus* sp. prevalence observed 32.1% in fingerlings, while lowest prevalence (0%) in adults and prevalence of 23.8% in fry stage was recorded.

IV. Discussion

In this study it was observed that among IMCs *Labeo rohita* highly susceptible species to the parasites. In all the fishes mixed infection with *Myxobolus* sp., *Thelohanellus* sp., *Dactylogyrus* sp., *Argulus* sp. *and Lernea* sp. was observed throughout the year and adult fishes were found to be more infested with these parasites compare to fingerlings. Fry and fingerlings were more susceptible to *Dactylogyrus* sp., may be due to poor immune power compare to adult fishes. All the fishes were highly infested with Mongenean parasite i.e *Dactylogyrus* sp. in the rainy season. The *Myxobollus* sp. infestation was high in the winter due to cold weather temperature. *Myxobollus* sp. showed strict influence of temperature on the prevalence and intensity of infestations which generates a definite seasonal cycle of the parasite, while some species showed a maximum prevalence in summer and winter season.

Of all the stages of fishes highest prevalence of *Dactylogyrus* sp. was found in fry and fingerlings. The probable reason for less number of species observed in adult groups may due to strong immune power compared to fry & fingerling and less number of adult fishes available in fish farms. Fry and fingerlings were more susceptible to *Dactylogyrus* sp., which corroborated with the result of Golder *et al* (1987) [10]. He had observed that among the different size groups of fishes, the prevalence was highest in medium length groups. The reason for it is that small and medium size fishes have less immune power compared to large size fishes. Large size fishes were more susceptible to *Myxobollus* sp. because larger hosts provide more nutrient resources and space, which in turn promote parasitic growth. According to Ramudu *et al* (2013) and Dash *et al* (2015) [11], [12] not only that an increasing host size is linked with an increase in available niches for colonization and thus grater parasite richness also. During the study period, parasite species composition, PFI (%), prevalence, and severity of infestations varied in different fish species and it might be

due to host specificity, soil, temperature, metabolic activity and suppression of natural immune system of fish.

V. Conclusion

Prevalence and severity of parasites were found throughout the year. The maximum prevalence of *Myxobollus* sp. was recorded in the winter season. The maximum prevalence of monogenean parasite *Dactylogyrus* sp. was recorded in the summer & rainy season and the minimum in winter. Prevalence of *Lernea* sp. was recorded in rainy season only. Poor water quality, sudden changes of temperature, health management, irregular feeding practices and host specificity and preference are some of the key factors that lead to stressful conditions and subsequent parasitic infection of the host organism. This study describes the parasitic infestations from different fish farms of four different blocks of Bankura district of West Bengal and indicates that infestation rate of parasites varied with stage of fish and season. This could be due to stocking density, water depth, temperature along with other physico-chemical parameters and management practices maintained. Nevertheless, more in depth research is needed to be carried out for studying parasites as well as diseases of these fishes.

VI. Acknowledgment

The authors gratefully acknowledge the assistance extended by the Faculty of Fishery Sciences, West Bengal University of Animal And Fishery Sciences for providing necessary facilities for undertaking the work and also special thanks to NBFGR- NFDB, for financial support during the study.

References

[1] H. Saha. Occurrence, distribution and pathology of monogenetic gill parasites in *Labeo rohita* (Hamilton). M.F.Sc. thesis college of fisheries. Central Agricultural University. Tripura. India. 2009.

[2] R. Poulin. Toxic pollution and parasitism in fresh water fish. *Parasitology Today*. 1992,volume 8: pp 51-61.

[3] A. Avenant-Oldewage. Protocol for the assessment of fish health based on the Health index Report and manual for training of field workers to the Rand Water Board Report no. 2001/03/03/13. *BIOM.GEN*. (H1) Rand Water Vereeniging, 2002.

[4] G. Malmberg. Taxonomical and ecological problems in *Gyrodactylus* (Trematoda, Monogenea) Zoological Institte, University of Stockholm, Sweden. 1962.

[5] P.D. Harris. Studies on the *Gyrodactylidae* (Monogenea). PhD thesis, University of London. 1982.

[6] L. Margolis, G.W. Esch, J.C. Holmes, and G.A. Schod. The use of ecological terms in parasitology. Report of an ad-hoc Committee of the American Society of Parasitologists. *Journal of parasitology*. 1982, volume 68: pp 131-133.

