ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 8, Issue, 03, pp. 27323-27328, March, 2016

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

RESEARCH ARTICLE

DIVERSITY OF HELMINTH PARASITE OF FOOD FISHES OF IKOP LAKE, THOUBAL DISTRICT, MANIPUR INDIA

[1]Khumukcham Mangolsana, *,[2]Ngasepam Romen, [3]Ningthoukhongjam Indira, [3]Chabungbam Bijayalakshmi and [3]Shomorendra, M.

[1]Department of Zoology, Kakching Khunou College, Umathel 795103 Manipur
[2]Department of Life Science and Bioinformatics, Assam University Silchar-788011
[3]Department of Zoology, Thambal Marik College, Oinam 795134, Manipur

ARTICLE INFO

Article History:
Received 08th December, 2015
Received in revised form
15th January, 2016
Accepted 29th February, 2016
Published online 16th March, 2016

Key words:

Ikop Lake,
Intensity,
Parasite, Prevalence,
Economic source.

ABSTRACT

The present research paper communicates the helminth parasites infection rate of the fishes of Ikop Lake, Thoubal District, Manipur. A total of 1114 fishes were sacrificed during my investigation, 35 different fish species were examined for helminth parasites infection. Of these 697 fish individual belonging to 19 different fish species are found to be parasitized with a total of 1395 helminth parasites. Ikop Lake (locally called as Ikop Pat) contributes 35 fish species under 28 genera, 15 family and 5 orders. About 34 different of parasite groups (*viz.* Nematode, Acanthocephala and Cestode. The intensity of infection rate was recorded highest in the host like *Clupisoma garua* (3.6, 44.44%), *Macrognathus aculeatus* (3.6, 41.18%) and lowest in *Trichogaster fasciata* (1.3, 76.19%). The prevalence percentage infection is recorded highest and lowest in *Channa striata* (86.67%, 1.8) and *Systomus sarana* (15.94%, 3.0) of Ikop Lake.

Citation: Khumukcham Mangolsana, Ngasepam Romen, Ningthoukhongjam Indira, Chabungbam Bijayalakshmi and Shomorendra, M., 2016. "Diversity of helminth parasite of food fishes of Ikop Lake, Thoubal District, Manipur India", *International Journal of Current Research,* 8, (03), 27323-27328.

INTRODUCTION

Fishes are one of the important food items of many people around the globe. They become important economic source for many people, as well as many nations. They are also act as good indicator of water pollution. They also directly or indirectly influence to life of human being. Fish has been associated with the life of the people of NE India since time immemorial. Fishes become very important not only for their food value, but also for their role in the economy of the state. Fish have great significance in the life of mankind which also plays significant role as source of protein and providing certain important useful products as well as economic sustenance to various nations (Binky, *et al.,* 2013). Fishes are very important and most acceptable food because of its nutritive value. So much emphasis may be given to fish farmers for more production in India (Puinyabati, *et al.,* 2010).

***Corresponding author: Ngasepam Romen,**
Department of Life Science and Bioinformatics, Assam University Silchar-788011.

Fishes are abundant in most water bodies as well as in nearly all aquatic environments, from high mountain streams to the abyssal and even hadal depths of the deepest oceans. At 32,000 species, fish exhibit greater species diversity than any other group of vertebrates (Goldman, (1997). North-East (NE) is endowed with huge fishery potential, in Assam possesses immense fishery resources in the form of rivers, Beels, swamps, ponds, tanks, and paddy fields. Fishery is considered to be the important sectors for the economy of the state (Das, *et al.,* 2014). Helminths are multicellular, eukaryotic animals that generally possess digestive, circulatory, nervous, excretory, and reproductive systems. Some are free-living in soil and water. Helminths are parasitic worms that feed on a living host to gain nourishment and protection, while causing poor nutrient absorption, weakness and disease in the host. Helminths are studied in microbiology because they cause infectious diseases and most are diagnosed by microscopic examination of eggs or larvae. Helminths infect more than one-third of the world population. Helminth infections differ from bacterial or protozoan infections because the worms do not usually increase in number in the host. Symptoms are usually due to mechanical damage, eating host tissues, or completing

