PLANKTON PROFILE IN WHITE SHRIMP (*L. vannamei*) POND

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Abstract

Plankton are microscopic organisms that exist in the waters of shrimp ponds. The purpose of this study was to determine the profile of plankton dominance in white shrimp (L. vannamei) aquaculture ponds. This research was conducted using an ex-pose facto causal design method in intensive white shrimp culture ponds. The results of this study showed that in the research shrimp ponds, 4 main genera of plankton were found, namely the genus Chlorophyceae consisting of species Chlamydomonas sp.*, Chlorella* sp.*, Oocystis* sp.*, Tetracelmis* sp.*, genus Cyanophyceae consisting of species Anabaena* sp.*, Chroococcus* sp.*, Microcystis* sp.*, Oschillatoria* sp.*, genus Euglenophyceae namely Phacus* sp. *and the genus Dinophyceae which consists of the species Gymnodinium* sp. *Noctiluca* sp. *Peridinium* sp. *Prorocentrum* sp. *Overall the level of dominance of abundance and community dominance index was dominated by plankton of the genus Chlorophyceae as much as 1.03E+06 cells/ml and a dominance index of 82.40%. Then from the genus chlorophyceae the dominant species was plankton species Chlorella* sp.*, with an abundance of 7.50E+05 cells/ml and a dominance index of 73%. The conclusion of this study was that plankton in the research ponds were dominated by the genus Chlorophyceae which consists of dominant species of Chlorella* sp *and Chlamydomonas* sp*, Oocystis* sp*, Tetracelmis* sp *which were predominant.*

Keywords: *Plankton, white shrimp, pond, L. vannamei*

Introduction

White shrimp (*L. vannamei*) aquaculture is one of the most widely practiced fisheries agribusiness activities in Indonesia (Ariadi et al, 2019). White shrimp first entered Indonesia in mid 2001 (Ariadi et al, 2021). In its development, the cultivation of this species continues to growth with the application of various technological applications. White shrimp aquaculture can be done with extensive, intensive, and semi-intensive cultivation systems with various models of cultivation techniques (Apud, 1985).

Plankton was one of the biological indicators that exist in pond aquatic ecosystems (Case et al, 2008). The presence of plankton will greatly affect the productivity level of pond waters (Ariadi et al, 2019). Plankton was useful as a natural feed for shrimp and as an indicator of the pond environment. The plankton dominance in the waters will take place dynamically following temperature fluctuations and the seasoning (Asaduzzaman et al, 2020).

Plankton were microorganisms that float in waters that were carried by currents and were abundant of nutrients (Ariadi et al, 2020). The dynamic and diverse plankton dominance index will affect the overall structure of the aquatic ecosystem (Selleslagh et al, 2012). The purpose of this study was to determine the profile of plankton dominance in white shrimp (*L. vannamei*) aquaculture ponds.

Materials and Methods

This research was conducted in an intensive white shrimp pond on Panimbang Village, Pandeglang Regency, Banten in October 2014. The research concept used was an *ex-pose facto* causal design model or conducting research based on real data in the field. The research parameters observed were the abundance

and dominance of plankton obtained from water samples by the waters of intensive white shrimp ponds on Panimbang Village, Pandeglang Regency.

The plankton abundance was calculated using a Neubauer™ haemocytometer and an Olympus CX22 electron microscope. Then the abundance of each individual plankton was calculated by multiplying by 10^4 based on the width and depth of the counting box on the haemocytometer cross section. Then, the plankton dominance index is calculated using formula by Odum, (1996) as follows:

$$C = \sum_{i=1}^{S} \left(\frac{ni}{N}\right)^2$$

Where,

C : Dominance index
ni : Number of genus individual in i
N : Total number of individuals

Results And Discussion

Plankton Profile

The structure of the plankton profile found in the research ponds can be seen in Table 1. During 1 cycle of shrimp culture, 4 dominant plankton genera were found in the ponds, namely Chlorophyceae, Chyanophyceae, Euglenophyceae, and Dinophyceae. From 4 plankton genera found in pond waters, 13 plankton species were identified.

