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A preliminary survey on parasitic occurrence in indigenous climbing perch, *Anabas testudineus* (Bloch, 1972) from West Bengal state of India

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ABSTRACT

Objective: To describe the parasitic infestations of *Anabas testudineus* (*A. testudineus*) collected from three different fish producing districts of West Bengal state in India.

Methods: A total number of 75 specimens of *A. testudineus* were collected from different floodplain areas of West Bengal, India. These specimens were examined for parasites using established techniques after measuring basic morphometric parameters.

Results: A total 165 individual of 20 parasites (13 ectoparasites and 7 endoparasites) belonging to 7 phyla were recorded from 64 infected *A. testudineus*. Among the observed parasites, 8 were protozoan including 3 ciliates; 2 monogenic trematodes, 2 strigeidid trematodes, 1 nematode, 3 crustaceans, 3 myxozoans and 1 echinorhynchus acanthocephalan parasites. The quantitative abundance of parasites were highest in gill (37%) followed by body outer layer (35%) and intestine (28%). District wise quantitative count of parasites in different investigated organ from *A. testudineus* revealed that North 24 Parganas is highly infected followed by West Midnapore and East Midnapore. The highest prevalence (%) and mean abundance of parasitic occurrence was observed in North 24 Parganas followed by West Midnapore and East Midnapore. The highest mean intensity was found at West Midnapore followed by North 24 Parganas and East Midnapore.

Conclusions: Especially West Bengal state of India, inland culture and capture fishery mainly rural based and operated by poor farmers. Developing right kind of interventions and management practice can prevent adverse impact of diseases and assist poor farmers for sustainable production.

1. Introduction

The inland fisheries resources of India are renowned for their heterogeneity in fish diversity as for as their magnificent productive potential. West Bengal state of India is endowed with a vast expanse of inland waters in the form of rivers, canals, estuaries, lakes, ponds, tanks, *etc.* and always attracted attention for its fish production. Diseases are the most serious limiting factors in fishery sector and prime cause for chronic mortalities and poor growth which affects yield and marketability of fishes. Fishes are prominent carrier of parasites because they are the most important source of protein and apparently act as an intermediate host of various parasites[1]. Various protozoans, myxozoans, monogeneans, digeneans, larval cestodes and ectoparasitic crustaceans have been regularly reported in fish; however, reports on mortality associated with these pathogens are few with some exceptions[2,3]. Annual losses of US$ 1.0 million due to disease

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induced mortality and impaired growth were also reported in carp culture in Andhra Pradesh state of India[4]. Parasitic infections often give an indication of poor water quality since increasing abundance and diversity of parasites generally found in more polluted and derelict water[5].

Climbing perch, *Anabas testudineus* (*A. testudineus*) is a freshwater indigenous air-breathing fish popularly known as *Koi* in West Bengal Province of India. It is well distributed in Indian subcontinent as well as other Asian countries and commonly found in low lying swamps, marshy lands, lakes, canals, ponds, paddy fields, estuaries, *etc*[6]. They are very hardy by nature and can thrive extremely adverse ecological conditions like very low dissolved oxygen, high turbidity, polluted water, *etc*[7]. Due to its unique taste, high quality protein source and therapeutic value, it fetches high price in domestic markets. In recent times, the population has drastically reduced due to environmental degradation, destruction of breeding grounds, disease, *etc.* and became a vulnarable species in Indian context[8].

In the recent past, a quantum of parasitic diseases of various fishes has already been reported from water bodies of West Bengal[2,3,9-14]. Some workers have made some attempts to explore various aspects of helminth infection of *A. testudineus* from India[15-20] and as well as from other countries[1,21,22]. However, the detail group or phyla wise accounts of parasitic infection occurring in *A. testudineus* is meager. *A. testudineus* is becoming a candidate species for aquaculture in India and also in other Asian countries. Considering the future potential for culturing this fish, the present study was designed to quantitatively investigate the prevalence and intensity of parasitic infection in climbing perch *A. testudineus* in three districts of West Bengal Province of India.

2. Materials and methods

Randomly sampled live climbing perch *A. testudineus* (n = 75) was collected from different floodplain areas of three districts of West Bengal, namely, North 24 Parganas (22.1300° N, 88.5000° E), East Midnapore (22.3000° N, 87.9167° E) and West Midnapore (22.4333° N, 87.3333° E) and were brought to laboratory in oxygenated polythene bags during May to July, 2014. In the laboratory, the length, weight, external symptoms of each fish were noted immediately. The external surfaces of the host body including scales, fins, skin were examined by magnifying glass for ectoparasites. The dorsal, pectoral, pelvic, anal and caudal fins were cut, placed in separate Petri-dishes and thoroughly examined. Mucus was collected by scrapping throughout the dorso-ventral surface of the fish, transferred on grease free glass slides with saline solution (0.75% NaCl) and examined under compound microscope. The gill filaments were dissected out of the branchial cavity, placed in a Petri-dishes containing saline solution, pieces of gills were treated with 4% formalin and examined. For endoparasitic investigation, fish species was dissected dorso-ventrally and the internal organs were examined. The intestinal fluids were collected and smears were prepared. The entire digestive system was taken in a Petri-dish with saline solution, cut into three sections and each section was examined for parasites. The air-dried smears were stained with Giemsa solution (HiMedia, Mumbai) after putting 70% alcohol and washing through distilled water. The number of parasites per fish and site of infection were recorded. The prepared slides were observed under Carlzeiss stereomicroscope and identification of parasites was done based on standard literatures[23-26]. After that, the slides were deposited at the Laboratory of Aquaculture Management and Technology, Vidyasagar University, India.

