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# Study of the development of milkfish (*Chanos-chanos* sp.) cultivation based on plankton aspects

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## Abstract

**Background**: Mandalle Beach, Pangkep Regency, is located in a coastal area with areas consisting of beaches, river estuaries, mangrove forests, rice fields, ponds, and residential areas. This area has potential for fish cultivation, especially milkfish cultivation. To support data and information about the prospects for cultivating milkfish in this region, a study was carried out on biological aspects, especially plankton.

**Materials and Methods**: The research was carried out at five research locations, namely: location 1 is on the coast, which borders the coast of Barru Regency; location 2 is the location around the Pangkep State Agricultural Polytechnic Campus Pier; location 3 is on the beach, where mangrove vegetation grows around it; location 4, namely at the mouth of the river, which borders Mandalle Village and Tamarupa Village; and location 5, namely in the part adjacent to the rice fields and ponds of Mandalle Village. The plankton parameters tested were plankton abundance, variety, and dominance. The data obtained was then processed and analyzed using descriptive analysis. The plankton parameters tested were abundance, uniformity, diversity, and plankton dominance. The data obtained was then processed and analyzed using descriptive analysis.

**Results**: The results showed that plankton abundance (cells/ml) was in the range of 250–300 cells/ml. Each research location has different types of plankton, which have the highest abundance. The plankton uniformity index value is in the range of 0.18108–0.22653, with the highest uniformity value occurring at location 2 and the lowest at location 3. The types of plankton that dominate in each research location are *Chaetoceros* sp., *Gyrodinium* sp., *Thallasionema* sp., *Gymnodinium*, and *Cosconodiscus*, but the most dominant type of plankton in all research locations is Chaetoceros sp., namely 0.461538462.

**Conclusions**: Based on the study of the type, abundance, diversity, uniformity, and dominance of plankton, it can be stated that, based on the plankton aspect, the waters of Mandalle Beach, Pangkep Regency, are suitable and meet the requirements for cultivating milkfish; however, due to the large number of fishing activities and the proximity of residential areas and rice fields, the cultivation technique What is recommended is traditional or semi-intensive milkfish cultivation.

**Keywords:** Development; Cultivation; Milkfish; Plankton

## 1. Introduction

Milkfish (*Chanos chanos*) is a fish of important economic value. Milkfish is widely consumed because it has a high nutritional value [6]. Fish cultivation in Indonesia shows good prospects, namely an increase in production of 9.75% from 2011–2015, with the highest production of 672,196 tons in 2015 [23]. Cultivation activities using traditional

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cultivation systems that use natural feed such as phytoplankton and kelekap as feed are still widely carried out in pond areas in Indonesia. The use of kelekap and phytoplankton in traditional cultivation in ponds can depend on the large value of primary productivity to support cultivation [22]. One of the fishery commodities that is widely cultivated is milkfish.

Milkfish is a fish consumed by the wider community in Southeast Asia in general and in Indonesia in particular. This fish is one of the species that still exists in the Chanidae family [2]. Milkfish has a wide salinity tolerance (euryhalien) so it can be cultivated in brackish water ponds [3]. Milkfish (*C. chanos*) is a type of fish that inhabits brackish water areas which is widely cultivated in Indonesia and will be developed in various regions [22]. Apart from being euryhalien, milkfish is also resistant to high temperatures, making it suitable for development in Indonesia. Milkfish are diurnal, meaning they search for food during the day [29].

Ponds are habitats intended for brackish water cultivation activities and are located in coastal areas. In general, ponds are often associated with tiger prawn rearing activities, but in fact, there are many other species that can be cultivated, such as grouper, white snapper, milkfish, and others [36]. Phytoplankton is one of the organisms that plays a role in the growth of milkfish [13]. There are 3 methods of cultivation or cultivation systems in brackish water: intensive, semi-intensive, and traditional. The differences between these three cultivation technologies can be seen in the seed stocking density cultivated and the type of feed provided. In intensive ponds, high density is usually applied with additional feed [39]. In traditional types of ponds, there is no additional feeding treatment [42]. However, this intensive cultivation system can cause high dynamics in organic matter levels, thereby triggering extraordinary algal growth (blooming) [5]. In relation to feeding, in intensive ponds, usually natural food in the form of plankton is not used as the main feed, in contrast to traditional pond cultivation, which only relies on natural food in the form of plankton as the main feed for milkfish.

