Sultana et al., *Journal of Innovation in Applied Research* (2023), 6(1): 45-55
https://doi.org/10.51323/JIAR. 06/01/01.02.2023

Journal of Innovation in Applied Research
eISSN: 2581-4206

Received: 27 December 2022
Accepted: 27 January 2023
First Published: 16 February 2023

Reviewing editor: Kamlesh Choure

Additional information is available at the end of the article

ORIGINAL RESEARCH

Seasonal variation of the nutritional compositions of Tuna (*Euthynnus affinis*) and Pama croaker (*Otolithoides pama*) of the Bay of Bengal

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Abstract: The present study was carried out to assess the nutritional and fatty acid composition of Tuna fish (Euthynnus affinis) and Pama croaker (Otolithoides pama) of the Bay of Bengal. In the present study the proximate chemical composition and seasonal variations of moisture, protein, fat, ash and fatty acid compositions in marine fish's tuna and pama croaker were recorded during three different seasons. Higher moisture content was observed during summer and higher protein content was observed during rainy season. Higher content of lipid (3.34 $\pm$ 0.32% & 1.80 $\pm$ 0.19% for Tuna and Pama Croaker respectively). Moreover, higher ash content recorded (2.31 $\pm$ 0.30%) for Tuna and (1.55 $\pm$ 0.28%) for Pama in summer season. Results showed that higher concentration of fatty acid for E. affinis and for pama compositions were found in winter season and lower concentration of fatty acid compositions for Tuna and Pama were found in summer season in both fishes. The study can conclude that the composition varies greatly from species to species and also from individual to individual depending on age, sex, environment, season and feed intake.

Keywords: Nutritional composition; Fatty acid compositions; seasonal variation

1. Introduction

Fish are consumed worldwide on the account of their unique nutrient source; higher protein constitute and lowest saturated fat constitute. Diet is cited as one of the biggest reasons because of that consumers are devoted to seafood (Gall, Otwell, Koburgier, & Appledorf, 1983). They provide a satisfactory balance of proteins, vitamins, minerals and lipids (Edirisinghe, Perera, & Bamunuarachchi, 2000). Edible part of the fish muscles usually contains about 18% protein, 80% muscle's wet weight is made of water and lipid and 1-2% ash (Ackman, 1989). Fish is a good source of polyunsaturated fatty acids (PUFAs), mainly docosahexaenoic acid (DHA; 22: 6) and eicosapentaenoic acid (EPA; 20: 5), these fatty acids can be used to treat diseases such as arthriosclerosis, hypertension, cancer and promote the enhancement of the mammalian brain (Nordøy, Marchioli, Arnesen, & Videbaek, 2001; H. Suzuki, Park, Tamura, & Ando, 1998). Additionally, fish include minor amounts of carbohydrates, nonprotein substances, and some of the essential vitamins and minerals, such as calcium, magnesium, iron, copper, zinc, iodine, selenium, and trivalent chromium. These include vitamins A, D, E, B12, folic acid, choline, and coenzyme Q10. When compared to mammalian protein, fish protein is highly rich in amino acids like methionine and lysine and low in tryptophan, which are crucial elements for both newborn and adult diet supplements. These fats are essential for human nutrition **(Reames, 2012; Tacon & Metian, 2013)**.

The white muscle is utilized for quick bursts of swimming, while the black muscle is directly beneath the skin and used for slow, continuous swimming (Tsukamoto, 1984). Compared to bottom-dwelling fish like flounder and cod, active fish like tuna, herring, and mackerel have more dark muscle (Kobayashi et al., 2006). The headless skipjack tuna's black muscle, which makes about 13–16% of its mass **(Hiratsuka, Aoshima, Koizumi, & Kato, 2011)** enables **i**t to swim rapidly for longer stretches of time without becoming exhausted (Herpandi, Rosma, & Nadiah, 2011). The amount of lipid might vary depending on the species and time of harvesting **(**Suzuki, 2012), and dark muscle, which contains more lipid, is more susceptible to lipid oxidation than white muscle. White meat is lower in lipids than dark meat (Shahidi & Spurvey, 1996)

Euthynnus affinis is an excellent alternative to meats and dairy items that are higher in saturated fats and trans-fatty acids because it is low in fat and calories as well. Seafood proteins have significant nutritional value, much like the majority of animal meals. All of the necessary amino acids are present in fish protein, which is also very simple to digest (Jhaveri, Karakoltsidis, Montecalvo, & Constantinides, 1984). The majority of tuna species have a protein level that ranges from 15% to 30% (Bykov, 2017). They have the black muscle that is found directly beneath the skin and is utilized to swim continuously. While the white muscle of Euthynnus affinis, which is also known as "small tunny" or "kawakawa" and is a member of the scombridae family, commands a high price on the international market (Poisson, 2006). They make up a significant component of the world's fishery products and are found in temperate and tropical oceans all around the world. (I. C. Chen, Lee, & Tzeng, 2005).

