



## Behavioural patterns related to the marine fish consumption- An analysis of coastal belt households, Noakhali, Bangladesh

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**Abstract.** Marine fish is a major source of Omega-3 fatty acids (Eicosapentaenoic acid, EPA and Docosahexaenoic acid, DHA), which are now recognized worldwide as a key factor in human health. The present study was conducted to depict the status of marine fish consumption in three districts (namely Feni, Lakshmpur, and Noakhali) of greater Noakhali district, Bangladesh using a questionnaire survey in 240 households during the month of May-June, 2018. Almost all the households (96%; n=230) consumed marine fishes. Price, availability, presence of inter-muscular bones, and characteristic fishy smell were the major barriers to marine fish consumption in the studied area. The average quantity of fresh and dried marine fish consumed was 53.35 g/capita/day and 3.71 g/capita/day, respectively in greater Noakhali. Marine fresh fish consumption in the three districts differed significantly ( $p < 0.001$ ). The highest ( $80.20 \pm 32.72$  g) and the lowest ( $40.02 \pm 27.90$  g) amount of marine fresh fish consumption were observed respectively, in Lakshmpur and Feni district and the highest ( $4.19 \pm 7.47$  g) and the lowest ( $3.47 \pm 4.87$  g) amount of dried marine fish consumption were observed respectively, in Feni and Noakhali district. About 32% of consumers consumed marine fresh fish 3 to 6 times in a week whereas 46% of consumers consumed dried fish once in a month. Consumers belonging to high-income households consume more marine fish (57.11 g) than the low-income households (49.33 g). *Harpadon nehereus*, *Tenualosa ilisha*, *Otolithes cuvieri*, *Polynemous paradiseus*, *Mugil cephalus*, *Oxyurichthys microlepis*, and *Sillago domina* were among the most frequently consumed marine fishes in the studied areas. About 76% of respondents perceived eating marine fish was good for health. Increased availability, lower price and creating awareness on health benefits may lead to increasing marine fish consumption among local people in the region.

**Keywords:** Marine fish, Consumption behavior, Noakhali

### Introduction

Fish consumption has always been an essential part of daily meal of the Bangladeshi people. The enormous variety of fisheries resources of both marine and freshwater has offered rise to a strong fish consumption behavior in most region of the country (DoF 2016). Especially, marine fish serves as an important food source and an increasing consumption rate of seafood is observed in coastal regions of the world (Burger *et al.* 2014, NOAA 2004). A notable progress has been observed regarding fish consumption in Bangladesh. Currently, the fish consumption rate is 62.58 g/capita/day that was 49.5 g/capita/day in 2010 (BBS 2017), which denotes a positive change regarding fish consumption in Bangladesh. However, all those data were for fresh water fish consumption. Bangladesh is a country with one of the highest rates of kid and maternal deficiency disease in the world (UNICEF 2008). Nutritionist and food scientist believe that better health of people can be ensured quickly and economically through greater consumption of fish (Borgstrom 1962). Being a unique source of essential nutrients, fish can serve an important function in contribution to nutrition (FAO 2016); particularly in Bangladesh

where removing malnutrition is a major challenge, the country has long been facing (Bogard *et al.* 2015). Marine fish exhibits a good combination of protein, vitamin and minerals (Tacon and Metian 2013). Several studies showed that omega-3 fatty acids are abundantly found in marine fishes (Özogul and Özogul 2007, Brunner *et al.* 2008, Huynh and Kitts 2009). One of the most beneficial features of marine fish consumption is that only marine fish provide iodine along with other seafood, which is essential to prevent enlargement of thyroid gland (goiter) and mental retardation in children (Mohanty 2011). Since marine fish provide quality protein and essential nutrients as well, the habit of marine fish consumption more frequently can help the people to get alleviated from nutrient deficiency and can play a remarkable role through fulfilling the protein requirements of coastal people as well as providing them with essential minerals.

Being a coastal region, marine fishes of different variety are found in greater Noakhali district, which help the people to enjoy the advantages of consuming marine fish more frequently than other regions of Bangladesh far from the coast. In Bangladesh a lot of researches have been conducted on fish consumption particularly on freshwater fish and interestingly consumption of marine fish although having significant impact on human health has so far been overlooked more specifically in greater Noakhali district. Therefore, this research aimed to find out the status and causes of variations in marine fish consumption in different Upazilas of greater Noakhali district, subsequently to compare the present findings with other findings of freshwater and marine water fish consumption in different countries.

### Materials and Methods

Marine fish consumption was estimated by conducting a household survey in 20 Upazilas under Feni, Lakshmipur and Noakhali district with a questionnaire during May and June 2018 (Fig. 1). A well-structured questionnaire was developed with a vision to enlisting all the information related to the marine fish consumption. The questionnaire focused responses on household details of respondent, household marine fish consumption, consumer's knowledge and preference, and consumer's attitude towards marine fish consumption. The questionnaire included open-ended questions which allowed respondents to express themselves freely while the close-ended questions consisted of Likert scaled questions to assess the attitudes of respondents. Finally, the questionnaire was developed that allowed each respondent to answer all the questions comfortably and confidently without any hesitation.

