The Australian Prawn Industry Association

Handling Prawns at Sea

A Guide for Prawn Trawler Skippers and Crew at Advanced Level

by Grant Carnie Australian Fisheries Academy

Funded by the Fisheries Research and Development Corporation



FISHERIES RESEARCH & DEVELOPMENT CORPORATION

Learning Guide

Handling Prawns at Sea A Guide for Prawn Trawler Skippers and Crew at Advanced Level by Grant Carnie, Australian Fisheries Academy Principal Investigator Phillip Walsh

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INTRODUCTION TO THIS LEARNING GUIDE

This Learning Guide, *Handling Prawns at Sea – A Guide for Prawn Trawler Skippers and Crew at Advanced Level*, will assist skippers and senior crew members who are responsible for ensuring correct product handling aboard prawn trawlers.

This Learning Guide deals with the skills and knowledge required to correctly supervise the handling of prawns from the time they land on board, through the various handling procedures up to the time the prawns are unloaded from the vessel.

This Learning Guide is designed to be used either during a formal training session or as a learning aid for a skipper or senior crew member who is already working on a trawler and is learning on the job.

At the end of training, you should be able to:

- describe the potential problems that may occur in the handling process on board
- conduct a Risk Analysis and develop a HACCP plan
- solve problems, including:
 - methods for checking gradings
 - test dip solutions
 - preparation and handling procedures during busy periods
- understand freezing and storage principles, including:
 - generation of heat
 - freezing cycle
 - correct snap/freezer loading
- unload and transport prawns correctly
- complete record keeping requirements for the company, the Australian Quaratine & Inspection Service (AQIS) and others.

WHO COULD USE THIS LEARNING GUIDE

This Learning Guide is mainly designed to develop the skills and knowledge required by learners to work effectively in the prawn industry. Learners may be existing workers or those looking for employment in the industry. Trainers, coaches and assessors can also use this Learning Guide to support training and assessment, both on and off the job.





HOW TO USE THIS LEARNING GUIDE

- Read through this Learning Guide carefully. It is divided into topics that cover all the skills and knowledge you need to successfully become competent in supervising the handling of prawns on a prawn trawler.
- Talk to your trainer and agree on how you will both organise your training.
- Work through all the information in each topic. If your training is off the job, you may use this Learning Guide as a study guide and companion for materials delivered in classroom-style sessions.
- Ask for help when you need it. It is probable your trainer will also be your supervisor or skipper. They will support you and show you the correct way to do things. Talk to more experienced colleagues and ask for their guidance too.
- Listen, take notes, ask questions and practise your new skills on the job or in a simulated workplace environment. Make sure you practise your new skills regularly. That way you will improve both your confidence and performance.
- Throughout this Learning Guide you may see these symbols. This is what they mean:



Danger! You could get hurt.

Remember this! It is important.

- Use the self check questions at the end of each section to check your own progress.
- When you are ready, ask your trainer to watch you perform the tasks outlined in this Learning Guide, and ask for feedback on your progress.

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IDENTIFYING PROBLEMS

As a skipper, supervisor or senior person involved in handling prawns aboard a trawler, it is important that you are aware of potential problems and have a strategy in place to prevent those problems from occurring. Remember that prevention rather than cure is always the best policy.

In order to develop a prevention strategy you should draw up a checklist of potential problems and why they may exist. The checklist below includes some of the more common problems that can occur because of incorrect handling procedures.

Study the list, think of methods to prevent the problems from occurring and add others that you believe can occur in an operation you are familiar with.



PROBLEM CI	HECKLIST	
Problem	Why it can occur	Prevention
Black spot is the darkening of the head and shell. While not harmful, it affects the look of the prawn and	Prawns not treated, or incorrectly treated, with a suitable chemical.	Use a recognised treatment method (e.g. dipping in metabisulphite) and make sure the correct procedure is followed.
therefore its marketability.	Prawns exposed to warm temperatures for too long, i.e. the time from landing to freezing is too long.	Develop ways to speed up sorting and grading; chill prawns in chilled sea water first during busy periods.
	Freezing problems – freezer not working efficiently; snap room incorrectly loaded; prawns taken from snap freezer to holding room too early.	Have refrigeration system checked; supervise correct loading of snap freezer and holding room; check temperature when prawns are transferred to holding room.
Damaged prawns.	■ Area trawled.	■ Move location.
	Trawl time too long.	Shorten trawl time.
	 Other species (e.g. crabs) are causing the damage. Too many prawns in a 	 Develop a method to quickly separate the species. Do not overfill baskets.
	basket.	
Foreign matter such as mud, sand, weed, other fish species in packed	Incorrect sorting.	Make sure crew are sorting properly and re-check when processing further.
prawns.	 Prawns not thoroughly washed. 	 Check washing and equipment cleaning procedures.

PROBLEM CHECKLIST

Problem	Why it can occur	Prevention
Contaminated prawns.	 Incorrect cleaning procedures. 	 Use a cleaning schedule; train crew.
Sorting and gradings are incorrect.	 Crew are unaware of different species or sorting without care. 	 Training; double check when packing.
	 Crew not separating damaged prawns or other unacceptable prawns (e.g. parasites); crew fatigue. 	 Training; double check when packing.
	 Crew not able to identify different gradings; crew fatigue. 	 Training; double check when packing.
	 Grading machine not working properly. 	Check: quantity of prawns going through the machine, water flow is enough, machine settings, machine for wear.
	Incorrectly marked cartons.	Check that the species, grading, etc., reflect the markings on the carton.
Weights incorrect.	 Scales not calibrated correctly. 	 Continually check scales for accuracy using a suitable method.
	Water in pack.	 Drain sufficiently before packing and weighing.
	 Carton weight, liners, etc., not correctly allowed for. 	 Check that net weight is correct; take random samples.
Prawns overcooked/ undercooked.	Water not hot enough; prawns not left in boiling water for sufficient time/ too long.	 Check prawns after cooking; follow cooking schedule; training.
	 Grading range too great. 	 Cook prawns in individual size range.



