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Types, Frequency, Clinical Signs and Management of Fish Crustacean Parasites

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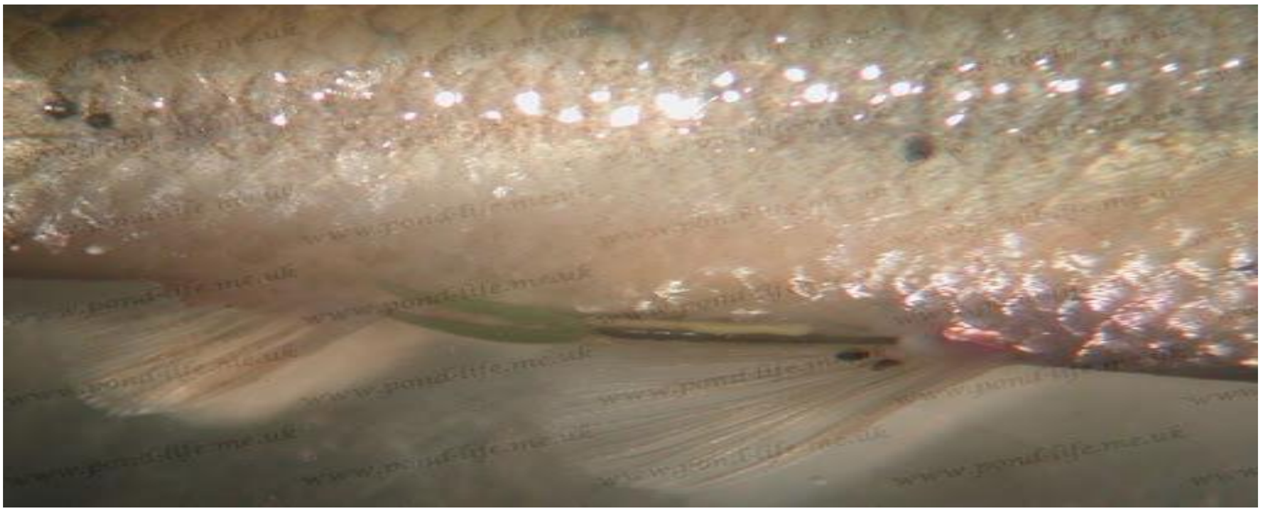
1. Introduction

Fish illnesses can be classified as infectious or non-infectious. Non-infectious diseases are abiotic in nature and result from a variety of biotic sources, such as bacteria, fungus, viruses, and parasites from other animal species. Due to their contagious nature and ability to spread quickly across several hosts, particularly in contaminated environments, parasitic illnesses in fish are typically regarded as biological markers of environmental pollution. There are two kinds of parasites: "obligate" parasites that require hosts to survive and/or reproduce, and "opportunistic" parasites that live freely and feed on vulnerable hosts, a condition known as opportunistic parasitism. An unjust connection in which one living entity gains while the other suffers is known as parasitism. Fish infections with parasites affect fish output both directly and indirectly. The parasites affect the development and reproductive capacity of the hosts and raise the death rates of the infected fish, which results in a large financial loss for the aquaculture sector One tactic for that unequal relationship is ecto-parasitism, in which the parasite targets the external organs of the ultimate host, such as the integumentary system and bodily apertures, which typically have an impact on the hosts' physiology, behaviour, energetics, and even morphology. Numerous ectoparasite species, ranging from Protozoa like Trichodina sp. to Chordata like Sea lamprey (*Petromyzon sp.*), have been shown to cause disease in fish farms. The tiny crustaceans occasionally cause internal organ infestations and endoparasitization in their hosts. Because they have evolved to be closely related to and dependent on other creatures for existence, a number of crab species have contributed to the spread of illness. These crustacean parasites have the ability to infect fish species found in fresh, brackish, and marine water environments globally. While endo-parasitic crustaceans remain in the bloodstream or target internal organs such the heart and branchial tissues, ectoparasite crustaceans target the integument, gills, nostrils, and/or oral cavity of fish. Additionally, Crustacea may infect fish at various phases of their lives and readily adapt to their hosts; this infestation might manifest as a single fish having a double, triple, or numerous parasites, which can lead to significant disease outbreaks in aquaculture in addition, blood parasites and other microbiological pathogens like viruses are spread by parasitic crabs. Consequently, secondary infectious illnesses are typically linked to fish parasitism, exacerbating the severity of the infestation and the suffering of the affected fish. Fish parasites include a wide variety of crustacean species, all of which belong to one of three main groups: branchiura, isopods, or copepods. This page reviews a substantial amount of information on fish parasitizing crustaceans, including their prevalence, pathophysiology, and management.

