FATTY ACID PROFILING AND DETERMINATION OF NUTRITIONAL QUALITY OF LIPIDS IN SELECTED COMMONLY CONSUMED FISHES IN DHAKA CITY

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ABSTRACT

Background: Fish is one of the most widely consumed foods worldwide and It has been the third most-consumed food item in Bangladesh. **Objective**: This study thoroughly analyzed the fatty acid content and nutritional quality of lipids extracted from five widely consumed fish species in Dhaka city, since fish fatty acid profile is an essential indicator of fish lipid quality. **Methodology:** Five commonly consumed fishes, which were analyzed in the current study, were *Labeo bata*, *Wallago attu*, *Chanda nama*, *Labeo calbasu*, and *Channa striata*. The crude lipid content was assessed using Folch method and fatty acid profiles were assessed by Gas chromatography method. The fatty acid profile data were then used to calculate various nutritional indices to assess the overall quality of the fish lipids. **Results:** Four of the fishes named *L. bata, W. attu, C. nama, and C. striata*, were classified as lean or low-fat fish based on their extracted fat percentages falling below 4%. In contrast, *L. calbasu* stood out as a medium-fat fish with a fat content of 4.01 ± 0.26%. A total of 32 distinct fatty acids were obtained in the study. The analysis of the fatty acid profiles revealed a substantial amount of saturated fatty acids, making up around 40% of the total fatty acids. Palmitic acid was identified as the most predominant saturated fatty acid. Monounsaturated fatty acids constituted 25-40% of the total fatty acids, with oleic acid recognized as the predominant monounsaturated fatty acid. The fish samples were found to have substantial amounts of nutritionally advantageous polyunsaturated fatty acids (PUFAs), with omega-3 fatty acids comprising up to 18%. The ratio of ω-3 to ω-6 ranged from 0.4 to 2.0 across the different fish species. Higher values for desirable fatty acids are preferable, and the fish had a 52-70% desirable fatty acids range. Conversely, lower values for hypercholesterolemic fatty acids are preferred, and the fish had a range of 24.6-30.9%. The Atherogenecity index (AI) and Thrombogenecity index (TI) of the samples ranged from 0.44-0.88 and 0.43-0.61, respectively. The comprehensive analysis of fatty acids and assessment of lipid quality provide valuable information regarding the nutritional importance of consuming these locally available fish species as part of a healthy diet in Bangladesh. **Conclusion:** In summary, the assessment of the indices indicates that the lipids found in *L. calbasu* have a comparatively more advantageous nutritional composition when compared to other species that were studied. Nevertheless, all fish species offer a harmonious combination of beneficial fatty acids and specific less favorable components regarding their overall fatty acid composition.

KEYWORDS: Fatty acid, nutritional quality, lipid, fishes, Bangladesh.

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Introduction

Bangladesh is considered one of the world's most fisheries-friendly areas, boasting the largest flooded wetland globally and the third-highest aquatic biodiversity in Asia, after China and India (Shamsuzzaman *et al.*, 2017). Over 12% of the nation's population lives directly or indirectly in the fishing industry (DOF 2022). This industry has expanded at an average yearly pace of around 6.19% during the last decade (Afrooz *et al.*, 2024). The world's fish consumption reached 20.2 kg per person per year in 2022 (FAO, 2022). In Bangladesh and India, fish is a popular source of moderate protein. It is high in protein, unsaturated essential fatty acids, minerals, and vitamins (Muduli *et al.*, 2022). Fish is very nutritious, rich in essential minerals and vitamins that promote human health (Khan *et al.*, 2014). The lipid levels and fatty acid compositions of fish species might vary, even among individuals of the same species. These variances arise due to differences in geographical areas, food amounts, eating behaviors, and other environmental variables (Alexis *et al.*, 2002; Jacobsen *et al.*, 2012; Khan *et al.*, 2014).

