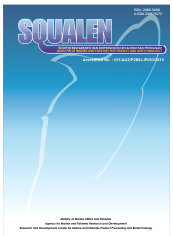

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NUTRITIONAL AND ALBUMIN CONTENT OF SWAMP FISHES FROM MERAUKE, PAPUA, INDONESIA

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Abstract

Study on chemical content of swamp fishes from Merauke has been conducted to obtain nutritional status of these fishes. Sampling was conducted twice (August and November 2015) in Merauke. There were six dominant fish species, namely striped snakehead (*Channa striata*), nile tilapia (*Oreochromis niloticus*), tade gray mullet (*Liza tade*), philippine catfish (*Clarias batrachus*), barramundi (*Lates calcarifer*), and climbing perch (*Anabas testudineus*). Result on proximate analysis showed that the fishes had moisture content of 75.73±0.25%-81.45±0.04%, ash 0.94±0.01%-1.26±0.21%, protein 17.11±0.09%-18.92±0.05%, and lipid 0.59±0.19%-3.80±0.63%. The dominant essential amino acid of 6 swamp fishes from Merauke was *lysine* followed by *leucine*. Meanwhile the dominant non-essential amino acid was glutamic acid (32.26±0.61 mg/g), followed by aspartic acid. Calcium (Ca) was the dominant macro mineral for all fishes studied, being the highest was in nile tilapia (328.76±8.14 mg/100 g). Micro mineral was dominated by the presence of Selenium (Se) which the highest was in nile tilapia (0.084±0.005 mg/100g). These fishes were also rich in albumin, being the highest was stripe snakehead (138.59±1.68 mg/g). The average of total fatty acid showed that the fishes had saturated fatty acid (SFA) content of 46.30±0.27%, monosaturated fatty acid (MUFA) 9.20±1.6% and polyunsaturate fatty acid (PUFA) 34.49±0.44% of total fatty acid. From the result, it can be concluded that fish harvested from swamp of Merauke and surrounding area had a good nutritional value.

Keywords: swamp fish, amino acid profile, fatty acid profile, albumin, mineral

1. Introduction

The Province of Papua, especially Merauke district has an inland fisheries potency. Type of lowlands and swamps was dominant in Merauke. The swamps area are about 1.425 million ha and has potential for the fisheries development (Mulyani, 2011), while land fishery capable of producing 300 thousand tons per year (Tumaang, 2014). Fish consumption level in Merauke in 2013-2014 was relatively high, i.e. 35.90 kg/capita/year. However, fish utilization and consumption rate was very low, i.e 2.39%. At the same time, fish consumption rate in other provinces were high, i.e. DI Yogyakarta (30.96%), Bengkulu (15.05%), East Java (14.02%), Bali (13.69%), East Nusa Tenggara (13.24%) and South Sumatera (10.49%). National fish consumption level was 38.14 kg/capita/year and fish consumption rate was 8.32% (Statistik KKP, 2015).

Fish contributes not only for their high nutritional value but also improving human health status. Consumption of fish has been recommended in prevention of heart diseases patients (Nwali, Egesimba, Ugwu & Ogbanshi, 2015). However, information of nutritional status of Indonesian swamp fish is limited. Suseno et al. (2015) reported the proximate composition, fatty acid profile and heavy metal of swamp fish from Tanah Laut, South Kalimantan. The fatty acid analysis showed that fish contained 11 types of fatty acids, being the dominant was palmitic acid (8.86-19.99% wb) and followed by oleic acid included the omega-9 with the amount of 5.19-19.66% wb. Another potency of the swamp fish is albumin content. Albumin in fish plays an important role for metabolism transport such as fatty acids, hormones and bilirubin (Andreeva, 2011; Baker, 2002; Kovyrshina & Rudneva, 2012), regulating for osmotic pressure; and plays a role to osmoregulation (Zhang,

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Lai, Hue-Lee, & Zhang, 2005) and lately, albumin based nutraceutical product has been developed in Indonesia due to its claim in improving health status of the hospitalized patients who are suffering from hypoalbuminia and post surgical tissue damage (Mustafa, Kris, & Yohanes, 2012).

Striped snakehead (*Channa striata*) has been used as raw material for albumin based nutraceutical products, and at present, fishing pressure of striped snakehead in Java Island is so high, causing snakehead declining. Striped snakehead (*C. striata*) from swamp of Merauke is abundance. Therefore, it is important to analyze the albumin content along with other nutritional status of the swamp fish from Merauke to fulfill the need for raw material of that industries.

The objective of this study was to obtain information on nutrition and chemical composition, including albumin content of the swamps fishes from Merauke. This information is important to support food security and product diversity developed especially in the area of Merauke District.