Major Crustacean Parasites for Fish

The primary groups that make up the classes of parasitic crustaceans are known to include Copepoda, Branchiura, Isopoda, Amphipoda, Barnacles, and Ostracoda. The three main categories of fish crustacean parasites are Copepoda, Isopoda, and Branchiura. These groups are either ecto- or endoparasites; moreover, the only family in the world that has mesoparasites on fish is the Lernaeidae (Copepoda) family. Ostracoda are not parasites and cannot pose a major threat to the host fish, but they can attach themselves to fish tissues that have been harmed by other isopod parasites and feed on the mucus and skin debris. The parasitism of an ostracod (Sheina



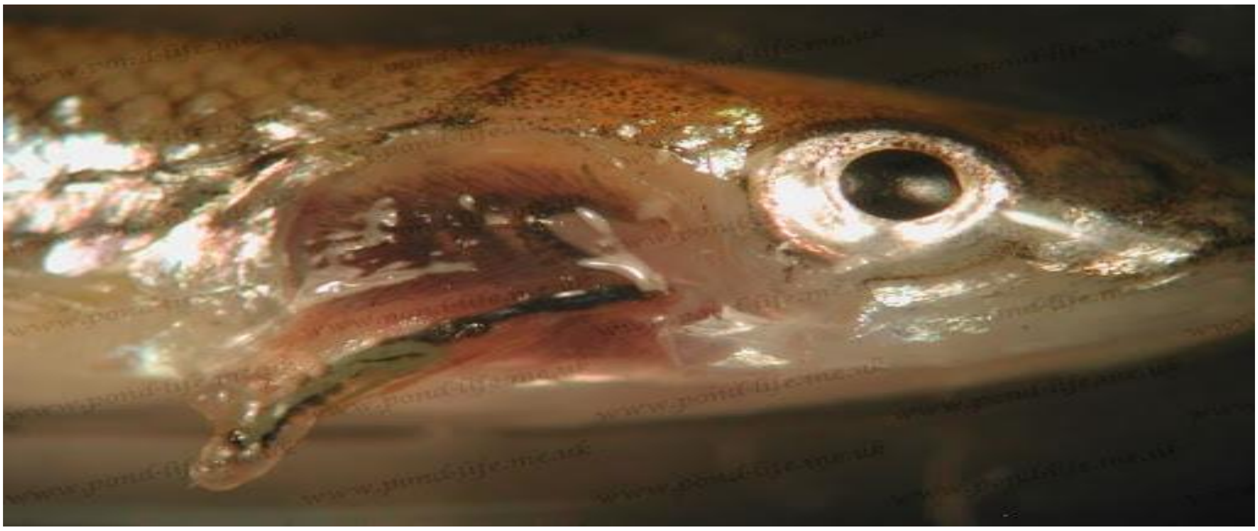


Fig.1. Learnea Diseases Effected Fish

orri) on a shark's gills was, nonetheless, documented in early research; however, they did not guarantee that the ostracod would really consume shark flesh.

A. Order: Copepoda

On fish, copepods are the most frequent and widespread type of parasite. Copepoda are tiny to microscopic crustacean parasites that were free-living in their early life stages before, in most cases, becoming fish pathogenic and causing significant mortality rates in fish farms, in contrast to the generously sized Isopoda and Branchiura. It has been observed that some copepod members parasitize a broad variety of fish species globally. While some of their larval stages are free-living crustaceans, the adults of the genus Caligus (order Siphonostomatoida) are ectoparasites and are known as fish lice (Sea fish lice). 2009 saw the isolation of the parasite copepod Caligus chiastos from the body surface and gill chambers of marine fish kept in floating cages in Malaysia. This was the documented case of the copepod. Certain mature male copepods, including Ergasilus sp., are able to live freely, but the females are limited to parasitizing fish. It has been documented that salmincola species ecto-parasitize both wild and farmed salmonids. Other common fish lice copepods that have been observed to infest the external bodies of multiple freshwater fish gathered from various aquaculture facilities include *Learnea* sp. and *Ergasilus* sp.

