

Marketing Status of Fermented Fish Products (Sheedal) in Tripura: An Empirical Market Assessment

Akash Debnath¹, Dr. L. Surulivel²

¹PG Scholar, Department of Fisheries Resource Management, Dr. M.G.R. Fisheries College and Research Institute, TNJFU, Ponneri - 601204, Tamilnadu, India

Corresponding Author email: [adebnath.511111\[at\]gmail.com](mailto:adebnath.511111[at]gmail.com)

²Assistant Professor, Department of Fisheries Extension and Economics, Dr. M.G.R. Fisheries College and Research Institute, TNJFU, Ponneri - 601204, Tamilnadu, India

Abstract: *Fermented fish products are important components of the food culture and economy of Tripura, but quantitative information on their production and marketing remains limited. A market assessment was conducted in Teliamura, Maharajganj, and Battala to examine production, raw-material sourcing, pricing, and market characteristics of major fermented fish products, including Puti sheedal (Puntius sphore), Phasa sheedal (Setipinna phasa), and Lona ilish (salt-fermented Hilsa ilisha). The survey identified 51 registered Sheedal production units in Tripura and approximately 1,300 MT of reported annual production in 2023. Teliamura emerged as the principal production centre, with substantial processing activity and an estimated annual turnover of approximately Rs. 100 crore. RCBD ANOVA indicated a significant market effect on wholesale prices after accounting for product differences ($F = 5.06$; $df = 2,8$; $p = 0.038$). In contrast, retail prices between Maharajganj and Battala did not differ significantly in the paired comparison ($t = -1.09$; $df = 4$; $p = 0.337$). The sector is economically important but remains constrained by dependence on external raw-material sources, seasonal variation, limited standardization of processing and storage, and inadequate packaging and organized marketing. Strengthening local supply chains and improving hygienic processing, packaging, and marketing could enhance the commercial potential of Sheedal in Tripura.*

Keywords: Sheedal, fermented fish, Tripura, market assessment, price analysis, Puntius sphore, Setipinna phasa

1. Introduction

Fish fermentation is a traditional preservation method practised widely across Southeast Asia and Northeast India (Khongthaw et al., 2026). Regional fermented fish products include ngari and hentak (Manipur), tungtap (Meghalaya), ngatu and dang pui thu (Mizoram), ngyii papi (Arunachal Pradesh), and heedal (Assam) (Majumdar et al., 2015; Priyadarshini et al., 2014). In Tripura, the corresponding product is Sheedal, a traditional fermented fish product of Tripura prepared predominantly from Puntius sphore (Puti) and Setipinna phasa (Phasa) (Goswami, 2013; Majumdar et al., 2016), alongside the well-known Lona ilish, a salt-fermented preparation of Hilsa (Ilisha ilisha) (Majumdar & Basu, 2010).

These products constitute a regular component of the diet of tribal communities in Tripura and are consumed widely by non-tribal populations as well (Muzaddadi & Basu, 2012). Fermented fish products are nutritionally significant, being a source of high-quality protein, B-complex vitamins, vitamin D, and minerals such as calcium and phosphorus (Majumdar et al., 2009). The fermentation process additionally introduces beneficial microbiota with probiotic potential, and generates bioactive compounds exhibiting antioxidant and antimicrobial properties (Chan et al., 2023; Khongthaw et al., 2026).

Despite the scale of consumption and evident commercial activity, no published data exist on the production volume, market structure, or price trends of fermented fish products in Tripura. The present study was undertaken to generate

baseline quantitative data on production capacity, raw-material sourcing, workforce engagement, and price structure across the state's principal fermented-fish markets, to characterize the current status of the industry, test for significant inter-market price variation, and identify constraints to its expansion.

2. Materials and Methods

2.1 Study area and survey period

The survey was conducted across three major fermented-fish trading centres of Tripura: the Teliamura production-cum-market complex, Maharajganj Bazar (Agartala), and Battala Bazar (Agartala). Data collection was carried out between 21 December 2023 and 25 January 2024, consistent with the field-survey approach adopted in comparable market assessments of Northeast Indian fermented fish products (Uchoi et al., 2022).