2. Material and Methods

Sampling has been conducted twice on August and November 2015 in the market of Mopah Baru, Merauke (Figure 1). Sample was caught by traditional methods in the swamp and stream in Mopah area, Sub District of Rimba Jaya. The six species with the different family were sampled, i.e. climbing perch "betik" (*Anabas testudineus*; Anabantidae), philippine catfish "lele" (*Clarias batrachus*; Clariidae), striped snakehead "gastor" (*Channa striata*; Channidae), nile tilapia "nila"(*Oreochromis niloticus*; Cichlidae), barramundi "kakap putih" (*Lates calcarifer*; Latidae), and tade gray mullets "belanak" (*Liza tade*; Mugillidae); each of which contained 15 fish. The size of fish sampel about 150-1100 g in weight. Following filleting step, about 300 g of fish meat had been freezed immediately and kept cold during transportation to the laboratory for analysis. The all analysis was done with two replicates.

2.1. Proximate Analysis

Proximate analysis was conducted following SNI method, i.e. protein (SNI 01-2354.4-2006, 2006), lipid (SNI 01-2354.3-2006, 2006), moisture (SNI 01-2354.2-2006, 2006), and ash content (SNI 01-2354.1-2006, 2006).

2.2. Amino Acid Profile

Amino acid analysis of six fish meat was done at PT SIG Saraswanti laboratory method and Nollet (1996). A total of 0.1 g sample in a bottle, added with

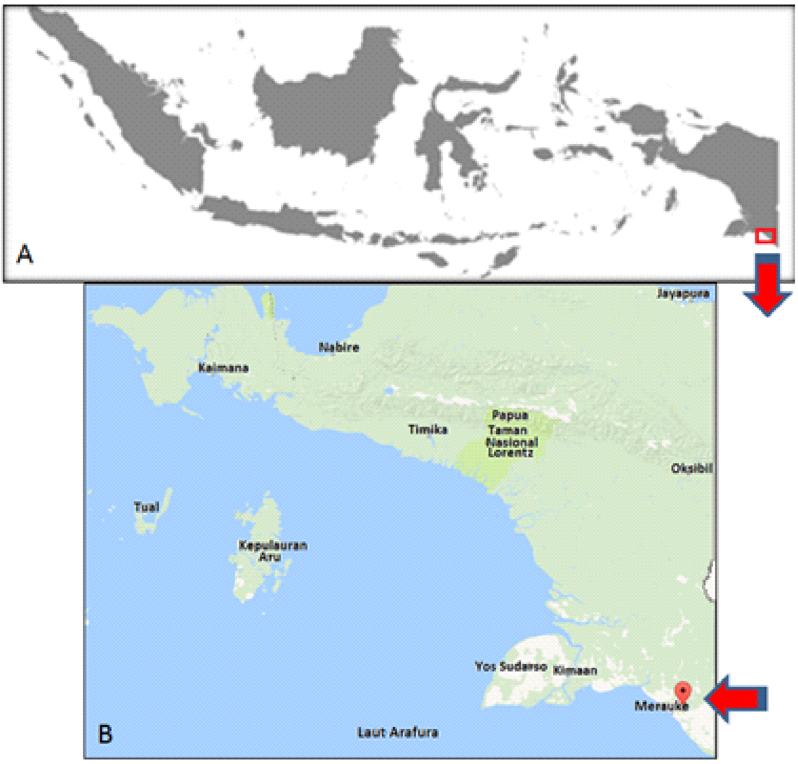

Figure 1. Map of Merauke (*https://freevectormaps.com/indonesia* (A) & google map (B)).

5 ml of HCl 6 N, then heated at temperature of 110 °C in a microwave for 60 minutes. Hydrolized sample (50 ml) was filtered using size filter of 0.45 µm. The analysis of amino acid used acquity waters UPLC H class with internal standard alpha amino butyric acid (AABA), column ACCQ-Tag Ultra C18 with a photo diode array (PDA) detector at a wavelength of 260 nm, temperature of 49 °C. UPLC mobile phase using the composition gradient system (water/acetonitril) with a flow rate of 0.7 ml/min.

2.3. Fatty Acid Profile

Fatty acid profile analysis of six fish meat was conducted at PT SIG Saraswanti laboratory. Five gram sample was weighed into clean quechers tube, added 4 ml isopropyl alcohol and shaked for 1 minute. Added with 6 ml hexane, vortex for 1 minute then centrifuge for 3 minute, 12.370 rcf to completly disolve extract. Removed the upper layer containing hexane fase into screw tube. For methylation process, about 1 ml hexane extract removed into tube, added 1.5 ml of 0.5 M KOH methanol, heated at 100 °C for 20 minutes and being cooled at room temperature after that added with 1.5 ml BF3 20% in methanol, heated it again at 100 °C for 20 minutes. The solution being cooled and shaked until the temperature decreased at 30 °C, then added with 3 ml of NaCl and 2 ml of hexane then put into a vortex for 2 minutes. After being cooled and the formation made two phase, a phase containing fatty acid methyl ester (FAME) was transferred into tube and dried with 0.1-0.2 g anhydrous sodium sulphate (NA_2SO_4). The FAME solution was removed into vial and injected to GC-FID. FAME was identified and measured by Parkir Elmer Technologies Gas Chromatography equipped with flame ionization detector (FID) with SP TM -2560 column of 100 m having a 0.35 mm ID and 0.20 µm film thickness, 0.5 µl split 100:1 injection. The initial oven temperture was 100 °C, held for 3 minutes, subsequently increased to 240 °C at a rate of 2.5 °C/minute, and then held for 23 minutes. The carrier gas was helium at a total flow rate of 18.0 cm/second with column length 100 m. The detector temperature were set at 240 °C and the injector temperature were set 224 °C.