for vitamins. In this exercise, we will examine prepared slides of parasitic helminthes. Parasite is an important group of pathogen causes infection and diseases of fish both in freshwater and marine environments. With the increasing interests in aquaculture parasitic infestations are becoming threats for fish health management and aquatic crop production throughout the world. It is therefore an essential area for proper attention to be given by the scientists for sustainable aquaculture production (Chandra, 2006). There is a bewildering array of fish parasites and probably all the fish species harbour one or more parasite species. (Chubb, 1980 and 1982) illustrated the studies of seasonal occurrence of helminthes in freshwater fishes in different climatic zones of the world. Work of Yamaguti (1951, 1961) related the occurrence of helminth parasite in vertebrate host is of immense importance, (Gupta, 1961) described new cestodes from freshwater fishes. Jha (1989) studied the characterization of parasite fauna of fishes of Muzaffarpur, Bihar. Shomorendra and Singh, *et al.* (2013) reported 40 species of fishes belonging to 27 genera, under 14 families and 7 orders from Pumlen Lake Thoubal District Manipur. Devi, *et al.* (2014) reported 35 fish species belonging to 5 orders, 15 family and 28 genera from Ikop Lake, Thoubal Manipur.

Ngasepam, *et al.* (2015) reported 49 different fish species under 32 genera, 17 family and 6 orders in Jatinga River, Assam. Binky *et al.* (2011) studied the diversity of helminth parasites in fishes of Karbhala wetland in Cachar District of Assam. Das, D. and Goswami, (2014) made a detail study on helminth infection in *Anabas testudineus* of three wetlands of Goalpara, Assam. Das, *et al.* (2014) studied the multiple infections of helminths in the stomach and intestine of *Clarias gariepinus.* Distribution of helminth parasites in different organs and their seasonal rate of infestation in three freshwater fishes of Goalpara, Assam, India Das, D. and Goswami, (2014). Ngasepam, and Kar, (2014) give a detail report on abundance and distribution of helminth parasites in the fishes of Sone Beel, the biggest wetland in Assam. Das, G. *et al.* 2015 made a detail study on parasitic study of Indian Major Carp, *Catla catla*. Singh, *et al.* (2015) studied the diversity of helminth parasites infection of the fishes of Jatinga River, Assam India. Ikop Lake (locally called as Ikop Pat) is one of the important freshwater wetland of Manipur which lies between $94^0 0^{'}$ to $94^0 15^{'}$ E and $24^0\ 15^{'}$ to $25^0\ 30^{'}$ N at Thoubal District of Manipur which is about 42 km from Imphal. The Lake lies at the elevation of 772 m above the MSL[6]. The Lake surface area is 13.5 km^2 while the depth ranges from 0.93 and 1.59m. The volume of the Lake is estimated as 0.013 cu m. Fishing is an important source of livelihood of the inhabitants of the surrounding area of the lake. So far, there are no reports on the study of helminth parasites of the fishes of lake. The main objective of this study is to find out the diversity of fishes as well as helminth parasites diversity of fishes of Ikop Lake, Manipur.

MATERIALS AND METHODS

The fish hosts examined for the helminthes infection in the present study were collected during survey work in April 2015 to February 2016 from Ikop Lake. Before examination of helminth parasites, the weight, total length and sex of fish were entered as host data on an accession card with a reference number for each fish specimens. The fishes were examined thoroughly for external and internal helminth parasites. The sex of the fish was determined by inspecting the urino-genital papillae which is pointed and narrow in males and broad and square in females (Miller, 1984) and by observing the reproductive organs. First of all a systematic list of different fish species in present study site was prepared with the help of standard taxonomic keys like Jayaram, 2010 and Vishwanath, 2002. Small fishes were killed by pithing and somewhat larger specimens by blow on the top of cranium. The external body surfaces as well as the internal body organs (alimentary canal, liver, heart, kidney, gonads, and swim bladder) were thoroughly examined for the parasites. The parasites collected were being fully relaxed, were fixed in the fixatives prescribed for different helminthes group. The trematodes were fixed in AFA (alcohol-formalin-acetic acid) solution and stored in 70% alcohol, acanthocephalan fixed and preserved in AFA, cestodes in 5% formalin and nematodes after immersing in warm 70% alcohol were finally stored in 70% alcohol (Bylund, *et al.,* 1980). To facilitate identification of the worms, the trematodes and the cestodes were stained in alum carmine, dehydrated in glacial acetic acid, cleared in methyl salicylate and mounted in canada balsam while in the case of nematode and acanthocephala the worms were cleared in lactophenol and mounted in glycerin jelly (Margolis, *et al.,* 1982).