District wise different parasitic indices like prevalence (%), mean intensity and mean abundance were calculated using the following formulae[27].

$$\text{Prevalence (\%)} = \frac{\text{Number of infected fish}}{\text{Total number of fish examined}} \times 100$$

$$\text{Mean abundance} = \frac{\text{Number of collected parasites}}{\text{Number of fish examined}} \times 100$$

$$\text{Mean intensity} = \frac{\text{Number of collected parasites}}{\text{Number of infected fish}} \times 100$$

3. Results

During the present investigation, a total of 165 individuals of 20 parasites (13 ectoparasite and 7 endoparasite) under umbrella of 7 phyla were recorded from 64 infected *A. testudineus* collected from three districts of West Bengal. The average weight of the samples was 25 g and the average length was measured about 15 cm. Among the observed parasites, 8 were protozoans including 3 ciliates, 2 monogenic trematodes, 2 strigeidid trematodes, 1 nematode, 3 crusteceans, 3 myxozoans and 1 echinorhynchus acanthocephalan parasites. Six numbers of parasites were remained unidentified. The parasites showed strong organ specificity and heterogeneity of occurrence. Protozoans and monogeneans were very common on the gill and skin. Crustaceans were most abundantly attached to the fin and skin. In the intestine, protozoans, trematode, nematode, acanthocephalans and myxozoans were found. The detail list of parasites recovered and their site of infection were depicted in Table 1. The counted number wise quantitative abundance of parasites were highest in gill (37%) followed by body outer layer (35%) and intestine (28%).

Table 1
The detail list of parasites recovered from *A. testudineus* in North 24 Parganas, East Midnapore and West Midnapore districts of West Bengal and their site of infection.

Group		Parasites	Site of infection
Ectoparasite	Protozoan	*Hexamita* sp	Skin, Gill
		Trichodina sp	Skin
		Ichthyobodo sp	Skin, Gill
		Costia necatrix	Skin, Gill
		Cryptocaryon irritans	Skin
		Ichthyophthirius sp	Skin, Gill
		Eimeria aurata	Gill
	Trematode	*Dactylogyrus* sp	Gill
		Gyrodactylus salaris	Skin, Gill
	Crustacean	*Ergasilus* sp	Scale, Skin, Gill
		Argulus sp	Scale, Skin, Gill
		Lernaea sp	Skin
	Myxozoa	*Myxobolus* sp	Gill
Endoparasite	Protozoa	*Chilodonella uncinata*	Intestine
	Trematode	*Diplostomum spathaceum*	Intestine
		Clinostomum gideoni	Intestine
	Acanthocephalans	*Acanthocephalus* sp	Intestine
	Myxozoa	*Henneguya* sp	Intestine
		Myxidium giardi	Intestine
	Nematode	*Camallanus anabantis*	Intestine, Liver

District wise quantitative count of parasites in different investigated organ from *A. testudineus* revealed that North 24 Parganas is highly infected followed by West Midnapore and East Midnapore. Organ specificity of parasitic manifestations in district North 24 Parganas was skin > gill > intestine, whereas in West Midnapore and East Midnapore was gill > skin > intestine, respectively (Figure 1). Table 2 represents prevalence (%), mean intensity and mean abundance of parasitic infection of *A. testudineus* in three districts of West Bengal. The highest prevalence (%) and mean abundance of parasitic occurrence was observed in North 24 Parganas followed by West Midnapore and East Midnapore. The highest mean intensity was found at West Midnapore followed by North 24 Parganas and East Midnapore.

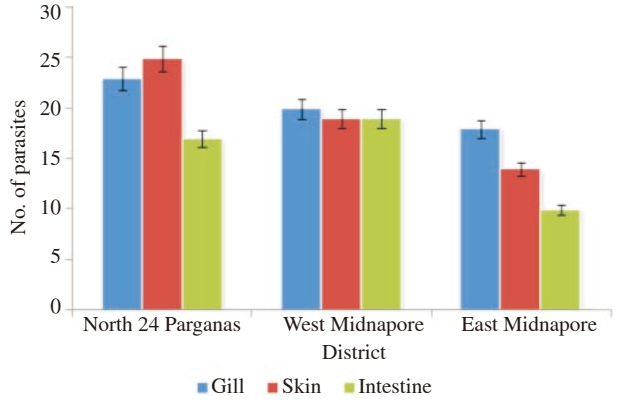

Figure 1. District wise parasitic organ specificity of *A. testudineus* from West Bengal.

Table 2
Prevalence (%), mean intensity and mean abundance of parasitic infection of *A. testudineus* in three districts of West Bengal.