Fish lipids have a highly varied quantitative fatty acid composition influenced by the species' characteristics and behaviors, along with biotic and abiotic factors (Harlıoğlu,

2012). The advantages of eating fish are associated with the fatty acid content of the fish, particularly the amount of long-chain polyunsaturated fatty acids (LC-PUFAs). LC-PUFAs contain healthy fatty acids like arachidonic acid, eicosapentaenoic acid, docosahexaenoic acid, and other significant n-3 fatty acids like docosapentaenoic acid. Omega-3 fatty acids may aid in the prevention of coronary heart disease. Furthermore, it is a component of cellular membranes. It performs several functions in various biological processes, including the transport of amino acids and neurotransmitters, as well as the modulation of ion channel activity and retinal pigment responses (Katakura *et al.*, 2015). Furthermore, n-3 PUFAs have the capacity to decrease the number of inflammatory cells and contribute to the prevention of atherosclerosis, a condition characterized by the narrowing and hardening of the arteries (Harris, 1989). Research has shown that fish oil offers defense against several types of cancers, such as those that impact the colon, liver, breast, prostate, and lung (Jatoi, 2005).

The fish species examined in this research are widely accessible in national markets and are crucial to the export of agricultural goods. Bengali culture promotes fish consumption for its nutritional advantages, although individuals often neglect the nutritional importance and diversity among various fish species. Moreover, there is a lack of data about the fatty acid profiles and nutritional quality of these fish species. Numerous research have investigated the fatty acid profiles of freshwater fish obtained from aquaculture ponds and freshwater lakes (Khan *et al.*, 2014; Islam *et al.*, 2022). The only complete Food Composition Table (FCT) in the nation, produced by the Institute of Nutrition and Food Science (INFS), includes fatty acid profile for 42 food samples, of which only six are fish samples (Rahim *et al.*, 2013). Additionally, many studies have been conducted to examine the fatty acid composition of Bangladeshi fish (Thilsted *et al.*, 2015; Shoeb *et al.*, 2018; Islam *et al.*, 2022). This research aimed to assess the fatty acid composition of five frequently eaten fish species available in the local market of Dhaka City.

Methodology

Sample Collection Area

Samples for the research were obtained from two fish markets in Dhaka. These two markets are the biggest wholesale and retail markets in Dhaka city. One was Rajdhani Matshya Vander Fish Market, Jatrabari, and another one was Kawran Bazar Fish Market, Karwan Bazar.

Sample Collection

Samples were collected at dawn to guarantee their freshness and uniformity. Equivalent amounts of samples were acquired from two distinct markets to provide a fair and equitable comparison. The samples were transported in plastic bags to ensure that they remained uncontaminated and their integrity was maintained during transportation. Upon reaching the laboratory, the samples were duly recorded and marked with suitable labels to ensure their traceability and to avoid any confusion or mixing up.

Sample Identification and Characterization

The samples were transferred to Dhaka University's Institute of Nutrition and Food Science (INFS) food analysis laboratory for additional processing. They were first identified in the laboratory. The five fish samples were as follows:

Taxonomy	Bata	Boal	Chanda	Shol	Kal Baus
Kingdom	Animalia	Animalia	Animalia	Animalia	Animalia
Phylum	Chordata	Chordata	Chordata	Chordata	Chordata
Class	Actinopterygii	Actinopterygii	Actinopterygii	Actinopterygii	Actinopterygii
Order	Cypriniformes	Siluriformes	Perciformes	Anabantiformes	Cypriniformes
Family	Lebeoninae	Siluridae	Chandidae	Channidae	Cyprinidae
Genus	*Labeo*	*Wallago*	*Chanda*	*Channa*	*Labeo*
Species	*Labeo bata* (Hamilton 1822)	*Wallago attu* (Bloch, Hennig *et al*. 1801)	*Chanda nama* (Hamilton 1822)	*Channa striata* (Hamilton 1822)	*Labeo calbasu* (Hamilton 1822)

Sample Preparation

At first, the samples were measured for their length, width and weight. After the measurement, the samples were descaled, the intestines were cleaned, and the fins and head were removed. The bodies were then cleaned with tap water thrice, thrice with distilled water, and deionized water once. After the washing, the samples were air-dried. Then, the bone of the sample was taken out, and the flesh of the sample with skin was weighed. It is the edible portion of the sample. The flesh with skin was then chopped, turned into tiny pieces, and mixed well. Samples were then taken to the fish analysis laboratory of Institute of Food Science and Technology (IFST), Bangladesh Council of Scientific and Industrial Research (BCSIR).

