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STUDY OF MONOGENEAN PARASITE INFECTION AND ITS IMPACT ON FISH PRODUCTIVITY IN SEONI DISTRICT (M.P.)

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ABSTRACT:- Monogenean parasites are important ectoparasites of freshwater and marine fishes. They commonly inhabit the gills, skin and fins of fish and may influence host health, growth, survival and aquaculture productivity. Fishes are the good source of aquatic food that provides nutrients and gives nourishment to the human`s body and promotes growth. This study was carried out to determine the prevalence of monogenean ectoparasites on fresh water Indian major carps inhabited in the cultured ponds and natural ponds lakes and river of district Seoni , Madhya Pradesh, India, in a bid to suggesting ways of curbing them. Total 360 fishes were examined from cultured fish ponds consisting of 120 Bhakur (*Catla catla*), 120 Rohu (*Labeo rohita*) and 120 Mrigal (*Cirrhinus mri*gala) and 360 fishes from natural water bodies such as ponds, pools, lakes and river also consisting of 120 Bhakur (*Catla catla*), 120 Rohu (*Labeo rohita*) and 120 Mrigal (*Cirrhinus mrigala*). Higher infestations were recorded in cultured fish farm in rainy season whereas, in natural water bodies in summer season. The higher monogenean infestation was recorded in Indian major carp Bhakur (*Catla catla*) in both natural as well as cultured fish farm. The captive fishes are more infested in rainy season due to high pollution load but the fishes inhabited in natural water bodies are highly infested in summer season, when water level falls and fishes come in contact with each other. Prevention of monogenean ectoparasites infestation by given appropriate quarantine is preferable to treatment of the parasites after they have become established in a system. Administration of praziquantel and hydrogen peroxide should be used for the removal of monogenean ectoparasites and prevents the Indian major carps from infestation of monogenean ectoparasites. In present study, the larger fishes recorded higher infestation than smaller ones. Therefore, routine checkup of physicochemical parameters, water level, fish density and monitoring of parasitic status of fishes would reduce the mortality and loss in fish production. The study is expected to provide baseline information on monogenean infections in selected fish populations of Seoni district and help identify potential relationships between parasitic burden, fish condition and productivity. The findings may support improved fish health monitoring and sustainable fisheries management in the region.

KEYWORDS:- Infestations, Indian major carps, Monogenean ectoparasites, Seoni.

INTRODUCTION:-

Fisheries and aquaculture are important components of food security, nutrition and rural livelihoods. Fish productivity depends on several interacting factors, including water quality, availability of food, stocking density, environmental conditions, host genetics and disease burden. Parasitic infections are among the biological factors that can influence fish health and production.

Monogenea are small parasitic flatworms mainly found on skin or gills of fish. They are rarely longer than about 2 cm. Monogeneans are mainly ectoparasites of fishes, occasionally they are found endoparasitic (Mishra, 2007). Most monogeneans are browsers that move about freely on the fish`s body surface feeding on mucus and epithelial cells of the skin and gills; however, a few adult monogeneans will remain attached permanently to a single site on the host (Mishra, 2014a). Approximately 4,000 to 5,000 species of monogeneans have been described. Monogeneans are small to medium sized trematodes which complete their life cycle on single host (Mishra, 2014b).

The distribution of monogenean parasites may be influenced by host species, host size, water temperature, water quality, stocking density and seasonal conditions. Some monogeneans exhibit substantial host specificity, and infection levels may differ considerably among fish species and populations (Šimková et al., 2024).

Gill infections may interfere with normal respiratory function, particularly when parasite burdens are high. Skin and fin infections may cause irritation, tissue damage and secondary infections. However, the severity of these effects depends on the parasite species, infection intensity, host condition and environmental circumstances.

Seoni district in Madhya Pradesh contains freshwater habitats and fishery resources that may support a variety of fish species. A systematic assessment of monogenean infections in selected fish populations could provide useful information about local parasite diversity and fish health.

The present study therefore proposes a systematic investigation of monogenean parasite infections and their possible relationship with fish productivity in Seoni district.

REVIEW OF LITERATURE:-

Research on fish parasitology has established that monogeneans are important components of fish parasite communities. Their host associations, distribution and infection levels differ among fish species and ecological conditions.

Šimková et al. (2024) reviewed host specificity and ecological relationships in freshwater fish monogeneans. Their work emphasized the importance of host identity, microhabitat preference and quantitative infection data in understanding host–parasite associations.

A study of ectoparasites in *Mystus vittatus* from the Penna River system in Andhra Pradesh reported a prevalence of 77.1%, a mean intensity of 4.4 parasites per infected fish and a mean abundance of 3.4. Two monogenean species were among the ectoparasites identified in that study (Indian Society for Parasitology, 2020).

