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A survey on ectoparasite fauna of cold water fish farms in Mazandaran Province, Iran

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Abstract. Rainbow trout is commercial species that breed all over the world, and Mazandaran Province is one of the important areas of this industry in Iran. The present study was carried out to survey on ectoparasite fauna of cold water fish farms in Mazandaran Province (Iran) during a period of 12 months. For this aim 500 samples were obtained from 50 fish farms and after arriving to laboratory the parasite examination started immediately. From the total of 500 specimens, 182 fish (36.4%) were infected with ectoparasites. Through the parasitic examinations five species of parasites were detected, namely: *Ichthyophthirius multifillis*, *Trichodina sp.*, *Chilodonella sp.*, *Gyrodactylus sp.* and *Dactylogyrus sp.* The results showed that, from total percentage (36.4%) of detection, 31.4% of detected parasites were protozoan (16.4% *Ichthyophthirius multifillis*, 14% *Trichodina sp.,* and 1% *Chilodonella sp.*) and 5% were monogenean trematodes (3% *Dactylogyrus sp.* and 2% *Gyrodactylus sp.*). The highest prevalence of parasites in our study belonged to the *Ichthyophthirius multifiliis* causative agent of White Spot Disease.
Key words: *Oncorhynchus mykiss*, rearing, rainbow trout, cold water, parasites of Iran.

Introduction. Fish were the first vertebrates that appeared on Earth. There are roughly 25 thousands of types of fish consisting in a great number of species. With a complex morphological and anatomical dynamics (Bud et al 2009; Boaru et al 2010), the trout's group is such a type, having its own history, and rainbow trout is one species of this group. Scientifically, it is known as *Oncorhynchus mykiss* (Walbaum, 1792).

Fish are continuously exposed to stressful procedures in rearing facilities e.g. inadequate water parameters, transport, over handling and overcrowding (Barton & Iwama 1991; Petrescu-Mag et al 2007ab). Like other poikilotherm vertebrates (Trandaburu & Trandaburu 2010ab) fish have their own mechanisms of response to stressors (Wendelaar-Bonga 1997). A particular type of stressors is the parasitism. Most often, the parasitic organisms co-evolve and surpass the geographic barriers together with their host. For example, in the young and continuously evolving group of Cyprinids (Luca et al 2010) a frequent co-evolution of hosts with their parasites was reported (Molnar 2009). Sometimes parasites penetrate into new geographical areas and establish relationships with other hosts (Stavrescu-Bedivan & Aioanei 2008). Therefore, a permanent inventory of the parasitic fauna in a specific geographical area (in this case Mazandran Province) is of real interest.

Rainbow trout is one of the most important commercial fish that cultivated in cold water for protein production and human consumption. One stressor influencing fish health is that imposed by parasites. External parasites are the most common parasites encountered in aquatic animals raised in both ponds and aquaria (MacMillan 1991). This group is a diverse array of mainly ciliates and flagellates that feed on the most superficial skin layer. Clinical signs are due to damage caused by parasite feeding activity. Parasites irritate the

skin and often cause a reactive hyperplasia of the epithelium and increased mucus production. All protozoan ectoparasites have a direct life cycle, which is faster at higher temperature. Generation time of some species may be as short as 24 hours under optimal conditions. Thus, these parasites can quickly overwhelm a host population. Ectoparasite infestations can cause severe skin damage such as abrasions and ulcerations on the body surface, hemorrhagic spots on the skin and eroded fins resulting in economic losses due to reduced growth, fecundity and increased morbidity and susceptibility to secondary infections (Pike 1989). Furthermore in affected fish respiratory function can be drastically impaired because of hyperplasia, degeneration and necrosis of the gills. Therefore due to importance of ectoparasite infestations and their significant economic losses in aquaculture, knowledge of the parasites, their hosts and their prevalence is an essential prerequisite of preventative procedures for the parasite problem in aquaculture. The aim of present study was to identify ectoparasites of cold water fish farms and their prevalence in Mazandaran Province of Iran which will be important for monitoring of cold water fish farm in this area.

Materials and Methods. Five hundred samples of rainbow trout (*O. mykiss*), weighing 1-150g, were sampled randomly from 50 cold water fish farms in Mazandaran Province of Iran from April 2009 to March 2010. Specimens were transferred alive to an aquatic laboratory in Amol (Mazandaran, Iran).

The parasitic examination began immediately with checking samples for any abrasion or ulceration on body surface. Fish skin is not keratinized and thus is susceptible to iatrogenic damage. Two major methods were used to obtain skin biopsies: skin scraping and fin clipping. After that wet smear of skin, fins and gills were prepared and observed carefully under the light microscope (LABOVAL 4) with 40x magnification. For this process basic required equipment were latex gloves, simple surgical instruments (scalpel, fine and coarse forceps etc) microscope slides and cover slip. Finally the prevalence of each parasite was statistically estimated.