Extraction of Fat

The fish samples' overall lipid content was assessed following the method of Folch *et al*. (1957) outlined with minor adjustments. The fish samples were homogenized together, and about 10g of the mixture was taken for lipid extraction. The homogenized mixture was immersed in chloroform-methanol solvent (2:1) overnight. After that, it was filtered through

Whatman no.1 filter paper. The solvent was then evaporated at 45 ^{o}C in a rotary evaporator.

Preparation of FAME

With minor adjustments, fatty acid methyl ester (FAME) was created following the AOAC-2005 protocol. In this protocol, 25 mg (±1 mg) of sample was added in a methyl ester containing tube. Various reagents were used in this process such as methanolic NaOH, BF3, isooctane, NaCl solution, etc. After the top layer of isooctane was collected in a vial and filtered via an anhydrous sodium sulfate column, 1 µL was utilized for gas chromatography's FAME analysis.

Fatty Acid Profile by Gas Chromatography

With the use of a fused silica capillary column (TR-FAME, 30 m 0.25 mm 0.25 m film thickness, Thermo Scientific, PA, USA) and a flame ionization detector. The fatty acid content was investigated using a gas chromatograph (Trace 1300, Thermo Scientific, PA, USA). At a constant flow rate of 1 milliliter per minute, nitrogen has been employed as the carrier gas in a split injection (20:1) technique. The data were presented as relative percentages using the Chromeleon version-7.00 automated GC program after identifying the fatty acids using the appropriate fatty acid methyl ester standards (Supelco 37 Component FAME mix, USA).

Calculation of Nutritional Lipid Quality Indices

The nutrition quality of fat was determined by ω-6/ω-3 ratio, Desirable Fatty Acid Index (DFA), Index of Hyper-Cholesterolemic Fatty Acid (OFA), Atherogenecity Index (AI), Index of Thrombogenecity (TI) and, Hypocholesterolemic-Hypercholesterolemic ratio (H/H). The formula to calculate these indices are given below:

1. ω-6/ω-3 ratio = Total ω-6 fatty acids content / Total ω-3 fatty acid content
2. DFA = Total unsaturated fatty acid content + C18:0 content
3. OFA = Sum of C12:0, C14:0, C16:0 content
4. AI = ((C12:0 + (4*C14:0) + C16) / (ω-3 PUFA + ω-6 PUFA + MUFA)
5. TI = (C14:0 + C16:0 + C18:0) / ((0.5*MUFA) + (3* ω-3) + (0.5*ω6) + (ω-3/ω6))
6. H/H = (C18:1 + C18:2 + C18:3) / (C12:0 + C14:0 + C16:0)

Here, C12:0 = Lauric Acid; C14:0 = Myristic Acid; C16:0 = Palmitic Acid; C18:0 = Stearic Acid; C18:1 = Oleic Acid; C18:2 = Linoleic Acid; C18:3 = Linolenic Acid.

Results and Discussion

Fish samples were collected from two markets, Kawran Bazar Fish Market, Karwan Bazar (Market 1) and Rajdhani Matshya Vander Fish Market, Jatrabari (Market 2). The average length, width and weigh were similar between these two. Only the average weight of Bata fish is different. The average weight of Bata fish from market 1 was 253.35 grams where in market 2 the average weight was 167.40 grams. About ten samples of each fish species from two markets (five from each market) were measured to estimate the average weight, (g) length (cm) and width (cm) of the fishes.

Table 1. Average length, width and weight of the fish samples.