2.4. Analysis of Minerals

Mineral (K, Ca, Na, Fe, Se, and Zn) were analysed following PT SIG Saraswanti method and AOAC method 14.2011 (2011). A total of 0.5 g sample was added with 10 ml HNO_3, then the sample was destructed at temperature of 190 °C for 20 minutes. The sample was introduced into the flask and added with aquabidest until 50 ml in volume, then filtered. Determination of mineral content was conducted by using Inductively Coupled Plasma (ICP) OES Agilent 720 at each wavelength of minerals.

2.5. Analysis of Albumin Concentration

Analysis of albumin concentration was done following Januar, Fajarningsih, Zilda, Bramandito, & Wright, (2015) method. Each species was taken about of 3-10 fish (150-500 g in weight) by random sampling method. Amount of 25 g of meat was diluted with 75 ml of aquabidest and homogenized with the Ultra Turax homogenizer. Then, protein extract was preserved in liquid nitrogen for futher analyse in the laboratory. At the initial phase, the sample extract centrifuged at 15.344 rcf for 15 minutes using a Beckman centrifuge. A total of 2 ml of the extract was filtered with filter paper 0.45 µm. Then, the quantitative determination of albumin from the extract was conducted by High Performance Liquid Chromatography (HPLC, Shimadzu) with Phenomenex Jupiter 2010a (150 × 20 mm) column and C5 PDA (Photo Diode Array) detector at a wavelength of 280 nm. HPLC mobile phase used 0.1% trifluoroacetic acid in water (solvent A) and 0.1% trifluoroacetic acid in acetonitrile solvent (solvent B). Mobile phase eluting the sample (20 µl) was a gradation from 90% to 10% solvent A for 30 minutes with flow rate of 0.2 ml/min. Determination of albumin content was based on ratio of albumin peak area from sample and *Bovine Serum Albumin* (BSA) standard from Biogen. Before analysis, plot of BSA standard and peak area in HPLC chromatogram was made with concentration 250, 500, 1000, and 2000 ppm.

2.6. Statistical Analysis

The results are reported as mean values ± standard deviation (SD). Analysis of variance (ANOVA) was used to verify whether there were differences in proximate content among the analysed species. Significance was accepted at a probability of 0.05 ($p < 0.05$) according to the LSD (least significant differences) procedure. Statistical analysis was performed using the SPSS 13.0 statistical software.

3. Result s and Discussion

3.1. Proximate Content

Result on proximate analysis can be seen in Table 1. Result on proximate analysis showed that there was difference ($p < 0.05$) in value of the 6 fish samples. The moisture content of the 6 fish were 75.73-81.45%, being the highest was *L. calcarifer*, 81.45±0.04%. The results of this analysis is greater than the moisture content of Vietnam barramundi (*L. calcarifer*)

Table 1. Proximate composition of swamp fishes from Merauke

Fish samples	Moisture content (%)	Ash content (%)	Protein content (%)	Lipid content (%)
Climbing perch (*A. testudineus*)	78.53 ± 0.21	1.24 ± 0.02	18.92 ± 0.05	0.62 ± 0.06
Philippine catfish (*C. batrachus*)	78.93 ± 0.97	1.26 ± 0.21	18.43 ± 0.15	1.12 ± 0.08
Striped snakehead (*C. striata*)	80.36 ± 1.38	1.06 ± 0.19	18.31 ± 0.34	0.59 ± 0.19
Nile tilapia (*O. niloticus*)	80.8 ± 0.28	1.15 ± 0.09	17.26 ± 0.12	0.79 ± 0.36
Barramundi (*L. calcarifer*)	81.45 ± 0.04	0.94 ± 0.01	17.11 ± 0.09	0.58 ± 0.08
Tade gray mullet (*L. tade*)	75.73 ± 0.25	1.02 ± 0.01	18.9 ± 0.33	3.8 ± 0.63

