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Population dynamics of *Pallisentis ophiocephali* in *Channa striata* from Karimnagar, Telangana, India

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Abstract
Parasites are one of the components of ecosystem. Acanthocephala are endoparasites. The present investigation was conducted to document the seasonal population dynamics of *Pallisentis ophiocephali* (Acanthocephala), and the impact of host on it, *Channa striatus* of Karimnagar region of Telangana. A total of 419 and 379 viscera of fish were examined over a period of two years (from February 2019 to January 2021). Annual prevalence was 37.42% and 43.48% for the 1st and 2nd years respectively. The average monthly prevalence was 22.64% (January, 2019) to 63.33% (October, 2019) and for the 2020-2021 year it ranged from 22.91% (January, 2012) to as high as 81.81 %(June, 2021). It was more during rainy (53.85%), followed by summer (44.93%) and winter (31.72%). It may be attributed to the availability of food organisms during rainy season.

Keywords: *Pallisentis ophiocephali*, Acanthocephala, *Channa striatus*, prevalence, parasite

Introduction
Parasites are good model systems. Acanthocephalans inhabit in the gut of vertebrates. They have greater importance as they infect wild animals. An eversible proboscis is present and covered by spines and it is used as an anchor in the intestinal wall of the host. They are dioecious; females are usually larger than males. Acanthocephalans are suitable to study population dynamics as their life cycle involves only three stages *viz*., egg, larval stage and their life cycle in intermediate hosts (arthropods) and definitive hosts.

The life cycle invariably includes hosts like insects, isopods and millipedes as intermediate hosts while parasites of aquatic hosts include crustacean insects. Acanthocephalan interactions cause variations. Acanthocephala differ from other animals and exhibit complex life histories. Several authors reported the prevalence and seasonal variation in the infection.

Physical, biological, and chemical factors influence the geographical distribution of a parasite. They are part of natural community and regulate host population. Parasites affect their hosts' health and behavior too. Survival of parasites depends on host specificity and adaptability to its host. As the parasites depend on hosts for the completion of life cycle, the population fluctuations are in synchronous with the population dynamics of hosts. The physical environment, host-parasite interaction, and the local climatic conditions will influence the transmission. Temperature role in development and growth was studied. Fluctuations in population dynamics was observed by Anderson (1976) [1]. Kennedy (1977) [2], Chubb (1977) [3] reviewed seasonal dynamics Crompton (1970) [4] has reported the effect of ecological and physiological aspects on dynamics. Anderson (1976) [5] detailed the variation of *Caryophyllus laticeps*. Muralidhar (1991) [6] presented an account on the seasonal variation of helminth parasites. Achaiah (2013) [7] studied the prevalence of *Raillitiena tetragona* infecting the domestic chick. Achaiah (2017) [8] documented the seasonal variation of *Pallisentis ophiocephali.*

Since they infect animals of commercial / food/ aesthetic value and most of the reports were pertaining to feeding, nutrition, metabolism were from *Moniliformis moniliformis, Machrocanthorhynchus hirudinaceus* and *Pallisentis minutus* despite the suitability to study the seasonal fluctuations and regulation of dynamics a very few attempts were made. Sampling of stages simultaneously is a big problem to study them and most of the reports were confined to a single host organism and it is in fresh water habitat

The parasites of genus Pallisentis (Van Cleave, 1928) infects freshwater fish, it induces abnormality in intestinal morphology and damages villi along with mucosal epithelium. It greatly affects the absorption (Woo, 1995) [9].

In the present investigation seasonal prevalence of acanthocephalan parasite *Pallisentis ophiocephali* infecting *Channa striatus* in Karimnagar area. The area under the study is located at 18.438 N, 79.128 E in a temperate climate area; seasonal fluctuations are distinct and the study site is located on the banks of the Manair River, Telangana, India.

Material and Methods

Pallisentis ophiocephali parasite dynamics were studied in different seasons to know the impact of seasons and the fish were procured from different parts of the Karimnagar, the study was carried out for two consecutive years i,e 2019-21 to document the seasonal variation, intensity and incidence of infection. The intestine was brought to the laboratory and was dissected and screened for infection, parasites were collected after washing in 0.9% normal saline. The collected parasites were washed repeatedly to remove mucus and other associated material. Parasites were fixed and stained and permanent mounts were prepared and preserved and identified by following Yamaguti (1985) [10] and Helminths, arthropods and protozoa of domesticated animals (1986) [11].

