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Dynamics of plankton populations as natural food for fish and a tributary of the Ogan River

Elva Dwi Harmilia[1,*], Khusnul Khotimah[1], Irkhamiawan Ma'ruf[1], Intan Pratiwi[1]

[1] *Department of Aquaculture, Faculty of Agriculture, Universitas of Muhammadiyah, Palembang 3026, Indonesia.*

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ABSTRACT

The research was conducted to determine the abundance, diversity, uniformity, and dominance of plankton in fish stomachs and waters that are expected to provide information about water productivity. The research was carried out in a tributary of the Ogan River, Indralaya District, Ogan Ilir Regency, South Sumatra at three stations, namely Indralaya Mulya Village, Tanjung Seteko Village and Muara Penimbung Village. The method used field surveys and location determination using purposive sampling with fish stomach contents, water samples for plankton observations, and water quality parameters. Fish sampling was carried out six times in 3 months, and water samples for plankton observations were one time per month, from April to June 2018. Plankton is found in fish stomachs and waters with a total abundance of 35.6 - 448.12 ind/l plankton consisting of 8 divisions with 11 classes. The plankton diversity index has moderate diversity and moderate community stability with a value between 1.11 - 1.45. The uniformity index of plankton in the fish stomach showed small uniformity of plankton (0.41-0.67), while in the waters, at station three and station 1 in April, the uniformity was high (E values 0.72 and E 0.93). The value of the plankton dominance index is in the range of 0.27-0.37. No species dominate other species or D = 0 (<0.5), with moderately polluted water quality.

Introduction

The Ogan River is one of the main rivers in South Sumatra, which passes through many districts, one of which is the Ogan Ilir Regency. It has many streams or tributaries, including those flowing from Indralaya District, Indralaya Mulya Village, Tanjung Seteko Village, Muara Penimbung Ulu Village, Muara Penimbung Ilir Village and others, to Pemulutan Barat District, namely Suka Merindu Village (Harmilia & Dharyati, 2017). Residents rely on the Ogan River tributaries as a secondary source of income in addition to farming. Optimal catches indicate the abundance of fishes in these waters. The presence of fish in these waters is an indication that plankton is equally numerous. Meanwhile, the presence of phytoplankton is an indicator of the fertility of the waters (Radiarta, 2013; Iswanto *et al.* 2015).

(Odum, 1996) explained that the definition of plankton is a passive aquatic organism whose life hovers or floats in the waters and its movement always follows the current. It is microscopic organisms used as a natural food by first-level consumers in water. According to (Nontji, 2005), this organism is classified into Zooplankton, Phytoplankton, Bacterioplankton, and Virioplankton. Phytoplankton and plants on land have the green pigment chlorophyll-a, which can absorb sunlight for photosynthesis to produce oxygen and glucose. All other aquatic organisms need oxygen for respiratory activities. Aryawati & Thoha (2011) explained the nutrient content in waters is closely related to the abundance of phytoplankton. Witariningsih *et al.* (2020) stated that water fertility could be known by measuring the abundance and circulation of plankton. Phytoplankton can

* Corresponding author.
Email address: elvamozza@gmail.com

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photosynthesize and function as a oxygen producer, while zooplankton functions as the first level consumer between phytoplankton and the next level organisms (Istadewi *et al*., 2016) . Richardson (2008) found that zooplankton is critical to ocean food webs' functioning and a beacon of climate change because it is poikilothermic. Pollutants can cause changes in the structure of the plankton community (species diversity) (Fitriya & Lukman, 2013).

Analysis of stomach contents in fish helps identify the abundance of plankton, their types, and the amount in water to show the level of productivity. Junaidi *et al*. (2013) research in the Ogan River show 81 species from 14 classes of plankton in the low-high group between 8 ind./l-325 ind/l. Therefore, it is necessary to determine the composition of the plankton eaten by the caught fish with diversity and abundance.

Materials and Methods

Location and time of research

The study was conducted from April to June 2018 in the tributaries of the Ogan River, Indralaya District, Ogan Ilir Regency, South Sumatra, at three stations. The sampling station was determined using purposive sampling based on variations in environmental conditions. The first, second and third stations are in Indralaya Mulya, Tanjung Seteko, and Muara Penimbung Villages at 3º15'04.5"S 104º40'38.6"E, 3º14'27.0"S 104º41'06.1ºE, and 3º14'07.3"S 104º41'57.3"E, respectively.

Fish sampling

The fish sampling was carried out every two weeks for three months (six times). Two fish samples were taken for each traditional fishing gear (*bay tangkul* or barrier traps, *tangkul* or lift net, *bubu* or bambbo traps, *jaring* or gill nets, *pancing* or pole and lines). A sampling of plankton water was conducted randomly by determining the area that represented the research location.

Water quality measurement

Insitu measurements of physical and chemical parameters of waters are current velocity, transparency, temperature, pH, and dissolved oxygen. Measurement and analysis were conducted according to (APHA, 2005).

Table 1. Water parameters measurement.

