Consumer preference analysis for shrimp characteristics across income groups in Southcentral Mindanao, Philippines

Junicel V. Gilon and Romiel John P. Basan*

Department of Agricultural Economics, College of Business, Development Economics and Management, University of Southern Mindanao, Kabacan, 9407, Cotabato

**Corresponding Author: rjbasan@usm.edu.ph*

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ABSTRACT

Shrimp is a highly demanded seafood worldwide, valued for its nutritional benefits, versatile culinary applications, and delicious taste. In Southcentral Mindanao, specifically Cotabato province, understanding consumer preference for shrimp quality is critical for enhancing market competitiveness and meeting diverse consumer demands. This study examines shrimp preference patterns by employing a hedonic pricing model to analyze how shrimp attributes and consumer traits influence market price for shrimp. Data collected through face-to-face interviews with 245 respondents across income groups were analyzed using descriptive statistics, ANOVA, and regression analysis. The findings show that size, origin, and freshness significantly affect shrimp prices, with consumers willing to pay premiums for high-quality shrimp. Ocean-sourced, white-colored, fresh shrimp preserved in ice cubes are universally preferred, although low-income consumers tend to opt for freshwater shrimp stored in water, while higher-income groups prioritize ocean-sourced shrimp. Consumer traits, such as education, influence purchasing decisions among low-middle-income groups, but none significantly influence the purchase decisions of those consumers in high-income groups. These findings emphasize the economic value that consumers attribute to shrimp quality and highlight the need for targeted strategies to address diverse preferences. Improving shrimp quality through aquaculture innovations, better preservation methods, and market segmentation, while emphasizing government support to enhance competitiveness, is imperative. Moreover, these insights guide producers and marketers in meeting consumer demands and suggest further research to explore the implicit value of shrimp attributes throughout the supply chain for a more comprehensive understanding of market dynamics.

Keywords: consumer traits, freshness, hedonic pricing model, market segmentation, Mindanao, price sensitivity

INTRODUCTION

Shrimp farming has developed rapidly in the Philippines, driven by potential high profits, the growing demand for high-value seafood products, and the increasing reliance on farmed shrimp due to limitations in supply from capture fisheries (Islam and Yasmin 2017). Additionally, the industry's ability to generate foreign exchanges and provide employment in poor coastal areas has fueled its expansion (BFAR 2020). In the Philippines, it is both a source of livelihood and food for coastal communities. The best-known species for shrimp culture is *Penaeus vannamei* Boone, 1931 (Cuvin-Aralar et al. 2009). The species

has won favor with tropical producers due to properties that include short culture time and fast growth, and it is an entry into the world market (Rosario and Lopez 2005). Its production has tremendously increased over the years, putting on the human menu an important seafood item giving high commercial profit, but the disease has heavily wrecked this (Shinn et al. 2018). While the bulk of shrimp production is in Negros and the Panay Islands, shrimp production has been growing and increasing in other areas, such as in the Southcentral Mindanao regions, Central Luzon and other parts of Central Visayas (PSA 2020a). Globally, shrimp serves as a staple protein source and is one of the most widely consumed seafood products. The increasing demand is fueled by its perceived health benefits, culinary versatility, and the expansion of global seafood markets. However, this growth in consumption has raised concerns about food safety, environmental sustainability, and the socio-economic impacts of shrimp farming practices (Macusi et al. 2022).