The high-quality protein found in Pama croaker is comparable to that found in foods produced from other animals. Croaker flesh is typically white when raw but can occasionally have a crimson color. White meat has been prepared. Croaker has an almost sweet flavor and is lean and flavorful. Similar to black drum, the flesh is solid. The skin of the croaker fish can be eaten. They are very popular and relatively cheap fish species in the market of Bangladesh. These species are important because of their production adding up to a huge amount of the total marine fish production and their common consumption in the region. Despite the importance of these species, seasonal variation in their proximate composition is not well known. There is a requirement to establish the seasonal amino acid and fatty acid profile of these two species due to its popularity and lack of seasonal information.

Research on the biochemical makeup of tuna and Pama croaker is particularly those from tropical waters like Bay of Bengal, is fairly lacking. An excellent measure of the body's proportional amount of energy, proteins and lipids making these species valuable both for the consumers and for the researchers. In this study, seasonal variations in the biochemical makeup of the tuna fish species Tuna and Pama Croaker are examined. Pre-monsoon (March, April, May, and June), monsoon (July, August, September, and October), and post-monsoon season variations in the proximate composition of muscle tissue were investigated (November, December, January and February). These figures would serve as helpful guides for customers looking to select fish based on its nutritional worth.

2. Materials and Methods

2.1. Collection of fish

The raw materials were collected in fresh condition from fish supplier of Bay of Bengal in the early morning. The collected fresh fish samples were transported in ice condition in an insulated box.

2.2. Site and period of study

The study was performed in the Faculty of Fisheries, Chattogram Veterinary and Animal Sciences University (CVASU). Nutritional study was conducted at Nutrition and Processing Laboratory, CVASU. The study was performed for a period of one year from July, 2019 to June, 2020.

2.3. Sensory analysis

The Torry schemes are arguably the most widely used techniques for assessing the freshness of fish (; Torry advisory note No. 91) (Regenstein & Regenstein, 1991). A scale that ranges from 10 (fresh fish) to 3 (putrid or spoiled fish) has been occupied. In order to evaluate the loss of freshness in fish, a specialized sensory analysis scheme for each fish species or similar groupings may also be helpful to know that the species to be used for proximate composition analysis is in the fresh from (Ranken, 1993).

2.4. Seasonal variation of proximate composition of tuna and pama croaker

Proximate composition of tuna and pama croaker were determined at each month according to Association of Official Analytical Chemists (AOAC, 2016) methods with certain modifications. Muscles taken from fishes were finally ground with an electric blender to make a homogeneous mixture. Triplicate samples were used in determining moisture, ash, and crude protein and lipid contents. The protein percentage was assessed by the Kjeldahl apparatus (DK 20/26) using distillation and digestion unit. Moisture was determined by placing an accurate weighed 2g for dry and 3g for raw ground sample in pre-weighed porcelain crucible in hot air oven (LNO-150) at the temperature of 105°C for 12 hours. Ash content was determined by placing an accurate weighed 2g sample in pre-weighed porcelain crucible in muffle furnaces (Nabertherm-L9/13) at the temperature of 450°C for 5 hours. Lipid content was determined by the soxhlet apparatus (FOOD ALYTRD40) using diethyl ether as a solvent.

2.5. Seasonal variation of fatty acid compositions of tuna and pama croaker

Amino acid of tuna and pama croaker were analyzed according to Association of Official Analytical Chemists (AOAC, 2016) methods with certain modifications by GCMS (Gas Chromatography Mass Spectrometry).

2.6. Comparative study

At last a comparative study of proximate composition and fatty acid content of tuna and pama croaker were conducted to identify seasonal variation among them.

2.7. Data analysis

The obtained data were stored in Microsoft Excel 2010 and the significance differences will be examined through one-way and two-way analysis of variance (ANOVA) and Tukey multiple range tests using SPSS software version 21. The significance level was set at the level of $p<0.05$.

