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Study of nutritional and mineral composition in indigenous fish species of Diplai Beel of Kokrajhar, Assam

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ABSTRACT

Background: Fish is an important dietary source of proteins, minerals, vitamins, and fatty acids. Fish meat can provide excellent quality of nutrients for good health and also support the economy of the society.

Objectives: The present study investigated the nutritional content and trace element composition of selected indigenous fishes of Diplai Beel of Kokrajhar district of Assam, India. **Materials and Methods:** A total of eight local fish species were collected from Diplai Beel. The collected fish were washed properly with distilled water and dried in a hot air oven till the complete dry of the moisture content of the fish smaple. The proximate composition was analyzed following the standard AOAC method. The mineral contents were analyzed using ICP-OES. Results: Fishes contained high moisture content, ranging from 76.71% to 82.62% of wet weight. Assessment of the moisture content of fish is an important parameter in the evaluation of their overall quality, shelf life, and nutritional value. The highest moisture content was observed in *Glossogobius giuris*. The highest protein and carbohydrate content were observed in *Xenentodon cancila* and *Macrognathus pancalus* respectively. The fat content varied from 3.34% to 16.73%. The fiber and ash content ranged from 1.11% to 0.24% and 11.98% to 18.59%, respectively. The analysis of major elements revealed the higher concentration of Na followed by Mg, K, and Ca that ranges from **0.08 to 569.24 ppm respectively**. Trace elements like Co, Zn, and Fe were observed ranging from **0.01 to 6.66** ppm. **Conclusion:** The rich nutritional contents and essential micronutrients suggests high food value of the fish. In the present study, the protein was reported to be the highest in quantity among the nutrient components. However, further studies are required to analyze the free amino acids and fatty acids contents of the fish.

Keywords: Proximate composition, trace elements, Diplai Beel, Kokrajhar, Assam

INTRODUCTION

Fishes are an important source of proteins, minerals, vitamins, and essential fatty acids (WHO, 2010; Begum et al., 2012; Sarma et al., 2014). Studies have revealed that fish protein contain several nutritional content making it more safer and healthier than any other animal proteins. (Ogundiran et al., 2014). Fish also contain essential fatty acids that are important for healthy life (Sarma et al., 2013). Minerals are essential nutrients and components of many enzymes and metabolism and contribute to the growth and development of organisms (Glover and Hogstrand, 2002; Mahamed, 2010). Fishes can incorporate trace elements by ingestion of suspended particulate matter in water (Azevedo et al., 2012). Fishes are known to contain rich quantity of trace elements (Hei and Sarojnalini, 2012; Ullah et al., 2016; Sarkar et al., 2017). Manganese (Mn) plays a major role in the regulation of blood, digestion, bone growth, and reproduction. It also acts as a cellular antioxidant (Aschner and Aschner, 2005). Copper (Cu) is responsible for the synthesis of RBCs and electron transfer and exists in the nervous system whose deficiency may cause blood and nervous system diseases (Dabbaghmanesh, 2011). Minerals play a critical role in supporting physiological functions, particularly in the activation of enzymes, as evidenced in recent studies (Lowell, 2019; Heaney 2013; Crichton, 2016). Deficiencies in mineral contents lead to several health complications (WHO, 2015). Calcium (Ca) and phosphorus (P) are essential minerals crucial for maintaining healthy bones and teeth. Deficiencies in these minerals can lead to serious conditions such as Rickets in children and Osteomalacia in adults (Charrondière et al., 2013). Chronic hypocalcemia may be responsible for improper bone mineralization and may also cause convulsions, tetany, or numbness (Fong and Khan, 2012). Zn is an essential trace element in human metabolism and nutrition (Gupta and Dey, 2017). Fish are used as biomedicines by various communities, the Karbi community of Assam uses fish as biomedicines against diseases such as kala-azar, malaria, smallpox, night blindness, common cold, rheumatoid arthritis, etc. The whole fish body of *Xenentodon cancila* is used for the treatment of joint pain, and swelling (Paul, 2018). Cooked flesh of *Glossogobius gutum* is used to treat nocturnal enuresis (Chanu et al., 2016).

