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Proximate Composition of Endemic Fish in Towuti Lake, South Sulawesi, Indonesia

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Abstract. Endemic fish in Towuti Lake, which has a local name "pangkilang", is safe for consumption. In addition, this endemic fish has the potential to increase the economical value of the society around Towuti Lake. So far, no information about the content of the proximate composition of endemic fish in Towuti Lake was reported. In this paper, we report the proximate composition of endemic fish in Towuti Lake. Proximate analysis was carried out at the Research Center for Brackish Cultivation Fisheries and Fisheries Extension, Maros, South Sulawesi. Proximate analysis was done by the AOAC International Method. In this study, five endemic fish species were identified in the family of Telmatherinidae; *Telmatherina bonti. Telmatherina celebensis, Paratherina striata, Tominanga sanguicauda,* and *Oryzias marmoratus.* The results showed that the lipid content of the fish samples as follows; *O.marmoratus* (7.34%)> *T.bonti* (6.75%)> *T.celebensis* (6.31%)> *P.striata* (5.23%)> *T.sanguicauda* (4.52%). In addition, the protein content for each species were *T. sanguicauda* (69.31%)> *O.marmoratus* (68.15%)> *P.striata* (67.76%)> *T.celebensis* (59.94%)> *T.bonti* (56.93 %). Endemic fish species have protein with a range of 56.93% - 69.31% and fat of 4.52% - 7.34%.

INTRODUCTION

Fish is one of the most important food commodities for the community because it contains high-quality protein, lipids, minerals, vitamins, and other nutrients which are very good for health [1-3]. The proximate composition of fish species differs among fish species [4].

Indonesia has a total of 440 endemic freshwater fish species, ranking 4th, after Brazil (1716 species), China (888), and the United States (593 species) [5]. One of the lakes in South Sulawesi, namely Towuti Lake was reported that have several endemic fish species from the Telmatherinidae family, such as the *Telmatherina, Oryzias,* and *Tominanga genera* [6-10]. The endemic fish in Towuti Lake is safe for consumption [11]. This endemic fish also needs for conservation because its population status is vulnerable [12]. The Conservation effort that needs to be done on endemic fish is domestication [13]. The endemic fish species as food sources from Towuti Lake such as *Telmatherian bonti, Telamtherina celebensis, Tominanga sanguicauda, Oryzias marmoratus,* and *Paratherina striata*. The local name of the endemic fish species is called "Pangkilang".

Pangkilang has a lot of protein and it is a great potential to increase the economic value of the surrounding community. However, information regarding the composition of the endemic fish in Towuti Lake has not been reported. Therefore, research on the proximate composition of the endemic fish in Towuti Lake is an urgent issue. Measurement of several profiles such as protein, lipid, mineral, vitamin, ash, and water content is important in determining the nutritional composition of fish. Nutritional composition information is also needed to meet food regulatory requirements and commercial specifications before being traded.

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RESEARCH METHOD

Collection of Fish Samples.

Fish samples of the Telmatherinidae family were obtained from Towuti Lake, East Luwu Regency, South Sulawesi, Indonesia. To catch fish, we used a trap net with a mesh size of 1 mm. Determination of fish species using identification based on the references [14-16]. The number of samples for each type of fish is 250 grams. Specimens were packed in separate labeled plastic bags and stored in a cool box with the ice cube to keep the temperature during distribution to the laboratory for proximate analysis at the Indonesian Fisheries Research Institute for Aquaculture and Fisheries Extension, Maros. Then, the fish were brought to the laboratory by bus within 15 hours.

Proximate Composition Analysis.

Proximate analysis was carried out using the Association of Official Analytical Chemists (AOAC) International method. Analysis of the proximate composition of fish samples included water content of fish species by drying in an oven at 110^0C to constant weight, analysis of crude protein content by semi-micro Kjeldahl, crude fat content by Soxhlet extraction with benzene petroleum, ash content by heating with muffle-furnace at 550^0C, crude fiber by heating with acid and base washing.