Consumer preferences for shrimp are influenced by a range of factors, including sensory attributes, perceived quality, and socioeconomic considerations. Understanding these preferences is crucial for producers and marketers aiming to meet consumer demands effectively. One of the primary sensory attributes influencing consumers' preference is color. Research has shown that consumers strongly associate specific colors with quality. For instance, Parisenti et al. (2011) found that consumers preferred cooked shrimp with a reddish-orange hue, a color linked to freshness and higher quality. Similarly, Zancan et al. (2023) noted that consumers favor lighter-colored raw shrimp and more intensely orange-colored cooked shrimp. These findings underscore the importance of visual appeal in seafood marketing. In addition to color, freshness and perceived quality significantly impact consumer willingness to pay (WTP). According to Hoque et al. (2021), locally farmed shrimp are believed to be fresher and more appealing than imported ones. This belief stems from the influences of culture and national pride, thereby developing such appeal for local products. Nayak and Joshi (2022) also discussed the significant role of appearance, smell, and texture in shaping consumer preference. With this, the value of shrimp produced for the market is contingent upon the sensory and visual preferences that are typical for consumers before making a purchase (Omobepade et al. 2018). Accordingly, Parisenti et al. (2011) revealed that, in terms of size, consumers put a premium on medium-sized shrimp sold in the market. Similarly, bioeconomic modelling of Moreno-Figueroa et al. (2018) showed that the quality and perceived size of the shrimp motivated consumers to increase their satisfaction value. Suthamathy (2012), on the other hand, emphasized that extrinsic characteristics of shrimp, such as carapace size, mass, origin, species, freshness, product form, and preservation method, significantly influence its market price. Hence, these studies emphasize that hedonistic motives for purchasing play a strong role in consumer preference (Sahubawa and Suratno 2023).

Additionally, socioeconomic characteristics influence consumer preference. Studies reveal that educated and affluent households tend to purchase organic or sustainably produced shrimp (Paul and Vogl 2012). While other studies emphasized the personal characteristics of the consumers, Jhan et al. (2023) proved that trust and product features consistently influence consumers' purchase intention on shrimp. For example, Ortega et al. (2014) found that safety-oriented features included in shrimp products are likely to receive higher premiums among consumers. Aside from this, market dynamics influence consumer preferences. Santo and Marques (2022) found the competitive retail pricing present in the e-commerce context led consumers to focus on hedonic benefits in association with perceived value.

Therefore, the price consumers are willing to pay for seafood products, such as shrimp, often depends on quality standards (Suthamathy 2012). While consumers consider various characteristics like nutrition, convenience, food safety, and environmental impact, studies quantifying these preferences remain limited. While product attributes can be observed, they may be subjective. A more objective approach to analyzing quality changes and consumer preference was recommended referring to major hedonic study of Griliches (1961) highlighting the need for further research in this area. Hence, this study attempted to determine the socio-economic characteristic of the consumers, analyze the consumer preference for shrimp characteristics using hedonic price analysis, and determine variations in preference across income groups.

METHODS

Theoretical Framework

The consumer preference analysis is underpinned by the "characteristics" approach to consumer theory developed by Lancaster (1966), which assumed that consumption is an activity in which goods, singly or in combination, are inputs and in which the output is a collection of characteristics. The approach builds upon activity to model the combination of the characteristics that can be achieved given the assumptions on (a) whether the combination of goods is possible or not in the market, (b) whether the combination of goods can be made in a linear way or not, and (c) whether the number of characteristics is smaller or larger than the number of goods containing them (Chumpitaz et al. 2010).

The fundamental theory of hedonic price explains the price (P) of a commodity as a function of

its characteristics. The model assumes that a product is composed of a variety of specific attributes that consumers value independently. For any given commodity, let us consider it characterized by the set of *j*-th specific attributes and are denoted as $Z = (Z_1, Z_2, Z_3)$, and it is assumed that the preference of the economic agents towards the commodity is determined by its corresponding characteristic vector alone. The functional relationship between its price *P* and characteristics vector *Z* is given by Equation 1:

$$P = f(Z) \quad \text{(Eq. 1)}$$

This function specifies the hedonic relationship for a commodity. According to the functional relationship in the Equation 1, the marginal price of the j-th characteristic, say *Zj*, is given by the partial derivative of the hedonic function (Equation 2) with respect to *Z*:

$$\frac{\partial p}{\partial z_j} = \frac{\partial f}{\partial z} \quad \text{(Eq. 2)}$$

The hedonic price $\frac{\partial p}{\partial z_j} = \frac{\partial f}{\partial z}$ indicates how much the price *P* of a good changes if this good is endowed with an additional unit of the characteristics Z_j and all others are constant (Suthamathy 2012).

