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Parasites in *Caranx ignobilis* at Floating Net Cage in Inner Ambon Bay

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ABSTRACT

The utilization of Ambon Bay influences the health of fish cultured in floating net cages. Environmental disturbances can disrupt the balance between fish, their environment, and pathogens, thereby increasing the susceptibility of fish to disease. The aim of this research was to identify the types of parasites found in *Caranx ignobilis* reared in floating net cages in Inner Ambon Bay. Fish samples were collected from five floating net cage locations—Poka, Latta, Negeri Lama, Lateri, and Waiheru villages—along with seawater samples for water quality analysis, using a purposive sampling method. Parasite identification revealed the presence of seven ectoparasite species and three endoparasite species, namely *Caligus* sp., *Hexostoma* sp., *Cryptocaryon irritans*, *Cryptocaryon* sp., *Bacteriastrum* sp., *Trichodina* sp., *Benedenia* sp., nematodes, *Diphyllobothrium* sp., and *Anisakis* sp. Ectoparasites were predominantly found on body parts other than the gills, while endoparasites were mainly located in the stomach. The findings also indicated that the water quality in Inner Ambon Bay remains within acceptable limits for the cultivation of *C. ignobilis* in floating net cages.

INTRODUCTION

The Inner Ambon Bay is extensively utilized by the local community for multiple purposes, including capture fisheries, aquaculture, marine transportation, conservation, as well as recreational and sports activities **(Selanno *et al.*, 2016)**. In the aquaculture sector, the bay supports the cultivation of the grouper and rabbitfish using floating net cage systems **(Miller, 1999; Nirahua, 2009)**. In recognition of these activities, the Ambon City Government designated the Inner Ambon Bay as a marine aquaculture zone utilizing floating cage systems in the Ambon City Spatial Plan for 2011–2031 **(Ambon City Planning and Development Agency, 2011)**.

One of the most significant challenges to fish farming in floating cages in the Inner Ambon Bay is the occurrence of disease outbreaks. The bay's utilization influences the health of cultured fish **(Tjoa, 2014)**, and environmental disturbances can disrupt the

balance between fish, their environment, and pathogens, increasing the risk of disease. Fish infected with parasites often experience immune suppression, making them more susceptible to secondary infections from bacteria, fungi, or viruses.

Based on habitat, parasites are classified into two major groups: ectoparasites, which inhabit external surfaces such as fins, skin, and gill lamellae, and endoparasites, which live within internal organs such as the liver, kidneys, spleen, brain, digestive system, circulatory system, respiratory system, body cavity, muscles, and other deep tissues **(Batam Fish Quarantine Center, 2007)**. A study by **Ode (2014)** reported 90 individuals of ectoparasites infecting the tiger grouper (*Epinephelus fuscoguttatus*) and 61 parasite individuals infecting giant trevally (*Caranx ignobilis*) in floating cages in the Inner Ambon Bay.

Given the limited available information on parasites infecting cultured fish in floating net cages within the Inner Ambon Bay, and the diseases they cause, further research is needed to assess parasite abundance and prevalence in aquaculture systems in this area.

MATERIALS AND METHODS

This study was conducted from August to October 2024 at floating net cage sites in Poka, Waiheru, Negeri Lama, Lateri, and Latta (Fig. 1). The identification of parasites was conducted at the laboratory of the Mariculture Development Center, Ambon, Ministry of Marine and Fisheries Indonesia. Water samples were analyzed *in situ* for temperature, salinity, pH, and dissolved oxygen (DO) parameters.

