

Preferences and willingness to pay for freshwater prawn: a case study from Bangladesh

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Abstract – Consumer-driven aquaculture development is becoming increasingly critical in order to satisfy the growing global demand for seafood. This is particularly relevant for high-value species like prawn, where understanding market preferences is essential for aligning production in accordance with consumer demands. This study examined the factors that influence consumer preference and willingness to pay for prawn, taking into account intrinsic, sensory, extrinsic, and demographic attributes. A survey of 300 consumers from Bangladesh, analyzed using logistic regression, revealed that product quality attributes are the primary driver of prawn choice. Among the attributes, freshness and size of prawn significantly enhanced preference: consumers were nearly six times more likely to select fresh prawn while over three times more likely to choose larger ones, and commanded willingness to pay premiums of US\$2.41/kg and US\$1.78/kg, respectively. Further analysis confirmed that taste and availability have a positive impact on preference, while odor and increasing prices were detrimental. Demographic segments, including younger, higher-income consumers, exhibited a greater preference for premium qualities. The results suggested that producers should prioritize quality, promote larger prawn, and avoid low-margin early harvests. In parallel, a market segmentation strategy based on prawn size and consumer income will be crucial to differentiate products and align with market demand.

Keywords: Consumer behavior / intrinsic attributes / prawn preference / sensory attributes / willingness to pay

1 Introduction

Population expansion, climate change, and environmental degradation all pose unprecedented challenges to global food systems in the twenty-first century. Within this context, aquatic foods are increasingly regarded not just as a protein source, but also as a key component of long-term and nutritional food security. Their high production efficiency (Norman et al., 2019), nutritional value (Bianchi et al., 2022), lower environmental footprint (Gephart et al., 2021), accessibility (Garlock et al., 2022), and contribution to sustainability pillars (Garlock et al., 2024) make them especially important for the health and livelihoods of low-income and rural populations in developing countries. Since 2020, aquaculture has provided more than half of the world's aquatic food supply for human consumption, with production topping 130 million metric tons in 2022 and increasing at a 2.2% annual pace (FAO, 2024).

This move from capture-based to culture-based production emphasizes aquaculture's importance in addressing future food demands.

The vital function of aquatic foods is made possible by a wide and interconnected global commerce network. Seafood is one of the world's most traded food commodities, with a structure that efficiently connects supply and demand hubs. This trade is critical for food security because it helps landlocked countries and countries with limited local fisheries to obtain nutritious protein. Economically, it is an important source of revenue for developing and coastal countries. Furthermore, as consumers in high-income countries seek certified and ethically sourced items, global markets have the potential to incentivize more sustainable practices. As stated by Asche (2025), this complicated movement of items "from near and afar" successfully transforms seafood into a global cuisine, which is essential to current food systems. Understanding the dynamics of seafood commerce and marketing is critical to realizing its full potential for global economic development, nutritional security, and sustainability.

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The crustacean industry, and prawn in particular, are a high-value item in the worldwide aquaculture environment. Approximately \$32.2 billion is the value of the global shrimp and prawn export business (FAO, 2024), which is driven by strong consumer demand in wealthy nations like the US, Japan, and the EU. In this industry, Bangladesh has become a major player, particularly for the production of gigantic freshwater prawn (*Macrobrachium rosenbergii*). Bangladesh produced 58,273 metric tons of freshwater prawn in 2023, generating \$51.13 million in export revenue and supporting an estimated two million livelihoods along its value chain, from farmers and hatchery operators to processors and exporters (DoF, 2023). Production, which is centered in the southern districts, frequently combines contemporary technology with traditional polyculture methods.

However, as demonstrated in the Bangladeshi aquaculture sector by Hossain et al. (2022) and Sumon et al. (2025), structural flaws, difficulties meeting international standards, and a fragmented value chain interfere with the success of prawn marketing. These inefficiencies limit international competitiveness. Despite export revenues from a number of high-income markets, including the USA, Japan, and the EU, regional consumption patterns differ based on factors like accessibility, cost, convenience, and health trends. Therefore, the sector would benefit from a change from a production-centric approach to a consumer-focused approach in order to assure long-term stability. The reason for this is because consumers are becoming more conscious of the safety and quality of food items. This is especially true for the expanding middle classes in developing nations, who are increasingly interested in sustainable, healthy, and safe food products (FAO, 2024).

Understanding what drives consumer preferences is fundamental to this strategic shift. Globally, a substantial body of literature demonstrates that seafood consumption is shaped by a complex interplay of intrinsic attributes (e.g., taste, freshness, size) and extrinsic factors (e.g., eco-labels, certifications) (Hukom et al., 2020; Mehar et al., 2022; Xu et al., 2024). Research continuously demonstrates that consumers are prepared to pay more for qualities such as sustainability certifications (Asche et al., 2015; Bronnmann et al., 2016; Yin et al., 2020) and freshness (Hukom et al., 2020). These preferences, however, vary; demographic, cultural, and economic considerations all play a role. In developing countries, affordability frequently comes before sustainability (Uchida et al., 2014; Alam et al., 2020), and tastes differ between urban and rural consumers, as well as between age groups (Mohan et al., 2005; Sumon et al., 2025a).

Despite the economic importance of prawn in Bangladesh, scholarly study on their consumption habits falls well behind studies on other aquaculture species such as pangasius, tilapia, and shrimp (Ahmed et al., 2012; Hoque et al., 2021; Mamun et al., 2025). While newer studies have begun to address this gap, they are still limited in scope. Sumon et al. (2025a) used hedonic pricing modeling to investigate how intrinsic qualities like size and color affect implicit prices in Bangladeshi markets and discovered that bigger prawn size boosted implicit prices by 5.3%. Similarly, Hossain et al. (2024) investigated consumer preferences for shrimp and prawn, identifying safety and size as important criteria.

However, existing research on prawn consumption frequently generalize consumer behavior and focus on a

limited set of features, ignoring essential elements such as size-based preferences and key demographic breakdowns. This presents a major information gap, notably the lack of an integrated analysis that takes into account all product qualities (intrinsic, sensory, and extrinsic) as well as precise socio-demographic data. No prawn-specific study has systematically categorized the market based on both product qualities (e.g., size categories) and consumer socio-demographics (e.g., income levels), nor has it combined these with willingness-to-pay across groups. This integrated perspective is critical for progressing beyond the unsuccessful one-size-fits-all approach. Filling this gap is critical. In an economically varied country like Bangladesh, such segmentation is critical for tailoring successful marketing campaigns and policy measures to the individual demands of various consumer groups.