PROBLEM CHECKLIST

Problem	Why it can occur	Prevention
Freezing or chilling of prawns	 Refrigeration system not working properly. 	■ Check, repair.
not satisfactory.	Prawns taken from snap freezing system too early.	 Check temperature before taking prawns from snap to holding room.
	Prawns incorrectly stacked in snap and/or holding room; airflow insufficient.	 Supervise loading of prawns in freezer area.
	 Large catches causing high start temperatures. 	Chill prawns in brine until there is more time to process.
Defrosting when unloading.	 Unloading in hot outside temperatures. 	Keep exposure to outside air temperature to a minimum; consider time of day for unloading.
	Too many prawns taken from freezer at once.	Do not take too many cartons from freezer at one time and so over-expose to outside air temperature.

V	SELF CHECK	YES	ΝΟ
	Can you discuss the problems that may occur when handling prawns on a trawler, i.e.:		
	identify the problem?		
	why the problem occurs?		
	how to prevent it?		

- If you have answered YES to all of the questions above, you are ready for the next topic.
- If you have answered NO to any question, review the topic again and ask your trainer or coach for help.



SAFETY PLAN

All vessels should have a safety plan in place so that:

- handling prawns is systematic
- potential problems are identified
- handling procedures are in place to maintain hygiene safety and highest quality.

Depending on the type of operation your vessel is involved in, as a skipper or the person responsible for the quality of handling and processing, you will be accountable to some external handling requirements. At the very least these may be company or vessel requirements.

REGULATIONS

Apart from your own vessel or company requirements regarding handling and quality, there will generally be regulatory authorities that will set standards that you have to adhere to. These authorities may audit your operation. This is particularly so when you are involved in the export of prawns direct from the vessel. The requirements and regulations you may need to adhere to include:

- Iocal health regulations
- ANZFA (Australian & New Zealand Food Authority) standards food safety standards to be progressively implemented in each state and territory
- AQIS (Australian Quarantine & Inspection Service) requirement for exporters
- APIA Code of Conduct
- individual vessel/company standards
- customer/buyer standards.

Make sure you are familiar with the standards that you need to adhere to in your operation and devise an operational plan and a safety plan that will help to ensure you are consistently meeting those standards.



A, C, E, F, H

What is an EX 26?

When does a premise need to be registered with AQIS?

What is an export establishment?

What is a prescribed good?

What is an occupier?

When do I need to complete an EX 26?

Who should an EX 26?

Add

ald complete

(Who should be nominated in management and contres?

Who should be included us Authorised Signatories?

Is there an application fee?

Phone ma () affect the establishment's application or ability to process.

NSW 02.9364 7222 OLD 07.3246 8735

Application Classifications

Australian Quarantine and Inspection Service Export Control Act 1982 (Prescribed Goods (General) Orders) as amended

An approved form to apply for registration or notify a charge of detail or amongements r A, E, F, H to a registered establishment.

Application for Registration or Notification to the Secretary of Change of Details of an Establishment ('establishment' includes premises or ship)

nplete each section as indicated below (please type clearly print all details)

Sections to be Completed

Explanatory Notes - To be Retained by Applicant

OPERATIONAL PLAN

All successful organisations have a well thought-out system in place and procedures that must be followed. The operation on a prawn trawler is no different. To assure the quality of the product you will need to develop an operational plan that covers all procedures that take place during the catching and processing operation. This will also set a framework for formulating the safety plan.

Of course the methods used on prawn trawlers vary according to such things as the layout of the vessel, the particular fishery and the product to be produced (e.g. cooked/raw, chilled/frozen, customer pack/bulk pack). You need to consider a range of important points and develop a system that suits your operation.

Responsibilities

You need to make sure that all crew members are familiar with the allocation of responsibilities. Devise a list of responsibilities for your vessel. It may include a list similar to the following:

Skipper/Engineer

- Safety of the crew and vessel at all times is a primary responsibility.
- Must ensure all crew are trained in safety, quality and hygiene practices.
- Is responsible for determining optimum trawl times with regard to both quality and efficiency.
- Must ensure transfer certificates are prepared and records completed before unloading product.
- Must ensure efficient running of the engines, freezers and all mechanical equipment.
- Is responsible for recording information in logbooks regarding trawl locations, quantities of catch, freezer temperatures, etc.

Mate/Leading Hand

- Is responsible for safety on the back deck, particularly during landing of product and deploying nets.
- Must ensure the quality of product, including grading, sorting, packing and freezing.
- Must inform the skipper of any issues affecting safety of crew or quality of product.
- Is responsible for ensuring all deck crew follow hygiene procedures.

Deck Crew

- Must follow all safety procedures. Are responsible for their own safety and must not endanger the safety of other crew.
- Must be aware of and comply with all hygiene requirements regarding processing of product.
- Are responsible for grading, sorting, weighing, packing and freezing of product.
- Must inform the mate/leading hand of any problems meeting hygiene, quality, or safety standards.

Induction/training

All new crew members need to have an induction session when they start on a vessel so that they are familiar with the expectations and policies and procedures of the vessel. An induction should include the following areas:

- Introduction to the company/vessel and its policies and procedures
- Safety on board basic rules, specific requirements
- Personal hygiene, cleaning list of requirements
- Protective and safety clothing provision and use
- Specific training instructions for various tasks as they are carried out on board the vessel.



Fishing/processing operation

It is probably stating the obvious but the ability to produce a quality product is dependent on having a system in place that is consistent, flows well, accounts for any limitations in the vessel layout and most importantly, is clearly explained to all crew members.

In the same way that quality cars are produced because there is a clearly defined assembly line in car manufacturing plants, so the consistent production of a quality product will rely on the vessel having a clear system that all crew members are familiar with and clear standards that they know must be met.

Think about your vessel and the steps that need to be followed in your processing operation. Is it consistent and does it flow smoothly? Are all crew members familiar with the operation, know their roles and understand the standards to be met at each step?

A well-developed operational system, starting with catching methods, then from the sorting table to product freezing or chilling, and on to unloading, will also allow you to put in place a safety plan that monitors potential hazards and eliminates them should they occur.

Cleaning and personal hygiene

The first step to eliminating prawn contamination is to ensure that the vessel is clean. In particular, surfaces and equipment that come into contact with the product are to be kept clean at all times.