2.2 Survey instrument

A structured questionnaire was administered to producers, wholesalers and retailers to gather primary data on: identity and number of major production units; source and cost of raw material; number of functional Sheedal production units in the state; species preference; per-unit production capacity; distribution pattern (in-state and inter-state); wholesale and retail price; average daily and annual production; and the number of wholesalers and retailers operating in each market. A total of 20 producers, 45 wholesalers and 60 retailers were interviewed across the three markets;

Volume 15 Issue 9, September 2026

Fully Refereed | Open Access | Double Blind Peer Reviewed Journal

www.ijsr.net

respondents were selected randomly and data collected by personal interview method and information was gathered from each category of respondents.

2.3 Statistical analysis

Reported price figures were recorded by respondents as ranges; the midpoint of each range was taken as the representative value for a given product in a given market to construct a market $\times$ product price matrix suitable for comparative analysis. Because the same five product categories (Lona ilish, Phasa-good, Phasa-poor, Puti-small, Puti-big) were priced in all three markets, wholesale price data were analysed using a randomised complete block design (RCBD) two-way ANOVA, with market treated as the factor of interest and product category as the blocking factor, to test whether wholesale price differed significantly among markets after accounting for baseline product-to-product price variation. Retail prices, available only for Maharajganj and Battala, were compared using a paired t-test (paired by product). All tests were performed at $\alpha = 0.05$ using Python (SciPy v1.x). Given the exploratory, single-round nature of the survey and the absence of within-market replicate sampling, these tests should be interpreted as indicative of trend rather than as definitive population-level inference.

3. Results and Discussion

3.1 Production infrastructure

The survey identified 51 registered Sheedal production units in Tripura, of which a subset was found non-functional at the time of the study. The cumulative reported production from active units in 2023 was approximately 1,300 MT. Teliamura was identified as the principal production centre, hosting the largest processing units, while smaller-scale units were concentrated in and around Agartala, consistent with earlier reports identifying Assam and Tripura as the major shidal-producing states of the region (Muzaddadi & Basu, 2012). Secondary markets for the product include Golbazar, Battala, Lakechowmuhuni, Bishalgarh, Sonamura and Udaipur.

3.2 Processing methodology

Processing was found to follow a broadly uniform sequence across units: cleaning and gutting of fresh Puti/Phasa; water-washing/soaking of salted and unsalted dried fish in running river water for rehydration; fan-drying to reduce surface moisture; and packing into earthen pots (locally termed mutka) of 10–12 kg to 40–50 kg capacity for natural fermentation- a sequence broadly consistent with the traditional shidal processing method documented by Uchoi et al. (2022) and Muzaddadi and Basu (2012). Fermentation duration at Teliamura was reported at 6–8 months per batch. Salt was applied at an approximate ratio of 60% salt to 40% water for preservation. The use of urea to accelerate fermentation was reported to have declined substantially owing to recognised health risks; turmeric was occasionally used for colour enhancement, with no other additives reported. Labour productivity was estimated at

approximately 10 mutka per worker per day under task-specialised (single-operation) working arrangements.

3.3 Raw-material sourcing

Raw material procurement was found to be predominantly extra-state and, for Lona ilish, extra-national. Major sourcing locations included Jagiroad market and Guwahati (Assam), West Bengal (Kakdwip), Gujarat, Odisha, Andhra Pradesh, and Bangladesh- a pattern also reported by (Uchoi et al., 2022) for Puntius-based raw material sourcing in Tripura. Lona ilish was reported to be almost entirely imported from Bangladesh, as the traditional Hilsa-fermentation technique is retained principally in that country (Majumdar & Basu, 2010); no functional domestic production unit for Lona ilish was recorded during the survey.