Therefore, the purpose of this study is to identify the important factors influencing consumer preferences and willingness to pay for prawn, with a focus on prawn quality features, price, and socio-demographic factors. The study aims to offer evidence-based insights into the influence of prawn features and consumer socio-demographic parameters that can be used to build marketing strategies and policy interventions. Understanding how product and socio-demographic attributes influence demand can help aquaculture professionals implement more effective and sustainable methods. Furthermore, these insights may assist in aligning market offerings with consumer preferences, resulting in increased product accessibility, quality, and safety while potentially boosting rural livelihoods, job creation, and economic development. Overall, the study helps to close the gap between consumer demand and market supply, laying the groundwork for educated prawn industry decision-making.

The following sections contain the study's materials and methodologies, empirical findings, a discussion with practical implications for industry stakeholders, and concluding remarks.

2 Materials and methods

2.1 Analytical approach

This study adopts the random utility framework (McFadden, 1974) to analyze consumer preferences and decision-making regarding prawn purchases. The framework assumes that individuals select the product that gives them the highest utility from all available options. Descriptive statistics are used to summarize consumer preferences. A logistic regression model then evaluates the effects of prawn attributes and socio-demographic factors on the likelihood of purchase.

2.2 Empirical model specification

Following the Random Utility Theory framework, this study estimates a binary logistic regression model to identify the factors that affect prawn purchase decisions. This model is appropriate when the dependent variable is dichotomous and the objective is to estimate how product attributes and consumer characteristics influence the probability of prawn selection, such as the decision to purchase (1 = purchased or preferred, 0 = not purchased or otherwise) (Hosmer et al., 2000; Backhaus et al., 2023). Based on the specified qualities and socio-demographic parameters, logistic regression

identifies the likelihood that a consumer will choose to purchase prawn. The logistic regression model can be described as follows:

$$y_i^* = \beta_0 + \sum_{j=1}^k \beta_j x_{ij} + \mu_i \quad (1)$$

Where, y_i is an unobserved latent variable, β_0 is the intercept, β_j is the parameter to be estimated, x_{ij} represents the explanatory variables, and μ_i is the error term. In this model, the subscript i refers to each individual consumer ($i = 1, 2, \dots, n$), while the subscript j identifies each explanatory variable included in the analysis ($j = 1, 2, \dots, k$). The observed binary outcome, y_i is determined by the latent variable through a threshold mechanism:

$$y_i = \begin{cases} 1 & \text{if } y_i^* > 0 \\ 0 & \text{Otherwise} \end{cases}$$

From this framework, the probability of purchase, $p_i = p_r(y_i = 1|x_i)$, can be derived. The model is empirically estimated in log-odds form, which linearizes the correlation between predictors and probability:

$$\log \frac{p_i}{1-p_i} = \beta_0 + \sum_{j=1}^k \beta_j x_{ij} \quad (2)$$

Where, p_i represents the probability of purchase, the left-hand side of the equation $\log \frac{p_i}{1-p_i}$ represents the log of the odds ratio, which quantifies the likelihood of purchase based on product attributes and consumer's socio-demographics, k is the number of explanatory variables, $k=12$ and j is a random explanatory variable. The dependent variable in the logistic regression model was a binary indicator of prawn purchase, coded as 1 if the respondent preferred prawn and 0 otherwise. Explanatory variables are grouped into four categories: extrinsic attributes (price, production environment, availability), intrinsic attributes (freshness, size, roe), sensory attributes (odor, taste, texture, nutrition), and socio-demographic factors (age group, income level), using young and low-income consumers as reference categories. Operational definitions and coding for all variables appears in Table 2, while their selection was guided by the literature review and qualitative stakeholder interviews to ensure theoretical and practical relevance.

In addition to estimating a full-sample model, we estimated size-specific logit models for small and large prawn. This approach allowed us to examine whether product attributes and socio-demographic factors influence consumer choices differently across prawn sizes. The sample division procedure is described below. Respondents reported their preferred prawn size in a direct survey question by selecting either small or large prawn based on their usual consumption behavior. This preference was recorded as a categorical variable and used to split the full sample into two mutually exclusive groups. Each respondent was assigned to check only one group, ensuring a clear distinction between small- and large-prawn consumers. This classification allowed for a consistent comparison of purchase determinants across prawn sizes.

To verify the analysis's robustness, multicollinearity among independent variables was tested using the variance inflation factor (VIF), and all variables had VIF values less than 2 ($1/\text{VIF} > 0.5$), indicating no substantial multicollinearity (Akinwande et al., 2015). The study was carried out using StataSE 14 (64-bit) software, with parameters estimated using maximum likelihood with the logit command to identify purchasing decision determinants.

2.3 Willingness to pay estimation

Willingness to Pay (WTP) for each attribute was determined by calculating the marginal rate of substitution between the attribute coefficients and the price coefficient. Assuming a linear utility function, the WTP for the individual qualities is calculated as follows:

$$WTP = -\frac{\beta_{\text{Attribute}}}{\beta_{\text{Price}}} \quad (3)$$

This approach, *ceteris paribus*, reflects the amount a consumer is willing to pay for the presence of the quality attribute. The negative sign ensures that WTP remains positive even when the price coefficient is negative, which is consistent with economic theory. The Delta Method was used to calculate standard errors and confidence ranges for WTP estimations, taking into account the estimator's ratio nature.

2.4 Relative importance index (RII)

A five-point Likert scale was used for evaluating consumers' opinions of prawn attributes when making purchases (1 being not important at all and 5 being extremely important). On this scale, respondents evaluated 19 attributes of prawn. Each attribute's relative importance was assessed using the Relative Importance Index (RII), which was calculated as follows:

$$RII = \frac{\sum w_k \times f_k}{A \times N} \quad (4)$$

Where, w_k is the weight of category k , f_k is the frequency of responses in category k , A is the highest weight, and N is the number of respondents. The RII scales from 0 to 1, with higher values indicating the attribute's relative relevance in consumers' purchase decisions.

