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RESEARCH ARTICLE

Diversity and Ecology of Metazoan parasites of *Channa gachua* (Ham.) of Lake Mansar, Jammu

*Ranvijay Singh**

Dean of Research Studies, The Cluster University of Jammu, Nawabad, Jammu, Nawabad, Jammu and Kashmir 180001, India

Corresponding Author : Ranvijay Singh (ranvijaysingh172@gmail.com)

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ABSTRACT

A study on the metazoan parasites of Channa gachua (Ham.) from Mansar Lake, Jammu was conducted and out of 240 fish hosts examined, 171 were found infected with metazoan parasites. The parasite fauna was recorded comprised of both adult and larval forms. A total of 6 adult species, which includes Digenean Trematoda: Phyllodistomum mansari, Allocreadium A. gachuai n. sp, Genarchopsis G. piscicola; Cestoda: Ancistro-cephalus sp; Nematoda: Camallanus jammuensis n. sp., Pseudoproleptus macrognathus and 3 larval forms; Trematoda: Clinostomum giganticum, Euclinostomum reticultum, Nematoda: Camallanus were recorded. The prevalence and mean intensity of metazoan parasites were higher in the month of summer (April to July) and falling to low during winter (December to February). Host size had a positive correlation with the prevalence and dominance of the parasites. Sex of the host had no affect on the seasonal distribu-tion of the parasites. Allocreadium A. gachuai was the most dominant parasite community.

Keywords: *Diversity, metazoan, Channa gachua, ecology, prevalence, mean intensity, dominance*

INTRODUCTION

Fish serve as a source of animal protein for Man. Both qualitatively and quantitatively the biology of fish parasites is little known in different water bodies of Jammu. Studies on the fish parasites from Jammu province are relatively recent [6] [33], [20], [11] [14-16] [26]

The ecology of animal parasites is a very interesting and significant part of modern research [5] thoroughly reviewed factors believed to be involved in the seasonal distribution of fish helminthes and discussed numerous studies dealing with several geographical areas of the world. The present investigation is the first on the diversity and ecology of metazoan parasite infecting *Channa gachua* from lake mansar, Jammu.

MATERIAL AND METHODS

In total 240 *Channa gachua* were collected from Mansar lake Jammu. Fish were collected with the use of a steel mesh hand net and variable mesh gill nets. Fish were transported to the laboratory alive, measured, sexed, and necropsied within 24 hrs of collection. The alimentary canal viscera and Gonads were removed and placed in separate petri dishes containing normal saline. The parasites were fixed the acetic acid formalin-alcohol stained the various carmine stains and prepared as a whole mount. All measurements are in millimeters. The nomenclature

to define ecological parameters is under that of [19] and significance is taken at P<0.05. Only adult parasites were subjected to ecological analysis. Dominance is the total number of individuals of a particular parasite species expressed as a percentage of the total number of all parasites in that sample.

RESULTS AND DISCUSSION

During the investigation period, the fish *Channa gachua* was parasitized by 9 different parasite species of which 6 were found as adult parasites and three as larval parasites. Of the adult species of parasites, 3 species were of digenean trematodes (*Phyllodistomum mansari*, *Allocreadium A. gachuai* n. sp, *Genarchopsis G. piscicola*); 1 of a cestode (*Ancistrocephalus* sp;) and 2 of a nematode (*Camallanus jammuensis n. sp.*, *Pseudoproleptus macrognathus*). The other three species, which were found as larval stages included 2 clinostome metacercaria (*Clinostomum giganticum*, *Euclinostomum reticultum*) and nematode larvae (*Camallanus sp.*) Diversity and infection prevalence of the metazoan is represented in table 1.

Diversity analysis

Phyllodistomum mansari [33] (Fig. 1)
Family: Gorgoderidae [14-15]
Sub-family: Phyllodistominae [24] [35]
Location: Intestine
The worms describe belong to *Phyllodistomum* for reasons; two unbranched testes, uterus not spreading into the lateral field of forebody, absence of cirrus pouch, and presence of laurel's canal.

