A survey on gastro-intestinal helminth parasites of *Channa* species at Kanchanrup Municipality, Saptari, Nepal

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ABSTRACT

A survey on gastro-intestinal helminth parasites of *Channa* species was done from the fish markets of Kanchanrup municipality and surrounding rivers and ponds with the help of local fishermen from May 2017 to April 2018. The experimental fishes were carried in the laboratory of Post Graduate Campus, Biratnagar. The visceral masses of the fishes were removed and examined under microscope by simple wet mount preparation for occurrence of various helminth parasites. Data were analyzed using SPSS version 16. *C. orientalis* (n=200) was infected by nematodes (*Capillaria pterophylli*), trematodes (*Gonocerca physidis* and *Genarchopsis goppo*) and cestodes (*Senga* sp.) giving prevalence of 87.5%. Similarly, *C. striatus* (n=225) was infected by nematodes (*Camallanus intestinalis* and *Neocamellanus* sp.), cestodes (*Bothriocephalus* sp.) and acanthacephalan (*Pallisentis ophiocephali*) with prevalence of infection 85.33%. The total multiple infection number was 131(74.9 %) found in *C. orientalis*. *Channa* spp. were heavily loaded by gastro-intestinal helminth parasites which may give rise to a health threat of zoonotic transmission to consumers. Therefore, immediate development of effective control measures and an application of good nourishment practice urgently needed to lower the helminth infection to fishes.

Keyword: snake head fish, *Gonocerca phycidis*, multiple infection, eastern Nepal

INTRODUCTION

Fishes are high quality, cheap and easily available source of animal protein, mainly for human, livestock and fishery itself. About 25 % of the world's protein is contributed alone by fish and shellfish. Their meat is easily digestible containing most of animal proteins, minerals (phosphorus, magnesium, iron, copper, and zinc), vitamins (A&D) and unsaturated fatty acid including Omega-3. Among the various fish species, *Channa* sp. (the snakehead fishes), an important food for Nepalese people, are predatory freshwater teleosts of family Chhanidae inhabiting in streams, reservoirs, lakes, swamps, paddy fields, ponds and lowland stretches of rivers distributed across Bangladesh, west Bengal and Assam of India, Bhutan, Myanmar, Pakistan, Thailand and Sri Lanka including most of the Nepalese riverine system such as Koshi,Gandaki, Karnali , Narayani, Bagmati, Trisuli, etc.

The predatory fish species promote a greater diversity and abundance of larval helminths than herbivorous and planktivorous species (Luque & Poulin, 2004). About 80 % infection of warm water, fishes is caused by parasites (Eissa, 2002). *Channa* species are resistance to the parasites but the adverse conditions like water pollution, temperature fluctuation, absence of suitable foods, low oxygen dissolves and others adverse conditions permit them to become susceptible to the various helminth parasitic infections (Sharma, 2012). Viruses, bacteria and fungi are other agents that cause secondary infection in fishes (Khalil & Polling, 1997). Khurshid & Ahmad (2012) found that locality of its habitat also determines the kinds and acuteness of helminth infections in fishes. Helminth infections also depend on host species, age and immunity of fish, helminth species and its intensity. The helminth parasites are detrimental to fish health either through fatality and distress along with reduction in host's weight and reproduction (Rohde, 1993) or through interference in nutrition, metabolism and secretory function of the alimentary canal, damaging the nervous system (Markov, 1961) leading it to gastrointestinal abrasions and facilitation of invasion by opportunistic microorganisms which drive towards an ultimate economic loss.

