

## Economic Viability and Market Potential of Value-Added Drying Techniques for *Solenocera crassicornis*: A Case Study From the Northwest Coast of India

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Drying has been a traditional method for preserving perishable fish commodities, particularly in the context of India, which is the second-largest fish-producing country globally. Despite some fish and shrimp varieties being deemed uneconomical and of low value, there exists a potential market for them through value addition techniques such as drying and salting. *Solenocera crassicornis*, the second-largest shrimp landed in Gujarat, is a dominant species along the southwest coast of India. Captured either intentionally through otter trawling or incidentally as by-catch. The marketing of *S. crassicornis* extends to fresh, frozen, dried, and canned forms. The dried mud shrimp is processed as whole shrimp or peeled undeveined (PUD) shrimp, with the dried variant boasting higher nutritional value compared to its fresh counterpart. It contains 20.83 % protein, 1.05 % fat, 77.20 % moisture, 1.53 % ash and a good amount of minerals. This product finds a market both domestically and internationally.

### Introduction

India is third largest fish producing country in world with 8% global fish production. Gujarat was the nation's 4th top producer state for marine fish in 2022, with 5.03 lakh tonnes production annually (CMFRI -2022). Products made from dried and frozen seafood are mostly exported from Gujarat. In that practice of drying is a traditional method of fish preservation, beneficial in preventing seafood spoilage. Shrimp can be preserved for long periods of time because the drying process prevents microorganisms from growing by removing moisture. *Solenocera crassicornis* (H. Milne-Edwards, 1837) is a dominant species of the Solenoceridae family that is known as "coastal mud shrimp" and is found in fishing area 51-W of the Indian Ocean on the southwest coast of India. Whereas *Solenocera crassicornis* is the second highly marine landed shrimp species after *P. stylifera* along Gujarat's northwest coast (Veraval, Porbandar, Jafrabad, Mangrol, Okha, Nava Bandar, etc.). In Gujarat, it is known by the local name Goinar, lal jinga, lal kolmi, Udang merah. In 1999 and 2000, *S. crassicornis* became a major contributor to the fisheries in Maharashtra (23-28%) and Gujarat (31-54%). It has high nutritional value which contains 20.83 % protein, 1.05 % fat, 77.20 % moisture, 1.53 % ash and a good amount of minerals in fresh form.

**Biology:** Antennae, pleopods, and uropods are all uniformly red; posterior margins of each abdominal segment are darker; body, pereopods, and pleopods are reddish-orange to red. The weight range is 3.7–13.5 gram. Mud shrimp have an average length of 6-6.5 cm.



Figure 1:- *Solenocera crassicornis*

## Drying

An ancient method of preserving nutrients and enhancing food flavour is drying. The drying preservation method relies on bringing the moisture content down to a point where microorganisms and intrinsic enzymes stop functioning. For the purpose of keeping marine fish alive, solar energy is the oldest technique. According to CIFT' 2017 data, about 25% of fish that are landed in India are set aside for drying. As a food preservation technique, drying works by removing moisture using techniques like evaporation (air-sun drying, smoking, or wind drying). By contrast, freeze drying entails first freezing prawns and then sublimating them to remove water.

### Methodology: - Drying preparation for *S. crassicornis*

1. Select fresh material if possible for drying
2. Placed it in ice until it process and wash and clean the *S. crassicornis*
3. Peeling the shrimp (Remove exoskeleton and head it's called peeled undeveined shrimp [PUD])
4. Take a Weight
5. Take water (water and mud shrimp in 1:1 ratio) and heat it at 80°C. (Shrimp cooked with water and salt mixture is called blanching)
6. Add 3% salt to it (salt used to destroy the non-halophilic, osmophilic fungi and spore forming bacteria) keep it for overnight or 7-8 hour in mixture
7. Give a dip in the water until the sample colour changes to pink
8. Dip the sample in 0.1% citric acid (act as a preservative and improve the quality & color of products during sun drying)
9. Drain the water and keep it for drying (3-4 days required for drying in sun light)
10. Weighing & Grading (check moisture content in product)
11. Packaging & storage (packaging type effect the shelf life, normally dried shrimp shelf life is >6 months)

### Quality Problems in Dried Shrimp

- ✓ "Dun" refers to the dark patches that result from Halophiles molds growing on completely dry prawns. Red tiny shrimp undergo colour and flavour changes due to fungal attack.
- ✓ The Halophiles bacterial group is responsible for the reddening of wet or partially dried salted red tiny. The majority of commercial salt contains these bacteria.
- ✓ Case hardening is brought on by over-rapid drying.
- ✓ Fragmentation: Fish that has been overly dried or denaturalized breaks down when handled.
- ✓ Insects such as beetles, mites, and blowflies contaminate dried goods early on in the drying process.

### Economic

Table 1: -Economy of 1 kg dried *S. crassicornis* (whole shrimp and peeled undeveined shrimp)

Whole shrimp		Peeled undeveined shrimp	
Material	Amount in ₹	Material	Amount in ₹
Raw mud shrimp (4kg)	70₹/kg 280/4kg	Raw mud Shrimp (7kg)	70/kg 490/7kg
Salt and citric acid	20	Salt and citric acid	25
Packaging	10	Packaging	10
Total	310	Total	525/kg
Selling price of whole dried shrimp	370-380/kg	Selling price of PUD shrimp	620-630/kg
Profit per kg	60-70₹	Profit per kg	95-105₹

## Market

The demand for dried *S. crassicornis* is very high in both domestic and foreign markets. The dried mud shrimp is shipped to Ahmedabad, Rajkot, Valsad, and Surat, among other Gujarati cities. It also spreads to various states, including Kerala, Madhya Pradesh, Andhra Pradesh, Tamil Nadu, and Assam. The dried fish is supplied to international markets such as Sri Lanka, Malaysia, Singapore, and the United Arab Emirates while maintaining a high standard of quality. This indicates that high-quality dried fish as good market demand.

## Conclusion

Drying serves as a valuable means to utilize by-catch and provides an income source for fisherman, particularly in coastal areas. Its role in these regions is pivotal, contributing significantly to increased employment opportunities and food production. A considerable volume of small-sized coastal mud shrimp is often discarded at sea due to economic impracticality for preservation and onshore marketing. However, the transformation of these otherwise disregarded shrimp into dried products enhances their nutritional richness and extends their preservation to an average of six months. This not only minimizes waste but also generates a marketable and nutritionally enhanced product, underscoring the importance of drying in sustainable economic and food production practices in coastal communities.

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