B. Order: Isopoda

Cymothoids, Epicardiae, and Gnathiids are the three primary parasite groups that make up crustacean isopods. Only fish are parasitized by adult cymothoids, gnathiid larvae parasitize fish while their adult forms live freely, and epicardia parasitize other Crustacea. Some isopods are obligatory parasites, much as all other parasites, while others are opportunistic. There have been reports of fish larvae and adults being infected by a number of cymothoids isopods. They attack the host's primitive tongue (the tongue-biter parasite Ceratothoa famosa) or infest various bodily cavities and surfaces. They may even attach themselves within the body and feed on its blood. Furthermore, isopods have the ability to endo-parasitize the internal organs of their hosts due to their minuscule size.

C. Order: Branchiura

Branchiura has a number of fish parasite groups that have been extensively researched, covering topics ranging from sexual size dimorphism to fish and frog pathogenicity. Often referred to as fish lice or fish louse, Argulus sp. is one of the most prevalent Branchiura parasites on fish and associated species. Globally, there are about 100 distinct species of Argulus that may infect freshwater and marine fish in both natural and artificial environments, including ponds and wild fish. A few of these species can also infect toads and frogs.

vulnerability to parasite illnesses is, however, influenced by their size and age. Larger fish are more likely than smaller fish to be infected with Argulus foliaceus and Ergasilus sieboldin. The duration of exposure is a crucial element in the parasites' ability to gather on their hosts and cause illness. To a certain degree, the incidence varies between the fish's contaminated areas. In many different aquatic environments and depths, Ectoparasitism is common; however, in deep-sea communities, the diversity of both the hosts and the ectoparasites declines, and the ectoparasites are frequently detached. Further elements that affect the fish's vulnerability to parasite infections include lighting and their sluggish swimming pace in the dark. Summer is the season when parasitic infections and development occur more frequently because of the higher water temperatures. The crab parasites, on the other hand, usually hatch their eggs throughout the summer at a considerably slower pace and at a faster rate during the winter.