An effective cleaning program is essential if potential food safety risks are to be controlled. While cleaning programs need to be designed to suit the vessel and the operation that the vessel is involved with, there are typically four steps.

Ste	ер	Description
1.	Remove loose dirt	Brushing or hosing surfaces, baskets, etc., removes much dirt and reduces chemical use.
2.	Wash	Washing uses detergents that help break down fats and grease. Washing does not necessarily remove all bacteria.
3.	Sanitise	Sanitising chemicals or very hot water (70°–80°C) reduces bacteria to low levels. Follow sanitiser instructions as there may be a minimum contact time for effectiveness and the sanitiser may need to be rinsed off afterwards.
4.	Dry	Bacteria love water, so drying prevents them growing or being transferred between wet surfaces. Obviously drying is not always possible on a trawler.

All trawlers should have a cleaning schedule in place that clearly identifies the method to be used. This cleaning program needs to be consistently monitored to ensure it is being followed. If your vessel is licensed to export, you will be required to keep a written program in place.

Develop a cleaning schedule for your vessel or a vessel you are familiar with. You can use the example on the next page to help you or you can develop your own system.



Cleaning Schedule

Task/Method	Frequency	Responsibility
Amenities Toilets/shower/hand basins, etc. Check soap, brushes, paper and general cleanliness; rinse if necessary.	Daily	John M
Amenities Spray and wipe all surfaces with Cleansol solution; scrub toilets with neat 'toilet aid'; mop floors with 'toilet aid' diluted 1 cap per bucket hot water.	Weekly	John M
Operational Areas Deck/sorting Hose down deck and tables prior to unloading catch; rinse again between shots; hose at end of day, then scrub tables with detergent/sanitiser solution 'Superclean' diluted 1 cap per bucket. Leave 10 minutes then rinse off.	Daily	Mary T
Baskets		
Carton Store		
Blast Freezer		
Other		



Cleaning programs often fail because:

- cleaning methods are not effective
- crew do not know how to clean properly
- cleaning tools or chemicals are not suitable.

Personal hygiene standards are also important in ensuring quality, particularly the microbiological safety of prawns. All crew need to be instructed in personal hygiene standards and made aware of the following:

- Hands must be washed after going to the toilet or returning to the process area after a break.
- When handling prawns long hair must be tied back and aprons/clothes kept clean to avoid contaminating the prawns.
- Any cuts or sores must be covered when handling prawns.
- Gloves must be clean.
- Smoking is not allowed anywhere near product.
- Allow no food/eating during processing.
- Sickness/diarrhoea must be reported to the skipper who will reallocate tasks.
- Anyone handling cooked prawns must not handle raw prawns.



It is a good idea to have notices detailing hygiene standards laminated and fixed in prominent locations.



Sorting, grading, cooking, packing and freezing

Processing requirements will vary from trawler to trawler and can also change from time to time on the same trawler depending on customer/market requirements. As skipper or supervisor you need to ensure that all crew members are familiar with general requirements and standards on the vessel and any variations that may take place from time to time. You will need to consider the following:

- Sorting requirements are understood (e.g. species) and standards are met (i.e. no foreign matter).
- If cooking, a cooking procedure is in place and crew members are familiar with the procedure.
- Grading requirements are understood and standards followed.
- Dipping procedure is in place and understood by all crew members.
- Packing standards are in place (e.g. liners, marking cartons); weighing procedures are understood; weights are checked regularly.
- Freezing procedures are understood and followed including stacking cartons correctly and temperature of product before moving from snap to holding area.

Key operations in the process need to have a schedule similar to the cleaning schedule devised and all crew members must understand the process. Study the following examples of a dipping schedule and cooking schedule and prepare similar schedules to suit the operation aboard your vessel or a vessel you are familiar with.

Dipping

- Keep a laminated copy of procedures near the dip tank.
- Use a whiteboard marker to tick off each batch of prawns dipped before the solution is changed.
- Keep empty bags of metabisulphate (meta) in a bin.
- The mate checks the number of bags used and records this on the production log before placing the empty bags in the garbage ready for disposal next time the vessel is in port or unloading at a barge.

Prawn Dipping Procedure

- 1. Ensure dip tank is clean then fill to mark (100 litres) with potable water.
- 2. Put on face mask then open 1 bag of meta and pour slowly into the tank. Put empty bag into the marked bin for collection by the mate.
- 3. Stir using clean stirrer until all the meta has dissolved. Remove face mask and store for reuse.
- 4. Check that the minute timer is reset. Rub off ticks from chart below.
- 5. Dip each basket (approximately 20 kg) of prawns for 1 minute using the timer. Lift the basket up and down a few times to help circulation of the solution.
- 6. Remove the basket and place on draining rack, then tick off the chart.
- 7. When the chart is full (12 ticks), drain tank, flush with clean water, then repeat from Step 1.
- 8. If the prawns are muddy the solution may need to be changed more regularly. Seek advice from the mate/leading deckhand.

1	2	3	4
5	6	7	8
9	10	11	12



Cooking Specification

- 1. Check that the cooking pan and basket are clean, then fill pan to the mark (approximately half full) with clean sea water or clean water and a measured amount of salt.
- 2. Add 1 bag of ice to the cooling tank and fill to the mark with potable water.
- 3. Turn the cooker on full. It should take about 5 minutes for the water to boil. If it takes any longer, ask the mate/leading deckhand to check the unit.
- 4. When the water is boiling add a maximum 10 kg graded prawns (small basket) and bring the water back to the boil.
- 5. When the water is reboiling set the timer for 1 minute. After 1 minute remove a large prawn with the scoop and check that the shell is starting to come away from the body. If it is not, continue cooking then recheck. If overcooked, ask the mate for a quality check.
- 6. Remove the basket and hose the prawns with clean sea water for at least 3 minutes to stop the cooking process.
- 7. Transfer basket to iced water in the cooling tank. Leave until ready to pack or a minimum of 3 minutes. Drain on rack for at least 2 minutes.
- 8. Check the packing table has been cleaned. Prepare carton with new liner. Tip in cooked, drained prawns. Pack, weigh, seal and mark cartons as usual. N.B. Only handle cooked prawns wearing clean gloves.
- 9. After about 5 batches the cooker will require topping up with water and another measure of salt. Also add more ice and salt to the cooling tank when all the ice has melted.
- 11. Record details of product cooked on the production log.