3.4 Production and workforce parameters- Teliamura

Table 1: Operational and economic parameters at Teliamura, the principal Sheedal production centre.

Parameter	Recorded value
Approximate daily raw-material processing	100–150 tonnes
Total workers engaged in production	200–300
Labour charge (per person per day)	Rs. 400–500
Approximate daily sale volume	50 tonnes
Estimated annual turnover (Sheedal sales)	~Rs. 100 crore per annum
Survey period	21 Dec 2023 – 25 Jan 2024
Principal products	Sheedal (Setipinna phasa, Puntius sphore); Lona ilish

Source: collected from the field

3.5 Price structure across markets

Raw-material and wholesale price ranges recorded at Teliamura are presented in Table 2.

Table 2: Raw-material and wholesale price structure at Teliamura.

Product	Raw material price (Rs./kg)	Wholesale price (Rs./kg)
Lona ilish	1,050	900–1,000
Phasa (good quality)	250	300–350
Phasa (poor quality)	70–80	80–150
Puti (small)	500–600	100–150
Puti (big)	—	250–300

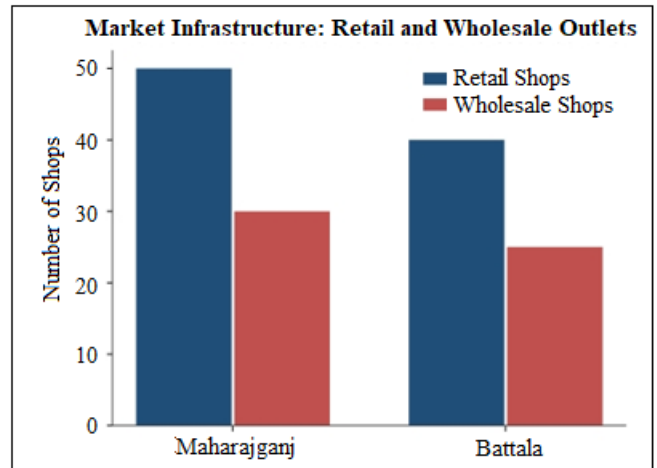
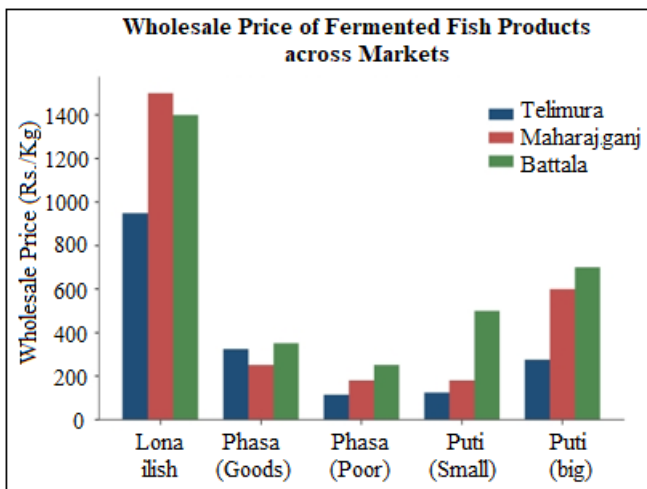
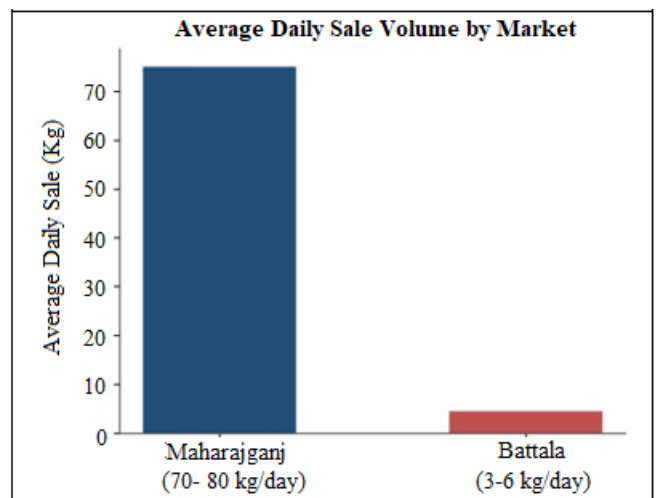
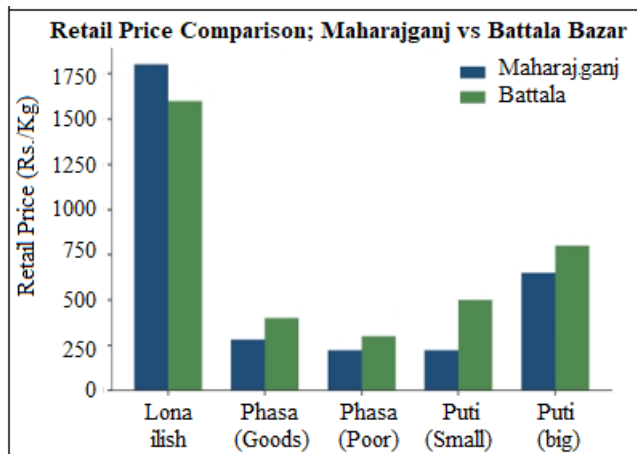
Source: collected from the field