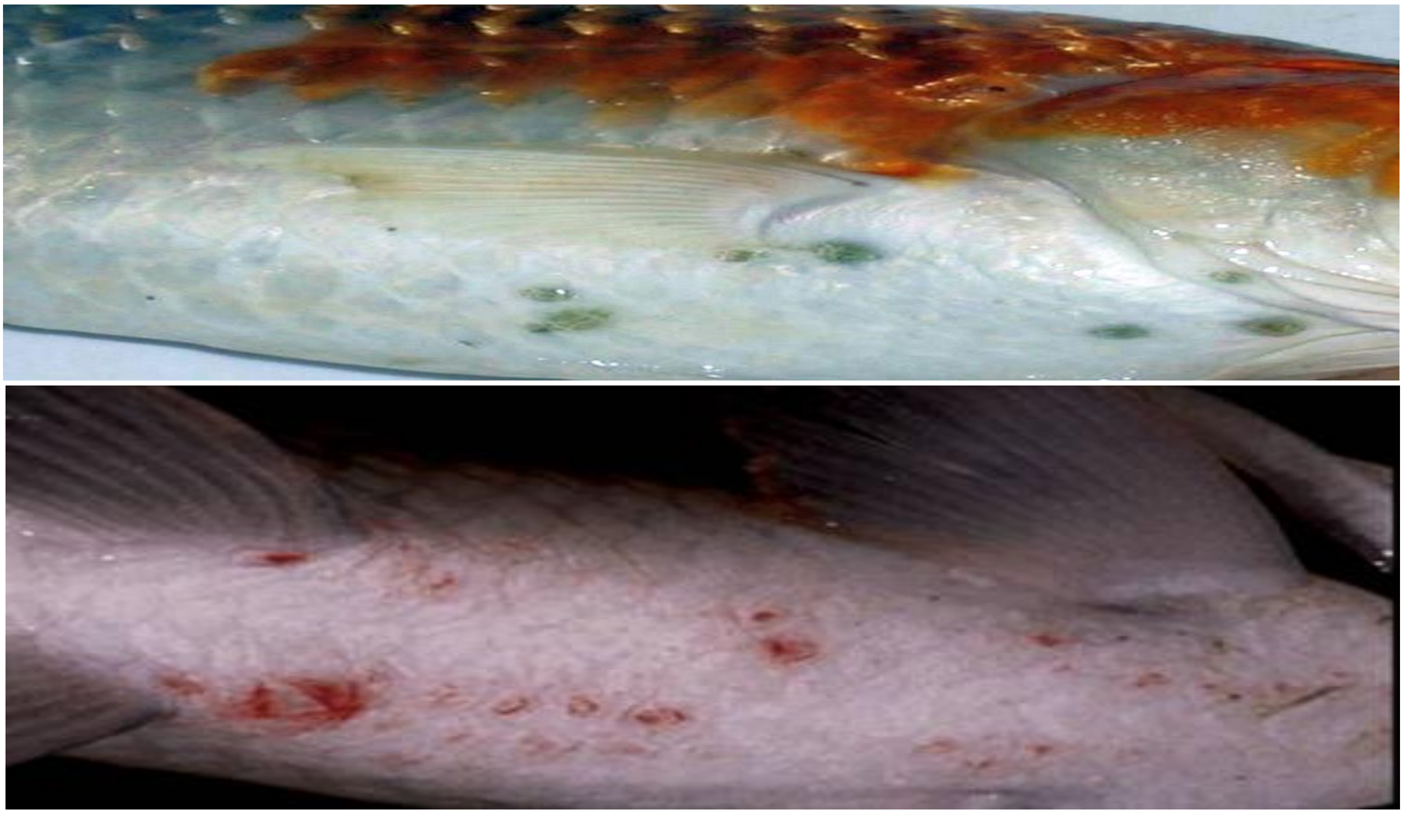


Fig.2. Argulus Diseases Effected Fish

Prevalence of the Crustacean Parasitism and Fish Susceptibility

Crustacean parasitism, which is widespread in contaminated habitats, may affect any type of fish found in fresh, brackish, or marine waters, including farmed, wild, and feral fish. Fish's

Branchiura Argulus coregoni has been known to have a higher egg prevalence in the summer, and the deeper stones have the greatest egg grasping. With a higher frequency in warm marine waters, isopod crustacean parasites have been documented as obligatory ectoparasites for fish in both fresh and marine waters. In July, a greater seasonal predominance of the copepod Lernaea cyprinecea was observed.

Clinical signs

A range of clinical symptoms have been displayed by the infected fish as a defence strategy. many studies mentioned many typical clinical indications that define the ectoparasites of crustaceans. Fish die as a result of osmoregulatory failure and secondary illnesses brought on by severe sea lice infestation (Lepeophtheirus sp. and Caligus sp.). To get rid of the unpleasant ectoparasites, the afflicted fish scrapes its body against hard surfaces while the host fish secretes more mucus from its skin and gills. Argulosis was primarily characterised by fast operculum motions, profuse mucus production, and redness and opacity of the skin). An infestation of Branchiora and Copepoda is often indicated by swelling of the attachment sites in conjunction with erythematous and haemorrhagic symptoms. Adhesion sites for worms have been documented to exhibit skin damage and inflammations. gills that are blocked and anoxia were also reported as signs of crustacean ectoparasites. A frequent indicator of an isopoda infestation is severe tissue deterioration and malfunction that extends to the replacement of fish mouth. Not to be overlooked is the possibility that ectoparasites may modify the host skin microbiome; this is linked to the frequent switching of the hosting fish or location. In addition to causing skin damage, this may make the host more vulnerable to subsequent infections. The copepod Lernaea cyprinecea's microbiome was recently discovered to deviate markedly from the typical microbial communities of unbroken skin, whether from fish that were infected or not. This suggests that the skin microbiome is altered when a crustacean infestation causes a skin ulcer. Furthermore, fish tissues' proteome and transcriptome characteristics may be changed by crustacean parasites; as a result, in-depth molecular studies on the proteome and transcriptomic levels are necessary to comprehend the host parasite interactions.

Treatment and Control

Aquaculture relies heavily on prevention of fish diseases over treatment, so managing fish health (prophylactics in feed, for example) and environment (maintaining water and feed quality, avoiding pond overstocking, drying, and liming) is essential to preventing parasitic infections. Effective feedback greatly depends on prompt treatment and a precise pond case history questionnaire. Furthermore, the development of ant parasite vaccines is strongly linked to omics technologies; still, fish parasitology is still pursuing this new field in parasitology.