3. Result and discussions

3.1. Nutritional composition of Tuna

Proximate composition of Tuna was analyzed seasonally. Table-1 shows the seasonal variation of nutritional compositions of Tuna. Higher moisture content was found in summer (75.87%) and higher protein content was found in rainy season (25.57%). Higher content of lipid found in winter and higher ash content were found in rainy season in tuna. In the present study moisture was inversely related to lipid content. Moisture and fat levels are inversely connected and account for about 80% of the total weight of fish fillets. FAO also describes, the remaining 20% is made up of other ingredients which is similar with the result (Fao, 1999). Tuna basically considered a good source of high-quality protein. Table-1 shows higher content of protein (25.57 $\pm$ 0.83 %) due to the rainy season which is a good nutrient for human growth. Fish protein contains all essential amino acids which are easy to digest. The protein digested and assimilated is mostly incorporated in the muscles of the fish (Dabhade, Pathan, Shinde, Bhandare, & Sonawane, 2009). Ali, Salam, and Iqbal (2001) has reported that protein content, which is a vital constituent of living cells, tends to vary relatively little in healthy fish unless drawn upon during particular demands of reproduction or during food deprivation periods. Tuna contains high amount of protein, (27%) and also rich in essential amino acids (Love, 1970). In the present study, the protein content of monsoon season is comparable with Suseno, Hidayat, Paramudhita, Ekawati, and Arifianto (2015).

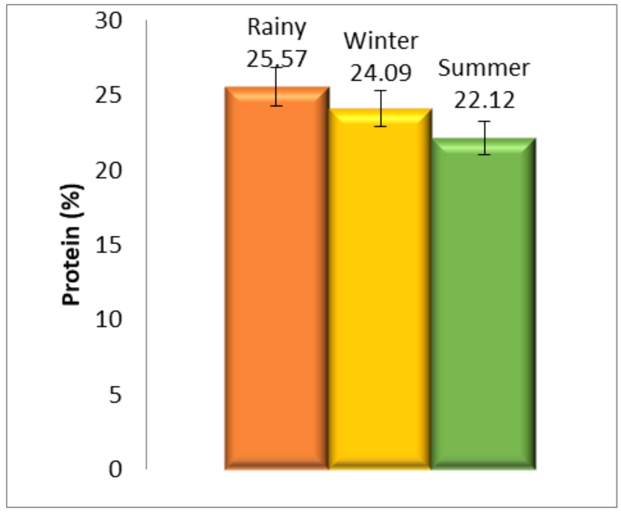

Figure 1. Seasonal variation of moisture content of Tuna

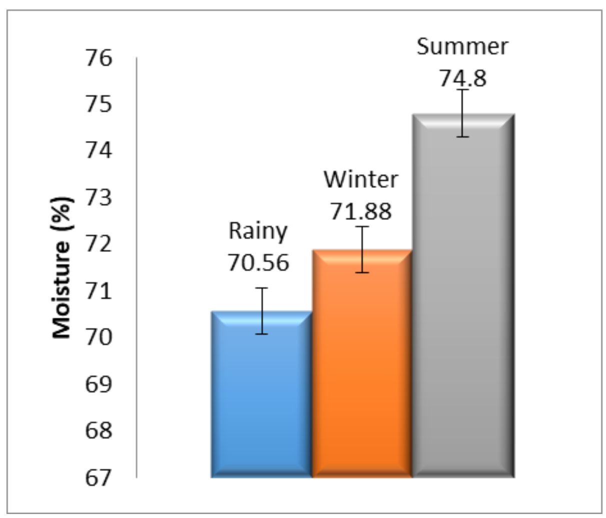

Figure 2. Seasonal variation of protein of Tuna

3.2. Nutritional composition of Pama Croaker:

2 shows the seasonal variation of nutritional compositions ofpama croaker. Higher moisture content (83.97 $\pm$ 0.92%) were found in summer and higher protein content (23.86 $\pm$ 0.26%) were found in rainy season. Higher content of lipid1 (1.80 $\pm$ 0.19%) and ash content (1.55 $\pm$ 0.28%) were found in winter season in pama croaker. The total lipid content of fish in a given range not only affects the fish's softness but also improves its flavor as the lipid content rises (L. Chen,