RESULTS AND DISCUSSION

A total of 1114 fish species were sacrificed during my investigation, 35 different fish species were examined for helminth parasites infection. Of these 697 fish individual belonging to 19 different fish species are found to be parasitized with a total of 1395 helminth parasites. (Table:3). Ikop Lake contributes 35 fish species under 28 genera, 15 family and 5 orders (Table 1). About 34 different parasite groups *viz.* 12 species of Nematode, 9 species of Trematode, 3 species of Acanthocephalan and 10 species of Cestodes (Table 2). The intensity of infection rate was recorded highest in the host like *Clupisoma garua* (3.6, 44.44%), *Macrognathus aculeatus* (3.6, 41.18%) and lowest in *Trichogaster fasciata* (1.3, 76.19%). The prevalence percentage infection is recorded highest and lowest in *Channa striata* (86.67%, 1.8) and *Systomus sarana* (15.94%, 3.0) of Ikop Lake (Table 3). According to Aloo *et al.* (2004) the main reason for the differences in the parasitic load with sex is physiological. Our study also that observed that the prevalence and intensity of parasite of different groups varied for sex of host. Diseases affect the normal health conditions and cause and reduction of growth, abnormal metabolic activities and even death, thus results great economic loss. Healths of population depend on the control of diseases and maintenance of a healthy relationship between living creature and their environment (Snieszko, 1983). Five factors directly influence the parasitic fauna of the fishes like age, diet, abundance of the fishes, independent number of the parasites within fish and season (Kabatta, 1985). Srivastava, (1975) also stated that the characteristic of any form of water body can influence and determine its parasitic fauna and when environment conditions such as water, food and temperature become flavourable for mass reproduction of parasites, the disease may spread very quickly.