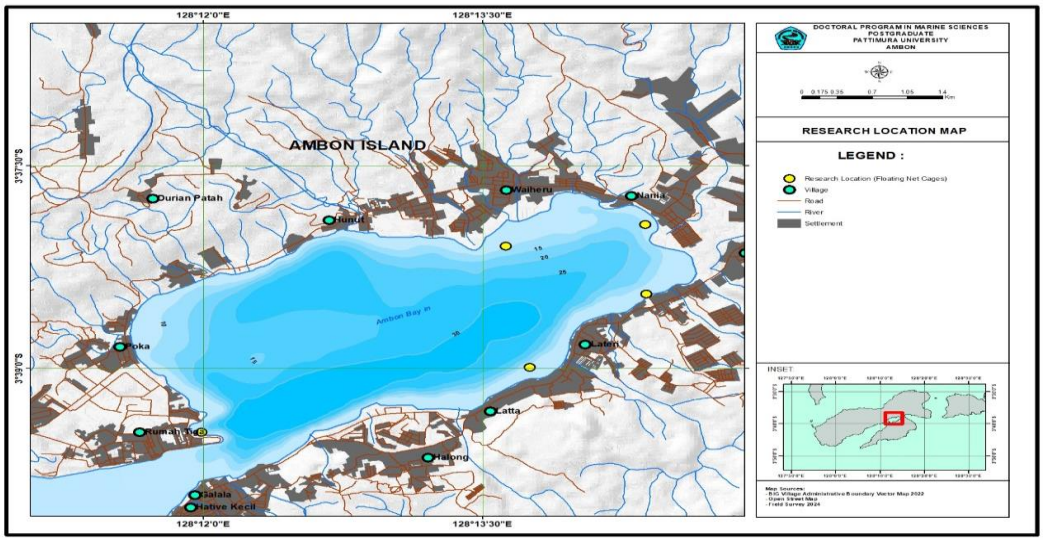

Fig. 1. Location map of the study area

Parasite examination and identification

Parasite examination was conducted through sample collection, inspection, and taxonomic identification. Prior to examination, the length and weight of each fish sample were recorded. Both external and internal body parts were examined. External examinations focused on the body surface and gill filaments, while internal examinations targeted the gastrointestinal tract.

The procedure for ectoparasite detection followed the method described by **Khor *et al.* (2021)**:

1. Mucus was scraped from the body surface, gills, scales, and fins using a scalpel, with material from each site placed on separate glass slides.
2. A drop of distilled water was added to each slide.
3. The mucus and distilled water were thoroughly mixed and covered with a cover slip.
4. The wet mount preparations were examined under a binocular microscope at 100–400× magnification.

Endoparasite examination followed the procedure outlined by **Roberts-Sweeney (2014)**. The abdominal cavity was dissected to obtain the gastrointestinal tract, from which mucus and stomach contents were collected. These were placed on a glass slide, a drop of distilled water was added, and the preparation was covered with a cover slip before microscopic examination at 100–400× magnification.

All parasites, whether ectoparasitic or endoparasitic, were identified using the taxonomic references of **Kabata (1985)** and **Grabda (1991)**.

RESULTS AND DISCUSSION

A total of seven ectoparasite species were identified: *Caligus* sp., *Hexostoma* sp., *Cryptocaryon irritans*, *Cryptocaryon* sp., *Bacteriastrum* sp., *Trichodina* sp., and *Benedenia* sp. Three endoparasite taxa were also recorded, namely nematodes, *Diphyllobothrium* sp., and *Anisakis* sp. (Table. 1)

Table 1. Parasite species identified in fish at floating net cage in Ambon Bay

Location of KJA	Parasite	
	Ectoparasites	Endoparasites
Latta	*Caligus* sp.	Nematoda
	Hexostoma sp.	*Dphyllobothrium* sp.
Lateri	*Cryptocaryon irritans*	-
	Hexostoma sp.	-
Negeri Lama	*Hexostoma* sp.	*Anisakis* sp.

	Cryptocaryon irritans	-
	Bacteriastrum sp.	-
	Caligus sp.	-
Waiheru	*Hexostoma* sp.	-
	Trichodina sp.	-
	Benedenia sp.	-
	Bacteriastrum sp.	-
	Cryptocaryon sp.	-
	Cryptocaryon irritans	-
Poka	*Hexostoma* sp.	-

The findings of this study are consistent with those reported by **Pattipeiluhu *et al.* (2024)**. Parasites are among the major biological factors causing economic losses in aquaculture, as they can initiate primary infections and facilitate secondary diseases caused by viruses or bacteria. Infestations often result in reduced feeding activity, progressive weakening, and, in severe cases, mortality.

Based on their habitat, parasites are classified as ectoparasites or endoparasites. Ectoparasites inhabit the external surfaces of the host, with common sites of infestation including fins, body surface, and gill lamellae. Endoparasites reside within the internal organs, such as the liver, kidneys, spleen, brain, digestive tract, circulatory system, respiratory system, abdominal cavity, muscles, flesh, and other deep tissues **(Batam Fish Quarantine Center, 2007)**.

Parasitic infections can disrupt fish production at various stages of cultivation, affecting both juvenile and adult *Lates calcarifer* (barramundi). The level of infestation may also be influenced by host size, with larger individuals tending to harbor more parasites **(Mutaqqin & Abdulgani, 2013)**.