FOOD QUALITY AND SAFETY PLAN

In order to ensure your product is safe to eat you will need to have a food safety plan in place. This will assist in maintaining the safety of your product and can also include quality requirements (such as correct grading) which will optimise the marketability of your prawns.

Even if you are not required to have a formal safety plan in place, any responsible skipper or supervisor will develop a safety plan relevant to their trawler and will monitor the operation.

Trawlers operating under regulated agencies such as AQIS will need to use the Hazard Analysis and Critical Control Point (HACCP) technique. Trawlers that do not need to develop a HACCP plan can still use the technique to put a safety and quality plan in place.

The HACCP process is quite logical and fairly easy to apply. It uses a process of identifying potential problems, monitoring them and having responses in place to rectify them. It has three critical steps:

- 1. Process Flow
- 2. Hazard Analysis
- 3. Critical Control Points.

1. Process Flow

All steps in the process need to be identified and listed in the order they occur. For a prawn trawler these steps might be:

- trawling
- Ianding
- sorting
- grading
- dipping
- packing and weighing
- freezing
- frozen storage
- unloading.



The steps may differ for different vessels and operations. For instance, dipping may occur before grading; wet boats do not pack, weigh and freeze; and cooking procedures may vary.

Write down the steps (in order) as they occur on your vessel or a vessel you are familiar with.

2. Hazard Analysis

Hazard Analysis involves looking at each step in the process and asking the following questions:

- Is there a potential food safety hazard or risk?
- What could go wrong?
- If you are also considering quality in your plan, what could go wrong that would affect quality?

Study the following examples of possible hazards and quality issues and using the processes that occur on your vessel, put together a similar list or lists.

Process Step	Potential Hazard
Trawling	Fishing in contaminated or unapproved waters; too long a trawl time (damaged prawns).
Landing	Contaminated sorting tray; contamination from other fish or left over prawns on tray.
Sorting	Spoilage/black spot from sorting in hot/sun; damaged prawns; contamination from other fish.
Grading	Quality hazards – wrong grade, wrong species, prawn defects, long handling time resulting in black spot.
Dipping	Too much metabisulphite is a safety hazard while too little may result in black spot; contaminated dip water.
Packing & weighing	Wrong weights, packaging, labelling, excess water (all quality or trade description hazards).
Freezing	Spoilage from too slow or insufficient freezing.
Frozen storage	Deterioration, black spot formation if temperature fluctuates.
Unloading	Deterioration from too long out of the freezer; damage from poor handling.

Raw Prawns – Process Flow

Cooked Prawns – Process Flow

Process Step	Potential Hazard
Prepare boiling water	Contaminated boiling pan and water; too much water (safety of crew).
Add pre-graded prawns	Possible undercooking if size varies greatly; splashing (safety of crew).
Cooking	Undercooking (food safety); overcooking (quality).
Cooling in sea water	Contaminated water.
Chilling in ice/salt	Contaminated ice, salt and water; inadequate chilling, hot product may spoil during freezing.
Packing	Contamination at packing.



Quality problems and potential food safety hazards are not necessarily the same. For example, damaged prawns may not be a food safety hazard but may affect the quality and the marketability of your product.

The first responsibility when developing a food safety plan is to take measures to ensure the product is not a food safety risk. Regulatory authorities are responsible for ensuring your product does not present a health hazard. Quality issues such as accurate grading and correct weights and therefore the marketability of your product are your concern but can easily be integrated into the safety plan.



3. Critical Control Points

When you have identified potential hazards, the next step is to put controls in place that prevent potential problems from becoming real ones. Strictly speaking *critical* control points only apply to food safety hazards (e.g. metabisulphite concentration, cooking time/temperature for cooked prawns). However, as explained already, providing particular attention is paid to food safety hazards, quality controls can be integrated into the process.

For each control point there must be *target* and *tolerance* levels. For example, frozen storage temperature may have a target of -20°C with a tolerance of plus or minus 2°C. These limits need to be monitored and the person or job function of the person responsible for checking must be identified.

The Hazard Analysis table also needs to identify corrective actions if a target or tolerance is not met.

Study the two Hazard Analysis tables on the following pages and then develop a table or tables to suit the operation aboard your vessel or a vessel you are familiar with.

Remember



- ✓ List the process steps that are involved in your operation in the order in which they occur.
- ✓ Beside each step list the potential hazard or hazards.
- ✓ Match a control point or critical control point to each potential hazard. (Not every step is a critical control point some are simply control points or checks.)
- ✓ After each process step, its potential hazard and the control or critical control point, you need to identify:
 - a monitoring procedure and whether that is recorded and where
 - any target and tolerance level
 - corrective action to be taken if a problem exists.