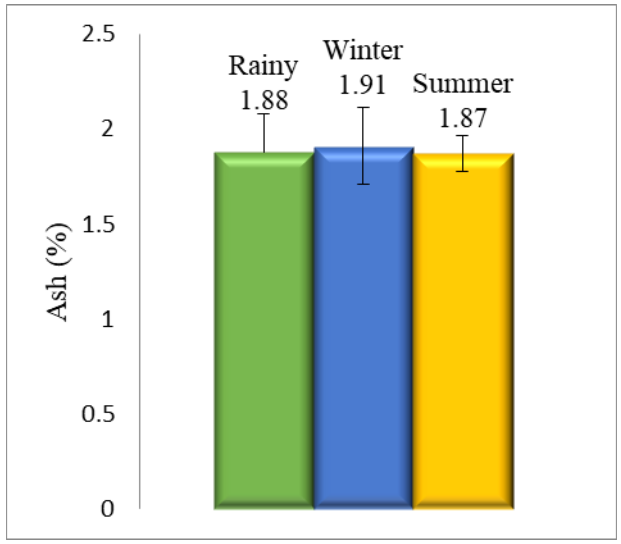

Figure 3. Seasonal variation of lipid of Tuna

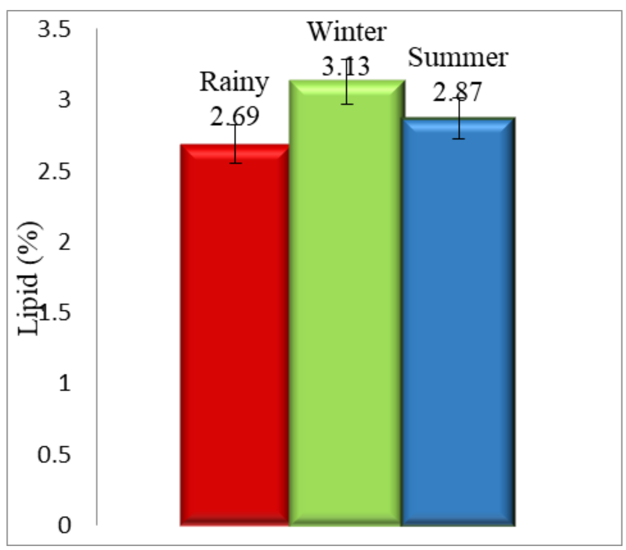

Figure 4. Seasonal variation of ash of Tuna

Table 1. Seasonal Variation of Proximate Composition of Tuna:

Season	Month	Moisture (%)	Protein (%)	Lipid (%)	Ash (%)
Rainy	July	70.23 ± 0.30^{c}	25.20 ± 0.32^{a}	2.87 ± 0.24^{a}	1.75 ± 0.25^{bcd}
	August	70.66 ± 0.52^{c}	25.57 ± 0.83^{a}	3.00 ± 0.04^{a}	2.52 ± 0.35^{a}
	September	70.16 ± 0.17^{c}	23.77 ± 0.18^{ab}	2.49 ± 0.44^{a}	1.15 ± 0.04^{d}
	October	71.17 ± 0.67^{bc}	23.51 ± 0.43^{ab}	2.38 ± 0.52^{a}	2.12 ± 0.08^{abc}
Winter	November	73.97 ± 5.0^{abc}	23.81 ± 0.48^{ab}	3.34 ± 0.32^{a}	2.20 ± 0.35^{abc}
	December	70.64 ± 0.45^{c}	21.68 ± 1.17^{bcd}	3.25 ± 0.66^{a}	2.21 ± 0.31^{abc}
	January	70.71 ± 0.55^{c}	21.21 ± 0.87^{cd}	3.05 ± 0.66^{a}	2.24 ± 0.29^{abc}
	February	72.19 ± 0.69^{abc}	23.45 ± 1.70^{abc}	2.87 ± 0.25^{a}	1.01 ± 0.15^{d}
	March	73.20 ± 1.00^{abc}	21.69 ± 0.46^{bcd}	2.67 ± 0.16^{a}	1.55 ± 0.11^{cd}
	April	74.43 ± 0.99^{abc}	20.18 ± 0.36^{d}	2.74 ± 0.60^{a}	2.13 ± 0.18^{abc}
	May	75.70 ± 0.34^{ab}	21.78 ± 0.35^{bcd}	2.79 ± 0.16^{a}	2.31 ± 0.30^{ab}
	June	75.87 ± 0.22^{a}	21.94 ± 0.45^{bcd}	3.26 ± 0.35^{a}	1.51 ± 0.38^{cd}

Zeng, Rong, & Lou, 2022). In the present study moisture was inversely related to lipid content. According to FAO, moisture and fat levels are inversely connected and account for about 80% of the total weight of fish fillets. The relevant data of the study are comparable with the result of L. Chen et al. (2022).

