

# Abundance, type and size of plankton in situ on the nursery ground of endemic bilih fish larvae in Lake Singkarak, West Sumatra, Indonesia

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**Abstract.** The increased fishing efforts have resulted in the bilih fish (*Mystacoleucus padangensis* (Bleeker, 1852)) being classified as "vulnerable", which necessitates efforts toward its domestication and cultivation. The primary challenge is the lack of knowledge about suitable natural feed that matches the larval mouth gaps during the exogenous feeding phase. This research was conducted from April to August 2024 in the Sumpur River estuary, Lake Singkarak, at three stations noted as A, B, and C. The study aimed to determine the abundance, types, and sizes of in-situ plankton to identify potential natural feed for bilih fish larvae. It also examined the diversity, uniformity, and dominance index of plankton at the three stations. Plankton samples were collected using a plankton net at the water surface. The results showed that 25 species were identified at station A, 26 species at station B, and 27 species at station C. The most frequently found species belonged to the classes Cyanophyceae, Bacillariophyceae, Zygnematomyxaceae, Dinophyceae, Chlorophyceae, Trebouxiophyceae, Mediophyceae, Coscinodiscophyceae, zooplankton group, and Xanthophyceae. The diversity index at station A was 2.83, at station B was 2.87, and at station C was 2.89, all of which indicate moderate conditions. The uniformity index at stations A, B, and C was 0.88, also classified as moderate, while the dominance index at all three stations was 0.07, meaning no species dominated at any station. Among the 37 species found across the three locations, 23 species of plankton including *Aphanocapsa incerta*, *Merismopedia elegans*, *Westella botryoides*, *Chroococcus dispersus*, *Oocystis parva*, *Chroococcus turgidus*, *Cyclotella kuetzingiana*, *Cymbella turgida*, *Navicula anglica*, *Cocconeis placentula*, *Chlorella ellipsoidea*, *Scenedesmus bijuga*, *Tetraedron minimum*, *Navicula bacillum*, *Chodatella quadriseta*, *Cymbella tumida*, *Peridinium bipes*, *Arcella hemisphaerica*, *Ophiocytium majus*, *Crucigenia rectangularis*, *Gomphonema lanceolatum*, *Staurastrum gracile*, and *Navicula cryptocephala* were identified as potential natural food source for bilih fish larvae because it is suitable for larvae with mouth openings smaller than 60  $\mu\text{m}$ . This potential needs to be further studied to identify species that are suitable for the growth and development of bilih fish larvae.

**Key words:** *Mystacoleucus padangensis*, natural feed, plankton, uniformity, size.

**Introduction.** The structure of the plankton community in the nursery zone is an important factor affecting the survival of fish larvae, especially since plankton is the main food source during the exogenous phase of larval development. The presence of plankton of the right size and in sufficient abundance is crucial for the availability of food that can be utilized by larvae, which have narrow mouths (Sabatés & Saiz 2000). In addition to the structure of the plankton community, spatial and temporal variations in the plankton community can affect the growth and early mortality of fish larvae (Soudijn & de Roos 2017). This is because the size and type of food available are important determinants of their survival and growth rates (Munk 1997).

The early life stages of teleost fish, particularly larvae, are known to have high mortality rates, which are greatly influenced by the suitability of the digestive system to the size spectrum of food available in the environment. The feeding ability of larvae, which is limited by mouth size and suction performance, directly affects the maximum size of prey they can consume (Davis et al 2011). Variations in plankton size and composition, in terms of taxon and particle size, are determining factors for larval growth and survival

(Auth et al 2018). In addition to size, plankton also influences important processes in the trophic chain, such as consumption rates and predation probabilities (Dickie et al 1987).

Overall, the complex interactions between the digestive system, feed size, and environmental conditions are crucial in determining the survival of teleost fish larvae in the early stages of their life. A more in-depth mapping of how plankton size affects larvae can help in effectively managing fish populations and their habitats (Huijbers et al 2012).

In the Cyprinidae fish group in lentic ecosystems, such as the bilih, *Mystacoleucus padangensis* (Bleeker, 1852), which is a species endemic to Lake Singkarak, the suitability between the mouth opening of larvae and the plankton size spectrum in the rearing habitat is crucial. The composition and size of plankton in the larval environment significantly affect the ability of larvae to obtain suitable food. Syandri et al (2023) stated that the mouth opening size of bilih fish larvae 4 days after hatching was 61.8  $\mu\text{m}$  and had a body length of 4.3 mm.

With the decline in bilih fish resources as classified as "vulnerable" (IUCN 2020), conservation and restocking efforts are needed (Syandri et al 2011). Another alternative to maintain sustainability of endemic fish is by domesticating and cultivating them (Jubaedah et al 2023; Razi & Pattekai 2020). Syandri et al (2023) conveyed the results of previous research that had successfully bred and produced larvae. However, the larvae can only survive at a survival rate of  $28.4 \pm 3.04\%$ , with a specific growth rate of 3.30% per day for 30 days. Furthermore, it is mentioned that the type of feed that can increase the survival rate of larvae beyond  $28.4 \pm 3.04\%$  is not yet understood.