***Study area and sample selection criteria:*** The study was conducted in greater Noakhali region which consists of three districts namely Feni (22.9409° N, 91.4067° E), Lakshmipur (22.9447° N, 90.8282° E) and Noakhali (22.8724° N, 91.0973° E). Total 240 households were surveyed on marine fish consumption. The respondents were categorized into three income categories (viz. low-income, medium-income, and high-income) based on the monthly household income. Households were classified according to PPRC Governance and Economy Survey, 2015 and income ranges (income/year/HH) for low-income (BDT 10,657-25,763), medium-income (BDT 25,763-147,388), and high-income (BDT >147,388) groups are parenthesized. In each Upazila, 12 households were selected through stratified sampling based on three income classes and one person from each household was interviewed who provided all the information as a representative person of the respective household.

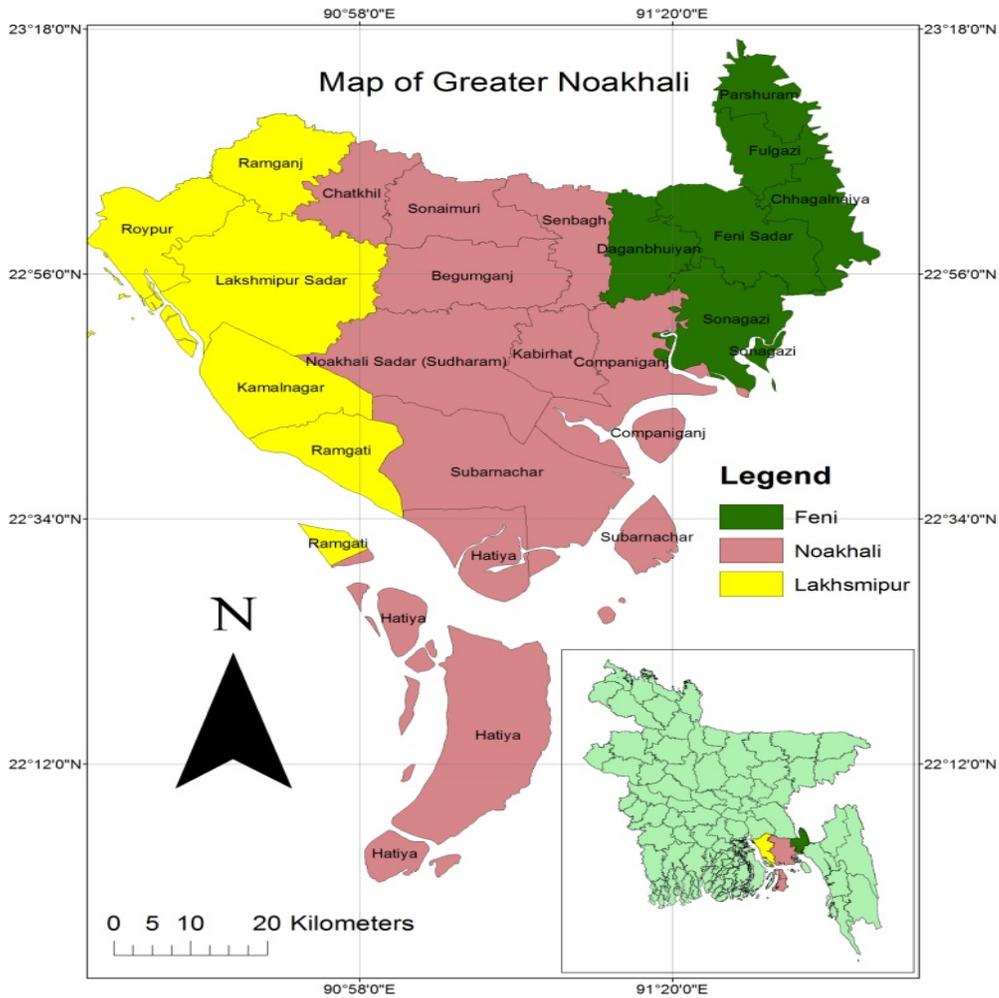


Fig. 1. Map of the study area showing the location of each Upazila of greater Noakhali district.

**Data collection:** As the current study focused mainly on gathering information regarding marine fish consumption from the local people in greater Noakhali district, the primary data were collected through person to person interviews using the pre-designed questionnaire in each Upazila of greater Noakhali district. Although the questionnaire was developed in English, the respondents were interviewed in Bangla so that they could provide information comfortably. The data collector visited each respondent's house for conducting this survey.

**Method of determining the consumption rate:** To determine the marine fish consumption among household members, 7-day household fish consumption recall method was used to collect relevant fish consumption data from the respondents. Respondents were asked to mention if any marine fish had been consumed by the household members, and if so, how much of fish had been consumed during 7-days. In this research, respondents were also asked about quantity of

marine shellfish they consumed. All the respondents mentioned only about *Penaeus monodon*. Therefore the amount of shellfish consumed was included in the fresh finfish consumption section. The average fish consumption rate (g/capita/day) was estimated using the following formula:

$$W_{fr} = \frac{w_{fc} \times 1000}{n \times 7}$$

where  $W_{fr}$  is the marine fish consumption rate (g/capita/day),  $w_{fc}$  is the amount of fish consumed by a household per week,  $n$  is the number of members in the household and 7 represents the no of days in a week.