Name of vessel		Hazard Analysis	s Table – Raw Prawns	Date of Issue	
Process Step	Potential Hazard	(Critical) Control Point	Monitoring Procedure and Recording	Target and Tolerance	Corrective Action
Trawling	Contaminated prawns Damage/detenioration	Location Time	Trawling in approved location; visual check of product on landing. Record in Skipper's Log.	Time dependent on location and conditions – not fixed	Reject catch from wrong location; adjust trawl time.
Landing	Contamination on tray	Visual Clean tray	Mate ensures sorting tray empty and cleaned between shots per cleaning schedule – not recorded.	No left over prawns Clean tray No tolerance	If prawns unloaded onto previous catch, check product after freezing for quality & black spot.
Sorting	Spoilage, damaged prawns, contamination	Visual Time	Deck crew sort and separate other fish, all defective/diseased prawns. Prawns protected from sun (if day).	No defective or diseased prawns retained; no black spot formation (no delay)	If delays, prawns checked after freezing for eating quality and blackspot.
Grading	Incorrect grades, species, defects, contamination	Visual Product standards	Crew rinse prawns with clean water then grade according to procedures; random check by mate, recorded in production log.	Per product specifications	Product regraded or cartons relabelled to alternative specification.
Dipping	Insufficient/excess (unsafe) meta	Solution makeup Quantity Time	Mate prepares dip; crew dip to set time/quantity before replacing – dip procedure and production log, external testing.	Max 30 ppm residual domestic; max 100 ppm residual export	Product held for testing by laboratory and repacking/ processing as appropriate.
Packing and weighing	Incorrect weight; package (trade description); excess water	Visual	Mate ensures packaging marked, scales tared. Crew pack after draining prawns, marking grades and weight. Totals recorded in packing log.	All weights = or above net weight; correctly marked cartons	Repack underweight or wrongly marked cartons.
Freezing	Microbiological spoilage	Temperature Time	Mate loads freezer to ensure good airflow, checks freezer operating temp – packing log.	Freezer max -30°C Product -18°C or colder atter 8 hours	Continue freezing: repair refrigeration. Check for quality and black spot.
Frozen storage	Spoilage	Temperature	Engineer checks storage temperatures and records in packing log.	Target -25°C Max - 18°C Min -30°C	Transfer to blast freezer if temp above -18°C. If above -12°C, hold and do not export.
Unloading	Deterioration; damage	Visual Time Temperature	Mate checks temperature before unload. Product unloaded rapidly and carefully direct to transport. Transfer certificate prepared.	Max - 18°C at unload No delays	Do not unload if product warm, transport unsuitable. Separate any dropped/damaged cartons.

Handling Prawns At Sea



Name of vessel		Hazard Analysis	s Table – Cooked Prawns	Date of Is	sue
Process Step	Potential Hazard	(Critical) Control Point	Monitoring Procedure and Recording	Target and Tolerance	Corrective Action
Prepare boiling water	Contamination Scalding	Cleaning checks Visual	Crew (*) checks pan clean, uses potable water and salt – fills only to set level, burners on full. Refer cooking specification.	No tolerance; hygiene	Re-clean pan, rinse and replace water.
Add pre-graded prawns	Undercooking (microbiological)	Visual	Crew* adds specified quantity of graded prawns – visually checking size. Refer cooking specification.	Visually to target grade Max qty prawns predetermined	Regrade prawns before cooking.
Cooking	Undercooking (microbiological)	Visual Time	Crew* cooks for at least min specified time and visually checks prawns at end of cook. Refer cooking specification.	No tolerance for undercooking	Recook if undercooked Overcooked keep chilled for taste test before packing.
Cooling in sea water	Contamination	Visual	Crew* removes cooker basket, places in tank with running sea water.	Clean sea water for minimum 3 minutes	Reject if contamination.
Chilling in iced, salted water	Contamination	Visual	Crew* transfers prawns to potable water/ice/salt mix.	Potable water salt and ice, minimum 3 minutes	Reject if contamination. Check frozen product for spoilage if noticed first.
Packing	Contamination Underweight	Visual Weight check	Crew* drains prawns and packs into clean lined cartons wearing clean gloves. Cartons check weighed before sealing. Recorded production log.	No tolerance hygiene; Minimum net weight as declared	Reject any prawns at risk of contamination. Hold for rechecking if underweight suspected.

(*) Crew member responsible is identified and must complete and sign log.

Cooked prawns are regarded as a 'high risk' product as they are ready to eat. Ensure cooling water is clean and that the cooked prawns do not come in contact with raw prawns from reusing baskets or equipment or by cross contamination by the crew.

A Guide for Prawn Trawler Skippers and Crew at Advanced Level

V	SELF CHECK		
		YES	NC
	your trawler?		
	Do you know the requirements and regulations you may need to adhere with regard to food safety planning for your trawler?		
	Can you explain what should be covered in an operational plan?		
	Can you devise an operational plan for your vessel?		
	Can you explain the three steps of the HACCP process with regard to your prawn operation (or an operation you are familiar with)?		

- If you have answered YES to all of the questions above, you are ready for the next topic.
- If you have answered NO to any question, review the topic again and ask your trainer or coach for help.



PROBLEM SOLVING METHODS

The skipper or supervisor responsible for the quality of the product on a trawler should take a proactive approach and have in place testing procedures for monitoring that the product produced is meeting the required standards.

There are three particularly important checks that should be continually conducted. These are:

- grading checks
- testing the level of metabisulphite
- checking scales for accuracy.

Most quality problems occur during busy fishing periods when the crew is snowed under by the quantity of prawns to be processed. Therefore, as well as having ongoing testing procedures, it is very important to have a 'busy period' procedure to help you maintain quality.

CHECKING GRADINGS

Prawns graded into size ranges have a tolerance level or permissible error factor. This is expressed as a percentage (%) by number and varies according to the type of pack being produced.

A typical maximum tolerance for out of grade prawns is 10% by number for set weight packs and 14% by number for bulk packs.

Make sure you know the standards on your vessel.

Make sure you know the tolerance levels allowed for the product you are producing. This can be a regulated level, an industry standard or the level set by your buyer.

Customer expectation is for similarly sized prawns with an average count close to the centre of the allowed range.

A quick method for checking gradings is to take a sample weight (e.g. 1 kg), count all the prawns in the sample and then compare the count to the range allowed.

For example, if you are checking a 10/20 to the pound sample, there must be between 10 and 20 prawns similarly sized prawns per pound. Because there are 2.2 pounds to a kilogram this means there must be between 22.5 (round to 22) and 44.5 (round to 44) prawns in the sample.

However, this only gives an indication of the accuracy of the gradings. It is possible to have the required number of prawns in a grading range but still have too great a number by percentage that are too small – or too large – although buyers do not generally complain then!





The standards for out of grade are % by number. This is calculated by counting all the prawns in a sample, counting the number of prawns out of grade and then calculating the percentage.

For example, 4 prawns out of grade in a 10/20 grade sample of 40 prawns (i.e. 4 smaller than 44 grams each) means that even though you have between 22 and 44 prawns in the sample (and hence meet the quick test requirement described above), the percentage by number may not meet the standard. The percentage is calculated as follows:

(4 ÷ 40) X 100 = 10%



If the standard you are working to is 8%, the grading % by number is too great even if the total number of prawns (40) in the 1 kg sample falls between 22 and 44 prawns.