Research on fish ectoparasites has also demonstrated the value of recording infection prevalence, mean intensity and mean abundance separately. These parameters describe different aspects of parasite distribution and allow comparisons among host species and sampling locations.

Recent studies have further shown that molecular approaches can complement morphological identification and improve the assessment of parasite diversity, particularly where closely related species are difficult to distinguish.

Although these studies provide useful methodological and ecological background, their findings cannot be directly extrapolated to Seoni district. Local sampling is necessary to establish the occurrence, distribution and intensity of monogenean infections in the fish populations under investigation.

OBJECTIVES OF THE STUDY:-

The major objectives are:

1. To investigate the occurrence of monogenean parasites in selected freshwater fish species of Seoni district.
2. To determine the prevalence, mean intensity and mean abundance of monogenean infections.
3. To identify the major infection sites, including gills, skin and fins.
4. To assess variation in infection among fish species, sampling sites and seasons.
5. To examine relationships between parasitic infection, fish length, body weight and condition factor.
6. To investigate whether parasite burden is associated with indicators of fish productivity.
7. To suggest suitable fish health monitoring and parasite management measures based on the findings.

MATERIALS AND METHODS:-

Study Area

Seoni district is situated 22.08°N 79.53°E. It has an average elevation of 611 meters (2004 feet). The city is 2,043 ft. above sea-level, half-way between Nagpur and Jabalpur. It is bordered by Jabalpur, Narsinghpur and Mandla districts to the north, Balaghat to the east and Chhindwara to the west and the shares its southern boundary with Nagpur (Maharashtra). National Highway No. 7 connects the Kanyakumari-Banaras passes through the district from north to south. Fair weather roads connect the major towns in the district. The narrow-gauge Chhindwara- Nainpur Central Railway passes through Seoni connecting Jabalpur, Nagpur, Chhindwara, Balaghat, Katangi, Keolari and Nainpur Prateet.

The proposed study will be conducted in selected freshwater habitats of Seoni district, Madhya Pradesh, India. Sampling sites may include rivers, ponds, reservoirs and fish culture facilities, depending on availability, accessibility and permission. The final study area will be defined by recording the names and geographical coordinates of all sampling sites. Site selection will aim to represent different habitat types and fish production systems.

Study Duration

For the investigation of monogenean ectoparasites, the samples were collected from various fish farms and natural water bodies situated in district Seoni, Madhya Pradesh, India. To observe the seasonal variation three distinct seasons were used as Year 2025-26 summer season (February - May), winter season (October - January) and rainy season (June - September) in the experimental period. The Indian major carps Rohu (*Labeo rohita*), Bhakur (*Catla catla*) and Mrigal (*Cirrhinus mrigala*) were selected as experimental fishes and sampled regularly from all sampling stations. Experimental fishes were collected for a period of 12 months from February 2025 to January 2026. Samples were collected from each sampling station at monthly intervals with the help of fisherman. Per month 10 samples of each fish were collected from cultured ponds and 10 natural water bodies. The samples were transported to the laboratory of department of Zoology, PMCoE J.S.T. P.G. College Balaghat with plastic container and bags for further investigation.

Collection of Parasites

The monogeneans were collected especially from gill region by using Mizelle`s (1936 and 1938) freezing techniques. The external examination were made by scrapping the skin and examining smear using a magnifying glass or by under microscope. Cut both the opercula of fish and remove gills. The dissected gills were placed in petri dish containing clean water and kept in refrigerator for 8-48 hours. The low temperature not only relaxes the parasites but also help in automatic removal of mucous in which these flukes were entangled (Hossain, et. al., 2007). Subsequently, the gills were removed, placed in separate tubes, half filled with water and sake vigorously. This solution now poured in clean petridishes, diluted with water and examined under binocular microscope. The live monogeneans were gently rubbed to dislodge from the gill filaments with the help of a triangular pointed needle and forceps as suggested by Malmberg, (1957). The monogeneans were removed and picked out using a finepipette with a small drop of water on a clean slide and covered with a cover slip (Das, et. al., 2016).

Fixation of Parasites

Monogeneans were fixed with a drop of ammonium picrate or Malmberg fixative introduced beneath the cover slip to fix and clean the parasite. Sometimes monogeneans were immediately fixed in 70% ethyl alcohol or 10% neutral formalin for further processing. The fixed monogeneans were studied under microscope and their size, shape and chitinoid structure was noted. Then the slides were marked by a permanent marker pen according to probable monogenetic trematode. The identification of the parasites was done following Yamaguti, (1953) and Chandra, (2008).