Results. From a total of 500 specimens, 182 fish (36.4%) were infected with ectoparasites. Through the parasitic examinations five species of parasites were detected, namely: *Ichthyophthirius multifillis*, *Trichodina sp.*, *Chilodonella sp.*, *Gyrodactylus sp.* and *Dactylogyrus sp.* (see pictures in Figure 3).

The results (presented in Figs 1-2) showed that, from total percentage (36.4%) of detection, 31.4% of detected parasites were protozoan (16.4% *Ichthyophthirius multifillis*, 14% *Trichodina sp.,* and 1% *Chilodonella sp.*) and 5% were monogenean trematodes (3% *Dactylogyrus sp.* and 2% *Gyrodactylus sp.*). The highest prevalence of parasites in our study belonged to the *Ichthyophthirius multifiliis* causative agent of White Spot Disease.

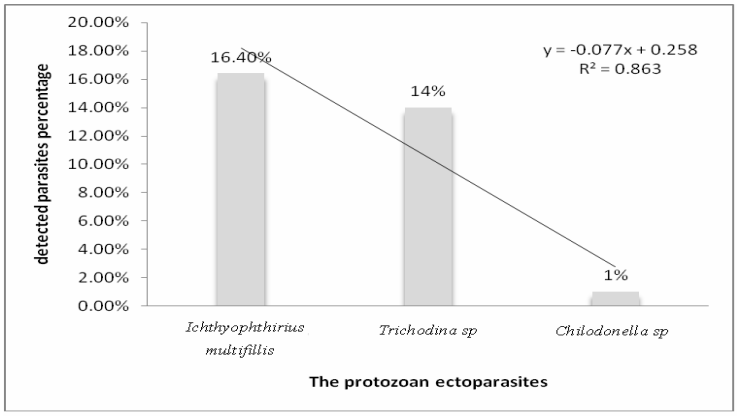

Figure 1. The performance of protozoan ectoparasites infestation ratio (%).

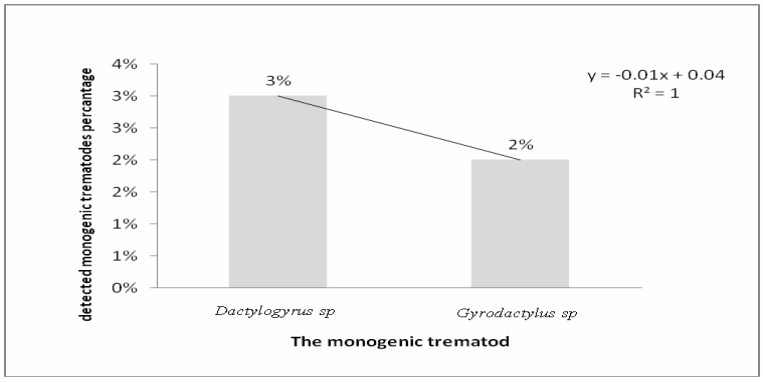

Figure 2. The performance of monogenean trematodes infestation ratio (%).

