

Parasitic diseases in fishes and their Control

Introduction — Parasites are organisms which depend for their livelihood on other organisms. A large and number and diversity of animal species are capable of parasitizing fishes, ranging from microscopic protozoans to easily visible crustaceans and annelids. Most of the fishes either wild or cultured, are infested with parasites. Parasites exhibit a high degree of adaptations to their hosts, many parasites are host specific to some extent and are capable of infecting only one or only a limited number of host species.

Most parasites rarely cause problems in the natural environment but in aquaculture, Parasites often cause serious outbreaks of disease (Roberts 2012) playing an important role in determining the productivity, sustainability and economic viability of aquaculture. Parasite infections cause serious socioeconomic, ecological and welfare consequences in global fish fin aquaculture. This is a matter of great concern that many of the parasites are also of economic importance, and have public health consequences. The impacts of these pathogens can be significant. The following lines presents some important parasitic infections in fishes —

- 1) Protozoan diseases — There are three main groups of protozoans parasitizing the external tissue of fishes.
 - (a) Ciliates
 - (b) Flagellates and
 - (c) Amoebas

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Ciliates - Protozoa belonging to the ciliophora are equipped with cilia, ciliated protozoans are most common external parasites which cause mortalities in a number of farmed fishes. Ciliates can be motile, attached or found within the epithelium, some of the common ciliate infected disease are as follows -

Ichthyophthiriasis - *Ichthyophthirius multifiliis*, referred as ich is the causative agent of white spot disease or Ichthyophthiriasis. It is the most common pathogen of protozoan parasites of freshwater ~~fish~~ fishes worldwide, Ich infections can occur at any of the growth stages of fish from fry, fingerling, table size to brood fish. Parasite causes epizootics in warm and temperate water fish culture. The parasite is spherical in shape and the cilia are evenly distributed over the whole surface, characteristic feature is horse shoe shaped nucleus and its rotating movement. It is an obligate parasite and has a unique direct life cycle which allows a rapid ^{intensity} intensification of infection. The parasite ^{invades} epithelial tissues of gills, skin or fins leaving a small wound and visible white spot or nodule where each parasite encysts. Infected fish are extremely lethargic and covered with visible white dots. Mortality can be rapid and causes damage to respiratory, excretory and osmoregulatory systems leading to secondary infection and eventually death of fish.

2) Trichodiniasis — Trichodiniasis is one of the major protozoan diseases found in fish worldwide. The disease is caused by a large assemblage of petrichous ciliates of fishine trichodinids. The trichodinid group includes *Trichodina*, *Trichodinella* and *Tripartiella*, which are important ectoparasites of freshwater and marine fish worldwide.

Trichodinids have a monoxenic life cycle, and reproduce mainly by binary fission on the host. They can be horizontally transmitted by direct contact or by contaminated water, contaminated fish farming utensils are also another important source of transmission of trichodinids.

Trichodinids are up to 100 μm in diameter, and have basic saucer shape with a fringe of cilia around the perimeter which used for locomotion and feeding. Their body is supported by a rigid ring of interconnected discs called chitinous or denticular ring. The parasite browse over the surface of gills and skin with spinning motion, damaging the host tissues and consuming the resulting tissue debris. Infected fish often have a grayish sheen due to excess mucus production and fins may become frayed. Ultimately erosion of epithelium will occur. The main pathological changes are related to gill tissue, such as hyperplasia, hyperostrophy, oedema, inflammatory infiltration and necrosis (Ye mmen et al. 2011, Valla do et al. 2013, 2014)

3) Chilodonellosis — *Chilodonella* is a highly pathogenic holobrich ciliate, ectoparasite

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on the skin and gill of a wide range of temperate and tropical freshwater fish. The parasite has a flattened, ovoid shape is upto 800um in length, covered by rows of cilia which move in a steady gliding manner over the epithelial cells of its fish host. Heavy infection of chilodonella are often associated with poor water quality. Carps, salmonids, and catfish are the most common species affected. Chilodonella piscicola infects cyprinids particularly, but can be found on other fish, fingerlings are specially vulnerable.

mass development of fishes cause high mucus production and disturbance in respiratory function of the skin. The fish is restless and rises to the upper layers of the water. Its body is covered with bluish, white coating particularly in head region. it leads to secondary infection by bacteria, fungi, and other pathogens. It causes localized hyperplasia of the gill epithelium. The thin respiratory epithelium is covered by the hyperplastic epithelium and this drastically reduces the respiratory surface of the gills.

Flagellates - Flagellated protozoans are small parasites that can infect fish externally and internally. They are characterized by one or more flagella that cause the parasite to move in a whip-like or jerky motion. Flagella are longer and more powerful than cilia and are always few in number.

Ichthyobodosis - The disease is caused by heavy infections on skin and gills of fish by parasitic flagellates belonging to the genus *Ichthyobodo* (Teakon 2013). It is an important disease that has caused severe loss among farmed and ornamental fish worldwide for more than a century. It is a major cause of mortality among Salmonid fry and fingerlings. *Ichthyobodo* species spread rapidly between hosts in fish farms most likely by direct or through free swimming parasites. Massive infections on skin and gills can cause epithelial hyperplasia or hypertrophy and may result in severe or fatal osmoregulatory or respiratory problems. excess mucus production, flashing, lethargic behaviour, listlessness, loss of appetite and increased mortality are some common symptoms.

Ichthyobodo are obligate ectoparasites with a direct life cycle on the host, feeds on epithelial cells of fishes. The free swimming form is kidney shaped with two pairs of flagella. The attached form is pear shaped and attaches to the gill and skin. The parasites disappear from a dead host and die after 30-60 minutes in the free swimming form outside a host.

Hexamitiasis - Hexamitiasis is caused by excessive numbers of flagellated, protozoa of the genus *Hexamita* in the alimentary tract of farmed and wild fresh water fishes. *Hexamita* sp is a shell pear shaped, pyriform organism with three

anterior and one posterior pair of flagella. Hexamita truttae is common in North American trout hatcheries causing mass mortality in fishes. Clinically the young fish have anorexia, reduced growth, acute enteritis, yellowish watery gut contents with numerous organisms present in the faeces or bile from the gall bladder. Transmission is by ingestion of an infective cyst. The parasites present a monoxenic life cycle, the pear shaped trophozoites change to spherical before cellular division and transmitted horizontally by excreting trophozoites and oocysts in water from the fish faeces that will be ingested by other hosts.

Amoebic gill disease - Amoebic gill disease is caused by the free living facultative amoeba Paramoeba perurans, which leads to gill damage and death of infected fish. Gross pathology of infected fish is characterised by raised multifocal white mucoid patches on the gill, which represent regions of epithelial hyperplasia of the primary and secondary lamellae. This phase is followed by desquamation of the epithelium, local disturbances of blood circulation and progressive changes represented by inflammation, ultimately loss of gill supporting surface area. Significant cardiac changes and acid base disturbance leads to acute cardiac dysfunction and death of fishes.

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