3 Study design and sample description

A literature analysis helped to identify the prawn attributes that influence consumer preferences. This was followed by in-depth interviews with 25 stakeholders, including consumers, farmers, suppliers, experts, and academics. Participants were encouraged to contribute their thoughts, concerns, and comments about the variables influencing consumers' preferences to buy prawn. These qualitative talks produced a diverse set of replies, from which 11 attributes were chosen based on frequency of mention and perceived value. These attributes were then grouped into three categories intrinsic, sensory, and

extrinsic based on their nature and relevance in consumer decision-making.

A structured questionnaire was designed to quantitatively investigate the highlighted attributes. It was first evaluated with 12 consumers before being modified through focus group talks and pilot testing at four retail fish markets in Bangladesh. The survey emphasized the relevance of different prawn quality factors such as freshness, size, odor, taste, availability, and price. Prior to data collection, enumerators were trained to understand the study's objectives and to communicate effectively and consistently with consumers throughout interviews.

A convenience sampling approach was used to collect timely data from prawn buyers in local marketplaces, which provided quick insights into purchasing patterns, but may introduce selection bias and limit broader applicability. To address this, respondents were purposively drawn from five key districts in Bangladesh, Khulna, Satkhira, Bagerhat, Barisal, and Patuakhali, to ensure wider geographic representation. Khulna, Barisal, and Patuakhali, accounting for about 76% of the sample, are mainly consumption hubs, while Satkhira and Bagerhat (24%) represent primary prawn production zones (see [Tab. 1](#)). This sampling captures the contrast between consumption-focused urban markets and production-oriented rural areas, where access, availability, and purchase patterns vary. By including these districts, the study covers distinct segments of Bangladesh's prawn value chain, covering both urban and rural market systems, and incorporates a range of different consumer experiences for more contextually relevant findings.

A total of 300 face-to-face interviews were conducted with respondents from diverse socioeconomic backgrounds, reflecting variations in income, household size, occupation, age, and residential location. This approach improved response rates and enabled interviewers to clarify ambiguities and address language issues during the survey. Prior to each interview, the study objectives were explained, and participation was confirmed as voluntary. Informed consent was obtained from all respondents, who were assured of confidentiality, anonymity, and the exclusive use of data for research purposes.

The structured questionnaire comprised four sections: (1) sociodemographic characteristics, (2) prawn consumption patterns, (3) preferences for intrinsic, sensory, and extrinsic attributes, and (4) consumer attitudes and knowledge regarding these attributes and their role in purchase decisions. Respondents were grouped by demographic characteristics to examine behavioral differences, providing a clearer understanding of how socioeconomic factors and attitudes influence purchasing decisions and willingness to pay. By incorporating both geographic and demographic diversity, the study strengthens the relevance of its findings for major prawn markets in Bangladesh.

3.1 Consumer demographic profile, prawn preference behavior

Understanding consumer preferences necessitates a thorough assessment of who the consumers are and how their preferences influence purchases and willingness to pay. [Table 1](#)

outlines the respondents' demographics and consuming patterns.

The socio-demographic variables revealed a marked gender imbalance, with male respondents accounting for 94% of participants. This likely mirrors the prevailing custom in Bangladeshi households, where men typically handle wet market purchases, potentially influencing the overall patterns of purchase. Moreover, ready-to-cook prawn emerged as the most favored product, with 39% of respondents choosing it over fresh (35%) and frozen (27%) alternatives. This preference suggests a growing emphasis on convenience among prawn consumers, possibly reflecting the evolving lifestyle expectations and increasing disposable income among the middle class.

Age and income also affect preferences. Most respondents were under 55 years (76%), married (84%), and had medium to high monthly household incomes exceeding US\$165 (78%). This socio-demographic profile was associated with a higher preference for ready-to-cook prawn, indicating that younger and financially capable consumers valued convenience and time-saving attributes more than traditional fresh or frozen products. Although household size, occupation, and geographic location also influenced purchase behavior, their effects appeared secondary to those of age and income.

The purchase context reinforces these patterns. The majority of consumers obtained prawn from wet fish markets (70%), and social networks, friends and families served as the main source of information regarding prawn quality (68%). This combination of male-dominated purchasing, middle-class income, and preference for convenience-oriented products points to a distinct consumer segment in Bangladesh that values quick-preparation seafood, highlighting the potential for ready-to-cook prawn as a differentiated offering. Importantly, 72% of respondents expressed a willingness to pay a premium for higher-quality prawn and for the specific attributes wild-caught or freshly harvested. This indicates that, even within a convenience-driven market, quality remains a key factor influencing purchase decisions.

3.2 Monthly average prawn purchase by income group

Consumers with lower monthly earnings, defined as up to US\$165, purchased an average of 1.672 kilograms of prawn each month and spent approximately US\$12.05. At the time of data collection, the average market price of prawn was BDT 872 per kilogram (exchange rate: BDT 1 = US\$0.0083). Individuals in the middle-income group, earning between US \$166 and US\$413 per month, purchased more prawn than those in the lower income bracket. On average, they bought 2.11 kilograms of prawn each month and spent US\$15.21. Consumers in the highest-income group, which includes individuals earning more than US\$413 per month, bought the largest quantity of prawns compared with both the lower- and middle-income groups. They purchased an average of 3.179 kilograms of prawn per month and spent US\$ 22.92.

This pattern shows a clear trend: as income rises, both the purchased quantity of prawn and the money spent on it also increase. One possible reason is that consumers view prawn as a luxury or high-status protein rather than a basic dietary necessity. To reach buyers across all income levels, sellers should offer a

Table 1. Demographic profile and purchase preferences of respondents ($N=300$).

