Wild Caught Barramundi Best Practice Guide November 2021

Developed by Dr Janet Howieson, Curtin University
in consultation with the Australian Wild Barramundi Industry

Table of Contents

1. Introduction

1.1. Pre-amble

This manual is designed to provide guidance and a set of best practice hygiene, handling and product management protocols for the wild barramundi industry. It was developed as part of a larger project, with the aim to improve the consistency of fish quality and food safety and therefore, catch value.

It is to be noted that the document provides best practice guidelines but is intended to be tailored to individual company requirements, practices and vessel specifications.

Draft format specific (frozen fillets and chilled whole fish) quality specifications have also been developed as part of the project, and are also available for individual company use and formatting for marketing and other purposes.

1.2. Process Flow

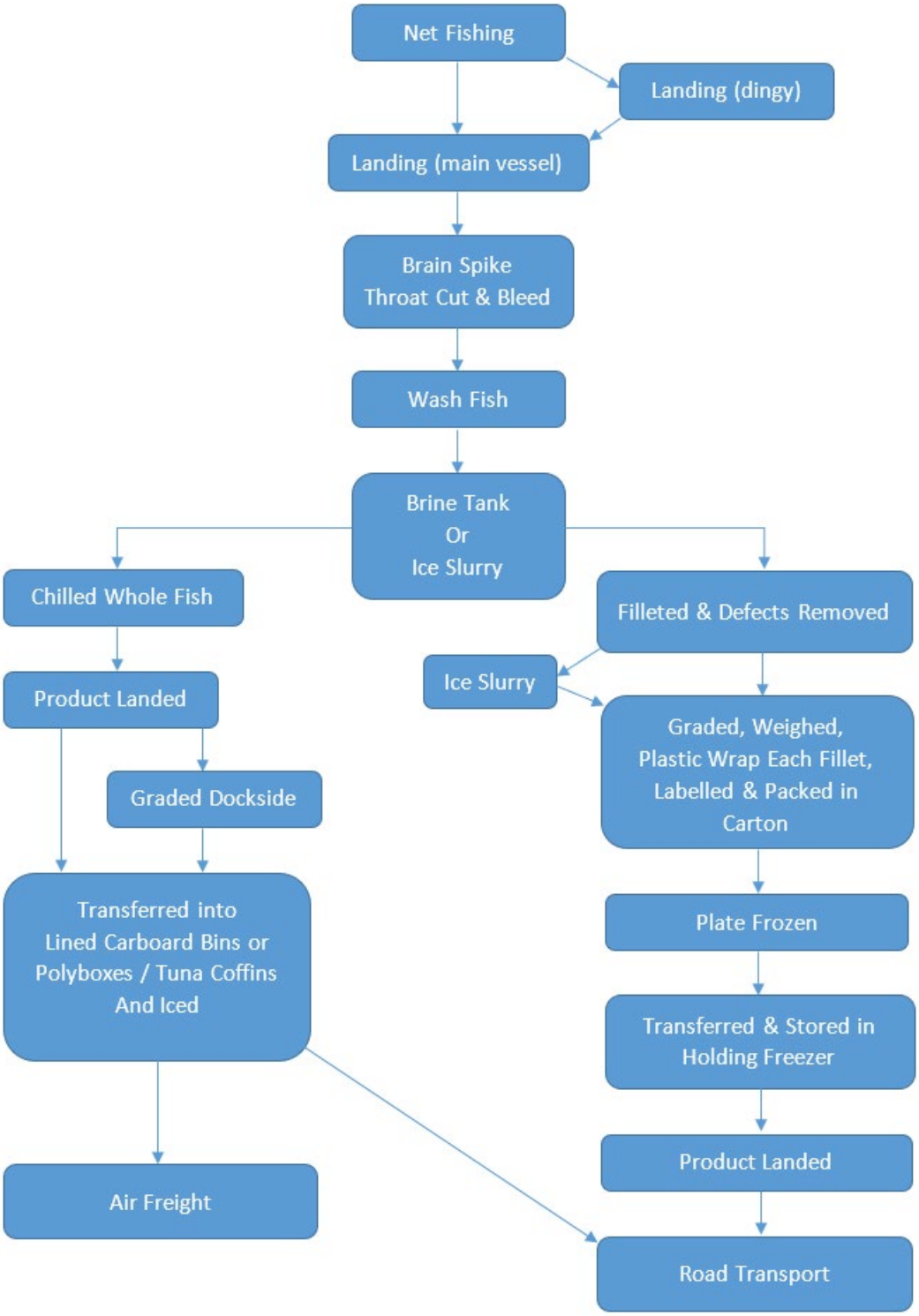

Figure 1: On-board processes in wild barramundi vessels. There might be variations in the order of this flow diagram due to equipment and vessel set-up.

2. Good Manufacturing Practices

2.1. Hygiene

Good hygiene on-board is extremely important to protect the fish from contamination and ensure the best possible shelf life. Contamination sources includes; all people (personnel), personal protective equipment, foreign bodies, transferring between vessels, cleaning tools, chemicals, fish tubs, decks, brine tanks, filleting areas, plate and storage freezer areas, packaging, and weighing, grading or processing machinery that may come into contact with the fish. Additionally, random surface testing should be completed during and after trips to ensure cleaning and hygiene practices are working.

The following, is a list of measures you can take to help prevent product contamination.

2.1.1. Personnel

- Clean clothes each day
- Clean clothes thoroughly after each use
- Shower daily
- Bed lined and towels washed regularly
- Don’t wear jewellery, ripped clothing or anything else that could end up on the fish.
- Wash your hands with soap and water thoroughly (see 2.1.3).
- Avoid touching your hair, nose, mouth, ears and eyes while handling the fish, as people carry bacteria that can be passed onto the fish.