So far, pond farmers have been cultivating milkfish in the waters of Mandalle District, Pangkep Regency. Evaluation of pond cultivation land is a suitable benchmark for whether the land is being cultivated for further development [22]. However, no evaluation study has been carried out regarding the presence of plankton in these waters. Evaluation of the presence of plankton is important because plankton can be the main natural food for milkfish. The presence of plankton can be used as an indicator of water quality, namely a description of how many or how few types of plankton live in a body of water and the types of plankton that dominate. The existence of types of plankton that can live because certain substances are blooming can provide an idea of the real state of the waters [29]. The role of plankton in ecology is as a parameter of whether waters are fertile or not, because plankton is the basis of the natural food chain in waters [12].

Phytoplankton is an important element in efforts to develop brackish water fisheries cultivation. The role of phytoplankton as a biotic component in the process of transferring energy to higher trophic levels [34]. A pond's waters are said to be fertile if they contain many primary producers, namely phytoplankton, both in quantity and quality as a natural food source, and also act as a producer of oxygen through the process of photosynthesis [32]. Therefore, this research was carried out with the aim of evaluating the presence of plankton in Mandalle waters, Pangkep Regency, for the purposes of cultivating milkfish.

## 2. Material and methods

This type of research is descriptive research using a survey method that aims to evaluate the presence of plankton for the needs of cultivating milkfish in Mandalle waters, Pangkep Regency. Sampling was carried out at five locations, namely: location 1 was on the coastline bordering the coast of Barru Regency; location 2 is the location around the Pangkep State Agricultural Polytechnic Campus Pier; location 3 is on the beach where mangrove vegetation grows around it; location 4, namely at the mouth of the river that borders Mandalle Village and Tamarupa Village; and location 5, namely in the part adjacent to the rice fields and ponds of Mandalle Village.

Water samples were taken twice at each location, with an interval of one month. The data used in this research is primary data taken directly at the location and secondary data collected from various research results. This research was carried out from May to July 2023 on the Mandalle Coast, Pangkep Regency, and plankton was analyzed at the Water Quality Laboratory of the Pangkep State Agricultural Polytechnic. The tools and materials used in this research were sample bottles, plankton nets, microscopes, analytical pipettes, buckets, cool boxes, and writing tools [33]. The materials used in this research were river water, distilled water, and Lugol. The data collection technique used in this research is the observation method, which is a data collection technique where the researcher makes direct observations of the object to be studied. The observations used for research have been planned systematically. Observations were carried out by observing and recording data on human activities around the Mandalle coast, river estuaries, and rice fields and ponds. The procedure for identifying phytoplankton samples is determining the sampling location and taking water samples using a 10-liter bucket. Water samples were filtered with Plankton Net No. 25, and the water sample was put into a 19-ml bottle, which was preserved with 5–10 drops of 1% Lugol. The plankton samples were then observed under a microscope using the sweeping method using a Sedgwick rafter to count the filtered plankton, which was then identified using the Prescot book [20, 30, 31]. The calculation of phytoplankton abundance data (ind/ml) was used using the modified Luckey Drop method [26] as follows:

$$N = \frac{T \times V}{L \times V \times p \times W} \times n$$

Where:

N = Total amount of plankton (Ind/ml)
n = Number of plankton in each field of view
T = Cover glass area (20 x 20 mm)
L = The width of one field of view
r = Fingers of field of view

The calculation of diversity, uniformity, and dominance from Shannon-Wiener and the formula are as follows [8; 24]:

### 2.1. Species Diversity Index:

H´ = - Σ pi ln pi

$$\text{pi} = \frac{ni}{N}$$

Where:

H'= Species diversity index
ni = Number of individuals in the i-th taxa
N = Total number of individuals
pi = ni/N = Proportion of i-th species

### 2.2. Uniformity Index

$$E = \frac{\text{H}'}{\text{H}'max}$$

Where:

E = Species uniformity index
H' = Species diversity index
H' max = Maximum diversity index

### 2.3. Indeks Dominansi

$$D = (pi)^2$$

Where:

D = Dominance index
ni = Number of individuals in the i-th taxa
N = Total number of individuals
pi = ni/N = Proportion of i-th species

The data that has been collected is then processed and analyzed using descriptive analysis.

## 3. Results

Plankton are floating organisms whose movements depend on currents [25]. Plankton is divided into two groups, namely phytoplankton and zooplankton [29;37]. Phytoplankton is a member of plant plankton. Phytoplankton is found in water masses with light intensity that can penetrate the water and act as primary producers in the water. Zooplankton are members of the animal plankton family; zooplankton play a role as primary consumers in waters [29]. Plankton are very small organisms, commonly called microorganisms, that live floating in water. The existence of plankton organisms in water is influenced by several environmental factors and their physiological characteristics [10].

Primary productivity is the level of organic carbon production in a certain unit of time, which is the result of the photosynthesis of green plants absorbing solar energy. Green plants in ponds in the form of phytoplankton and shellfish can be used as natural food for milkfish. In phytoplankton, there is chlorophyll-a, which plays a role in photosynthesis by utilizing light entering the pond [41]. High chlorophyll-a content itself is also influenced by environmental quality parameters that support the development and lifespan of phytoplankton at observation stations. Chlorophyll concentration is often used to indicate the main productivity of water bodies [43]. Many studies have subsequently investigated the factors that contribute to the initiation of algal blooms. The abundance of phytoplankton is generally indicated by the concentration of chlorophyll-a, which is one of the main driving factors for the development of eutrophication [19].

### 3.1. Amounts of Plankton

The types and amounts of plankton during the research can be seen in Table 1.

**Table 1** Types and Amounts of Plankton at the Research Location

| No. | Location of Research | Types of Plankton | Amounts |
|---|---|---|---|
| 1. | Location 1 | *Chaetoceros* sp | 12 |
| | | *Navicula* sp | 5 |
| | | *Euglena* sp | 1 |
| | | *Oscillatoria* sp | 5 |
| | | *Gyrosigma* sp | 2 |
| | | *Favella* sp | 1 |
| | | | 26 |
| 2. | Location 2 | *Cosconodiscus* | 3 |
| | | *Gyrodinium* sp | 10 |
| | | *Chaetoceros* sp | 6 |
| | | *Cosconodiscus* | 3 |
| | | | 22 |
| 3. | Location 3 | *Thallasionema* sp | 22 |
| | | *Cosconodiscus* | 2 |
| | | *Ceratium* sp | 2 |
| | | *Navicula* sp | 2 |
| | | | 28 |
| 4. | Location 4 | *Gymnodinium* sp | 10 |
| | | *Coleps* sp | 9 |
| | | *Oscillatoria* sp | 4 |
| | | *Gyrosigma* sp | 3 |

| | | | |
|---|---|---|---|
| | | *Navicula* sp | 7 |
| | | *Chaetoceros* sp | 2 |
| | | | 35 |
| 5. | Location 5 | *Cosconodiscus* | 10 |
| | | *Anabaena* sp | 3 |
| | | *Navicula* sp | 5 |
| | | *Gyrosigma* sp | 2 |
| | | *Gyrodinium* sp | 4 |
| | | | 24 |

Source: Primary Data After Processing (2023)

### 3.2. Abundance of Plankton

The abundance of plankton at five locations during the study can be seen in Table 2.