District	No. of host		Total parasites		Prevalence (%)	Mean abundance	Mean intensity
	Examined	Infected	Ecto	Endo			
North 24 Parganas	25	23	48	17	92	2.60	2.83
West Midnapore	25	20	39	19	80	2.32	2.90
East Midnapore	25	21	32	10	84	1.68	2.00

4. Discussion

The biotic integrity of an ecological system is often reflected by the health of organisms that reside in that system. In aquatic ecosystems, fish and particularly those species near the top of the food chain, are generally regarded as representative indicators of overall system health. Fish fingerlings become more susceptible to infection because of their immature immune system[28]. Carnivorous fish generally harbored rich parasite faunas than the predominantly herbivorous forms and metazoan parasites are most common in fishes inhabiting Indian waters that encounter more frequently than microbial infections in natural as well as culture systems[29].

Present study documented 20 parasitic species (additional 6 remain unidentified) in freshwater indigenous air-breathing fish *A. testudineus* from three districts of West Bengal. During the study period, the variations in parasite composition, prevalence, abundance and intensity might be due to host specificity, physico-chemical properties of water, metabolic activity and impaired immune system of fish. Due to accessory respiratory organ, *A. testudineus* can survive in extremely adverse water. Water quality has a great impact on the abundance of fish pathogens and their ability to survive on host[13].

Endoparasitic helminths of *A. testudineus* were well studied rather than the other group of parasites such as protozoans, crustaceans, myxozoans, acanthocephalans, *etc*[15-22]. In consistent with the present study, various workers recovered common intestinal nematode *Camallanus anabantis* from *A. testudineus*[1,15-21]. This intestinal parasite also reported to be harboured by many other indigenous fishes such as *Clarias batrachus*, *Channa gachua*, *Channa punctatus*, *Puntius filamentosus*, *Mastacembelus armatus* and *Trichogaster trichopterus*[30]. According to a recent report, *Henneguya manipurensis* is considered as the main cause of ulcerative disease syndrome in *A. testudineus* in Manipur state of India[31].

The present study revealed that quantitative abundance of parasites was highest in gill. Similar findings was reported that majority of infections like *Myxobolus* sp. were found in the gills of cyprinids [32]. Some authors described that gill myxoboliosis was the most widely distributed disease infecting various species of carps in many states of India and they also reported heavy mortality in Andhra Pradesh during November and December, 2000[33].

Monogenean parasites fishes are one of the major group of parasites infect freshwater fishes that often cause diseases worldwide[34]. Among monogenetic trematodes, *Dactylogyrus* sp infects the gill whereas *Gyrodactylus* sp affects only skin[14]. Moreover, monogenean infection also lead to indirect damage, making the fishes more susceptible to secondary infections by degrading the epithelium and mucous layer[35].

Among eukaryotic organisms, protozoa has vast assemblages and most of them commonly encountered as fish parasites[36]. The

ectoparasitic and endoparasitic protozoa attack the fish, causing massive destruction of skin and gill epithelium, even if moderate protozoal infection on small fish may prove a fatal disease[37]. Present investigation encountered that the gills and skin to be infested by different protozoan parasites. This might be due to the gills are the centre of filter feeding and are the sites of gaseous exchange. The heavy load of parasites on the gills relative to other parts of the body caused impaired respiratory function and resulted death of organisms[38].

Different kind of protozoan parasites like *Trichodina* sp. *Ichthyobodo* sp, *Chilodonella* sp, *etc.* were found on skin, gill, intestine, *etc.* from catfish and tilapia which corroborated the present findings[14,38]. *Cryptocaryon irritans* is a ciliated protozoan which causes a disease known as marine "ich" or marine "white spot" disease in wild and cultured marine fishes at temperatures between 15 ˚C and 30 ˚C[39,40]. Temperature is a crucial benefactor for parasitic outbreak in fishes as discussed by some authors[41]. Similar to the present study, acanthocephalans from the liver, mesentery, stomach and intestine in addition to body cavity from various freshwater fishes were also reported[42,43].

The highest prevalence (%) and mean abundance of parasitic manifestation from *A. testudinus* was observed in North 24 Parganas district of West Bengal. The floodplain wetlands in West Bengal are mostly eutrophicated and clogged with aquatic vegetation resulting sub-optimal water quality, which ultimately affected the general fish health condition[44]. Moreover, neumerous sewage-fed water bodies present in North 24 Parganas district of West Bengal having low dissolve oxygen, high microbial load, high unionised ammonia creating disease induced stress to fish[2].

A little information is available regarding detail parasitic survey of *A. testudineus* in India. The observation from the present short span study will be served as a baseline for the detail health assesment of *A. testudineus* in future. The disease associated threats has now become a primary challenge for growth of aquatic resources which is significantly hampered socio-economic development of fishery. In West Bengal, inland culture and capture based fishery activities mainly rural based and operated by poor farmers. Developing right kind of intervention and managemnt practice can prevent adverse impact of diseases and assist poor farmers for sustainable production.

Conflict of interest statement

We declare that we have no conflict of interest.

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