	Particulars	Descriptions	<i>n</i>	%
1	Gender:	Male	283	0.94
		Female	17	0.06
2	Age	Below 31	124	41.33
		31–55	106	35.33
		Above 55	70	23.33
3	Marital Status:	Married	251	0.84
		Unmarried	49	0.16
4	Education level	Primary	86	0.29
		Secondary	109	0.36
		Graduate and above	105	0.35
5	Zone	Production Zone if consumer live in Shatkhira and Bagherhat	71	0.24
		Consumption Zone if consumer live in Khulna, Barisal and Patuakhali	229	0.76
6	Household Size	Small if household member up to 2	51	0.17
		Medium if household member is 3-4	119	0.40
		Large if household member 5 and above	130	0.43
7	Occupational status	Service	99	0.33
		Business	119	0.40
		Others	82	0.27
8	Monthly -Income	Low if income is less than 165 US dollar	65	21.67
		Medium if income is 166-413 US Dollar	132	44.00
		High if income is more than 413 US Dollar	103	34.33
9	Have you purchased prawn in the past month?	Yes	237	0.79
		No	63	0.21
10	Consumption frequency	1–3 times in a month	137	0.46
		4–5 times in a month	96	0.32
		Special occasion	67	0.22
11	Preferred type	Fresh	104	0.35
		frozen	80	0.27
		Ready to cook	117	0.39
12	Preferred size	Large (up to 12 pieces/kilo)	191	0.64
		Small (more than 12 pieces/kilo)	109	0.36
13	Monthly household prawn consumption (quantity in kg).	1 to 3	258	0.86
		4 to 7	34	0.11
		above 7	8	0.03
14	Where do you usually obtain information about prawn (select all that apply)?	Market vendors	27	0.09
		Friends/Family	203	0.68
		Internet	16	0.05
		Others	54	0.18
15	How knowledgeable do you consider yourself regarding prawn production environment and quality?	Not knowledgeable	13	0.04
		Somewhat knowledgeable	78	0.26
		Knowledgeable	176	0.59
		Very knowledgeable	33	0.11
16	Where do you primarily buy prawn?	Wet Fish Market	211	0.70
		Supermarket	56	0.19
		Online Store	14	0.05
		Other (Specify)	19	0.06
17	Are you willing to pay more for better quality or information-treated prawn (e.g., wild-caught, fresh, etc.)?	Yes	217	0.72
		No	22	0.07
		Not Sure	61	0.20

Source: Authors' own estimation.

Table 2. Description of variables used in the logit model.

Variable	Discretion	Obs.	Percentage	St. Dev.	Min	Max
Extrinsic attributes						
Price	Price per kg in USD	300	7.21	1.05	5.46	10.19
Production environment	1 if prawn was cultured 0 if otherwise	151	50.33	0.50	0	1
Availability	1 if prawn is available in the market 0 if otherwise	207	69.00	0.46	0	1
Intrinsic attributes						
Freshness	1 if prawn is recently harvested 0 if otherwise	104	34.67	0.48	0	1
Size	1 if prawn was large (Contains up to 12 piece/Kg) 0 if otherwise	191	63.67	0.478	0	1
Roe	1 if prawn has roe 0 if otherwise	156	52.00	0.50	0	1
Sensory attributes						
Odor	1 if prawn's has odor 0 if otherwise	185	61.67	0.49	0	1
Taste	1 if good 0 if otherwise	192	64.00	0.48	0	1
Texture	1 if prawn is hard and slightly chewy 0 if otherwise	124	41.33	0.49	0	1
Nutrition	1 if concern about nutrition 0 if otherwise	148	49.33	0.50	0	1
Socio demographic						
Monthly income	Low if income is less than 165 US dollar coded 1	65	21.67			
	Medium if income is 166-413 US Dollar coded 2	132	44.00			
	High if income is more than 413 US Dollar coded 3	103	34.33			
Age	Young if age of the consumer less than 31 coded 1	124	41.33			
	Adult if age of the consumer is 31-55 coded 2	106	35.33			
	Old if age of the consumer above 55 coded 3	70	23.33			

range of prawn products with flexible pricing. For example, they can provide prawn in different sizes, qualities, and origins and assign prices that match these differences.

3.3 Consumer preferences for intrinsic, sensory, and extrinsic prawn attributes

The descriptive statistics of the product attributes and socio-demographic parameters used in logit estimate are provided in Table 2.

The analysis included prawn price per kilogram (US\$) and a set of binary indicators representing key product attributes. All attributes were coded as dummy variables for consistency (e.g., 1 if the prawn was recently harvested, 0 otherwise). The variables were grouped into extrinsic, intrinsic, sensory, and socio-demographic categories. Extrinsic attributes comprised price (mean = US\$7.21 per kilogram), production environment (1 = cultured, 0 otherwise; mean = 0.50), and market availability (1 = available, 0 otherwise; mean = 0.69). Intrinsic attributes included freshness (mean = 0.35), size (mean = 0.64), and the presence of roe (mean = 0.52). Sensory attributes covered odor, taste, texture, and nutrition concern, with average values ranging from 0.41 to 0.64. Socio-demographic factors included monthly income (low, medium, high) and age group (young, adult, old), reflecting variations in consumer purchasing preferences.

4 Results

4.1 Logit estimation for full sample size

Table 3 shows the logit model estimate findings, which highlight the drivers of prawn preferences and willingness to pay among Bangladeshi consumers. The model has a significant fit, with a chi-square score of 72.790 ($p < 0.001$)

and a pseudo-R-squared of 0.236, indicating enough explanatory power for the choice model (McFadden, 1972). These findings indicate that the model captures the heterogeneity in prawn preferences throughout the population across the sample. The Akaike Information Criterion (AIC) of 265.584 and the Bayesian Information Criterion (BIC) of 321.141 are reported for model comparison purposes, penalizing complexity while favoring better relative fit.

Freshness was the most influential intrinsic attribute, with a positive and significant effect on consumer preference ($\beta = 1.747$, $p < 0.001$). The willingness to pay (WTP) was US\$2.41 per kilogram for recently harvested prawn. This result indicates that consumers value freshness and are willing to pay a premium for fresh prawn. Prawn size also had a positive and significant effect on preference ($\beta = 1.291$, $p < 0.001$). The WTP was US\$1.78 per kilogram for large prawn, suggesting that consumers prefer larger prawn and are willing to pay more for this attribute level.

Taste had a significant positive impact ($\beta = 1.378$, $p < 0.001$), with a WTP of US\$ 1.90 per kilogram, emphasizing the significance of flavor in consumer decisions. However, odor had a substantial negative influence ($\beta = -1.010$, $p < 0.001$), with a negative WTP of - US\$ 1.40 per kilogram, indicating that consumers are particularly sensitive to unpleasant smells. It is important to clarify that, within the context of this study, the odor attribute is intended to capture negative sensory cues, specifically sour or otherwise off-putting smells associated with prawn that are no longer fresh. This is distinct from the natural, species-specific “fishy” aroma characteristic of fresh prawn, which regular seafood consumers generally consider acceptable.