**Table 2** Abundance of Plankton (cells/ml) Research Location

| No. | Location of Research | Types of Plankton | Abundance (sel/ml) |
|---|---|---|---|
| 1. | Location 1 | *Chaetoceros* sp | 3000 |
| | | *Navicula* sp | 1250 |
| | | *Euglena* sp | 250 |
| | | *Oscillatoria* sp | 1250 |
| | | *Gyrosigma* sp | 500 |
| | | *Favella* sp | 250 |
| 2. | Location 2 | *Cosconodiscus* | 750 |
| | | *Gyrodinium* sp | 2500 |
| | | *Chaetoceros* sp | 1500 |
| | | *Cosconodiscus* | 750 |
| 3. | Location 3 | *Thallasionema* sp | 5500 |
| | | *Cosconodiscus* | 500 |
| | | *Ceratium* sp | 500 |
| | | *Navicula* sp | 500 |
| 4. | Location 4 | *Gymnodinium* sp | 2500 |
| | | *Coleps* sp | 2250 |
| | | *Oscillatoria* sp | 1000 |
| | | *Gyrosigma* sp | 750 |
| | | *Navicula* sp | 1750 |
| | | *Chaetoceros* sp | 500 |
| 5. | Location 5 | *Cosconodiscus* | 2500 |
| | | *Anabaena* sp | 750 |
| | | *Navicula* sp | 1250 |
| | | *Gyrosigma* sp | 500 |
| | | *Gyrodinium* sp | 1000 |

Source: Primary Data After Processing (2023)

### 3.3. Diversity of Plankton

The diversity of plankton at five locations during the study can be seen in Table 3.

**Table 3** Diversity og Plankton at Research Locations

| No. | Location of Research | Types of Plankton | Diversity |
|---|---|---|---|
| 1. | Location 1 | *Chaetoceros sp* | 0.356856871 |
| | | *Navicula sp* | 0.317049736 |
| | | *Euglena sp* | 0.125311405 |
| | | *Oscillatoria sp* | 0.317049736 |
| | | *Gyrosigma sp* | 0.197303797 |
| | | *Favella sp* | 0.125311405 |
| | | | 0.239813825 |
| 2. | Location 2 | *Cosconodiscus* | 0.271695022 |
| | | *Gyrodinium sp* | 0.358389709 |
| | | *Chaetoceros sp* | 0.354349905 |
| | | *Cosconodiscus* | 0.271695022 |
| | | | 0.314032415 |
| 3. | Location 3 | *Thallasionema sp* | 0.189484473 |
| | | *Cosconodiscus* | 0.188504095 |
| | | *Ceratium sp* | 0.188504095 |
| | | *Navicula sp* | 0.188504095 |
| | | | 0.18874919 |
| 4. | Location 4 | *Gymnodinium sp* | 0.357932277 |
| | | *Coleps sp* | 0.349231753 |
| | | *Oscillatoria sp* | 0.247891851 |
| | | *Gyrosigma sp* | 0.210577352 |
| | | *Navicula sp* | 0.321887582 |
| | | *Chaetoceros sp* | 0.163554336 |
| | | | 0.275179192 |
| 5. | Location 5 | *Cosconodiscus* | 0.364778641 |
| | | *Anabaena sp* | 0.259930193 |
| | | *Navicula sp* | 0.326794983 |
| | | *Gyrosigma sp* | 0.207075554 |
| | | *Gyrodinium sp* | 0.298626578 |
| | | | 0.29144119 |

Source: Primary Data After Processing (2023)

### 3.4. Uniformity of Plankton

The uniformity of plankton values at the research location can be seen in Figure 1.

