

Course Manual on

# Shrimp Processing and Quality Assurance for Export



**AU-Avanti Aquaculture Skill Development Centre**  
**(AU-Avanti ASDC)**

Established by Avanti Foundation  
New Building, MLR Department, Andhra University  
Visakhapatnam, Andhra Pradesh



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## Good Harvesting Practices for Farmed Shrimp

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**Introduction:** Shrimp farming and processing are vital to the Indian fishery exports. Of the 13,69,264 MT of fishery products exported from India in 2021-22, frozen shrimp alone accounted for 7,82,123 MT (53%). The value of frozen shrimp exported was Rs. 42,709 crores which constituted 74% of the total export value of Indian fishery products in 2021-22 (Rs. 57,586 crores). Though frozen shrimp includes both wild caught shrimp and farmed shrimp, the maximum export of frozen shrimp from India was from shrimp sourced from

brackish water aquaculture farms. *Penaeus vannamei* (white leg shrimp / Pacific white shrimp) and *Penaeus monodon* (black tiger shrimp) are the major shrimp species cultured in brackish water farms of India. Andhra Pradesh is the leading state in the farming, processing and export of farmed shrimp from India and most of the processing units in Andhra Pradesh are currently involved in the processing of *Penaeus vannamei* (formerly known as *Litopenaeus vannamei*) shrimp.

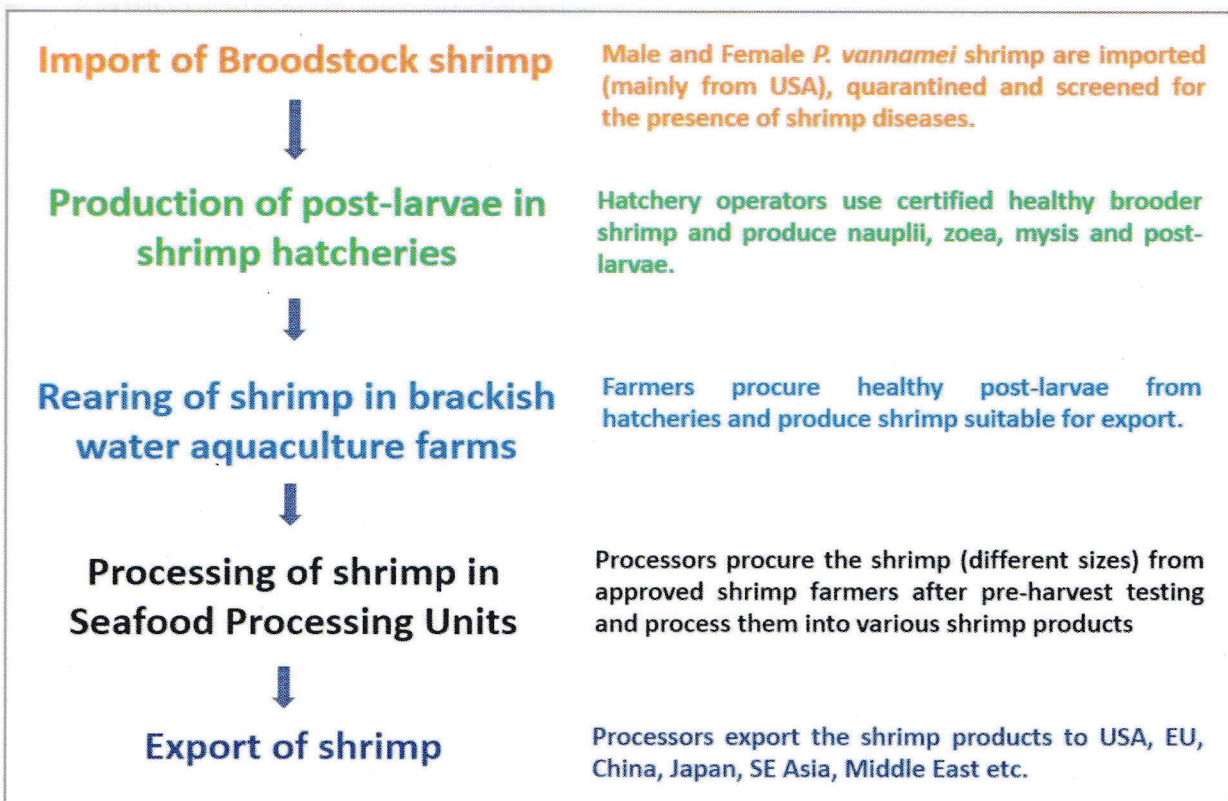


Fig. 1. Production-Processing-Export chain of *Penaeus vannamei*

The Production-Processing-Export chain of *Penaeus vannamei* (Fig. 1) starts with the import of male and female brooder shrimp (mainly from USA) and are later supplied to shrimp hatcheries after thorough screening for the presence of pathogens so as to prevent the entry of exotic diseases into India. The hatcheries use these certified disease-free brooders to produce healthy shrimp post-larvae. Aquaculture farmers procure active, disease-free post-larvae (PL) from shrimp hatcheries and rear them scientifically in shrimp farms for a period of 3 to 4 months. The shrimp processing units in Andhra Pradesh procure market sized *P. vannamei* shrimp from the aquaculture farmers and process them into different shrimp products such as block frozen shrimp, individually quick frozen (IQF) shrimp, battered and breaded frozen shrimp etc., and store them under frozen condition at -18 °C in cold storages. The shrimp products are finally exported to USA, China, European Union, South East Asia, Middle East Asia and Japan in freezer containers through sea route.