***Alloceradium Alloceradium gachuai* n.sp.** (Fig. 2)
Family: Alloceradidae [16] [31].
Sub-Family: Alloceradinae [16]
Location: Intestine
The worm belongs to the genus *Alloceradium* because, the vitelleria are spread in the hind body extending but only a little into the fore body, but no further cephlad of the ovary, an oral sucker is non appendiculate.

Genarchopsis Genarchopsis piscicola [30] (Fig. 3)
Family: Hemiuridae [17]
Subfamily: Helipeginae [7]
Location: Intestine
The worms fall under the genus *Genarchopsis* [25], due to; a tubular parsprostatica, a prostatic complex enclosed in a thin-walled sac, simple hermaphroditic duct, Posteriorly united caeca.

***Ancistrocephalus* sp.** [21] (Fig. 4)
Order: Pseudophyllidea [3]
Family: Triaenophoridae [13]
Location: Intestine
The worms assigned to genus *Ancistrocephalus* sp. [21] for reasons of; having a scolex with an apical disc armed with a circle of small hooks, conspicuous neck, distinct external metamerism, proglottids broader than long and craspedote, testes irregularly confined in two lateral fields, a posteriorly placed bilobed ovary, uterus narrowly coiled with expanded terminal ends, uterine pore mid ventral near the anterior end of proglottids, operculated embryonated eggs.

***Camallanus jammuensis* n. sp. (Fig. 5)**
Family: Camallanidae [27].
Location: Intestine
The worms belong to Genus *Camallanus* [27] due to Stoma consisting of chitnous valves with a well developed white chitinous ring in the base, trident two, chitnous, one ventral and other dorsal, spicules two, unequal, genital papillae 10-13 pairs, vulva pre equatorial backed up by muscular vagina.

***Pseudoproleptus macrognathus* [8] (Fig. 6)**
Family: Cystidicolidae **[4]**
Location: Intestine
The worms belong to Genus *Pseudoproleptus macrognathus* [8] for the reasons of mouth bounded by two lateral lips, each with a single tooth and one pair of sub-median papillae, esophagus bipartite, vulva post equatorial, vagina directed posteriorly, consist of small ovijector and leaves into two uteri.

***Clinostomum giganticum* [1] (Fig. 7)**
(Metacercarial stage)
Family: Clinostomidae [18]
Sub-Family: Clinostominae
Location: Body Cavity, Muscles, attached to the external intestinal wall, Liver and Air Bladder
The metacercarial fall under genus *Clinostomum* Leidy, 1956 because; the oral sucker is surrounded by the collar like fold, acetabulum pre-equatorial, larger and muscular, excretory vesicle V-Shaped with sub-terminal excretory pore.

***Euclimostomum reticulum* [33] (Fig. 8)**
Family: Clinostomidae [17]
Sub-Family: Euclinostominae [35]
Location: Body Cavity, Muscles and Liver
The worm belongs to *Euclimostomum* [32] because

of aspinose cuticle, strongly diverticulated ceaca, and highly glandular network of glandular body lying around the acetabulum up to the anterior testis.

***Camallanus* larvae (Fig. 9)**

Family: Camallanidae [27]

Location: Intestine

The larval form belongs to genus *Camallanus* for the reason of a bipartite esophagus and each part ending in globular enlargement.

Fig 1.

Ecological analysis

Seasonal infection patterns

The prevalence and intensity of the most frequently encountered metazoan, *Phyllodistomum mansari*,