The main problems in cultivation activities are the low survival rate and slow growth of larvae due to the lack of suitable feed, both plankton and artificial feed (Efrizal et al 2018; Lubis et al 2021; Zakaria et al 2022; Efrizal et al 2023). One way to begin domesticating wild species is to gather as much information as possible about their natural habitat, including the physical, chemical, and biological factors in their natural habitat (Amin et al 2022). Similarly, Kashinskaya et al (2018) suggested that creating a profile of the natural habitat of certain animals can reveal the feeding patterns of aquatic biota. For example, plankton can be a natural food source for various aquatic species (Amin et al 2022). Bilih fish have main food source coming from the Bacillariophyceae class and other groups such as Chlorophyceae, Desmidiaceae, Cyanophyceae, Protozoa, Rotifers, and Crustaceans (Febriani 2010). Other studies show that the preferred food of bilih fish in various habitats includes *Chlorococcum* sp., *Diaphanosoma* sp., and Crustacea, with differences in composition between regions: populations in Lake Singkarak and Lake Dibawah are dominated by zooplankton, especially Crustacea, while populations in Lake Toba prefer *Chlorococcum* sp. while populations in the Batang Anai River tend to consume *Fragilaria capucina* and *Synedra ulna* (Nofrita 2017). The dominant types of phytoplankton consumed mainly come from the Bacillariophyceae family, such as *Navicula* sp. and *Cymbella* sp., in line with the plankton composition of Lake Singkarak, which is also dominated by Bacillariophyceae (48.6%) (Purnomo 2008). However, no reports have been made on the types of plankton that are the main food source for bilih fish larvae.

Previous studies have shown that bilih fish are plankton feeders (Syandri 1996; Purnomo & Sunarno 2009; Nofrita 2017; Suryanti et al 2017). However, no one has reported on the types and sizes of in situ plankton that serve as natural food for the survival of larvae. Therefore, a study on the types, abundance, diversity, uniformity, and dominance index, as well as the size of in situ plankton in the nursery area of endemic bilih fish larvae in Lake Singkarak, West Sumatra, needs to be conducted.

## Material and Method

**Description of the study sites.** The study was conducted from April to August 2024 in the estuary area of the Sumpur River, Nagari Sumpur, Batipuh Selatan District, Tanah Datar Regency. The Sumpur River was chosen as the research location because it is one of the rivers that flows into Lake Singkarak, along with five other rivers. Additionally, this river serves as a spawning ground for bilih fish, characterized by flowing, clear, and shallow waters, with a substrate consisting of pebbles and gravel (Syandri et al 2013).

Supported by its natural conditions, the community in Nagari Sumpur has local wisdom encapsulated in Nagari Regulation No. 03 of 2004 regarding the regulations for fish capture within the Nagari Sumpur area. This regulation outlines the prohibition of fishing, stipulations regarding the use of fishing gear, such as permitted fishing tools, operating times for fishing gear, and prohibitions against using explosives, electricity, illegal nets (specifically for bilih), and toxic chemicals in the waters of Lake Singkarak, as well as penalties for community members who violate these regulations (Hadi et al 2020).

To maintain the sustainability of the bilih fish population in Lake Singkarak, the community of Nagari Sumpur has created facilities for bilih fish, which include artificial reefs (*rumpon*) placed around the waters of Lake Singkarak. These serve as resting and spawning sites for the fish, as well as artificial sanctuaries (Alahan) providing alternative locations for fishermen to catch bilih fish and other aquatic resources available in Lake Singkarak (Hadi et al 2020). Data collection was conducted at three stations: station A (00°32'20.9"S 100°29'28.2"E) located on the right side of the Sumpur estuary, station B (00°32'17.3"S 100°29'37.4"E) located on the middle side of the Sumpur estuary, and station C (00°32'13.4"S 100°29'41.4"E) located on the left side of the Sumpur estuary (Figure 1). The distance between station A and B is 236 meters, while the distance between station B and C is 158 meters.

Stations A, B, and C are assumed to represent areas where bilih fish migrate to spawn into the river, as well as serve as the hatching grounds for fertilized eggs after spawning, and act as nursery grounds for bilih fish larvae. At all three research locations, juvenile and young bilih fish were observed playing and foraging near the lake's edge, along with several types of submerged aquatic plants with their roots anchored to the water's bottom, such as *Potamogeton sumatranus*, *Najas marina*, *Hydrilla verticillata*, and *Chara sp.*