Respondents of the Study

Shrimp consumers were systematically and randomly selected from the total number of households in the selected market areas - Midsayap, Kabacan, Makilala and city of Kidapawan. These were considered as the major market centers due to its substantial consumer bases. Midsayap has a total population of 165,376; 93,822 for Kabacan; Makilala with a total population of 87,927 and 160,791 people in Kidapawan based on the 2020 Census of Population (PSA 2020b). These consumers were those who bought shrimp from the market. A total of 245 (Midsayap [n = 60]; Kabacan [n = 55]; Makilala [n = 65], and Kidapawan [n = 65]) consumers were considered as the respondents of the study.

Research Instrument

An interview guide was used to gather necessary information for the study. It was composed of two parts. Part I consisted of questions eliciting information about the socio-economic characteristics of the respondents. Consequently, part II was composed of questions pertaining to the quality of shrimp preferred or demanded by the consumer-respondents. The interview guide was validated to ensure applicability and appropriateness.

For the development of the instrument, specifically in part II, the considered shrimp attributes in the study were size, carapace length, species color, freshness, preservation method, product form, and origin. These attributes, except for size and carapace length, were measured using a hedonic scale. For size and carapace length, the researcher brought small weighing scale and ruler for determining the weight (g) and length (mm) of the shrimp and its carapace, respectively.

Data Gathering Procedure

The primary data were elicited through a survey of the consumer-respondents. This was a direct face-to-face interview with the consumer-respondents. According to Owusu and Anifori (2013), face-to-face interviews offered an opportunity to explain some questions to respondents with low literacy levels and did not introduce significant bias to the study. Hence, consumer-respondents were personally interviewed to obtain their socio-economic characteristics as well as their preferences for shrimp characteristics.

The interview was simultaneously done while the consumer-respondents were buying shrimp. This is to ensure that the information on the quality preference is correctly obtained. Further, during the conduct of the interview, the researcher asked for a sample of shrimp to measure and obtain its correct weight and carapace length.

Statistical Analysis

Descriptive statistics. Descriptive statistics such as frequency counts, percentages, and means were computed to describe the socio-economic characteristics of the consumer-respondents. In addition, the key quality attributes preferred by the consumer-respondents were analyzed descriptively. Tabular presentation was used to present the result. Moreover, results were categorized across income groups – low, middle, and high. This categorization was based on the NEDA classification for income groups.

Hedonic regression analysis. The hedonic regression method is used in this study. It recognizes that heterogeneous goods can be described by their attributes or a characteristic, i.e. a good is essentially a bundle of (performance) characteristics (Eurostat et al. 2013) RPPI Handbook 2011). In this method, the regression technique is used to obtain estimates of the willingness to pay for the different characteristics.

The ordinary least square method was used to determine the effect of shrimp qualities on its price. The estimated coefficients were obtained using the STATA 10.0 software. The regression analyses were done separately for different income groups. However, the low- and middle-income groups were pooled together since the sample size for low-income is relatively small with n=24 households. According to Chang et al. (2006), a sample size equal or greater than 30 is considered sufficient for the central limit theorem to hold, hence, can proceed to regression.

