p-ISSN. 2406-9825
e-ISSN. 2614-3178
Acta Aquatica: Aquatic Sciences Journal, 8:1(April, 2021): 13-17

Acta Aquatica
Aquatic Sciences Journal

Histologi ikan Bandeng (*Chanos chanos,* Forskal) yang mengalami stunting.

Histological analysis of Milkfish (*Chanos chanos,* Forskal) which was stunting

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Abstract

Milkfish (*Chanos chanos*) is an important economically valuable fish. Milkfish is widely consumed because it has a high nutritional value. Milkfish is also used as live bait for fishing. In the milkfish culture system increasing production is a very important factor. One of the efforts to increase production in fish culture systems is by applying high stocking density.The constraints of applying high stocking densities caused non-uniform growth of milkfish, even some of them stunted, which is a condition where fish experience slow growth.This study aims to observe the condition of milkfish tissue with non-stunted and stunted fish. The milkfish (*Chanos chanos*) used are fish that have been reared for 6 months. The fish organs that became the observation sample were stunting and non-stunting fish. The organs observed were gills, muscles, and intestines. The results showed that milkfish (*Chanos chanos*) which experienced stunting affected the condition of the gill, muscle and intestinal tissue. Gills experience edema and necrosis. Muscles observe edema, degenerate muscle fibers, and necrosis. The intestine experiences necrosis or cell death.

Keywords: Milkfish, Stunting, Histological.

Abstrak

Ikan Bandeng (*Chanos chanos*) merupakan ikan bernilai ekonomis penting. Ikan Bandeng banyak dikonsumsi karena mempunyai nilai gizi yang tinggi. Ikan bandeng juga dimanfaatkansebagai umpan hidup untuk penangkapan ikan. Pada sistem budidaya ikan Bandeng peningkatan produksi menjadi faktor yang sangat penting. Salah satu upaya peningkatan produksi pada sistem budidaya ikan adalah dengan aplikasi padat tebar yang tinggi. Kendala penerapan padat penebaran yang tinggi menyebabkan pertumbuhan ikan Bandeng tidak seragam, bahkan beberapa diantaranya mengalami stunting yang merupakan suatu kondisi dimana ikan mengalami lambatnya pertumbuhan. Penelitian ini, bertujuan untuk mengamati kondisi jaringan ikan bandeng dengan pertumbuhan normal dan ikan yang mengalami stunting. Ikan Bandeng (*Chanos chanos*) yang digunakan adalah ikan yang telah dipelihara selama 6 bulan. Organ ikan yang menjadi sampel pengamatan adalah ikan yang mengalami stunting dan normal (non-stunting). Organ yang diamati adalah insang, otot, dan usus. Hasil penelitian menunjukan ikan Bandeng (*Chanos chanos*) yang mengalami stunting mempengaruhi kondisi jaringan insang, otot dan usus. Insang mengalami edema dan necrosis. Otot mengamali edema, degenerasi serabut otot, dan necrosis. Usus mengalami necrosis atau kematian sel.

Kata Kunci: Histologi, Ikan Bandeng, Stunting

1. Introduction

Milkfish (*Chanos chanos*) is an important economically valuable fish that has been widely cultivated in various countries such as Indonesia (Sulistijowati and Mile 2016), Philippines (Santander-de Leon et al. 2015), Taiwan (Chiang et al. 2004), India (Lalramchhani 2019), Sri Lanka (Vasava et al. 2018), Kenya (Mirera, 2019), Tanzania (Mwangamilo and Jiddawi, 2003), and the Solomon Islands (Blythe et al. 2017). Milkfish is widely consumed because it has a high nutritional value (Malle et al. 2019). Aside from being a consumption material, milkfish are also used as live bait for catching yellowfin and skipjack tuna (Rinaldi et al. 2019).

In the milkfish culture system (*Chanos chanos*), increased production becomes a very important factor. Efforts to spur increased fish production have been carried out through various approaches such as optimization of aquatic aquatic environmental parameters (Jana et al. 2006) and feeding according to nutritional needs (Borlongan et al. 2003).

One of the efforts to increase production in fish culture systems is by applying high stocking density. The application of this system will be followed by an increase in the amount of feed, the body's metabolic waste, oxygen consumption and can reduce water quality. Stocking density of fish affects the degree of survival and growth of fish (Ofori-Mensah et al. 2018; Adineh et al. 2019).