From this it is obvious that while the first method is useful to quickly check gradings, it does not always give a true indication that the gradings are meeting the appropriate standard. It is important to weigh individual prawns in samples and then calculate the % by number. Most trawlers now have scales that can weigh accurately to 2 grams and if your vessel is equipped with these, you will be able to weigh individual prawns.

Per pound (lb)			Prawn weights grar	ns (g)
Grade	Count		Minimum weight per prawn	Maximum weight per prawn
	Target	Maximum		
U/10	7	9	46 g	over 46 g
U/15	11	14	32 g	over 32 g
10/20	15	18	22 g	44 g
16/20	18	19	22 g	28 g
15/25	20	23	18 g	30 g
21/30	25	27	16 g	20 g
31/50	40	45	10 g	14 g

1. Typical grades used in bulk (not weighed) or larger weighed packs (e.g. 10 kg)

2. Some other grades use in fixed weight packs (called customer packs)

Grade	Count		Minimum weight Per prawn	Maximum weight Per prawn
	Target	Maximum		
U/6	5 or less	5	76 g	76 g
6/8	6–8	8	54 g	76 g
9/12	10/11	12	38 g	52 g
13/15	13–15	15	30 g	36 g



You need to calculate the number of prawns allowed out of grade according to the standard you are required to meet, the grading sizes you are working with and the weight of samples you intend to check. Prepare your own tables beforehand using the following examples of some grading ranges, the target and maximum prawns per pound and the minimum and maximum weight per prawn. This will allow a quick calculation at sea by referring to the tables you have prepared.

- ✓ Continually monitor grading accuracy by using acceptable checking procedures.
- ✓ Prawns may meet the count requirement but be out of % by number.
- Grading machines can also be inaccurate check the machine settings regularly and take sample grades for checking.
- ✓ Have grading tolerance tables suitable to your operation prepared so that assessment can occur quickly at sea.
- ✓ If you have a HACCP or other safety plan in place, make sure you follow the checking procedure as described and document the results.

TESTING METABISULPHITE

There are a number of treatments that can be used to prevent black spot occurring in prawns. These include:

- Metabisulphite
- Everfresh
- HQ Bacterol F
- Antidot.

The most common treatment used on prawn trawlers is metabisulphite, so this Learning Guide concentrates on testing methods for that. If you are using another treatment make sure you find out the amount allowable, recommended usage and any testing procedures available.

Sodium metabisulphite is an antioxidant and when applied in a solution it forms a barrier that stops the oxygen necessary for the chemical reaction which forms melanin. This prevents black spot from developing.



The correct use of metabisulphite

- Store correctly away from direct heat and where it will not get wet.
- Make sure you have a standard procedure for making a dip and follow the manufacturer's instructions.
- Have the correct water level mark permanently marked in the dipping tank.
- Too little meta and the prawns may go black; too much meta and the level may be higher than regulations allow.
- Thoroughly wash the prawns dirty prawns will lessen the life of the dip.
- Do not overfill the baskets with prawns.
- Make sure the meta is fully dissolved in the tank before adding prawns.
- Agitate the basket of prawns in the dip tank to ensure good coverage.
- Find a method that allows the product to receive the correct dipping time.
- Change the dip at the recommended time or the after the recommended quantity of prawns dipped.



As skipper or supervisor you will need to have a dipping procedure in place and make sure all the crew are familiar with the process. A laminated dipping procedure kept near the dipping tank is a good idea (see previous topic).

Metabisulphite concentration testing procedure

There are regulated amounts of metabisulphite allowed on prawns and this can vary depending:

- on the regulatory authority
- whether the prawns are cooked or raw
- country of destination.

The amount is expressed in parts per million and you need to be familiar with the amount allowed for your product and its destination.

A revised Australian Food Standards Code was planned for gazetting in November 2000 and would raise the maximum residual sulphur dioxide in raw prawns to the export level of 100 ppm and was to introduce a 30 ppm allowance for cooked.

There are a number of methods for testing the concentrations of sulphur dioxide, although most require testing in a laboratory. It is a good idea to periodically have a sample of your product tested this way.

A quick procedure for testing aboard the vessel uses Merckoquant sulphite test strips, either dipped into the solution or pressed against the flesh of dipped prawns.

Checking prawns directly

- Press the strip against the flesh of a sample prawn.
- If the test strip turns a very pale pink colour, the level is correct.

Checking the dipping solution

- Take a 100 g sample of the meta solution (1/2) cup but check the actual weight).
- Pour into a large container and fill to total weight of 1 kg with tap water.
- Take a 100 g sample from the 1 kg; discard the rest of the water.
- Pour back the 100 g sample into the container and again fill to a weight of 1 kg.
- Immerse a sulphite test strip in the diluted sample for 1–2 seconds.
- Leave for 30 seconds and then compare the colour of the test strip with the standard on the test strip pack.



- ✓ Have a dipping procedure in place and make sure all crew members are familiar with it.
- ✓ Know the regulated allowable concentration of sulphur dioxide allowed for your product.
- ✓ Use the strip testing procedure regularly and also send samples to a laboratory periodically for checking.
- ✓ If you have a HACCP or other safety plan in place, make sure you follow the checking procedure as described and document the results.



CHECKING ACCURACY OF SCALES AND WEIGHTS

The Australian regulations for weight control state that:

- the average weight of a random 12 cartons must be equal to or greater than the declared weight
- no individual pack must be less than 95% of the declared weight.

The AQIS export regulations are slightly different in that the number of samples to be taken depends on the batch size.

- The average weight must be equal to or greater than the declared weight.
- Packs of 5 kg or greater the minimum weight of an individual pack must be a least 98% of the declared weight.

Therefore, it is very important that each pack is carefully weighed and checks are carried out regularly to ensure that the process and the scales are correct.

Checking accuracy of scales

Scales need to be checked for accuracy and there are a number of varying situations that can cause scales to give an inaccurate reading. These include:

- checking accurate weight
- checking for drift
- checking radial load.