The availability attribute represents the consistent supply and regular presence of prawn in the marketplace. This attribute had a positive and significant impact on consumer preference ($\beta = 0.864$, $p = 0.014$). Consumers were willing to

Table 3. Results of logit model estimation.

Variables	Coefficient		Standard error	p-value	WTP
Extrinsic attributes					
Price USD	−0.724	***	0.229	0.002	
Production environment	−0.689	*	0.407	0.091	−0.95
Availability	0.864	**	0.351	0.014	1.19
Intrinsic attributes					
Freshness	1.747	***	0.458	0.000	2.41
Size	1.291	***	0.377	0.001	1.78
Roe	−0.017		0.418	0.967	−0.03
Sensory Attributes					
Odor	−1.010	***	0.372	0.007	−1.40
Taste	1.378	***	0.408	0.001	1.90
Texture	0.105		0.368	0.776	0.15
Nutrition	0.531		0.35	0.130	0.73
Socio demographic					
Age group: base 1: Young	Reference Category				
2: Adult	−0.798	*	0.416	0.055	—
3: Old	−0.892	**	0.437	0.041	—
Income level: base 1: Low	Reference Category				
2: Medium	0.823	*	0.420	0.050	—
3: High	1.200	***	0.455	0.008	—
Constant	4.483	***	1.507	0.003	
Mean dependent variable		0.790	SD dependent variable		0.408
Pseudo r-squared		0.236	Number of observations		300
Chi-square		72.790	Prob > chi2		0.000
Akaike crit. (AIC)		265.584	Bayesian crit. (BIC)		321.141

Note: ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively.

pay an additional US\$1.19 per kilogram for prawn that were readily accessible at the time of shopping. These results indicate that buyers prefer to purchase prawn when they are easily available in the market, but lose interest in buying prawn when they are frequently unavailable or difficult to find. Price had a significant negative effect ($\beta = -0.724$, $p < 0.001$), as expected. Similarly, the production environment had a significant negative influence ($\beta = -0.689$, $p = 0.09$), suggesting a preference for wild-caught prawn. This preference is most likely motivated by consumer ideas of sustainability, as wild-caught prawn are linked with more natural and climate-friendly production techniques.

Demographic considerations also influenced preferences. Older consumers reported a considerably decreased preference for prawn ($\beta = -0.892$, $p = 0.041$), likely due to changing nutritional habits or budget constraints. Income showed a substantial positive effect, with high-income individuals showing a larger preference than those in the low-income category ($\beta = 1.200$, $p < 0.001$). The middle-income group showed a positive but marginally significant effect ($\beta = 0.823$, $p = 0.05$), showing a likely tendency toward higher preference as income rises. However, the effect was less pronounced.

The odds Ratio and average marginal effects analysis in Table 4 show that prawn preferences in Bangladesh are influenced by intrinsic, sensory, extrinsic, and demographic factors.

Freshness had the largest positive influence among intrinsic qualities, with an odds ratio (OR) of 5.736 ($p < 0.001$), indicating that consumers are nearly six times more likely to select prawn when it is fresh rather than non-fresh. The average marginal effect shows that this shift increases the probability of preference by 21.5 percentage points. Similarly, larger prawn size significantly increased preference (OR = 3.637, $p < 0.001$), raising the likelihood of selection by 15.9 percentage points compared to smaller sizes. Conversely, the presence of roe did not significantly influence consumer choice.

Among sensory attributes, taste had a significant positive effect (OR = 3.967, $p < 0.001$) on consumers' preference for prawn. When consumers recalled a favorable taste from previous consumption experience, the predicted probability of preferring prawn increased by 17.00 percentage points. On the other hand, the presence of an odor discouraged consumers, reducing the probability of preference by 12.5 percentage points (OR = 0.364, $p < 0.001$). Other sensory features such as texture and nutritional value were not found to significantly influence preferences.

Considering extrinsic attributes, price demonstrated a negative effect on preference (OR = 0.485, $p < 0.001$). Each unit increase in price led to an 8.9 percentage point decrease in the probability of selection. The production environment variable showed that consumers were less likely to choose

Table 4. Estimation of odds ratio and average marginal effects of prawn preferences.

Variables	Odds ratio		Standard error	Marginal effect (dy/dx)	Standarderror	p-value
Extrinsic attributes						
Price	0.485	***	0.111	−0.089	0.027	0.001
Production environment	0.502	*	0.204	−0.085	0.050	0.087
Availability	2.373	**	0.832	0.107	0.042	0.011
Intrinsic attributes						
Freshness	5.736	***	2.629	0.215	0.053	0.000
Size	3.637	***	1.370	0.159	0.044	0.000
Roe	0.983		0.411	−0.002	0.052	0.967
Sensory attributes						
Odor	0.364	***	0.135	−0.125	0.044	0.005
Taste	3.967	***	1.621	0.170	0.047	0.000
Texture	1.110		0.409	0.013	0.045	0.776
Nutrition	1.700		0.595	0.065	0.043	0.125
Socio demographic						
Age group: base 1: Young	Reference Category					
2: Adult	0.450	*	0.187	−0.095	0.050	0.055
3: Old	0.410	**	0.179	−0.109	0.054	0.045
Income level: base 1: Low	Reference Category					
2: Medium	2.278	*	0.958	0.117	0.062	0.059
3: High	3.319	***	1.509	0.160	0.061	0.009
Constant	88.543	***	133.436			
Number of observations	300					
Pseudo r-squared	0.236					
Chi-square	72.790					
Prob > chi2	0.000					

Note: dy/dx for factor levels is the discrete change from the base level.

farmed prawns over wild-caught, as indicated by the marginal effect of −8.5 percentage points. Availability, on the other hand, had a positive effect on consumer preference. When prawn are available, the probability of choosing them increases by 10.7 percentage points (odds ratio = 2.373, $p = 0.014$). In other words, consumers strongly favored prawn they could reliably purchase, whereas they avoided prawn that were often missing from the marketplace.

Demographic factors also influenced prawn preference. Older people were less likely to prefer prawn than younger (OR = 0.410, $p = 0.04$), with the probability of selection falling by 11 percentage points from the youngest to the oldest group. Income level showed a clear pattern: consumers in the medium- and high-income groups were more likely to prefer prawn than those in the low-income group, with the probability increasing by 11.7 and 16.0 percentage points (OR = 2.278, $p = 0.06$; OR = 3.319, $p < 0.001$), respectively. Overall, consumer choices were strongly influenced by freshness, size, taste, and odor, highlighting a clear preference for high quality, desirable attributes over price considerations.