RESULT AND DISCUSSION

In this study, five endemic fish species from the Telmatherinidae family collected from Towuti Lake were *T. bonti, T. celebensis, P. striata, T. sanguicauda, and O marmoratus* (Table 1). Towuti Lake has become an important habitat for several endemic freshwater fish [10,17]. Freshwater fish species provide food and nutrition, livelihood, and additional income for people living around Towuti Lake. Fish are considered a source of protein, lipids, minerals, vitamins, and a small number of carbohydrates [18].

TABLE 1. Proximate composition of endemic fish of the Telmatherinidae family in Towuti Lake

Species	Ash (%)	Water (%)	Lipid (%)	Protein (%)	Crude (%)
Telmaterina bonti	26,81	2,36	6,75	56,93	6,97
Telmatherina celebensis	23,44	3,42	6,31	59,94	6,44
Paratherina striata	16,43	3,65	5,23	67,76	6,72
Tominanga sanguicauda	17,18	3,67	4,52	69,31	4,39
Oryzias marmoratus	16,48	2,56	7,34	68,15	5,22

Analysis of the proximate composition for ash, water, lipid, protein, and crude of the endemic fish of Towuti Lake is shown in Table 1. The composition of ash, water, lipid, protein, and crude of the five endemic fish species showed differences. The nutritional components of freshwater fish tend to differ between species, sex, size, season, and geographic location [19]. The type of proximate content of ash, fat, protein, water, and crude oil in fish varies depending on the species [20-22]. Proximate composition is a basic component of metabolic activity related to the supply of energy used to drive major physiological processes [23]. The proximate composition of fish is important in determining the nutritional composition of fish that can be beneficial for human nutrition. Measurement of multiple proximate profiles such as protein, lipid, ash, water, crude, and moisture content is necessary to ensure that they meet food regulatory requirements and commercial specifications [24].

In this study, The lipid content of fish were *O. marmoratus* (7.34%)> *T.bonti* (6.75%) > *T.celebensis* (6.31%)> *P.striata* (5.23%) > *T. sanguicauda* (4 , 52%). The fat content is in the range of 7.34% - 4.52%. The type of fish that had the highest fat content was *O. marmoratus* (7.34%) and the lowest was *T. sanguicauda* (4.52%). According to [25] generally, fish can be grouped into four categories according to their fat content: lean fish (<2%), low fat (2–4%), medium fat (4–8%), and high fat (>8%). The lipid content of fish differed which could be due to variation of species, diet, geographical origin, age, and season [26]. The difference in the value of crude fat level in the fish species could be due to water temperature difference, stage of life, environmental salinity, food type, and species [27]. Fat has a lot of energy, so it can survive for a long time vulnerable without eating because they use glycogen

and fat reserves first before the body's protein [28]. Fatty fish store fat in muscle tissue so that the color of the meat is yellow, gray, and pink [29]. Fat is one of the components in the fish body as a source of energy. Fat contains 8-9 kcal/g of energy [30] and is higher than protein and carbohydrate energy content of 4.5 and 4.0 kcal/g [31]. Fat provides energy for metabolism, while protein provides energy for growth.

Based on the analysis, the protein content were as follows: *T. sanguicauda* (69.31%) > *O. marmoratus* (68.15%) > *P. striata* (67.76%) > *T. celebensis* (59.94%)> *T.bonti* (56.93%). *T. sanguicauda* has the highest protein content, which is (69.31%) and T. bonti has the lowest protein (56.93%). Protein is essential for the growth and maintenance of body tissues of organisms [32]. Proteins have an important role in the structure and function of the body, such as growth and reproduction [33]. Protein is a 'source of energy and amino acids,' which are 'essential' for cell growth and repair. Fish protein is an excellent source of lysine, methionine, and cysteine and can significantly increase the value of cereal-based foods, which are poor in essential amino acids [34]. Protein from fish is a good source of functional and nutritional aspects to meet human nutritional needs [35].

CONCLUSIONS

Endemic fish of the Telmatherinidae family in Towuti Lake is safe for consumption. Based on the proximate composition, endemic fish contains protein with the range of 56.93% - 69.31% and fat range of 4.52% - 7.34%. The conservation is needed for several families such as *Telmatherina bonti. Telmatherina celebensis, Paratherina striata, Tominanga sanguicauda,* and *Oryzias marmoratus.*

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