Checking weight accuracy

This is a check to ensure the scales are giving the true weight of objects weighed. The scales need to be checked daily and placing a known weight on the scale and checking the reading for accuracy does this. Follow the manufacturer's instructions to correct.

Checking for drift

Drift is the ability of the scale to accurately return back to a loaded weight when another weight is removed. To check this simply place one known weight on the scale (e.g. 2 kg), check the reading for accuracy, then add a second known weight to the scales and check the reading for combined weight accuracy. Take the second weight from the scale and the reading should return to the first indicated weight (e.g. 2 kg). Follow the manufacturer's instructions to correct. Scales that show drift may indicate the load cell is damaged.

Checking for radial load

Radial load is the ability of the scales to read accurately from all corners of the weighing platform. To check for radial accuracy place a known weight on each corner of the weighing platform and make sure the weight is the same reading from each corner. Follow the manufacturer's instructions to correct. Scales that show radial load problems indicate a damaged or offset platform or again load cell damage.

Remember

- ✓ Scales should be checked daily for accuracy.
- ✓ Follow manufacturer's instructions for using and checking scales.
- ✓ If you have a HACCP or other safety plan in place, make sure you follow the checking procedure as described and document the results.

Checking accuracy of net weight packs

Gross weight - the weight of prawns plus packaging.

Net weight – the actual weight of prawns in the pack.

Periodically, take random samples of the net weight of frozen packs. The following technique should be used.

- 1. Check the accuracy of the scales (see above).
- 2. Weigh the total pack to obtain gross weight (GW).
- 3. Remove all the packaging, dry any plastic liners and reweigh all the packaging (P).
- 4. The net weight is the GW minus P.
- 5. Repack the prawns without allowing them to defrost.



Surface frost immediately surrounding the prawns is considered part of the prawns. Lumps of ice are not and need to be removed, weighed and taken from the gross weight to get a net weight.

Remember F

- ✓ Know the regulated weight requirements that your operation needs to meet.
- ✓ Periodically check sample packs to ensure the net weight of prawns is accurate.
- Lumps of ice are not part of the net weight. Ensure prawns are being well drained before being packed.
- ✓ If you have a HACCP or other safety plan in place, make sure you follow the checking procedure as described and document the results.

BUSY PERIODS

Many quality problems occur during busy periods when the crew is under pressure to quickly process large quantities of prawns. As skipper or supervisor of product quality you should have a plan in place for handling prawns during busy periods. A 'busy period' plan should consider a range of procedures including:

- chilling tanks prepared and the temperature lowered to at least 2°C ready to hold prawns until they are able to be further processed
- preparing enough netting bags (if used) to hold the prawns in the chilling tank
- sufficient cartons, liners, etc., prepared to handle the amount of prawns that may be expected to be caught
- changing to a quicker packing method such as bulk packs rather than customer packs during busy periods
- extra crew member/s employed for busy periods.

Prepare a plan that suits your operation or an operation you are familiar with.





The most critical factor is to get the temperature of prawns lowered as quickly as possible. Therefore, treat this as a priority during busy periods and have an appropriate plan in place.



V	SELF CHECK	YES	NO
	Can you conduct grading checks?		
	Can you test metabisulphate levels?		
	Can you check scales for accuracy?		

- If you have answered YES to all of the questions above, you are ready for the next topic.
- If you have answered NO to any question, review the topic again and ask your trainer or coach for help.

FREEZING AND STORAGE

Skippers and senior crew members need to understand the principles of freezing, know the temperature requirements of frozen and chilled prawns and be able to manage correct loading of snap freezers and holding rooms to lower temperatures quickly and maintain the optimum temperature.

FREEZING PRODUCT

There are three golden rules for freezing at sea:

- 1. Freeze it fast.
- 2. Freeze it cold.
- 3. Keep it frozen.

It is important to remember freezing is not about putting cold into a product, but removing heat from a product. Similarly, frozen storage is not about losing 'cold' but preventing heat from entering the product.

1. Freeze it fast

The freezing rate of prawns (or any edible product) should be as rapidly as possible. Most importantly heat should be removed as quickly as possible after capture – when they are dead they begin to go off. Freezing quickly helps prevent spoilage.

Prawns are approximately 70% water and while water is changing to ice it is critical that there is no fall in temperature. It is during this phase (called the latent heat phase or period of thermal arrest) that most problems associated with freezing occur – usually because the time taken to go through this phase is too long. This is the reason that snap freezers must have a lot of power – not so much to get the temperature down to a very low temperature (e.g. -40°C) but so they have the thermal arrest (or grunt) to take the heat out of the product quickly.





Freezing curve for seafood



Ice content of fish

The freezing process follows three stages:

Stage	Description
Stage 1	Relatively rapid stage where the temperature of the prawn falls to approximately -1°C.
Stage 2	Takes much longer and the temperature changes only slightly (from about -2°C to about -4°C). This is the thermal arrest period.
Stage 3	Rapid fall in the product temperature to the same temperature as the freezer.

2. Freeze it cold

Bacterial action which causes spoilage in prawns will tail off once the temperature drops through the latent heat phase (approximately -5°C) and enzyme action usually stops below -18°C. This is why AQIS stipulates this is the maximum temperature for frozen export product.

It is very important that the temperature of frozen product is kept at least at -18°C (and a much lower temperature is preferred). This will give a rapid freezing rate and also allows a margin for error in case you have any refrigeration problems.

The temperature of the product should be at least -18°C before being transferred from the snap room to the holding room. If you have to transfer before that temperature is reached (particularly during busy periods), never move it before the product is through the thermal arrest period (-5°C) and preferably at -10°C.

If you do transfer to the holding room at a temperature higher than -18°C, place the cartons on edge or in a way that they are going to get maximum airflow. Do not stack them on top of one another.



Holding rooms are designed to maintain a low temperature but do not necessarily have the grunt to rapidly lower temperatures.



3. Keep it cold

Keep the product at a *constant* low temperature. If the temperature varies even while keeping the prawns frozen, chemical and enzyme action can start, and this will dramatically reduce the shelf life of the product and cause a dramatic loss of quality.