(79.00±0.5%) and Australian barramundi (*L. calcarifer)* (75.7±0.8%) (Manthey-Karl, Lehmann, Ostermeyer, & Schröder, 2016). Suseno et al. (2015) reported that moisture content of swamp fish from Kalimantan were lower than Merauke, i.e. 74.23-78.84%. The protein content of Merauke swamp fishes studied was 17.11-18.92%, while the protein content of the 5 swamp fishes harvested from South Kalimantan had wider range, i.e 15.85-21.74%. The 6 swamp fishes harvested from Merauke contained lipid of 0.59-3.80%, while the lipid from 5 fish harvested from swamp in South Kalimantan was in the range of 0.45–3.42%. Among 6 swamp fishes, the highest lipid content was *L. tade* (3.80±0.63%). Mullet (*Mugil* sp) caught from Bangkalan's waters was reported to have similar lipid content ranging from 2.83 to 3.33% (Hafiluddin, Zainuri, & Wahyudi, 2012). Based on the fat content grouping, i.e. lean fish (under <2% fat by weight), low fat (2-4%), medium fat (4-8%), and high fat (>8%) (Ackman, 1989 *in* Prato & Biandolino, 2012), the five species (*A. testudineus*, *C. batrachus*, *O. niloticus*, *C. striata*, *L. calcarifer*) studied were grouping into lean fish, whereas *L. tade* was including low fat fish. Fat content generally varies much more widely than other proximate components. It was affected by seasonal/lifecycle variations and the diet/food availability of the species at the time of sampling (Ababouch, Gandini, & Ryder, 2005). Fat in particular species is stored in specific organ or meat (Ababouch et al., 2005; Alam, 2016). For example, bottom dwelling species such as carps which is typically lean fish, is storing fat in the liver, whereas, migratory fish such as skipjack has a higher lipid content in their dark muscle. A starved fish will content less fat compared to the full feeding fish. The sum of water and fat in a fatty fish is fairly constant at about 80% (Pavlov, Dimitrov, Penchev, & Georgiev, 2008).

Based on the feeding habit, the six swamp water fish can be classified as detritivorous (*L. tade*), herbivorous (*O. niloticus*), carnivorous (*A. testudineus L. calcarifer*, *C. striata*), and omnivorous (*C. batrachus*) (Sentosa & Satria, 2015). Variation of feeding habit, age, sex, environmental condition and season will affect the chemical composition and nutritional value of fish (Ayas & Ozogul, 2011; Fawole et al., 2013).

Ash content of the 6 swamp fish from Merauke were 0.94-1.26%, being the highest was the *C. batrachus* (1.26±0.21%). This results is lower than ash content from the Nigerian catfish (3.06±0.04%) (Chukwu & Shaba, 2009). Ash content was related to the mineral content of the fish. *C. batrachus* in this study contained potassium (K) 284.52 mg/100 g, calcium (Ca) 34.17 mg/100 g, sodium (Na) 30.75 mg/100 g, iron (Fe) 2.53 mg/100 g, selenium (Se) 0.07 mg/100 g, zinc (Zn) 0.72 mg/100 g.

Figure 2A provides the macro mineral of the 6 swamp fish harvested from Merauke, i.e calcium (Ca), potassium (K) and sodium (Na). Calcium is one of essential macro minerals, being the highest was *O.*

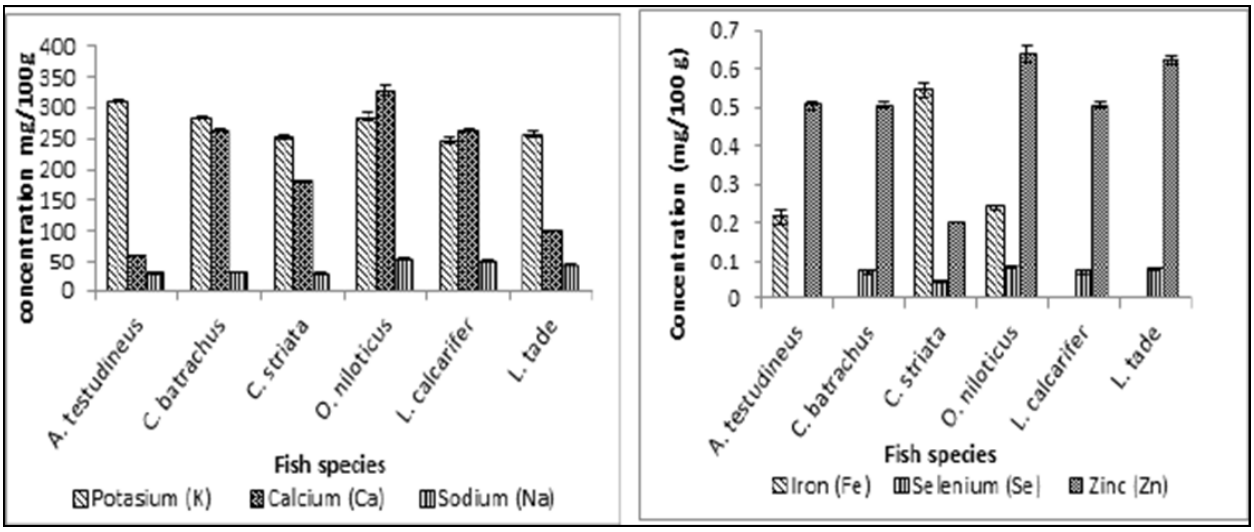

Figure 2. Minerals content of swamp fish from Merauke;(A) macro minerals content, (B) micro minerals content.

