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RESEARCH ARTICLE

A STUDY ON POPULATION DYNAMICS OF *PALLISENTIS OPHIOCEPHALI*, INFECTING FRESH WATER FISH, *CHANNA STRIATUS* IN WARANGAL REGION OF TELANGANA

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ABSTRACT

Acanthocephalans are endoparasites in the gut of vertebrates and have greater importance as they infect wild animals. The prevalence of *Pallisentis ophiocephali*, was examined in fish, *Channa striatus* for a period of two annual cycles to determine the effects of seasonal variation on intensity and incidence of infection. The statistical evaluation of difference between different seasons of two annual cycles (2012-2014). Parasites were prevalent throught the year but showed variation in different seasons. These changes may be due to temperature, sex, immunity of host, developmental stages of parasite, feeding habits of host and availability of intermediate hosts.The infection was single or in association with others. The results are discussed in relation to seasonal variation. The results were analyzed by student t-test ($P<0.05$).

INTRODUCTION

Parasites represent an important component of natural community (Preston and Jhonson, 2010). Parasites have a wide impact on ecology of their hosts like health (Arme and Owen 1967) and regulation of host population (Freeland, 1979) and behavior (Millinski, 1984 and Moore, 1984). Acanthocephalans, thorny headed worms, are endoparasites in the gut of vertebrates (Margulis and Schwartz, 1998). They are characterised by the presence of an eversible proboscis covered with spines which is useful to anchor themselves to the intestinal wall of the host. They are dioecious *i.e*, sexes are separate and generally females are larger than males and the life cycle of acanthocephalan parasites of terrestrial hosts include insects, isopods and millipedes as intermediate hosts while parasites of aquatic hosts include crustaceans (Richardson, 2006). Since these are exclusively endoparasites; the host parasite interactions should also be considered as they are responsible for such variations. Acanthocephala differ from other animals in displaying extreme rarity of some forms and seasonal availability of others with complex life histories. Parasites are good model systems (Smyth, 1969). 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. Survey of literature on seasonal variation of helminth infection in vertebrates has been done in different parts of world by several workers.

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Kennedy (1977), Chubb (1982) reviewed seasonal dynamics. Awachie (1965, 1966, 1972a, b) studied population dynamics of *Echinorhyncus truttae* in *Salmo trutta*. Crompton (1970) has given detailed account of acanthocephala in ecological and physiological aspects. Amin (1975b, 1977, 1978 and 1987) extensively worked on prevalence of acanthocephala and host parasite relationship. Anderson (1976) studied seasonal variation of *Caryophyllus laticeps*. Anantharaman and Anantharaman (1980) reported acanthocephala from India. Aquatic parasites have significance as they interact with their host and the environment. Muzzal (1980) studied ecology and seasonal variation. Muralidhar (1991) presented an account on the seasonal variation of helminth parasites. Achaiah (2013) reported the prevalence of helminth parasites infecting domestic fowl. They have greater importance to man as they infect wild animals which are important in commercial aspects/ food/sport/aesthetic value. Most studies of feeding, nutrition, metabolism and related aspects in acanthocephalans have been limited to three species: *Moniliformis moniliformis, Machrocanthorhynchus hirudinaceus* and *Pallisentis minutus.* Inspite of suitability of acanthocephalans to seasonal fluctuations and regulation of dynamics 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. In view of this the present study was undertaken and the objective of present study was to assess the seasonal prevalence of intestinal parasite *Pallisentis ophiocephali* (Thapar, 1930) Baylis, 1933 (Acanthocephala) infecting *Channa striatus* in Warangal region of Telangana, India. The area under study was located

18.0°N-79.35° E in a temperate climate area, well marked with seasonal fluctuations.

MATERIAL AND METHODS

In the present study, acanthocephalan parasite dynamics were studied in different seasons to know the impact of seasons and host material was collected from different parts of the Warangal to know the regional distribution too, during the year 2012-13 and 2013-14. *Pallisentis ophiocephalus* is an acanthocephalan, parasitizes fresh water fish, *Channa striatus*. The viscera were brought to the laboratory from different parts of Warangal throughout the year. The intestine was dissected and screened for infection, parasites were collected and washed with 0.9% normal saline and washed in several changes to remove debris, mucus and sticky food material. Parasites were fixed and stained and permanent mounts were prepared and preserved for identification and to know its taxonomic position.

infection of the parasite, the recorded data was analyzed. Identification and counting was done based on morphology, number of proboscis seen and the site of infection in host. The recorded data was analyzed to derive prevalence of infection and intensity of infection by using following formulae.

- Incidence of infection = Infected host X 100 ÷ Total hosts examined.
- Intensity of infection = No. of parasites collected in a sample ÷ No. of infected host.
- Density of infection = No. of parasites collected in a sample ÷ Total host examined.
- Index of infection = No. of host infected X No. of parasite collected ÷ (Total hosts examined) ^{2}

RESULTS

The data collected is presented in the table-1 and histogram-1. The data obtained was statistically analysed by student t-test

Table 1. Month and season wise occurrence of *Pallisentis ophiocephali* for the years 2012-14

Season	Month	2011-2012			2012-2013		
		No. screened	No. Positive	%	No. Screened	No. positive	%
Summer	March	36	13	36.11	30	15	50.00
	April	39	10	25.64	26	17	65.38
	May	42	16	38.09	25	20	80.00
	June	40	11	27.50	32	14	43.75
Rainy	July	40	12	30.00	30	13	43.34
	August	35	14	40.00	32	16	50.00
	September	35	10	28.58	36	18	50.00
	October	32	15	46.88	26	11	42.30
Winter	November	40	25	62.50	30	20	66.67
	December	42	20	47.61	41	35	85.37
	January	39	16	41.02	36	29	80.56
	February	46	15	32.60	35	28	80.00

