

CHAPTER 1 INTRODUCTION

1.1 Research Background

Koi fish (*Cyprinus carpio Linnaeus*) is one of the most potential freshwater fish resources that has wide distribution in Indonesia. Moreover, Koi fish supplies ornamental fish commodities and has a stable price in the international market (Rizky *et al.*, 2015 ; Kusrini *et al.*, 2015) due to their beautiful colour and body shape (Azmi *et al.*, 2013). Lately, the interest of ornamental fish such as Koi fish industry grows bigger prioritizing the sufficiency of Koi fish fry' quality and quantity as the chain-link of Koi fish cultivation business (Emaliana *et al.*, 2016).

Kemloko, located in Nglegok sub-district, Blitar regency is already known as a center for koi cultivation in Blitar (Hermawan, 2007). This is supported by the factor of Kemloko area which is located in the slopes of Mount Kelud impacted to the soil in Kemloko that is still very fertile, and is passed and irrigated by many rivers. The management of fishery resources in Kemloko is mostly koi fish, so in Kemloko Koi fish has become the identity of the area, even well-known at the national and international level (Bappeda Jawa Timur, 2013).

Fish disease becomes a challenge to fish cultivation. Fish disease itself can arise from either infectious or non-infectious causes. Infectious diseases can be caused by viral, bacterial, mycotic, and parasitic agents which usually accompanied with high mortality and morbidity rates. Meanwhile, non-infectious disease can be caused by environmental changes or nutritional deficiency. Environmental changes that less support to fish health could be from sudden

temperature changes, too high or low of pH or dissolved oxygen level, and the existence of poisonous substances, pesticide, or industrial waste. Such intolerable conditions can cause physiology disturbance leading to mortality in fish. Meanwhile, nutritional deficiency such as vitamin C, D, phosphor, or tryptophan deficiency can cause lordosis or scoliosis in fish (Akbar and Fran, 2013).

A heavy infestation of parasites pose a significant threat for fish production (Sutarni *et al.*, 2021) and can be one of predisposition factor to a more dangerous pathogen infection that can lead the infected fish to derivation of fish body weight, deterioration of cultivation, rejection due to their abnormal morphology, or even mortality (Ulkhag *et al.*, 2018). In the other hand, the distribution of parasite is easier and faster in Koi fish cultivation (Subekti *et al.*, 2013).

Most of the commonly encountered parasites which can be a significant disease agents towards *Cyprinidae* family especially Koi fish is *Myxobolus* (Phylum: *Myxozoa*). *Myxobolus* is a parasitic agent that is harmful for various types of freshwater fish and common known as the cause for Myxobolus in fish that can bring economical losses to farmers in the terms of cultivation business (Helmiati *et al.*, 2005). In 2013, Ministry of Fishery and Maritime Affairs through Decision Number 26/Kepmen-Kp/2013, decided *Myxobolus koi* is included in the list of Class I Quarantine of Fish Pests and Disease (Hama Penyakit Ikan Karantina) in the parasite type (Nurekawati *et al.*, 2016).

In Kemloko, the report of *Myxobolus* infection in Koi fish itself was 59% which is higher than Penataran sub-district (Yuliono, 2013). In a research

conducted by Firmansyah *et al.*, (2012) total of Koi fish infected by *Myxobolus* was 107 fish from 200 sample, which was higher from Penataran sub-district (62 fish from 100 sample), and Nglegok sub-district sub-district (68 fish from 200 sample). Based on the area of Pemantauan Daerah Sebar Hama Penyakit Ikan (HPI)/Hama Penyakit Ikan Karantina (HPIK) in Balai Karantina Ikan, Pengendalian Mutu dan Keamanan Hasil Perikanan Kelas I Surabaya, *Myxobolus koi* attacks was also reported from 2012 – 2014 infecting koi fish fry with 3 – 16 cm in size from Kemloko, Nglegok sub-district, Blitar Regency with 90% deaths.

The kinds and the age of a fish affects to the parasitic infestation degree. The younger fish/fry/juvenile stage is more susceptible to the parasite infestation compared to the older fish due to the readiness of its body defense system and immunity (Hardi and Handayani, 2016). According to Kaur and Ahmad (2017), younger fish is more susceptible to *Myxobolus* infections. *Myxobolus* affects the survival rate of Koi fish and can cause death up to 80% - 100% in the fry stage (Mahasri *et al.*, 2013 ; Mahasri, 2017). *Myxobolus* sp. were also reported infecting many kinds of freshwater fish which one of them was carper aquaculture by causing 60 – 90% from total infected fish (Prihartini and Alfiyah, 2017). *Myxobolus* develop fast and cause genetic change which impacted to mutation in body immune system (Nurekawati *et al.*, 2016).

Myxobolus attacks various organs in tissues and cause various damage. This study is focused in the gills and intestine organ of the fish. High mortality rates caused by infestation in gills and become a serious concern among fish farmers (Kaur and Ahmad, 2017). Thus correspond with the statement of Kaur

and Singh (2012) that recorded the majority of *Myxobolus* infestation happen in gills. Infestation of *Myxobolus* sp. nodule in gills leads to imbalance oxygen distribution in fish to support their respiratory and will disturb those process due to the reduction of gas exchange capacity in gills. The appearance of nodule in high infestation will also make operculum of a fish can't be closed perfectly. Thus will lead into dysfunctional breathing, and lose body balance impacted to spirally swim behavior of the fish and impact to fish mortality (Handajani and Adiputra, 2014). Meanwhile, infestation of *Myxobolus* sp. in intestine can cause monolitic in intestinal wall impacted to the absorption of nutrition disruption, and make fish does not maximally grow (Sugianti, 2005). Thus, gills and intestine are being the most liked organ target for some *Myxosporean* parasite including *Myxobolus* (Jabal *et al.*, 2015).