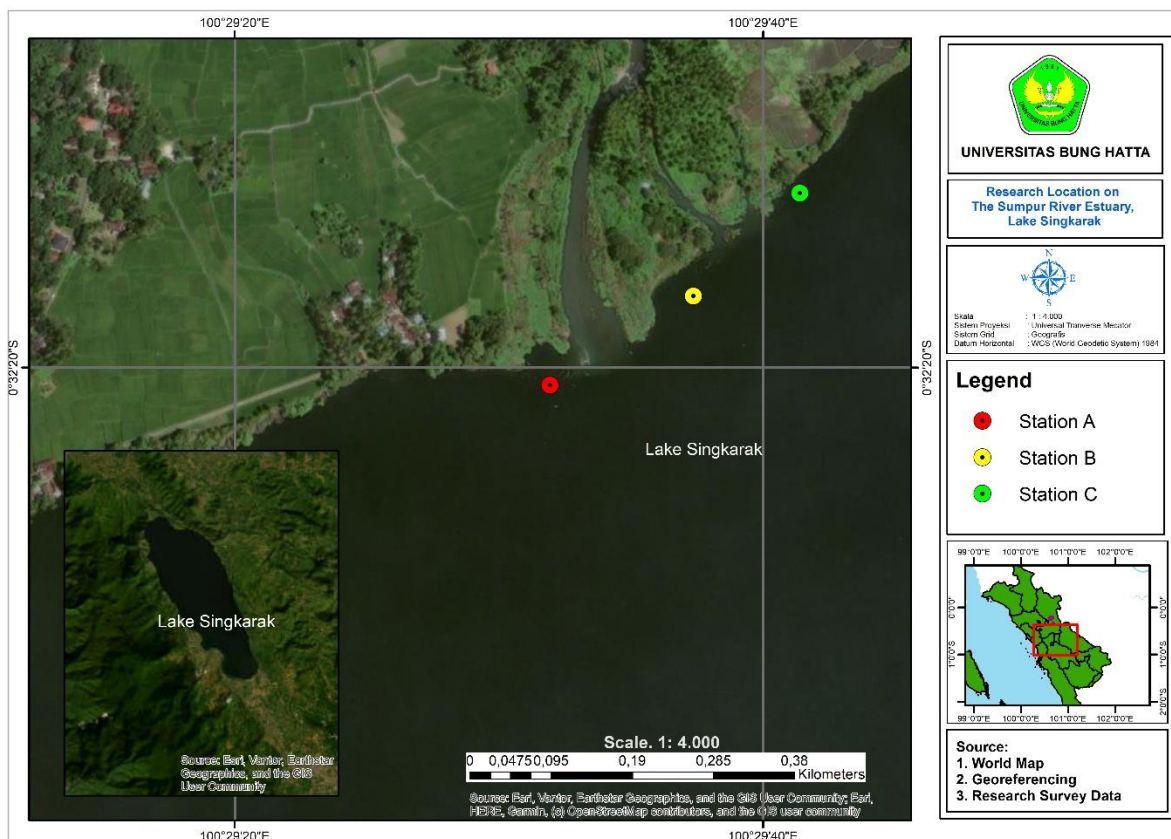


Figure 1. Research locations at the estuary of the Sumpur River, Lake Singkarak, West Sumatra.

**Abundance and identification of plankton.** Plankton sampling was conducted at each research location. Water samples were taken at 2 m depth, by a plankton net, and placed in sterile bottles. The filtered samples were then treated with 1% Lugol's solution to

preserve the plankton. The bottles containing the plankton samples were stored in a cool box. The samples were subsequently examined in the Ecology Laboratory, Department of Biology, Universitas Andalas. The identification and abundance of plankton were analyzed using the method described by LeGresley & McDermott (2010). Plankton samples were placed in Sedgewick rafter counting (SRC) cells and observed under a binocular microscope at a magnification of 400x. The plankton found in each sample were then counted, measured, photographed, and identified according to the identification guide of Mazzocchi et al (1995). The abundance index was calculated based on the formula from Fachrul (2007):

$$N = \frac{a}{b} \times \frac{c}{d} \times \frac{Vb}{Vsrc} \times \frac{1}{Vs}$$

where: N represents the abundance of plankton (ind L<sup>-1</sup>), a indicates the number of SRC boxes, b is the area of one field of view (mm<sup>2</sup>), c represents the number of individuals observed, d is the number of boxes observed, Vb is the volume of water in the sample bottle (mL), Vsrc is the volume of water in the SRC (mL), Vs indicates the volume of water filtered in the field (L).

**Diversity, uniformity, and dominance indices.** The value of the diversity index (H') is calculated using the following formula (Fachrul 2012):

$$H' = - \sum Pi \ln Pi, \text{ where } Pi = \frac{ni}{N}$$

where: H' is the Shannon-Wiener diversity index, pi is the number of individuals of the i-th species, ni is the number of species, and N is the total number of individuals.

The evenness index (E') was calculated using the following equation (Ulfah et al 2019):

$$E' = \frac{H'}{Lns}$$

where: E' is the uniformity index, H' is the Shannon-Wiener diversity index, S is the total number of species.

The dominance index (d) was calculated using the following equation (Berger & Parker 1970):

$$d = \frac{Nmax}{N}$$

where: d is the Simpson's dominance index, Nmax is the number of individuals of the most abundant species, and N is the total number of individuals.

## Results

**Plankton abundance.** Based on the research conducted at the estuary of the Sumpur River at station A, a total of 25 plankton species were identified. The most abundant species was *Aphanocapsa incerta*, with an abundance rate of 12.23%, followed by *Ceratium hirundinella* at 10.11%, *Merismopedia elegans* at 9.57%, *Chroococcus dispersus* at 8.51%, *Oscillatoria formosa* at 8.51%, *Synedra ulna* at 8.51%, and *Staurastrum longiradiatum* at 6.38%. At station B, 26 plankton species were found, with the most abundant species being *Merismopedia elegans*, which had an abundance rate of 13.64%, followed by *Staurastrum longiradiatum* at 11.93%, *Synedra ulna* at 10.80%, *Aphanocapsa incerta* at 7.95%, *Synedra acus* at 7.39%, *Oscillatoria formosa* at 5.68%, and *Staurastrum gracile* at 5.68%. At station C, a total of 27 plankton species were identified, with the most abundant species being *Merismopedia elegans*, which had an abundance rate of 13.13%, followed by *Oscillatoria formosa* at 11.25%, *Synedra ulna* at 10.63%, *Ceratium hirundinella* at 8.75%, *Chroococcus dispersus* at 8.13%, *Navicula anglica* at 5.63%, and *Synedra acus* at 5.63%. A detailed description of the density and abundance can be seen in Table 1.