[7] A.O. Bush, K.D. Lafferty, J.M.Lotz, and A.W. Shostak. Parasitology meets ecology on its own terms: Margolis et al. Revisited, *Journal of parasitology*., 1997, volume 83: pp 575-583.

[8] C.B.Srivastava. Estimation of helminthic infections. Proceedings Workshop Technology Parasitol. Zoological Survey of India. 1980, pp 29-31.

[9] D.V. Lightner. Diseases of cultured penaeid shrimp. In: J.P. McVey (ed.), Handbook of Mariculture. Crustacean Aquaculture.Second Edition, CRC Press, Boca Raton, FL., 1993, volume 1: pp 289-320.

[10] M.I. Golder, K.J. Chndra, and A.K.A. Rahman. Helminth parasitism in *Nandus nandus* (Hamilton). *Bangladesh Journal of Fisheries*. 1987, volume10: pp 11-12.

[11] K. R. Ramudu, and G. Dash. Prevalence of Monogenean Parasites on Indian Major Carps in Bheries of West Bengal. *International Journal of Chemical and Biochemical Sciences*. 2013, volume 4: pp 13-21.

[12] G. Dash, B. B. Sharma, D. Chakraborty, and D. Mukherjee. Parasitic Study of Indian Major Carp *Catla catla* (Hamilton, 1822) in Selected Districts of West Bengal, India. *International journal of advanced scientific and technical research*. 2015, volume1(5): pp 75-83.

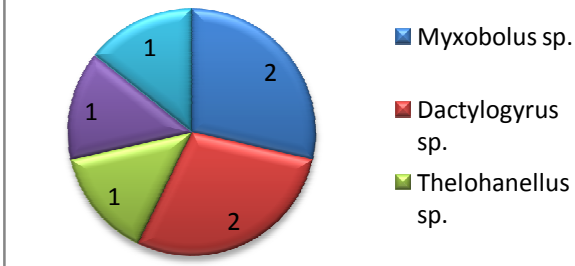


Fig. 1. Severity of Infection of different parasites in IMC from January'2014 to December'2015

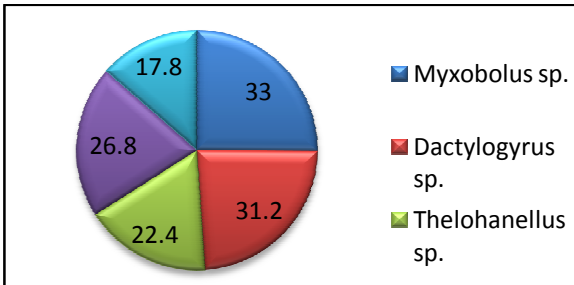


Fig. 2. PFI (%) of different parasites in IMC from January'2014 to December'2015

Table II: Season wise distribution of parasites from January 2014 to December-2015

Year	Season	Parasitic Data			
		Parasites Present	No of infected fish	Total no. Fish Examined	Site of infection
2014	Winter	*Myxobolus* sp.	91	100	Gill, Tail, Fins, Body surface, Operculum
		Dactylogyrus sp.	18		
		Thelohanellus sp.	21		
		Argulus sp.	19		
	Summer	*Dactylogyrus* sp.	32	80	
		Thelohanellus sp.	29		
		Argulus sp.	30		
	Rainy	*Dactylogyrus* sp.	54	60	
		Thelohanellus sp.	14		
		Argulus sp.	16		
		Lernea sp.	89		
2015	Winter	*Myxobolus* sp.	74	110	
		Thelohanellus sp.	13		
		Argulus sp.	14		
	Summer	*Thelohanellus* sp.	8	95	
		Argulus sp.	33		
	Rainy	*Dactylogyrus* sp.	52	55	
		Thelohanellus sp.	27		
		Argulus sp.	22		

N.B. Winter- October to February, Summer- March to July, Rainy Season- August to September

Table III. Stage wise prevalence (%) of Myxobollus sp. and Dactylogyrus sp. in Catla catla from January 2014 to December-2015

Age	Total no. of Fish Host Examined	Total no. of *Myxobollus* infected fish	Prevalence (%)	Total no. of *Dactylogyrus* infected fish	Prevalence (%)
Fry	190	2	1.1	19	10
Fingerling		21	11.1	26	13.7
Adult		28	14.7	3	1.6