Table 1. Plankton profile identified in research pond

Genera	Species
Chlorophyceae	*Chlamydomonas* sp. *Chlorella* sp. *Oocystis* sp. *Tetracelmis* sp.
Chyanophyceae	*Anabaena* sp. *Chroococcus* sp. *Microcystis* sp. *Oschillatoria* sp.
Euglophyceae	*Phacus* sp.
Dinoflagellata	*Gymnodinium* sp. *Noctiluca* sp. *Peridinium* sp. *Prorocentrum* sp.

The plankton species identified in the research ponds were the plankton types that were commonly found in pond waters, such as *Chlorella* sp., *Oschillatoria* sp., *Oocystis* sp., *Anabaena* sp., *Noctiluca* sp., *Peridinium* sp., and *Prorocentrum* sp. The diversity of identified plankton species indicates that primary productivity in pond waters was very high. Intensive shrimp ponds has diverse aquaculture inputs that would an impact on excess nutrient abundance in their aquatic ecosystems (Ariadi et al, 2021). In addition, changes in the value of water quality parameters would also affect the type of abundance of existing plankton (Munthe et al, 2012).

Plankton Abundance

The plankton abundance based on the number of species found and the dominance index in the research pond can be seen in Figure 1. The dominant plankton genus in pond waters during the cultivation cycle was based on the number of individual abundances and the percentage of dominance was the genus Chlorophyceae, followed by the genus Cyanophyceae, Dinophyceae, and Euglenophyceae. The dominant chlorophyceae genus because the plankton of this genus was cosmopolitan microorganism (Ariadi et al, 2020). Cosmopolitan plankton tend to be more stable lived in dynamic water conditions (Asaduzzaman et al, 2020).

Plankton from the genus Cyanophyceae and Dinophyceae were also a genus of plankton that were often found in pond waters. Several species of these two genera were harmful algae. Most of the plankton species from the cyanophyceae genus that live in ponds were *Blue Green Algae* plankton communities which usually secrete toxin compounds (Ariadi et al, 2021). Meanwhile, the dinophyceae genus was also detrimental because it can release toxic compounds and the existence of plankton was unstable (Case et al, 2008).

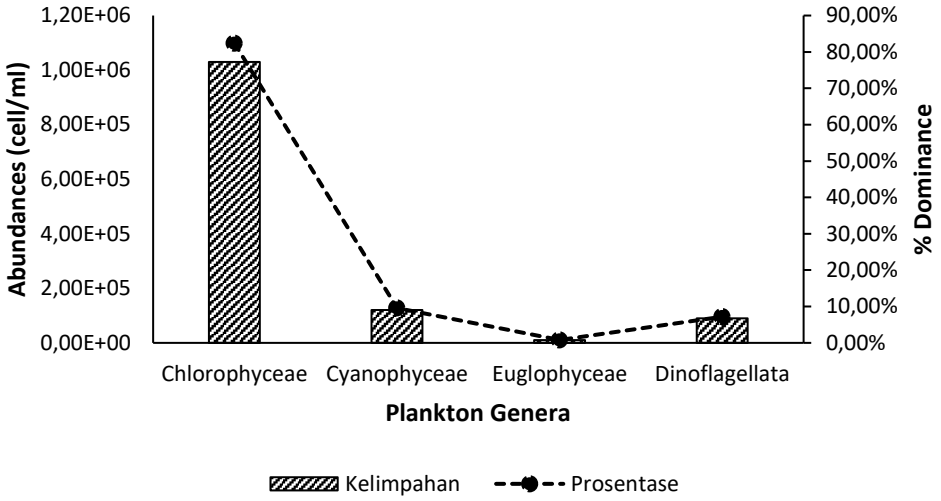

Figure 1. Plankton abundance on research pond

Chlorophyceae Genera

Chlorophyceae genus was the dominant plankton at the research site. Species found from this genus were *Chlamydomonas* sp., *Chlorella* sp., *Oocystis* sp., and *Tetracelmis* sp. *Chlorella* sp was very dominant compared to other species because it was cosmopolitan microorganism (Ariadi et al, 2020). Then, the species of *Chlorella* sp was a plankton species that exists living in several kinds of waters with varying of salinity levels. So that its existence can be used as an indicator of water quality (Ariadi et al, 2021).