The easiest way in suspecting *Myxobolus*-infested fish can be noticed by nodule apparent on the gills. A nodule consisted of a bunch of cyst. A small nodule contains more than 15.000 *Myxobolus* spore. Spore itself is the finest structure to support identification necessity. The Genus *Myxobolus* contains more than 450 species (Lom and Dykova, 1992). Spore itself is the most obvious morphological stage of *Myxosporea* class, since it is the final developmental stage found in the fish (Andree *et al.*, 1999). Identification of *Myxobolus* is known by their multicellular spores which have a typical polar capsules. The variability of sizes, shapes and number of constitutive elements is significant and vary between *Myxobolus* species, thus is useful and has been used traditionally as the main key for species descriptions and taxonomical classification (Yuasa *et al.*, 2003).

The transmission of *Myxobolus* can be direct or indirect. Direct transmission happen between fish to fish, meanwhile indirect transmission needs *Oligochaete* worms usually *Tubifex tubifex* to continue myxospore stage to develop into actinospore stage. Life cycle of *Myxobolus* itself starts when the fish fed *Myxobolus* spore and the spore will be developed inside the fish body. The spore then come out from the fish body through faeces, lay in the base of the waters, and waiting to be eaten by the *Oligochaete* worms, *Tubifex tubifex*. Thus, the more *Tubifex tubifex* found in the base of a water or a pond, the bigger chance of *Myxobolus* infection in fish can happen (Yuliono *et al.*, 2012).

Since the spread of *Myxobolus* sp. in Koi fish cultivation is rapid and convenient causing mass deaths only in a short time, and considering the impact to the cultivation, we are necessary to ensure the existence of *Myxobolus* using native and histopathological examination. The examination will confirm the existence of *Myxobolus* together with its sizes. The writer also hopes the appropriate treatment for *Myxobolus*-infested Koi fish will be performed since the early stage so it won't spread massively. Therefore, Koi fish will continue its next life stage to have the best selling price and so to farmers it will give more profit than losses.

1.2 Problem Statement

Problem statements of this research are:

1. Do *Myxobolus* sp. spore exist on the gills and intestine of Koi fish fry from Kemloko, Nglegok sub-district, Blitar Regency confirmed with native and histopathological examination?

2. How is the size of *Myxobolus* sp. spore on the gills and intestine of Koi fish fry from Kemloko, Nglegok sub-district, Blitar Regency based on native and histopathological examination?

1.3 Research Aim

The aims of this research are:

1. To investigate the existence of *Myxobolus* sp. spore on the gills and intestine of Koi fish fry from Kemloko, Nglegok sub-district sub-district, Blitar Regency using native and histopathological examination.
2. To measure the size of *Myxobolus* sp. spore on the gills and intestine of Koi fish fry from Kemloko, Nglegok sub-district, Blitar Regency based on native and histopathological examination.

1.4 Research Benefit

The benefit of this research is to provide information regarding the existence of *Myxobolus* sp. spore from Koi fish fry from Kemloko, Nglegok sub-district, Blitar Regency together with their size confirmed using native and histopathological examination.

1.5 Theoretical Base

Koi fish supplies ornamental fish commodities and has a stable price in the international market (Rizky *et al.*, 2015 ; Kusrini *et al.*, 2015) due to their beautiful colour and body shape (Azmi *et al.*, 2013). Lately, the interest of ornamental fish such as Koi fish industry grows bigger prioritizing the sufficiency of Koi fish fry' quality and quantity as the chain-link of Koi fish cultivation

business (Emaliana *et al.*, 2016). Fish disease is an obstacle to Koi fish cultivation development leading into economical losses to farmers by decreasing fish selling price (Yunus *et al.*, 2021). Most of the commonly encountered parasites which can be a significant disease agents especially in Koi fish is *Myxobolus*. Based on Balai Karantina Ikan, Pengendalian Mutu, dan Keamanan Hasil Perikanan, *Myxobolus* sp. is included in the list of Quarantine Fish Disease (Hama Penyakit Ikan Karantina) Group I. *Myxobolus* sp. were reported infecting many kinds of freshwater fish which one of them was carper aquaculture by causing 60-90% from total infected fish (Prihartini and Alfiah, 2017).

In a short time, *Myxobolus* can cause mass deaths. It affects the survival rate of Koi fish and can cause death up to 80% - 100% in the fry stage (Mahasri, 2013 ; Mahasri, 2017). In the other hand, Priyono *et al.*, (2013) stated the high mortality rate of Koi fish caused by *Myxobolus* sp. infestation was reported in Yogyakarta at 2002 (Rosita, 2012). In Magelang, the prevalence rate of *Myxobolus* in a pond can reach to 91% (Anugrahi, 2013). *Myxobolus* sp. were also reported infecting many kinds of freshwater fish which one of them was carper aquaculture by causing 60-90% from total infected fish (Prihartini and Alfiah, 2017).

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