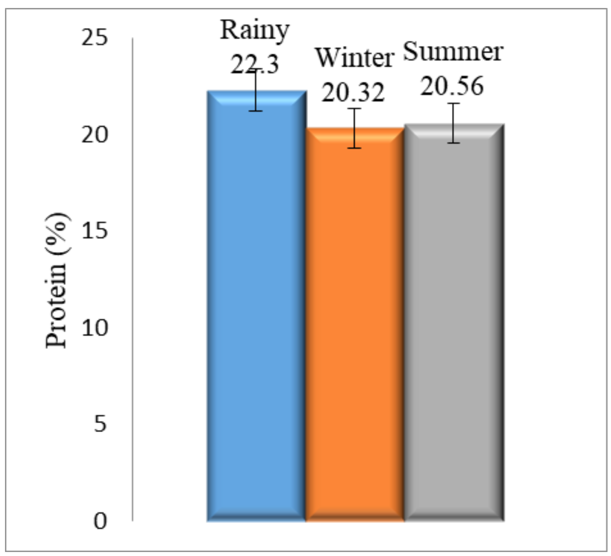

Figure 5. Seasonal variation of moisture content of Pama Croaker

Pama Croaker
Pama Croaker Croaker

3.3. Seasonal variation of fatty acid compositions of Tuna and Pama Croaker

Seasonal variation of fatty acid compositions of Tuna and Pama Croaker were showed in table 3 and 4. Results showed that higher concentration of fatty acid compositions were found in winter season in both fishes.

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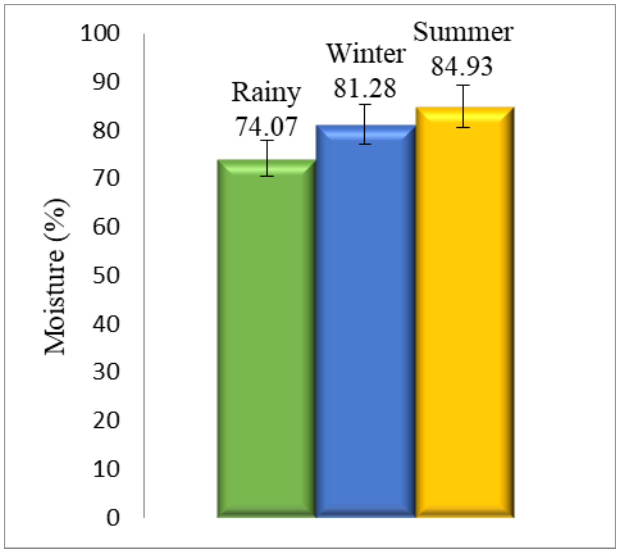