Retail and wholesale prices recorded at Maharajganj and Battala markets, Agartala, are presented in Table 3, alongside market infrastructure indicators.

Table 3: Comparative market infrastructure and price structure at Maharajganj and Battala Bazar, Agartala.

Parameter	Maharajganj Bazar	Battala Bazar
Retail shops (no.)	50	40
Wholesale shops (no.)	30	25
Lona ilish – retail / wholesale (Rs./kg)	1,800 / 1,500	1,600 / 1,200–1,600
Phasa, good – retail / wholesale (Rs./kg)	280 / 250	400 / 350
Phasa, poor – retail / wholesale (Rs./kg)	220 / 180	300 / 250
Puti, small – retail / wholesale (Rs./kg)	220 / 180	500 / 500
Puti, big – retail / wholesale (Rs./kg)	650 / 600	800 / 700
Average daily sale	70–80 kg	3–6 kg

Source: collected from the field

**Figure 3:** Number of retail and wholesale outlets at Maharajganj and Battala Bazar.**Figure 1:** Wholesale price (Rs./kg) of fermented fish products across the three surveyed markets**Figure 4:** Average daily sale volume (kg) at Maharajganj and Battala Bazar.**Figure 2:** Retail price (Rs./kg) comparison between Maharajganj and Battala Bazar.

The price data indicate marked inter-market variation, with Battala recording consistently higher per-kilogram prices than Maharajganj for Phasa and Puti despite a comparatively lower daily sales volume (3–6 kg versus 70–80 kg), suggesting differences in customer base, product grade availability, or purchasing pattern between the two markets. Lona ilish commanded the highest price among all products surveyed (Rs. 1,200–1,800/kg across markets), consistent with its dependence on cross-border import (Majumdar & Basu, 2010).

3.6 Statistical analysis of price variation

Wholesale price data (Table 4) were analysed by RCBD two-way ANOVA with market as the treatment factor and product category as the blocking factor.

Table 4: RCBD two-way ANOVA of wholesale price (Rs./kg) by market, blocked by product category (*significant at $p < 0.05$; **significant at $p < 0.01$; F-critical at $\alpha = 0.05$ for treatment = 4.46, $df = 2,8$).

