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Comparative status of infestation index value of helminthes parasite in selected fresh water bodies of Palghar district region.

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Abstract

Fishes are the most important source of food in all over the world. They are also easily infested by endo-parasites and

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ecto-parasites in both fresh and sea water ecosystems. The present study was conducted to estimate the infestation index of helminth parasite in *Channa punctata*, *Anabus testudineus* and *Oreochromis mossambicus* from Vasai- Virar region of Palghar district during July 2021 to December 2022. The study helps to predict the comparative and present status of fresh-water bodies of Vasai region i.e Chikaldongri and Satpala lake. It was found that the infestation index of helminth parasite in *Oreochromis mossambicus* and *Channa punctata* is less than *Anabus testudineus*. During summer season maximum parasite was collected from freshwater fishes. Also, it was observed that due to drastic anthropogenic activities held in study area since 2017, the fish species have started to decline because of loss of habitat and vigorous pollution with illegal constructions and activities. The analysis of data shows the occurrence of helminth parasites varies according to the season in freshwater fishes. Helminth parasite and host species, host size, feeding habitats and seasons and localities also influence the intensity. After data analysis, the study concluded that the high infections of helminth parasites occurred in summer followed by winter and low in the rainy season. Thus, studies postulated that the environmental factors and feeding habitat are influencing the seasonality of parasitic infestation directly or indirectly. The present work also indicates that the helminth (Nematode) parasite is extensively distributed in the stomach and digestive system of edible freshwater fish *Channa punctatus*. It is postulated that, “due to the occurrence of these parasites, the physiological activities of the victimized fishes are hindered. Parasites may lead to epidemics and mortalities, resulting in economic loss in a particular area. Besides this,

there is always the possibility of their transfer to human beings by consumption of raw and partially cooked infected fishes.” Post- pandemic studies revealed low availability of fish species in study areas.

Keywords: Chikaldongari lake, Satpala Lake, *Channa punctatus*, *Oreochromis mossambicus*, *Anabus testudineus*, Endo-parasites, Host-parasite relationship.

Introduction

Fishes are the most important staple food in the coastal areas. They are also easily infested by endo-parasites and ecto-parasites in both fresh and sea water ecosystem. Ecto-parasites live and feed on the external surface of fish attached to the gills, skin, fins etc. While, endo-parasites live and feed within the internal organs, tissues or blood vessels. Fish parasites are a diverse group of organisms which have significant impact on fish health, growth, sexual behaviour and ecosystem dynamics. Hence, understanding the prevalence rate, diversity and effects of fish parasites is very much essential for both fisheries management and healthy aquatic ecosystem.

Palghar is a district in northern Maharashtra state in western India. The total geographic area of the district is 5,344sq.km. It is located on **19.69°N** and **72.77°E**. It comprises the wide amphitheatre like Ulhas basin on the south and hilly Vaitarna valley on the north together with plateaus and the slopes of Sahyadri [1].

The present study was conducted to estimate the infestation index of helminth parasites in selected freshwater fish species from Vasai- Virar region of Palghar district.

Objectives:

- 1) To study the selected fresh water bodies and to collect the adequate number of specimens for the designated studies.
- 2) To identify endo-parasites from stomach and intestine of the selected fresh water fish species with the help of appropriate identification keys at hand.
- 3) To find out the prevalence and comparative status of parasites overall observed in the selected fish species from two localities and its proper bio-statistical presentation.
- 4) To find out the status of host-parasite relationship in the selected fish species.
- 5) To present the record of parasites collected from fish specimens by digital photography wherever possible.

Materials and Method

Study area: Station 1: Chikaldongari lake is situated at Chikaldongari area in Virar, the suburb of Mumbai which coordinates Lat. 19.47°N and Long. 72.8°E. It is approximately 2km from Virar railway station. It has a total population of approx. 25,000. This area is very rich in flora and fauna due to suitable habitat for many animal and plant species. There is also very less human interaction as this is fully covered by mudflats and also estuaries.

Station 2: Satpala lake is situated at Satpala area in Vasai, the suburb of Mumbai which coordinates Lat. 19°26'1"N

and Long. 72°46'42"E. It is approximately 11km from Vasai railway station. It has a total population of approx. 15,000. This area is very much famous for its traditional ponds and lakes. There is human interaction as anthropogenic activity is concerned.