Figure 6. Seasonal variation of protein of Pama Croaker

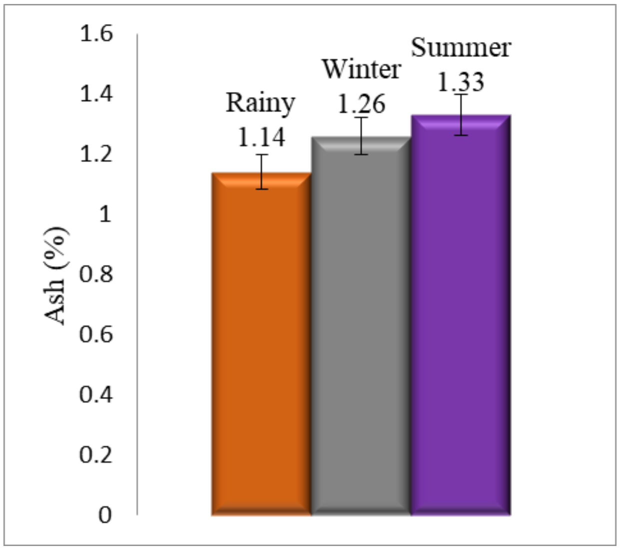

Figure 7. Seasonal variation of lipid of pama

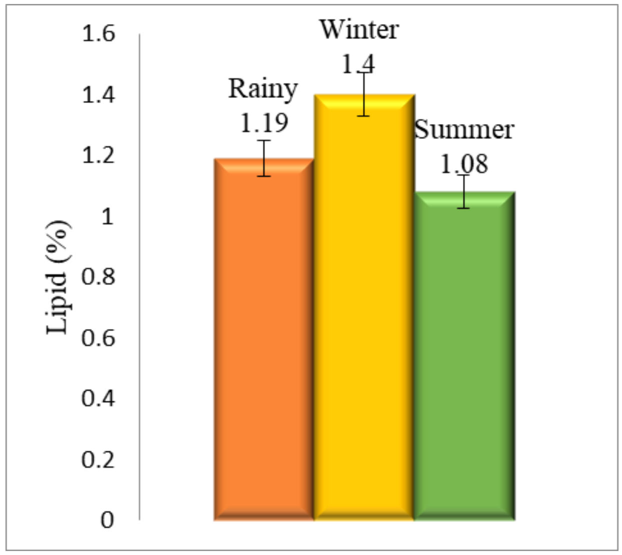

Figure 8. Seasonal variation of ash of Pama

Table 2. Seasonal variation of proximate composition of cama croaker

Season	Month	Moisture (%)	Protein (%)	Lipid (%)	Ash (%)
Rainy	July	70.77 ± 0.56^{e}	23.86 ± 0.26^{a}	0.96 ± 0.06^{b}	1.06 ± 0.06^{a}
	August	70.66 ± 0.52^{e}	22.66 ± 0.29^{ab}	1.51 ± 0.47^{ab}	1.09 ± 0.07^{a}
	September	77.83 ± 0.69^{d}	21.70 ± 0.76^{abc}	1.13 ± 0.19^{ab}	1.15 ± 0.04^{a}
	October	77.01 ± 1.02^{d}	20.98 ± 1.74^{bc}	1.18 ± 0.17^{ab}	1.26 ± 0.18^{a}
Winter	November	80.51 ± 0.59^{c}	19.24 ± 1.03^{c}	1.53 ± 0.46^{ab}	1.28 ± 0.25^{a}
	December	80.35 ± 0.61^{c}	19.16 ± 0.64^{c}	1.80 ± 0.19^{a}	1.26 ± 0.23^{a}
	January	80.91 ± 0.21^{c}	20.40 ± 0.51^{bc}	1.29 ± 0.27^{ab}	1.49 ± 0.04^{a}
	February	83.34 ± 0.56^{b}	22.50 ± 0.80^{ab}	0.99 ± 0.05^{b}	1.03 ± 0.03^{a}
	March	83.97 ± 0.92^{ab}	21.06 ± 1.45^{bc}	1.14 ± 0.36^{ab}	1.55 ± 0.28^{a}
	April	84.29 ± 0.74^{ab}	20.09 ± 0.59^{bc}	0.89 ± 0.08^{b}	1.23 ± 0.28^{a}
	May	85.61 ± 0.41^{a}	20.15 ± 0.79^{bc}	1.10 ± 0.08^{ab}	1.34 ± 0.25^{a}
	June	85.83 ± 0.59^{a}	20.94 ± 0.45^{bc}	1.20 ± 0.12^{ab}	1.19 ± 0.14^{a}

3.3.1. Seasonal variation of fatty acid composition of Tuna

The fatty acid composition of tuna that studied is listed in table-3. The major fatty acids that found were Methyl Palmitate (SFA), Methyl Arachidate (SFA), Methyl Stearate (SFA), Methyl Arachidonate (PUFA), Methyl Myristate (SFA). The most dominant fatty acid found in tuna's body is Methyl Palmitate (Saturated fatty acid) in each of the three seasons and highest ($121.36 \pm 0.62\%$) occupied in winter. Palmitic acid is a part of methyl palmitate (Jay, 2021). Palmitic acid is the the dominant saturated fatty acid in both dark and white muscles, contributing roughly 57.50% (white muscle) and 48.89% (dark muscle) of the total saturated fatty acids in tuna (Kannaiyan, S. K. et al., 2019) which is comparable with the study. Fish naturally contain palmitic acid, which serves as a source of metabolic energy for their growth (Sargent & Tocher, 2002). On the other hand, the least amount of fatty acid that found in tuna in this study was Methyl

Heneicosanoate (SFA). The result shows that Tuna muscle have higher percentage of SFA and PUFA than MUFA which is in contrast with the study of Kannaiyan et al., 2019. This difference is because the composition of fatty acid in fishes is differ with the age, sex, water temperature, pollution level, season, nutritional state etc. (Bandarra, Batista, Nunes, & Empis, 2001; Tanakol, Yazici, Şener, & Sencer, 1999). In spite of that, consuming E. affinis can be regarded as a good source of fatty acids (Pigott & Tucker, 1990).