Local name (Scientific name)	Average Length (cm)		Average Width (cm)		Average Weight (g)	
	Market 1	Market 2	Market 1	Market 2	Market 1	Market 2
Bata *(Labeo bata)*	18.43	20.30	4.64	4.90	253.35	167.40
Boal *(Wallago attu)*	60	60	8	7	1042	1055
Chanda *(Chanda nama)*	7	8	3	3	8	7.5
Kal baus *(Labeo calbasu)*	48	48	11	10	1655	1651
Shol *(Channa striata)*	54	52	6	6	1140	1104

Fat Content: An examination of fat content in several fish species reveals significant variance, with fat percentages ranging from 0.93% to 4.1%. Out of all the species that were studied, Kal baus (*Labeo calbasu*) had the greatest fat content, with an average of around 4%. This makes it the fish with the highest amount of lipids in this dataset. On the other hand, Shol (*Channa Striata*) has the lowest fat content of the species investigated, with an average value of 0.93%, making it the leanest.

Table 2. Fat content (%) of the selected fish samples.

Fish Name	Fat Content (%) (Mean ± SD)
Bata (*Labeo bata*)	2.20 ± 0.19
Boal (*Wallago attu*)	1.76 ± 0.14
Chanda *(Chanda nama)*	0.99 ± 0.09
Kal baus *(Labeo calbasu)*	4.01 ± 0.26
Shol *(Channa striata)*	0.93 ± 0.18

Fatty Acid Profile: Table 3 summarizes the fatty acid profiles of each sample. The amount is expressed as percent (%)of extracted fat. About 32 fatty acids were identified, which cover almost 89.7%-98.5% of the extracted fat. On average, almost 40% of the extracted fats consist of saturated fatty acids, while almost 40% of the MUFAs and 25% of the PUFAs were identified. Overall, the majority of the species

Table 3. Fatty acid profile of the selected fish samples.

Fatty Acid Name	Fatty Acid Structure	Bata (*Labeo bata*) (Mean±SD)	Boal (*Wallago attu*) (Mean±SD)	Chanda *(Chanda nama)* (Mean±SD)	Shol *(Channa striata)* (Mean±SD)	Kal baus *(Labeo calbasu)* (Mean±SD)
Saturated Fatty Acid (SFA)						
Lauric Acid	**C12:0**	0.15±0.01	0.39±0.017	0.097±0.021	0.17±0.01	0.153±0.021
Tridecylic acid	**C13:0**	0.237±0.021	0.077±0.006	0.1±0.01	0.097±0.021	0
Myristic Acid	**C14:0**	3.997±0.134	3.317±0.137	2.193±0.065	1.647±0.185	1.21±0.095
Pentadecanoic Acid	**C15:0**	2.633±0.055	0.767±0.035	1.05±0.07	1.023±0.091	0.333±0.038
Palmitic Acid	**C16:0**	26.11±0.173	27.197±0.358	26.35±0.606	24.403±0.645	23.193±0.263
Heptadecanoic Acid	**C17:0**	1.453±0.084	1.59±0.026	1.197±0.012	1.417±0.18	0.467±0.058
Stearic Acid	**C18:0**	4.697±0.225	8.497±0.095	7.977±0.604	8.52±0.526	5.36±0.061
Arachidic Acid	**C20:0**	3.603±0.105	0.13±0.017	0.297±0.108	0.573±0.012	0.123±0.006
Henicosanoic Acid	**C21:0**	0.363±0.012	0.553±0.006	0.553±0.115	0.767±0.125	0.763±0.015
Behnic Acid	**C22:0**	1.237±0.025	0.65±0.026	0.357±0.072	0.16±0.03	0.21±0.036
Lignoceric Acid	**C24:0**	0	0	0	0	0
Total SFA		**44.48±0.844**	**43.168±0.723**	**40.171±0.108**	**40.114±0.015**	**38.777±1.825**
Monounsaturated Fatty Acid (MUFA)						
Myristoleic Acid	**C14:1**	0	0.113±0.006	0	0	0
Trans Myristoleic Acid	**C14:1 t**	0.717±0.09	0.68±0.026	0.48±0.113	0.633±0.225	0.213±0.021
Pentadecenoic Acid	**C15:1**	0.417±0.029	0.29±0.017	0.253±0.015	0.44±0.114	0.11±0.017
Palmitoleic Acid	**C16:1**	0.32±0.035	0.51±0.03	0.427±0.206	0.46±0.026	0.52±0
Trans Palmitoleic Acid	**C16:1 t**	5.99±0.33	6.853±0.169	5.71±0.382	4.447±0.411	2.583±0.023
Heptadecenoic Acid	**C17:1**	0.667±0.012	0.303±0.015	0.1±0	0	0.137±0.006
Trans Heptadecenoic Acid	**C17:1 t**	1.153±0.021	0.79±0.017	0.763±0.015	0.943±0.14	0.33±0.035
Elaidic Acid	**C18:1 t9**	0.283±0.006	0.13±0.044	0.15±0	0.16±0.01	0
Oleic Acid	**C18:1 c9**	8.21±0.199	18.09±0.685	13.697±0.169	19.17±0.244	31.28±0.51