No	Parameters	Unit	Instruments
1	Current velocity	$m.s^{-1}$	Current meter
2	Transparency	m	Secchi disk
3	Temperature	°C	Thermometer
4	pH	Unit	pH meter
5	Dissolved Oxygen	mg/L	DO meter

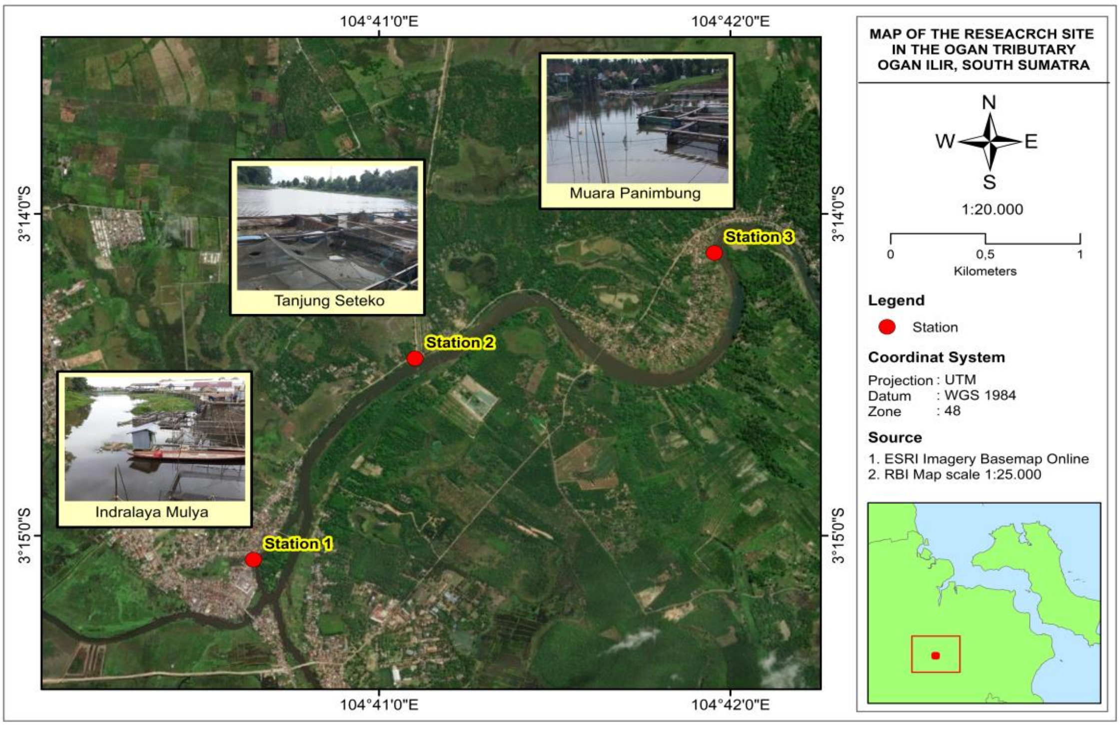

Figure 1. Survey location map.

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Fish length-weight measurement

Samples were cleaned of mucus and dirt from the body, and then the total length was measured with an accuracy of 0.1 cm. Measurement of total length starting from the tip of the fish's mouth to the tip of the tail fin was conducted using a ruler and then weighed using a digital scale (grams).

Fish surgery and observation of the stomach contents of fish

Two fish were taken from each species to observe the stomach. The abdominal part was split open with a scalpel from the anus to the head or operculum. The digestive tract was cleaned, and the stomach was incised using scissors before being weighed. The obtained sample was put into a small plastic bottle containing a 10% formalin solution. Observation of gastric contents and plankton identification was carried out at the Biology Laboratory of the Faculty of Agriculture, the University of Muhammadiyah Palembang, which refers to Sachlan (1982). Furthermore, fish hulls that have been soaked in 10% formalin are washed with water to remove the smell of formalin and then dried using a tissue. The fish's stomach was opened, the contents were taken, and the volume was measured. The contents were put into a measuring cup, and 10 ml of distilled water was added and then stirred until it was crushed to dissolve in distilled water. Identification was carried out by taking 0.5 ml of the solution and then dropping it on a petri dish before being observed. The repetition was conducted two times.

Plankton sampling, observation, and identification of plankton

Water sampling for plankton was carried out by filtering 100 litres of river water using a plankton net and a 5-litre bucket 20 times. It was transferred to a sample bottle with a volume of 100 ml and then preserved with five drops of 4% formalin (APHA, 2005). Each bottle was labelled before placing in a cooler box, and sampling at each station point was repeated twice. Sample bottles were shaken slowly such that the water sample inside did not accumulate in one area. A 0.5 ml dropper with two repetitions was used to capture the water sample. Observations were made using a petri dish under a microscope using a magnification of 4 x 10 and 10 x 10.