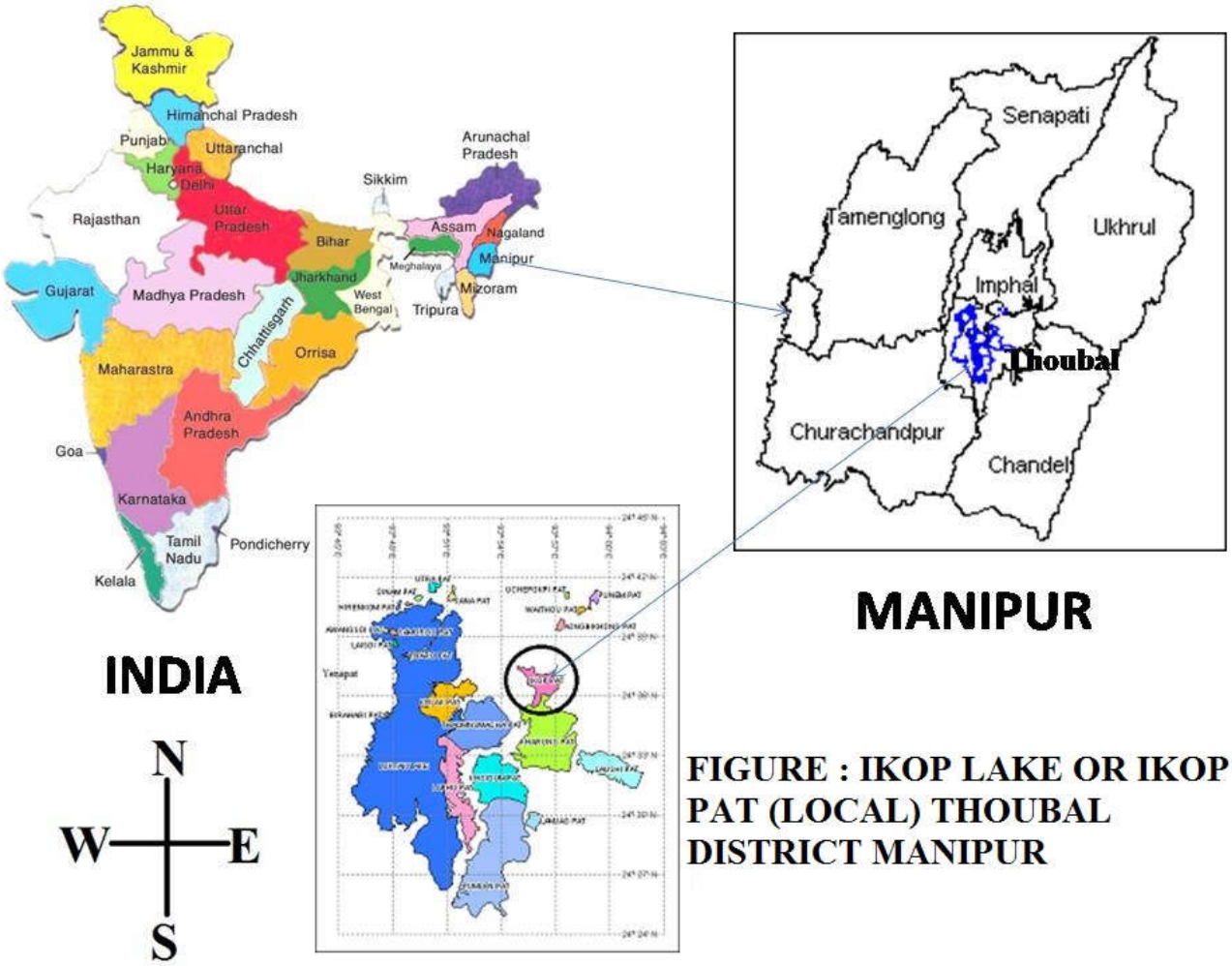

FIGURE : IKOP LAKE OR IKOP PAT (LOCAL) THOUBAL DISTRICT MANIPUR

Figure. The study site of Ikop Lake

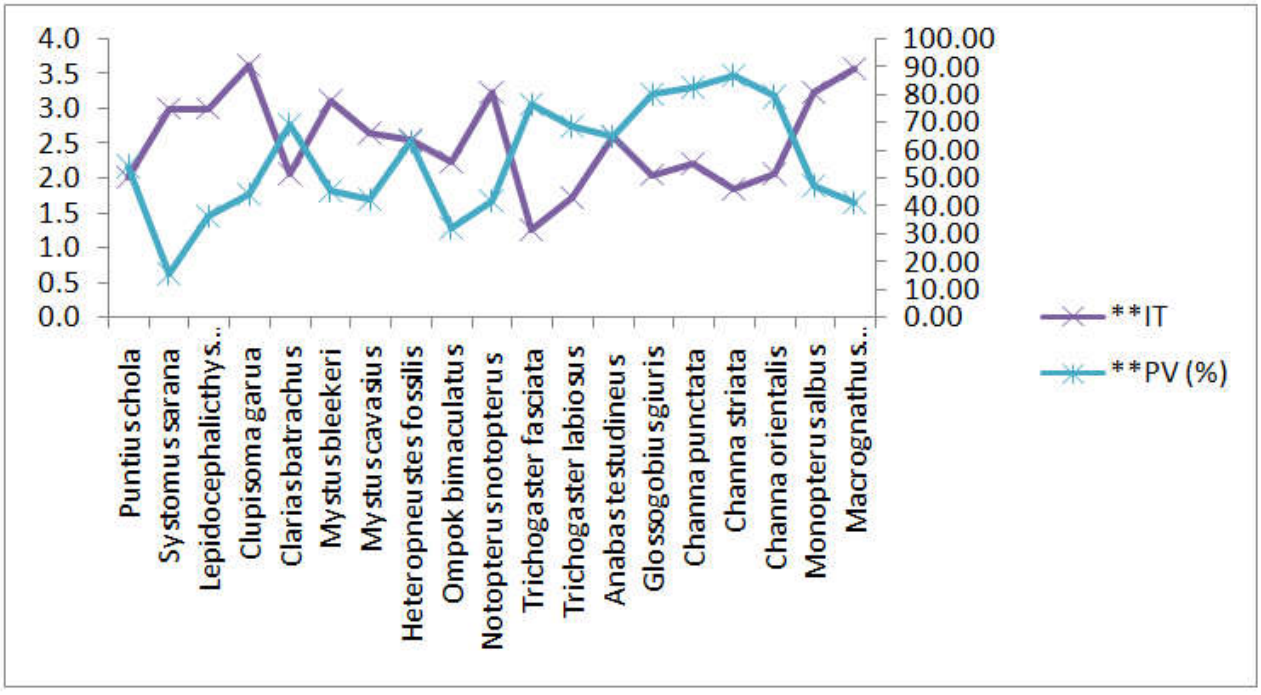

Figure 2. The intensity (IT) Prevalence Percentage (PV) of helminth infection in the fishes of Ikop Lake