Table 3. Seasonal variation of fatty acid composition of Tuna

SL.	Name	Conc. (ppm)		
		Rainy	**Winter**	**Summer**
1.	Methyl Octanoate	3.81 ± 0.02	3.36 ± 0.47	32.03 ± 0.13
2.	Methyl Decanoate	2.82 ± 0.05	2.71 ± 0.13	2.36 ± 0.24
3.	Methyl Laurate	16.40 ± 0.37	16.08 ± 0.62	13.96 ± 0.25
4.	Methyl Tridecanoate	1.89 ± 0.03	2.09 ± 0.04	1.09 ± 0.01
5.	Methyl Myristate	33.01 ± 0.11	32.80 ± 0.50	20.11 ± 0.02
6.	Methyl Palmitpleate	32.11 ± 0.37	32.32 ± 0.50	23.25 ± 0.56
7.	Methyl Palmitate	120.33 ± 1.09	121.36 ± 0.62	90.03 ± 0.14
8.	Methyl Linoleate	1.07 ± 0.13	1.13 ± 0.07	1.07 ± 0.06
9.	Methyl Oleate	17.83 ± 0.27	18.04 ± 0.06	18.40 ± 0.61
10.	Methyl Linolenate	25.87 ± 0.73	26.03 ± 0.95	26.35 ± 0.54
11.	Methyl Stearate	59.35 ± 0.97	60.42 ± 0.52	56.32 ± 0.49
12.	Methyl Arachidate	97.04 ± 1.22	97.24 ± 0.72	66.82 ± 1.00
13.	Methyl Arachidonate	40.35 ± 1.13	40.70 ± 0.53	32.02 ± 0.10
14.	Methyl Eicosapaennoate	30.43 ± 1.18	31.05 ± 0.06	23.01 ± 0.04
15.	Methyl Eicosatrienoate	2.66 ± 0.18	3.05 ± 0.06	3.07 ± 0.06
16.	Methyl Heptadecanoate	6.16 ± 0.22	6.24 ± 0.32	6.07 ± 0.08
17.	Methyl Heneicosanoate	0.37 ± 0.55	1.09 ± 0.03	0.37 ± 0.56
18.	Methyl Docosahexanoate	0.59 ± 0.48	1.78 ± 0.11	0.88 ± 0.10
19.	Methyl Docosapentaenoate	2.27 ± 0.42	2.61 ± 0.48	2.33 ± 0.11
20.	Methyl Eirocate	14.12 ± 0.26	14.21 ± 0.99	19.08 ± 0.04
21.	Methyl 11-Eicosenponoate	11.26 ± 0.59	11.96 ± 0.08	5.06 ± 0.07
22.	Methyl Hehenate	2.36 ± 0.37	2.39 ± 0.51	2.32 ± 0.11
23.	Methyl Tricosanoate	0.73 ± 0.23	1.05 ± 0.06	0.85 ± 0.25
24.	Methyl Nervonate	3.65 ± 0.49	4.04 ± 0.06	5.643 ± 0.49
25.	Methyl Lignocerate	1.24 ± 0.16	1.84 ± 0.16	2.01 ± 0.03

3.3.2. Seasonal variation of fatty acid composition of Pama Croaker

The fatty acid composition of Pama that studied is listed in table-4. The major fatty acids that found were Methyl Docosapentaenoate (PUFA), Methyl Palmitate (SFA), Methyl Palmitpleate (MUFA), Methyl Arachidate (SFA), Methyl Stearate SFA). The most dominant fatty acid found in pama's body is Methyl Docosapentaenoate (Poly unsaturated fatty acid) in each of the three seasons and highest ($126.98 \pm 5.35\%$) occupied in winter. On the other hand, the least amount of fatty acid that found in pama in this study was Methyl Heneicosanoate (SFA). Linoleic acid (C18:2n6) and -linolenic acid (C18:3n3) are important fatty acids for human health, and cultured yellow croaker muscle had 0.033% and 0.04% that are vary in wild yellow croaker fish, 0.26% and 0.031% respectively (L. Chen et al., 2022). This can be compared to the methyl Linolenate and Methyl Linoleate of this study. This result indicates that pama fish is a good source of fatty acids that same interpretation is founded by Renuka, Zynudheen, Panda, and Ravishankar (2016) for tiger tooth croaker.