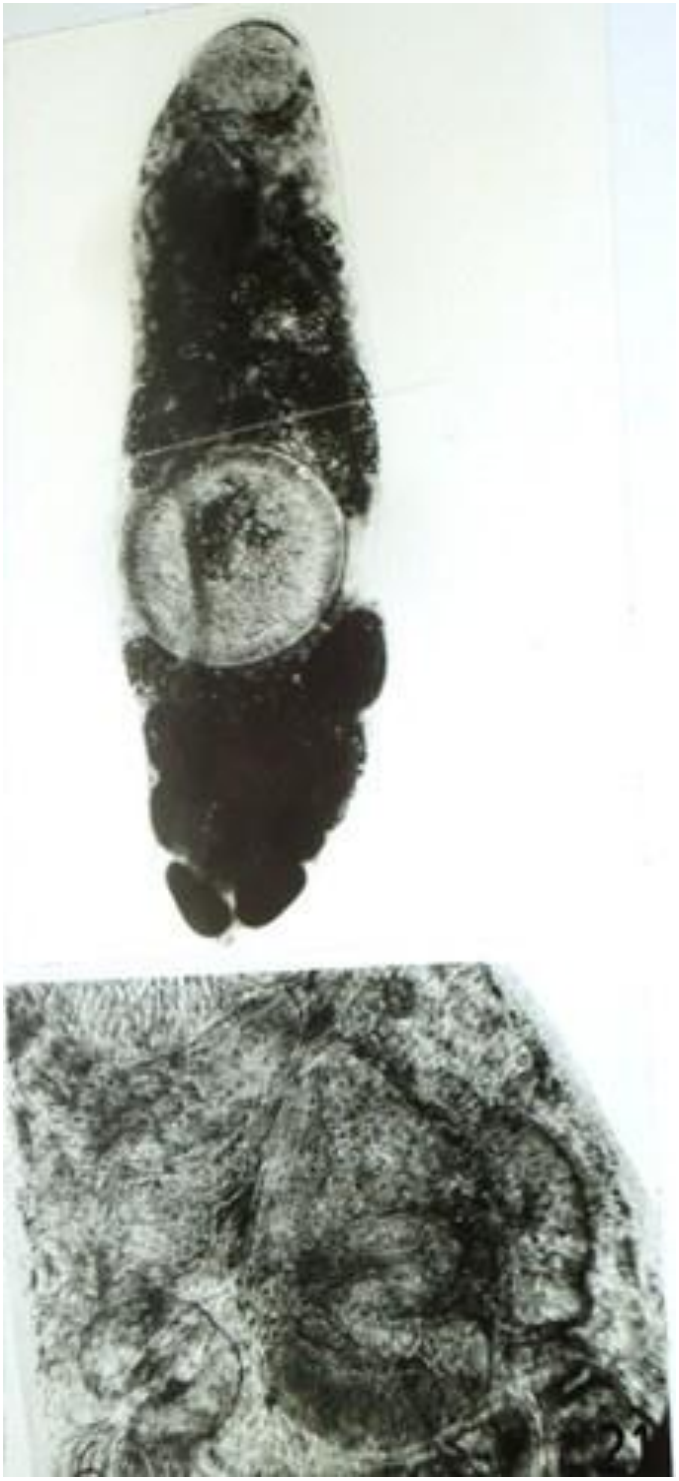

Fig 2.

Allocreadium A. gachuai n. sp, *Genarchopsis G. piscicola, Ancistrocephalus* sp. and *Cammallanus jammuensis* varied from season to season (Table 2). The prevalence and mean intensity of infection were high during the month of Summer (April to July) and fell to low during winter (December-February) indicating a cryptic relationship between temperature and infectivity of a parasite. While studying the seasonal distribution of helminth parasites of fish *Cyrinus carpio* [34] recorded similar variations in prevalence and mean intensity.[2] reported that temperature in conjugation with day length affects the feeding activity of the fish and indirectly the

Fig 3.

immigration rate of parasites.

Effect of Host Size

Correlation analysis between host size and parasite dominance indicates that of the most common 5 metazoan parasites recovered (Table 3) *A.A. gchuai* (*r* = 0.99), *P. mansari* (*r* = 0.796) and Ancistrocephalus *sp.* (*r* = 0.483) showed the highest dominance of the size group of 70-90. On the other hand, *C. jammuensis* (*r* = 0.883) dominated in the fish size group of 130-150 body length, whereas G.G.Pissicola (*r* = -0.279)