Table 1. Fish diversity of Ikop Lake Thoubal District Manipur

S No.	Name of fish	Local name	Order	Family
1	*Amblypharyngodon mola*	Mukak nga	Cypriniformes	Cyprinidae
2	*Barilius gatensis*	Ngawa	Cypriniformes	Cyprinidae
3	*Barilius bola*	Ngawa	Cypriniformes	Cyprinidae
4	*Catla catla*	Bao	Cypriniformes	Cyprinidae
5	*Cyprinus carpio*	Puklaobi	Cypriniformes	Cyprinidae
6	*Esomus altus*	Beluntongbi	Cypriniformes	Cyprinidae
7	*Neolissochilus hexagonolepis*	Ngara	Cypriniformes	Cyprinidae
8	*Bangana dero*	Khabak	Cypriniformes	Cyprinidae
9	*Labeo angra*	Ngaton	Cypriniformes	Cyprinidae
10	*Labeo calbasu*	Ngathi	Cypriniformes	Cyprinidae
11	*Labeo rohita*	Rou	Cypriniformes	Cyprinidae
12	*Osteobrama belangeri*	Pengba	Cypriniformes	Cyprinidae
13	*Puntius chola*	Phabounga	Cypriniformes	Cyprinidae
14	*Systomus sarana*	Nganoi	Cypriniformes	Cyprinidae
15	*Pethia ticto*	Phabounga	Cypriniformes	Cyprinidae
16	*Ctenopharyngodon idella*	Silver carp	Cypriniformes	Cyprinidae
17	*Garra lamta*	Ngamu sangum	Cypriniformes	Cobitidae
18	*Lepidocephalicthys guntea*	Ngakijou	Siluriformes	Cobitidae
19	*Clupisoma garua*	Ngahei	Siluriformes	Schilbeidae
20	*Clarias batrachus*	Ngakra	Siluriformes	Clariidae
21	*Mystus bleekeri*	Ngasep	Siluriformes	Bagridae
22	*Mystus cavasius*	Ngasep	Siluriformes	Bagridae
23	*Heteropneustes fossilis*	Ngachik	Siluriformes	Heteropneustidae
24	*Ompok bimaculatus*	Ngaten	Siluriformes	Siluridae
25	*Notopterus notopterus*	Ngapai	Osteoglossiformes	Notopteridae
26	*Trichogaster fasciata*	Ngapemma	Perciformes	Osphronemidae
27	*Trichogaster labiosus*	Phetin	Perciformes	Osphronemidae
28	*Anabas testudineus*	Ukabi	Perciformes	Anabantidae
29	*Chanda nama*	Ngamhai	Perciformes	Ambassidae
30	*Glossogobius giuris*	Nailon ngammu	Perciformes	Gobiidae
31	*Channa punctata*	Ngamu Bogra	Perciformes	Channidae
32	*Channa striata*	Porom	Perciformes	Channidae
33	*Channa orientalis*	Meitei ngammu	Perciformes	Channidae
34	*Monopterus albus*	Ngaprum	Synbranchiformes	Synbranchidae
35	*Macrognathus aculeatus*	Ngaril	Synbranchiformes	Mastacembelidae