**Data analysis:** All the collected information were scrutinized and summarized carefully before the ultimate tabulation. Data from the questionnaires were computerized using Microsoft Access software. A program was designed to allow the data entry in the sample order and format that the information appeared in the questionnaire. The general tables and descriptive statistics (ANOVA, Pearson correlation) were carried out using MS Excel & SPSS respectively.

## Results and Discussion

**Household details:** Household details of respondent represents important socioeconomic characteristics such as residential area, household status, household size, level of education, occupation, etc. In the present research, 68% of respondent were from rural areas whereas the rest 32% were from urban areas (Table I). Household status denoted the financial situation of a household and the household of respondents were categorized into low-income, medium-income, and high-income, based on the household income. However, a significant relationship between consumer's household income status and fish consumption rate was revealed from the findings.

**Table I.** Household details of respondents interviewed in greater Noakhali district

Profiles	Levels	% of respondents
Residential Area	Rural	68%
	Urban	32%
Household Status	Low-income	33%
	Medium -income	33%
	High-income	33%
Household Size	Small (1-3)	8%
	Medium (4-6)	33%
	Large (>6)	59%
Levels of Education	Primary	33%
	Secondary	32%
	Tertiary	29%
	Others	6%

Household size was another determinant of consumption rate at household level. It was found that 59% of households were large-sized (>6 members), about 33% households were

medium sized (4-6 members) and the rest of 8% households were small sized (1-3 members) respectively (Table I). As most of the respondents interviewed were from rural areas, respondents belonging to large-sized household dominated in the study areas. According to BBS (2017), the average household size was 4.47 persons in Chittagong division and households in rural areas were comparatively large-sized than the households in urban areas. Higher educated person remain concerned about the health benefits of fish consumption whereas less educated person consider it as a minor issue. It was found that respondents with primary education have the maximum percentage of distribution (33%), which followed by with a minimum of no formal education observed about 6% (Others). About 32% of respondents have secondary (up to SSC level) education while about 29% respondents were interviewed having a tertiary education (above HSC) (Table I).

**Marine fresh fish and dried fish consumption:** Households consumed marine fresh fish mostly, but there were some households where dried fish was preferred over fresh fish. Almost all the households (96%) consumed marine fresh fish whereas 80% of households (n=192) consumed marine dried fish. Price, consumer's behavior, smell, availability, bones were the major barriers to marine fresh fish consumption while quality remained a major issue in case of dried fish consumption (Fig. 2). Apart from socioeconomic parameters, consumer's fish consumption is driven by major parameters such as quality, price, smell, taste and nutrition (Olsen 2001, Olsen 2004, Verbeke and Vackier 2005, Grieger *et al.* 2012). Now-a-days, consumers remain concerned about the misuse of chemicals (e.g., using formalin on fish) during the handling, processing, and preservation of fish, knowledge of these unsafe handling processes may resist them to consume fish (Redmond and Griffith 2005).

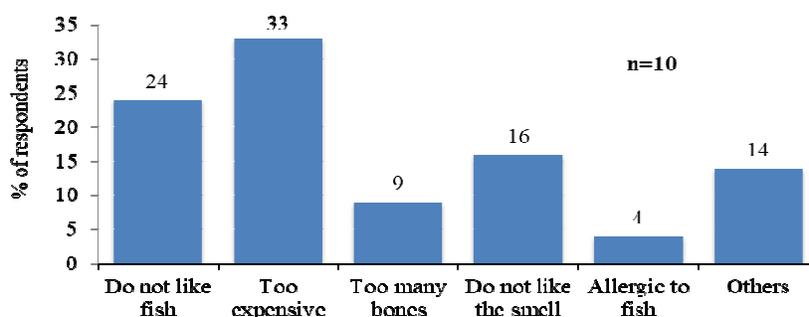


Fig. 2. Reasons for not consuming marine fish.

The average marine fresh and dried fish consumption rates were estimated 53.35 g/capita/day and 3.71 g/capita/day in greater Noakhali district, respectively (Table II). In Feni, Lakshmipur and Noakhali districts, fresh fish consumption rate was found 40.02g, 80.20g and 46.64g respectively, whereas dried fish consumption rate was 4.19g, 3.54g, and 3.47g respectively, (Table II). A Tukey post hoc test revealed that marine fresh fish consumption rate was significantly higher in Lakshmipur district after comparing Feni ( $40.02 \pm 27.90$  g/capita/day,  $p < 0.05$ ) and Noakhali ( $46.64 \pm 24.90$  g/capita/day,  $p < 0.05$ ) districts to Lakshmipur district ( $80.20 \pm 32.72$  g/capita/day). There was no statistically significant difference

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in average marine fish consumption rate between Feni and Noakhali districts ( $p= 0.167$ ) (Table III).