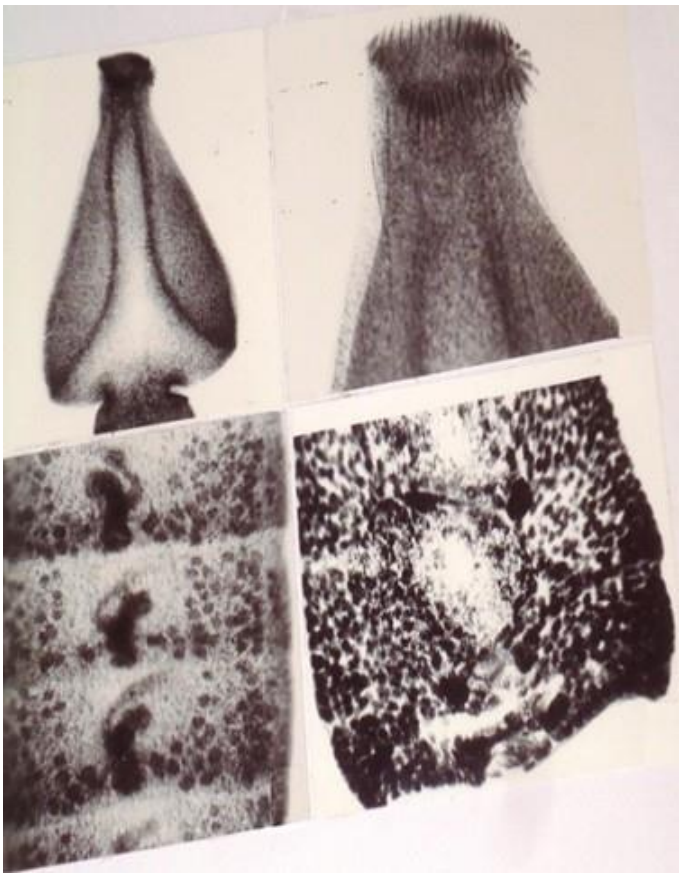

Fig 4.

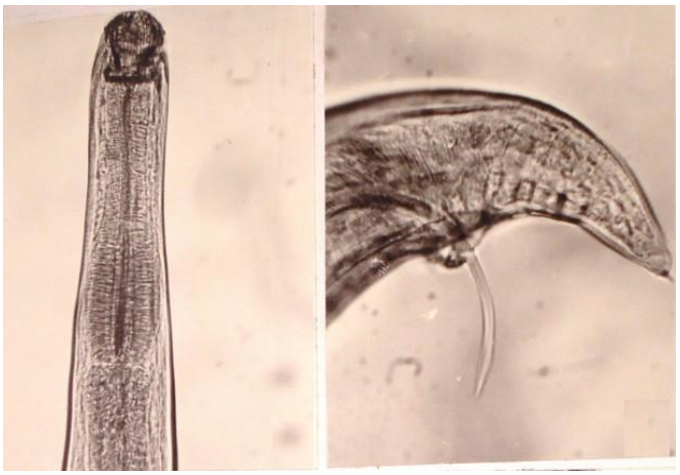

Fig 5.

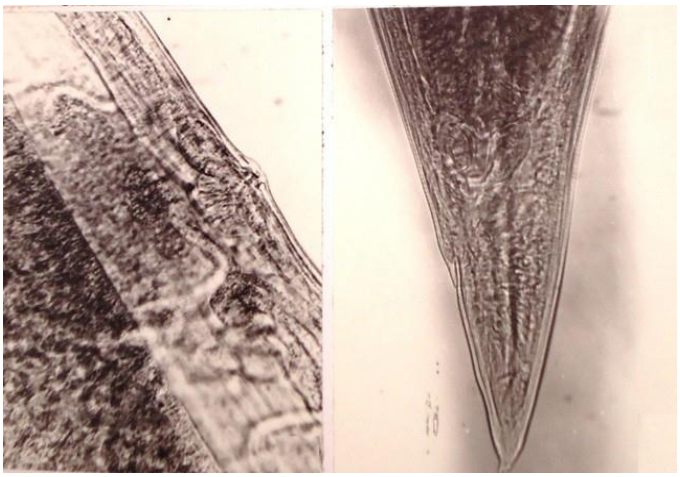

Fig 6.