Empirically, the hedonic price estimation/analysis is shown in Equation 3:

$$P_s = \alpha_s + \beta_1 S_{(w)} + \beta_2 O + \beta_3 SC + \beta_4 F + \beta_5 PM + \beta_6 PF + \beta_7 Age + \beta_8 Educ + \beta_9 Occup + \beta_{10} Dist + \beta_{11} Gen + \beta_{12} Civil + \varepsilon_s \quad \text{(Eq. 3)}$$

Where:

Ps=actual/prevailing price of shrimp (P/kilogram)

$S_{(w)}$ =Ave. size of shrimp (weight)

O=dummy variable for origin (1 if ocean-sourced, 0 if freshwater)

SC =dummy variable for species color

F =dummy variable for freshness

PM = dummy variable for preservation method

PF= dummy for product form

Age = age of the respondents at the time of study

Educ = education (in years)

Occup = occupation (1 if employed, 0 if unemployed)

Gen = gender

Civil = civil status

Dist = distance from the market

$\propto_S$ = intercept term

$\beta_1 - \beta_7$ = slope of the estimated coefficients

ε_S = error term of the model

Comparison of means. Leven's test was used to determine the homogeneity of variance prior to the use of one-way analysis of variance (ANOVA). The ANOVA was used in determining if there was any significant difference in the consumer traits between income groups in selected large market centers.

The F-distribution was used as a basis of comparison. The hypotheses tested among the means are H_0: $\mu_1 = \mu_2 = \mu_3$ (all means are equal), and the alternative hypothesis (*Ha*): at least two of the means are not equal (Lantican et al. 1996). The condition to reject the null hypothesis is that the F statistic should be greater than the critical value. In this study, Statistical Package for Social Sciences (SPSS) was used.

A post hoc test was done to evaluate the pairwise difference among income groups. In the literature, the most common and recommended post hoc tests used are Tukey's Honestly Significant Difference (HSD) and the Games-Howell multiple comparison. Tukey HSD was used for those variables that do not violate the assumption of homogeneity of variance, and Games-Howell was used if otherwise.

RESULTS

Table 1 shows the socioeconomic characteristics of consumer-respondents across income groups. The average age of respondents across income groups ranges from 36 to 37 years, with no significant variation. Similarly, the average years of education are consistent, spanning 11 to 12 years across all income groups. Gender composition shifts notably between groups. Females predominate in the low-income group (75%), while gender distribution becomes more balanced in the middle-income group (50.9% female and 49.1% male) and slightly favors males in the high-income group (45.1% female and 54.9% male). Civil status shows a clear trend of increasing marriage rates with income level. In the low-income group, 58.3% are married, compared to 70.4% in the middle-income group and 90.3% in the high-income group. Despite these differences, all income groups exhibit a unanimous interest in a health-conscious lifestyle, with 100% of respondents in each category identifying as health-conscious. Moreover, results reveal variations in average household size and distance. While low- and middle-income groups have a similar average household size of 3-4 members, the high-income group shows a slightly larger average of 5 members. The average distance follows a similar pattern, with no significant differences observed across the groups (2.65-3.23). Income characteristics indicate significant disparities among groups. The low-income group has the lowest average monthly income (PHP 3,845.83 or USD 66.17) and annual income (PHP 46,150.00 or USD 794.03), while the high-income group reports the highest values (PHP 13,034.07 or USD 224.26 monthly and PHP 56,408.80 or USD 970.54 annually). The middle-income group falls between these extremes. Per capita income also demonstrates a statistically significant difference ($P < 0.05$), with the high-income group achieving more than double the per capita monthly and annual income compared to the middle-income group and nearly triple compared to the low-income group.

Shrimp Attributes Preferred among Consumer-respondents

As this study examines shrimp attributes preferred by consumer-respondents across income groups, significant differences are observed in price, size, and carapace length (Table 2). The low-income group prefers significantly lower shrimp price (M = PHP 215.83 (USD 3.71), $P < 0.05$) compared to both middle-income group (M = PHP 269.44, $P < 0.05$) and the high-income group (M = PHP 298.14 (USD 5.13), $P < 0.05$). Similarly, the average size of shrimp preferred increases with income, ranging from 28.71 grams for the low-income group to 34.37 g for the high-income group. Carapace length follows the same pattern, with preferences increasing from 31.04 mm in the low-income group to 34.83 mm in the high-income group.