High density of stocking also causes the growth of milkfish (*Chanos chanos*) not uniform, even some of them experience stunting which is a condition where fish experience

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slow growth (Murnyak et al. 2015; Lingam et al. 2019). This study aims to observe the condition of milkfish (*Chanos chanos*) tissue with non-stunted and stunted fish.

2. Research Methods

2.1. Sample Collection

The milkfish (*Chanos chanos*) used are fish that have been kept for 6 months with high density, which is 1000 fish / m3 in a fiber bath with a 3m3 volume size. The fish organs that became the sample of observation were stunted and non-stunted (non-stunted) fish. The organs observed were gills, muscles, and intestines.

2.2. Water Quality Observation

The quality of the waters is crucial for fish growth. Observation of water quality data is done in-situ. Water quality parameters observed were temperature, salinity, pH, dissolved oxygen.

2.3. Histological examination

Histological examination by modifying the procedures of Korun and Timur (2008) and Rajeshkumar and Munuswamy (2011). Samples of fish organs were fixed with NBF 10%, dehydrated using ethanol solution in stages, then clearing using xylene and embeded using paraffin. Next the sample was cut to a thickness of 5 µm with a microtome and stained using haematoxylin and eosin (H&E).

3. Results and discussion

3.1. Water Quality Conditions

Quality conditions greatly affect milkfish production (*Chanos chanos*) (Chang et al. 2018). Water quality parameters also determine the level of success of milkfish fish farming (*Chanos chanos*) (Saraswati and Sari, 2017). The results of observations of water quality parameters can be seen in **Table 1.**

Water temperature is one of the most important factors in regulating the life processes and spread of organisms in water (Burt et al. 2011; Kale, 2016). Water temperature affects the growth and development, reproduction and continuity of milkfish (*Chanos chanos*) (Haser et al. 2018). Observations show that the temperature range is 29 - 31 ℃. The optimal range for raising milkfish (*Chanos chanos*) is 22-35 (Beltran Jr. et al. 2020).

Salinity is closely related to the adjustment of the osmotic pressure of aquatic biota (Varsamos et al. 2005; Kale, 2016).The observations showed that the salinity range was 26-29 mg/l.

Milkfish (*Chanos chanos*) is aneuryhaline that can adapt to broad salinity, can live in fresh, brackish and marine waters (Budiasti et al. 2015). A good range of salinity for milkfish (*Chanos chanos*) is 10-25 mg/l (Barman et al. 2012).

The degree of acidity or pH is one of the important chemical parameters in monitoring water stability (Kale, 2016). The degree of acidity is a limiting factor that influences and determines the speed of metabolic reactions in consuming food (Simanjuntak, 2009; Chang et al. 2019). The observations showed a pH range of 7.7 to 8.7. The optimal pH range for raising milkfish (*Chanos chanos*) is 6.8 - 8.7 (Beltran Jr. et al. 2020).

Dissolved oxygen (DO) in water is one of the parameters of water quality that affects the milkfish fish farming (*Chanos chanos*) (Mwangamilo and Jiddawi, 2003). Oxygen really determines the life of organisms that exist in such waters, especially in the biological function of growth (Pörtner, 2009; Kale, 2016). In cultivation systems with high stocking densities, oxygen consumption will increase (Mmochi and Mwandya, 2003). The observations showed the DO range was 2.8 -> 4 mg / l. The optimal range of dissolved oxygen (DO) for the maintenance of milkfish (*Chanos chanos*) is > 3 mg / l (Beltran Jr. et al. 2020).

3.2. Histological Observation

Cultivation systems with high stocking densities greatly affect the growth of milkfish (*Chanos chanos*) (Faisyal et al. 2016). Stocking densities also affect the growth of Gurame fish (*Osphronemus gouramy*), Seurukan fish (*Osteochilus vittatus*), and Acne fish (*Leptobarbus hoeveni*) (Prasetio et al. 2016; Azhari et al. 2017; Pranata et al. 2017). High density of stocking causes the growth of milkfish (*Chanos chanos*) is not uniform, even some of them experience stunting which is a condition where fish experience slow growth (Murnyak et al. 2015; Lingam et al. 2019). The growth that occurs also affects changes in tissue constituent cells (Arisandi et al. 2011). These cell changes, can occur in the gills, muscles, and intestines (Benjamin et al. 2019).