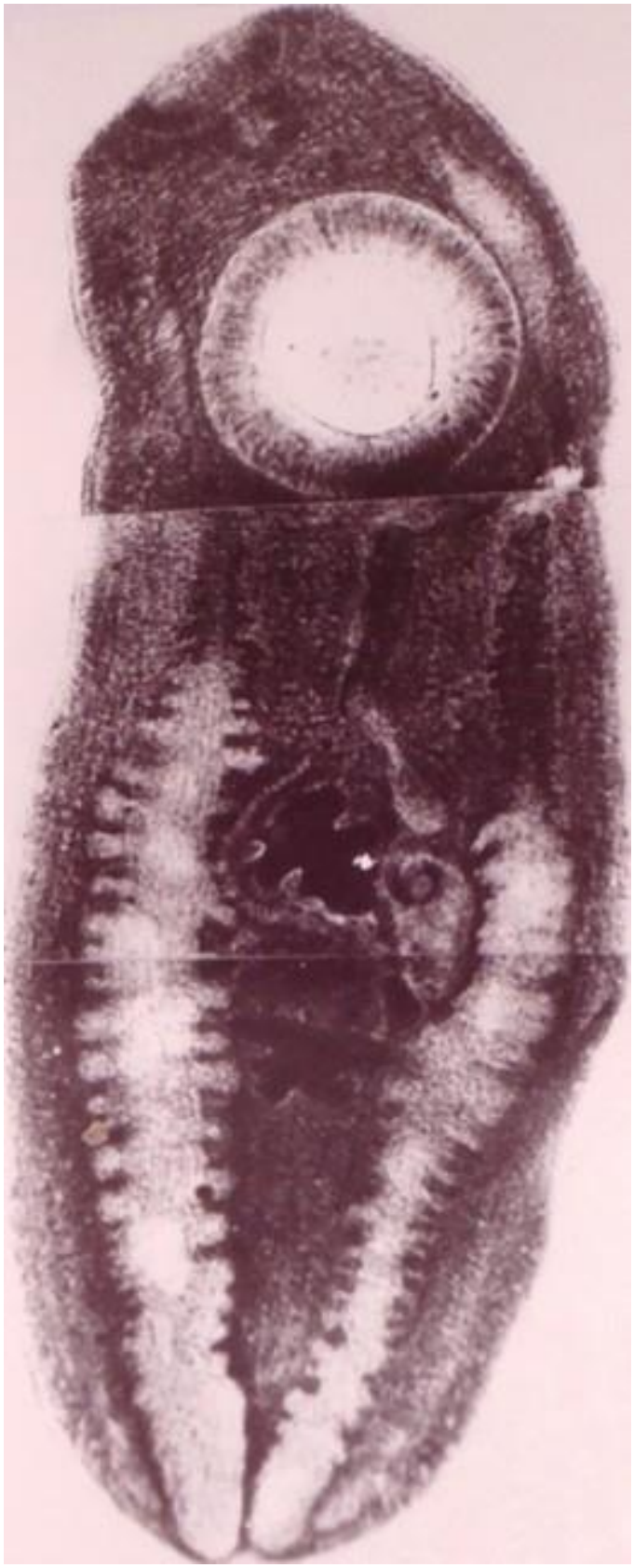

Fig 7.

dominated in the fishes still higher age group of 150-170 body length. With the increase in the size of the host, the parasite diversity and mean intensity also increased could be a result of increased food intake with increasing size (hence of increasing age) during which an involuntary increased number of infected transport hosts are eaten by the fish, leading thereby to increase the species richness (= diversity)

