

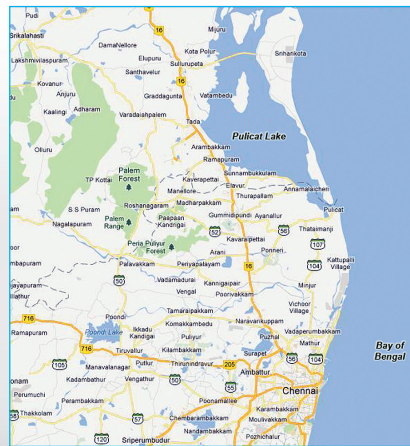
**P**ulicat Lake, the second largest coastal lake of India is located along the Bay of Bengal, in Tamil Nadu, about 60 km north of Chennai and separated from the sea coast by a strip of land which became as the place of human settlement centuries back, particularly for the fisher community called as Pulicat town. The lake is a low saline back water having connection with the sea and has influence of the seawater through tidal flow. The aquatic biodiversity of the lake and the wildlife in and around the lake have earned the recognition as one of the important Wildlife Sanctuaries of India. The lake also has a rich population of jellyfish that have not been utilised for any purpose in the past years. Nevertheless, in the recent years, the jellyfish are collected and processed as an exportable commodity.

**The jellyfish**

The word “jellyfish” is used to denote different kinds of cnidarians, all of which have a basic structure resembling an umbrella, including *Scyphozoans*, *Staurozoans*, (stalked jellyfish), *Hydrozoans* and *Cubozoans* (box jellyfish) which altogether represent about 1 500 species. Most of the larger jellyfishes live about 2 to 6 months. The presence of blooms in the ocean, increase in temperature and the pattern of water currents lead to congregation of jellyfish into large shoals. The increased nutrients in the seawater, ascribed to agricultural run-off may also be an antecedent for the proliferation of jellyfish in the coastal waters. Jellyfish population in the low saline waters is very general with some negative ecological impact on ecosystem and the coastal developmental structures. When in large numbers, they clog the pipelines established to draw seawater and are considered as menace.

Three species of jellyfish, namely *Crambionella stuhlmanni*, *Chiropsoides buitendijki* and *Dactylometra quinquecirrha* occur predominantly around the Chennai coastal waters and remain in plenty during August – October. Fishes like Tuna, Shark, Swordfish and the semi-terrestrial animals like sea turtles and sea birds are predatory on jellyfishes. The edible jellyfishes are basically marine inhabitants and aggregate

# Jellyfish processing as a cottage industry in the Pulicat Lake, India



**Jellyfish processing offers an additional avenue of income generation and a livelihood option to villagers engaged in this seasonal activity along the Tamil Nadu coast of India.**



**S Kannappan**

around river mouth drainages. The main gears used for jellyfish exploitation are gill nets, trawl nets and scoop nets. Jellyfish collection and processing are predominantly done in North West Pacific and Western Central Pacific Oceans. In Asia, Thailand, India, Indonesia, Malaysia, the Philippines

and China are engaged in this sector. Among the edible species, *Rhopilema esculentum* (*Kishinouye*) is the most predominant species contributing to a multi-million dollar seafood business in Asia.

## Processing

Jellyfish should be processed instantly once taken out of the water since it spoils rapidly due to high water content. Processing of jellyfish involves dehydration and exposing to different concentrations of crystal salt and alum. A Chennai based company has been engaged in processing and exporting jellyfish to countries all over the world. The company has established a mini processing plant in *Thoniraevu* village near the Pulicat Lake. The processing plant is a low investment temporary structure of thatched shed that harbours a series of cement tanks (3 m length, 1.5 m width and 2 m height) used for this purpose. The jellyfishes are transferred from one tank to another serially during the process for step-by-step dehydration gradually. Nearly 50-100 mechanised boats are being used to collect jellyfishes from the lake waters and are brought to the processing site.

### Steps followed in jellyfish processing unit at Pulicat Lake

1. Collection of fresh jellyfish from the adjoining lake water.
2. Cleaning them in seawater to eliminate the mucous membrane, oral arms, viscera, gonads *etc.*
3. Cleaning of the Umbrellas.
4. Salting for 36 h in 10:1 ratio of crystal salt and alum ( $\text{AlK}(\text{SO}_4)_2 \cdot 12 \text{H}_2\text{O}$  -First salting) in cement tanks.
5. Salting for 72 h in 12:1 ratio of crystal salt and alum in cement tanks (Second salting).
6. Salting for 120 h in 16:1 ratio of crystal salt and alum in cement tanks (Third salting).
7. Salting for 120 h in 25 percent crystal salt-



Processing of jellyfish umbrella.