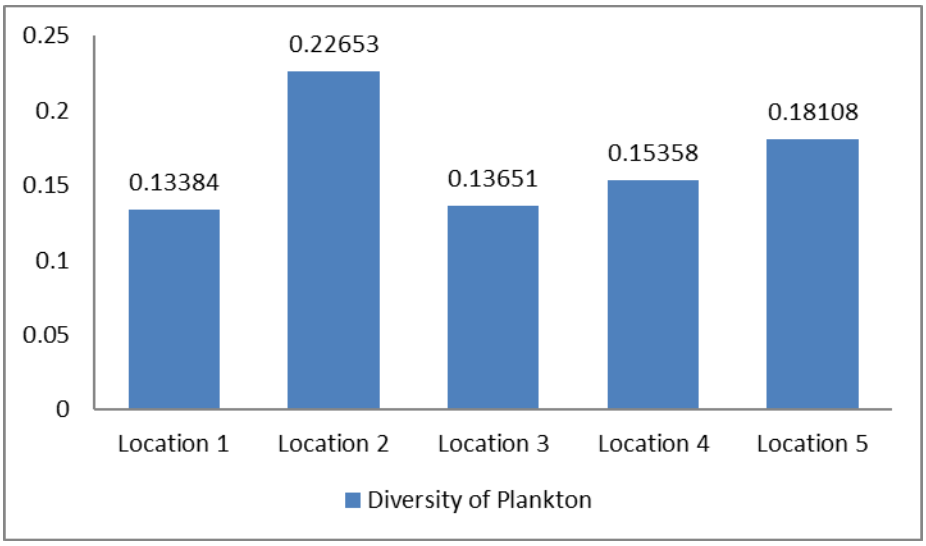


**Figure 1** Uniformity of Plankton Values During Research

### 3.5. Dominance of Plankton

The dominance of plankton at the research location can be seen in Table 4.

**Table 4** Dominance of Plankton

| No. | Location of Research | Types of Plankton | Dominance | |
|---|---|---|---|---|
| | | | (ni/N) = pi | $(ni/N)^2 = pi^2$ |
| 1. | Location 1 | *Chaetoceros* sp | 0.461538462 | 0.213017751 |
| | | *Navicula* sp | 0.192307692 | 0.036982249 |
| | | *Euglena* sp | 0.038461538 | 0.00147929 |
| | | *Oscillatoria* sp | 0.192307692 | 0.036982249 |
| | | *Gyrosigma* sp | 0.076923077 | 0.00591716 |
| | | *Favella* sp | 0.038461538 | 0.00147929 |
| 2. | Location 2 | *Cosconodiscus* | 0.13636364 | 0.01859504 |
| | | *Gyrodinium* sp | 0.45454545 | 0.20661157 |
| | | *Chaetoceros* sp | 0.27272727 | 0.07438017 |
| | | *Cosconodiscus* | 0.13636364 | 0.01859504 |
| 3. | Location 3 | *Thallasionema* sp | 0.785714286 | 0.617346939 |
| | | *Cosconodiscus* | 0.071428571 | 0.005102041 |
| | | *Ceratium* sp | 0.071428571 | 0.005102041 |
| | | *Navicula* sp | 0.071428571 | 0.005102041 |
| 4. | Location 4 | *Gymnodinium* sp | 0.28571429 | 0.08163265 |
| | | *Coleps* sp | 0.25714286 | 0.06612245 |
| | | *Oscillatoria* sp | 0.11428571 | 0.01306122 |
| | | *Gyrosigma* sp | 0.08571429 | 0.00734694 |
| | | *Navicula* sp | 0.20000000 | 0.04000000 |

| | | | | |
|---|---|---|---|---|
| | | *Chaetoceros* sp | 0.05714286 | 0.00326531 |
| 5. | Location 5 | *Cosconodiscus* | 0.41666667 | 0.17361111 |
| | | *Anabaena* sp | 0.12500000 | 0.01562500 |
| | | *Navicula* sp | 0.20833333 | 0.04340278 |
| | | *Gyrosigma* sp | 0.08333333 | 0.00694444 |
| | | *Gyrodinium* sp | 0.16666667 | 0.02777778 |

Source: Primary Data After Processing (2023)

## 4. Discussion

Table 1 shows that at location 1, the type of plankton with the highest number is plankton of the Chaetoceros sp type; at location 2, it is Gyrodinium sp; location 3 is Thallasionema sp; location 4 is Gymnodinium sp; and location 5 is Cosconodiscus. Thus, it can be stated that at the research location, there was no dominant type of plankton found that had the same type of plankton. Excessive plankton density in pond waters is dangerous for farmed shrimp because it can cause acute respiratory problems. Shrimp usually float on the surface of pond water. On the other hand, at night, there will be a shortage of O2 due to the respiration process carried out by plankton [28]. The entry of waste into coastal waters is also a very influential factor and can cause pressure on the pond water environment [8].