**Table II. Marine fresh and dried fish consumption rate (g/capita/day) observed in the study areas (including shellfish)**

Name of district	of	Name of Upazilas	Consumption rate (g/capita/day)							
			Mean		Maximum		Minimum		Standard deviation	
			Fresh fish*	Dried fish*	Fresh fish	Dried fish	Fresh fish	Dried fish	Fresh fish	Dried fish
Feni		Chhagalnaiya	43.65	13.68	87.30	35.71	12.99	0.22	21.06	12.56
		Daganbhuiyan	30.53	1.07	47.62	4.46	5.95	0.20	11.97	1.46
		Feni Sadar	46.97	1.16	164.84	3.57	3.97	0.09	44.03	1.14
		Fulgazi	34.28	2.03	85.71	5.95	5.95	0.35	23.93	1.88
		Parshuram	26.47	5.91	40.82	20.41	9.52	0.24	11.70	7.49
		Sonagazi	52.75	1.22	111.11	2.98	11.90	0.22	31.17	0.97
		Total	40.02	4.19	164.84	35.71	3.97	0.09	27.90	7.47
Lakshmipur		Kamalnagar	99.56	3.41	142.86	7.14	47.62	0.28	29.58	2.57
		Lakshmipur Sadar	65.19	3.92	126.98	11.16	28.57	0.99	32.76	3.57
		Raipur	84.45	6.53	142.86	14.28	47.62	1.49	24.26	4.57
		Ramganj	66.14	2.50	119.05	5.95	19.48	0.22	28.10	2.08
		Ramgati	84.40	1.34	178.57	2.98	30.08	0.19	39.06	0.10
		Total	80.20	3.54	178.57	14.28	19.48	0.19	32.72	3.44
Noakhali		Begumganj	31.37	3.35	71.43	5.95	5.95	0.56	26.34	2.01
		Chatkhil	42.78	3.16	53.57	4.46	31.75	0.74	7.47	1.40
		Companiganj	51.74	5.96	60.44	39.68	39.68	0.64	5.76	12.09
		Hatiya	60.71	4.02	107.14	8.93	23.81	0.99	19.51	3.42
		Kabirhat	49.23	1.56	60.44	3.25	38.96	0.81	6.31	0.88
		Noakhali Sadar	53.73	3.00	171.43	5.95	5.95	0.71	47.87	1.71
		Senbag	28.46	3.17	47.62	8.93	11.90	1.12	11.87	2.36
		Sonaimuri	26.60	4.03	35.71	8.93	7.14	1.27	9.45	2.99
		Subarna Char	72.93	1.97	103.90	3.57	44.64	0.40	19.44	1.27
	Total	46.64	3.47	171.43	39.68	5.95	0.40	24.90	4.87	
Grand total			53.35	3.71	178.57	39.68	3.97	0.09	32.05	5.47

\*including the amount of marine shellfish (*Penaeus monodon*) consumed

**Table III. Multiple comparison (Post hoc test) on the average marine fish consumption rate (g/capita/day) among three districts of greater Noakhali**

District (I)	District (J)	Mean Difference (I-J)	Standard Error	Sig.	95% CI	
					Lower bound	Upper bound
Feni	Noakhali	-12.27716	8.86226	.167	-29.7400	5.1857
	Lakhsmipur	-76.95744*	10.10811	.000	-96.8752	-57.0397
Lakhsmipur	Feni	76.95744*	10.10811	.000	57.0397	96.8752
	Noakhali	64.68029*	9.17940	.000	46.5926	82.7680
Noakhali	Feni	12.27716	8.86226	.167	-5.1857	29.7400
	Lakhsmipur	-64.68029*	9.17940	.000	-82.7680	-46.5926

\*The mean difference is significant at the 0.05 level

Consumers' attitude, availability of marine fish, geographical location, and season were the key determinants of marine fish consumption in this region. Although the estimated result was exclusively on marine fish consumption rate in greater Noakhali district, it is consistent with the findings of Belton and Thilsted (2014), where they reported that fish consumption rate was 51.23 g/capita/day in Bangladesh. According to BBS (2017), average fish consumption rate was 62.58 g/capita/day in Bangladesh. Marine fish contribute to per capita total fish consumption in the coastal regions within each country; the actual consumption rate is higher than the national data published (Mohan *et al.* 2005). In global context (FAO 2016), the world per capita fish consumption was 54.79 g/capita/day (20 kg/year), which is very much similar with the present finding. Belton and Thilsted (2014) reported that the annual fish consumption in China, Philippines and Myanmar was 31.6 kg (86.58 g/capita/day), 35.8 kg (98.08 g/capita/day) and 50.4 kg (138.08 g/capita/day) respectively. Geographical location influence the fish consumption of any country and marine species appeared to dominate household fish consumption in countries with long coastlines like Philippines and Malaysia (Dey *et al.* 2008).

Consumption rate also varied in different Upazilas of greater Noakhali district. The people of Kamalnagar Upazila under Lakhsmipur district consumed the highest ( $99.56 \pm 29.58$  g), whereas the people of Parshuram Upazila under Feni district consumed the lowest ( $26.47 \pm 11.70$  g) amount of marine fresh fish (Table II). In case of marine dried fish, the highest ( $13.68 \pm 12.56$  g) and the lowest ( $1.07 \pm 1.46$  g) amount of fish consumption was observed respectively in Chhagalnaiya and Daganbhuiyan Upazilas under the Feni district (Table II). Places adjacent to coastal belt are blessed with more accessibility and availability of marine fish. Coastal dwellers get more opportunities to consume marine fish than others. In Lakhsmipur district, researchers observed the dominance of marine fishes in the local markets. This dominance occurred due to the easy access of marine fish to the local markets which may ultimately reflected in the strong marine fish consumption attitude among the people of Lakhsmipur district. A completely different scenario was observed in Feni district as cultured fish species dominated in this region. Households with personal homestead pond showed less interest in marine fish, as they often capture and consume fish from the pond. Therefore, households having homestead ponds comparatively consumed less marine fish, as homestead ponds influenced the household fish consumption (Roos *et al.* 2003). In contrast to fresh fish, marine dried fish consumption rate was higher in Feni district among three districts of greater Noakhali. However, consumption rate varied greatly among different Upazilas of greater