Table 1

Identification results of class, species, number, and abundance of plankton at stations A, B, and C

Class/Species	Station A		Station B		Station C	
	Density (ind L <sup>-1</sup> )	Abundance (%)	Density (ind L <sup>-1</sup> )	Abundance (%)	Density (ind L <sup>-1</sup> )	Abundance (%)
Bacillariophyceae						
<i>Cocconeis placentula</i>			0.08	0.57	0.08	0.63
<i>Cymbella tumida</i>					0.42	3.13
<i>Cymbella turgida</i>					0.08	0.63
<i>Gomphonema lanceolatum</i>					0.08	0.63
<i>Navicula anglica</i>	0.75	4.79	0.33	2.27	0.75	5.63
<i>Navicula bacillum</i>					0.08	0.63
<i>Navicula cryptocephala</i>	0.17	1.06			0.08	0.63
<i>Nitzschia amphibia</i>	0.75	4.79	0.50	3.41	0.50	3.75
<i>Synedra acus</i>	0.42	2.66	1.08	7.39	0.75	5.63
<i>Synedra ulna</i>	1.33	8.51	1.58	10.80	1.42	10.63
Chlorophyceae						
<i>Ankistrodesmus falcatus</i>	0.25	1.60	0.33	2.27	0.33	2.50
<i>Crucigenia rectangularis</i>			0.08	0.57		
<i>Scenedesmus bijuga</i>			0.08	0.57	0.25	1.88
<i>Tetraedron minimum</i>			0.33	2.27	0.17	1.25
<i>Westella botryoides</i>			0.08	0.57	0.08	0.63
Coccinodiscophyceae						
<i>Melosira italica</i>			0.17	1.14	0.33	2.50
Cyanophyceae						
<i>Aphanocapsa incerta</i>	1.92	12.23	1.17	7.95	0.25	1.88
<i>Chroococcus dispersus</i>	1.33	8.51	0.58	3.98	1.08	8.13
<i>Chroococcus turgidus</i>	0.67	4.26	0.50	3.41	0.50	3.75
<i>Lyngbya</i> sp.			0.17	1.14	0.08	0.63
<i>Merismopedia elegans</i>	1.50	9.57	2.00	13.64	1.75	13.13
<i>Oscillatoria formosa</i>	1.33	8.51	0.83	5.68	1.50	11.25
Dinophyceae						
<i>Ceratium hirundinella</i>	1.58	10.11	0.67	4.55	1.17	8.75
<i>Peridinium bipes</i>	0.25	1.60	0.17	1.14		
Mediophyceae						
<i>Cyclotella kuetzingiana</i>	0.17	1.06	0.33	2.27	0.50	3.75
Trebouxiophyceae						
<i>Chlorella ellipsoidea</i>	0.42	2.66				
<i>Chodatella quadriseta</i>	0.17	1.06	0.17	1.14		
<i>Oocystis parva</i>	0.08	0.53	0.33	2.27		
Xanthophyceae						
<i>Ophiocytium majus</i>	0.08	0.53				
Zygnematophyceae						
<i>Cosmarium contractum</i>	0.08	0.53				
<i>Staurastrum dorsidentiferum</i>	0.50	3.19	0.42	2.84	0.42	3.13
<i>Staurastrum gracile</i>	0.58	3.72	0.83	5.68	0.33	2.50
<i>Staurastrum longiradiatum</i>	1.00	6.38	1.75	11.93	0.25	1.88
Zooplankton						
<i>Arcella hemisphaerica</i>	0.17	1.06				
<i>Keratella cochlearis</i>					0.08	0.63
<i>Keratella tropica</i>	0.08	0.53				
<i>Trinema enchelys</i>	0.08	0.53	0.08	0.57		
Grand total	15.67	100.00	14.67	100.00	13.33	100.00

From Table 1, it can also be observed that the plankton density found at station A was 15.67 ind L<sup>-1</sup>, at station B was 14.67 ind L<sup>-1</sup>, and at station C was 13.33 ind L<sup>-1</sup>. Based on the plankton density values obtained at each station, the plankton density in the study area indicates relatively low levels (Dodds et al 2010). In terms of the classes of plankton

identified, the most abundant class at station A was Cyanophyceae (43.09%), followed by Bacillariophyceae (21.81%), Zygnematophyceae (13.83%), Dinophyceae (11.70%), Trebouxiophyceae (4.26%), zooplankton (2.13%), Chlorophyceae (1.60%), Mediophyceae (1.06%), and Xanthophyceae (0.53%). At station B, the most abundant class was also Cyanophyceae (35.80%), followed by Bacillariophyceae (24.43%), Zygnematophyceae (20.45%), Dinophyceae (5.68%), Trebouxiophyceae (3.98%), zooplankton (0.57%), Chlorophyceae (5.68%), Mediophyceae (2.27%), and Coscinodiscophyceae (1.14%). At station C, the most abundant class was again Cyanophyceae (38.75%), followed by Bacillariophyceae (31.88%), Zygnematophyceae (7.50%), Dinophyceae (8.75%), zooplankton (0.63%), Chlorophyceae (6.25%), Mediophyceae (3.75%), and Coscinodiscophyceae (2.50%), as illustrated in Figure 2.