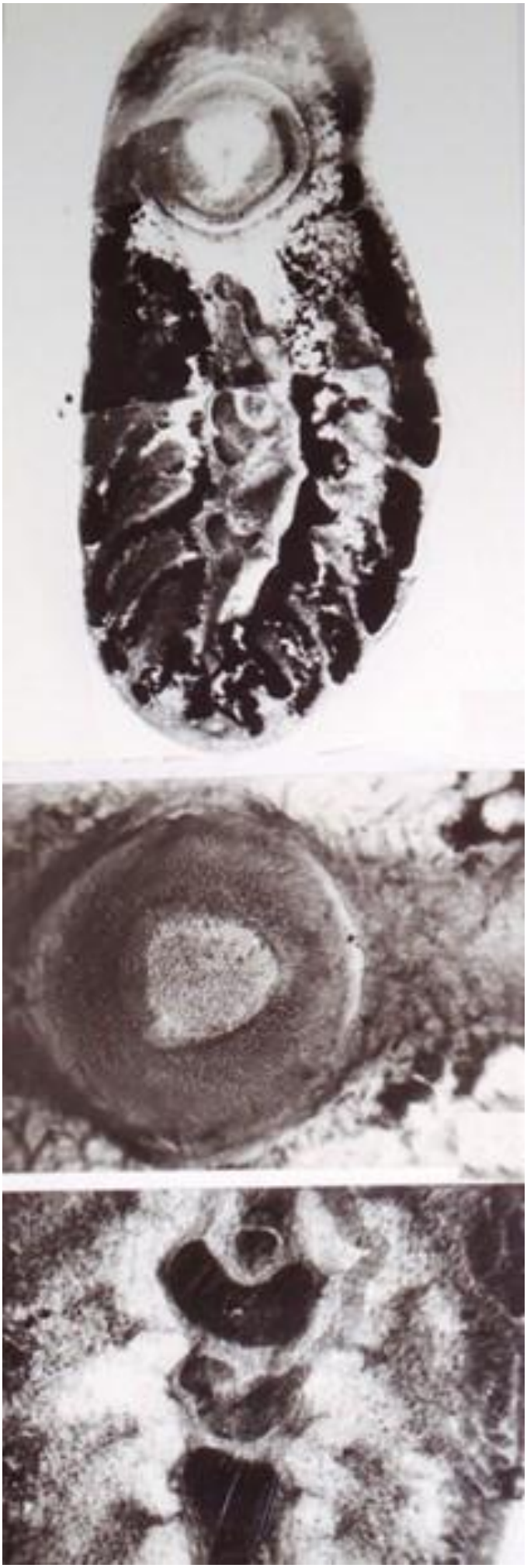

Fig 8.

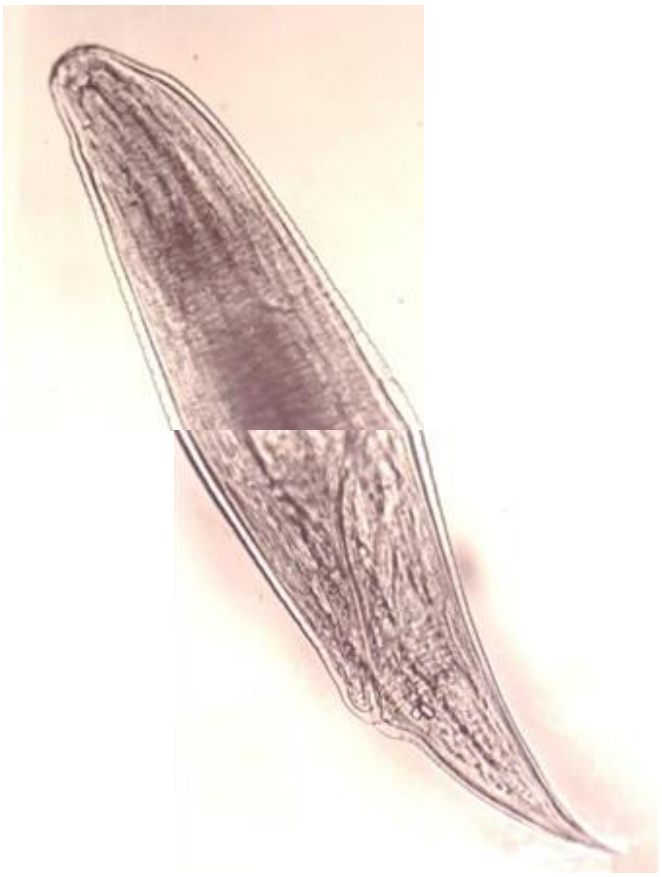

Fig 9.