Assam is gifted with plenty of lentic water bodies along with swamps connected with the tributaries of the Brahmaputra and Barak valley rivers. Wetlands are ecologically and economically essential for human existence and development. They are excellent habitats for significant biodiversity. The wetland ecosystems provide shelter to a good number of fish diversity (Agarwala, 1996; Deka et al., 2001; Goswami and Goswami, 2020). Over the last few decades, there has been an alarming decrease in the wetland ecosystem in Assam causing habitat loss to several fish species (Sarkar and Ponniah, 2000; Singh et al., 2017). Kokrajhar district is one of the four districts of the Bodoland area with a rich diversity of freshwater fishes. The district is gifted with beautiful Beels, namely Diplai, Dheer and Shareshwar Beel. A little work has been carried out to explore the aguatic biodiversity of Kokrajhar district. Recent study revealed a total of 67 fish species belonging to 53 genera and 26 families from different freshwater habitats of Kokrajhar district (Singha et al., 2017). The present study aims to investigate the nutritional and elemental content of eight indigenous fish species collected from Diplai Beel, Kokrajhar, **Assam, India**.

MATERIALS AND METHODS

Study area

Diplai Beel, situated in the Kokrajhar district, is renowned for its scenic beauty and serene environment. Located at approximately latitude N26°17’35.8692” and longitude E90°19’11.6904”, this natural water body is encircled by hills to the northeast and villages to the east, including Bhetgaon and Garopara to the west, and Bamunpara and Bashbari to the north. Southern boundaries are marked by Jharnagra and Satipur villages. The local economy primarily revolves around agriculture and fishing, utilizing the natural resources of Beels (wetlands) and rivers. The area is culturally diverse, with prominent communities such as Bodo, Garo, Rashbongshi, and Rabha, alongside various minority groups scattered across pockets of the region. This blend of cultural diversity and natural beauty makes Diplai Beel a significant tourist attraction and a vital part of the local livelihoods.

Collection and identification of fishes

A total of eight fish species were systematically sampled from Diplai Beel in Kokrajhar district throughout the year 2022. Following collection, the fish underwent a thorough washing process with tap water to eliminate any external contaminants. Identification of the fish species **were done by** established taxonomic keys (Talwar and Jhingran, 1991; Jayaram, 1999; Viswanath, 2002). The fish species were identified as *Ompok pabo, Nandus nandus, Glossogobius giuris, Macrognathus pancalus, Macrognathus aral, Osteobrama cotio, Channa gachua* and *Xenentodon cancila*.

Proximate analysis

Sample preparation

About 500 g of untreated fresh fish (wet weight, whole body) of *Ompok pabo* (n=50), *Nandus nandus* (n=14), *Glossogobius giuris* (n=32), *Macrognathus pancalus* (n=42), *Macrognathus aral* (n=14), *Osteobrama cotio* (n=50), *Channa gachua* (n=14) and *Xenentodon cancila* (n=20) were collected from Diplai Beel and brought to the laboratory as soon as possible.

The average length (L) and weight (W) of each individual fish were as follows: *Ompok pabo* (L=10.29±2.50 cm and W=9.30±1.50 g), *Nandus nandus* (TL=13.18±1.05 cm and W=33.39±2.45 g), *Glossogobius giuris* (TL=12.56±0.87 cm and W=15.93±1.54 g), *Macrognathus pancalus* (L=13.90±1.86 cm and W=11.80±1.50 g), *Macrognathus aral* (L=22.90±1.20 cm and 32.06±3.25 g), *Osteobrama cotio* (L=8.83±0.95 cm and W=9.87±1.40 g), *Channa gachua* (L=13.75±2.07 cm and W=30.72±2.35 g), and *Xenentodon cancila* (L=21.42±3.05 cm and W=25.03±2.07 g), respectively. The total length and total weight of the each selected individual fishes were measured carefully. After washing properly with tap water, the whole body fish are used for the purpose of the nutritional content studies and chopped into pieces by removing the faecal matter and dried on a hot plate for 12 h at 50±2°C and kept in hot air at 50^0c for 6 hours to remove the moisture completely. The dried fish were ground into powdered form using a mechanical grinder. Ash content was estimated using a muffle furnace at 450°C. The crude fiber content was estimated by acid and alkaline extraction methods (AOAC, 1990).