Differences in preference for shrimp origin are notable. The low-income group predominantly favors freshwater shrimp (70.8%), while the high-income group prefers ocean-sourced shrimp (82.4%), with the middle-income group exhibiting a balanced preference. Regarding species color, all respondents in

Table 1. Socioeconomic characteristics of shrimp consumers in selected large market centers by income groups in Southcentral Mindanao. Means followed by the same letter are not significantly different from each other at the 5% level. Post-hoc test: [d]Tukey HSD; [e]Games-Howell. Values inside parenthesis ( ) are percentages of numbers reported. Low: n = 24, Middle: n = 108, and High: n = 113.

Characteristics	Income Groups		
	Low (n=24)	Middle (n = 108)	High (n = 113)
Average Age[d]	36[a]	37[a]	37[a]
Education (ave. in year)[e]	11[a]	12[a]	11[a]
Occupation			
Employed	22(40)	44(67.7)	39(60)
Unemployed	33(60)	21(32.3)	26(40)
Gender			
Female	18(75)	55(50.9)	51(45.1)
Male	6(25)	53(49.1)	62(54.9)
Civil Status			
Married	14(58.3)	76(70.4)	102(90.3)
Single	10(41.7)	32(29.6)	11(9.7)
Lifestyle			
Health Conscious	24(100)	108(100)	113(100)
Ave. Distance to the Market[e]	2.65[a]	3.13[a]	3.23[a]
Ave. Household Size[d]	3[a]	4[a]	5[b]
Ave. Monthly Household Income[e]	3845.83[a]	6449.07[b]	13034.07[c]
Ave. Annual Income[e]	46150[a]	77388.89[b]	156408.8[c]
Per capita average monthly income[d]	1281.94[a]	1612.27[b]	3258.52[c]
Per capita average annual income[d]	15383.33[a]	19347.22[c]	39102.2[b]

Table 2. Quality attributes of shrimp preferred by consumers in selected large market centers by income groups in Southcentral Mindanao. Means followed by the same letter are not significantly different from each other at the 5% level. Post-hoc test: Games-Howell. Values inside parenthesis ( ) are percentages of numbers reported. Low: n = 24, Middle: n = 108, and High: n = 113.

Characteristics	Income Groups		
	Low (n = 24)	Middle (n = 108)	High (n = 113)
Average price per kilogram	215.83[a]	269.44[b]	298.14[c]
Average size (weight in g)	28.71[a]	30.94[b]	34.37[c]
Average carapace length (in mm)	31.04[a]	31.46[c]	34.83[b]
Origin			
Ocean-sourced	7 (29.2)	68 (63)	92 (82.4)
Freshwater	17 (70.8)	40 (37)	21 (18.6)
Species Color			
White	24 (100)	88 (81.5)	86 (76.1)
Black		13 (12)	13 (11.5)
Brown		7 (6.5)	14 (12.4)
Freshness			
Fresh	16 (66.7)	68 (63)	95 (84.1)
Acceptable Fresh	8 (33.3)	40 (37)	18 (15.9)
Preservation Method			
With ice cube	4 (16.7)	58 (53.7)	82 (72.6)
Water only	20 (83.3)	50 (46.3)	31 (37.4)
Product Form			
Whole shrimp	24 (100)	108 (100)	113 (100)

the low-income group prefer white shrimp, while middle- and high-income groups display diversified preferences, with white shrimp being most popular but supplemented by minor preferences for black and brown shrimp. Moreover, the high-income group shows the strongest preference for fresh shrimp (84.1%), followed by the low-income group (66.7%). The preservation method preferences also vary. Low-income groups predominantly favor shrimp preserved in water (83.3%), whereas both middle- and high-income groups show increasing preference for shrimp preserved with ice cubes (53.7% and 72.6%,

respectively). Meanwhile, a uniform preference for whole shrimp is observed across all income groups, with 100% of consumer-respondents choosing this product form.