Each annual cycle was studied in all the seasons *viz*, rainy season from July-October, winter season from November-February and summer season from March-June. Parasites were identified and recorded on the basis of morphology, number of proboscis seen. The recorded data was analyzed to obtain prevalence and intensity of infection by using following formulae.

$$\text{Incidence of infection} = \frac{\text{Infected host}}{\text{Total hosts examined}} \times 100$$

$$\text{Intensity of infection} = \frac{\text{No. of parasites collected in a sample}}{\text{No. of infected host}}$$

$$\text{Density of infection} = \frac{\text{No. of parasites collected in a sample}}{\text{Total host examined}}$$

$$\text{Index of infection} = \frac{\text{No. of No. of host infected X No. of parasite collected}}{\text{Total host examined}}$$

Results

The data collected is presented in the table-1 and histogram-1 and was analysed by student t-test ($p < 0.05$)

Table 1: Month and season wise occurrence of *Pallisentis ophiocephali* for the years 2019-21

Season	Month	2019-2020			2020-2021		
		No of screened	No of positive	%	No of screened	No of positive	%
Summer	March	42	10	23.80	36	12	33.33
	April	36	11	30.55	32	10	31.25
	May	36	11	30.55	36	12	33.33
	June	28	12	42.85	22	18	81.81
Rainy	July	51	16	31.37	54	19	35.18
	August	43	17	39.53	36	22	61.11
	September	39	13	33.33	28	13	46.42
	October	30	19	63.33	22	16	72.72
Winter	November	27	16	59.25	32	13	40.62
	December	44	13	29.54	36	12	36.11
	January	53	12	22.64	48	11	22.91
	February	26	11	42.30	33	09	27.27

A total of 419 and 379 viscera of fish were screened for two years (from February 2019 to January 2021). Annual prevalence was 37.42% and 43.48% for the 1st and 2nd years respectively. The mean monthly prevalence was 22.64% (January, 2019) to as high as 63.33% (October, 2019) and for the 2020- 2021 year it ranged from 22.91% (January, 2012) to as high as 81.81 % (June, 2021).

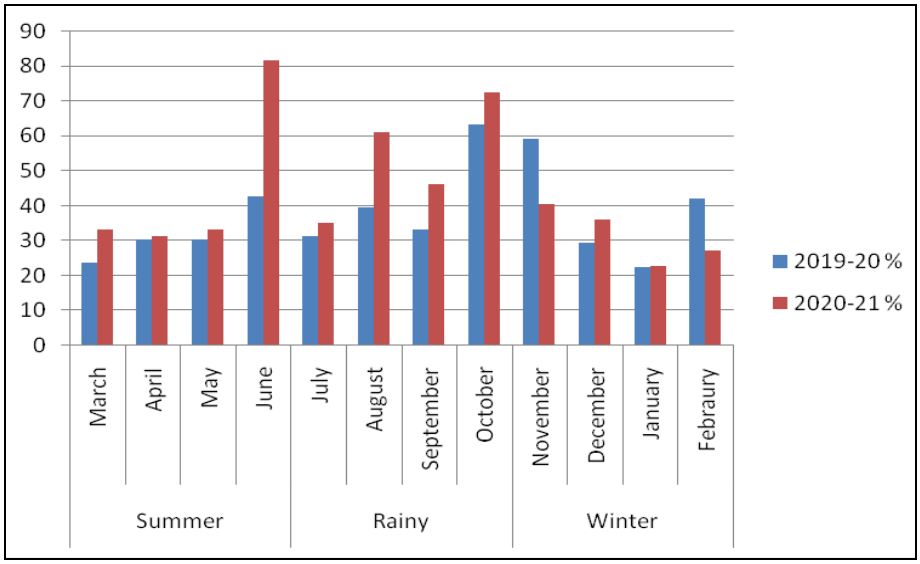

Fig 1: Histogram showing the month & season wise occurrence of *Pallisentis ophiocephali* for the years 2019-21

It was highest during rainy (41.87%) followed by winter (36.18%) and summer (31.93%) for 2019-2020. Similar trends were recorded for the 2020-2021 study period. The prevalence was highest during rainy (53.85%), followed by summer (44.93%) and winter (31.72%). The results are represented in table1 and histogram1 accordingly.

Discussion

The present study revealed more prevalence during October month in *Channa punctatus*. Similar findings were reported by Malhotra and Banerjee (1997) [12] from *P. allahabadi*. Bhuiyan *et al*., (2008) [13] recorded the peak levels of prevalence from *Cirrhinus mrigala* during October to December followed by January and April. Higher prevalence of *Pallisentis pandei* was documented by Sinha *et al* (2008) [14] during rainy season and was corelated with the synchronous availability of prey organisms during rainy season.

Conclusion

Seasonal effects on fish might have been related in some way to its spawning. Acanthocephalan reproductive cycle could be regulated by its hosts's endocrine system. Prevalence of infection during rainy season appears to be influenced by density independent transmission factors. The most important one there appears to be availability of cystacanth larvae, host diet, feeding behavior densities of intermediate and definitive hosts and water temperature.

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