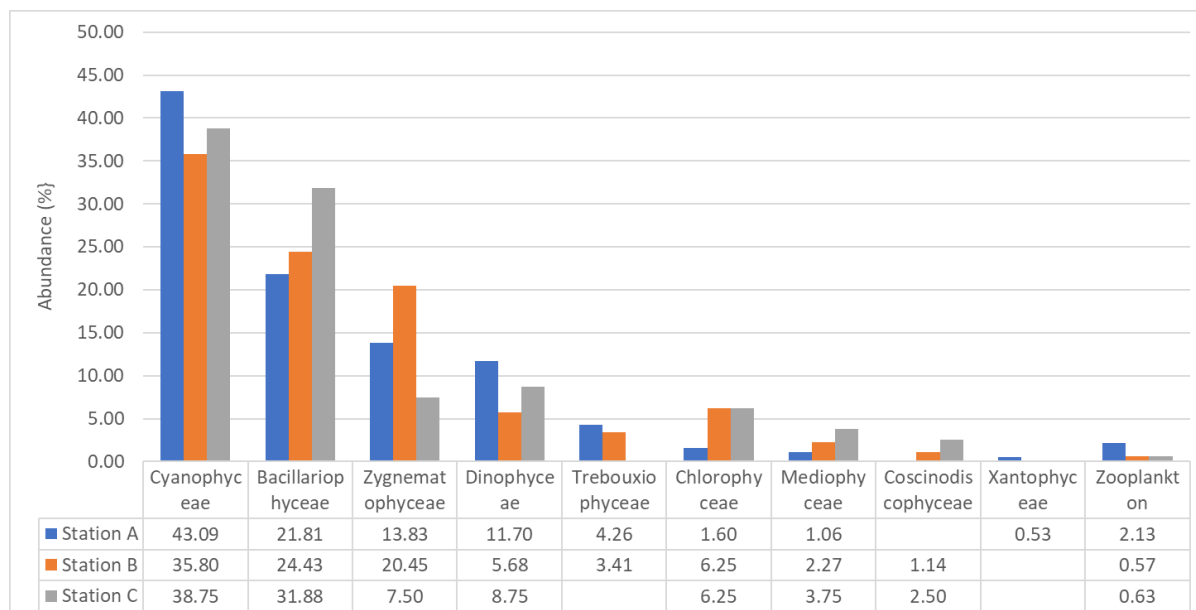


Figure 2. Distribution of plankton abundance by group and class at stations A, B, and C.

From the Figure 2, it can be observed that the Cyanophyceae class has a higher abundance compared to the others, followed by the Bacillariophyceae, Zygnematophyceae, Dinophyceae, and Trebouxiophyceae classes. According to Nweze (2006) it should be noted that in many tropical lakes, the Cyanophyceae class is found to be more abundant than other algae classes, although there are variations depending on the specific conditions of the location. This shows that even though Cyanophyceae dominate, the diversity and abundance of other classes still play a significant role that should not be overlooked.

**Diversity, uniformity, dominance indices and plankton size.** The diversity index value obtained at station A is 2.83, indicating that station A has moderate diversity. The diversity index value at station B is 2.87, which also suggests that the plankton conditions at station B have moderate diversity. Meanwhile, station C has a diversity index of 2.89, also indicating moderate diversity conditions. The uniformity index value obtained at station A is 0.88, indicating that the uniformity of plankton at station A is at a high level. Similarly, the uniformity index obtained at station B is also 0.88, meaning that the plankton uniformity at this station is also at a high level. At station C, the uniformity index is also 0.88, indicating that station C has high plankton uniformity.

The dominance index value obtained from stations A, B, and C is 0.07. All three locations have the same dominance index value, indicating that there are no dominant plankton species in the natural habitat of bilih fish larvae at these three stations. Out of the 37 plankton species identified in this study, 33 species belong to the phytoplankton and 4 species to the zooplankton. The sizes of each species can be seen in the following Figure 3.