Moisture content

The moisture content analysis of fish samples involved employing a thermostat oven set at 105°C for a duration of 24 hour. This standardized method is recognized for its efficacy in determining moisture levels in biological tissues. The moisture content (%), expressed as a percentage of the wet weight of the tissue, was calculated using the formula:

$$\text{Moisture } \% = \left(\frac{\text{Wet weight of tissue} - \text{Dry weight of tissue}}{\text{Wet weight of tissue}}\right) \times 100$$

Here, the wet weight of the tissue refers to the initial weight of the fish sample before oven drying, while the dry weight of the tissue represents the weight of the sample after complete removal of moisture through drying at 105°C. This methodological approach ensures accurate quantification of moisture content, critical for nutritional assessment and quality evaluation of fish samples from Diplai Beel.

Crude protein

Crude protein was expressed as % protein per gm of dry tissue weight. A sample of 0.50 g of dry fish powder was subjected to a digestor for allowing it to digest. After performing digestion, the sample was distilled using a Kjeltec distillation unit (Pelican Equipment, Model: KES 12L-VA). This apparatus is designed to isolate the ammonia released during digestion from the digested sample. The distillation process involves neutralizes the digested mixture with a strong acid, letting for the assemblage of ammonia gas. The resulting distillate was then titrated with 0.2 N HCL to quantify total nitrogen content. Crude protein content was subsequently estimated by multiplying the total nitrogen value by a conversion factor of 6.25, by following the methodology (AOAC, 1990). The crude protein was expressed as a percentage of protein per gram of dry tissue weight.

Crude lipid

To determine the crude lipid of the fish sample, the weighed sample was dissolved with acetone in Soxhlet extraction unit. The lipid % was determined by following the formula (AOAC, 1990) and expressed as % weight per gm of dry tissue weight.

Lipid (%) = [(weight of lipid / weight of sample)] × 100.

The acetone is used an effective solvent for the exctraction of non-polar compounds like lipids and the precisely weighed fish sample is dissolved in acetone.The Soxhlet apparatus facilitates continuous cycling and maximizing solvent-lipid solubilization over extended periods. This quantitative analysis is essential for nutritional food quality assessment, and exploring metabolic processes in various fishes.

Ash content

The determination of ash content is an important investigative method in food science that provide understandings into the mineral composition of selected fish species. The fish samples were employed in the muffle furnace at a controlled temperature of 450°C and kept overnight. The higher temperature efficiently removes organic matter and retains inorganic residues, mainly minerals. After the completion of ash formation, the residual ash was carefully weighed. The ash content was then calculated using the following formula:

Ash content (%)=(weight of sample/weight of ash)×100

Here the weight of the ash indicates the mass of the inorganic residue found postcombustion and the weight of the sample indicates to the initial mass of the fish tissue studied. Expression of the ash content as a percentage suggests the comparisons of standards across different fish species and assists the calculations of their mineral content. Understanding ash content is indispensable, as it offers valued data about the mineral profile of fish, comprising significant elements such as calcium, phosphorus, magnesium, and trace minerals.

Methodolgy for mineral element analysis:

Sample preaparation:

The elemental analysis was carried out at the SAIF, NEHU, Shillong. The accurately weighed 5g of dried powdered fish sample was taken into a conical flask, and 10 ml conc. HNO_3 was added. Concentrated HNO_3 functions as a potent dissolving agent which is essential for the dissolution of organic matrices and the liberation of elemental constituents. The mixture was allowed to stand for 30 minute for pre-digestion under the fume hood. This pre-digestion phase expedites the initial breakdown of the organic material, reducing the risk of hazardous splattering during the heating phase.

Digestion procedure:

The mixture was heated on a hot plate at 60-70^{0}C for complete digestion of the fish sample. This controlled heating ensures complete digestion and solubilization of the fish sample's organic matter in HNO_3. Fresh acid was added to the flask and heated till the solution became completely transparent. The solution was dried to about 5 ml and the final volume was made up to 100 ml with distilled water.