niloticus (328.76±8.14 mg/100 g). FAO considered Ca in fish muscle within range values of 19-881 mg/100 g (Murray & Burt, 2001). The content of potassium (K) was the highest in *A. testudineus* (311.66 ± 1.41 mg/100 g). In other studies, the same species from the waters of Sri Lanka contains potassium (K) on ranges from 272.2 ± 5.78 mg/100 g (Wimalasena & Jayasuriya, 1996). Potassium (K) content in fish muscle according to FAO is within the range of 19-502 mg/100 g (Murray & Burt, 2001)

Sodium (Na) is also high in *O. niloticus* (56.14±2.09 mg/100 g). Sodium (Na) plays a role to regulate of plasma volume and acid-base balance, keeping of irritability of skeletal muscle and permeability cells, activate of neural and muscle function, neuron impulse transmissions, and contribute to absorption process of monosaccharide, amino acid, pyrimidine, galls acid, involved to keep of osmotic pressure and also the variation of osmotic pressure depending on sodium concentration (Murray et al., 2000 *in* Soetan, Olaiya, & Oyewole, 2010). Sodium is also good for muscle function (Alaº, Özcan, & Harmankaya, 2014), and according to FAO sodium in fish muscle is 30-134 mg/100 g (Murray & Burt, 2001). Meanwhile, micromineral in the 6 fish studied was dominated by zinc (Zn), followed by iron (Fe) and selenium (Se). The results of this study showed that the highest zinc content was found in *C. batracus* (0.72±0.01 mg/100 g) and this is in the range of FAO report of Zn in muscle fish, i.e 0.23 - 2.1 mg/100 g. Zinc (Zn) is required for metabolism process and wound healing (Malakootiani, Tahergorabi, Daneshpajooh, & Amirtaheri, 2011).

Another important micronutrient is iron (Fe). In this study *C. striata* had higher iron content (5.45±0.02 mg/100g) compare to *C. striata* from West Java (0.17±0.21 mg/100g) (Chasanah, Nurilmala, Purnamasari, & Fithriani, 2015). Iron (Fe) plays of role to erythrocyte formation and part of hemoprotein enzyme, which is an important to oxidation-reduction process in the body cells (Arifin, 2008). It is also important for transporting oxygen around the body (Mogobe, 2015). Selenium (Se) is another mironutrient that plays an important role in the body, because selenium will collaborate with glutation peroksidase became antioxidant (Lordache, Culea, Horj, & Cozar, 2011). The highest selenium (Se) was obtained from *O. niloticus* (0.08±0.005 mg/100g wb). This results is lower than selenium content of carp from Rome, ie 2.9 mg/100g.

This study showed that *O. niloticus* and *C. striata* contained six of minerals analyzed. However, these fishes have a lower ash level (1.05±0.19 % and 1.15±0.09%) compare to *A. testudineus* and *C. batracus* (1.24±0.02% and 1.26±0.21%) that only contained of five mineral. It is possibly that *A. testudineus* and *C. batracus* contained other minerals apart from six types that been analysed in this study. Sluiter, Hames, Ruiz, Scarlata, Sluiter, & Templeton, (2008) reported that ash content is a measure of the total amount of minerals present and other inorganic matter within biomass. Characteristic of habitat and fish diet can affect mineral content on the fish body (Fawole et al., 2013), as well as differences in environmental conditions, water quality and species (Mogobe, 2015).

3.2. Amino Acid Profile

Figure 3 showed lysine was the dominant amino acid among 6 swamp fish from Merauke, followed by leucine. The highest lysine was found in the *L. tade*

