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**FOOD HABITS OF THE ENDEMIC RICEFISHES (*ORYZIAS NIGRIMAS*, KOTTELAT 1990)
IN POSO LAKE, CENTRAL SULAWESI OF INDONESIA**

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ABSTRACT

Lake Poso, one of the ancient lakes of Sulawesi, Indonesia, has several endemic fish species, including the ricefishes (*Oryzias nigrimas*), local name rono pahit. Populations of Poso Lake endemic species are declining, due to the introduction of alien species, lakeshore development and watershed land-use changes. One way help maintain an *O. nigrimas* population is through captive breeding and domestication, for which knowledge of food habits is a pre-requisite. The purpose of this research was to study the food habits of *O. nigrimas*. The research was conducted during April 2018. Samples were collected from three sampling sites: Watudilana in Pamona Urban Village, Tolambo Village and Taipa Village. The Index of Preponderance (IP) and Relative Length of Gut (RLG) were calculated the results show that *O. Nigrimas* is an omnivorous-herbivorous fish with an average IP range of 57.73 to 70.75 for vegetable matter and 29.25-42.27 for animal food (prey), while the RGL range 2.48 to 3.26. *Rhizosolenia* sp. (IP 77.84) was the most dominant plant-based diet component, while unidentified Annelida larvae (IP 24.49) were the most common animal food.

KEY WORDS

Oryzias, food habits, index of preponderance, Poso Lakes.

Lake Poso is one of the natural resources that have the potential to produce fish that has long been used by local fishing communities as a source of life and also this lake is rich in endemic species, one of which is Rice fish. Rice fish (*Oryzias nigrimas* Kottelat), is a type of freshwater fish that only inhabits freshwater, inhabits shallow areas and many aquatic plants (Kottelat, 1990; Miesen, 2016). *O. nigrimas* is a fish from Adrianichthyidae family, has small finfish, found in fresh and brackish waters from India to Japan and to the Indo-Australian Islands, especially Sulawesi (Parenti et al, 1998). This is probably caused by the reproductive behavior strategy of the fish itself which always attaches the eggs to the surrounding water plants.

Based on community reports and observations in the field it is known that the introduction of foreign fish species to the lake is still rampant whether intentionally or not. According to Parenti (2010), the introduction of foreign fish species that is rampant in tectonic lakes is a serious threat to the presence of freshwater endemic fish, including Rice fish in Lake Poso. In addition, the expansion of settlements and population growth around the lake, the opening of agricultural land and household waste resulted in pressure on the Poso lake ecosystem. If this pressure continues unchecked it can disturb the habitat and the survival of endemic biota in the lake including rice fish (Gundo, 2015).

To prevent the extinction of rice species, an adequate and appropriate management effort is needed for the presence of these fish in relation to the environmental aspects of lake waters and the characteristics of rice fish. Information about rice fish is limited to taxonomy (Kottelat, 1990) and its distribution (Soeroto and Tungka, 1996). Until now, rice fish have not received much attention from researchers and local governments, so there has been no attempt to protect or save these fish. For this reason, it is necessary to study food habits as the purpose of this study.

METHODS OF RESEARCH

The research was conducted during April 2018. Samples were collected from three sampling sites: Watudilana in Pamona Urban Village, Tolambo Village and Taipa Village. Data taken by sampling at the study site, obtained Rice fish were analyzed in the laboratory for study of eating habits.

The tools used in this study include: bottled fial, buckets, camera, dissecting sets, fishnets, microscope, paper labels, petri disk, plastic bags, a pipette, a ruler, tissue, and an analytical balance and weight per gr. While the materials needed are formalin 4%, water, and samples *O. nigrimas* which is derived from water of Poso Lake.

Fish sampling using purposive sampling method use a lift net. Fish numbered, measured the total length, body weight is weighed, then dissected to download the contents in the intestines and cleaned with water, put in a bottle containing 4% formalin. Intestine extracted the contents of feed. Food contents are separated according to its kind, and one each in the measuring volume, and then identified.

Measuring the relative length of gut is one method used to distinguish fish based on the type of food. According to Zuliani et al. (2016), Relative Length of Gut/RLG can be calculated using the following formula:

$$RLG = GL \text{ (cm)} / TL \text{ (cm)}$$

Where: RGL = Relative Length of Gut; GL = Gut Length (cm); TL = Total Length (cm).