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Noakhali districts for various reasons. As dried marine fish consumption is subjected to consumer preference and attitude; some consumers preferred dried marine fish rather than fresh fish (Siddique *et al.* 2012). Needham and Funge-Smith (2014) reported that inhabitants of Chittagong division eat dried fish of marine origin exclusively with an average of 2.02 g/capita/day. Although dried fish is a part of our culture, people around the world like it for its nutritional value, taste, and flavor (Siddique *et al.* 2012), but most of the consumers inquietude about its quality. The production process of dry fish may influence the consumption, as consumers become aware of the health issues more than ever (Siddique and Aktar 2011).

The frequency of consumption illustrated how often consumers were used to consume fish on the daily, weekly and monthly basis. About 32% of consumers consumed marine fresh fish 3 to 6 times a week while 28% of consumers kept marine fish in their daily diet. But a completely reverse scenario was observed in dried marine fish consumption, as 46% of respondents consumed dried marine fish at least once a month and only 6% of respondents consumed daily (Fig. III). Availability of improved refrigeration facilities helped consumers to consume marine fish more frequently. Belton *et al.* (2011) described that 98.5% of households consume fish on at least one occasion, and 60% eat fish at least every second day.

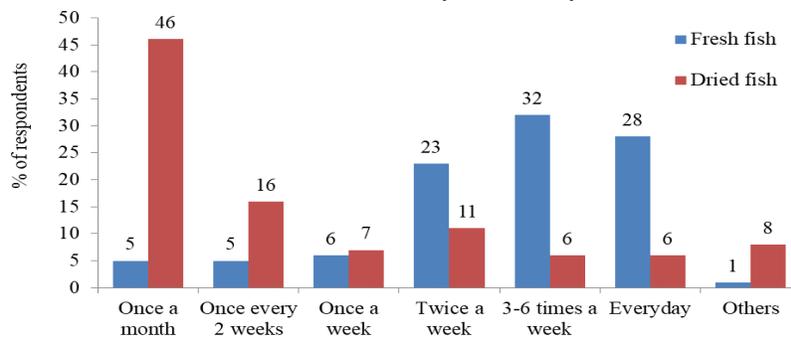
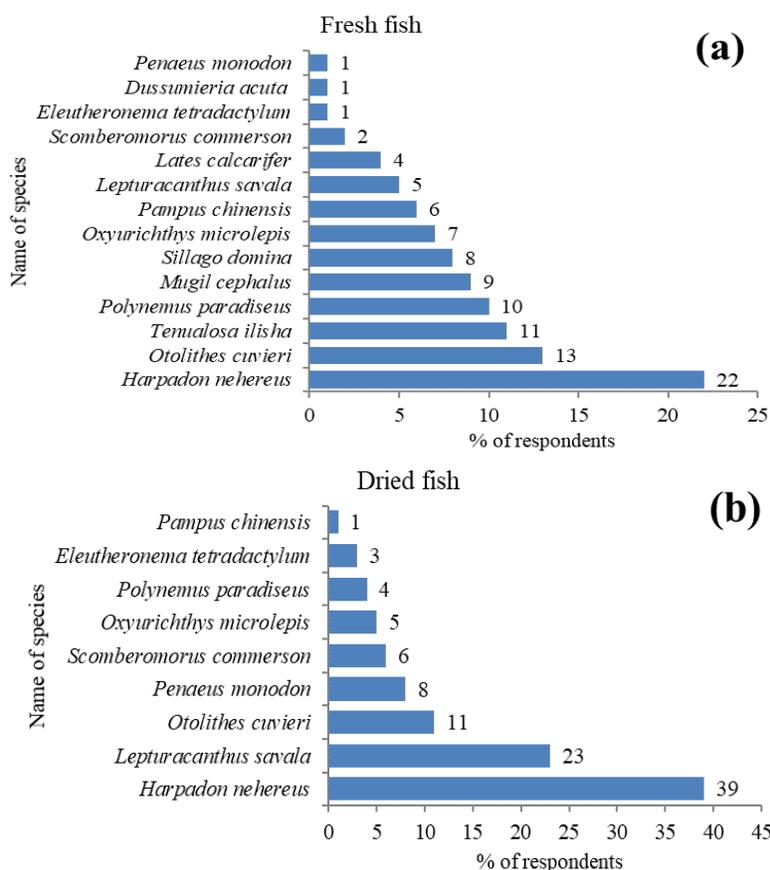


Fig. 3. Frequency of marine fresh and dried fish consumption.

*Harpadon nehereus* was the most frequently consumed marine fish in both fresh and dried form. Dried *H. nehereus* was the popular dried fish in greater Noakhali as 39% of consumers mentioned it as the most consumed species. Besides, *Otolithes cuvieri*, *Polynemus paradiseus*, *Lepturacanthus savla*, *Penaeus monodon* were consumed in both forms. Although *Tenualosa ilisha* is one of the most expensive marine fishes, 11% of consumers preferred it for its taste (Fig. IV). Consumer's preference for fish varies across species and geographical location (Bose and Dey 2007, Mohan *et al.* 2005). Hossain *et al.* (2013) reported that dried fish are consumed all round the year and a wide variety of marine fishes like *Harpadon nehereus*, *Lepturacanthus savala*, *Otolithes cuvieri*, *Oxyurichthys microlepis*, *Pampus chinensis*, *Eleutheronema tetradactylum* are dried in the coastal regions of Bangladesh.