Instrumentation:

The sample was analyzed using ICP-OES Analyzer. This method enables the simultaneous detection and quantification of various elements by evaluating the intensity and wavelength of light emitted from atoms (Enamorado-Báez et al., 2013).

Statistical analysis

All calculations were carried out in MS- excel. All biochemical experiments were carried out for three replicates (n = 3). Values are represented as mean ± standard deviation (SD).

RESULT AND DISCUSSIONS

The study observed that fish exhibit a significant amount of water content within their body. The moisture content ranged from 76.71% to 82.62%, indicating a relatively high water composition across different species. Notably, *Glossogobius giuris* exhibited the highest moisture content while the *Ompok pabo* showed the lowest content (Table 1). The existence of high moisture content in fish bodies has been documented in several studies (Mazumder et al., 2008). The moisture content in the eight indigenous fishes were found to be very similar with the findings of the Mustafa et al. (2022). In a similar study, Bogard et al. (2015) revealed that the moisture content of eight species ranged from 70.5% to 80.7%, respectively.

Similarly, the fishes also showed a substantial quantity of ash content. The study observed that the ash content ranges from 11.98% (*Macgrognathus aral*) to 24.25% (*Nandus*

nandus). A slightly higher ash content was reported in the present study compared to the findings of Sarkar et al. (2017) but lower than that of the findings of Flowra et al. (2012). Moreover, the ash percentage varies from *Barilius barna* (1.28%) to *Neolissochilus hexagonolepis* (3.20%). Contrary to the present finding, Ahmed et al. (2012) reported the ash content of *Puntius sophore* and *Cyprinus carpio* ranging from 0.26 to 3.56%.

Table 1. Proximate composition of selected fish species of Diplai Beel (per 100 g dry weight)

Name of fishes	Moisture* (%)	Ash (%)	Protein (%)	Carbohydrate (%)	Fat (%)	Fiber (%)
Ompok pabo	78.12±2.68	12.31±3.50	60.27±3.23	7.45±1.09	16.73±1.17	0.81±0.07
Nandus nandus	77.81±2.59	24.25±4.70	58.24±1.98	7.26±1.76	5.58±0.97	0.50±0.06
Glossogobius giuris	82.61 ±2.10	17.23±3.60	66.49±2.78	7.70±1.01	3.34±0.86	0.24±0.02
Macrognathus pancalus	78.49±1.28	12.07±2.65	65.76±1.66	8.15±0.91	9.71±1.09	0.89± 0.05
Macrognathus aral	76.80±2.63	11.98±1.95	67.80±2.09	6.00±0.87	9.14±1.87	0.45±0.07
Osteobrama cotio	81.32±3.67	14.99±1.78	64.81±1.82	2.64 ±0.51	12.63±2.09	0.43±0.01
Channa gachua	76.71±1.80	18.59±2.45	65.43±1.56	2.60 ±0.31	9.09±1.04	1.11±0.03
Xenentodon cancila	79.23±2.80	16.38±2.11	70.25±2.78	3.04± 0.12	5.54±0.62	0.38±0.08

Values represented as mean ±SD. *moisture content was estimated from fresh wet tissue weight (whole body of fish)

Current study shows that protein concentrations range from 58.24% to 70.25% with an average of 64.88% (Table 1). The protein content of *Channa* species collected from Assam, Arunachal Pradesh, and Manipur ranged from 28.63% to 53.84%, as reported by Hazarika et al. (2016). In comparison, Sultana et al. (2011) documented that the protein content of seven different fish species ranged from 52.65% to 72.45%. The differences in protein content highlight the potential for significant interspecies variation in protein content, which may be influenced by factors such as species-specific metabolic rates, ecological conditions, and dietary intake. These findings underscore the importance of species selection in nutritional assessments and dietary content, as variations in protein content can impact the overall nutritional value and potential health benefits derived from fish consumption. In another study, the protein concentration of five selected dried fish species was found to range from 44.08% to 65.65% (Flowra et al., 2012). The freshwater fish collected from Hel River, Kokrajhar, Assam showed lower protein content in *Rajamas bola* (21.91%), and high content in *Garra gotyla* (29.33%) (Sarkar et al., 2017). The total protein amount of the ten different freshwater fish species collected from different local markets in Tripura was reported to range from 12.89% to 16.75%, with the maximum amount of protein in *Amblypharyngodon mola* and *Macrognathus pancalus* and the least amount in *Esomus danricus* and *Chanda nama,* respectively (Jena et al., 2018).