Hedonic Price Analysis by Income Groups

The result of the hedonic regression analysis shown in Table 3 provides an examination of the factors influencing shrimp prices for low-, middle-, and high-income consumer groups. The use of the low-middle-income group was because the low-income group had fewer respondents (n = 24); hence, it was pooled together with the middle-income consumers. Thus, only two income groups were examined. The results of the hedonic regression analysis provide a detailed examination of the factors influencing shrimp prices for low-, middle-, and high-income consumer groups. The models are robust, as evidenced by the adjusted R^2 values of 0.8929 and 0.8621 for the low-middle and high-income groups, respectively. The adjusted R^2 indicates that the included explanatory variables explain a substantial portion of the variations in shrimp prices (89.29% and 86.21% for low-middle and high-income groups, respectively). Both models are statistically significant, with F-statistics of 85.01 and 54.86 at the 1% level. Using the *ceteris paribus* principle, the significant variables were interpreted to isolate their specific effects on shrimp prices.

For shrimp characteristics, size, origin, and freshness emerge as significant determinants of shrimp prices in both income groups. Shrimp size has a significant positive effect on price in both groups, with coefficients of $\beta = 0.002$ (low-middle income) and $\beta = 0.008$ (high income), both significant at the 1% level. This indicates that, *ceteris paribus*, a 1-gram increase in shrimp size (measured by its weight in grams) leads to a 0.2% and 0.8% increase in price for low-middle and high-income groups, respectively. The larger coefficient for high-income consumers suggests that this group places a higher premium on shrimp size. Shrimp origin also significantly influences price, with coefficients of $\beta = 0.42$ and $\beta = 0.43$ for the low- middle and high-income groups, respectively, at the 1% level. This implies that, holding all other factors constant, ocean-sourced shrimp are priced 42% and 43% higher than freshwater shrimp for the respective income groups. Freshness has a positive and significant impact on price, with $\beta = 0.061$ for low-middle income and a $\beta = 0.117$ for high income, indicating that fresh shrimp, compared to acceptably fresh shrimp, commands a price premium of 6.1% and 11.7% in the two groups, respectively. The stronger effect of freshness among high-income consumers reflects their heightened sensitivity to this quality attribute. In contrast, species color and preservation methods are not significant determinants of shrimp prices for either income group. Hence, these attributes are less critical in consumer preference valuation.

Table 3. Estimated hedonic regression model for the characteristics affecting the price of shrimp by income groups in Southcentral Mindanao. Characteristics followed by letters and not seen in the table are the base dummy variable. Figures in ( ) are t-values. ***, ** - significant at 1% and 5% level; ^{ns} – not significant.

Variables	Income Groups	
	Low-Middle (n = 132)	High (n = 113)
Shrimp Characteristics		
Size	.002*** (8.01)	.008*** (4.69)
Origin	.42*** (12.79)	.43*** (14.28)
Species Color		
White	a	a
Black	-.012^{ns} (-0.05)	-.015^{ns} (-0.55)
Brown	-.011^{ns} (-0.23)	-.005^{ns} (-0.18)
Freshness	.061** (2.78)	.117*** (4.75)
Preservation Method	-.025^{ns} (-0.87)	-.032^{ns} (-1.46)
Consumer Characteristics		
Age	.001^{ns} (0.98)	-.001^{ns} (-0.73)
Gender	-.015^{ns} (-0.69)	.014^{ns} (0.18)
Civil Status	.017^{ns} (0.54)	-.042^{ns} (-1.26)
Education	.010** (2.08)	-.004^{ns} (-0.74)
Occupation	-.031^{ns} (-1.27)	-.016^{ns} (-0.67)
Distance	-.009^{ns} (-1.20)	-.002^{ns} (-0.31)
Adj. R2	0.8929	0.8621
F	85.01***	54.86***
n	132	113

For consumer characteristics, only education exhibits a significant effect, and this is observed in the low-middle income group ($\beta = 0.010$, $t = 2.08$, $P < 0.05$). *Ceteris paribus*, a one-year increase in education level leads to a 1% increase in the price low-middle-income consumers are willing to pay for shrimp. This suggests that better-educated consumers in this group are more likely to value quality attributes, potentially due to increased awareness or knowledge. In the high-income group, none of the consumer characteristics significantly influence price, which may reflect their broader financial flexibility and reduced sensitivity to individual demographic factors.