- Keep cuts and sores well covered with waterproof dressings.
- Do not handle fish if unwell, as you can transfer the bacteria to the fish.
    - Do not handle fish if boils are present and especially if burst.
    - Do not handle fish if you have received a positive ‘Staph’ result. Follow-up with doctor and need to have a follow-up test for negative result to resume handling fish.
- Do not smoke while working.
- Do not uses handkerchiefs, as they hold bacteria and help it spread.
- No food/eating in the processing area during processing.
- Try not to carry anything in pockets if possible, as it might fall onto the fish.
- Limit walking on the fish, as it reduces fish quality and can contaminate fish.

2.1.2. Personal Protective Equipment (PPE)

PPE includes wet-weather gear, gloves, aprons and boots. Having a specific storage area(s) for clean PPE when not in use is recommending.

- Do not share or use someone else's PPE
- Wash PPE with an appropriate approved detergent and sanitiser
- All PPE must be thoroughly cleaned and sanitised after each use, including before going on a break, at the end of the day / shift and after handling waste / dead fish.
- Allow PPE to dry out where possible e.g. end of day
- Replace damaged PPE.
- Gloves waterproof for handling fish and cut proof for fish.

2.1.3. Hand washing

Hand washing is a critical part of reducing contamination risks and should occur: before starting work and also after using the toilet, smoking, eating, drinking, sneezing, scratching yourself, touching your face or skin and handling waste/dead fish, chemicals and allergens.

Figure 2 and below show a step-by-step process to effectively clean your hands.

1. Wet hands and apply soap, rub hands as in steps 2 to 8.
2. Palm to palm
3. Right palm over left back of hand and left palm over right back of hand
4. Palm to palm fingers interlaced
5. Back of fingers to opposing palms with fingers interlocked
6. Rotational rubbing of right thumb clasped in left palm and vice versa
7. Rotational rubbing, backwards and forwards with clasped fingers of right hand in left palm and vice versa
8. Rinse thoroughly removing all residues
9. Dry hands thoroughly using paper towel and place used towels in the waste bin.
10. Apply sanitiser rubbing hands as in steps 2 to 7.

Figure 2: Steps on how to wash hands.