Table 2 shows that at all research locations, plankton abundance (cells/ml) was in the range of 250–300 cells/ml. At location 1, the highest plankton abundance was in the *Chaetoceros* sp type plankton; location 2 was *Gyrodinium* sp; location 3 was *Thallasionema* sp; location 4 was *Gymnodinium* sp; and location 5 was *Cosconodiscus*. This shows that each research location has different types of plankton, which have the highest abundance. The abundance of plankton in this study was higher than the results of research conducted by [11], where the abundance of phytoplankton at each station in the waters of milkfish ponds in the Tapak Region is classified as moderate because the abundance of phytoplankton ranges from 103 to 106 ind/L [11]. However, the results of this study are still lower than the results of research conducted by [13], where the abundance of plankton found ranged from 6616-7152 ind/ml. This shows that milkfish ponds (*Chanos chanos*) are classified as medium or mesotrophic waters, and the diversity index ranged from 5,534-5,706 [13]. The results of research conducted by [41] stated that the results obtained from the types of phytoplankton found at each research station showed that in each milkfish cultivation pond in the study, many types of phytoplankton were found that could be used as natural food for milkfish and were able to meet the availability of food for the fish. milkfish at that location, where concentration in aquaculture water is an important and effective indicator for evaluating water quality, preventing water pollution, and evaluating nutrient availability indices such as phytoplankton abundance and biomass [41]. The abundance and distribution of phytoplankton are closely related to physical and chemical factors [21]. Increased phosphate and nitrate can stimulate phytoplankton growth. Apart from that, fertilization in ponds is thought to produce phosphate. Phosphate will be a determinant of phytoplankton growth [17]. The composition and abundance of plankton can change at various levels in response to changes in physical, chemical, and biological environmental conditions [10]. The abundance of zooplankton at each station is classified as high because the abundance of zooplankton is more than 500 ind/L [11]. This is thought to be influenced by the presence of phytoplankton in these waters; in the food chain, phytoplankton has become a food source for zooplankton both directly and indirectly [14]. The highest abundance of zooplankton groups is in Rotatoria. Rotatoria consists of the genera Karatella and Branchionus, while cladocera consists of Daphnia and Bosmina, and copepods consist of the genus Cyclops [4]. Copepods and cladocera are zooplankton groups that are almost always found in every lake in West Java; rotifers are also found in all lakes except at Patenggang Lake [35].

Waters are divided based on the abundance of phytoplankton; namely, oligotrophic waters are waters with a low level of fertility with an abundance of phytoplankton ranging from 0-2000 ind/ml. Mesotrophic waters are waters with a moderate level of fertility with an abundance of plankton ranging between 2000 and 15000 ind/ml, and eurotrophic waters are waters with a high level of fertility with an abundance of phytoplankton ranging between >15000 ind/ml [15]. The oligotrophic category means that the waters are still clean and have not been polluted by nutrients [16]. Oligotrophic waters are generally clear and there is no abundance of aquatic plants and algae. This condition describes low nutrients [44]. Indicators that water has been polluted are changes in the water that can be observed, namely changes in water temperature, pH, color, smell, taste, and the appearance of sediment [38]. In general, apart from changes in the abundance of plankton in pond waters, this is also accompanied by fluctuating changes in the plankton genus throughout the year. This is caused by natural factors and human activities [40]. The main factor that influences the structure of the phytoplankton community is changes in environmental conditions in coastal waters, including ponds, caused by tides and seasons [18]. The abundance of plankton genera in waters fluctuates depending on the season; there are some plankton genera that are abundant in the dry season, while others are abundant in the rainy season [40]. The abundance of plankton (traditional ponds) in this study is relatively lower compared to traditional ponds in Sinjai Regency, in the range of 140–2060 ind/L [27].

