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ECTOPARASITES AND WATER QUALITY MANAGEMENT ON SILVER POMPANO IN REARING FLOATING NET CAGES AT THE CENTER FOR MARICULTURE FISHERIES (BBPBL) LAMPUNG

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ABSTRACT

The production value of silver pompano has been increasing annually, with strong market demand both locally and internationally. One significant issue in silver pompano aquaculture is infectious diseases caused by parasites. Water quality, being a critical component of the fish's environment, plays a crucial role in disease occurrence, necessitating effective management practices. This study was conducted at the Center for Mariculture Fisheries (BBPBL) Lampung from July 11 to August 31, 2022, aiming to identify the species, intensity, and methods for examining ectoparasites on silver pompano in floating net cages and to assess water quality management practices that can mitigate the proliferation of parasitic diseases. The methodology employed included direct examination and observation. Ectoparasite assessments at BBPBL Lampung involved scraping the surface of the fish body and mounting the fish gills. The identified ectoparasites in the floating net cages of silver pompano were *Pyragraphorus hollisae*, *Benedenia seriolae*, and *Neobenedenia girellae.* Water quality management in the floating net cages is routinely monitored on a weekly basis.

Keywords: *BBPBL Lampung, Ectoparasites, Silver Pompano, and Water Quality.*

INTRODUCTION

The production value of silver pompano (*Trachinotus blochii*) in Lampung has shown a consistent annual increase. In 2014, the production value was IDR 4,780,778,000; in 2019, it rose to IDR 6,486,615,000; and by 2020, it had reached IDR 12,338,581,000 (KKP, 2020). Silver pompano, characterized by its flat, star-like shape (Ezraneti *et al.,* 2019), holds substantial market potential both locally and internationally, presenting a promising opportunity for development in Indonesia (KKP, 2020). The cultivation of silver pompano is considered an alternative business development strategy aimed at enhancing marine productivity (Susanti *et al.,* 2014). However, a major challenge in its cultivation is the occurrence of diseases, primarily caused by ectoparasites. Infectious diseases result from an imbalance between pathogens (ectoparasites), the host (fish), and the environment, known as the epidemiological triangle, where interactions among these three factors can either increase or decrease disease prevalence (Gordon and La Richt in Irwan, 2017).

Previous research has identified several ectoparasites affecting silver pompano. In Tanjungpinang City in 2018, three types of ectoparasites were identified: *Cirolana* (Arthropoda: Cirolanidae), *Benedenia* (Platyhelminthes: Capsalidae), and *Zeylanicobdella arugamensis* (Annelida: Piscicolidae) (Azuar *et al.,* 2019). At BBPBL Lampung, two species of ectoparasites were also found: *Neobenedenia girellae* (Platyhelminthes: Capsalidae) and *Pyragraphorus hollisae* (Platyhelminthes: Pyragraphoridae) (Sisari, 2019). Protozoan ectoparasites identified at BLUPPB Karawang included *Trichodina, Apiosoma*, *Vorticella*, and *Chilodonella* (Panduheriana and Abdillah, 2019). Additionally, *Amyloodinium ocellatum* (Protozoa: Oodiniaceae) was discovered at the Mandapam Regional Center (MRC) of the Central Marine Fisheries Research Institute

(CMFRI) in Tamil Nadu, India (Kumar *et al.,* 2015). In Lombok, the ectoparasite *Canuella* (Arthropoda: Cerioporidae) was found in both pond hatcheries and floating net cages (Syahputra *et al.,* 2021).

The Lampung Marine Fisheries Cultivation Center is equipped with a fish health and environment laboratory dedicated to observing and examining silver pompano for diseases, particularly ectoparasites. The objectives of this observational study are to identify the species and intensity of ectoparasites, to establish methods for ectoparasite inspection, and to develop water quality management practices for silver pompano reared in floating net cages at BBPBL Lampung.

MATERIAL AND METHODS

Materials

The tools and materials employed for water quality examination included a dissolved oxygen (DO) meter, refractometer, pH meter, Erlenmeyer flasks, spectrophotometer, oxidator solution, phenol, and dye solution. For ectoparasite examination, the necessary tools and materials comprised surgical instruments (scissors, scalpels, tweezers), object slides, cover slips, pipettes, stationery, rulers, tissue, trays, a light microscope, scoops, aerators, 70% alcohol, and seawater.

Methods

The research was conducted from July 11 to August 31, 2022, at the Fish Health and Environment Laboratory of the Center for Mariculture Fisheries (BBPBL) in Lampung. The methodology encompassed observational and examination techniques. Collected samples included ectoparasites and water quality parameters.