Parasites can hinder growth by impairing nutrient absorption and damaging tissues. Internally, species from the Trematoda (Digenea) and Nematoda groups are most frequently encountered, whereas externally, Monogenea species are more common. Certain larval stages and parasitic worms can cause digestive system disorders and secrete enzymes that degrade muscle texture, thereby reducing flesh quality **(Mamesah, 1991)**.

The prevalence data of the identified parasites are presented in Table (2).

Table 2. Parasite prevalence at each sample collection location

Location	Prevalence (%)			
	Ectoparasite		Endoparasite	
	Gills	Body surface	Gills	Body surface
Latta	11.1	33.3	0	33.3
Lateri	22.2	0	0	0
Negeri Lama	44.4	55.6	0	11.1
Waiheru	44.4	77.8	0	11.1
Poka	44.4	11.1	0	22.2

Trichodina is a parasitic protozoan that infects cultured fish and is the causative agent of trichodiniasis **(Conchita *et al.*, 2023)**. According to **Pramono and Syakuri (2008)**, *Trichodina* sp. attaches to the host's body surface and rotates 360° using cilia, damaging adjacent cells and consuming the resulting broken epithelial cells, which causes irritation to the skin.

Cryptocaryon irritans is a pathogenic protozoan from the class Ciliata that causes white spot disease on the surface of infected fish. This parasite can lead to mass mortality events in marine aquaculture **(Haryanto *et al.*, 2018)**.

Benedenia sp., commonly referred to as the skin fluke, typically attaches to the skin of fish, causing irritation that can serve as an entry point for secondary infections. Common clinical signs of infection include reduced appetite, lethargic swimming behavior, and—in severe infestations—skin lesions that create opportunities for opportunistic bacterial infections **(Harjuni *et al.*, 2023)**.

Parasite distribution at the study location

The spatial distribution of parasites at the study sites is shown in Fig. (2). The ectoparasite *Caligus* sp. was most prevalent at the floating net cage location in Latta. *Hexostoma* sp. was detected at all surveyed sites, including Latta, Lateri, Negeri Lama, Waiheru, and Poka. The endoparasites nematodes and *Diphyllobothrium* sp. were found exclusively at the Latta site, while *Anisakis* sp. was detected only at Negeri Lama.

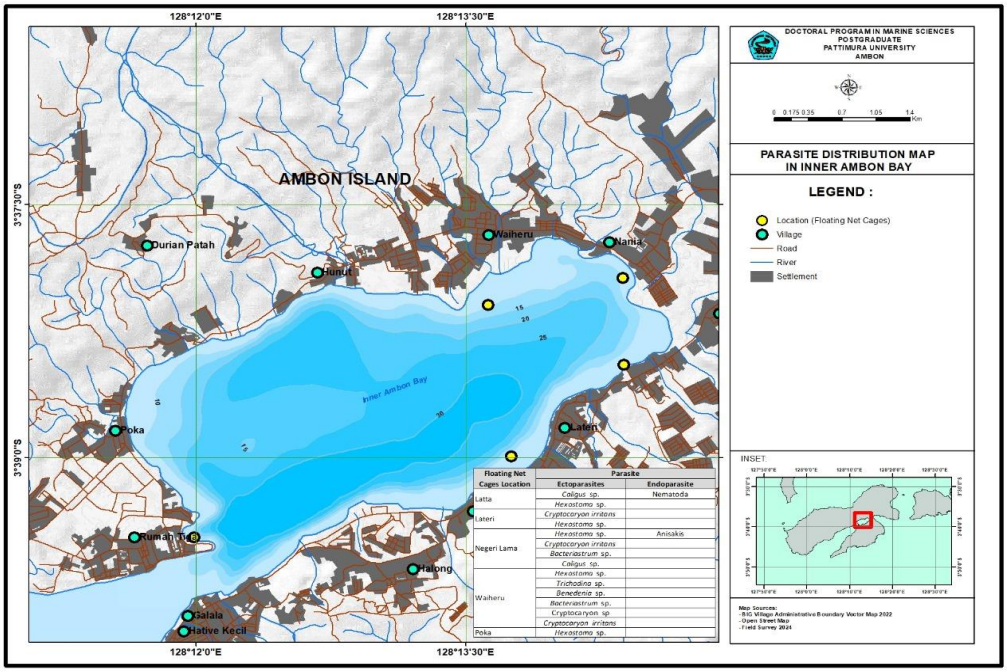

Fig. 2. Parasite distribution map of parasites at floating net cage in inner Ambon Bay

Parasite infestation intensity

The intensity of ectoparasite infestation in cultured barramundi (*Caranx ignobilis*) in Ambon Bay ranged from 0.56 to 1.89 individuals per fish. The highest infestation intensity was recorded in Negeri Lama (1.89 individuals per fish), while the lowest was observed in Lateri (0.56 individuals per fish). According to **Hakim *et al.* (2019)**, these values fall within the "very low" to "low" categories, as parasite intensity values are considered very low when < 1.