Source of variation	SS	df	MS	F	p-value
Market (treatment)	2,04,973.30	2	1,02,486.70	5.061	0.038*
Product (block)	24,15,266.70	4	6,03,816.70	29.819	<0.001**
Error	1,61,993.30	8	20,249.20	—	—
Total	27,82,233.30	14	—	—	—

The market effect was statistically significant ($F = 5.06$; $df = 2,8$; $p = 0.038$), indicating that wholesale price differed significantly among Teliamura, Maharajganj and Battala after accounting for baseline price variation between product categories. The product (block) effect was highly significant ($F = 29.82$; $p < 0.001$), confirming — as expected — substantial and consistent price differences between product types (Lona ilish, Phasa and Puti) irrespective of market. Mean wholesale price ($\pm$ SEM) was lowest at Teliamura (Rs. 357 ± 155 /kg) and highest at Battala (Rs. 640 ± 205 /kg), with Maharajganj intermediate (Rs. 542 ± 250 /kg), as illustrated in Fig. 5. This pattern is consistent with Teliamura's role as the primary production hub, where products are sold closer to the point of manufacture with fewer intermediary mark-ups, compared with Battala, a predominantly retail-oriented secondary market.

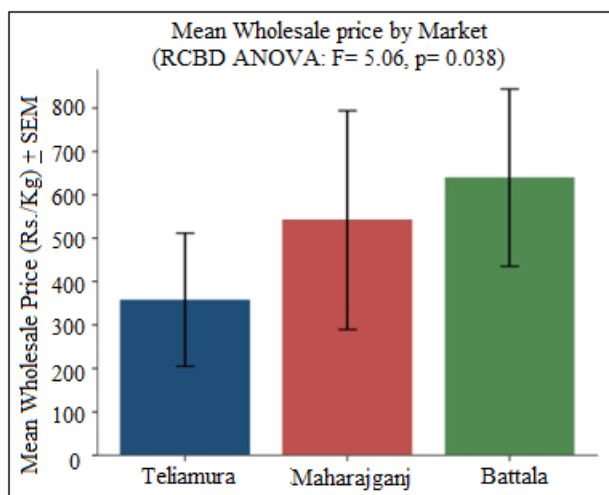


Figure 5: Mean wholesale price ($\pm$ SEM) by market. The overall market effect on wholesale price was statistically significant ($F = 5.06$, $p = 0.038$).

A paired t-test comparing retail prices between Maharajganj and Battala (paired by product) showed no statistically significant difference ($t = -1.09$; $df = 4$; $p = 0.337$), indicating that although Battala's retail prices were numerically higher for four of the five product categories, this difference was not statistically significant at the retail level given the small number of matched product categories ($n = 5$).

3.7 Economic and nutritional significance

The scale of activity recorded- 51 production units, approximately 1,300 MT annual output, and an estimated turnover of Rs. 100 crore per annum from Teliamura alone -

indicates that fermented fish processing constitutes an economically significant, though largely informal, sector supporting livelihoods across the production-to-retail chain. The product's nutritional profile (high-quality protein, B-vitamins, vitamin D, calcium, phosphorus) has been corroborated by proximate composition studies of shidal and related products (Majumdar et al., 2009; Muzaddadi & Basu, 2012), while probiotic lactic acid bacteria and antioxidant/antimicrobial bioactive compounds generated during fermentation have been documented in several Northeast Indian fermented fish products, including ngari and hentaak (Majumdar et al., 2015) and fermented fish more broadly (Chan et al., 2023; Khongthaw et al., 2026).

3.8 Constraints identified

The following constraints to expansion of the industry were identified during the survey, several of which corroborate findings reported for shidal processing elsewhere in Tripura (Uchoi et al., 2022):

- Dependence on inter-state and cross-border sources for raw material, elevating input cost and exposing the supply chain to external price and availability fluctuations.
- Marked seasonal variation in sale volume: peak demand during tribal festivals; reduced sales during the monsoon due to raw-material supply disruption and fermentation-quality risk; and comparatively lower winter sales owing to competing seasonal produce and increased insect-infestation risk.
- Insect infestation of the finished product, managed primarily through thorough sun-drying and salt application, but without standardised control protocols.
- Constraints in storage infrastructure and hygiene standardisation across production units.
- Absence of standardised packaging, labelling and organised marketing, limiting market reach largely to the Northeastern region.