**Fig. 4.** Fish species most frequently consumed by the consumers (a) fresh and (b) dried.

**Marine fish consumption among three income groups:** Several studies revealed that the most considerable reason of the variation in marine fish consumption rate occurred due to the variation in the financial status of the households. Part of the present research found that the high-income people consume the highest (57.11 g) whereas low-income people consume the least (49.33 g) amount of marine fish (Table IV). Pearson correlation analysis found a significant ( $r=-.33$ ,  $p< 0.01$ ) relationship between household income status and fish consumption rate.

**Table IV.** Marine fish consumption rate of three income groups observed in greater Noakhali district

District	Fish consumption rate (g/capita/day)		
	Low income	Medium income	High income
Feni	39.14	42.94	37.91
Lakhsmipur	76.02	81.92	82.45
Noakhali	40.38	43.56	55.81
Total	49.33	53.21	57.11

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Consumers belonging to high-income households consume more marine fish than the low-income households. Fish is considered as costly and per capita fish consumption increases with the higher income (Mohan *et al.* 2005). The price of marine fishes are comparatively higher than the freshwater fishes, which drives the intention of low-income people to purchase and consume freshwater fishes more frequently. Low-income households tend to spend more portion of their income on other food items rather than expensive marine fish, as they mostly consume low priced freshwater fish (Mohan *et al.* 2005, Dey *et al.* 2010). Moreover, they consider some marine fishes like hilsa as luxury commodities while the high-income households simply consider them as delicious food items (Dey *et al.* 2008). However, the supply of some marine fishes has decreased in contrast to increased price (Toufique and Belton 2014), which may result the lower consumption rate among poorer people. There are several factors influence purchase and consumption of marine fish among three income groups. Consumers of three income groups perceived more or less similar attitude about the health benefits of marine fish. High-income and medium-income households prioritize the freshness and quality whereas low-income households give comparatively less priority to the freshness and quality of fish. Although budget was a major factor for the low-income households, most of the consumers considered the quality of fish (56%) during purchase (Fig. V). High-income households considered the taste and the easy culinary process during purchase as they may find difficulties in preparing process of some fish species. Several studies revealed that taste and health benefits of fish act as positive attitude factors whereas price, difficulties in preparing process are considered as main deterrent to fish consumption (Verbeke and Vackier 2005, Myrland *et al.* 2000).

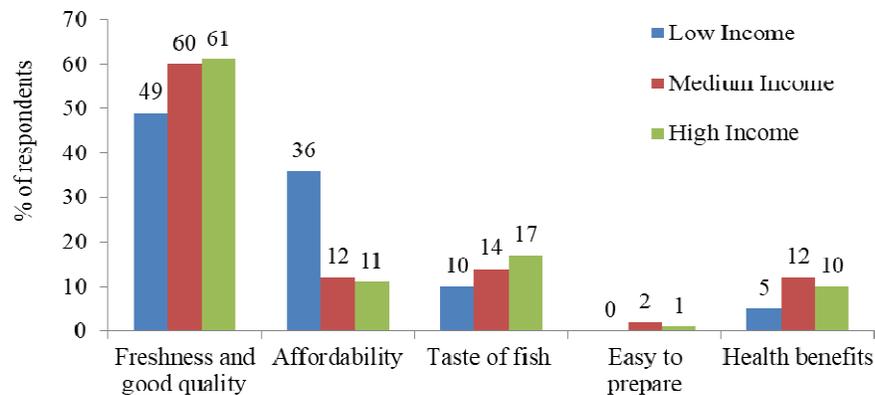
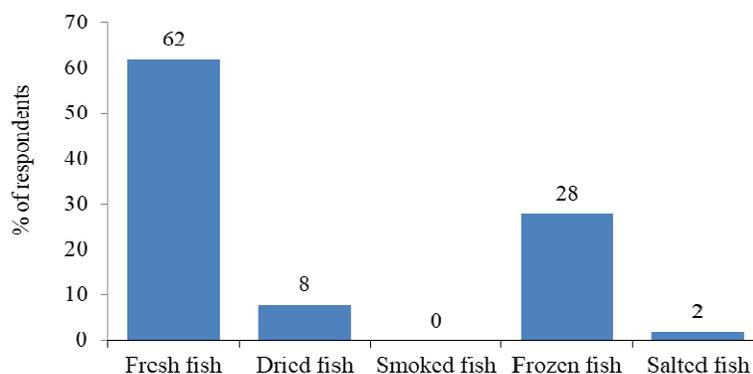


Fig. 5. Factors affecting the decisions of three income groups during the purchase of marine fish.