Vaccenic Acid	**C18:1 c11**	1.953±0.042	2.37±0.244	2.063±0.193	3.327±0.276	0.71±0.052
Eicosenoic Acid	**C20:1**	0.8±0.01	0.587±0.015	0.237±0.006	0.673±0.15	2.69±0.26
Nervonic Acid	**C24:1**	0	0.07±0	0.133±0.031	0.037±0.064	0.103±0.006
Total MUFA		**20.51±0.774**	**30.786±1.268**	**24.013±1.13**	**28.292±0.588**	**30.29±1.66**
Polyunsaturated Fatty Acid (PUFA)						
Linoleic Acid	**C18:2, ω-6 LA**	3.053±0.308	3.543±0.031	3.7±0.01	5.12±0.159	15.817±0.595
Linolenic Acid	**C18:3, ω-3 ALA**	9.113±0.471	3.763±0.142	2.06±0.341	1.937±0.522	2.88±0.036
Eicosadienoic Acid	**C20:2, ω-6**	0.483±0.021	0.267±0.006	0.2±0.211	0.373±0.205	0.333±0.012
Eicosatrienoic Acid	**C20:3, ω-6**	0.84±0.026	0.967±0.025	0.61±0.137	0.957±0.071	0.863±0.023
Arachidonic Acid	**C20:4, ω-6**	2.003±0.194	2.01±0.052	6.727±0.652	5.343±0.145	0.777±0.153
Eicosapentaenoic Acid	**C20:5, ω-6, EPA**	4.28±0.204	1.62±0.017	2.86±0.131	0.467±0.157	3.107±0.058
Docosadienoic Acid	**C22:2, ω-6**	0.163±0.006	0.123±0.006	0.11±0.01	0.197±0.133	0.17±0.01
Docosapentaenoic Acid	**C22:5, ω-3**	2.603±0.169	2.46±0.04	3.317±0.254	1.65±0.226	0.307±0.032
Docosahexaenoic Acid	**C22:6, ω-3, DHA**	4.723±0.319	4.473±0.032	7.753±0.205	4.623±0.081	1.603±0.27
Total PUFA		**27.261±1.718**	**19.226±0.351**	**27.337±1.951**	**23.875±0.771**	**20.667±1.699**