4. Conclusion

This survey provides the first quantitative baseline on the production and marketing status of fermented fish products in Tripura. The data indicate a substantial industry- 51 production units, approximately 1,300 MT of annual production, and an estimated Rs. 100-crore annual turnover from the Teliamura market alone- that nonetheless remains structurally informal and dependent on external raw-material supply, consistent with earlier observations on the unorganized market structure and limited market awareness characterising Northeast India's fermented fish sector (Muzaddadi & Basu, 2012; Uchoi et al., 2022). Statistical analysis confirmed a significant effect of market location on wholesale price ($p = 0.038$), reflecting the influence of proximity to the production hub and market-level intermediary structure on final price, while retail-level price differences between Maharajganj and Battala were not statistically significant. Reducing raw-material cost through development of local supply sources, alongside investment in standardised packaging, hygienic processing protocols, and organised marketing, would support wider market penetration for Sheedal, both within India and in export

markets showing established demand for comparable fermented-fish products (Khongthaw et al., 2026).

5. Limitations of the Statistical Analysis

The survey was designed as a one-time, structured-interview market assessment rather than a replicated experimental study; consequently, price observations reflect respondent-reported ranges rather than repeated field measurements. The ANOVA and t-test reported here were computed on representative (midpoint) values across five matched product categories and should be regarded as an indicative test of association rather than a substitute for a replicated sampling design. Future studies would benefit from repeated price sampling across multiple time points and vendors within each market to enable more robust inferential analysis.

References

- [1] Chan, S. X. Y., Fitri, N., Mio Asni, N. S., Sayuti, N. H., Azlan, U. K., Qadi, W. S., ... & Mediani, A. (2023). A comprehensive review with future insights on the processing and safety of fermented fish and the associated changes. *Foods*, 12(3), 558.
- [2] Khongthaw, B., Dladla, M., Chauhan, P. K., Dulta, K., Kumar, V., Oneyaka, H., & Ghosh, S. (2026). Fermented fish products: A comprehensive overview of traditional processing techniques, varieties, and their health benefits. *Comprehensive Reviews in Food Science and Food Safety*, 25(3), e70457.
- [3] Majumdar, R. K., & Basu, S. (2010). Characterization of the traditional fermented fish product Lona ilish of Northeast India. *Indian Journal of Traditional Knowledge*, 9(3), 453-458.
- [4] Majumdar, R. K., Basu, S., & Nayak, B. B. (2009). Assessment of nutritional quality of 'Shidal' a fermented fish product of northeast India. *Journal of the Indian Fisheries Association*, 36, 25-34.
- [5] Majumdar, R. K., Bejjanki, S. K., Roy, D., Shitole, S., Saha, A., & Narayan, B. (2015). Biochemical and microbial characterization of Ngari and Hentaak-traditional fermented fish products of India. *Journal of Food Science and Technology*, 52(12), 8284-8291.
- [6] Majumdar, R. K., Roy, D., Bejjanki, S., & Bhaskar, N. (2016). Chemical and microbial properties of shidal, a traditional fermented fish of Northeast India. *Journal of Food science and Technology*, 53(1), 401-410.
- [7] Muzaddadi, A. U., & Basu, S. (2012). Shidal-a traditional fermented fishery product of north east India. *Indian Journal of Traditional Knowledge*, 11(2), 323-328.
- [8] Priyadarshini, B. M., Roy, D., Majumdar, R. K., & Kanasi, S. (2014). Quality characterization of market available Tungtap-a fermented fish product of Meghalaya, India. *Asian J Micro Biotechnol Env Sci*, 16(4), 931-934.
- [9] Uchoi, D., Kishore, P., Kumar, A., Nadella, R. K., Panda, S. K., & Zynudheen, A. A. (2022). Prevailing challenges in processing of fermented fishery product 'Shidal' in Tripura, India and solutions. *Fishery Technology*, 59(1), 26-32.