Unlike protein content, carbohydrate content was found to be very low. Such low carbohydrate content could be a sign of ecological obligations or feeding strategies that have limited their capacity to store energy. The average carbohydrate content was found to be 5.60

g per 100 g of dry fish. The lowest and highest carbohydrate concentrations were reported in *Channa gachua* (2.60%) and *Macrognathus pancalus* (8.15%) respectively. Similarly the carbohydrate content of *Tenualosa ilisha* collected from the east coast of India **was** found to be 3.91% (Acharya et al., 2022). The percentage of the carbohydrate content of Tista and Baral river fish species in Bangladesh was reported to be ranges from *Ompok pabda* (1.37%), *Ailia coila* (2.51%), *Puntius sophore* (3.16%), *Rita rita* (3.22%), *Nandus nandus* (5.10%), *Barilius barila* (5.79%), *Anabas testudineus* (8.44%), *Eutropiichtyes vacha* (9.91%), and *Macrognathus pancalus* (21.41%) **respectively** (Ferdousi et al., 2023).

Among the eight fish under investigation, the percentage of fat content ranges from 3.34% (*Glossogobius giuris)* to 16.73% (*Ompok pabo*), and the average fat was reported to be 8.97% (Table1). Knowing the variation of lipid composition of the different fish species is useful for us because fat content is a critical factor that influence both nutritional value and culinary applications. More study could explore the consequences of these lipid levels on the benefits of health in humans. Many other studies also reported almost similar fat content in fish (Hazarika et al., 2016). Hussain et al. (1992) revealed the fat concentration of 23 fish in the range of 3.70% to 17.80% respectively. Another study by Sarkar et al. (2017) reported the fat content of the fish collected from the Hel River of Kokrajhar ranging from 13.51% (*Barilius barna*) to 29.85% (*Cyprinion semiplotum*), respectively.

Fiber is another essential component of healthy food. The average fiber content of the eight selected fish species were found to be 0.60%. The highest fibre content was repoted in *Channa gachua* and lowest in *Glossogobius giuris* (Table 1). A study by Adeniyi et al. (2012) reported that the crude fiber content of three fish species with an average percentage of 2.35%, which is higher than the average percentage of the present studies (0.60%) (Table 1). They found the fiber content to be 1.96% (*Clarias gariepinus*), 2.43% (*Malapterurus electricus),* and 2.65% (*Tilapia guineensis),* respectively, while the present study reveals varying concentrations from 0.24% to 1.11% in eight investigated fishes (Table 1). Sapkota (2022) also estimated the quantitative value of fiber content of small indigenous fish of the Budhi Rapti River, Chitwan, Nepal (*Puntius ticto*, *Puntius conchonius*, *Mystus tengara*, *Barilius bendelisis, and Acanthocobitis botia*) which was reported to range from 1.17 to 7.42% respectively.

The mineral content of all the eight fish species is measured in fresh wet weight which is presented in Table 2. Seven elements were analyzed in the present study. In comparison to other elements, Na and K were found to be the most abundant in all eight fish species. Of the seven elements, Na, Mg, and K showed higher concentration compared to Ca, Zn, and Fe respectively. Co showed the lowest value, detected only in two species, *Nandus nandus* and *Glossogobius giuris*. The Na content was found highest in amount among all the fish species followed by K, Mg, and Ca respectively.