examined (80%), had a greater amount of SFAs compared to MUFAs and PUFAs. The only exception from the trend was observed in the percentage of *L. calbasu*, which exhibited a different sequence with higher levels of MUFAs followed by SFAs and then PUFAs. Among all the identified results, *Wallago attu (*27.197±0.358%) had the highest proportions of palmitic acid, while *Labeo calbasu (*23.193±0.263*)* had the lowest quantities. The fatty acid stearic acid (C18:0) was found to be the second most prevalent in all of the fish samples, with concentrations ranging from 5.36±0.06% to 8.52±0.526%. The ratio of MUFAs in the overall lipids of the samples exhibited significant variation throughout a broad spectrum (Table 5-6). *L. calbasu* had around 38.676±0.93% of MUFAs, while *L. bata* had a comparatively low amount of MUFAs at 20.51±0.77%. The predominant MUFA is Oleic acid (C18:1 ω-9), which ranged from 8.21±0.2% in *L. bata* to 31.28±0.51% in *L. calbasu*. Palmitoleic acid (C16:1 ω-7) ranged from 2.58±0.02% in *L. calbasu* to 5.71±0.382% in *Chanda nama*. The concentration of other fatty acids in this category was typically less than 1%. The proportion of PUFAs found in the fish species ranged from 19.23±0.35% in *W. attu* to 27.34±1.95% in *C. nama* (Table 5-6). Among the detected 9 PUFAs, the predominant fatty acids were linoleic acid (C18:2 ω-6, 2.88% in *L. calbasu* to 5.12% in *C. striata*), linolenic acid (C18:3 ω-3, 1.94% in *C. striata* to 9.11% in *L.bata*), eicosapentaenoic acid (EPA, 0.47% in *C. striata* to 4.28% in *L. bata*), docosapentaenoic acid (DPA, C22:5 ω-3, 0.31% in *L. calbasu* to 3.31% in *C. nama*), and docosahexaenoic acid (DHA, 1.61% in *L. calbasu* to 7.75% in *C. nama)*

ω-6 and ω-3 ratio: Analysis of ω-6/ω-3 ratios in several fish species revealed significant variability in fatty acid makeup. *Labeo bata* had a favorable ω-6/ω-3 ratio of 0.51, indicating a good ratio of omega-3 to omega-6 fatty acids. *Wallago attu* came next, exhibiting a positive balance with a ratio of 0.95. Despite being higher, *Chanda Nama* had ratio of 1.16 indicated a very balanced profile. With a ratio of 1.95, *Channa striata* showed a considerable amount of omega-3 fatty acids. Ultimately, the ω-6/ω-3 ratio of 2.40 was greatest in *Labeo calbasu*, indicating a greater percentage of omega-6 fatty acids.

Table 4. ω-6 and ω-3 ratio among the fish samples.

Name of the Sample	ω-6 / ω-3
Bata (*Labeo bata*)	0.51
Boal (*Wallago attu*)	0.95
Chanda *(Chanda nama)*	1.16
Kal baus *(Labeo calbasu)*	2.40
Shol *(Channa striata)*	1.95

Trans Fatty Acids Content: The species *L. bata* had the highest trans-fatty acid content. 1.27 percent of the extracted fat was composed of trans-fatty acid. *W. attu* had the second highest amount (1.056%). The remainder had almost the same amount of trans-fatty acid content. It ranged from 0.62 to 0.677 percent of extracted fat. Figure 1 depicts the proportion of trans-fatty acid concentration in the fat recovered from the samples.

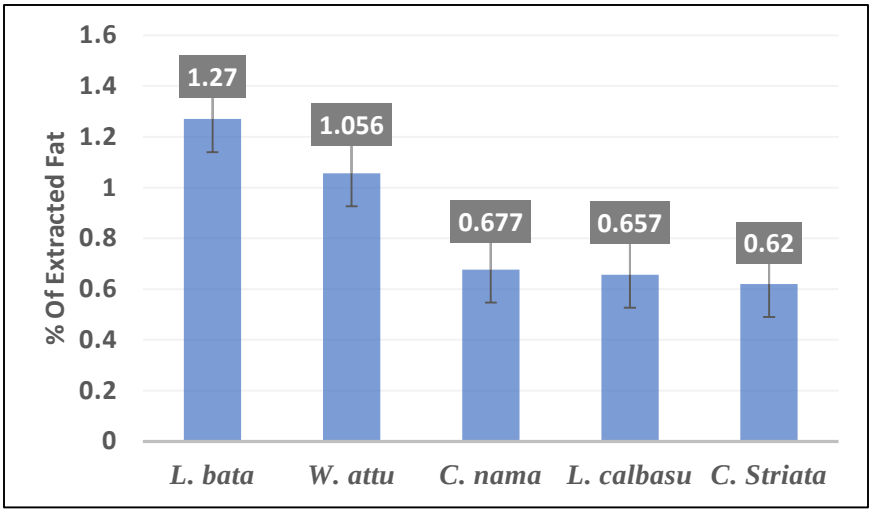

Figure 1. Trans Fatty Acids Content of the fish samples.