Table IV. Stage wise prevalence (%) of Myxobollus sp. and Dactylogyrus sp. in Labeo rohita from January 2014 to December-2015

Age	Total no. of Fish Host Examined	Total no. of *Myxobollus* infected fish	Prevalence (%)	Total no. of *Dactylogyrus* infected fish	Prevalence (%)
Fry	226	9	4	23	10.2
Fingerling		15	6.6	28	12.4
Adult		52	23	10	4.4

Table V. Stage wise prevalence (%) of Myxobollus sp. and Dactylogyrus sp. in Cirrhinus mrigala from January 2014 to December-2015

Age	Total no. of Fish Host Examined	Total no. of *Myxobollus* infected fish	Prevalence (%)	Total no. of *Dactylogyrus* infected fish	Prevalence (%)
Fry	84	-	-	20	23.8
Fingerling		11	13.1	27	32.1
Adult		27	32.1	-	-

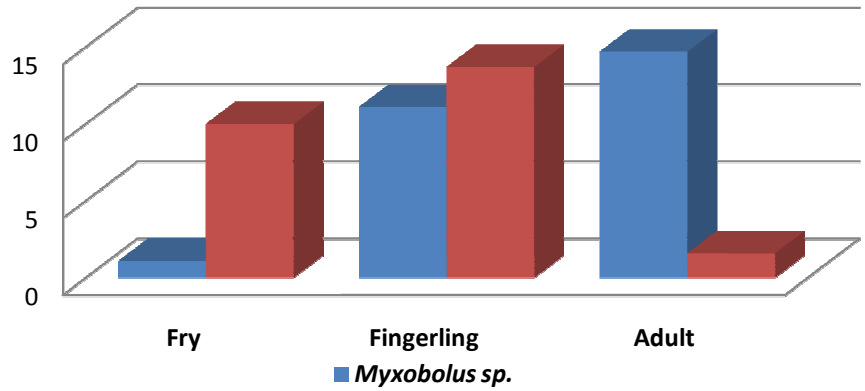


Fig. 3. Prevalence of Myxobolus sp. & Dactylogyrus sp. in different stages of *Catla catla* from January'2014 to December'2015

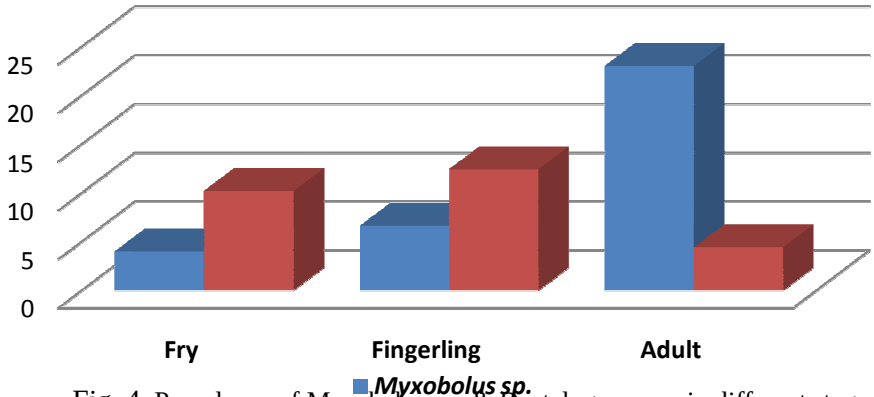


Fig. 4. Prevalence of Myxobolus sp. & Dactylogyrus sp. in different stages of *Labeo rohita* from January'2014 to December'2015

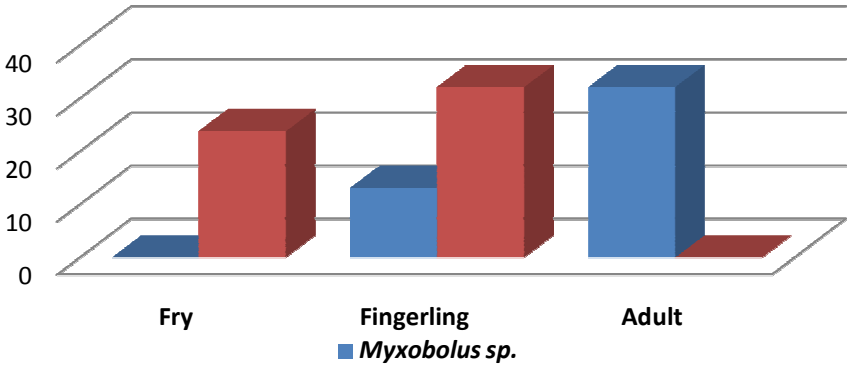


Fig. 5. Prevalence of Myxobolus sp. & Dactylogyrus sp. in different stages of *Cirrhinus mrigala* from January'2014 to December'2015