Sampling and examination of ectoparasites

After preparing the necessary tools and materials, fish were sampled for ectoparasite examination using a purposive sampling method. Fish showing changes in behavior and/or macroscopic anatomical pathology, as well as those without such changes, were included. Sampled fish consisted of 1-5 individuals per collection, ranging from 14.5 to 32 cm in length, and were taken in the morning before feeding. Fish were captured using a scoop, placed in a bucket filled with seawater and an aerator, and then transported to the laboratory for observation.

Before ectoparasite examination, fish were prepared to facilitate diagnosis. This preparation included recording behavioral changes, observing macroscopic pathological changes, and measuring body weight and length. Ectoparasites on the body surface and gills were examined. Mucus from the body surface was scraped using a scalpel from the anterior to the posterior end, placed on an object slide, and covered with a cover slip after adding seawater. For gill examination, gill lamellae were excised, separated from cartilage, placed on an object slide, and covered with a cover slip after adding seawater. Observations were performed using a light microscope with magnifications of 40x and 100x, equipped with a monitor connected to a computer.

Identification and intensity of ectoparasites

The ectoparasite found were identified based on specific morphological characteristics during observation. Identification of ectoparasite based on identification keys (11, 12, 13). Parasite identification was carried out at the Fish Health and Environment Laboratory in the Center for Mariculture Fisheries (BBPBL) Lampung. Intensity calculated using the following formulas:

$$Intensity = \frac{the\ number\ of\ invading\ parasites\ (individuals)}{the\ number\ of\ samples\ infected\ with\ parasites\ (fish)}$$

Then categorized according to (14) that intensity less than 1 is very low, 1-5 is low, 6-55 is moderate, 56-100 is heavy, more than 100 is super heavy and more than 1000 is super infected

Examination of Water Quality

Examination of water quality parameters is carried out in an insitu and exsitu. Parameters measured in an insitu are temperature, DO, and salinity, while the parameters measured in an exitu are pH, nitrite, and ammonia. Temperature and DO are measured use DO meter and salinity measured use refractometer. pH measurement uses pH meter, meanwhile nitrites and ammonia testing carried out at the BBPBL Lampung Fish Health and Environmental Laboratory. Nitrite testing accordance to SNI 19-6964.1-2003, while ammonia testing according to SNI 19-6964.3-2003.

RESULT AND DISCUSSION

Result

Identification and intensity of ectoparasites

As a result of the identification test, three of ectoparasites were identified as *Pyragraphorus hollisae*, Benedenia seriolae, and *Neobenedenia girellae*. This result according to key identification from Yamaguti (1934), Ogawa *et al*. (1995), and Euzet and Ktari (1970). *Pyragraphorus hollisae* is shown in **Figure 1**. *Benedenia seriolae* (i) and *Neobenedenia girellae* (ii) are shown in **Figure 2**

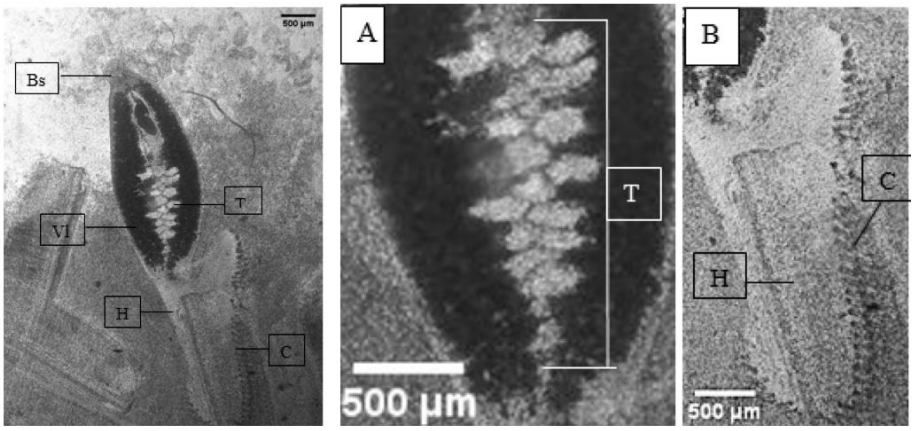

Figure 1. *Pyragraphorus hollisae* with scale bar 500 µm A: 3-18 testes, B: posterior (haptor and clamp) Description: Bs = Buccal sucker; Vl = Vitellaria lobulles, T = Testes; H = Haptor; C = Clamps