Data analysis

Observation of plankton in fish stomach

Performed manually, namely:

a. Identifying using a microscope
b. Screening the entire surface of the water dripping on a petri dish
c. Counting manually in each photo screenshot by the microscope application
d. Recording each species found

Plankton abundance

Calculation Plankton abundance calculation was carried out using the APHA (2005) using the following formula:

$$N = Z \times \frac{X}{Y} \times \frac{1}{V}$$

Description:

N = Abundance of plankton (ind)/L)
Z = Individuals found (ind)
X = Volume of concentrated water (mL) = 100mL
Y = Volume of one drop (mL) under cover glass = 0.5 mL
V = Volume of filtered water (L) = 100 L

Water fertility according to Basmi (2000) is classified into:

< 2000 ind/L = Oligotrophic fertility (less fertile)
2000-15000 ind/L = Mesotrophic fertility (moderate fertility)
>15000 ind/L = Fertility Eutrophic (fertile)

Shannon-wiener diversity index (H')

The equation used to calculate the Shannon-Wiener diversity index (Odum, 1996) with the formula :

$$H' = -\sum_{I=1}^{S} P_i \ln P_i$$

Description :

H' = index of species diversity
Pi = opportunity for each part as a whole, searched by the formula:
ni = number of individuals of the ith species
N = total number of individuals

$$Pi = \left(\frac{ni}{N}\right)$$

Information :

H'<1 = Small diversity and community stability low
H'1-3 = Medium diversity and community stability
H'>3 = High diversity and high community stability

Uniformity index (E)

It is the balance between the composition of individuals of each species present in a community. The formula for the uniformity index (Brower *et al.*, 1998) is:

$$E = \frac{H'}{H\ maks} \quad \text{or} \quad E = \frac{H'}{Ln\ S}$$

Description:

E : Uniformity index

H' : Diversity index
H Max: Ln S
S : Number of species
With criteria :
E~0 = Species dominance
E~1 = The number of individuals of each species is the same

Simpson's dominance index

The following formula obtains the dominance index according to the reference of Odum (1996) :

$$C = \sum \left[\frac{ni}{N} \right]^2$$

Information:
C = Dominance index
Ni = Number of individuals in each class
N = Total number of individuals in the community

Results

Overview the study location

Residents use the Ogan River tributary research location for household (MCK), PDAM, transportation routes, agricultural and fishery activities. Agricultural activities across the river are planting rice, rubber, coconut, and cocoa.

The first station is located upstream of a tributary of the Ogan River, part of the Indralaya Mulya Village, directly adjacent to the Kelekar River. There are densely populated residential areas on the coast that use the river for toilets, catfish farming activities, and even a place to dispose of garbage. In addition, Station 1 is adjacent to the traditional Indralaya market, which is always busy. The riverbanks will look dirty when the market is operating due to organic and inorganic waste disposal. Residents who carry out fish farming activities use feed from the intestines and offal of boiled chicken. The food floats and is carried away by the current. At station one, the river is greenish-black and smells terrible.

The second station is in Tanjung Seteko Village, located far from residential areas. There are several floating net cages where fish farming activities are located. The river water is clear greenish, but when the sand mining starts operating, which is only 500 m from Tanjung Seteko, it turns cloudy (brown yellow). The third station in Muara Penimbung Village is a place for fish farming activities with a dense floating net cage that reaches 50 units. Before the huge fish mortality, there were 200 floating net cages in Muara Penimbung Village, at that time cultivators were cultivating tilapia, catfish, and gourami. Due to losses, cultivators only engage in tilapia cultivation, while residents use river water for toilets and irrigate rice fields.

Types and number of plankton in fish stomach and river water on april

According to the data from April to June, plankton was discovered in the stomachs of fish and water samples, showing eight divisions and 11 classes. Seven classes are included in the phytoplankton, namely Cyanophyceae, Chlorophyceae, Bacillariophyceae, Chrysophyceae, Desmophyceae, Dinophyceae, and Euglenophyceae. The other four classes are included in the zooplankton, namely Ciliata, Rhizopoda, Monogononta, and Entomostraca. The fish caught during the study had different types and numbers each month (Figure 2).

In April, 21 types of fish were caught using various fishing gears, namely *bay tangkul (*barrier traps*)*, *pancing* (pole and line), and *tangkul* (lift net). There was varied plankton grouped into 11 classes: Cyanophyceae, Chlorophyceae, Bacillariophyceae, Chrysophyceae, Desmophycea, Dinophyceae Euglenaphyceae, Ciliata, Rhizopoda, Monogononta, and Entomostraca.

Based on the identification of plankton contents in fish stomachs in May, there were six classes, namely Cyanophyceae, Chlorophyceae, Bacillariophyceae, Euglenophyceae, Monogononta, and Entomostraca. In contrast, the identification results in the waters showed four classes, namely Cynophyceae, Chlorophyceae, Bacillariophyceae, and Dinophyceae. In April, the highest percentage came from Chlorophyceae, consisting of 36% and 44% in the stomach and water with 56 and 62 species. In June, planktons reported in the stomach were Cyanophyceae, Chlorophyceae, Bacillariophyceae, and Monogononta (Figure 2), with the highest percentage being Bacillariophyceae (35%) with 52 species.

Plankton community, a tributary of the Ogan river

The number of species and individuals found in fish stomachs was more than in the waters. In April, the highest number of individuals was found in the Tanjung Seteko village, amounting to 2263. The highest number of species is also found in April in the Tanjung Seteko village, amounting to 80 species. The results of the number of Species and total individuals can be seen in Tabel 2 and Tabel 3.

Based on the number of species, and total individuals in Tables 2 and 3, the abundance of plankton, index diversity Shannon-Wiener, uniformity, and dominance index, can be determined.

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Plankton abundance (Ind/L)

The abundance of plankton dramatically affects water quality because it is related to the productivity of phytoplankton. As waters become less productive, organisms in the ecosystem will be affected. The Plankton Abundance can be seen in Figure 3.