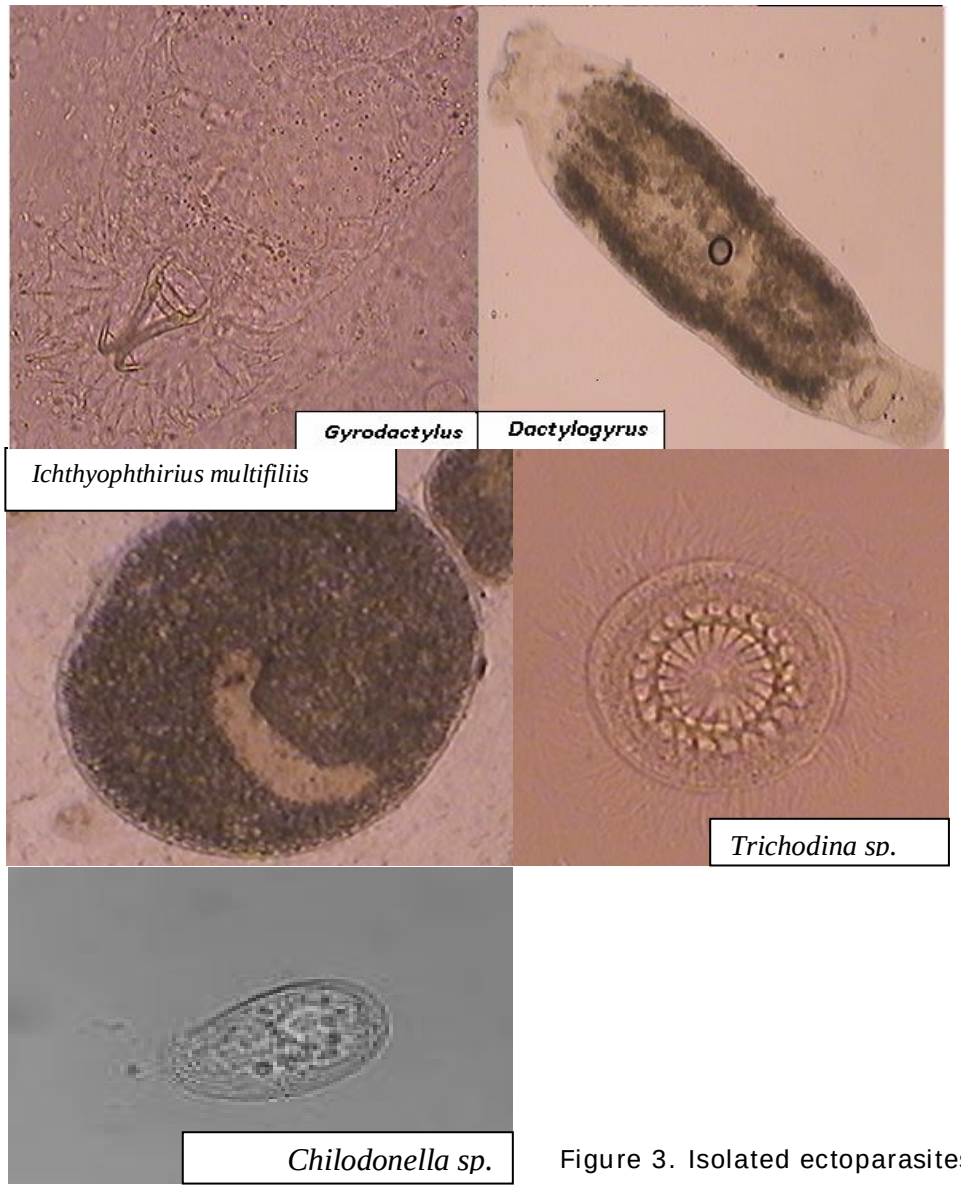

Figure 3. Isolated ectoparasites.

The comparison of infestation with monogenean trematods and protozoan ectoparasites (as it is shown in Figure 4) indicate large differences; protozoan ectoprasites were more prevalent than monogenean trematods. The total percentage of monogenean trematod was only 5% from total number of fish investigated, rather low value compared to that of protozoans.

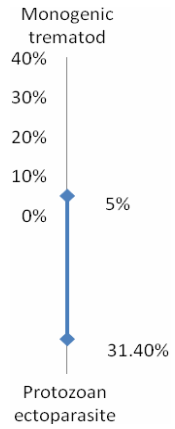

Figure 4. The comparison of protozoan and monogenean trematods infestation ratio (%).

Discussion. So far, there was not enough information about prevalence of ectoparasites in cultured rainbow trout (*O. mykiss)* of Mazandaran Province (Iran). The present study revealed that the overall parasites prevalence was 36.4% and demonstrated the increasing concern of parasitic infestation in cultured rainbow trout in the Mazandaran Province of Iran.

Ichthyophthiriosis is highly contagious and spreads rapidly from one fish to another so if it is detected, treatment should be applied before it becomes too serious. Because of the parasites life cycle, only the free-swimming stage of the parasite is susceptible to treatment. Neither the trophonts under the epithelium nor the tomont cysts can be killed, but repeated treatments continually, can kill the juvenile tomites. *I. multifiliis* is a serious problem for fish farmers and it is the cause of heavy economical losses. Careful management (such as quarantine and multiple treatments) is necessary, and this can minimize the economic losses (Omidzahir et al 2010).

Detected monogeneans in this study were *Dactylogyrus* and *Gyrodactylus*, which are gill and skin parasites. They have a series of hooks that attach to the fish causing irritation, excessive mucus production, and create an open window for bacterial invasion. A few flukes on a healthy mature fish are not usually significant; however, moderate numbers on a young fish can cause significant mortalities. Prevention of monogenean infestations by quarantine practices is preferable to treating the parasites after they have become established in a system. Formalin and potassium permanganate baths are effective for controlling monogenean infestations in freshwater fish. Members of the genus *Dactylogyrus* are egg layers. The eggs can be resilient to chemical treatment, therefore multiple treatments (1 dose per week) are appropriate to control this group of organisms (Reed et al 2005).

Predisposing stressors including over handling, overcrowding of the fish, poor quarantine conditions, poor sanitation practices and poor bio-security can accelerate the disease outbreaks (Shoemaker et al 2000), therefore enhance the health management through improving water quality and bio-security of fish farms are the most effective way to prevent the parasite infestation. Improvement of fish health and survival can be made also by bio-additives incorporated in their basal diet (see Ognean & Barbu 2009). Control of fish parasites requires knowledge of the parasites of each region, their hosts and their

prevalence, therefore periodic parasitical examination can contribute to the control of fish parasites and their economic losses.

Conclusion. The present study surveyed on ectoparasite infestations which is important in fish farm monitoring. Rainbow trout is commercial species that breed all over the world, and Mazandaran Province is one of the important areas of this industry in Iran. Ectoparasite infestations can be controlled and it needs good knowledge on ectoparasite species for best treatment use.

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