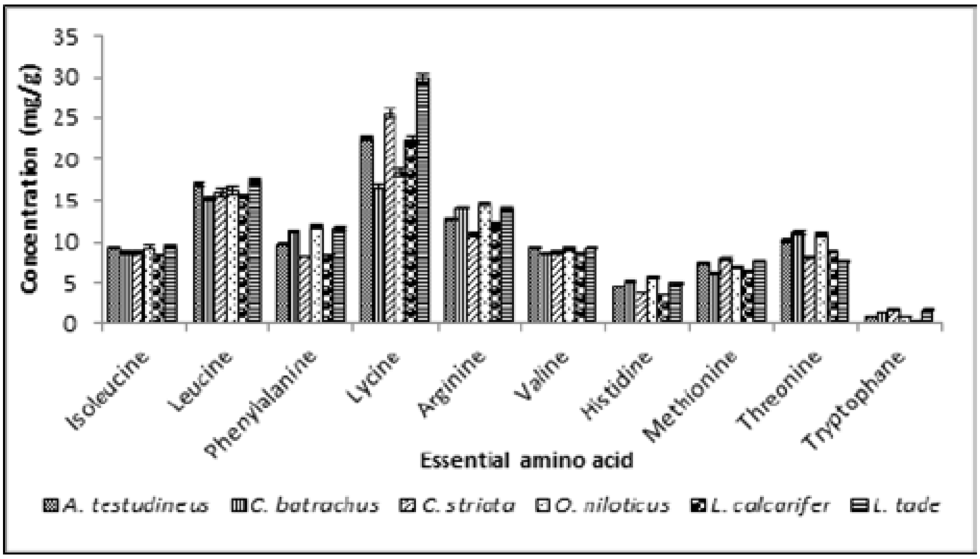

Figure 3. Essential amino acid of swamp fish from Merauke.

(29.60±0.8 mg/g wb). This results is similar to with the *L. tade* from India waters (30± 0.2 mg/g wb) (Mohanty et al., 2014). While the leucine, the second dominant essential amino acid was the highest (17.39±0.40 mg/g wb) in *L. tade*, followed by arginine (14.59±0.3 mg/g wb) in *O. niloticus*, nile tilapia. Mohanty et al. (2014) reported that fish from Indian waters, such as common carp (*Cyprinus carpio*) contains of isoleucine (8.0±0.1 mg/g wb), leucine (16±0.1 mg/g wb) and arginine (21±0.3 mg/g wb). It means that the 6 swamp fish contained comparable essential amino acid with fish from non swamp waters. It contained high lysine which is the key amino acid in fish, and this amino acid has an important role in solving malnutrition problem.

Leucine with isoleucine and valine were called the Branched-Chain Amino Acids (BCAAs), needed for skeletal muscle formation and somatic growth (Vuzelov, Krivoshiev, Ribarova, & Boyadjiev, 1999). In additional, BCAA in muscle is the one which has the most responsible for the direct stimulation of muscle protein synthesis (Fujita & Volpi, 2006). For patient with liver failure, the BCAA improve nitrogen retention, protein synthesis and albumin serum in bloods (Platell Kong, Maccauley, & Hall, 2000; Muto et al., 2005). Leucine has been reported having a function as a stimulant protein synthesis in the skeletal muscle (Etzel, 2004), and it has a role in burn therapy and infections (De Bandt & Cynober, 2006).

Glutamic acid, alanine, and aspartate were dominant non-essential amino acids on the 6 fishes studied (Figure 4). Glutamine plays an important role in purine and pyrimidine synthesis in the cells and also keeping in acid-base balance on the body (Mohanty et al., 2014). The striped snakehead has glutamine dominantly (35.60±0.1 mg/g in wb). Some of marine fishes has glutamine content very high, e.g. Japanese thread fin bream (165.5±1.2 mg/g), yellow fin tuna (111±3.5 mg/g); while the glutamine content of freshwater fishes has been found high on catfish (145±3,6 mg/g) and *A. testudineus* (131±4.0 mg/g) (Li, Mai, Trushenski, & Wu, 2009). But in this present study, glutamine content on the *A. testudineus* was found low (31.5±0.4 mg/g). The difference of environment condition and diet availability may be affect amino acid profiles. However, these six species of swamp fish could be an alternative source of natural glutamine supplement.

Alanine in the *L. calcarifer* was high (11.9±0.3 mg/g wb) as well as tyrosine of the *L. tade* (9.04±0.1 mg/g wb). Tyrosine plays a role as precursor for neurotransmitter including triiodothyronine, epinephrine, norepinephrine, dopamine, and melamine; and regulate of nervous systems (Chang, Wu, Kuo, & Cheng, 2007; Yoo, Takeuchi, Tagawa, & Seikai, 2000). Some fish have high tyrosine content, e.g. rainbow trout (84±0.8 mg/g wb) and putitor mahseer (57±0.5 mg/g wb) (Mohanty et al., 2014).

This study showed that the range of ratio between EAA and NEAA was 0.79-0.97, the highest was *C. batratus* (0.97) and the lowest was *L. calcalifer* (0.79). The ratio was higher than that of gilt head bream (*Sparus aurata*), i.e. 0.71, hence ratio of EAA to NEAA was categorized as high quality protein (Pinto et al., 2007 *in* Elshehawy, Gab-alla, & Mutwally, 2016). The protein quality of the 6 fishes in this research may be categorized as high to superior. According to the result of protein ratio, 6 fishes can be used to improve diet of the local people supplying the important esential amino acid as well as the macro and micro minerals.