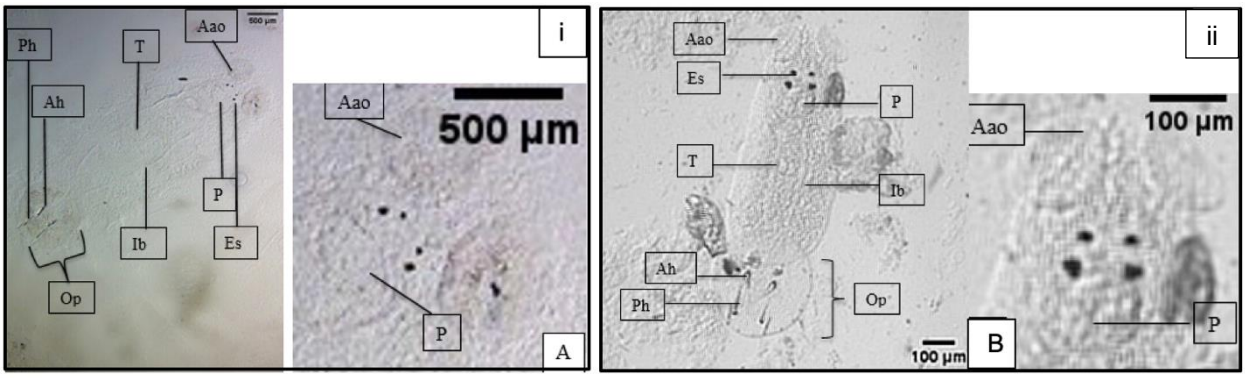

Figure 2. i. *Benedenia seriolae* (scale bar 500 µm); ii. Neobenedenia girellae (scale bar 100 µm) A: anterior (Aao convex, pharynx gilig) B: anterior (Aao concave, round pharynx). Description: Aao = Anterior attachment organ; ES = Eye spots; P = Pharynx; T = Testicles; Ib = Intestinal branch; Op = Opisthaptor; Ah = Anterior haemuli; Ph = Posterior haemulid

Identification and intensity of ectoparasites

Based on the examination of ectoparasites during research conducted at BBPBL Lampung, 21 samples of silver pompano were found at rearing floating net cages. There were 17 fish infected ectoparasites and 4 fish were negative ectoparasites. The intensity of ectoparasites in rearing floating net cages is presented in **Table 1**.

Table 1. Extoparasites intensity results of silver pompano in rearing floating net cages

Type of ectoparasites	∑ Infested fish	Amount of ectoparasite (ind)	∑ Not infested fish	Intensity (ind/fish)
Pyragraphorus hollisae	8	78		9.75
Benedenia seriolae	1	2		2
Pyragraphorus hollisae and *Benedenia seriolae*	4	33		8,25
Pyragraphorus hollisae and *Neobenedenia girellae*	4	23		5.75
Negative	0	0	4	-
Total	17	127	18	-
Sample fish total : 35				

Based on **Table 1**, there were 17 silver pompanos infested ectoparasites. *Pyragraphorus hollisae* infested 8 fish with 78 individuals of ectoparasites, resulting in the intensity of infestation of 9.75 ind/fish. The intensity is moderate according to Williams and Bunkley-Williams (1996). *Benedenia seriolae* infested 1 fish with 2 individuals of ectoparasites, so the intensity 2 ind/fish. The intensity is low according to Williams and Bunkley-Williams (1996). 4 fish infested by 33 individuals of mix ectoparasites consisting of *Pyragraphorus hollisae* and *Benedenia seriolae*. Also, another 4 fish infested by 23 individuals of ectoparasites consisting of *Pyragraphorus hollisae* and *Neobenedenia girellae*. Both of these mix ectoparasites intensity are moderate according to Williams and Bunkley-Williams (1996).

Water Quality in Rearing Floating Net Cages

Examination water quality in silver pompano rearing floating net cages are carried out regularly, once a week. The result is presented in **Table 2**.