Channa punctatus (Snake headed fish) is the native fish of Vasai and Virar region and is widely distributed in small lakes.

a) Methodology:

“Collection of host fishes: The host fishes (*Channa punctatus*, *Oreochromis mossambicus*, *Anabus testudineus*) collected from the study area during July 2021- December 2022 at regular interval of 15 days at different time. After random collection with the help of local fishermen from different study sites, the host fish were brought to the laboratory for identification and subsequent collection of parasites.

Fish Measurement: The total length(TL) of the fish hosts were measured from tip of the snout to the end of the caudal fin with the lobes folded.” Weight in grams were also measured.

Collection of Endo-parasites: The hosts were dissected for the collection of internal parasites by usual killing method of giving a blow on the head. The parasites collected were counted in the living state and “were processed and identified with the help of keys” (Yamaguti, 1985). Population dynamics of endoparasites were determined with appropriate biostatistical analysis.

Ecological analysis: Ecological terms are studied as per the formula given by Margolis[2].

Prevalence

$$= \frac{\text{Total No. of Hosts Infected} \times 100}{\text{Total No. of Hosts examined}}$$

Mean Intensity

$$= \frac{\text{Total No. of Hosts Examined}}{\text{Total No. of Infected Hosts Examined}}$$

Abundance

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

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

Total No. of Hosts examined

Table 1.1: Infestation index of Helminth parasites in selected freshwater species at study area (Chikaldongri lake) with respect to seasonal variations:

Fish Species	Seasons	Prevalence rate	Mean intensity	Abundance rate	Infestation index
<i>Anabus testudineus</i>	Rainy	20.53	4.86	0.22	5.13
	Winter	43.92	2.27	0.48	22.84
	Sum	54.47	1.83	0.56	37.58

<i>Oreochromis mossambicus</i>	mer				
	Rainy	8.69	11.5	0.13	1.30
	Winte	21.49	4.65	0.32	7.52
	r				
<i>Channa punctata</i>	Sum	33.60	2.97	0.36	15.12
	mer				
	Rainy	14.70	6.8	0.17	2.64
	Winte	22.44	4.45	0.28	6.28
	r				
	Sum	32.30	3.09	0.42	17.76
	mer				

Table 1.2 : Infestation index of Helminth parasites in selected freshwater species at study area (Satpala lake) with respect to seasonal variations:

Fish Species	Seasons	Prevalence rate	Mean intensity	Abundance rate	Infestation index
<i>Anabus testudineus</i>	Rainy	2.66	37.5	0.10	1.06
	Winte	12.12	8.25	0.14	1.69
	r				
	Sum	32.64	3.06	0.36	12.08
<i>Oreochromis mossambicus</i>	mer				
	Rainy	0	72	0	0
	Winte	6.31	15.83	0.06	0.37
	r				
<i>Channa punctata</i>	Sum	10	10	0.13	1.6
	mer				
	Rainy	6.74	14.83	0.07	0.47
	Winte	11.95	8.36	0.13	1.43
	r				

Sum	21	4.76	0.22	4.62
mer				

Figure 1: Comparative status of Prevalence rate in selected freshwater species at study area with respect to seasonal variations:

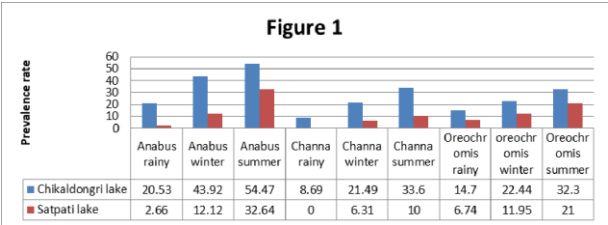


Figure 2: Comparative status of Mean intensity rate in selected freshwater species at study area with respect to seasonal variations:

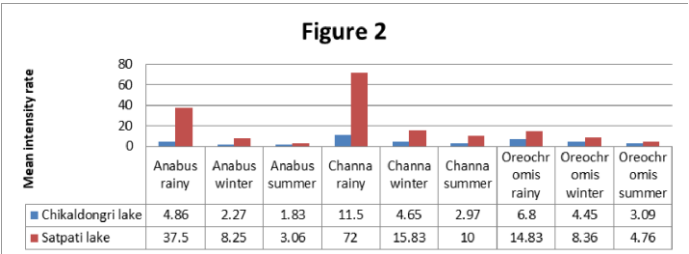


Figure 3: Comparative status of Abundance rate in selected freshwater species at study area with respect to seasonal variations:

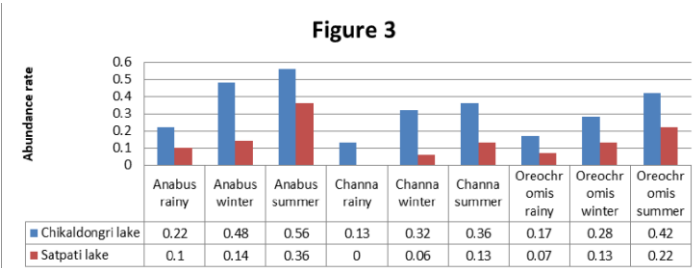
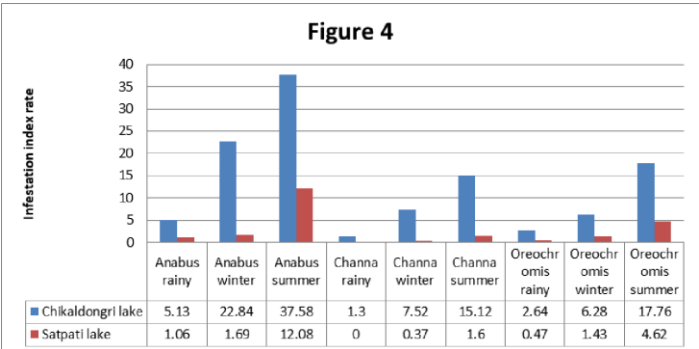


Figure 4: Comparative status of Infestation index rate in selected freshwater species at study area with respect to seasonal variations:



Observations and Discussions

The study helps to predict the comparative and present status of fresh-water bodies of Vasai region i.e Chikaldongri lake from Virar and Satpala lake from Nalasopara. It was found that the infestation index of helminth parasites in *Oreochromis mossambicus* and *Channa punctata* is less as compare to *Anabus testudineus* [Table 1.1]. During summer season maximum parasites was collected from freshwater fishes. The rise in the prevalence percent and mean intensity with the rising size (length) of the host can depend upon two factors- One factor is the increased volume of food ingested

by large-size fishes and another factor can be the age of the fishes. But some reviewed paper suggests that juveniles food intake capacity is more as compared to adult fishes as immunity of host is concerned. The degree of parasitism was discovered to be directly connected to the fishes feeding habits and age. Also, it was observed that due to drastic anthropogenic activities held in study area since 2017, the fish species have started to decline because of loss of habitat and vigorous pollution with illegal constructions and activities as well as ultra-modernization. The comparative data is as follows: **Prevalence, Mean Intensity, Abundance rate and Index of infection:** Out of total **1,019** fish specimens examined, **291** specimens were found infected with endoparasites in **Chikaldongri lake (site 1)**. These endoparasites were identified as **Nematode sps.** Overall, *Anabus* examined is 342 species, *Oreochromis* is 347 species and *Channa* is 330 species. During the study period, the recorded range of prevalence rate at Site 1 was highest in summer season followed by winter and rainy season. The maximum prevalence (54.47%) was recorded in *Anabus sps* in summer whereas minimum prevalence (8.69%) was recorded in *Oreochromis sps* in rainy season. The mean intensity was observed in *Oreochromis sps* (11.5%) is highest in rainy season and lowest in *Anabus sps* (1.83%). The abundance rate was recorded (0.13%) in *Oreochromis mossambicus* during rainy season whereas (0.56%) in *Anabus testudineus* during summer season. The infestation index rate is highest in *Anabus sps* (37.58%) during summer season whereas lowest in *Oreochromis sps* (1.30%) during rainy season (**Fig 1,2,3,&4**). Also, recorded data in **Satpala lake (site 2)** reveals that, the infestation rate is higher in summer and lowest in winter and