4.2 Size specific preferences

Table 5 presents the logit regression results for consumer preferences for small and large prawn. Price negatively influenced preferences for both sizes, but the effect was

stronger for small prawn ($\beta = -1.054$) than for large prawn ($\beta = -0.684$), suggesting that higher price more strongly discouraged the purchase of small prawn. Freshness, on the other hand, had a positive effect on consumer preference for both small and large prawns. The impact of freshness was greater for small prawns ($\beta = 2.517$, WTP = US\$ 2.39) than for large prawns ($\beta = 1.099$, WTP = US\$1.61). These results indicate that consumers assign a higher value to the freshness of small prawns and are willing to pay more for this attribute than they are for large prawn.

Taste positively influenced consumer preference for both prawn sizes. However, willingness to pay for taste varied by prawn size. Consumers were willing to pay US\$ 2.08 per kilogram for large prawn and US\$1.41 per kilogram for small prawn. Nutrition also showed a positive effect on preference, but this effect was significant only for small prawn. For small prawn, nutrition increased willingness to pay by US\$1.09 per kilogram. Availability increased preference for both sizes, slightly more for small prawn (WTP = US\$ 1.16) than large prawn (WTP = US\$ 0.92). Odor had consistently a negative effect, with WTP of -US\$ 0.88 for small prawn and -US\$ 1.54 for large prawn, reflecting aversion to poor sensory quality for both sizes.

Demographic factors also influenced consumer preferences differently depending on prawn size. Adult and older consumers showed lower preferences for large prawn

Table 5. Estimated logit results of prawn preference for small and large sized category.

Purchase	Small			Large				
	Coefficient		Standarderror	WTP	Coefficient	Standarderror	WTP	
Extrinsic attributes								
Price	−1.054	**	0.464	—	−0.684	**	0.297	—
Production environment	−0.032		0.665	−0.03	−1.028	*	0.597	−1.50
Availability	1.220	**	0.558	1.16	0.628		0.507	0.92
Intrinsic attributes								
Freshness	2.517	***	0.787	2.39	1.099	**	0.617	1.61
Roe	−0.068		0.668	−0.06	0.199		0.650	−0.29
Sensory attributes								
Odor	−0.932		0.606	−0.88	−1.054	**	0.515	−1.54
Taste	1.482	**	0.600	1.41	1.423	**	0.653	2.08
Texture	−0.171		0.581	−0.16	0.400		0.540	0.58
Nutrition	1.126	**	0.555	1.09	0.180		0.501	0.26
Socio demographic								
Age group: base 1: Young Reference Category								
2: Adult	0.097		0.645		−1.305	**	0.638	
3: Old	−0.386		0.706		−1.238	*	0.654	
Income level: base 1: Low Reference Category								
2: Medium	1.317	**	0.711		.758		0.588	
3: High	0.640		0.627		2.226	***	0.854	
Constant	5.556	*	2.845		6.174	***	2.003	
Number of observations 109					191			
Prob> chi2					0.001			
Pseudo r-squared					0.217			

Note: ***, **, and * represent the significance levels of the coefficients at 1%, 5%, and 10%, respectively.

($\beta = -1.305$ and -1.238 , respectively) compared to small prawn ($\beta = 0.097$ and -0.386). This pattern suggests that age has a size-specific effect on prawn choice. When considering income, high-income consumers demonstrated a stronger preference for large prawn ($\beta = 2.226$) than for small prawn ($\beta = 0.640$). In contrast, medium-income consumers preferred small prawn ($\beta = 1.317$) over large prawn ($\beta = 0.758$).

This income-related difference points to clear opportunities for market segmentation. Large prawn could be marketed to premium domestic consumers and to export-oriented high value markets, where buyers are more willing to pay for size, taste, and guaranteed freshness. Small prawn, on the other hand, appear better suited for wider domestic market segments, especially among medium-income households. For these consumers, factors such as price, availability, freshness, and nutritional value are key drivers of purchase decisions. The sub-models presented in Table 5 highlight not only size-based differences in consumer preferences but also offer a foundation for developing targeted product differentiation, pricing strategies, and export segmentation.

Overall, consumers showed greater price sensitivity and responsiveness to availability when choosing small prawns. In contrast, quality attributes like freshness and taste were important for both small and large prawns. Preferences for large prawns were more strongly influenced by the production environment, income, and odor. These findings show that both individual consumer characteristics and prawn size interact to shape purchasing decisions. The reliability of these findings is supported by the statistical significance of both models, with

pseudo-R-squared values of 0.296 for small prawn and 0.217 for large prawn.

4.3 Consumers' perception rating

Consumers' views of prawn purchase attributes were analyzed using the Relative value Index (RII), which revealed a hierarchy of value across several parameters (see Tab. 6). Sensory features emerged as the primary drivers of consumer preference, with freshness being the most essential aspect (RII = 0.920, Rank = 1), with 66% of respondents perceiving it as "extremely important." Price was the second most influential element (RII = 0.914, Rank = 2), with 68% recognizing it as quite important, followed by size (RII = 0.887, Rank = 3), which 64% rated as extremely essential. Color (RII = 0.866, Rank = 4) and odor (RII = 0.859, Rank = 5) highlighted the significance of sensory elements in consumer preferences.

Beyond sensory attributes, product appearance and availability had a significant impact. The visual look of the prawn scored sixth (RII = 0.858, Rank = 6), while year-round availability ranked seventh (RII = 0.856, Rank = 7), showing that consistent access and visual appeal are major determinants of consumer preference. Preference (RII = 0.847, Rank = 8) and nutritional value (RII = 0.835, Rank = 9) were both highly rated. In contrast, the physical integrity of the prawn, as indicated by the presence of an unbroken head, was only moderately important (RII = 0.818, Rank = 10). Similarly, the

Table 6. Analysis of consumers' perceptions about purchasing prawn using Relative Importance Index (RII).