**Consumers' behavior and knowledge of marine fish consumption:** Consumers' behavior and knowledge of marine fish consumption is important to understand consumers' consumption pattern, preference, and acquaintance about marine fish. In Bangladesh, male are the decision makers in majority of the households, therefore male are mostly to take decisions regarding purchase and consumption of fish. Besides, budget adjustment influence individual's desire to purchase, especially for low-income people as they consider marine fish as a luxury goods. About 62% of consumers preferred fresh fish to frozen, dried, salted and smoked fish. About 28% of consumers expressed their preference for frozen fish, while smoked fish was considered

as an unusual form of processed fish in Bangladesh; especially in coastal regions (Fig. 6). Majority of consumers found fresh fish tastier than other form of processed fish. Consumers perceived fresh fish more superior in appearance, texture, smell than the frozen fish (Olsen 2004) and therefore households consumed fresh fish more frequently. Consumers remain concerned about quality issues of frozen, dried and salted fish. Frozen fish was mostly preferred by medium and high income-groups as they have the intention and facility to store freshly purchased fish in the refrigerator for short or long duration. In case of low-income groups, they purchased frozen fish from the local markets. Consumer perceptions regarding the quality of fish are highly influential factors that express not only their knowledge of fish but also their ability to identify good quality fish during purchase. Generally, a fresh fish hold the characteristics like clear bright eyes, bright red gills, moist/shiny skin, sea-fresh smell, and firm flesh. The majority of respondents judged the fish quality by observation of the color of skin (36%), firmness of flesh (22%), gill color (19%), smell (13%), and eyes of the fish (7%). During purchase of fish, consumers face difficulties in decision making regarding quality and taste as well as considering the post circumstances of cooking and consumption, as it is a perishable commodity, it is hard to make conclusion based on physical appearance in the buying situation (Grunert 1997, Juhl and Poulsen 2000).



**Fig. 6.** Consumer's preference on processed marine fish.

**Consumers' attitude towards marine fish:** Consumers' attitude statements help to assess their awareness, existing facilities, and improvement required in the respective region. Attitude statements were so related to consumer's direct observation. However, majority of respondents (76%) strongly agreed with the statement that eating marine fish is good for health and 43% of consumers agreed that marine fishes are always available to buy. Again, 33% of consumers disagreed with the statement that frozen fish provide same quality as fresh fish. More than half (53%) of consumers couldn't make conclusion on hygiene of the buying places. However, 45% of consumers strongly agreed that marine fish is cheaper than meat and interestingly 41% of consumers couldn't make conclusion on it (Table V). It is a well-recognized statement that fish is a good source of nutrition for human consumption. But, it is important to know about how consumer rate fish consumption as healthy food which ultimately reflect consumers attitude

towards marine fish. Khan *et al.* (2018) found 81% stated that fish is better for health and consumers also believe fish contain superior nutrients compared to meat.

**Table V. Consumers attitude (%) statement about marine fish and its consumption**

Attitude statements	Strongly disagree	Disagree	Neutral agree	Strongly agree
Marine fish is good for health	1	2	21	76
Marine fishes are available in the local markets	6	10	41	43
Frozen fish provide same quality as fresh fish	14	33	31	22
Buying places are hygienic	3	17	53	27
Marine fish is cheaper than meat	2	12	41	45

**Conclusions:** It can be concluded that marine fish consumption rate was higher in different Upazilas of greater Noakhali district compared to national average of Bangladesh. The people of Lakshmipur district consumed more marine fish than the people of Feni and Noakhali districts which might be due to the lower price and availability fish. Geographical location, availability, price, consumers attitude were found to be the major causes of variation in marine fish consumption. Availability, low price and awareness about health benefits among local people may lead to increased marine fish consumption in Feni and Noakhali district as well. Marine fish trade needs geographical expansion at national level leading to increased availability, lower prices, and thus greater accessibility by the people, which will be translated into increased average per capita marine fish consumption in the country.

#### Literature Cited

- BBS, 2017. Statistical Year Book of Bangladesh. Bangladesh Bureau of Statistics (BBS), Statistics Division, Ministry of Planning, Government of the People Republic of Bangladesh, Dhaka.
- Belton, B. and S.H. Thilsted, 2014. Fisheries in transition: Food and nutrition security implications for the global South. *Glob. Food Sec.*, 3(1): 59-66.
- Belton, B., M. Karim, S. Thilsted, W. Collis and M. Phillips, 2011. Review of aquaculture and fish consumption in Bangladesh. Studies and Reviews 2011-53. The WorldFish Center. November, 2011.
- Bogard, J.R., S.H. Thilsted, G.C. Marks, M.A. Wahab, M.A.R. Hossain, J. Jakobsen and J. Stangoulis, 2015. Nutrient composition of important fish species in Bangladesh and potential contribution to recommended nutrient intakes. *J. Food Comp. Anal.*, 42: 120-133.
- Borgstrom, B., 1962. Digestion and absorption of fat. *Gastroenterology*, 43: 216.
- Bose, M.L. and M.M. Dey, 2007. Food and Nutritional Security in Bangladesh: Going beyond Carbohydrate Counts. *Agric. Econ. Res. Rev.*, 20(2): 203-225.
- Brunner, E.J., P.J. Jones, S. Friel and M. Bartley, 2008. Fish, human health and marine ecosystem health: policies in collision. *Int. J. Epidem.*, 38(1): 93-100.
- Burger, J., M. Gochfeld, Z. Batang, N. Alikunhi, R. Al-Jahdali D. Al-Jebreen, M.A.M. Aziz and A. Al-Suwailem, 2014. Fish consumption behavior and rates in native and non-native people in Saudi Arabia. *Environ. Res.*, 133: 141-148.