Plankton diversity index (H')

The diversity index (H') in fish hulls with the highest and lowest value at 1.45 and 1.11 was at stations 2 and 1 in April and June. Meanwhile, the diversity index in waters has the highest and lowest values at stations 2 and 1 in April and May (Figure 4).

Uniformity index (E)

The uniformity index is used to find out how much equal distribution of the number of individuals each type of biota. The uniformity Index can be seen in Figure 5.

Dominance index

The dominance index is used to determine the presence of dominance in certain types of waters. Therefore, the Ogan River tributary waters show a stable community structure. The results of the dominance index can be seen in Figure 6.

Water quality

Water quality observations are carried out every month at each research location to determine the water quality of the Ogan tributary based on several parameters. Quality measurements were based on physical and chemical parameters, including current velocity, transparency, water temperature, pH, and dissolved oxygen (Table 4).

Table 2. Number of species and total individuals in fish stomachs.

Month	April	May	June	Average
1. Indralaya Mulya Village				
Number of Species	60	40	46	48,67
Total Individual	1060	291	219	523,33
2. Tanjung Seteko Village				
Number of Species	80	58	52	63,33
Total Individual	2263	562	451	1092
3. Muara Penimbung Village				
Number of Species	77	52	51	60
Total Individual	1554	363	321	746

Table 3. Number of species and total individuals in waters.

Month	April	May	June	Average
1. Indralaya Mulya Village				
Number of Species	58	45	42	48
Total Individual	220	195	178	198
2. Tanjung Seteko Village				
Number of Species	73	48	46	56
Total Individual	392	310	284	329
3.	Muara Penimbung Village			
Number of Species	61	48	48	52
Total Individual	323	260	233	272

Table 4. Results of water quality measurements water.

Parameters	Indralaya Mulya Village			Tangjung Seteko Village			Muara Penimbung Village		
	April	May	June	April	May	June	April	May	June
Current velocity (m.s^{-1})	0,5	0,7	0,8	0,5	0,7	0,8	0,5	0,7	0,9
Tranparancy (m)	1,1	0,75	0,7	1,4	0,75	0,7	1,3	0,9	0,8
Temperature (°C)	32	30	32	31	29	31,5	30	29	31,5
pH (unit)	5	4	4	5	5	5	5	4,5	5
Dissolved oxygen (mg.L^{-1})	4,6	2,96	5,1	4,96	4,52	5,55	4,7	3,25	4,98

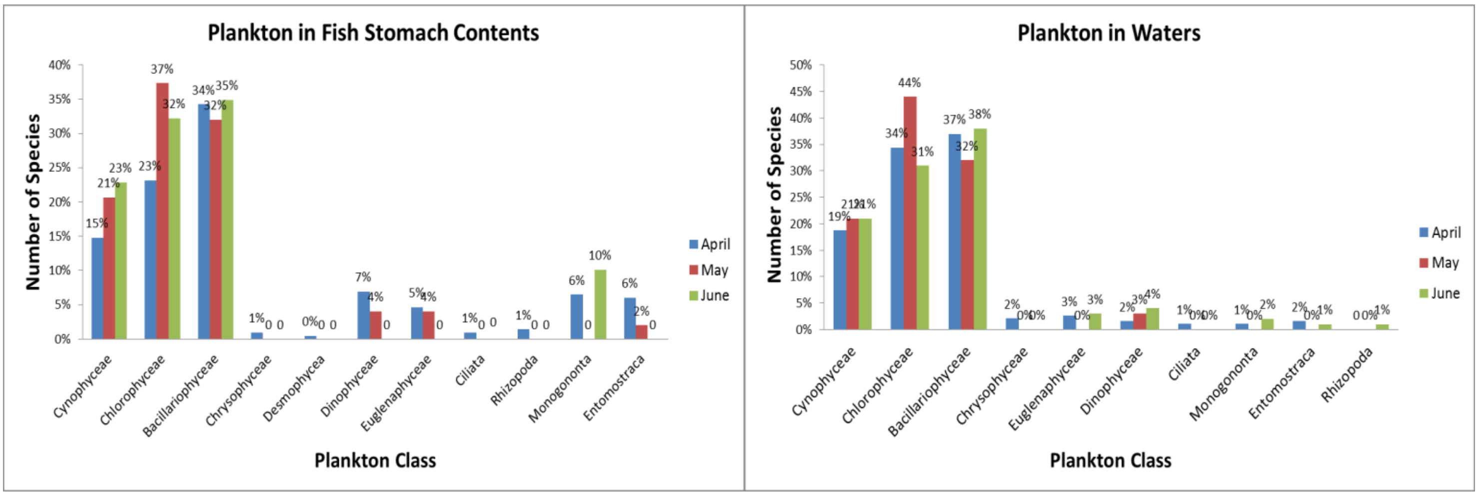

Figure 2. Composition of plankton in fish stomach and waters.