Eating habits are analyzed based on the Index of Preponderance (IP) proposed by Natarjan and Jhingran in Effendi (1979) in the form of the following formula:

$$IP = \frac{V_i \times O_i}{\sum V_i \times O_i} \times 100\%$$

Where: IP = Index of Preponderance; V_i = Percentage of volume of one type of food; O_i = Percentage of frequency of occurrence of one type of food; $\sum V_i \times O_i = V_i \times O_i$ number of all types of food.

RESULTS AND DISCUSSION

Total fish being observed was 109 fish which consisted of 42 fish from station one, 31 fish from station two and 36 fish from station three. Out of 26 fish selected based on random sampling method, 8 fish had empty stomachs. There are two reasons why these fish have empty stomach; the fish had not eaten anything before they were caught or they had digested their entire food (Fariedah, 2017). Average length of fish intestine was the indicator of fish eating habit. Table 2 showed average length of *O. nigrimas* fish intestine observed in this study.

Fish eating habit can be predicted based on RLG score. When RLG is between 2.48 and 3.26, the *O. nigrimas* fish is categorized as Omnivore-Herbivore fish. Lagler et al. (1977) stated that digestive track of herbivore fish is longer, even 5 times longer than its body. Digestive track of omnivore fish is slightly longer than its body while that of carnivore fish is shorter than its body. Zuliani et al. (2016) noted that average intestine of carnivore fish is <1

centimeter, that of omnivore fish is between 1 and 3 centimeters and that of herbivore fish is >3 fish. As an addition, Yulianto et al. (2018) explained that length of fish intestine is closely related to length of its body, which means that fish with longer intestine requires more and larger food and also wider area to search for food.

Table 1 – Average Length of *O. Nigrimas* Fish Intestine

Station	Length of Fish (Cm)	Length of Fish Intestine (Cm)	RGL
A1	6.4	20.9	3.26
A2	7.2	19.6	2.72
B1	5.5	17.2	3.13
B2	6.1	15.1	2.48
C1	5.8	18.3	3.16
C2	6.3	20.4	3.24

There are different types of food based on the sampling place as a comparison between the three stations. Of the 18 fish hulls analyzed, it can be seen that the *O. nigrimas* fish food is in the form of phytoplankton (7 types) and zooplankton (8 species) (Figure 1). The results of this analysis indicate that the variety of food *O. nigrimas* is quite a lot. Based on food habits, *O. nigrimas* includes omnivorous fish.