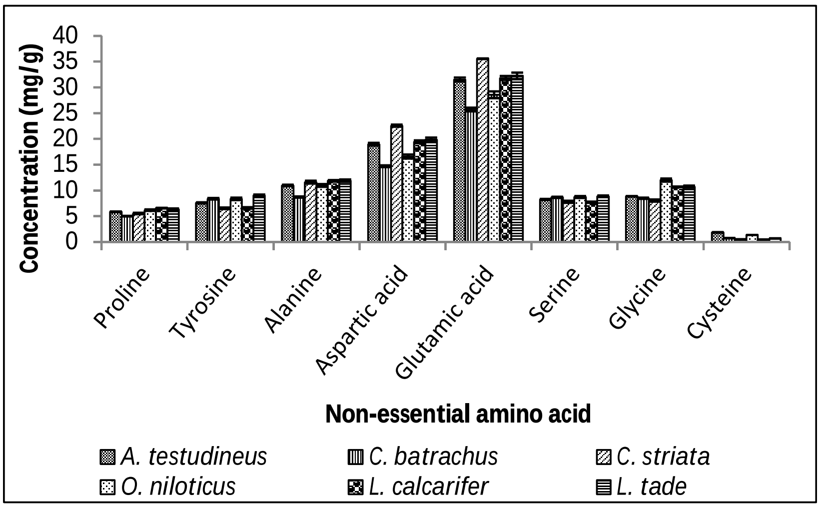

Figure 4. Non essential amino acid of swamp fish from Merauke.

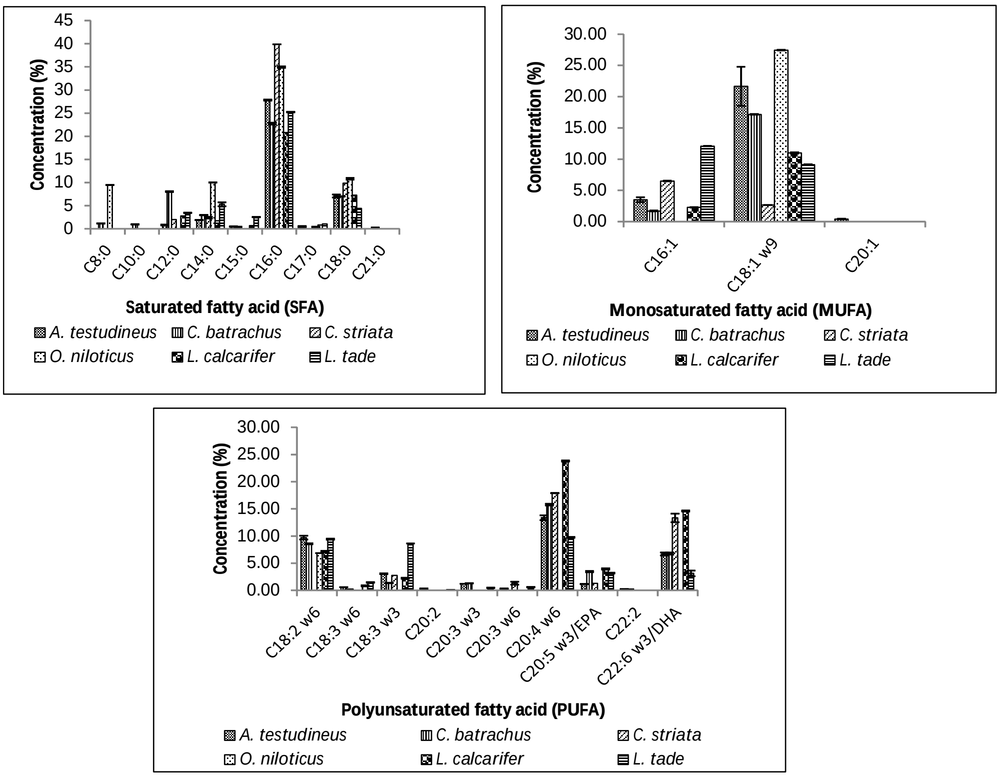

Figure 5. Fatty acid profile of swamp fishes from Merauke; (A) Saturated fatty acid, (B) Monounsaturated fatty acid, (C) Polyunsaturated fatty acid.

These fish can improve other diet such as plant proteins that have lower level of leucine, methionine, lysine and tryptophan (Marsh, Munn & Baines, 2012).