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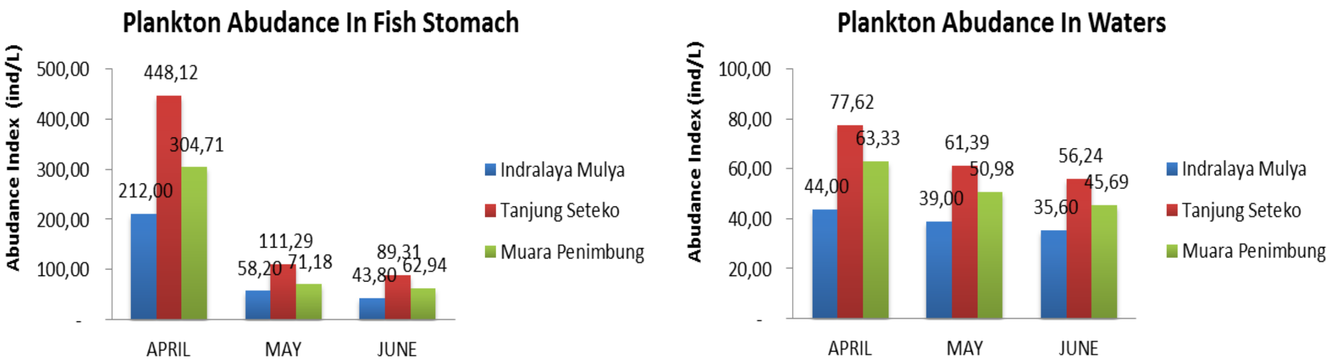

Figure 3. Plankton abundance of fish stomachs and waters.

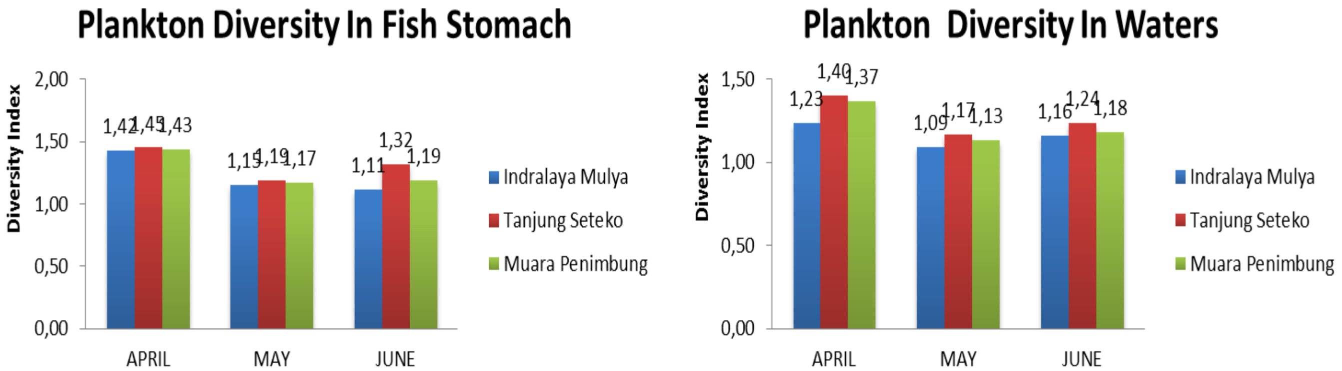

Figure 4. Plankton diversity of fish stomachs and waters.

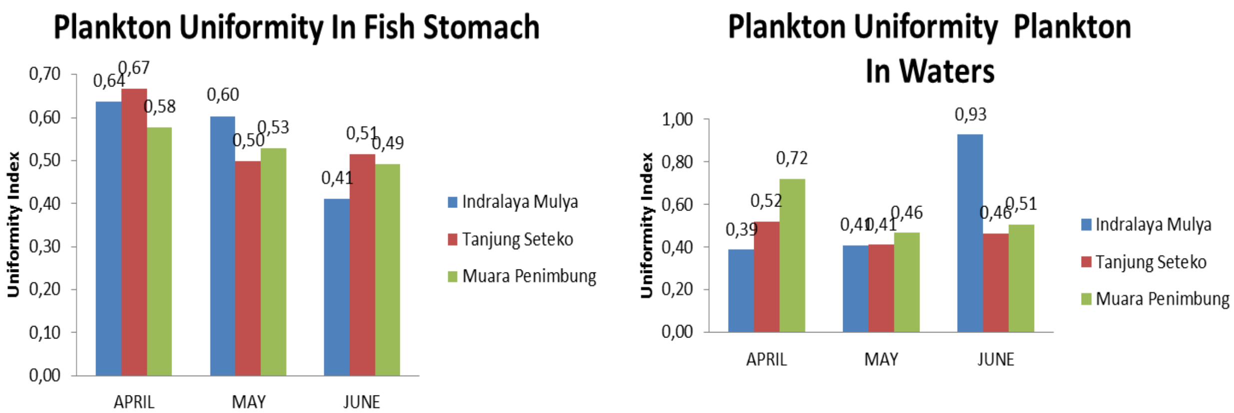

Figure 5. Plankton uniformity index of fish stomachs and waters.