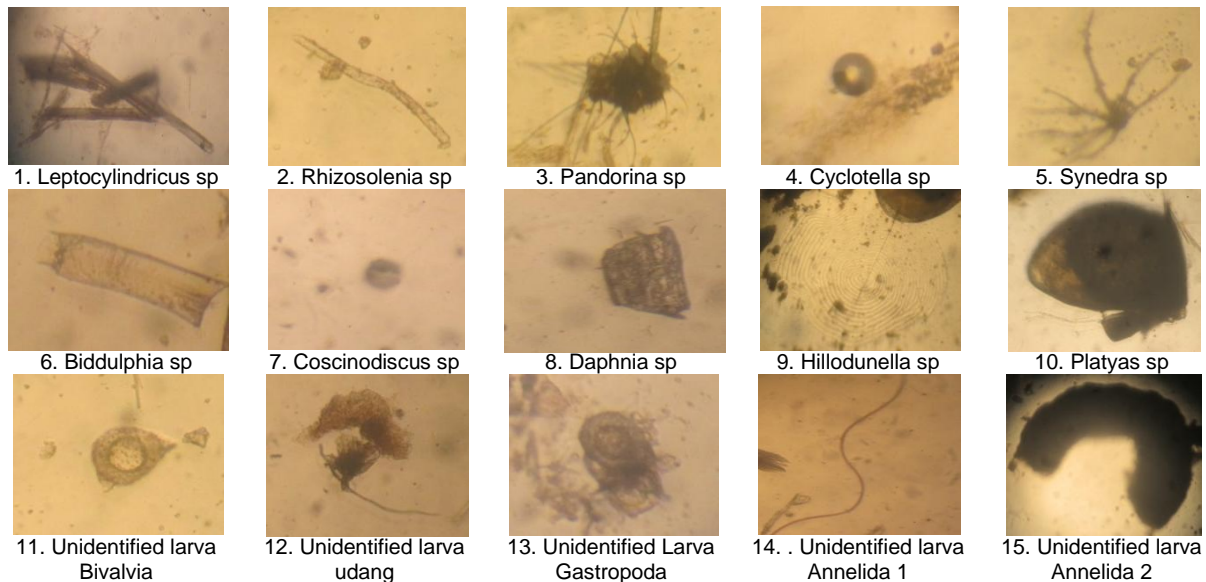


Figure 1 – Phytoplankton (no. 1-7), Zooplankton (no. 8-15) (Private collection, 2018)

Whereas based on the calculation of Index of Preponderance of *O. nigrimas* fish in Lake Poso waters, it can be seen in Figure 2. Based on the results of the calculation of Index of Preponderance, the main foods are *Leptocylindricus* sp and *Rhizosolenia* sp, supplementary foods are *Biddulphia* sp, *Coscinodiscus* sp, Unidentified larvae Annelida, unidentified shrimp larvae, and supplementary foods are *Daphnia* sp, Unidentified Gastropoda larvae, *Synedra* sp. This food grouping refers to Nikolsky (1963) that the main food group for fish is IP greater than 25%, supplementary feed if $5\% \leq IP \leq 25\%$ and additional feed if IP is less than 5%.

Based on the research of Gani et al (2015), in Lake Lindu that the main food of *O. sarasinorum* is *Melosira* sp (Phytoplankton) with a type of food source that is lacking (oligotrophic), but the result of gastric *O. nigrimas* analysis in Lake Poso shows that the main food is *Leptocylindricus* sp and *Rhizosolenia* sp (Phytoplankton). The difference in these main foods is in accordance with Effendie's (2002) statement, that in a large geographical area, for one type of fish that lives separately there can be differences in food, not for one size but all types of sizes. So different types of food are normal.