The *P. vannamei* shrimp are reared by the aquaculture farmers using scientific farming methods by adopting appropriate post-larvae stocking densities, good feed management and strong animal health management without the use of prohibited antibiotics. When the shrimp reach the market size (20 to 30 g) and are ready for harvest, the farmers inform the processing units. The shrimp must be harvested from the ponds using good harvest practices so that the quality of the shrimp is preserved in the best possible condition till it reaches the processing unit.

### Good Shrimp Harvest Practices

Good harvest practices aim to catch the farmed shrimp with minimum stress and without physical damage or bacterial contamination,

- Prior to the actual harvest, the farmer must submit the shrimp for pre-harvest testing (PHT) for the presence of prohibited antibiotics such as chloramphenicol, nitrofurans (metabolites) namely Furazolidone (AOZ), Furaltadone (AMAZ), Nitrofurantoin (AHD) and Nitrofurazone (SEM).
- Farmers can get the PHT done independently in MPEDA authorized laboratories. Alternatively, the quality control staff of the processing unit may visit the shrimp farm and collect PHT samples for analysis in their in-house laboratory. PHT is done by employing

Enzyme Linked Immunosorbent Assay (ELISA) method.

- Pre-harvest testing is necessary to minimize the chance of harvesting antibiotic residue containing shrimp. Generally, PHT is done one week prior to the actual harvest. If the PHT results are negative for the presence of chloramphenicol and nitrofurans (metabolites), the shrimp can be harvested.
- Processing unit must ensure that only those ponds with antibiotic residue free shrimp are selected for harvest.
- Moulting period of shrimp may be avoided for harvesting. The pond shall contain a maximum of 5% soft shelled shrimp only.
- A Shrimp-Harvest plan should be in place. The Shrimp-Harvest plan must contain
  - details of the traceability of the farm up to pond level (Farm ID, Pond ID and location of the shrimp pond)
  - total area of the shrimp pond that is being harvested,
  - total quantity of the shrimp that would be harvested,
  - number of fishermen required for harvest,
  - quantity of ice required for harvest,
  - number of crates required for transporting the shrimp,
  - details of the insulated vehicle for transporting the harvested shrimp from shrimp farm to the processing unit,
  - names of the processing unit staff deputed for harvest,
  - approximate time of start of harvest and completion of harvest
  - time required for transport of harvested shrimp from farm to the processing unit.
- Fishermen enter the shrimp pond at the time of shrimp harvest. Unhygienic habits of the fishermen introduce harmful bacteria. Awareness on personnel hygiene must be created among the fishermen. Fishermen should take bath before entering the shrimp pond and use hand dips before handling the shrimp to prevent transmission of bacteria from humans to the harvested shrimp.

- Fishermen with open wounds or suffering from infectious diseases must not be allowed to enter the shrimp pond.
- The fishing nets must be properly disinfected before use in shrimp ponds for complete harvesting or partial harvesting or for collecting PHT samples. After use, all the fishing nets must be thoroughly cleaned and dried. This process not only prevents the external introduction of bacteria but also prevents the transfer of bacteria between different ponds.
  - Feeding must be stopped minimum 6 hours before harvesting to minimize the metabolic activity.
  - Shrimp harvest time must be planned between evening (6 pm) to early morning (6 am) to avoid harsh temperatures during harvesting operations.
  - The fishermen must complete the harvest of the shrimp as quickly as possible.
  - Entry of pet animals in to the farm during harvesting must be strictly prohibited to prevent faecal contamination by animals.
  - The number of bacteria usually doubles in 20 minutes under ideal temperature conditions (25-35 °C). It is very important that the ideal conditions for bacterial growth must not be provided to prevent spoilage and contamination of the harvested shrimp.
  - The shrimp are harvested in live condition. The harvested shrimp must be 'Chill Killed' to ensure good quality of raw material for processing. Suspending the freshly harvested shrimp in cold ice slurry drastically slows down the bacterial activity. Ice slurry consists of 20% potable water and 80% crushed ice. The harvested shrimp are taken in perforated plastic baskets (plastic nets) and immersed in the ice slurry tank for 15 to 20 minutes. The plastic baskets must be agitated every 5 minutes for even distribution of chill water and homogenous cooling of all the shrimp. The core temperature of the chill killed shrimp would be around 1-2 °C and should be maintained at less than 4 °C till they reach the shrimp processing unit. Core temperature is measured by inserting a stainless-steel probe thermometer (digital) directly into the centre of the shrimp meat.
  - Potable water must be used for making ice slurry and for washing the shrimp and crates.
  - Only good quality ice prepared from potable water should be used for preparing the ice slurry and for packing the shrimp in plastic crates.
  - Shrimp are packed with ice in 1: 1 ratio in plastic crates. One kg of shrimp requires one kg of ice for maintaining the core temperature of shrimp at less than 4 °C. The required quantity of ice and shrimp are weighed and placed in the crates in alternate layers. The top and bottom layers must be filled with ice to ensure proper chilling of shrimp. After placing the last layer of shrimp, the remaining space of container must be tightly packed with ice leaving no air to avoid rapid melting of ice.
  - Cleanliness of the crates and other food contact surfaces must be ensured before placing the shrimp. Traceability labels must be stuck on each crate showing the Farm ID, pond ID, date of harvest, farm location.
  - Personnel handling the fish during weighing, packing, loading, and transportation must be made aware of good hygiene practices and importance of maintaining the cold chain.
  - The harvested shrimp packed with adequate ice in plastic crates is transported in insulated trucks from the shrimp farms to the processing unit. The crates can be stacked one above the other in the insulated trucks. It should be ensured that the bottom crates are cleaned before stacking them on another crate.

The good shrimp harvest practices detailed above ensures that the farmed shrimp reaches the processing unit in good condition and can be processed into different types of high quality shrimp products that meets the tastes of global shrimp consumers and also meets the food safety regulations of all the importing countries.