The productivity of a pond is very dependent on the large diversity of microorganisms, one of which is plankton as a natural food and as a determinant of water quality [1]. The level of plankton production in a body of water can be used to estimate the potential for shrimp and fish production, whether the condition of the body of water is stable or unstable, and if the plankton population in the body of water is oversaturated (blooming), it can be used as an indicator of biological pollution [7]. Aquatic ecosystems with low biodiversity are unstable and susceptible to the influence of external pressure compared to ecosystems that have high biodiversity [9]. Stable environmental conditions in pond waters are characterized by high plankton diversity; the number of individuals of each species is high and evenly distributed; and the water quality of the pond environment is in a range suitable for the growth of cultivated organisms [40]. The plankton diversity value at location 1 was highest for the plankton type *Chaetoceros* sp; location 2 was *Gyrodinium* sp; location 3 was *Thallasionema* sp; location 4 was *Gymnodinium* sp; and location 5 was *Cosconodiscus*.

Figure 1 shows that the plankton uniformity index value is in the range of 0.18108–0.22653, with the highest uniformity value occurring at location 2, namely 0.22653, followed by location 5, namely 0.18108, and the lowest at location 3, namely 0.13651. Meanwhile, the uniformity index values in intensive and traditional ponds range from 1.26 to 2.38 and 0.10 to 1.97, respectively [40]. If the uniformity index is low, it will reduce the diversity index value and cause the dominance value to be high. Low diversity values and low dominance indices are thought to be the cause of less stable water conditions, namely the influence of several environmental factors and different habitats in each pond [29].

Table 4 shows that the type of plankton that dominates location 1 is *Chaetoceros* sp., namely 0.461538462; location 2 is *Gyrodinium* sp., namely 0.45454545; location 3 is Thallasionema sp., namely 0.785714286; location 4 is Gymnodinium sp., namely 0.28571429; and location 5 is Cosconodiscus., namely 0.41666667. Thus, the most dominant type of plankton at the research location is Chaetoceros sp., namely 0.461538462. The most dominant plankton found were Synedra (15.4%) and Navicula (14.8%) from the Bacillaryophyceae class [4]. The range of dominance index values starts from 0-1. If the value obtained is close to zero, it means that in the observed biota community structure, there is no genus that extremely dominates other genera [8]. Dominance index values in intensive ponds and traditional ponds in this study ranged from 0.02 to 0.68 and 0.01 to 0.75, respectively [40].

## 5. Conclusion

The results showed that plankton abundance (cells/ml) was in the range of 250–300 cells/ml. Each research location has different types of plankton, which have the highest abundance. The plankton uniformity index value is in the range of 0.18108–0.22653, with the highest uniformity value occurring at location 2, namely the location around the Pangkep State Agricultural Polytechnic Campus Pier, and the lowest at location 3, namely the location on the beach where mangrove vegetation grows around it. The type of plankton that dominates at each research location is *Chaetoceros* sp., *Gyrodinium* sp., *Thallasionema* sp., Gymnodinium, and *Cosconodiscus*, but the most dominant type of plankton at the research location is *Chaetoceros* sp., namely 0.461538462. Based on the study of the type, abundance, diversity, uniformity, and dominance of plankton, it can be stated that based on the plankton aspect of the waters of Mandalle Beach, Pangkep Regency, it is suitable and meets the requirements for cultivating milkfish; however, due to the large number of fishing activities and the proximity of residential areas and rice fields, the cultivation technique What is recommended is traditional or semi-intensive milkfish cultivation.

## Compliance with ethical standards

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### *Disclosure of conflict of interest*

No conflict of interest to be disclosed.

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