The older the fish becomes the higher its warm load. The correltion co-efficient between the intensity of *A. A. gachuai* and fish size was significant ($r = 0.99$; $p < .01$).

When viewed from the angle of dominance index (Table 3), a marked decline for most parasite taxa in fish hosts above 170 lengths was evident, this drop in the sustainability of older hosts for larger loads of parasites can only be attributed to either inherent resistance to parasites or age-related acquired resistance of hosts against parasites. Hence a general tendency among fish hosts for increased resistance to parasitic infections with an increase in the size (age) of the hosts may be more or less a generalized phenomenon.

[12] reported that the fish C*atostomus commersoni* in the 5 and 5+ year classes had the heaviest infection of *Glaridacris catostomi*. [23] reported that the prevalence and mean intensity of *Glaridacris castostami* increased as host length increased. [10] found the number of *Caryophyllidlaeus simriceps* decreased as carp become older and suggested that this

Table 1. Metazoan parasites of *Channa gachua* from lake Mansar

Parasite	No. of Infected fish	Number of parasites	Prevalence (%)	Mean intensity	Mean Abundance
Adult forms					
Phyllodistomum mansari	66	123	27.5	1.86	0.512
Allocreadium A. gachuai	48	410	20.00	8.54	1.708
Genorchopsis G. piscicola	20	79	8.33	3.95	0.329
Ancistrocephalus sp.	34	55	14.16	1.62	0.229
Camallanus jammuensis	43	143	17.91	3.32	0.595
Pseudoproleptis macrognathus	1	1	0.41	1	0.004
Larval forms					
Clinostomum giganticum	24	157	10.0	6.54	0.654
Euclinostomum reticulatum	19	67	7.91	3.53	0.279
Camallanus sp.	99	556	41.25	5.6	2.316

or increased intensity of one or few of the parasites harboured at the time by the fish.

Allocreadium A. gachuai, the most dominant component of the parasite community (Tables 1-3) infected around 20% of the hosts examined, which in terms of prevalence comes next only to that of *Phyllodistomum mansari* in *C. gachua* (27.5%). The parasite was the most intense (mean intensity; 8.54) and constituted 50.56% of all the adult parasites found in this fish, varying in intensity between 1 and 25. The prevalence of this parasite varied in different size classes of the fish between 13 and 28.6 and the mean intensity increased as the fish became bigger.

was due to age-related immunity. [28] reported that prevalence of *Capillaria laticeps* decreased with age of chubb, *Leuciscus idus* and attributed this decrease to the non-benthic habits of older fish. However, [9] and [29] both working with *P. laevis*, and [23] working with *P. bulbocolli*, found that acanthoception mean intensity increased with host age and size. [34] reported that prevalence and mean intensity of *K. iowensis* increased as fish length increased.

Effect of Host sex

Host sex was not found to be a significant factor in

Table 2. Monthly Prevalence, Mean Intensity and Range of adult metazoan of *Channa gachua* from lake Mansar (Data combined for two years)