Table 2. List of helminth parasites recovered from the fishes of Ikop Lake

S. No.	Fish host	Cestodes	Nematode	Trematodes	Acanthocephalan
1	*Puntius chola*	*Lytocestus* spp.	Nil	Nil	*Pallisentis ophiocephali, Acanthosentis* spp.
2	*Systomus sarana*	Nil	Nil	Nil	*Acanthosentis* spp.
3	*Lepidocephalicthys guntea*	Nil	*Procamallanus saccobranchi*	Nil	Nil
4	*Clupisoma garua*	Nil	Nil	*Plagio porus* spp.	*Pallisentis ophiocephali*
5	*Clarias batrachus*	*Lytocestus fossilis, Djombangia penetrans, Djombangia* spp. *Lytocestus attenuatus Lytocestus indicus*	*Procamallamus saccobranchi*	*Astiotrema reniferum*	Nil
6	*Mystus bleekeri*	*Lytocestus fossilis, Pseudolytocestus spp, Introvertus raipurensis*	*Goezia* spp., *Spinitectus* spp. *Philometra* spp., *Procamallanus saccobranchi*	Nil	Nil
7	*Mystus cavasius*	*Lytocestus* spp.	*Pseudoproleptus* spp.	Nil	Nil
8	*Heteropneustes fossilis*	*Lytocestus fossilis, Lytocestus indicus*	*Haplonema spp.*	*Astiotrema reniferum*	*Acanthocephalus heteropneusti*
9	*Ompok bimaculatus*	Nil	Nil	Nil	Nil
10	*Notopterus notopterus*	Nil	Nil	Nil	Nil
11	*Trichogaster fasciata*	Nil	*Cosmoxynemoides colisi*	*Allocreadium fasciatusi, Clinostomum complanatum*	Nil
12	*Trichogaster labiosus*	Nil	*Cosmoxynemoides colisi*	*Clinostomum complanatum, Allocreadium fasciatusi*	Nil
13	*Anabas testudineus*	Nil	*Paraquimperia manipurensis, Rhabdochona spp., Camallanus anabantis*	*Astrotrema reniferum, Allocreadium fasciatusi, Metaclinostomum srivastavai, Allocreadium handi*	Nil
14	*Glossogobius giuris*	*Ophiotaemia* spp.	Unidentified spp.	Nil	*Pallisentis ophiocephali*
15	*Channa punctata*	*Senga* spp.	*Philometra* spp., *Paragendria* spp.	*Genarchopsis gopo Allocreadium fasciatusi, Metaclinostomum thaparus, Metaclinostomum srivastavai*	*Pallisentis ophiocephali*
16	*Channa striata*	Nil	Nil	Nil	*Pallisentis indica, Pallisentis ophiocephali*
17	*Channa orientalis*	Nil	Nil	*Allocreadium fasciatusi, Metaclinostomum srivastavai*	Nil
18	*Monopterus albus*	Nil	Nil	Nil	Nil
19	*Macrognathus aculeatus*	Nil	*Paracarophis spp.*	Nil	Nil

Table 3. Prevalence and intensity of helminthes parasites of Ikop Lake

S. No.	Fish host	**TFE	**TFI	**TNOP	**IT	**PV (%)
1	*Puntius chola*	81	44	88	2.0	54.32
2	*Systomus sarana*	69	11	33	3.0	15.94
3	*Lepidocephalicthys guntea*	33	12	36	3.0	36.36
4	*Clupisoma garua*	18	8	29	3.6	44.44
5	*Clarias batrachus*	49	34	70	2.1	69.39
6	*Mystus bleekeri*	22	10	31	3.1	45.45
7	*Mystus cavasius*	26	11	29	2.6	42.31
8	*Heteropneustes fossilis*	68	43	110	2.6	63.24
9	*Ompok bimaculatus*	28	9	20	2.2	32.14
10	*Notopterus notopterus*	31	13	42	3.2	41.94
11	*Trichogaster fasciata*	210	160	200	1.3	76.19
12	*Trichogaster labiosus*	180	123	210	1.7	68.33
13	*Anabas testudineus*	77	50	130	2.6	64.94
14	*Glossogobius giuris*	55	44	90	2.0	80.00
15	*Channa punctata*	62	51	112	2.2	82.26
16	*Channa striata*	45	39	72	1.8	86.67
17	*Channa orientalis*	24	19	39	2.1	79.17
18	*Monopterus albus*	19	9	29	3.2	47.37
19	*Macrognathus aculeatus*	17	7	25	3.6	41.18
TOTAL		1114	697	1395	2.0	62.57

