

Cestode Parasites: A Comprehensive Review of Their Ecology and Pathogenesis

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ABSTRACT

Fish is one of the most important sources of nutrition. Parasites are a group of pathogens that cause severe infections in the host fish. Fish are infected with numerous cestode parasites, which are also called tapeworms. Cestodes belong to the phylum Platyhelminthes and class Cestoda, a group of worms with 5000 species that parasitize all groups of vertebrates, including humans. They exhibit a complex life cycle with three hosts. It is the most important topic of research that enables us to understand the entanglement of intrinsic and extrinsic factors that impact the population of fish. From this review, it is found that parasitic infection in fish increases rapidly per year. This increase is mainly due to climate change, pollution, and several anthropogenic activities. Many researchers have been studying new species of cestode parasites and their harmful effects on fish growth. Parasitism is the most prevalent way to exist on Earth, researchers may be able to better understand changes in a particular fish population or stream ecology by comprehending its position in the environment.

Keywords: Fish, cestode parasites, host

I. INTRODUCTION

Fish is a rich source of minerals like magnesium zinc, iodine, iron and potassium. Parasites are omnipresent and they are mainly surviving in their host species. Numerous parasites with diverse life cycles that are categorized in various ways can be found growing on fish. Some of these parasites must pass through a number of intermediate hosts before they may reach a host, whereas many of them are transferred directly between ultimate hosts. Parasitic animals have evolved from free-living ancestors. Current evolutionary theory suggests that this is most likely to have occurred when individuals, pre-adapted for some other purpose, gained a selective advantage over other conspecifics by initial close association with and subsequent exploitation of a larger host organism (Poulin, 1998). Parasite life cycles can be maintained and developed in optimal conditions found in aquatic environments. The study of the occurrence of parasites in a particular fish species can give clues about the feeding ecology of the fish, and consequently about the food-web transmission of the parasites (Costa et al., 2018). Marine environment is complex and provides extremely diverse habitat for a host and their parasites. Every host population within a habitat therefore acquires a characteristics array of parasites and these

parasites communities in their turn can also characterize the habitat (Dogiel et al., 1962) and this concept forms the basis of modern ecological parasitology which deals with distribution and abundance of parasites in time and space (Kennedy, 1975).

The community structure of parasites is shaped by a number of ecological parameters, including temperature, depth range, host behavior, and food. They exhibit a complex life cycle with three hosts. Copepods are the primary host, followed by fish as the intermediate host and humans as the final host. Parasitic infections occur when parasites and hosts are present in the same place at the same time. The presence of infective parasite stages may also cause hosts to undergo changes in behavior. In fish infection mechanisms is depend on environmental factors and the tissue of the host. Parasites diminish the dietary level of the host. Parasites decrease the growth of fish, making the host more susceptible to pathogens and affecting productivity. Analysis of host-parasite associations accordingly shows that animals with comparable food habitats tend to have similar kinds of parasites and that related hosts tend to have related parasites (Cameron, 1964).

Cestode infection is foodborne or by ingestion by the host. All cestodes parasites shows three stages- eggs, larvae, and adults. Adult cestode parasites reside in the intestine of the final host species of fish. A cestode infection occurs when an adult tapeworm excretes feces into the environment, which is subsequently eaten by an intermediate host. Larvae develop from eggs, enter the circulation and accumulate in the muscle and other organs.

Effects of parasites on fish health: Fishes are vital constituent of ecosystem. The host and parasites relationship is temporary or may be lifelong. Cestodes are successful in surviving in the intestine of the fish till its reproduction. They attach to the intestine of the host with the help of hooks and ruptured, destruct the mucosal and sub-mucosal layer of intestine. The parasite finds nutritive material for growth and cause severe damage to the host. Parasite decreases fish growth and raised mortality rates.

Infection accompanying changes in behavior of fish: Fishes accomplish a capacious diversification of behaviors over different temporal scales. Every day they need to search out and *confrontation* for food and evade their predators. They need to find their mates, which may involve migration from one place to another or struggling over territory. Infection affects the ability of fish to perform these and other behaviors.

Change foraging behaviour of fish: Parasites exploit energy from their host. Fish infected with enervating parasites may reduce activity levels and affect fitness. Parasitic infection in fishes effects on frequently change energy expenditure and consequently, appetite and feeding behavior change.

Effects on humans: *Diphyllobothrium latum* is the largest species of tapeworm which infects humans. Diphyllobothriasis is occur worldwide. It is found in United States and northern Europe where people eat raw and undercooked fish. Larvae can cause severe disease and enter into the liver, eyes, muscles, subcutaneous tissues and brain. Infection of the cestode parasites is depending on the infecting species. Fish tapeworm if enters in the human intestine then, it take up dietary vitamin B12 and resulting vitamin B12 deficiency. Inadequate absorption of vitamin B12 leads to the gastritis, pernicious anemia, digestive diseases, headaches, dyspnea, transcobalamin II deficiency and heart failure or neurological manifestations may occur.

II. CONCLUSION

From the above data collected from different research papers, it is found that there is an immense diversity of cestode parasites in fish; they affect fish behavior and cause severe damage to their tissues. As the climatic conditions are favorable for the parasite, its population is increasing rapidly. This increase is mainly due to climate change, pollution, and several anthropogenic activities. This has affected the lives of fish. Aquatic

habitats provide the epitome of conditions for the evolution of the parasite life cycle. The conclusion reached was that, within a given geographic area, a specific species group could be dominant in one host and dominating, influent, or accessory in another host. Various contributing elements, including habit, habitat, food, and other physiological parameters, could be responsible for this. It is estimated that there are numerous species of fish parasites which are still unknown and many species are new to science. So it is suggested that molecular level of study is necessary to description of unknown species, understanding the life cycle and interaction of these organisms with their hosts is often key to understanding the dynamics of ecosystems generally. To bring the knowledge of India's cestode fauna up to par with current understanding, contemporary molecular technologies should be used in systematic research.

III.CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

IV.ACKNOWLEDGEMENT

The authors are grateful to the principal of Vivekanand College Kolhapur, (Autonomous) for motivate us to write this article. The authors are also grateful to the local fishermen for providing us with information about fish.

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