The Na content ranged from 126.58 ppm to 569.24 ppm with an average of **262.45** ppm. *Ompok pabo, Nandus nandus, Glossogobius giuris*, and *Macrognathus pancalus* showed higher Na concentration compared to other species followed by K content (Table 2). In the present study, the magnesium (Mg) content of eight fish species was quantitatively assessed that reveals a remarkable variation in concentration across the studied fishes. The magnesium levels ranged from a minimum of 13.68 ppm) to a maximum of 87.23 ppm among the eight investigated fish species. This inconsistency advocates probable differences in dietary intake, environmental factors, or biological characteristics among the species studied. Such findings add to our understanding of the nutritional profiles of these fish and may have consequences for both ecological studies and human health, particularly in contexts where fish serves as a dietary home of indispensable minerals. Further research into the factors prompting Mg accumulation in these species could offer valuable understandings into their natural balance and biochemistry. The following minced edible part of fish were also found to have high magnesium contents: *Sperata seenghala* (270 ppm), *Puntius sophore* (378 ppm), *Tenualosa ilisha* (383 ppm), *Amblyparyngodon mola* (402 ppm*), Mugil cephalus* (1420 ppm), *Lates calcarifer* (1498 ppm), *Ailia coila* (1600 ppm), and *Xenentodon cancila* (2200 ppm) in wet weight, respectively. (Mohanty et al., 2016). Whereas the Ca content of the present studies among the eight fish species are reported to be significant difference ranging from 0.08ppm to 6.37ppm having a mean value of 2.10ppm.

The variation in calcium levels may result from many environmental conditions of aquatic habitat, particular food habits and physiological conditions of the fishes that influences the accumulation of minerals in their body for different physiological responses. Among the eight fish, the average concentration of K was found to be 232.46 ppm, where the minimum and maximum values vary from 160.00 ppm to 398.13 ppm. In contrast to our results, Gopakumar (1997) reported that the mean K concentrations were, in order, 1320 ppm in *Labeo rohita,* 1620 ppm in *Catla catla*, 1700 ppm in *Cirrhinus mrigala*, and 4270 ppm in *Tenualosa ilisha* respectively.

In the present study, Zn was detected lowest in *Macrognathus pancalus* (0.15 ppm) and highest in *Xenentodon cancila* (4.18 ppm) (Table 2). Shantosh and Sarojnalini (2018) estimated the mineral contents in three different fish species, assessing the amount of Zinc in *Lepidochephalichthys guntea* (30.05 ppm), *Pangio pangia* (15.90 ppm), and *Syncrossus berdmorei* (14.00 ppm), respectively. Zinc levels was also demonstrated a remarkable variations in different fish species that ranges from 23.5 ppm in *L. rohita* to 154.4 ppm in *E. danricus* respectively (Debnath, C., et al., 2014).

In the previous study, zinc content was reported to be at concentration of 0.36 ppm while the iron concentration in *Glossogobius giuris* demonstrated at a concentration of 11.88 ppm which is higher than that of zinc content. On the other hand, *Puntius chola* revealed the presence of considerably higher zinc content at 1.77 ppm and also a high iron concentration of 17.6 ppm was reported . The greater zinc concentration in *Puntius chola* may specify a nutritive preference or enriched bioavailability of zinc sources within its environment, which could add to better enzymatic and metabolic functions. In contrast, the lower zinc levels in *Glossogobius giuris* may indicate limitations in dietary sources or ecological factors affecting zinc uptake.(Mayanglambam and Chungkham., 2018).

Table 2. Mineral contents of eight fish species from Diplai Beel, Kokrajhar

Name of the fish	**Mineral contents (ppm)**						
	Na	Mg	K	Ca	Zn	Fe	Co
Ompok pabo	289.54	14.12	160.00	0.98	0.23	2.51	Nd
Nandus nandus	307.46	15.91	167.52	2.37	0.19	1.69	0.01
Glossogobius giuris	569.24	21.66	276.56	0.08	0.30	1.63	0.01
Macrognathus pancalus	325.45	13.68	209.62	6.37	0.15	2.52	Nd
Macrognathus aral	125.06	45.66	310.26	4.70	1.48	3.97	Nd
Osteobrama cotio	126.58	87.23	398.13	0.31	2.76	2.14	Nd
Channa gachua	160.00	57.27	273.24	0.33	1.91	1.69	Nd
Xenentodon cancila	186.16	73.23	364.36	1.62	4.18	6.66	Nd

Nd - not detectable range; whole body tissue was minced for the determination of mineral analysis. Measurement of weight is taken in fresh wet weigth in ppm.