**TFE=Total Fish Examined, TFI=Total Fish Infected, TNOP=Total Number of Parasite, IT=Itensity, PV=Prevalence

The parasitic infection is greatly influenced by the season, which basically interferes with ecology and physiology of the fish. During the breeding season of fish lesser number of parasites invades the host because of the presence of the estrogen (Rahman and Jahan, 2002). The presence of certain helminth parasites, especially larval trematode is known to eliminate or reduce the reproduction in molluscs (Rahman and Jahan 2005). Singh *et al.* 2013 observed that fish disease due to helminth parasites is one of the important problems in fish culture and fish farming. The importance of the fish parasites is related directly to the importance of the fish they may affect. Ngasepam and Kar, (2014) discussed that the fish internal organs are disturbed (bulging of stomach and intestine) by the parasites. The infestation rate was lower in males than females. Helminth parasites inhabit in stomach, intestine, liver, body cavity, duodenum and airbladder. Hosts of intermediate length and weight were found to be more infected than the hosts of smaller and larger length. From this study it has been observed that the seasonal variation of parasites existed among the studied location and also in respect of fish species investigated. Singh *et al.* (2015) discussed that the infestation rate is lower in males than females and they mainly inhibit in stomach, intestine, liver, body cavity, duodenum and air bladder. Host of intermediate weight and length had got high infection rate. Further research need to be carried out for studying parasites as well as diseases of other species in the country to depict elaborate and full information of fish diseases of Ikop Lake, Manipur, India. Fish diseases are the great threat in our fish culture system. Many fish species affects by various types of diseases every year and as a result, production of fishes decreases significantly in Manipur. Necessary steps should be taken to prevent fish diseases and to protect these important fish species from extinction. From overall study it was observed that the parasites were most important pathogen for diseases outbreak. It was also observed that there was a direct relation between disease outbreak among fishes and environmental factors.

Acknowledgement

Authors are thankful to UGC, NERO, Guwahati for granting a minor research project to the first author. The authors are also thankful to the Head, Department of Life Science and Bioinformatics, Assam University, Silchar and Coordinator and Head, Institutional Level Biotech Hub, Department of Zoology, Thambal Marik College, Oinam, and Principal and Head of Department Zoology, Kakching Khunou College, Umathel, Thoubal Manipur for giving laboratory facilities.

Thanks are also goes to Prof. Umapati Sahay, the former Head of the Dept. of Zoology and Dean, faculty of Science, Ranchi University, Ranchi and Dr. B.K Sinha Head, Dept. of Zoology, S.S.M. College, Ranchi for helping identification of the specimens and providing necessary laboratory facilities.

REFERENCES

Aloo, P.A., Anam, R.O. and Mwangi, J.N. 2004. Metazoan parasites of the some commercially important fish along the Kenyan Coast. Western Indian Ocean. *J. Mar. Sci.,* 3 (1): 71-78.

Binky, K., Ranibala, T., Shomorendra, M. and Kar, D. 2011b. Diversity of Helminth Parasites in Fishes of Karbhala Wetland in Cachar District of Assam. *Environment & Ecology*. 29 (1): 20-21.

Binky, K., Shomorendra, M. and Kar, D. 2013. Population dynamics of the genus *Metaclinostomum* (Clinostomatidae) in *Channa puntatus* (Bloch) from Karbhala wetland in Assam. Vol.19 No. 343-348pp.

Bylund, G., Fagerholm, H.P., Calenius, G., Wikgreen, B.J. and Wikstrom, M. 1980. Parasites of fish in Finland - ii. Methods for studying parasite fauna in fish. *Acta Acad. Aboenisis*, 40(2): 1-23.

Chandra, K.J. 2006. Fish Parasitological Studies in Bangladesh: A Review. *J Agric Rural Dev* 4(1&2), 9-18.

Chubb, J.C. 1980. Seasonal occurrence of helminth parasite in fishes Part III. Monogenea. *Advances in parasitology.* Academic Press, York, USA. 18: 1-120pp.

Chubb, J.C. 1982. Seasonal occurrence of helminth parasite in fishes Part IV. Adult Cestoda, Nematoda and Acanthocephala. *Advances in parasitology.* Academic Press, New York, USA. 20: 1-292pp.

Das, B.K., Kar, S. and Kar, D. 2014. Studies on prevalence, abundance and intensity of fish parasites in *Monopterus cuchia*. *Indian J. Applied & Pure Bio*. Vol. 29 (1), 25-32.

Das, D. and Goswami, M.M. 2014. Distribution of Helminth parasites in different organs and their seasonal rate of infestation in three freshwater fishes of Goalpara, Assam, India. *Res. J. Ani. Vet. & Fish. Sci.* Vol. 2(9), 13-17pp.

Das, D. and Goswami, M.M. 2014. The helminth infection in *Anabas testudineus* of three wetlands of Goalpara, Assam. *J. applied & Nat. Sci.* 6 (2): 677-679pp.

Das, G., Sharma, B.B., Chakraborty, D. and Mukherjee, D. 2015. Parasitic study of Indian Major Carp *Catla catla* (Hamilton, 1822) in selected District of west Bengal, India. *Int. J. adv. Sci. & technical research.* Issue 5 Vol.1. 75-83pp.