DISCUSSION

Socioeconomic Characteristics of Consumer-respondents

The significant differences in the income of shrimp consumers explain the patterns of shrimp consumption and preference. High-income

households tend to have a greater disposable income, allowing them to purchase shrimp more frequently and in larger quantities compared to low-income households, which may prioritize more affordable protein sources such as finfish (Bashar et al. 2022; Akter and Khan 2021). Studies have shown that low-income consumers switch to less expensive alternatives when shrimp prices rise, indicating a direct correlation between income and shrimp consumption patterns (Akter and Khan 2021). While larger households may have higher gross income, their purchasing decision on shrimp is affected by a lower per capita income. On the contrary, smaller households with higher per capita income may signal a greater willingness to pay for premium shrimp (Nayak and Joshi 2022).

For other demographic factors such as age, gender, civil status, education, and distance to market, research has shown no statistical difference when grouped by income level in the patterns of shrimp consumption. Hoque et al. (2021) argued that shrimp preferences have shown no significant difference in consumption pattern between age or gender. Moreover, distance to market likely does not vary significantly across income level, as all consumers ranked quality and freshness above proximity. Research by Bassett et al. (2021) supported this evidence, demonstrating that marketing structures focused more on product quality rather than demographic segmentation would reach consumer bases more effectively.

Hence, programs that make shrimp more accessible and affordable for low-income households could help improve their protein intake, while promoting sustainable shrimp production for high-income consumers who are willing to pay for premium shrimp products. Moreover, a well-informed and proper market segmentation and marketing plan can be chosen and prepared, respectively.

Shrimp Attributes Preferred among Consumer-respondents

The significant variation in the preference for shrimp attributes such as price, size, and carapace length indicate that low-income consumers tend to look for cheaper alternatives when purchasing shrimp in the market, as they are constrained by their budget. Therefore, premium-quality shrimp motivates consumers to decrease the amount of shrimp consumption. In comparison, consumers in the middle- and high-income brackets are more likely to pay extra for shrimp that has better attributes (Chen et al. 2022). Additionally, evidence suggests that consumers with more income tend to favor large shrimp. These preferences in size are also typically about their belief that larger shrimp has more meat and is of better quality (Sirisha and Subba Rao 2024).

Furthermore, the source of the shrimp, whether it is freshwater or ocean shrimp, changes with income. Low-income groups are more likely to consume freshwater shrimp, which may be more accessible and available in the local markets (Nayak and Joshi 2022). This distinction reflects not only economic factors but also cultural and regional preferences among consumers in different income levels. Freshness, color, and preservation methods further differentiate shrimp preferences among income groups. Low-income consumers may prioritize freshness and affordability, often purchasing shrimp that are locally sourced and less expensive, while high-income consumers are more likely to seek out shrimp that are not only fresh but also exhibit desirable colors and are preserved using advanced methods to ensure quality (Sirisha and Subba Rao 2024). This trend aligns with findings that suggest higher-income households are more inclined to purchase organic and sustainably sourced seafood, reflecting their greater awareness and concern for food quality and environmental sustainability (Paul and Vogl 2012).

Technical improvements, either through genetic engineering, innovative pond management or improve feed formulation can be done since consumers have their own preferred shrimp attributes. Through this, consumer demand can be satisfied at the same time provide profit opportunity for shrimp growers and other actors in the value chain.