Similarly, the Fe content was found to range from **1.63 to 6.66** ppm in the present study (Table 2). *Glossogobius giuris* was found to have the lowest amount of Fe (1.63 ppm), but the highest concentration of that trace mineral was found in *Xenentodon cancila* (6.66 ppm) (Table 2). Fe is also detected in abundant amounts in *Macrognathus pancalus*(2.52 ppm) and *Macrognathus aral* (3.97ppm) comparatively than the other investigated fishes. There are reports that the various dried fish species that are harvested from Bangladesh's Padma River contain high levels of iron, ranging from 168.50 ppm to 452.00 ppm (Sultana et al., 2011). Iron content was also reported to be even greater variability between the *C. catla* with a concentration of 91.8 ppm and a markedly higher concentration of 997.7 ppm in *Colisa fasciata*, signifying the probable alterations in their metabolic mandate or environment (Debnath, 2014).

In the present study, the bioaccumulation of cobalt (Co) in selected fish species was detected at a concentration of 0.01 ppm in both *Nandus nandus* and *Glossogobius giuris,* however Co was not detected in the other selected fishes which includes *Ompok pabo*, *Macrognathus pancalus*, *Macrognathus aral*, *Osteobrama cotio*, *Channa gachua*, and *Xenentodon cancila,* respectively. This finding shows the possible for these species to accumulate trace metals in their tissues that may have consequences for both ecological health and human consumption. The absence of measureable levels of Co in these species submits a poorer predisposition for bioaccumulation or perhaps lower exposure to cobalt in their respective aquatic habitats. These results highlight the necessity for further research into the ecological factors prompting accumulation of cobalt in the studied fish. Similar finding to our research, the Co content of *Alosa braschnikowi* was reported to be **0.01** ppm (Sattari et al., 2020). The edible tissues of rainbow trout (*Oncorhynchus mykiss*), both farmed and wild, have varying concentrations of Cobalt, while the liver and muscles have concentrations ranging from 960 ppm to 998 ppm respectively (Fallah et al., 2011).

4. CONCLUSION

The present study investigated the nutritional content and mineral composition of eight selected fish species collected from Diplai Beel of Kokrajhar, Assam that possesses high moisture content which ranges from 76.71% to 82.62% and higher protein levels with 58.24% to 70.25% that establish these species as valuable protein sources for human consumption. However fat content was moderately low ranging from 3.34% to 16.73% and the occurrence of indispensable minerals, mostly sodium and potassium highlights their nutritional significance. Remarkably, the outcomes also specify considerable unevenness in mineral concentrations among species, with magnesium and calcium revealing noticeable differences influenced by ecological and dietary factors. Moreover, the comparative analysis of trace minerals such as zinc and iron designates species-specific nutrient profile that reflects the ecological adaptations and dietary habits. However, further studies need to be carried out to explore the vitamins, essential fatty acids, amino acids, etc. as well as secondary metabolites from fishes to establish their health benefits. Overall, this study contributes to our understanding of the nutritional value of indigenous fish species, emphasizing their role in human diets and the potential for further research into their health benefits and ecological significance.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest, financial or otherwise.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Not applicable.

HUMAN AND ANIMAL RIGHTS

No animals/humans were used for studies that are the basis of this research.

CONSENT FOR PUBLICATION

Not applicable.

AVAILABILITY OF DATA AND MATERIALS Not applicable.

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ABBREVIATIONS

ICP-OES: Inductively coupled plasma–optical emission analyser; SAIF: Sophisticated Analytical Instrumentation Facility; NEHU: North eastern Hill University; FQCL: Food quality control laborabory; AOAC: Association of Official Agricultural Chemists; SERBDST: Science and engineering research board- Department of science and technology; Nd : Not detectable

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