Devi, I.S., Singh, O, S. and Singh, S.S. 2014. Studies on species diversity of fishes found in Ikop Pat, Thoubal District, Manipur. *Proceeding of Two Day National Seminar on "Recent Advances in Fishery Science"* 7-8 March, 155-159pp.

Fish Base". Fish Base. February 2011. http//www.fishbase.org

Goldman, K.J. 1997. Regulation of body temperature in the white shark, *Carcharodon carcharias*. *Journal of Comparative Physiology*. B Biochemical Systemic and Environmental Physiology 167 (6): 423–429.

Gupta, S.P. 1961. *Morphology life history and biophysical studies of helminth parasites.* D. Sc. Thesis. Dept. Zool., Lucknow Univ., Lucknow, India

Jayaram, K.C. 2010. The freshwater fishes of the Indian region. Narendra Publ House (Delhi) Second revised edition. PP xxxi+616.

Jha, A.N. 1989. Characteristics of parasitic fauna of the fishes of Sikandarpur reservoir as the Muzzaffarpur, Bihar, India

Kabata, Z. 1985. Parasites and disease of fish cultured in the tropics. Taylor and Francis Ltd., London. 318pp.

Kar, D. and Sen, N. 2007. Systematic list and distribution of fish biodiversity in Mizoram, Tripura and Barak drainage in North East India. *Zoos Print Journal* 22(3)2599-26007pp.

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

Ngasepam, R.S. and Kar D. 2014. Abundance and Distribution of Helminth Parasites in the Fishes of Sone Beel, the biggest wetland in Assam. *International Journal of Scientific Research.* Vol: 3. Issue: 12. 2277-8179pp.

Ngasepam, R.S., Bijayalakshmi, C., Shomorendra, M., Bimola, M. and Kar, D. 2015. Ichthyodiversity of Jatinga River in Dima Hasao District (DHD), Assam. *Proceedings of Silapathar Science* College. (accepted)

Ngasepam, R.S., M, S. and Kar, D. 2015. A check list fish species diversity of Sone Beel, the biggest wetland in Assam. *NeBio. An International Journal of Environment and Biodiversity.* Vol. 6 (1). 21-26pp.

Puinyabati, H. M. Shomorendra, M and Kar, D. 2010. Studies on trematode parasites of air breathing fishes of Awangsoi Lake, Manipur. *Journal of Applied and Natural Science* 2 (2): 242-244.

Rahman, M. R. and Jahan, M. S. 2005. Larval Trematode Parasites of Freshwater Gastropods. *Bangladesh J. Zool.* 33(1), 13-34.

Rahman, M. R. and Jahan, M.S. 2002. Consequences of Larval Helminth Infecting Freshwater Gastropods. *Bangladesh J. Zool.* 30(2), 101-114.

Singh, N. R., Das, B.K., Shomorendra, M. and Kar, D. 2013. Fish diversity of Pumlen Lake in Manipur with a note on traditional fish catching devices. *Indian J. of applied research* Vol. 3, No. 10, 46-48pp.

Singh, N. R., Shomorendra, M. and Kar, D. 2013. Helminth Parasite Fauna of the Fishes of Pumlen Lake, Thoubal District, Manipur. *Research Frontiers in Wetlands, Fishery & Aquaculture*. Dominant Publisher & Distributor Pvt. Ltd. New Delhi 215-220pp.

Singh, N.R., Shomorendra, M. and Kar, D. 2015. A Diversity of Helminth Parasites Infection of the Fishes of Jatinga River, Assam India. *Uttar Pradesh J. Zool.* 35(2):151-159pp.

Snieszko, S. F.1983. Diseases of fishes: Research and Control. *Fisheries.* 8, 20-22.

Srivastava, C. B. 1975. Fish pathological studies in India: A brief review. Dr. B.S. Chauhan Comm. pp 649-358.

Vishwanath, W. 2002. Fishes of North East India. *NATP Publication*, Manipur University, pp.1-195pp.

Yamaguti, S. 1958. *Systema helminthum* Volume I. *The digestive Trematodes of vertebrates.* Interscience, New York, USA.

Yamaguti, S. 1961. *Systema helminthum.* Volume III. The nematode vertebrates Partt I and II. Interscience, New York, USA. 1-1261pp.

****