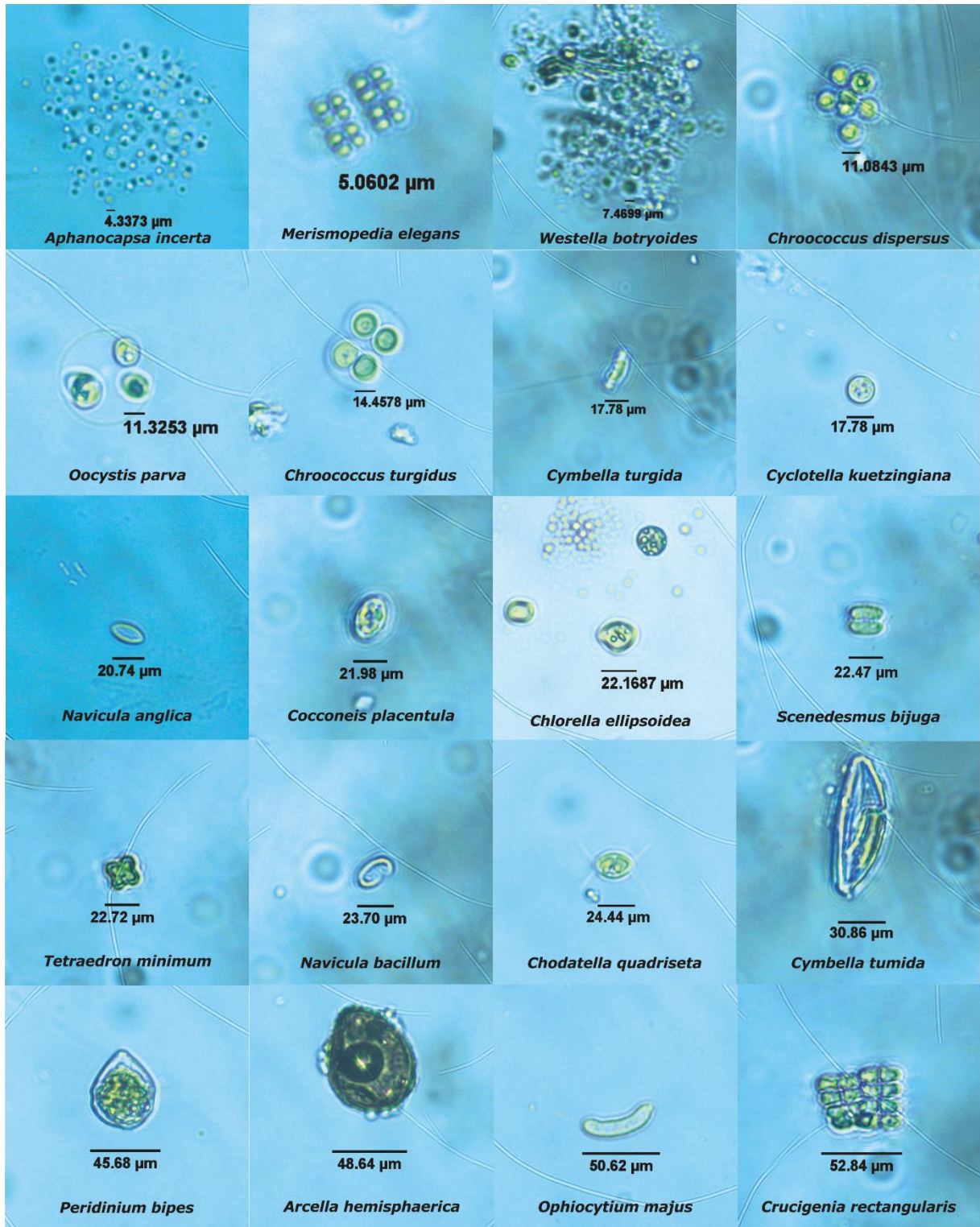
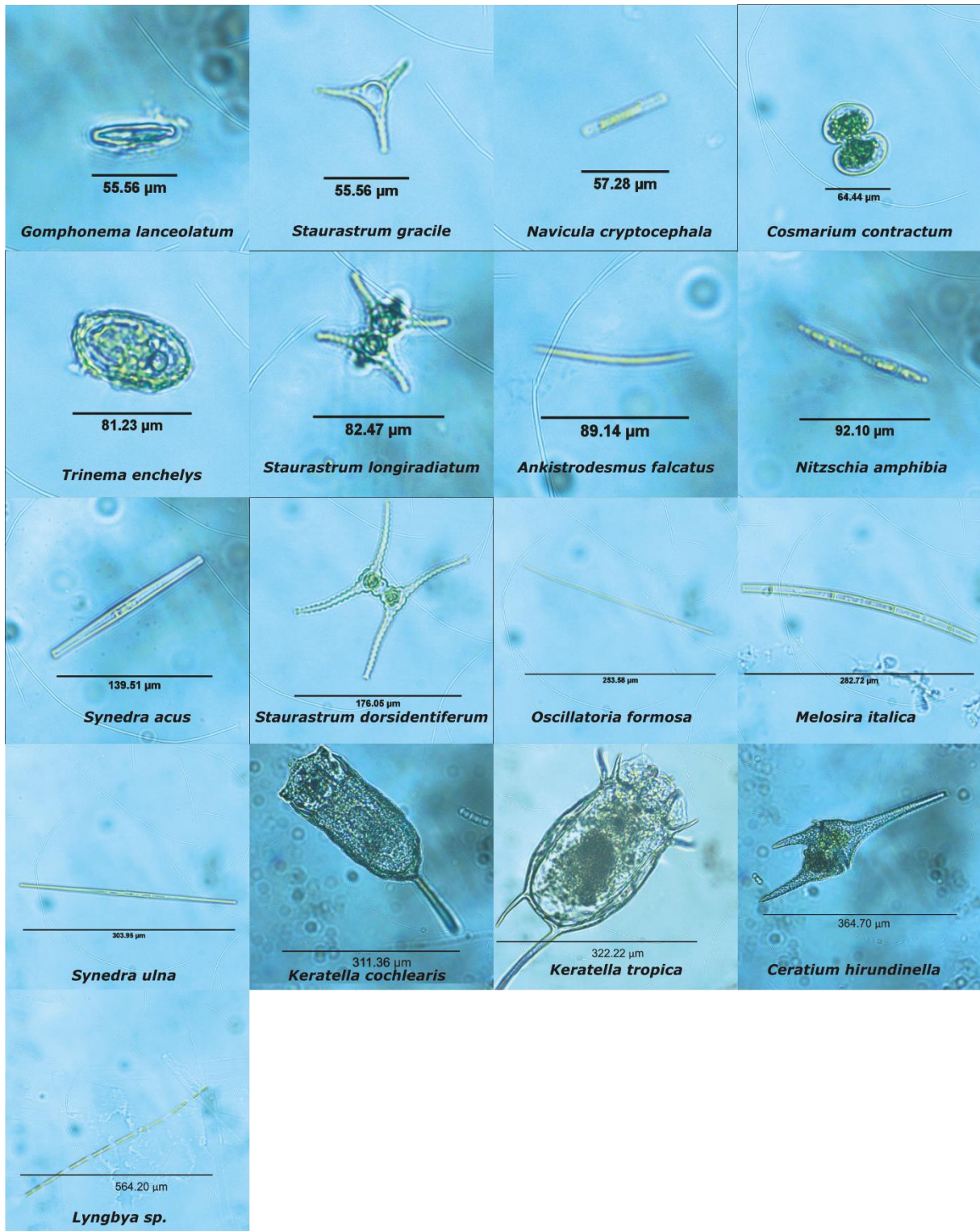