The snakehead fishes (*Channa* species) contribute to an important freshwater fishery and have great demand in Terai, Nepal because of their delicious flesh, high protein content and the presence of little bones. In spite of helminth's key role in parasitic

infections on fishes, studies on biodiversity of metazoan parasites are sparse such as *Euclinostomum multicaecum*, *E. heterostomum*,*Genarchopsis goppo*, *Allocreadium handiai*, *Senga ophiocephalina*, *Porrocaecum* sp. , *Ascaridia* sp., *Contracaecum* sp. and *Pallisentis ophiocephali* in *Channa punctatus* (Farzana *et al*., 2019) and Acanthocephala (*Pallisentis* sp.), Trematode (*Allocredium* sp. and *Genarchopsis* sp.), Nematode (*Procamallanus* sp. and *Neocamallanus* sp.) and Cestode (*Senga* sp.) in *Channa* species (Gautam *et al.,* 2018). Furthermore, few works have been carried out on helminth parasite of fishes in Nepal by Gupta (1996), Khanal (2003) and Yadav (2017). Some researchers in the same field from other countries are Chowdhury & Hossain (2015), Singha *et al.* (2015), Ningthoukhongjam *et al*. (2015), Gupta *et al.* (2016), Kundu & Bhuiyan (2016), Mangolsana *et al.* (2016), Gautam *et al.* (2018) and Farzana *et al*. (2019). Therefore, despite its detrimental effect on fish health and economy in fishery industry, only few works so far have been carried out on burden of helminth parasites in the gastro-intestinal tract of *Channa* species. Therefore aim of the present study was to detect the helminth parasites of *Channa orientalis* (Bloch & Schneider, 1801) and *C. striatus* (Bloch, 1793) in Saptari district, eastern Nepal.

Study area

The study was carried out in Kanchanrup Municipality (26.64^{o}N and 86.91^{o}E), Saptari district of Province no. 2, eastern Nepal covering the area of 143.33 sq. km with 63556 of total population. Saptari is rich with fresh water resources having highest number of ponds covering 9397 ha and with the surface area 4055 ha. (Budhathoki and Sapkota, 2018) (fig. 1a and 1b). The collected fishes were brought to Department of Zoology, Post Graduate Campus, Biratnagar, Tribhuvan University for examination and identification of helminth parasites.

Fig. 1. a) Map of Nepal showing Saptari district.

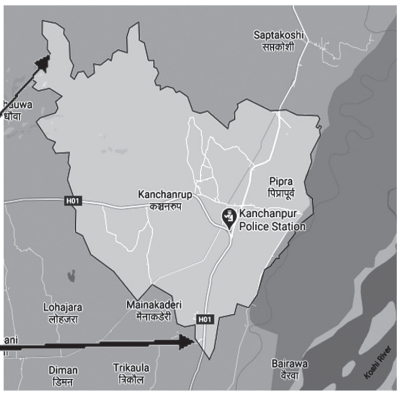

Fig. 1 b) A map of Kanchanrup showing study sites.

MATERIALS AND METHODS

Specimen collection

The snakehead fishes (*Channa orientalis* and *C. striatus*) were collected from fish markets of Kanchanrup municipality and surrounding rivers(Sundari and Paudaha) and ponds with the help of local fishermen from May 2017 to April 2018. After proper washed they were carried to Zoology department of Post Graduate Campus, Biratnagar for examination and identification of helminth parasites. The fishes were dissected to separate the gastro-intestine from the visceral mass of the body. The tracts were kept in petri dish. Then it was cut into pieces, each of one centimeter for observation of helminthes parasites. The cut parts were placed in petri dishes containing saline water. The gut contains were further examined under microscope by simple wet mount preparation for search of various helminthes. The remaining gut content was preserved in vials with formalin. The external and internal morphological characters of each worm were recorded and identified by using standard keys. Data were analyzed using statistical package for the social science (SPSS) version 16.0 and interpreted according to frequency distribution and percentage. Data were recorded regarding the prevalence of helminth parasites in two snakehead fishes. The prevalence of helminth parasites was calculated according to Margolis *et al*. (1982), where, prevalence (p) = the number of infected host with one or more individuals of a particular parasites species divided by number of hosts examined (expressed in percentage).

RESULTS AND DISCUSSION

The snakehead fishes were studied for gastro-helminth parasites which involved *C. orientalis* (n=200) and *C. striatus* (n=225). Out of 425 fish examined, 367 fishes were found to be infected. *C. orientalis* was infected by nematodes, trematodes and cestodes. Similarly, *C. striatus* was infected by nematodes, cestodes and acanthacephalan (table 1).