a. Chemotherapeutic Control

In aquaculture chemotherapy, a number of chemicals are often utilised, either separately or in combination. Chemotherapeutic treatments, such as avermectins, benzoylphenyl urea, pyrethrin/pyrethroid compounds, hydrogen peroxide (oxidising agent), and organophosphates, were claimed to be effective in controlling sea lice in an early research. A number of parasites were defeated with the help of sodium chloride, Dipterex, and lime; in fish farms, argulosis was successfully treated with lime, potassium permanganate. controlled argulosis treated indefinitely with "Benzene hexachloride" at modest dosages (0.12 and 0.25 mg/L) Interestingly, the use of bio safe and highly delivered natural medicines has been popular recently, particularly for the treatment of endoparasites infestations. These days, the use of bio therapeutics with high delivery, efficiency, and biosafety is popular. This is especially true for managing endo-parasitic diseases, as it helps prevent any potential adverse effects that might endanger fish or the environment. More research is still required in this developing subject, although bio nanotechnology has recently been strongly linked to fish medicine for a number of bio therapeutic uses.

b. Biological Control

In instances when fish infections are spreading, it is recommended to use manual methods like quarantine and thorough programmes for managing fish health and ponds instead of chemotherapy, which might have detrimental side effects for fish and their customers. Biological management with the use of cleaning symbionts is a frequent substitute technique for managing crustacean parasites. Hence, certain aquatic animals likely from different fish species are frequently employed in aquaculture to biologically manage parasites, and they show promise in managing crustacean ectoparasites. For the purpose of maintaining fish health and controlling crustacean parasites, it is advised to source wrasse fish from farms, particularly in the first year of the fish's life cycle. According to reports, wrasse parasites provide little to no damage to farmed fish since they are unique to wrasse and/or need an invertebrate host to finish their life cycle. In previous research, two wrasse species the rock cook (*Centrolabrus exoletus*) and the goldsenny (*Ctenolabrus rupestris*) reported a successful symbiosis cleaning strategy for delousing farmed Atlantic salmon (smolt) while taking infestation pressure quantification and wrasse/salmon ratios into account. For the purpose of delousing Atlantic salmon, Ballan wrasse (*Labrus bergylta*), both farmed and wild, were used. Similarly, in Atlantic salmon-intensive farms, the biological control of sea lice (*Lepeophtheirus salmonis*) infestation was achieved with the use of lumpfish (*Cyclopterus lumpus L*.).

Conclusion

The aquaculture business faces a significant danger from parasitic crustaceans. All habitats on Earth are home to them, albeit they are more common during the warm seasons when temperatures are greater. Fish overstocking, temperature, light, depth, age, size, and swimming speed are the primary parameters influencing the incidence of crustacean parasitism on fish. Furthermore, the length of time spent in contact with the parasites affects how bad the infestation gets. Fish that host to crustacean parasitism suffer significant harm and tissue malfunction, which has the potential to wipe out the whole population of affected fish. Both biological control techniques and medicines are available for eliminating the crustacean parasites. Biological control methods and bio therapeutics, however, are strongly advised for the protection of the environment.

References

Faruk, A.R.; Fish parasite: Infectious diseases associated with fish parasite. Seaf. Saf. Qual., 2018, 154–176.

Fatma Ahmed , Hend Ali, Youstena Bakheet, and Yasser Ahmed;Fish's Crustacean Parasites: Types, Prevalence, Clinical signs, and Control,Sohag J. Sci.. 7, No. 2, 123- 129 (2022),Doi: 10.21608/sjsci.2022.234455

Mansoor, N.T. & Al-Shaikh, S.M.J.; Isolate two crustaceans which infect Cyprinus carpio L. from Bab Al-Muatham fish markets, Baghdad City. Iraq. J. Vet. Med., 2011, 35: 52–59. https://doi.org/10.30539/iraqijvm.v35i1.603.

Rameshkumar, G. & Ravichandran, S.; Problems caused by isopod parasites in commercial fishes. J. Para. Dis.; 2014, 38: 138–141. https://doi.org/10.1007/s12639-012-0210-4.

Tavares-Dias, M.; Dias-Júnior, M.B.F.; Florentino, A.C.; Silva, L.M.A.; da Cunha, A.C.; Distribution pattern of crustacean ectoparasites of freshwater fish from Brazil. Revi. Brasi. de Parasit. Veteri., 2015, 24: 136–147. https://doi.org/10.1590/s1984-29612015036.

Waldman, J.; Grunwald, C.; Wirgin, I.; Sea lamprey Petromyzon marinus: An exception to the rule of homing in anadromous fishes. Biol. Lett., 2008, 4:659–662. https://doi.org/10.1098/rsbl.2008.0341.