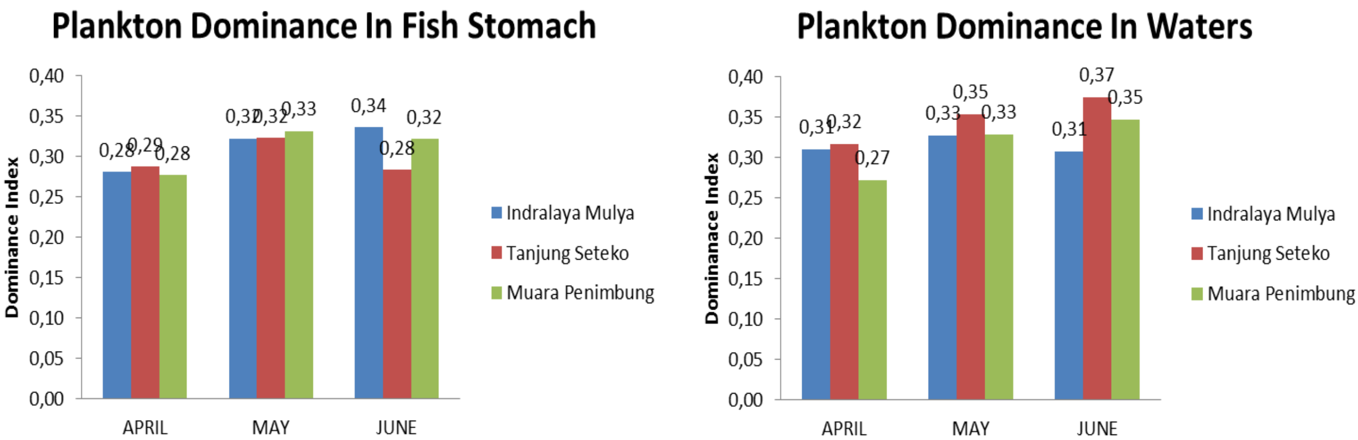

Figure 6. Plankton dominance index of fish stomachs and waters.

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Discussion

Figure 2 shows that the highest and lowest amount of plankton in fish stomachs in April was from the class Bacillariophyceae and Desmophyceae at 34% and 0%, with 74 and 1 species. Class Bacillariophyceae is a division of Chrysophyta with three classes, namely Xanthophyceae, Chrysophyceae, and Bacillariophyceae. The Chrysophyta division is tough to eliminate in fish stomachs or intestines. These classes have strong body walls (silica) and can not decompose or dissolve in water. Sachlan (1982) stated that when fish eat plankton from the Chrysophyta division, the feces will come out intact, resulting the shape remains crysophyta or not destroyed.

During the month of April, the plankton results in the waters differed from the observations in fish stomachs. In the waters, Bacillariophyceae has the highest percentage of 37%, with 71 species, while Chrysophyceae, Monogononta, and Entomostraca, with a percentage of 1%, are the lowest. Bacillariophyceae has the highest percentage in the waters, presumably because it can adapt to its environment (Yusanti, 2019). According to Baytut (2013) it is the class with the most numbers in the waters because it is cosmopolitan, has high adaptability, is resistant to pressure in an unfavourable environment, and has good reproductive power. Junaidi *et al.* (2013) argue that Bacillariophyceae has the highest abundance due to environmental factors such as acidity, lighting, and food (nutrients).

Chlorophyceae comes from the division Chlorophyta which is also called green algae. They are an essential component in the food chain in public waters and are primarily found in freshwater waters. Algae can survive at temperatures above average, dry, and live in groups in nature. The existence of Chlorophyceae can be of various types, according to the status of water quality which is divided into physical and chemical variables. (Harmoko & Sepriyaningsih, 2020) and Maresi *et al.* (2015) explained that Chlorophyta is easy to find in freshwater (a lot) because they quickly adapt to environmental conditions and grow with perfect lighting.

Chlorophyceae are easy to obtain and digest by fish. This statement follows Sachlan's (1982) that fish always consume phytoplankton division of Chlorophyta (Chlorophyceae) from the hatching to maturity. Ramadhan *et al.* (2020) stated that Phytoplankton and Zooplankton had been found in the stomach of the *sepat* siamese in Rawa Banjiran, Medium Village, which consists of 5 classes, one of which is Chlorophyceae. Razi (2013) argues that when they become larvae, the siamese *sepat* fish consumes mosses, Chlorophyceae, Copepoda, Flagellata, and other classes. In May, 19 types of fish were caught, and one of them was the *sepat* siamese and the tembakang, which contained a lot of Chlorophyceae with various species in the stomach.

The decrease in the number of classes and individual plankton in June was because of the dry season. The rain intensity was minimal, which caused the volume of river water to decrease even though it was high tide. Decreased fishing can affect the number of classes, and individual plankton found. The number of fish caught in June was 13 species, namely *bujuk, damaian, baung, betok, lampam, kojam, tilan, sepatung, semengkak, sepat, mentulu, sapil,* and *lambak*. This number is less compared to April and May. When the water recedes, the fishing gear used by residents, such as barrier traps and lift nets, cannot be used. These fishing gear require a sufficient water level to trap the fish. Residents use other fishing gear such as gill nets or poles and lines as an alternative.

There are eight classes of plankton in the waters, namely Cyanophyceae, Chlorophyceae, Bacillariophyceae, Dinophyceae, and Euglenophyceae, which are included in phytoplankton. Monogononta, Entomostraca, and Rhizopoda are included in zooplankton. In June, the highest percentage of plankton in fish stomachs was the same. Bacillariophyceae are algae found in almost all waters with various water conditions, both in freshwater, seawater, and moist soil. They were found at every observation station and dominated the percentage in April and June. Wirabumi *et al.* (2017) found that Bacillariophyceae dominate the Wadaslintang Reservoir by 92%. According to Idiawati *et al.* (2021) this class dominates in Lemukutan Island waters up to 93%. Astuti *et al.* (2017) stated that Bacillariophyceae were at each research observation station because they could adapt to the environment well. According to Smith (1950), the distribution of Bacillariophyceae (diatoms) in water is extensive, hence it can be easily obtained.