The intensity of endoparasite infestation in *C. ignobilis* ranged from 0 to 0.67 individuals per fish. Similarly, **Ode (2014)** reported that parasite infestation intensity in *C. ignobilis* ranged from 1 to 16.5 individuals per fish during the rainy season, suggesting that seasonal variation influences parasite intensity.

Table 3. Parasite intensity at each sample collection location

Location	Intensity							
	Ectoparasite		Number of sumples	Intensity	Endoparasite		Number of sumples	Intensity
	Gills	Body surface			Liver	intestine		
Latta	4	6	9	1.11	0	6	9	0.67
Lateri	5	0	9	0.56	0	0	9	0
Negeri Lama	8	9	9	1.89	0	2	9	0.22

Waiheru	7	9	9	1.78	0	2	9	0.22
Poka	8	1	9	1	0	3	9	0.33

Water quality parameters

Water quality is a critical factor influencing the success of marine aquaculture, including the cultivation of *Caranx ignobilis*. Assessing water quality is essential to determine whether a location is suitable for the cultured species **(Purnawan *et al.*, 2015)**.

The results of this study showed that water temperature at the study sites ranged from 25.6 to 29.9 °C, which is within the optimal range for aquaculture **(Peraturan Pemerintah RI No. 22 Tahun, 2021; Mamesah *et al.*, 2024)**. Salinity ranged from 32 to 33ppt, meeting the normal requirements for *C. ignobilis* culture **(Peraturan Pemerintah RI No. 22 Tahun, 2021; Darfin *et al.*, 2022)**. pH values ranged from 7.23 to 8.21, and dissolved oxygen concentrations ranged from 7.51 to 8.29mg/ L. Both parameters fall within the recommended limits for snapper aquaculture according to **Peraturan Pemerintah RI No. 22 Tahun (2021)**.

Table 4. Water quality parameters in each sample collection location

Location	Water Quality Parameters							
	Temp. (°C)	PP No. 22 Tahun 2021	Salinity (ppt)	PP No. 22 Tahun 2021	pH	PP No. 22 Tahun 2021	DO (mg/L)	PP No. 22 Tahun 2021
Poka	25.6–25.8	Natural	32-33	Natural	8.11-8.21	7-8.15	7.51-7.89	>5
Waiheru	26.8-29.9	Natural	32-33	Natural	8.05-8.13	7-8.15	8.21-8.29	>5
Negeri Lama	26.2-26.4	Natural	32-33	Natural	7.29-7.81	7-8.15	7.88-7.91	>5
Lateri	26.2-26.7	Natural	32-33	Natural	7.23-7.27	7-8.15	7.72-7.78	>5
Latta	25.6–25.8	Natural	32-33	Natural	8.19-8.21	7-8.15	8.10-8.25	>5

CONCLUSION

Based on the results of this study, water quality in Ambon Bay remains within suitable limits for the cultivation of *Caranx ignobilis*. A total of 10 parasite species were identified, comprising seven ectoparasites—*Caligus* sp., *Hexostoma* sp., *Cryptocaryon irritans*, *Cryptocaryon* sp., *Bacteriastrum* sp., *Trichodina* sp., and *Benedenia* sp.—and three endoparasites: nematodes, *Diphyllobothrium* sp., and *Anisakis* sp.

Parasite distribution was widespread across Ambon Bay, with variation among sites. *Hexostoma* sp. occurred in all sampling locations, suggesting broad environmental tolerance, whereas species such as *Caligus* sp. and *Diphyllobothrium* sp. exhibited more localized distributions. Ectoparasite prevalence was generally higher at sites with elevated water temperatures, such as Waiheru and Negeri Lama. In contrast, endoparasite prevalence showed no clear relationship with measured water quality parameters.

These spatial patterns highlight the need for further investigation into correlations between specific water quality parameters and parasite occurrence. Understanding such relationships could provide valuable insights into parasite proliferation risks and inform aquaculture site selection and management strategies in Ambon Bay.

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