- Dey, M.M., M.A. Rab, F.J. Paraguas, S. Piumsombun, R. Bhatta, M. FerdousAlam and M. Ahmed, 2005. Fish consumption and food security: a disaggregated analysis by types of fish and classes of consumers in selected Asian countries. *Aquac. Econ. Manage.*, 9(1-2): 89-111.
- Dey, M.M., M.F. Alam and M.L. Bose, 2010. Demand for aquaculture development: perspectives from Bangladesh for improved planning. *Rev. Aquac.*, 2(1): 16-32.
- Dey, M.M., Y.T. Garcia, K. Praduman, S. Piumsombun, M.S. Haque, L. Li, A. Radam, A. Senaratne, N.T. Khiem and S. Koeshendrajana, 2008. Demand for fish in Asia: a cross country analysis. *Aust. J. Agric. Resour. Econ.*, 52(3): 321-338.
- DoF, 2016. National Fish Week Compendium. Department of Fisheries, Dhaka. (In Bengali)
- DoF. 2017. Yearbook of Fisheries Statistics of Bangladesh 2016-17. Fisheries Resources Survey System (FRSS), Department of Fisheries, Bangladesh, Volume 34, p. 129.
- FAO, 2016. The State of World Fisheries and Aquaculture. Contributing to food security and nutrition for all. Rome, 200 p.
- Grieger, J.A., M. Miller and L. Cobiac, 2012. Knowledge and barriers relating to fish consumption in older Australians. *Appetite*, 59(2): 456-463.
- Grunert, K.G., 1997. What's in a steak? A cross-cultural study on the quality perception of beef. *Food Qual. Prefer.*, 8(3): 157-174.
- Hossain, M.A.R., B. Belton and S.H. Thilsted, 2013. Preliminary rapid appraisal of dried fish value chains in Bangladesh. WorldFish Bangladesh, Dhaka, 41 p.
- Huynh, M.D. and D.D. Kitts, 2009. Evaluating nutritional quality of pacific fish species from fatty acid signatures. *Food Chem.*, 114(3): 912-918.
- Juhl, H.J. and C.S. Poulsen, 2000. Antecedents and effects of consumer involvement in fish as a product group. *Appetite*, 34(3): 261-267.
- Khan, A.Q., F. Aldosari and S.M. Hussain, 2018. Fish consumption behavior and fish farming attitude in Kingdom of Saudi Arabia (KSA). *J. Saudi Soc. Agric. Sci.*, 17(2): 195-199.
- Mohanty, B.P., 2011. Fish as Health Food. In: Handbook of Fisheries and Aquaculture, 2nd edn., ICAR – DKMA, New Delhi, Ch. 35: 843-861.
- Myrland, Ø., T. Trondsen, R.S. Johnston and E. Lund, 2000. Determinants of seafood consumption in Norway: lifestyle, revealed preferences, and barriers to consumption. *Food Qual. Prefer.*, 11(3): 169-188.
- Needham, S. and S.J. Funge-Smith, 2014. The consumption of fish and fish products in the Asia-Pacific region based on household surveys. FAO Regional Office for Asia and the Pacific, Bangkok, Thailand, 87 p.
- NOAA, 2004. Seafood consumption rose again in 2003. NOAA Magazine, U.S. Commerce Dept., National Oceanographic and Atmospheric Administration.
- Olsen, S.O., 2001. Consumer involvement in seafood as family meals in Norway: an application of the expectancy-value approach. *Appetite*, 36(2): 173-186.
- Olsen, S.O., 2004. Antecedents of seafood consumption behavior: An overview. *J. Aquat. Food Prod. Technol.*, 13(3): 79-91.
- Özogul, Y. and F. Özogul, 2007. Fatty acid profiles of commercially important fish species from the Mediterranean, Aegean and Black Seas. *Food Chem.*, 100(4): 1634-1638.
- Redmond, E.C. and C.J. Griffith, 2005. Consumer perceptions of food safety education sources: Implications for effective strategy development. *Brit. Food J.*, 107(7): 467-483.
- Roos, N., M.M. Islam and S.H. Thilsted, 2003. Small indigenous fish species in Bangladesh: contribution to vitamin A, calcium and iron intakes. *J. Nutr.*, 133(11): 4021S-4026S.

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- Siddique, M.A.M. and M. Aktar, 2011. Changes of nutritional value of three marine dry fishes (*Johnius dussumieri*, *Harpodon nehereus* and *Leptura canthussavala*) during storage. *Food Nutr. Sci.*, 2(10): 1082.
- Siddique, M.A.M., P. Mojumder and H. Zamal, 2012. Proximate composition of three commercially available marine dry fishes (*Harpodon nehereus*, *Johnius dussumieri* and *Leptura canthussavala*). *Am. J. Food Technol.*, 7(7): 429-436.
- Tacon, A.G. and M. Metian, 2013. Fish matters: importance of aquatic foods in human nutrition and global food supply. *Rev. Fish. Sci.*, 21(1): 22-38.
- Toufique, K.A. and B. Belton, 2014. Is aquaculture pro-poor? Empirical evidence of impacts on fish consumption in Bangladesh. *World Dev.*, 64: 609-620.
- UNICEF, 2008. The state of the world's children 2009: maternal and newborn health (Vol. 9).

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