The observations from April to June showed that phytoplankton dominated at each station and every month compared to zooplankton. Witariningsih *et al.* (2020) explained that the abundance was high due to phytoplankton carrying out photosynthesis during the day. Phytoplankton is a fish's primary food source since they seek sunshine to photosynthesize. Water sampling was carried out in the Pk time range

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of 10.00 - 15.00 WIB every month when this class is photosynthesizing. The low number of zooplankton found in the fish's stomachs and the waters can be caused by their daily vertical migration. According to Iswanto *et al.* (2015), this class experiences daily vertical migration. During the day, the zooplankton is at the bottom of the water but rises to the surface layer in the evening. Furthermore, zooplanktons are very sensitive to sunlight, hence they tend to avoid it (negative phototaxis). The low diversity of zooplankton in the waters can also be due to its long life cycle. Khasanah *et al.* (2013) explained that phytoplankton reproduces by dividing cells, and their reproductive cycle is much shorter than zooplankton. As a result, production always comes first and reaches a maximum population (Indriyawati *et al.*, 2012). In other conditions, when water is unstable or unproductive, it will affect zooplankton. According to Riyantini *et al.* (2020), aquatic organisms such as zooplankton are susceptible to environmental changes. Judging from the fluctuations that can affect the environmental balance of a body of water, the presence is significant, especially in energy transfer and the food chain (Hasanah *et al.*, 2014). According to Yusanti, (2019) in the flood swamps of Medium Village, Banyuasin Regency, zooplanktons are relatively abundant, hence the waters are fertile.

Based on plankton community by the number of species, total individuals, the abundance of plankton, index diversity *Shannon-Wiener*, dominance index, and the highest uniformity index were found in the fish hull. The abundance can happen because the number of fish species caught is quite large. Hence, the results of plankton analysis for the number of species, total individuals, the abundance of plankton, and diversity index are much larger than those of plankton in the waters. According to Astuti *et al.* (2017), the number of individuals with microalgae can determine the abundance. In addition, when the total number is high, the abundance value will also be high. Purwanti *et al.* (2012) explained that when the number of individuals (microalgae) increases, it does not necessarily mean that the number of microalgae species will also increase.

The highest and lowest plankton abundance in fish hulls from April and June at stations 2 and 1 are 448.12 ind/L and 43.8 ind/L. However, all stations had a higher abundance in April than in May and June. Abundance in April occurs due to high rainfall, which is one of the factors causing the river's high water level. The fishing gear used by fishers can catch fish to the maximum. The catches may not only come from the Ogan tributary but also the current from the Kelekar river.

Plankton was found at a wide range in fish stomachs when there was a high abundance of prey in the water. There were 4877 cells and 217 types of plankton identified in the water in April. It is different when the months of May and June enter the dry season, which causes a little rain intensity, and the air temperature is relatively warm, ranging from 31-32°C. Harmilia *et al.* (2021) stated that an increase in temperature in waters could cause a decrease in dissolved oxygen, preventing all aquatic organisms from consuming oxygen. Some fish cannot live in good conditions when the temperature exceeds normal. The dissolved oxygen value at each station shows a negative value ranging from 2.96 to 5.55 mg/L. According to Effendi (2003), dissolved oxygen with 1-5 mg/L can interfere with fish growth. This is because fish and other aquatic biota prefer dissolved oxygen with>5 mg/L.

In April and June, the highest and lowest abundance of plankton in the waters was located at stations 2 (Tanjung Seteko Village) and 1 (Indralaya Mulya Village). The high water transparency in April at station 2 is a variable that causes the increased value of plankton abundance. The water transparency at station 2 is 1,4 m higher than that of stations 1 (1,1m) and 3 (1,3m). Phytoplankton utilizes sunlight for photosynthesis. The lowest at station one can be due to domestic waste discharged into water bodies, primarily when the Indralaya market operates. Garbage will be visible on the banks of the river, and the colour of the river water is blackish green and smells terrible, indicating bad water quality. The highest abundance of plankton in the stomach and the waters was only 448.12 ind/L. According to Maresi *et al.* (2015), the abundance of phytoplankton will be closely related to the fertility level of waters. The research results on the abundance of plankton in the Ogan River tributary are classified as oligotrophic or less fertile.

Odum (1996) stated that species with multiple variations could influence the diversity index, and the number of individuals does not dominate. The results of plankton diversity in the fish stomach and the waters showed an index value between 1.00-3.00. The community's variety is low when the Shannon-Wiener formula yields a value less than 1, indicating a poor sense of equilibrium. In addition, when the value is 1.00-3.00, the diversity is moderate, which means the community balance is also moderate. The higher the value, the more diverse and stable the community. From this reference, plankton in the waters of the Ogan River, Indralaya District, Ogan Ilir Regency, has moderate diversity, which means that the community balance is also moderate, with a value between 1.11 - 1.45. From the value, it can be concluded that the waters are classified as moderately polluted. According to Harmilia and Khotimah (2018), Ogan River is classified as moderately polluted during the dry season, even though they are still suitable for use. However, only fish can tolerate dangerous waters for fish farming businesses. The value of dissolved oxygen and pH of the waters at each station shows a less suitable value for aquatic organisms.