Based on raw sample, the trans-fatty acid content of *W. attu* and *C. striata* is negligible and the amount are 0.007 and 0.006 gram per 100 grams of sample respectively. On the other hand, *L. bata* and *L. calbasu* had almost same amount of trans-fatty acids content (0.027 and 0.026 g per 100 g samples). *W. attu* has a moderate level of trans fatty acids content in compare to the others.

Table 5. Trans fatty acids content (g per 100 g sample) of the fish samples.

Name of the Sample	Trans fatty acids content (g per 100 g sample)
Bata (*Labeo bata*)	0.027 ± 0.001
Boal (*Wallago attu*)	0.019 ± 0.002
Chanda *(Chanda nama)*	0.007 ± 0.002
Kal baus *(Labeo calbasu)*	0.026 ± 0.00
Shol *(Channa striata)*	0.006 ± 0.00

Essential Fatty Acids: The extracted fat from *L. calbasu* showed the greatest level of linoleic acid (15.817% ± 0.595%). Compared to *L. calbasu*, the other species showed comparatively low LA contents (3.54%-5.12%). *L. bata* has the highest alpha-linoleic acid (ALA) content rating among the species. It had 9.113% ± 0.471% ALA content of the extracted fat. The ALA content range for the other samples was (1.92%-3.54%). Figure 2 compares the LA and ALA content of the extracted fat from various sources.

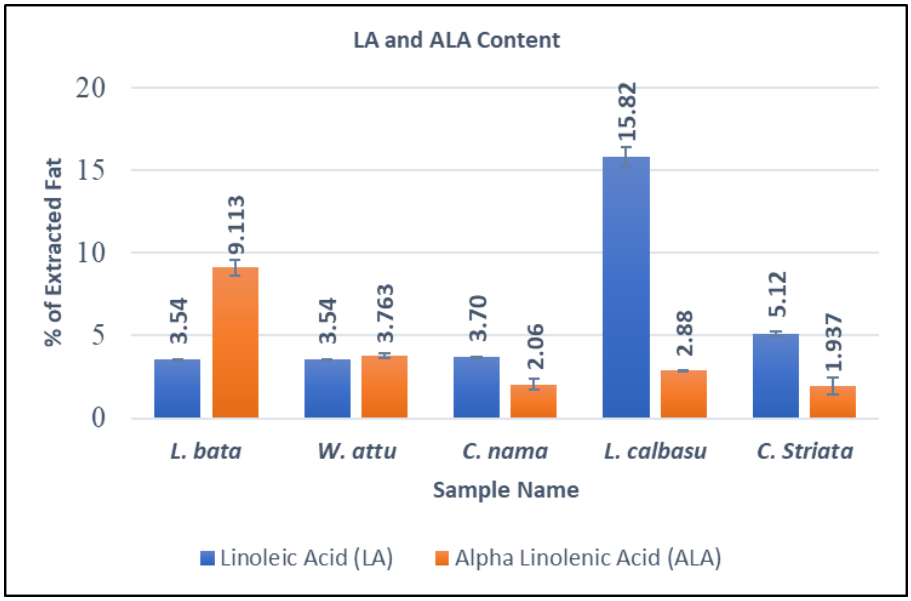

Figure 2. Essential Fatty Acid Content of the fish samples.

EPA and DHA: *L. bata* had the highest amount of EPA (4.28% ± 0.204%) content, whereas *W. attu* contained the highest percentage of DHA (7.753% ± 0.205%). *L. bata*, *W. attu*, and *C. striata* had similar DHA content. However, *W. attu* had the highest DHA content, it also had the lowest EPA content (1.62% ± 0.017%). Among the species, *L. calbasu* had the lowest rank in DHA content (1.603% ± 0.27%). Table 8 compares the EPA and DHA levels of the extracted fats from various sources.