Quantification of Parasites

Prevalence, mean intensity and abundance are suitable descriptors to quantify parasites in hosts. The prevalence, mean intensity of infestation and abundance

(relative density of parasites) were used after Margolis, et. al., (1982).

Prevalence is the number of disease cases present in a particular population at a given time, whereas incidence is the number of new cases that develop during a specified time period. Prevalence is calculated as-

Prevalence (%) = (Number of infected fish / Total number of fish examined) × 100

Mean intensity is the arithematic mean of the number of individuals of a particular parasite species per infected host in a sample. It is calculated as-

Mean intensity = Total number of parasites recovered / Number of infected fish

Abundance is the arithematic mean of the number of individuals of a particular parasite species per host examined. It is calculated as-

Mean abundance = Total number of parasites recovered / Total number of fish examined

OBSERVATION & RESULT:-

The skin mucous and gills of Indian major carps was taken by using scrapping put on object glass, added one drop of aquadest and covered with cover glass. Observation was done by binocular microscope with 400X to identify monogenean ectoparasites. The prevalence, mean intensity and abundance of monogenean ectoparasites were found fluctuated in irregular pattern over the study period in natural as well as cultured fish farm of district Seoni, Madhya Pradesh, India.

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Table 1: Seasonal Changes in Infestations of Monogenean Ectoparasites of fresh-water Indian Major Carps in Cultured Fish Farms Jewanara Seoni:

Season	Name of Fish	No. of Host Fish		Total No. of Parasites	Prevalence (%)	Mean-Intensity	Abundance
		Examined	Infested				
SUMMER	Bhakur	40	23	161	57.50	7.00	4.03
	Rohu	40	19	131	47.50	6.89	3.28
	Mrigal	40	17	115	42.50	6.76	2.88
	Total	**120**	**59**	**407**	**49.17**	**6.90**	**3.39**
RAINY	Bhakur	40	25	189	62.50	7.56	4.73
	Rohu	40	22	161	55.00	7.32	4.03
	Mrigal	40	18	127	45.00	7.06	3.18
	Total	**120**	**65**	**477**	**54.17**	**7.34**	**3.96**
WINTER	Bhakur	40	22	129	55.00	5.86	3.23
	Rohu	40	17	105	42.50	6.18	2.63
	Mrigal	40	16	86	40.00	5.38	2.15
	Total	**120**	**55**	**320**	**45.83**	**5.82**	**2.67**
Grand	**Total**	**360**	**179**	**1204**	**49.72**	**6.73**	**3.44**

In cultured fish farm of Indian major carps shows highest prevalence (62.50%), mean intensity (7.56) and abundance (4.73) of monogenean ectoparasites found in **rainy season** in Indian major carp Bhakur (*Catla catla*) and lowest prevalence (40.00%), mean intensity (5.38) and abundance (2.15) of monogenean ectoparasites found in **winter season** in Indian major carp Mrigal (*Cirrhinus mrigala*) **Table 1.**

Table 2: Seasonal Changes in Infestations of Monogenean Ectoparasites Indian Major Carps in Natural Habitats of fresh-water fishes Wainganga River Seoni.

Season	Name of Fish	No. of Host Fish		Total No. of Parasites	Prevalence (%)	Mean-Intensity	Abundance
		Examined	Infested				
SUMMER	Bhakur	40	24	181	60.00	7.54	4.53
	Rohu	40	22	152	55.00	6.91	3.80
	Mrigal	40	21	132	52.50	6.29	3.30
	Total	**120**	**67**	**465**	**55.83**	**6.94**	**3.86**
RAINY	Bhakur	40	19	104	47.50	5.47	2.60
	Rohu	40	16	85	40.00	5.31	2.13
	Mrigal	40	14	68	35.00	4.86	1.70
	Total	**120**	**49**	**257**	**40.83**	**5.24**	**2.14**
WINTER	Bhakur	40	21	129	52.50	6.14	3.23
	Rohu	40	19	114	47.50	6.00	2.85
	Mrigal	40	17	105	42.50	6.18	2.63
	Total	**120**	**57**	**348**	**39.17**	**6.11**	**2.90**
Grand	**Total**	**360**	**173**	**1070**	**48.06**	**6.19**	**2.97**

In natural habitats of Indian major carps shows highest prevalence (60.00%), mean intensity (7.54) and abundance (4.53) of monogenean ectoparasites found in **summer season** in Indian major carp Bhakur (*Catla catla*) and lowest prevalence (35.00%), mean intensity (4.86) and abundance (1.70) of monogenean ectoparasites found in **rainy season** in Indian major carp Mrigal (*Cirrhinus mrigala*) **Table 2.**

Relationship Between Infection and Fish Productivity

The relationship between parasite burden and fish productivity will be evaluated using the available growth, survival, condition and production data. If higher parasite burdens are associated with poorer fish condition or reduced growth, the strength and statistical uncertainty of that association will be reported. Alternative explanations, including differences in age, species, nutrition, habitat and management, will also be considered. If no statistically significant association is found, that result will be reported rather than interpreted as proof that monogenean infections have no biological effect.