8. saturated brine in cement tanks (Fourth salting).
8. Salting for 120 h with 3-10 percent of ground salt in cement tanks (Total dehydration occurs here).
9. Final processed jellyfish umbrellas.
10. Packing in vinyl or high density polythene lined boxes at 50 kg / pack with 10 kg extra to compensate dehydration loss during transportation.

In the course of processing the pH of fresh jellyfish is reduced from 6.6 to 4.8, which greatly reduce the possibility of microbial growth and enhance the shelf life of the product. The quality of salt used in processing may affect the ash content of processed jellyfish. The freshly processed jellyfish has a white or creamy colour and gradually turns into yellow or brown during prolonged storage. The salted jellyfish has shelf life up to 1 year at room temperature. However, the shelf life can be enhanced to 2 years or even more if the product is preserved at 4°C. Prolonged storage at warm ambient temperature may cause the loss of crispness or initiate spoilage of the product. Dehydrated jellyfish is not strictly a dried product as its moisture content is around 60 percent and



Processing of jellyfish tentacles.

therefore it can be categorised under intermediate moisture food products. Hence, the finished product has to be transported at 4°C.

Jellyfish processed by this method retains 7-10 percent of their original weight containing approximately 95 percent water and 4-5 percent protein, making it, a relatively low calorie food. Processed jellyfishes are packed in plastic boxes at the rate of 500 numbers per pack (150-200 g/piece). The processing and packing costs for the finished product work out to be INR 400-500 / box (US\$ 8-11) and they are sold for INR 1 000-1 500 / box (US\$ 20-30) in countries like China, Japan, Taiwan, Thailand *etc.* The market price of final product varies considerably depending on the size and condition of jellyfish. The larger pieces fetch higher price. The oral arms portion has lower market value than the umbrella portion due to the irregular shape. A premium Grade "A" jellyfish, with a wholesale price of US\$ 10-12 per pound in Asia, measures 18 inches in diameter, has white to creamy colour with crispy texture and at the same time is tender in nature. These dry salted jellyfish oral arms/umbrellas such as sunny type, white type and brown type are being exported to China, Japan, Taiwan,



Processed jellyfish fresh umbrella.

Malaysia, Singapore, Hong Kong, Korea and Vietnam. Frozen jellyfish and salted dried jellyfish are also exported in small quantities to these countries from India. In 1988, the processed jellyfish export from India to Japan was nearly 10 mt, where as it was 136 mt in 1999. However, with increasing demands from China, Japan and Korea, fisheries for jellyfish have expanded in many countries of Southeast Asia.

### Opportunistic livelihood and small scale business option

The jellyfish processing provides employment to about 175 persons in the Pulicat Lake village (75 female and 100 male), mostly belonging to the villages around

the lake for a period of 90 days. Among the 75 female workers half of them belong to the exclusively women Self Help Groups (SHGs) involved in aqua feed preparation and other avocations related to coastal and brackishwater fisheries and aquaculture. The remaining female workers are also from the same village. They work for 8-9 hours in a day, in two shifts, throughout the month. The seasonal employment that they get in

jellyfish processing serves as an additional means of income generation and a livelihood option.

### Future product developments

In spite of commercial availability of jellyfish in abundance, their processing and utilisation including medical applications have not been much studied and reported. Intensive manual harvesting and traditional processing of jellyfish are still practiced in Malaysia, China, Indonesia and India. With the trend towards globalisation of the jellyfish industry, a cost-effective harvesting design and automated processing are needed to reduce the labour costs, improve production efficiency and maintain nutritional adequacy. The

establishment of a standardised production for optimum quality from each species would facilitate the quality control of the jellyfish products. This low calorie seafood product with the potential of being used for treating rheumatoid arthritis or providing other health benefits could eventually become a much sought after food item by the people in various countries. The myths of medicinal value of eating jellyfish should be unveiled by conducting controlled studies on animal models and human subjects. The preventive and / or therapeutic effects of jellyfish collagen on arthritis need to be confirmed, and the effective dose range, treatment duration and mechanism of the suppressing effect should be further investigated in animal models. Carefully controlled preclinical studies would be essential before use of jellyfish collagen as a treatment for rheumatoid arthritis patients. Since jellyfishes constitute a huge unexploited resource of collagen, they may find a special niche in the near future for food, clinical and industrial utilisations. ☺

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