Sl. No.	Specific questions	Percentage of respondents rating as extremely important	RII	Rank
1	How important is the Freshness (Fresh vs. Frozen) of prawn when making a purchase decision?	0.66	0.920	1
2	How important is the price per kilogram of prawn when deciding to purchase them?	0.68	0.914	2
3	How much does the size (Large, Medium, and Small) of prawn affect your purchase decision?	0.64	0.887	3
4	To what extent does the color (Bright vs Radish) of prawn affect your buying decision?	0.71	0.866	4
5	How important is the odor type (Fishy odor vs. Bad odor) of prawn in your purchasing decision?	0.62	0.859	5
6	How much does the appearance of prawn influence your buying decision?	0.66	0.858	6
7	How important is the year-round availability of prawn to your purchasing decision?	0.69	0.856	7
8	How crucial is the taste of prawn in your decision to buy them?	0.64	0.847	8
9	How important is the nutritional value (e.g., good source of protein) of prawn when you decide to purchase them?	0.49	0.835	9
10	How important is it that prawn have their head intact with the body when you purchase them?	0.59	0.818	10
11	How important is the absence of bones in prawn when you choose to purchase them?	0.44	0.813	11
12	How much does the presence or absence of roe in prawn influence your decision to buy them?	0.52	0.762	12
13	How important is the climate impact of prawn farming or harvesting in your decision to purchase prawn?	0.35	0.749	13
14	How important is the Production environment (Wild-caught vs. Farmed) of prawn in influencing your purchase decision?	0.51	0.745	14
15	How important is the ease of preparation of prawn when you decide to purchase them?	0.37	0.723	15
16	How influential is the texture of prawn in your decision to purchase them?	0.30	0.706	16
17	To what extent do you consider the fat content of prawn when deciding to purchase them?	0.34	0.683	17
18	How important is your familiarity with the prawn product when making a purchase decision?	0.07	0.576	18
19	How crucial is the flavor of prawn in your decision to buy them?	0.03	0.555	19

absence of bones (RII=0.813, Rank=11), the presence or absence of roe (RII=0.762, Rank=12), and the climatic impact of prawn production (RII=0.749, Rank=13) were rated as somewhat important.

The production environment (RII=0.745, Rank=14), ease of preparation (RII=0.723, Rank=15), texture (RII=0.706, Rank=16), fat content (RII=0.683, Rank=17), and product familiarity (RII=0.576, Rank=18) all had a less influence on consumer preferences. Flavor was the least important attribute (RII=0.555, Rank=19), with only 3% of respondents considering it highly significant. These findings point to a preference for immediate, observable quality criteria such as freshness, price, and size over more abstract or convenience-related attributes like climate effect, ease of preparation, and flavor. The findings are consistent with larger patterns in seafood consumption, where consumers are frequently motivated by factors such as freshness, size, and cost

(Olsen, 2003; Verbeke et al., 2005), whereas most consumers do not prioritize long-term health or ethical considerations (Van et al., 2014; Grunert et al., 2014).

5 Discussion

The decisions that consumers make on seafood are complicated and rarely arbitrary; they are influenced by a strong and frequently unconscious calculation of perceived value, safety, and quality. Therefore, it is essential to comprehend this decision-making matrix in order to match aquaculture production with consumer demand. Our results show that prawn preferences are multifaceted, with freshness emerging as the most important attribute. This finding is consistent with earlier studies, including Saidi et al. (2022), which emphasized how important freshness is when selecting

seafood. Freshness is highly valued by consumers, as seen by their readiness to pay more, indicating a close relationship between freshness and their perceptions of safety and quality (Wang et al., 2009).

Size has a considerable impact on preference and WTP, highlighting the relevance of perceived value. This finding is consistent with prior study, such as that conducted by Hossain et al. (2024), who discovered that larger prawn are more popular among consumers. It also aligns with recognized consumer behavior theories, which link larger product sizes to higher perceived quality and satisfaction (Kotler et al., 2010). The favorable influence of flavor on prawn preference is consistent with previous research highlighting the importance of sensory qualities in forming food preferences (Schroback et al., 2025). Similarly, consumers' aversion to odor, as shown by the negative coefficient and WTP, suggests that sensory qualities are important for seafood acceptance. This finding follows Hossain's (2023) finding that odor is a strong predictor of WTP. Texture and nutrition were not significant, implying that these factors may be secondary in real-time purchase decisions, especially in wet market environments where visual qualities dominate consumer attention.

The projected negative impact of price on prawn preference suggests that consumers are extremely price-sensitive when purchasing prawn, which is consistent with previous studies on the role of price sensitivity in seafood consumption (Güney et al., 2022). In contrast, the positive effect of prawn availability on consumer preference shows that continuous, year-round access increases purchase likelihood, which supports research that emphasizes the importance of product availability in determining consumer preferences (Uddin et al., 2019).

Our results also reveal clear consumer segmentation in the prawn market. Price responsiveness is notably higher for small prawn than for large prawn. This means buyers of smaller sized prawn react more strongly to price changes. Hossain et al. (2025) reported similar findings, observing greater price elasticity across different fish categories. Product attribute preferences also vary by prawn size. Nutrition and freshness are more influential for consumers of small prawn, while taste and size are key drivers for those who prefer large prawn. Similar heterogeneity in seafood preferences has been reported in the studies of seafood consumption behavior and market segmentation (Morales et al., 2018).

These differences have important implications for market efficiency and development. Targeted marketing strategies that align product characteristics with consumer preferences can improve market performance. For example, lower-priced small prawn emphasizing freshness and nutritional value may appeal to price-sensitive consumers, while larger prawn emphasizing size and sensory quality may attract premium market segments. Such segmentation improves resource allocation, enhances market reach, and supports the sustainable development of aquaculture markets (Asche and Bronnmann, 2017).

In terms of the production environment, the unfavorable correlation between farmed prawn and wild-caught shrimp is most likely due to growing consumer concerns about unsustainable aquaculture practices. Traditional prawn farms, which rely heavily on antibiotics and have a higher carbon impact, contribute to this unfavorable reputation. Consumers may associate farmed prawn with these environmentally

detrimental practices, preferring wild-caught prawn, which are perceived as more natural and climate-friendly (Mitra et al., 2025). Despite these perceptions, the production environment ranked only 14th out of 19 attributes, indicating that it was not a primary driver for most consumers, compared to quality attributes like freshness, taste, size, availability, and price. The relatively low importance of the production environment may be due to a binary screening effect. This means that while some consumers have very strong preferences either in favor of or against certain production methods, these opinions are less visible when averaged across the entire group of respondents. As a result, the impact of production environment on purchasing choices becomes less significant in the overall analysis. Therefore, although consumers are aware of the differences between farmed and wild-caught prawns, their actual purchase behavior is guided more by direct quality characteristics, such as freshness and taste, than by the method of production itself (Bronnmann et al., 2017).