Table 6. EPA and DHA Content in the Extracted Fat

Sample Name	EPA (%) (Mean ± SD)	DHA (%) (Mean ± SD)
Bata (*Labeo bata*)	4.28±0.204	4.723±0.319
Boal (*Wallago attu*)	1.62±0.017	4.473±0.032
Chanda *(Chanda nama)*	2.86±0.131	7.753±0.205
Kal baus *(Labeo calbasu)*	3.107±0.058	1.603±0.27
Shol *(Channa striata)*	0.467±0.157	4.623±0.081

Nutritional Lipid Quality Indices

In order to thoroughly assess the nutritional value and any health effects of the fish lipids, various nutritional indices were computed using the fatty acid profiles. The Desirable Fatty Acids index represents the combined amount of unsaturated fatty acids and stearic acid, and the fish exhibited a range of 52-70% acceptable fatty acids. *L. calbasu* has the highest amount of desirable fatty acid (69.89%), and *Labeo bata* has the lowest value (52.57%). The Hypercholesterolemic The Fatty Acids Index quantifies the quantity of fatty acids, such as lauric, myristic, and palmitic acids, that have the potential to raise cholesterol. Smaller values are favoured, and the fishes had a range of 24.6-30.9%. *L. calbasu* had the most favoured value (24.556%), whereas *L. bata* and *W. attu* had the two highest values of OFA (30.25% and 30.90%, respectively). The Atherogenicity Index measures the capacity of the acids to facilitate the accumulation of fatty plaque deposits in arteries. Desirable values are lower, and the samples had a range of 0.44-0.88. *L. bata* had the highest AI value (0.884), and *Labeo calbasu* had the lowest and most favoured value (0.437). The Thrombogenicity Index is a measure of the propensity to develop insoluble blood clots, which is assessed by analysing the ratios of acids. Once again, it is preferable to have lower values, and the fish had a range of 0.43-0.61. L. bata had the lowest TI value of 0.43. The *Labeo calbasu* had the highest H/H ratio of 2.035, *L. bata* had the lowest ratio of 0.679, and the other samples had a range of 0.69-1.

Table 7. Nutritional Quality Indices of Extracted Fat.

Sample Name	DFA (%)	OFA (%)	AI	TI	H/H
Bata (*Labeo bata*)	52.468	30.257	0.884	0.425	0.690
Boal (*Wallago attu*)	55.372	30.904	0.817	0.610	0.822
Chanda *(Chanda nama)*	59.327	28.64	0.686	0.492	0.679
Kal baus *(Labeo calbasu)*	69.893	24.556	0.437	0.475	2.035
Shol *(Channa striata)*	59.477	26.22	0.612	0.602	1.000

Conclusion

This research provides useful information on the fatty acid profiles and nutritional value of lipids extracted from five regularly eaten fish species: *Labeo bata*, *Wallago attu*, *Chanda nama*, *Labeo calbasu*, and *Channa striata*. These fish species are frequently available in the local markets in Dhaka, Bangladesh. The fat content analysis revealed that the majority of the fish samples were classed as lean or low-fat, with the exception of *Labeo calbasu*, which had a considerable level of fat. In terms of fatty acid composition, saturated fatty acids were found to be the most common, followed by monounsaturated and polyunsaturated fatty acids in most species. Palmitic acid was the main saturated fatty acid, whereas oleic acid was the most common monounsaturated fatty acid.

Upon evaluating the nutritional indices, the study discovered that *Labeo bata* and *Wallago attu* had a more advantageous omega-6 to omega-3 ratio in comparison to the other fish. *Chanda nama*, *Labeo calbasu*, and *Channa striata* have significant amounts of EPA and DHA. Furthermore, when considering the atherogenicity, thrombogenicity, and hypocholesterolemic/hypercholesterolemic indices, it was shown that *Labeo calbasu* had the most nutritionally favorable lipid profile compared to the other fish species examined. In summary, the results of this study will help to improve the Food Composition Table of Bangladesh and can assist consumers in making educated decisions about the nutritional advantages of consuming locally sourced fish. Subsequent research should examine a more extensive array of fish species and analyse the impact of variables such as habitat, seasonality, and processing techniques on their fatty acid compositions and nutritional worth.

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Conflict of Interest

The authors declare that there was no conflict of interest.

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