Table 2. Water Quality Measurements Result of Silver Pompano at Rearing Floating Net Cages

Parameter	Rearing Floating Net Cages	Average	Water Quality Standards
Temperature (°C)	29.3 – 30.1	29,6	27 – 32*
Salinity (ppt)	31–32	32	30 – 35*
pH	8.48 – 8.62	8.55	7,0 – 8,5*
DO (mg/L)	5.1 – 6.12	5,46	> 5*
Nitrite (mg/L)	0.0639 – 0.2269	0.1435	< 0,3**
Ammonia (mg/L)	0.1484 – 0.5548	0.3065	< 0,1*

*Source: Kurniawan *et al.,* (2022)
** Source: Keputusan Menteri Negara Lingkungan Hidup (2004)

Discussion

The examination of ectoparasites in silver pompano reared in floating net cages identified three species: *Pyragraphorus hollisae* (Platyhelminthes: Pyragraphoridae), *Benedenia seriolae* (Platyhelminthes: Capsalidae), and *Neobenedenia girellae* (Platyhelminthes: Capsalidae). The observed intensity levels were as follows: *Benedenia seriolae* exhibited a low intensity of 2 individuals per fish, *Pyragraphorus hollisae* had a moderate intensity of 9.75 individuals per fish, a combination of *Benedenia seriolae* and *Pyragraphorus hollisae* showed a moderate intensity of 8.25 individuals per fish, and a combination of *Neobenedenia girellae* and *Pyragraphorus hollisae* displayed a moderate intensity of 5.75 individuals per fish.

Pyragraphorus hollisae, belonging to the family Pyragraphoridae, shares morphological similarities with the family Microcotylidae, particularly in the shape of clamps and haptors. However, *Pyragraphorus hollisae* is distinguished by its posterior organs resembling a fish tail and skeletal clamp structure, albeit with differences. The genus *Pyragraphorus* is characterized by smaller anterior clamps compared to the posterior ones, and *Pyragraphorus hollisae* specifically has 3-18 testes located in the posterior third of the body (Yamaguti, 1963).

Benedenia seriolae is a large species with a body length exceeding 5 mm, and can reach lengths of 10-12 mm. It possesses a large anterior attachment organ that is the same size or larger than the pharynx (Yamaguti, 1934). *Neobenedenia girellae* is distinguished by its serrated testicles and the sunken, flat shape of the sections between anterior attachments, whereas *Benedenia seriolae* has convex sections between anterior attachments (Kinami *et al.,* 2005).

Water quality management in the cultivation of silver pompano in floating net cages is minimal. Water quality is monitored regularly on a weekly basis to anticipate fluctuations in parameters. Silver pompano is maintained in water directly sourced from the sea, with no barrier between the water in the floating net cages and the open ocean. Ectoparasite infestations in silver pompano occur due to the presence of parasite seeds in the natural environment that infect the fish in the net cages. The correlation between water quality and ectoparasite infestation in floating net cages culture is not yet well understood and requires further study.

As listed above, there are some water quality parameters that are suited for rearing floating net cages culture according to the water quality standards, and there are some parameters that are outside the water quality standards for rearing floating net cages culture. The

parameters that were outside of the standards were pH, DO, and ammonia. There are number of factors that could influence the infestation of ectoparasites in fish cultured in floating net cages, according to Handayani and Siswanto (2022), the number of parasites that infest fish in floating net cages culture is influenced by the weather and environmental conditions of the waters.

Ectoparasite proliferation is associated with the unsuited water quality, marked by high levels of ammonia and nitrites, as well as pH fluctuations (Larasati *et al.,* 2020). The presence of ectoparasites in water is significantly influenced by ammonia and temperature, with pH also playing a role in some environments (Koila *et al.,* 2021). According to the water quality measurement values done in this research, there is a positive correlation between ammonia levels and the intensity of monogenean ectoparasite infestations. However, whether the infestation was caused strictly by water quality still needs further studies. There are still numerous factors that could lead to ectoparasites infestation in floating net cages culture, according to Handayani and Siswanto (2022), direct contact time span with the parasite along with fish size, culture activity, and change of seasons could influence the infestation of ectoparasites in floating net cages culture. Other than that, different fish habitats can influence the relationship between ectoparasite presence and specific water quality parameters (Modu *et al.,* 2012).

CONCLUSION AND SUGGESTION

Based on the thorough observation and monitoring conducted at the Lampung Marine Fisheries Cultivation Center, it can be concluded that the examination of ectoparasites was performed by scraping the body surface and examining the gill lamellae. The results indicated the presence of ectoparasites in floating net cages. The identified ectoparasites included *Benedenia seriolae* with a low intensity of 2 individuals per fish, *Pyragraphorus hollisae* with a moderate intensity of 9.75 individuals per fish, a combination of *Benedenia seriolae* and *Pyragraphorus hollisae* with a moderate intensity of 8.25 individuals per fish, and a combination of *Neobenedenia girellae* and *Pyragraphorus hollisae* with a moderate intensity of 5.75 individuals per fish. Water quality management is performed by routine weekly monitoring to prevent the occurrence of ectoparasites.

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