Figure 3. Types and sizes of plankton based on size.



Continuation of Figure 3. Types and sizes of plankton based on size (from the measurement results above, a total of 23 species were found to have sizes smaller than 61.880 µm.)

**Discussion.** Plankton, in general, consists of phytoplankton and zooplankton, which are the main components of aquatic food webs because they transfer energy to higher trophic organisms, including bivalves, crustaceans, and fish (Saravanakumar et al 2008; Moto & Kyewalyanga 2017; Kyewalyanga et al 2020). In aquatic environments, phytoplankton contributes to more than 90% of primary producers as nutrients and oxygen producers (Kyewalyanga et al 2020). Zooplankton consume them and transfer energy to higher

trophic levels such as fish, which has an overall impact on aquatic food webs (Mofu et al 2021; Stelmakh et al 2023). Previous research has reported that the bilih fish consumes 24 types of phytoplankton and 9 types of zooplankton. The diversity of these food types is one of the supporting factors for the bilih fish population to survive and reproduce well and to withstand environmental changes that destroy its food sources. In addition to sustaining life and growth, it also plays a role in the maturation of gonads (Syandri 1996).

Purnomo & Sunarno (2009) reported that the main food of bilih fish is detritus ( $38.9 \pm 7.1\%$ ) and phytoplankton ( $33.0 \pm 9.2\%$ ), while supplementary and additional foods are zooplankton ( $22.6 \pm 13.6\%$ ) and aquatic plants ( $5.4 \pm 2.7\%$ ). It seems that the food preferences of bilih fish tend to change as body length increases. When small, its main food is detritus and phytoplankton, but as the body length increases, the main food changes to zooplankton and detritus becomes its supplementary food. These changes in food preference are closely related to the age of the fish and the availability of natural food in the environment. Nofrita (2017) reported that the preferred foods of bilih fish in all habitats are *Chlorococcum* sp., *Diaphanosoma* sp., and crustaceans.

The bilih fish population in Lake Singkarak and Lake Dibawah has its main food consisting of zooplankton groups, particularly crustaceans, while *Chlorococcum* sp. serves the population in Lake Toba and *Fragillaria capucina* and *Synedra ulna* for the population in Batang Anai River (Nofrita 2017). It was stated that in Lake Toba, the natural food found in the intestines of bilih fish includes phytoplankton such as *Rhizosolenia*, *Synedra*, *Gonatozygon*, *Closterium*, *Surirella*, *Pinnularia*, *Oscillatoria*, *Melosira*, *Gyrosigma*, *Aulacoseira*, and zooplankton such as *Creseis*, *Tubifex*, and *Daphnia* (Suryanti et al 2017). From the research conducted at the three locations, the number of identified plankton species was found to be 25 species at station A, 26 species at station B, and 27 species at station C. Among the 37 species found at the three locations, the most frequently encountered species were *Merismopedia elegans*, *Synedra ulna*, *Oscillatoria formosa*, *Ceratium hirundinella*, *Aphanocapsa incerta*, *Chroococcus dispersus*, *Staurastrum longiradiatum*, *Synedra acus*, *Navicula anglica*, *Nitzschia amphibia*, *Staurastrum gracile*, and *Chroococcus turgidus*.

Based on previous studies, the types of plankton found in this study have a number almost identical to earlier reports. This condition is expected to play a role in maintaining the bilih fish population to survive, thrive, and cope with environmental changes that threaten its food sources. Considering the composition of total plankton types as natural food at the three locations in Lake Singkarak compared to previous studies, the composition of total plankton species as a natural food source at the three locations showed different results. Of the 37 plankton species found, the five most dominant were the classes Cyanophyceae (39.21%), Bacillariophyceae (26.04%), Zygnematophyceae (13.93%), Dinophyceae (8.71%), and Chlorophyceae (4.51%), while the five non-dominant plankton species were Trebouxiophyceae (2.74%), Mediophyceae (2.36%), Coscinodiscophyceae (1.21%), Zooplankton (1.11%), and Xanthophyceae (0.18%).