This is why quick transfers of prawns from the snap room to the holding room and during unloading is so important.

STORING PRODUCT

Correctly storing the cartons in both the snap room and the holding room is critical to rapid freezing and maintaining low temperatures on an ongoing basis.

Rapid freezing of all product in the freezer will only occur if cold air is circulated to all the cartons. Airflow will take the path of least resistance so in a partially loaded freezer some product may not receive a proper air blast. Cartons must also be positioned so that the fans are not blocked.

Product stored in the holding room must also be correctly positioned so that the airflow is able to cover all the cartons. Cartons should be off the holding room floor and walls so that air can circulate.

Remember



- ✓ Freeze it fast, freeze it cold and keep it cold.
- ✓ Never freeze prawns in the same room that they are being stored in.
- ✓ Load the snap room and holding room so that <u>all</u> cartons get maximum air flow.
- ✔ Open freezer doors as little as possible and minimise the time they are left open.

F CHECK	YES	NO
now the three golden rules for freezing at sea?		
now the minimum temperature prawns need to be and how quickly they should reach this ure to maintain quality?		
describe the procedures that need to be followed ly store product?		
	The second state of the se	FORE YES now the three golden rules for freezing at sea? Image: Comparison of the procedure prawns need to be and how quickly they should reach this ure to maintain quality? describe the procedures that need to be followed by store product? Image: Comparison of the procedure prawn of the prawn of the procedure prawn of the prawn of the

- If you have answered YES to all of the questions above, you are ready for the next topic.
- If you have answered NO to any question, review the topic again and ask your trainer or coach for help.



UNLOADING, TRANSPORTATION AND RECORD KEEPING

All the good work in producing a quality product at sea can be undone during unloading and transportation. There are two main problem areas:

- temperature
- damage.

The unloading process is under the control of the skipper and crew and checks can be made to at least ensure everything is as it should be when the prawns are ready to be transported.

UNLOADING

It is important that the temperature of the prawns is kept at the required level or colder throughout unloading (-18°C for frozen product and 0° -2°C for chilled prawns).

It is also important that cartons are carefully handled when unloading frozen prawns. Prawns snap very easily when frozen, therefore dropped cartons can easily result in broken prawns. Damaged cartons can also expose prawns and result in freezer burn.

While different trawlers will have different unloading methods and may be unloading to a truck, container or mother boat, there are a similar range of issues that a skipper or supervisor should address before unloading. The following is a list of things that may need to be considered. Study the list and then prepare a list to suit your operation.

- Temperature of frozen prawns at least -18°C (and preferably much colder) before being unloaded.
- Chilled prawns should be at approximately 0°C before unloading commences.
- Keep refrigeration going as close as possible to unloading time.
- Do not expose prawns to the outside elements until all unloading equipment (e.g. conveyors, lifting gear, etc.) is in place.
- Unload from the freezer in small batches so that the prawns spend the minimum amount of time exposed to outside air temperature.
- Keep prawns under cover as much as possible.
- Consider the time of the day for unloading if at all possible, do not unload in extreme heat.

- Have a system that minimises the risk of crew dropping cartons.
- If unloading chilled prawns, make sure there is adequate ice and/or cold brine in the unloading bins.
- Work as quickly as possible.

TRANSPORTATION

While there is little that you can do after the prawns have left your vessel, there are some checks as skipper or supervisor that you need to make before the prawns are transported:

- Check the cartons are well stacked and secure.
- Ensure the transport containers or trucks have their refrigeration unit running and the transporter is aware of the temperature that the product needs to be kept at.
- Make sure any documentation (regarding storage conditions, number of cartons, quality of product at unloading, agreements with the transport company, etc.) is signed by both parties.

Remember

- ✓ Have a good unloading system in place and make sure all crew members are familiar with it.
- ✓ Any casuals employed to help unload are supervised and the unloading procedure is explained to them.
- ✓ If at all possible, do not unload in extreme heat and always unload as quickly as possible.
- ✓ Ensure that the transporter is securely stacked, its refrigeration system is operating and all relevant documentation and agreements are in place.



RECORD KEEPING

All trawlers will have some form of recording system. The extent of those records will depend on vessel, company and regulatory requirements. As skipper or supervisor you will need to familiarise yourself with the requirements in your operation.

Study the list below, make a list of the records you may be required to keep on your vessel, familiarise yourself with them and design records to suit your operation if need be. Remember, some may simply be for your own information (e.g. shot records) and others will be company or regulatory requirements (e.g. AQIS records).

Type of Record	Description
Skipper's Log	Can be for skipper's own information on catch rates, areas, particular trawl shots, etc., or may be a requirement of organisations that require catch data (e.g. CSIRO, state fisheries authorities).
Production Records	Important for identifying what product as been produced and for product trace in case a problem arises. It may also help to isolate or define the limits of the problem.
Packing Log	Keeps a record of number of cartons packed and information such as serial numbers, species, grades, weights and temperature.

Vessel and company records

AQIS

If your vessel is operating under AQIS regulations, you will be required to keep a food safety/HACCP plan on board and maintain relevant records (see earlier topic called *Safety Plan* for further information).

Other records

Other records you may have to (or want to) keep include:

- customer feedback records
- unloading records.

SELF CHECK	YES	NO
Do you know what to do during unloading to ensure your product is:		
maintained at a safe temperature?		
not damaged by dropping?		
Do you know what checks to make before your product is transported?		
Can you keep all the records that are required on your vessel?		
	 SELF CHECK Do you know what to do during unloading to ensure your product is: maintained at a safe temperature? not damaged by dropping? Do you know what checks to make before your product is transported? Can you keep all the records that are required on your vessel? 	SELF CHECK YES Do you know what to do during unloading to ensure your product is: Image: Comparison of the product of the product is is in the product of the product

- If you have answered YES to all of the questions above, you are ready for assessment.
- If you have answered NO to any question, review the topic again and ask your trainer or coach for help.



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A Guide for Prawn Trawler Skippers and Crew at Advanced Level

(#) Record types of defects in comments section and advise crew of any recurring problems.

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	Product storage	freezer				
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