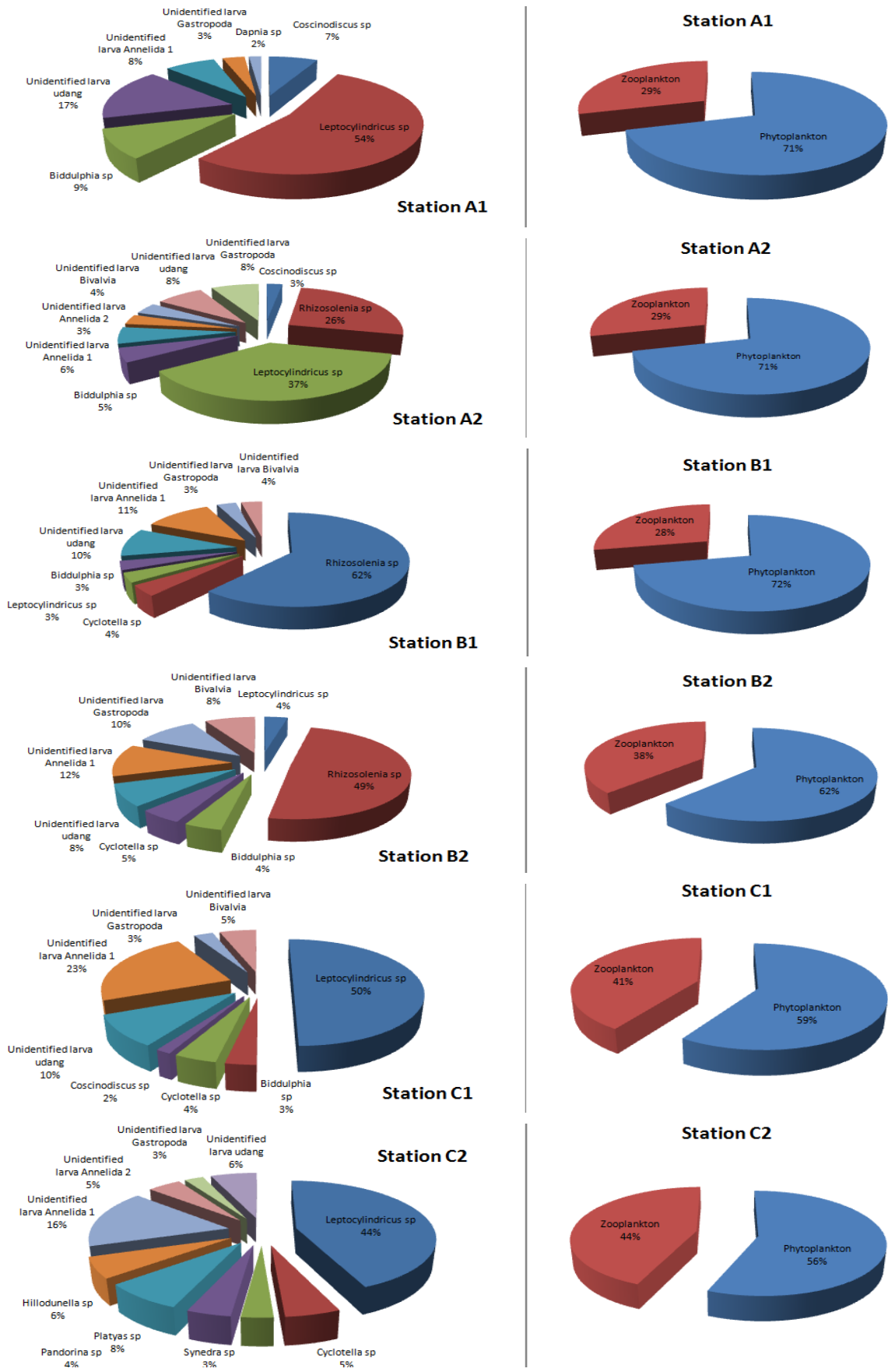


Figure 2 – Index of Preponderance *O. nigrimas* in Lake Poso

Table 2 – Availability of food in the waters of Lake Poso

Species	Station (Abundance/L)					
	A1	A2	B1	B2	C1	C2
Fitoplankton						
<i>Coscinodiscus sp</i>	2360	5160	0	0	5220	0
<i>Bacteriastum sp</i>	1160	1260	0	0	1080	1380
<i>Biddulphia sp</i>	1620	0	1440	2700	1080	0
<i>Leptocylindricus sp</i>	1440	2160	1620	3420	4320	4500
<i>Rhizosolenia sp</i>	0	1620	720	1080	0	0
<i>Cyclotella sp</i>	0	0	540	900	1080	1260
<i>Synedra sp</i>	0	0	0	0	0	180
<i>Pandorina sp</i>	0	0	0	0	0	360
<i>Isochrysis sp</i>	0	1080	0	720	0	540
Total (N)	6580	11280	4320	8820	12780	8220
<i>Zooplankton</i>						
<i>Microsetella sp</i>	720	660	900	540	720	1080
<i>Unidentified Larva Annelida 1</i>	360	280	320	540	540	420
<i>Unidentified Larva Annelida 2</i>	0	180	0	0	0	360
<i>Unidentified Larva Gastropoda</i>	180	240	300	360	420	480
<i>Daphnia sp</i>	360	0	0	0	0	0
<i>Unidentified Larva Bivalvia</i>	0	540	660	720	840	0
<i>Platyas sp1</i>	0	0	0	0	0	240
<i>Platyas sp2</i>	0	0	0	0	0	180
<i>Hillodunella sp</i>	0	0	0	0	0	360
<i>Temora sp</i>	540	360	420	540	660	720
Total (N)	2160	2260	2600	2700	3180	3840

The uniqueness of *O. nigrimas* is also because it is *Omnivorous* (although it is more likely to be herbivores) because based on the results of the analysis of gastric contents which shows the types of phytoplankton foods ranging from 56% -72% (Figure 2). It seems that *O. nigrimas* adapts to the availability of food in the waters of Lake Poso (Table 2).

CONCLUSION

The Index of Preponderance (IP) and Relative Length of Gut (RLG) were calculated, the results show that *O. Nigrimas* is an omnivorous-herbivorous fish with an average IP range of 57.73 to 70.75 for vegetable matter and 29.25-42.27 for animal food (prey), while the RGL range 2.48 to 3.26. *Rhizosolenia sp.* (IP 77.84) was the most dominant plant-based diet component, while unidentified Annelida larvae (IP 24.49) were the most common animal food.

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