Refer to the plankton density at the three locations, which is categorized as low, however, when viewed from the diversity index at the three locations in sequence, it is 2.83, 2.87, and 2.89 respectively. The diversity index at these three locations falls into the medium category ( $H'$  between 2-3). From this index, it can be interpreted that the ecosystem is in a stable condition with a relatively even distribution of plankton species (Ayu et al 2023). This diversity index reflects that no species dominates the plankton community, which will have a positive impact on the stability of the ecosystem (Razak & Sharip 2019).

Similarly, the evenness index at the three locations is 0.88. This evenness index is categorized as high ( $E' \approx 1$ ). This index reflects that the ecosystem is in good condition, with a uniform distribution among plankton species. It indicates that there are no species that dominate excessively, suggesting that the ecosystem is balanced and the water quality is good. Overall, the aquatic environment tends to be stable, unpolluted, and supports plankton diversity fairly (Magurran 2004). In addition, the availability of food nutrients and predation processes can influence the values of evenness because they affect the types and amounts of plankton. Furthermore, physical and chemical factors also impact the evenness index as they influence plankton growth (Nugroho et al 2020).

Meanwhile, the dominance index at the three stations has the same value of 0.07. This dominance index falls into the low category (d close to 0). From this dominance index value, it can be inferred that the ecosystem is in good condition, with a uniform distribution of species. There are no plankton species that dominate significantly, indicating that the aquatic ecosystem is balanced and stable, and the water quality tends to be good without significant environmental stress.

**Potential food for bilih fish larvae.** Natural food is a primary requirement that must be provided to enhance the survival of fish larvae. Natural food has a size smaller than the mouth gap of fish larvae and has good nutritional content (Priyadi et al 2010). As reported by Syandri et al (2023), the mouth gap size of bilih fish larvae at 72 hours after hatching will reach 61.880  $\mu\text{m}$ , when the yolk sac is exhausted and the mouth is open. This is a critical time for fish larvae, as they must find food that matches the size of that mouth gap.

Febriani (2010) stated that bilih fish are plankton feeders and are euryphagic, with their main food coming from the class Bacillariophyceae. The food found in the stomachs of bilih fish consists of Bacillariophyceae, Chlorophyceae, Desmidiaceae, Cyanophyceae, Protozoa, Rotifers, Crustaceans, and other groups. Although several studies have been conducted to analyze the stomach contents of bilih fish, they have not yet addressed the question of what size of plankton is available in the natural habitat of bilih fish larvae (in situ), so they can consume those plankton for survival and growth. In this study, 37 species of plankton (33 phytoplankton and 4 zooplankton) were identified. Based on the size of these 37 species, there were 22 species of phytoplankton and 1 species of zooplankton that were  $\leq 60.8 \mu\text{m}$  in size. These species were dominated by Bacillariophyceae, Chlorophyceae, Cyanophyceae, Trebouxiophyceae, Dinophyceae, Mediophyceae, Xantophyceae, Coscinodiscophyceae, Zygnematophyceae, and zooplankton, and had the potential to serve as natural food for bilih fish larvae.

**Conclusions.** In this study, 37 species of plankton were identified from 3 stations (stations A, B, and C). At station A, 25 species were identified, at station B 26 species, and at station C 27 species. The most commonly found species were from the classes Cyanophyceae, Bacillariophyceae, Zygnematophyceae, Dinophyceae, Chlorophyceae, Trebouxiophyceae, Mediophyceae, Coscinodiscophyceae, Xantophyceae, and the zooplankton group. The diversity index at station A was 2.83, station B 2.87, and station C 2.89, which is classified as moderate. The uniformity index at stations A, B, and C was the same, namely 0.88, which is also classified as moderate, and the dominance index at stations A, B, and C was also the same, namely 0.07, which means that no species dominated at each station.

From 37 species found at the three locations, 23 plankton species (*Aphanocapsa incerta*, *Merismopedia elegans*, *Westella botryoides*, *Chroococcus dispersus*, *Oocystis parva*, *Chroococcus turgidus*, *Cyclotella kuetzingiana*, *Cymbella turgida*, *Navicula anglica*, *Cocconeis placentula*, *Chlorella ellipsoidea*, *Scenedesmus bijuga*, *Tetraedron minimum*, *Navicula bacillum*, *Chodatella quadriseta*, *Cymbella tumida*, *Peridinium bipes*, *Arcella hemisphaerica*, *Ophiocytium majus*, *Crucigenia rectangularis*, *Gomphonema lanceolatum*, *Staurastrum gracile*, and *Navicula cryptocephala*) are considered potential natural food for Bilih fish larvae because they are suitable for the mouth opening size of larvae, which is smaller than 60  $\mu\text{m}$ .

**Acknowledgements.** All authors would like to thank the Ministry of Education, Culture, Research and Technology and also the Directorate General of Higher Education, Research and Technology who have funded this research. This research is included in the applied research scheme under contract No. 041/E5/PG.02.00.PL/2024 with derivative contract number 34/UN16.19/PT.01.03/PL/2024.

**Conflict of interest.** The authors declare that there is no conflict of interest.

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Received: 16 December 2025. Accepted: 12 February 2026. Published online: 13 April 2026.

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How to cite this article:

Kusuma H., Efrizal, Syaifullah, 2026 Abundance, type and size of plankton in situ on the nursery ground of endemic bilih fish larvae in Lake Singkarak, West Sumatra, Indonesia. *AACL Bioflux* 19(2):701-713.