Table 4. Seasonal variation of fatty acid composition of Pama Croaker

Name	Conc. (ppm)		
	Rainy	Winter	Summer
Methyl Octanoate	2.38 ± 0.35	2.82 ± 0.38	2.12 ± 0.20
Methyl Decanoate	2.56 ± 0.41	4.14 ± 0.68	3.10 ± 0.22
Methyl Laurate	24.24 ± 2.02	22.48 ± 1.05	23.62 ± 1.38
Methyl Tridecanoate	2.47 ± 0.53	1.99 ± 0.10	1.10 ± 0.02
Methyl Myristate	46.15 ± 1.40	52.93 ± 1.20	33.47 ± 1.23
Methyl Palmitpleate	80.94 ± 1.01	82.05 ± 4.60	87.34 ± 1.59
Methyl Palmitate	84.52 ± 4.02	84.39 ± 4.82	93.35 ± 4.08
Methyl Linoleate	1.14 ± 0.14	1.99 ± 0.31	3.18 ± 0.42
Methyl Oleate	19.87 ± 0.69	21.74 ± 1.15	23.60 ± 1.26
Methyl Linolenate	23.69 ± 1.40	22.13 ± 1.40	21.36 ± 0.59
Methyl Stearate	76.88 ± 1.63	78.19 ± 2.17	74.17 ± 6.19
Methyl Arachidate	77.21 ± 2.17	81.62 ± 3.57	74.53 ± 1.15
Methyl Arachidonate	53.95 ± 0.21	52.41 ± 6.46	42.57 ± 0.86
Methyl Eicosapaennoate	45.52 ± 1.65	46.67 ± 3.50	40.19 ± 4.89
Methyl 11-14-17-Eicosatrienoate	6.04 ± 0.97	7.09 ± 0.30	4.80 ± 0.88
Methyl Heptadecanoate	10.48 ± 1.33	12.61 ± 1.41	8.81 ± 0.26
Methyl Heneicosanoate	0.04 ± 0.04	1.08 ± 0.02	2.71 ± 0.60
Methyl Docosahexanoate	2.20 ± 0.31	1.73 ± 0.99	3.16 ± 0.24
Methyl Docosapentaenoate	120.69 ± 10.24	126.98 ± 5.35	97.12 ± 1.44
Methyl Eirocate	23.64 ± 1.93	25.44 ± 2.30	13.47 ± 1.25
Methyl 11-Eicosenponoate	6.15 ± 0.96	6.42 ± 0.57	4.54 ± 0.79
Methyl Hehenate	5.89 ± 0.72	8.11 ± 0.39	2.81 ± 0.80
Methyl Tricosanoate	1.44 ± 0.35	2.01 ± 0.94	0.83 ± 0.27
Methyl Nervonate	1.24 ± 0.29	2.02 ± 0.28	0.91 ± 0.12
Methyl Lignocerate	4.09 ± 0.45	3.91 ± 1.06	5.69 ± 0.70

4. Conclusion

The present study provides information on seasonal variation of nutritional composition of tuna and pama croaker. Tuna and pama croaker is a fantastic source of minerals and fatty acids, according to the study. The information from this study could be used as a starting point for future research. These tuna's white and black muscles' nutritional, textural, and qualitative traits suggest that this species is ideally suited as a raw ingredient in the culinary business. Pama's protein contains all essential amino acids which are easy to digest. The results indicated that the fish resources analyzed contain high protein content, and hence can be exploited commercially for meeting protein requirements.

Data availability

Data that are shown here are available on request from the corresponding authors.

Author's Contribution

Tahsin Sultana: Methodology, Conceptualization, Research Administration, Submission. Shafiul Islam Shahi: Data curation, Statistical analysis, Fahmida Ali Ria: Data curation, formatting manuscript, Nafisa Nawar Tamji: Formatting manuscript. Mahfuzul Alam Mithu: Formatting manuscript, Dr. Md. Faisal: Original draft review and editing

All authors have read and agreed to the published version of the manuscript

Acknowledgments

This study was supported by Chattogram Veterinary and Animal Sciences University grants through University Grant Commission. The authors would like to express appreciation to the Nutrition and Processing Laboratory, Faculty of Fisheries, Chattogram Veterinary and Animal Sciences University for providing laboratory facilities for this study.

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Citation information

Cite this article as: Sultana, T., Shahi, S. I., Ria, F. A., Tamzi, N. N., Mithu, M. A., & Faisal, M. (2023). Seasonal variation of the nutritional compositions of Tuna (Euthynnus affinis) and Pama croaker (Otolithoides pama) of the Bay of Bengal. *Journal of Innovation in Applied Research, 6(1)*, 45-55. doi: 10.51323/JIAR. 06/01/01.02.2023

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