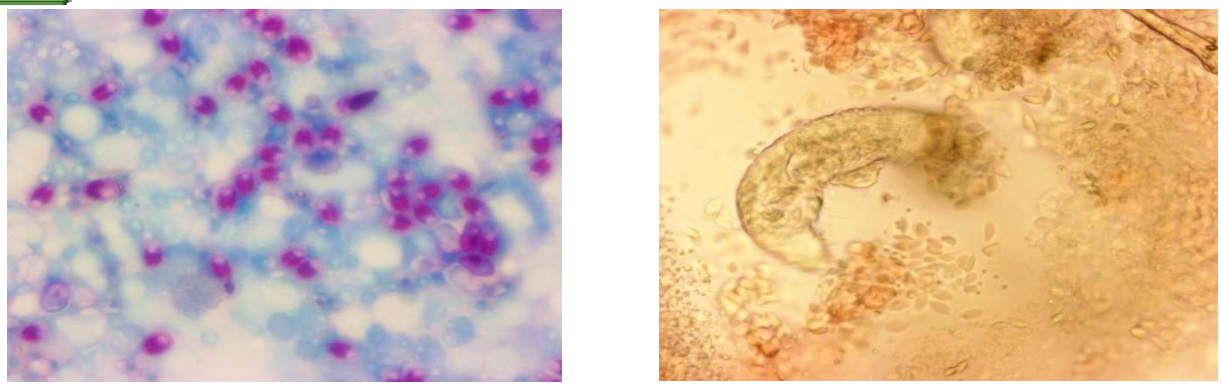
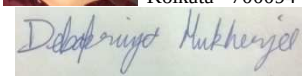


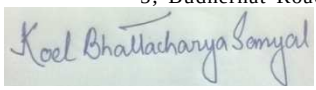
Fig 6. Myxobolus sp. isolated from Catla catla observed at 40X after staining & Dactylogyrus sp. isolated from L. rohita at 40X.

AUTHOR'S DETAILS

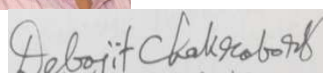
Mr. Debapriyo Mukherjee
M.Sc. (Microbiology), Senior Research Fellow, National Surveillance Programme on Aquatic Animal Disease. Department of Aquatic Animal Health , Faculty of Fishery Sciences, West Bengal University of Animal and Fishery Sciences 5, Budherhat Road, Chakgaria Kolkata - 700094



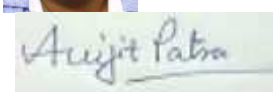
Dr. Koel Bhattacharya Sanyal,
Ph.D. (Microbiology)
Senior Research Fellow, National Surveillance Programme on Aquatic Animal Disease, Department of Aquatic Animal Health, Faculty of Fishery Sciences, West Bengal University of Animal and Fishery Sciences
5, Budherhat Road, Chakgaria, Kolkata - 700094



Mr. Debajit Chakraborty
M.Sc. (Aquaculture Management)
Department of Aquatic Animal Health , Faculty of Fishery Sciences, West Bengal University of Animal and Fishery Sciences, 5, Budherhat Road, Chakgaria, Kolkata - 700094



Mr. Avijit Patra
M.Sc. (BioTech.)
Department of Aquatic Animal Health , Faculty of Fishery Sciences, West Bengal University of Animal and Fishery Sciences, 5, Budherhat Road, Chakgaria Kolkata - 700094



Dr. Gadadhar Dash
M.F.Sc., Ph.D.
Associate Professor, Department of Aquatic Animal Health, Faculty of Fishery Sciences, West Bengal University of Animal and Fishery Sciences, 5, Budherhat Road, Chakgaria, Kolkata - 700094