Figure 7 shows the index in the fish stomach with an E 0.41- 0.67, indicating small plankton uniformity. In contrast to the plankton uniformity index in the waters, at station 3 in April (E value 0.72) and at station 1 in June with an E value of 0.93, these two data are included in high plankton uniformity. Basmi (2000) stated that when the uniformity index is close to 0, the diversity between species in the community is small, indicating the number of individuals belonging to each species is much different. Boyd (1979) explained that the phytoplankton group could change type and amount. The value of uniformity (E) ranges from 0 to 1, and the small value of E indicates reduced uniformity of a population. According to Odum (1996), the value of E is close to 0 when the distribution of individuals between species is not evenly distributed, or certain types of groups dominate. On the other hand, the closer the value is to 1, the plankton population shows a uniform number of individuals (Radiarta, 2013). According to (Lantang & Pakidi, 2015), phytoplankton will develop diversity and productivity in their community. The structure can change from place and time due to environmental factors.

Simpson's dominance index value is obtained to determine the dominance of certain species in water. If C≈0 value less than 0.5 indicates no dominant species, and if C≈1 value more than 0.5 indicates a dominant species. No plankton dominates at 0.27 - 0.37 concentration, regardless of studies conducted in fish stomachs or waters. According to Basmi's (2000) classification, the dominance index value of the waters close to zero means the waters are stable. Therefore, the Ogan River tributary waters show a stable community structure.

Currents are a factor in the distribution of phytoplankton in waters because their movements follow the direction. According to Mason (1993), a current speed of less than one millimetre per second (m/s) is considered very weak, whereas speeds of 0.1-1 millimetre per second (m/s) are considered moderate and speeds of more than one millimetre per second is considered high. The current velocity in the tributary of the Ogan River is medium, ranging from 0.5 to 0.9 m/s. Research by Adinugroho *et al.* (2014) found that the distribution of plankton in water is not uniform but has a significant impact on the environment.

The transparency values in May and June were not significantly different, ranging from 0.75 - 0.9 m. In April, the brightness was relatively high at the three stations ranging from 1.1 - 1.4m. The brightness can occur due to the absence of suspended materials in April, therefore, the abundance of plankton in the fish stomach and the water is relatively high. (Harmilia & Dharyati, 2017) explain that the light penetration in the Ogan River is high due to minimal external factors, such as rain or suspended materials. Arsad *et al.* (2019) explain that light also influences the abundance of phytoplankton because it plays an essential role in the occurrence of photosynthesis in waters. Hartmann *et al.* (2015) reported that algae life (growth and production mechanism) is strongly influenced by sunlight, especially ultraviolet. In addition, the dry season in June prevents rain from falling. Therefore, the weather is very sunny, and the sun's rays can illuminate the waters without being blocked by clouds.

The results of temperature measurements during the study ranged from 29-32°C. According to Effendi (2003), the optimal temperature range for phytoplankton growth is 20-30°C. Al Diana *et al.* (2021) explained that high or low temperatures in waters could increase or decrease the abundance of phytoplankton and the chlorophyll-a content. Marson and Harmilia (2021) stated that temperature could function as a monitor for an aquatic ecosystem that affects the sustainability of organisms such as plankton.

The pH value in the waters of the Ogan River ranges from 4 to 5. According to Effendi (2003), aquatic organisms according to the pH value of 7-8.5 and if 4-5 can cause the diversity and composition of plankton species to decrease. The low pH value can be caused by domestic and industrial waste discharged into the river. Indralaya Mulya village has a pH value of 4 because domestic waste from residential residents is also from traditional markets. Harmilia & Khotimah, (2018) stated that human activities, both directly and indirectly, such as dumping waste into rivers can hurt rivers

Dissolved oxygen in water is closely related to the temperature. Meanwhile, the dissolved oxygen value decreases with increasing temperature. The value of dissolved oxygen when the study showed a value that was not good was in the range of 2.96 to 5.55 mg/L. Pratiwi *et al.* (2015) explained that the life of plankton would be good when dissolved oxygen had a value of

>3 mg/L. According to Effendi (2003), aquatic biota-like dissolved oxygen with a value of 5 mg/L or more, and the lowest was at station 1 (June), with 2.96 mg/L. This is because the Kelekar River, which is right close to the Ogan tributary, carries both domestic and industrial waste.

Conclusion

Plankton found in fish stomachs and waters consist of 8 divisions with 7 classes of phytoplankton, namely Cynophyceae, Chlorophyceae, Bacillariophyceae, Chrysophyceae, Desmophycea, Dinophyceae, and Euglenaphyceae, and 4 more classes of zooplankton, namely Ciliata, Rhizopoda. and Entomostraca. The total abundance is 35.6 - 448.12 ind/L in less fertile waters <2000 (ind/L). The index has moderate diversity and community stability with a value between 1.11 - 1.45. The plankton in the fish stomach showed small uniformity of 0.41-0.67. During the month of April, the uniformity in the waters at stations 3 and 1 was high, with E values of 0.72 and E 0.93. The value of the plankton dominance index is in the range of 0.27-0.37, i.e., there are no species that dominate others or D = 0 (<0.5), with moderately polluted water quality.

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