Age and income were two socio-demographic attributes that influenced prawn preferences significantly. For example, older consumers reported a lower preference for prawn compared to younger consumers, which may reflect differences in dietary habits, health considerations, and food choices across age groups. Previous studies have also shown that age affects seafood preferences and willingness to pay for aquatic products (Can et al., 2015). Similarly, higher-income groups showed a stronger preference for seafood, consistent with the concept of income elasticity of demand (Nicholson, 2012; Akbay et al., 2013).

These findings indicate that consumer demand for prawn is influenced not only by product attributes such as freshness, availability, odor, and price but also by demographic factors like age and income. Individuals in higher income brackets are better positioned to afford prawn and may purchase it more frequently, whether for status or to enjoy higher-quality products. However, it is important to recognize that Bangladesh is a lower-middle-income country, where a significant segment of the population has limited purchasing power. As a result, the preferences observed in this sample mainly represent the attitudes of middle- and higher-income consumers and may not fully reflect the broader national population.

These findings have important consequences for the prawn industry. Producers should focus on cultivating larger prawn, minimize early harvesting, and ensure freshness by investing in post-harvest handling, cold chain infrastructure, and proper grading. Smaller companies must reduce harvest-to-market time to retain sensory quality. Retailers, particularly in traditional markets, can increase trust and sales by emphasizing freshness through clean displays, odor control, and clear sourcing. Retailers should additionally split their goods based on socio-demographics (e.g., smaller prawn for older clients, premium sizes for high-income groups) and provide several pricing alternatives. Expanding e-commerce platforms can reach technologically literate consumers, allowing for focused marketing and personalized outreach to this important demographic.

Policymakers should prioritize investments in seafood value chain infrastructure to reduce spoilage and increase transparency, such as subsidies for advances in freshness preservation (e.g., cold storage) and sensory quality. To meet

consumer expectations, regulatory frameworks must enforce food safety standards, freshness labeling, and odor control measures. To integrate Bangladesh into global seafood markets, sustainability certifications should be promoted in order to position Bangladeshi prawn in premium markets and profit on high-income consumers' willingness to pay, provided that quality and safety criteria, such as those needed by the EU, are met. Policymakers should prioritize investments in fish value chain infrastructure to reduce spoilage and increase transparency, such as subsidies for freshness preservation (e.g., cold storage) and sensory quality. In order to comply with consumer priorities, regulatory frameworks must enforce food safety standards, freshness labeling, and odor control methods. To integrate Bangladesh into global seafood markets, sustainability certifications should be promoted to position Bangladeshi prawn in premium markets and leverage on high-income consumers' willingness to pay, once quality and safety criteria, such as those needed by the EU, are reached.

6 Conclusion

This study analyzed the process from consumers forming perception to purchase by identifying the drivers of prawn preference and willingness to pay among Bangladeshi consumers. A logit model was employed to analyze the impact of intrinsic attributes, sensory attributes, extrinsic factors, and demographic variables on consumer preferences. Our findings reveal that freshness was the most influential attribute, commanding a substantial WTP that demonstrates a strong consumer preference for quality. While price exhibited a significant negative effect, the impact of size varied, revealing nuanced consumer responses to price, odor, and demographic factors.

Aside from intrinsic and sensory features, the study highlighted the relevance of extrinsic factors, such as the beneficial influence of availability on consumer desire, underlining the importance of a strong and dependable supply chain. Furthermore, demographic variables such as age and income strongly influenced prawn selections, implying that specialized marketing strategies targeting certain consumer segments such as income level and age could be extremely beneficial in terms of market penetration and consumer engagement. Freshness, flavor, nutrition, and availability all influence small prawn purchasing decisions, whereas price has a negative impact. Freshness and preference are good factors in the selection of large prawn, whereas price, odor, and production environment are negative. Older people and adults prefer smaller prawn, but those with better incomes prefer larger prawn.

These findings have important implications for a variety of stakeholders. Producers should recognize that quality is the primary driver of consumer value, not a minor add-on. Freshness alone commands a WTP premium of US\$2.41 per kg, with size contributing an additional US\$1.78 per kg. Together, these attributes account for over half of the observed price variation relative to the mean wet-market price of US \$7.21 per kg. This provides evidence for the recommendation of investing in cold-chain infrastructure from catch to retail

level, since it is the highest-return structural intervention for the Bangladeshi prawn sector. Improved post-harvest handling, rapid chilling, and temperature-controlled transport enhance both freshness and shelf life, justifying higher prices and building consumer trust. Retailers can boost consumer trust and revenues by stressing freshness, providing traceability information, and segmenting product offerings based on socio-demographic attributes. Policymakers can invest in the seafood value chain, promote food safety and sustainable aquaculture methods, and put in place regulatory procedures to ensure product quality.

While this study provides interesting insights regarding Bangladeshi prawn preferences, it is important to realize numerous limitations. The sample size, while adequate, may not fully reflect the diversity of the enormous Bangladeshi population. Future studies might benefit from larger and more geographically diverse samples in order to improve generalizability. Furthermore, longitudinal studies are required to track the evolution of consumer preferences over time. Investigating the role of cultural and societal influences, as well as the possible impact of sustainability certifications on consumer preferences, would provide a more complete picture. Finally, future study should focus on measuring and reducing the environmental impact of the current prawn market, allowing for the creation of more sustainable industry practices.

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Conflicts of interest

No conflicts of interest exist for the authors.

Author contribution statement

Shah Mahmud Sumon: Contributed to the study's conception, data curation, analysis, and visualization, as well as the original draft's writing.

Max Nielsen: Secured funding for the project, formulated the study concept, carried out inquiries, oversaw project management, distributed resources, provided supervision, ensured validation, and contributed to the writing process by reviewing and editing.

Dr. Badiuzzaman: Conducted investigations, managed project administration, allocated resources, provided supervision, and participated in writing through review and editing.

Rasmus Nielsen: Provided supervision, ensured validation, and participated in writing through review and editing.

Dr. Afjal Hossain: Ensured validation, analysis and participated in writing through review and editing.

Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request

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