Comparison with Previous Studies

The final results may be compared with published studies from other freshwater systems, including research on monogenean infections in *Mystus vittatus* from the Penna River system. Such comparisons will account for differences in host species, sampling methods, environmental conditions and study duration. Published values from other regions will be used as comparative evidence, not as substitutes for local observations.

DISCUSSION:-

Infestations of monogenean ectoparasites are very common in fresh water Indian major carps. During the investigation, prevalence of monogenean ectoparasites in Indian major carps Bhakur (*Catla catla*), Rohu (*Labeo rohita*) and Mrigal (*Cirrhinus mrigala*)} was quite high and fishes of larger size groups were more susceptible. However, several authors have noted only the correlation between outbreak of monogenean ectoparasites and stocking densities. It was also observed in our study that infestations of monogenean ectoparasites were higher in those fishes which are present in highly condensed form or in fishes inhabited with highly polluted water **(FAO, 1999)**. The infestation of monogenean ectoparasites are more in captive fishes than fishes inhabited in natural water bodies. The captive fishes are more infested in rainy season due to high pollution load but the fishes inhabited in natural water

bodies are highly infested in summer season, when water level falls and fishes come in contact with each other **(Majumdar and Agarwal, 1988)**.

The prevalence of monogenean ectoparasites was higher in captive Indian major carps in rainy season than summer and winter seasons whereas, the prevalence of monogenean ectoparasites on fishes inhabited in natural water bodies was higher in summer season than rainy and winter seasons **(Chandra, 2006)**. In both of these habitats captive as well as natural, the infestation was higher in Indian major carp Bhakur (*Catla catla*) than Rohu (*Labeo rohita*) and Mrigal (*Cirrhinus mrigala*). The Indian major carp Bhakur (*Catla catla*) was more susceptible for infestation of monogenean ectoparasites than Rohu (Labeo rohita) and Mrigal (*Cirrhinus mrigala*). The infestation of monogenean ectoparasites was highest in rainy season and lowest in summer season in captive Indian major carps whereas, the infestation was higher in summer season and lower in rainy season in fishes inhabited in natural water bodies because of the highest stocking density. This result agrees with **Das, (2003) and Banerjee and Bandyopadhyay, (2010)**. According to **Barai and Chandra, (2005)** the highest monogenean ectoparasites infestation were found in fry and fingerlings of Indian major carps during rainy season (June to September) because of highest stocking density and unfavorable environmental condition in captive fish farms. In natural water bodies especially in river (running water) the infestation of monogenean ectoparasites were found highest in summer season due to fall of water level that causes environmental or behavioral stressors and increases the infestation of monogenean ectoparasites on Indian major carps.

CONCLUSION:-

Monogenean parasites are important ectoparasites of fishes and may affect host health under conditions of substantial infection. Their distribution and potential effects depend on parasite identity, host species, environmental conditions and the intensity of infection. The present study highlighted the infestation of monogenean ectoparasites and disease problems in Indian major carps at district Seoni, Madhya Pradesh, India. Monogenean ectoparasites were found mainly on gills but sometimes occur on skin and fins of fishes. Infestation begins at the early stage of fish life and persists up to the adult stage. The captive fishes are more infested in rainy season due to high pollution load but the fishes inhabited in natural water bodies are highly infested in summer season, when water level falls and fishes come in contact with each other. Monogenean ectoparasites infestation also provides platforms for secondary infections of protozoans, bacteria, viruses and crustaceans. Monogenean ectoparasites were a common problem for fresh water Indian major carps of India especially in Seoni Madhya Pradesh. A systematic investigation in Seoni district, Madhya Pradesh, can help establish baseline information on monogenean prevalence, intensity, host associations and seasonal patterns. By combining parasite identification with fish condition measurements and reliable productivity indicators, the study can provide a scientific basis for evaluating the significance of these infections in local fisheries.

Recommendations for Fish Health Management

Based on established principles of fish health management, the following measures may be considered where relevant:

- ❖ Routine examination of fish for external parasites.
- ❖ Monitoring of water quality and stocking density.
- ❖ Maintenance of appropriate feeding and husbandry practices.
- ❖ Quarantine and health assessment of newly introduced fish.
- ❖ Accurate identification of parasites before treatment decisions.
- ❖ Consultation with qualified fisheries or aquatic animal health specialists before using antiparasitic treatments.
- ❖ Maintenance of records on infection, mortality, growth and production.

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