3.3. Fatty Acid Profile

Fatty acid composition of the 6 fishes studied are presented in Figure 5. The content of various saturated fatty acids (SFA) were found to be 0.21±0.1-39.87±0.2%, monounsaturated (MUFA) and polyunsaturated fatty acids (PUFA) were found to be 0.41±0.001-27.44±0.1% and 0.08±0.0-23.80±0.1% respectively. The important PUFA, i.e EPA (C20:5) and DHA (C22:6), were found to be 1.17±0.0-3.95 ± 0.1% and 3.12±0.5-14.59±0.1% respectively. The highest of EPA and DHA level was the barramundi (*L. calcalifer)* which the each values were 3.95±0.1% (EPA) and 14.59±0.1% (DHA). These result was higher than barramundi from Vietnam i.e 2.5±0.20% (EPA)

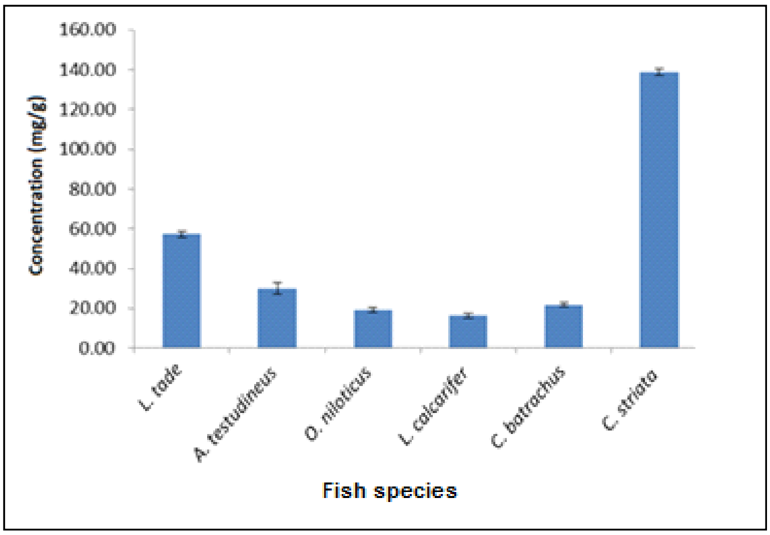

Figure 6. Albumin content of swamp fishes from Merauke.

and 13.3±1.29% (DHA), also from Australia i.e 3.3±0.17% (EPA) and 4.1±0.31% (DHA) (Manthey-Karl et al., 2016). The percentage of total SFA was 34.14±0.77-65.70±0.45% which the highest was nile tilapia (*O. niloticus)* and MUFA found to be 9.15± 0.1-27.44±0.1%, being the highest was climbing perch (*A. testudineus).* Total PUFA of these fish was 6.87±0.0-52.57±0.7%, being the highest was barramundi (*L. calcalifer*). These values were comparatively higher than the values of fish swamp from Tanah Laut, South Kalimantan, which contained the SFA of 0.04-19.99%, MUFA of 0.79-19.66% and PUFA of 0.05 - 4.7% (Suseno et al., 2015). Elshehawy et al. (2016) reported that fresh water fish, butter catfish (*Ompok bimaculatus*) has high amount of polyunsaturated fatty acids and containing 40.92% of PUFA and 26.54% of MUFA, which were considered as excellent nutritive fishes. The presence of the biochemical composition such as variety on the type and amount of fatty acids in fish tissues is affected by many parameters such as biological variations (species, sex, size, and age), diet, environmental conditions (temperature, pH, salinity, etc.) and seasonal changes (Tao et al., 2012).

3.4. Albumin Content

In this study, albumin concentration was the highest on *C. striata* (138.59±1.68 mg/g), followed by barramundi (57.33±1.37 mg/g) (Figure 6). Previous studies on albumin concentration of the freshwater fishes showed that the albumin content of *C. striata* from West Java was 107.28± 3.19 mg/g (Susilowati, Januar, Fithriani, & Chasanah (2015), *C. striata* from Central Java was 75.79±9.33 mg/g and East Java was (91.10±24.08 mg/g (Chasanah et al., 2015). Variation of the albumin concentration depends on fish species, size, diet consumption rate, dietary availabilityand digestibility rate (Niwa, Irma, Rina, & Yoyo, (2007). On the other hand, chemical composition of fish depends on the species, ages, sex, habitat, and environment condition (Irianto & Susilo, 2007). Based on this study, albumin content of fish harvested from Merauke swamp was comparable to these harvested from non swamp water, even higher.

4. Conclusion

Proximate content of the 6 fishes harvested from Merauke swamp waters showed comparable to those harvested from non swamp waters fish. Lysine and leucine were the dominant essential amino acid, and the ratio between essential to non-essential amino acid was 0.89 indicating its superior protein quality. The fatty acid profile showed that swamp fishes from Merauke were in premium quality, having percentage of PUFA and MUFA to be 6.87±0.00-52.55±0.00% and 13.29-29.64±0.01% . The fishes were also sources of important macro and micromineral namely potasium (K), calsium (Ca), sodium (Na), zinc (Zn), iron (Fe) and selenium (Se). Albumin content was very high, especially in *C. striata* and *L. tade*. Six species of swamp fish from Merauke contained six of minerals analyzed. This study support nutritional information of fish in general. The role of this swamp water fishes in supporting food security and reducing health problem such as malnutrition in Merauke and surrounding area can be fulfilled by developing product diversity of these fish. The fish of *c. striata* can also support health supplement industry due to its high albumin content.

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