Months	*Allocreadium A. gachuai*			*Phyllodistomum mansari*			*Genarchopsis. G. piscicola*			*Ancistrocephalus* sp.			*Camallanus jammuensis*		
	P	I+S.E.	R	P	I±S.E.	R	P	I±S.E.	R	P	I±S.E.	R	P	I±S.E.	R
J	10	4+0	4	20	1.5+0.33	1-2	-	-	-	10	2+1.41	1-3	5	2+0	2
F	15	7+2.56	3-10	20	1.3+0.33	1-2	-	-	-	20	1.5+0.33	1-2	15	3.67+2.31	1-9
M	10	4+0	4	25	2.2+0.54	1-4	10	3+1.41	2-4	15	1.33+0.40	1-2	10	3+1.41	2-4
A	25	10.8+2.88	6-20	35	1.71+0.20	1-2	15	3.67+0.41	3-4	15	1.33+0.40	1-2	25	3.2+0.65	1-5
M	35	8.2+2.39	23-20	40	2.25+0.44	1-4	10	5+1.41	4-6	15	1.33+0.40	1-2	20	3.25+1.28	1-6
J	45	11+2.76	41.25	40	1.88+0.31	1-3	10	2.57+0.71	2-3	15	2.33+0.40	1-4	30	5.33+1.22	1-9
J	25	14.2+3.21	5-20	30	1.5+0.24	1-2	15	3+0.71	2-4	5	2+0	2	35	2.86+0.64	1-5
A	20	6.75+2.60	1-12	40	1.75+0.27	1-3	-	-	-	10	1.5+0.71	1-2	45	3.33+0.95	1-8
S	20	5.25+1.09	4-8	30	2+0.49	1-4	10	6+0	6-6	15	1.67+0.41	1-2	20	2.75+0.99	1-5
O	30	5.33+1.12	3-10	20	2+0	2	10	4.5+0.71	4-5	20	1.75+0.29	1-2	10	2+0	2
N	-	-	-	10	1.5+0.71	1-2	20	4.25+0.99	2-6	15	1.67+0.82	1-3	5	3+0	3
D	5	11+0	11	20	2.25+0.58	2-3	-	-	-	15	1.33+0.41	1-2	5	10+0	10

Table 3. Prevalence, Mean Intensity, Range and Dominance of adult metazoan species in C*hanna* gachua from lake Mansar, Jammu.

Size Group	Host Examined	*Phyllodistomum mansari*				*Allocreadium A. gachuai*				*Genarchopsis. G. piscicola*				*Ancistrocephalus* sp.				*Camallanus jammuensis*			
		P	I+ S.E.	R	D	P	I+ S.E.	R	D	P	I+ S.E.	R	D	P	I+ S.E.	R	D	P	I+ S.E.	R	D
50-70	23	21.7	1.8± 0.22	1-2	0.07	13	4.33± 1.08	1-6	0.03	8.70	3± 1.41	1-4	0.07	13.0	1±0	1	0.05	13	2.33± 1.08	1-4	0.05
70-90	35	17.1	1.7± 0.23	1-2	0.08	14.3	5.8± 1.78	1-12	0.07	11.4	3.25± 0.55	1-4	0.16	20.0	2.14± 0.37	1-4	0.27	5.7	1± 0	1	0.01
90-110	35	22.9	2.1± 0.37	1-4	0.14	14.3	7±1 .5	1-10	0.08	2.9	3± 0	1-4	0.03	8.6	1.67± 0.41	1-2	0.09	8.6	5.33± 2.9	1-9	0.1
110-130	30	30.0	2.6± 0.44	1-4	0.19	16.7	9.8± 2.84	1-18	0.12	0	0	0	0	16.7	1.8± 0.22	1-2	0.16	20	3± 0.9	1-6	0.11
130-150	62	32.3	1.71± 0.15	1-3	0.29	24.2	8.33± 1.36	1-18	0.30	14.5	4.67± 0.47	1-6	0.57	12.9	1.38± 0.28	1-3	0.2	25.8	5.0± 0.57	1-9	0.36
150-170	48	27.0	1.6± 0.15	1-2	0.17	27.1	9.92± 2.24	1-25	0.31	8.3	3.75± 0.99	1-6	0.20	16.7	1.5± 0.29	1-3	0.22	25.0	3.83± 0.92	1-11	0.29
170-190	7	57.1	1.75± 0.29	1-2	0.06	28.6	15± 7.1	1-20	0.07	0	0	0	0	0	0	0	0	42.9	5.0± 1.88	1-7	0.09

determining the infection rate of *Phyllodistomum mansari*, *Allocreadium A. gachuai*, *Genarchopsis G. piscicola*, *Ancistrocephalus* sp, and *Camallanus jammuensis*. Similar results were reported by [12] [22-23] and [34].

Consent And Ethical Approval

As per university standard guideline, participant consent and ethical approval have been collected and preserved by the authors

Competing interests

Authors have declared that no competing interests exist.

Authors Contributions

The authors read and approved the final manuscript.

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