rainy seasons. Total fish specimens examined was **841**. The infected fish specimens were **103** and were found to be infected by identified **Nematodes sps** and **metacercia larvae of Liver fluke**. The maximum prevalence (32.64%) was recorded in *Anabrus sps* during summer season whereas minimum prevalence (0%) was recorded in *Oreochromis sps* during rainy season. In *Anabrus sps*, the highest mean intensity rate was recorded (37.5%) during rainy season and lowest was recorded (3.06%) during summer season. The highest abundance rate was found in *Anabrus sps* (0.36%) during summer season whereas in *Oreochromis sps* (0%) during rainy season. Also, infestation index rate is higher in *Anabrus sps* (12.08%) during summer season and *Oreochromis sps* (0%) during rainy season (**Fig 1, 2, 3, &4**). Host's size in length and a number of parasites: Larger-bodied host species should give more space, more nutrients, and possibly a wider variety of niches for parasitic organisms. They also feed at a higher rate, a feature that exposes them to more food-borne parasite infective stages per unit time, and they tend to live longer than small-bodied hosts, providing a more prominent habitat for parasites (Poulin and Morand, 2014). It was observed during study that larger fishes i.e more than 15cm in length were loaded more with parasites as compare to smaller fishes i.e less than 15cm in length. Basically, fishes from Chikhaldongri lake were found to be infected more by parasitic worms as compare to Satpala lake. The degree of parasitism was also found to be directly connected to the fishes feeding habits and age. It was also reported that at least one worm species was present in one specimen of the host fish with more than 15cm length. **Host- Parasite relationship:** The study indicates that there is a strong

interaction between host and parasite species in the study area. Many helminth parasites are collected from the intestinal tract of fish species. It is postulated that feeding habits, age, and size of fish hosts do matter for the residence of parasites inside the host body. It has been observed that fish act as an intermediate host for most helminth parasites. Very few fish hosts act as final hosts as concerned about the lifecycle of parasites. Also, it is studied that parasites reside in the host in order to complete their lifecycle. Hence, it is concluded that fish act as a first and second intermediate host for most of the helminth parasites. At least one larva of the third stage is observed and identified during the study period.

Conclusions

It is concluded that, till date no studies are carried out on fish helminthes in the Vasai-Virar region. This study is performed in order to find the health status of the host and also specify the host-parasite relationship status. It was found that host size, sex and weight definitely matter if parasite infestation rate is calculated. During the study period it is also found that fish doesn't show any vigorous infestation as the habitat is suitable for the growth of host species. Most larval stages of parasites are observed during dissections. Larval stages of helminth do not infect fish species adversely. But in recent years, due to drastic anthropogenic activities in a study area the fish species growth has lessened down. It is also very difficult to find fish specimens frequently due to environmental impact. In recent years, continuous flooding in the area every year has made fish species endangered. Availability of fish species is a

crucial task since the recent status of an area is concerned. Huge apartments, malls, international schools, amusement parks have taken place whereas traditional ponds, lakes have vanished. Even observation of migratory birds in study areas has affected. Many bird species have also lessened down their visits due to change in food habitat. Also, it is found that seasonal variation has an impact on growth of parasitic infestation in host species. It is observed that summer seasons have the highest prevalence rate. The study also helps to reveal the ecological and biological status of hosts and parasites.

Recommendations: In-depth knowledge of parasites: Proper identification of parasitic stages and its infestation ratio to the host species. Rate of prevalence, mean intensity and mean abundance of parasites must be thoroughly watched. Thorough identification of fish species: Fish species should be thoroughly identified by observing morphological features as well as its habitat is concerned. The reproductive cycle of fish species should be observed periodically. Awareness about infected and non-infected fish species: Identification of infected and non-infected fish species through general body markings and movements. Gills, scales, tail fins can be observed thoroughly for tests of infection. Comparison between the habitat and fish species: comparing fish species and its habitat will provide an authentic tool for parasitological study. Genetic studies on host-parasite: DNA sequencing and bioinformatic studies of selected species will give remarkable phylogenetic patterns and ecological evidence. Awareness among localities due to infected edible fish species: Local people should be made

aware about the consumption of infected fish species and diseases occurring due to the same through talk, interview or education.

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