Histological observation of the gills (**Fig. 1**) shows that there is a change in the structure of the milkfish gills (*Chanos chanos*) tissue cells that have been stunted. Milkfish (*Chanos chanos*) gill tissue stunting experiences edema and gill lamellar necrosis. Gills are the main organs that can experience damage due to environmental influences (Camargo and Martinez, 2007). Lamela gill edema is swelling caused by a buildup of fluid in the tissue. Severe cell damage in gill lamella is necrosis, which is the occurrence of cell death in gill lamellae (Ibrahim and Tayel, 2005; Poleksic et al. 2010).

Histological observations of the muscles (**Fig. 2**) showed a change in the structure of the milkfish muscle tissue cells (*Chanos chanos*) that were stunted. The milkfish muscle tissue (*Chanos chanos*) stunting experiences edema, degeneration of muscle fibers, and necrosis. Edema causes muscle tissue to look like it is spreading. Edema is swelling caused by a buildup of fluid in the tissue. At a more severe level, cells will experience degeneration and necrosis or death of muscle fiber cells (Bhuvaneshwari et al. 2015; Haredi et al. 2020).

Histological observation of the intestine (**Fig. 3**) shows that there is a change in the intestinal tissue structure of milkfish (*Chanos chanos*) stunting. The intestinal tissue of milkfish (*Chanos chanos*) stunting experiences necrosis. The intestine is an organ that is easily subjected to cell changes due to environmental influences (Hanna et al. 2005).The level of severe damage to the intestines of fish is necrosis, which is the occurrence of intestinal cell death (Younis et al. 2013; Dohaish et al. 2018).

4. Conclusions

The results showed that milkfish (*Chanos chanos*) which experienced stunting affected the condition of the gill, muscle and intestinal tissue. Gills experience edema and necrosis. Muscles observe edema, degenerate muscle fibers, and necrosis. The intestine experiences necrosis or cell death.

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Table 1. Results of observing water quality parameters

Observation Result	**Parameters**
Temperature (℃)	29 – 31
Salinity (mg/l)	26-29
Ph	7.7 - 8.7
Dissolved oxygen (mg/l)	2.8 -> 4

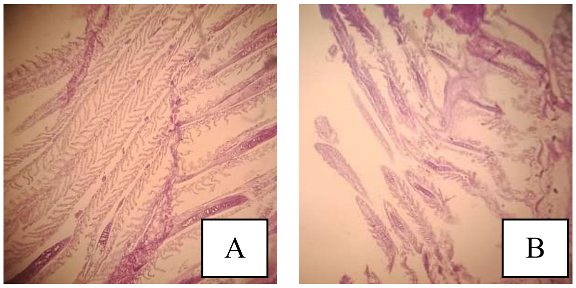

Figure 1. Photomicrograph of gills milkfish(*Chanoschanos*).
Note: A (Non-stunted); B (Stunting)

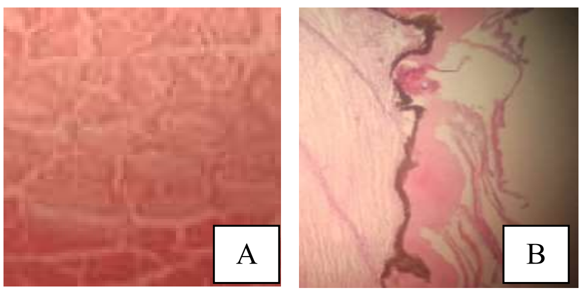

Figure 2. Photomicrograph ofmuscle milkfish (*Chanos chanos*).
Note: A (Non-stunted); B (Stunting)

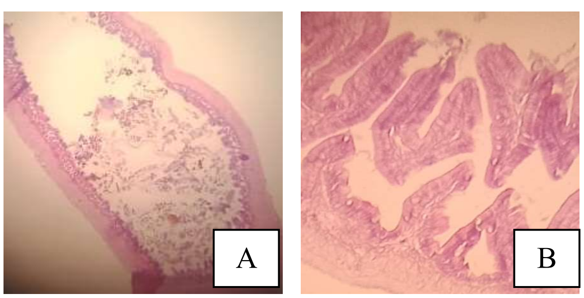

Figure 3. Photomicrograph of Intestine milkfish (*Chanos chanos*).
Note: A (Non-stunted); B (Stunting)