Table 1. Infection of *Channa* species with gastrointestinal helminth parasites.

Fish species	Group of helminth parasites detected			
	Nematode	Trematode	Cestode	Acanthacephalan
Channa orientalis	+	+	+	-
Channa striatus	+	-	+	+
+ (present); - (absent)				

C. orientalis was infected with 4 helminth species giving prevalence of 87.5%. *Capillaria pterophylli* was observed in 95 fishes (P=47.5%), *Gonocerca phycidis* in 175 fish specimens (p=87.5%), *G. goppa* from 25 fishes (p=12.5%) and *Senga* sp. in 11 fishes (p=5.5%). The fishes infected by trematodes were 175 (table 2).

Table 2. Prevalence of helminth parasites in *Chana orientalis.*

Number of fish examined	Observed parasites	Number of fish infected	Prevalence (P) of infection
200	**Nematodes**	**95**	**47.5%**
	Capillaria pterophylli	95	47.5%
	Trematodes	**175**	**87.5%**
	Gonocerca physidis	175	87.5%
	Genarchopsis goppo	25	12.5%
	Cestoda	**11**	**5.5%**
	Senga sp.	11	5.5%
Total		**175**	**87.5%**

G. phycidis and *C. pterophylli* were concurrently detected from 95 fishes. Similarly, *G. phycidis* and*G. Goppo* were concurrently detected from 25 fishes. Likewise, *G. phycidis* and *Senga* sp. from 11 fishes showing total multiple infection number 131(74.9%) (table 3).

Table 3. Multiple infections of *C. orientalis* with helminth parasites.

Total number of fish examined	Total number of fish infected	Parasites observed	Number (%) of multiple infection with			Total number (%) of multiple infection
			Capillaria pterophylli	*Genarchopsis goppo*	*Senga* sp.	
200	175	*Gonocerca phycidis*	95 (54.3%)	25 (14.3%)	11(6.3%)	131(74.9%)

Out of 225, 192 specimens of *C. striatus* was found to be infected with four species of helminth parasites i.e. *C. intestinalis* from 51 fishes (p=22.67%), *Neocamellanus* sp. from 8 fishes (p=3.55%), *Bothriocephalus* sp. from 71 fishes (p=31.55%) and *P. ophiocephali* from 76 fishes (p=33.78%) (table 4).

Table 4. Prevalence of helminth parasites in *C. striatus.*

Number of fish examined	Observed parasites	Number of fish infected	Prevalence (p) of infection
225	**Nematodes**	**59**	**26.22%**
	Camallanus intestinalis	51	22.67%
	Neocamellanus sp.	8	3.55%
	Cestodes	**71**	**31.55%**
	Bothriocephalus sp.	71	31.55%
	Acanthacephalans	**76**	**33.78%**
	Pallisentis ophiocephali	76	33.78%
Total		**192**	**85.33%**

Channa spp. was heavily loaded with gastro-intestinal parasite with prevalence of 86.35%.

The prevalence of helminth parasites in *C. orientalis* was 87.5% whereas nematodes, trematodes and cestodes were 47.5%, 87.5% and 5.5% respectively. One nematode (*Capillaria pterophylli*), two trematodes (*Gonocerca phycidis* and *Genarchopsis goppo*) and one cestode (*Senga* sp.) were detected in the fishes showing trematodes as more commonly detected parasites than nematodes and cestodes in *C. orientalis*.

Parasites, an important but often neglected component of any ecosystem, drain off energy at virtually every trophic level within a food web giving diverse effects on hosts. They affect behaviour, reduce fecundity and mass mortality causing great economic loss in aquaculture. Fishes become infected with nematodes if they are fed live foods containing

infective life stages or if they are raised in culture settings that promote the growth of other animals carrying the infective stages of the nematode (vector or parasitic host) or allow nematodes to complete their life cycle (intermediate hosts). Some nematodes can be transmitted directly from fish to fish (Yanong, 2017). Srivastava (1975) expressed the mass reproduction and very quickly spread of the parasites taken place when environmental conditions such as water, food and temperature become favorable.