Hedonic Price Analysis by Income Groups

The price of shrimp is influenced by several factors, including size, origin, and freshness, which vary significantly between income groups. In general, consumers exhibit a willingness to pay a premium for shrimp that is perceived as fresher, larger, and sourced from reputable origins. Research indicates that size plays a relatively minor role in consumer preferences, particularly among adults, who prioritize factors such as freshness and origin over size (House et al. 2011). In contrast, studies suggest that low-middle-income consumers may be more sensitive to price variations and less likely to prioritize size when making purchasing decisions (Nayak and Joshi 2022). Freshness is a critical determinant of shrimp quality and price. It is widely recognized that consumers are willing to pay more for shrimp that is fresh, as freshness is closely associated with quality and safety (Prema and Visumathi 2023). For instance, Hoque et al. (2021) found that local consumers are willing to pay a premium for both inland and coastal farmed shrimp, driven by perceptions of quality linked to freshness. Additionally, the processing and handling of shrimp significantly affect its freshness, which in turn impacts consumer willingness to pay (Prema and Visumathi 2023). In high-income markets, consumers often demand higher quality and freshness, leading to a greater price premium for shrimp that meets these criteria (Ortega et al. 2014). The origin of shrimp also plays a vital role in pricing dynamics. Whether it is sourced from freshwater or the ocean, it influenced the price of shrimp across income groups. This distinction

affects consumer preferences and willingness to pay across different income groups. Freshwater shrimp, often farmed in controlled environments, tend to be perceived as more sustainable and may command higher prices in certain markets (Paul and Vogl 2012). Conversely, ocean-sourced shrimp, which are often wild-caught, can vary in price based on factors such as fishing regulations, environmental conditions, and market demand (Asche et al. 2011). Research indicates that consumers in high-income groups are more likely to pay a premium for sustainably sourced ocean shrimp, reflecting a growing trend towards environmental consciousness (Paul and Vogl 2012).

In low-middle income groups, the price sensitivity is more pronounced. These consumers often prioritize affordability over origin, leading to a preference for freshwater shrimp, which may be more readily available and less expensive due to lower transportation costs (Thi Phoung Dong et al. 2021). However, as income levels rise, there is a noticeable shift in preferences, with increasing willingness to pay for premium ocean-sourced shrimp, particularly when marketed as organic or sustainably harvested (Soedrijanto and Istiqamah 2016). This trend suggests that education and awareness of environmental issues play a crucial role in shaping consumer behavior in these markets (Paul and Vogl 2012). Education significantly influences the willingness to pay for premium shrimp among low-middle-income groups. Higher levels of education mean increased awareness of food quality and safety, leading to a greater willingness to invest in premium shrimp products (Nayak and Joshi 2022; He et al. 2013). Studies have shown that educated consumers are more likely to prioritize attributes such as freshness and origin, which can justify higher prices (Yang and Yao 2023). This trend is supported by research indicating that consumers with greater knowledge about food safety and quality are more inclined to pay for shrimp that meets higher standards (Ortega et al. 2014).

The present study revealed consumer preferences regarding the physical shrimp attributes across different income groups. However, there is a notable gap in understanding the intrinsic properties of the preferred shrimp, which warrants further investigation. Given the well-established body of literature on the shrimp marketing chain, future research could build upon this foundation by examining both the preferences and the implicit prices assigned by each actor within the chain. This would provide a more comprehensive understanding of the factors influencing shrimp demand and supply dynamics.

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GENERATIVE AI STATEMENT

This work has benefited from the use of Generative AI tools (i.e. Quillbot, Grammarly) to assist in the refinement of writing and grammar checking. The authors reviewed, validated, and are fully responsible for the accuracy, interpretation, and conclusions in this paper.

ETHICAL CONSIDERATIONS

Communication letters were sent to different municipalities for the permission to conduct the study. When it was approved, an informed consent was secured from the respondents before the conduct of the study.

DECLARATION OF COMPETING INTEREST

The authors declare no competing interests to any authors.

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