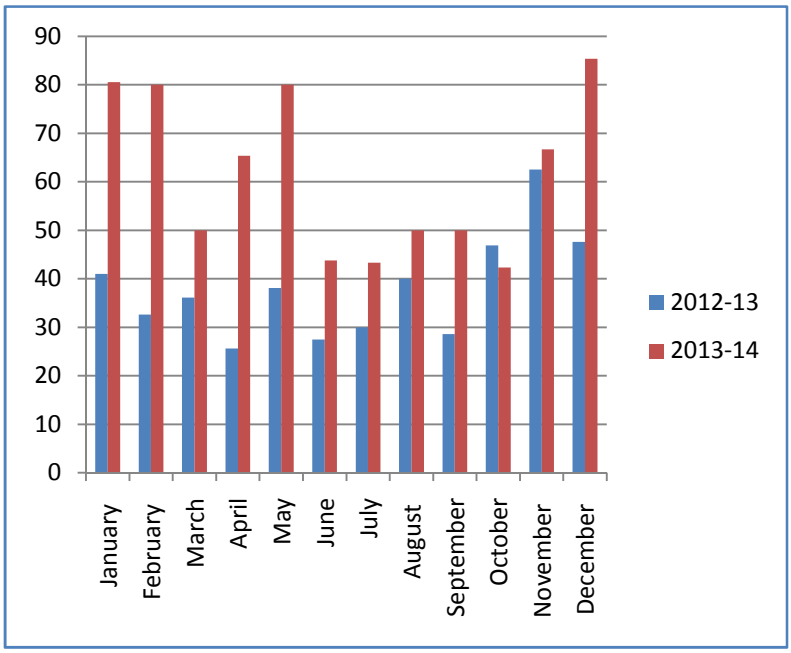

Figure 1. Histogram showing the month & season wise occurrence of *Pallisentis ophiocephali* for the years 2012-14

The aim was to determine the status of the parasite prevalence, intensity and abundance. To minimize the inconsistency, it was carried out for two consecutive years from 2012-2014 and each annual cycle was studied in three different seasons *viz,* rainy season which generally ranges from July-October, winter season from November-February and summer season which ranges from March-June. To obtain various bio-statistical parameters such as incidence, intensity, density and index of

($p<0.05$). A total of 466 and 379 viscera of fish were examined over a period of two years (from February2011 to January 2013). Annual prevalence was recorded as 38.04% and 61.16% for the 1st and 2nd years respectively. The mean monthly prevalence was recorded as low as 25.64% (April, 2011) to as high as 62% (November, 2011) and for the 2012-2013 year it ranged from 42% (October, 2012) to as high as 85 %(December, 2012). The seasonal patterns was found to be

highest during winter (45.93%) followed by rainy (36.36%) and winter (31.83%) for 2011-2012, and similar seasonal patterns were observed for the next consecutive year *i,e* 2012-2013. It was more during winter (77.75%), followed by summer (59.5%) and rainy (46.25%). The results are presented in tables and histograms accordingly. The statistical evaluation of difference between different seasons of two annual cycles was determined by t-test (with significance level of $p < 0.05$) and was found to be significant between summer and winter; but not summer and rainy seasons of 2011-2012 but it was significant between summer and rainy and summer and winter seasons of 2012-2013. It was found to be significant between two years too. Concurrent infections with other helminth parasites are also observed.

DISCUSSION

The parasite *Pallisentis ophiocephali* was prevalent in all seasons observed in the host *Channa striatus*. The overall prevalence was different from the studies of Permin *et al* (1997) with that of Poulsen *et al* (2000). The difference may be due to difference in geography, period of study, ambient temperature, humidity and sample size. Establishment of worms in intestine is influenced by many factors such as age of fish, age of infective stages, sex of host and diet. Seasonal changes in mean intensity and prevalence may be due to temperature, sex, feeding habits of hosts, host immunity, developmental stages of parasites, and availability of intermediate hosts (Chubb 1963, Kennedy 1969; Pennycuick1971; Hanzelova and Zintan 1985; Simkov *et al*., 2005, Drobney *et al* 1983). Prevalence in natural populations (intermediate hosts) varies from 60% Seidenberg, 1973) to less than 1% (Amin, 1978b). It depend s on parasites locality and species and it was reported as from 80% and 3% for same species at different sites within a locality (Hine and Kennedy, 1974a). Smyth (1969) reported the relationship between climate and parasite infections. Kennedy (1972) reviewed on the seasonal fluctuations of many parasites. Sunita *et al* (2008) revealed higher prevalence of *Pallisentis pandei* during rainy season, which was attributed to larger availability of food organisms during rainy season.

Biochemical changes in the worm triggered by temperature also influence the proliferation rate. Variations in distribution pattern may be due to temperature, behavior of host diet, migratory property, immune response etc. As the temperature influences maturation process of parasites, it also effects seasonal fluctuation of parasites. During rainy season inflow will be more whereas during winter season, the inflow is reduced which stabilizes the parasite population (Chapel, 1969).Larger hosts are more heavily and frequently infected than the younger ones (Amin, 1975). In the present study the same is observed in collections in different seasons of the study period. Significant number of hosts with large size was infected. Increased food volume /diet composition may probably involve in this pattern.

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