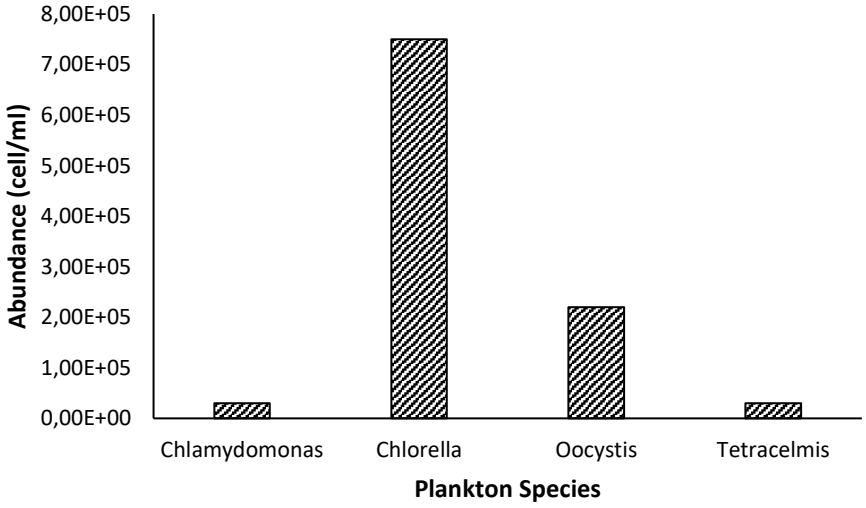

Figure 2. Cholorophyceae abundance

Chlorophyceae genus in some tropical waters tends to be dominant (Case et al, 2008). This genus of plankton belongs to the plankton green algae. Its existence was not only influenced by nutrient elements but also by physical and chemical water quality factors of its ecosystem (Selleslagh et al, 2012). This plankton not detrimental microorganism.

Chlorophyceae Dominance Index

In pond aquatic ecosystems, *chlorella* sp. species very dominant up to 73% compared to other species such as *Chlamydomonas* sp., *Oocystis* sp., and *Tetracelmis* sp. A part from being

cosmopolitan, the dominance of plankton *chlorella* sp in research ponds was also caused by temperature factors and oxygen solubility which tend to be stable throughout the culture periods (Rahardini et al, 2018). The chlorella abundance species can be used as natural feed for shrimp. So when analyzed financially the presence of *Chlorella* sp. this was very profitable economically (Ariadi et al, 2019).

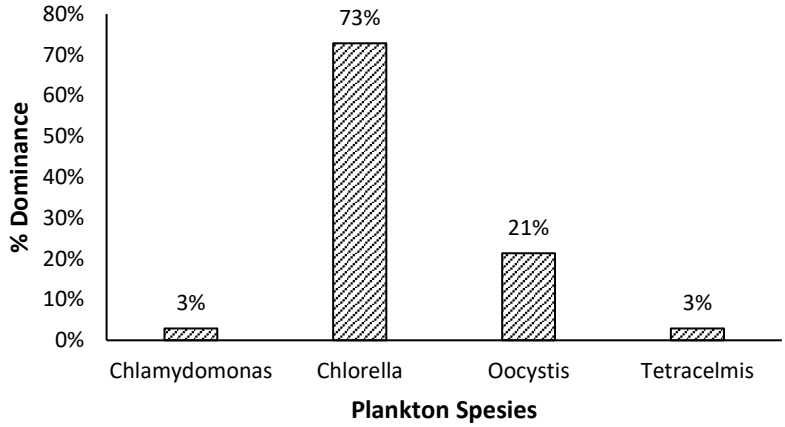

Figure 3. Clorophyceae index dominance

Overall, plankton community in the aquatic ecosystem of the research ponds were found to be very diverse. This showed that aquaculture pond waters has a high primary productivity level (Rahardini et al, 2018). The high primary productivity level allows various types of tolerant plankton to growth (Ariadi et al, 2020). The plankton dominant by genus Chlorophyceae growing in pond waters indicates that the quality of the plankton dominance index in the pond ecosystem was quite good. As an autotrophic microorganism, *Chlorella* sp. can exist throughout the season if there was sunlight and nutrients in the waters (Rasconi et al, 2015).

4. Conclusions

Plankton in the research ponds were dominated by the genus chlorophyceae which consists of dominant species of *Chlorella* sp. *Chlamydomonas* sp., *Oocystis* sp., and *Tetracelmis* sp which were predominant.

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