In the present study, the snakehead fishes (*C. orientalis* and *C. striatus*) were studied for their gastrointestinal helminth parasites. *C. orientalis* was infected by nematode *Capillaria pterophylli*. It was not found in *C. striatus* which was infected by two others species of nematode i.e., *Camallanus intestinalis* and *Neocamellanus* sp. Similarly, *C. striatus* was infected by Cestodes *Bothriocephalus* spp. and Acanthocephalans *Pallisentis ophiocephali*. Both of them were absent in *C. orientalis*. It was infected by cestode *Senga* sp. Likewise, *C. orientalis* was infected by two species of trematodes i.e. *Gonocerca physidis* and *Genarchopsis goppo* but not found in *C. striatus*. *C. orientalis* was to be infected with four helminth species i.e.*Capillaria pterophylli*, *Gonocerca phycidis*, *G. goppa* and *Senga*. The prevalence of infection in trematode was maximum (87.5%) in *Gonocerca physidis*. This prevalence of infection by trematode in *C. orientalis* is near to the result of Mangolsana *et al*. (2016) who stated that *C. orientalis* were found to be infected with trematodes (*Allocreadium fasciatusi* and *Metaclinostomum srivastavai*) having prevalence 79.17% (19 out of 24). Similarly, Puinyabati *et al.* (2010) identified two species of trematodes (*A. fasciatusi* and *A. handia*) from *C. orientalis*.

The prevalence of helminth parasites in fishes (*C. striatus*) was 85.33% having infections by Acanthocephalans (33.78%), Cestodes (31.55%) and Nematodes (26.22%). Four species of helminth parasites were identified from gastro-intestine of *C. striatus* i.e. two nematodes (*Camallanus intestinalis* and *Neocamellanus* sp.), one cestode (*Bothriocephalus* sp.) and one acanthacephalan (*Pallisentis ophiocephali*). The result is synchronized with finding of Mangolsana *et al.* (2016), and Kundu & Bhiyan (2016). Mangolsana *et al*. (2016) stated the prevalence of infection was 86.67% for *C. striatus*. Kundu & Bhuiyan (2016) reported four different helminth parasites from *C. striatus* i.e. *Pallisentis ophiocephali*, *Camallanus intestinalus*, *Ascaridia* sp. and *Bothriocephalus cuspidatus*. Also, 100% fish were infected by Acanthocephalans (Ningthoukhongjam *et al*., 2015). The difference in types of parasites in the present study may be due to geological variation (water pollution, temperature fluctuation, the absence of suitable foods, low oxygen dissolves, etc.) and number of fish specimen included in the study. Air breathing fishes are infected by nematodes, cestodes, trematodes and acanthocephalans

as reported by other previous workers like Bhure, 2008.The presence of parasites up to a large extent are dangerous to fish production. They produce disease condition in fish thereby increasing their susceptibility to other diseases, causing nutritive devaluation of fish and fish loss and finally reduced the fish productivity in aquaculture. The parasitic diseases, either alone or in conjunction with other environmental stresses, may influence weight and reproduction of the host, alter its population characteristics or affects its economic importance. The common clinical signs occur due to nematode (adult and larvae) infection include haemorrhage, inflammation, adhesions, oedema, necrosis, encapsulation, granuloma formation, atrophy, ulceration, degeneration, erosion of the layer of the intestine and stomach. The adult is the inhabitant of the intestine in fishes as suggested by Das (2015) and Ranibala *et al*. (2013).Nematodes utilize the predatory fishes like *Channa* sp. as intermediate or temporary hosts and can infect all organs of their hosts with heavier infections as suggested by Paperna (1996b).

Channa sp. is heavily loaded by gastro-intestinal helminth parasites might be the result of poor water quality, crowding and absentees of favorable foods enhancing suitable habitats for those parasites. The hazard of multiple and simultaneous infection of helminth may give rise to a health threat of zoonotic transmission to consumers. The parasitic infections to fishes influence their productivity, marketability and death of fishes resulting great loss to fish farmers. Therefore, immediate development of effective control measures and an application of good nourishment practice are necessary to lower the helminthes infection to fishes.

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