2.1.4. Chemicals

- All chemicals used must be approved by the company and from an approved supplier.
- Personnel to have access to the Safety Data Sheets (SDS) for each chemical onboard the vessel.
- All cleaning chemicals must be food grade for any fish contact surfaces and equipment.
- Hand soap and sanitiser to be fit for purpose and food grade.
- Ensure correct Personal Protective Equipment (PPE) is available when using chemicals.
- Follow the instructions for chemical usage including any mixing / dilutions, otherwise the chemical won't work correctly e.g. sanitiser not at correct strength to kill the bacteria.
- Store all chemical as per instructions and away from fish to prevent contamination.
- If a chemical spillage does occur, follow any company procedures and instructions on the SDS, reduce any impacts to the environment and correctly dispose of any contaminated fish. Ensure correct PPE is used when cleaning up a spillage and clean thoroughly.
- Examples of chemicals include; cleaning chemicals, oil, diesel, lube, grease and any other engineering chemicals.

2.1.5. Workplace

- Reminder of section 2.1.4 requirements with chemicals.
- Wash and hose down decks with sea water after fish are transferred to vessel. Scrub them with a detergent at the end of each day, and after unloading.

- Keep knives, filleting boards, brushes, shovels, rakes and scales in good condition that won't create a contamination risk (e.g. free from rust, broken parts, bristles falling out) and cleaned with detergent and sanitiser after use.
- Filleting boards should be made out of plastic and where possible to be soaked in sanitiser overnight.
- Sharpen knives away from product and clean before using
- Do not use damage equipment.
- Plate freezer and storage/holding freezers washed and sanitized at the end of each trip and when they are shut down for any reason.
- Store cardboard cartons, plastic liners, plastic sleeves/sheets and any other packaging in a clean dry place free of insects, rodents and chemicals. Ensure packaging is covered to protect from rain and bird poo, especially whilst transferring to the vessel or sitting on the deck.
- Ensure baskets, tubs, bins etc., are cleaned thoroughly with detergent and sanitiser after use and re-sanitised before use. Cover after cleaning and store in a clean dry place free of insects, rodents and chemicals.
- Scrub all storage rooms/areas and refrigerated brine tanks with detergent and sanitise them after use.
- Flush and sanitise refrigerated brine tank pipe work after use.
- Hose down, scrub with detergent and sanitise all sorting tables, filleting area, packing tables and processing equipment after use and sanitise them again before use
- Thoroughly hose down, scrub with detergent and sanitise any new equipment or equipment that has been storage for a period of time before loading onto the vessel
- During a breakdown ensure the repairs are fit for purpose and any food contact equipment and areas are clean thoroughly with detergent and sanitiser before using again.
- Keep toilets in a clean condition and hand washing facilities working correctly.
- Ensure hand soap and sanitiser is freely available and positioned in spots to maximise use.
- Galley, wheelhouse, cabins, showers, laundry area, stairs, engine room and other areas must be kept clean and tidy
- Tenders kept clean and tidy and hosed out after each use.

2.1.6. Cleaning Procedures

Good cleaning detergents are necessary to remove proteins, fat, slime, and blood, whilst sanitisers are necessary to kill the microbiological contaminants.

A proper cleaning and sanitising process is essential to prevent the spread of contamination which can include:

- physical (e.g. dirt, sand, blood, fish scales, slime, fish waste)
- microbiological (e.g. bacteria, viruses, mould)

- chemicals (e.g. diesel, oil, lubes)

Without clean surfaces there is always the risk of contamination. 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
- Cleaning tools not kept in good condition

There are two main steps to a cleaning program:

1. The physical removal of contamination with the use of food grade detergents and scrubbing. This is about removing what you can see and feel.
2. Sanitising to reduce the microbiological contamination. The growth of organisms that you can't see, that reduces the shelf life and quality of the fish and therefore the price of the product.

Steps involved in proper cleaning:

Step	**Description**
1. Remove physical contamination	Brushing and hosing of surfaces, baskets, bins, equipment etc., to remove dirt and other loose physical contaminates.
2. Wash	Use detergents and manual scrubbing to help break down fats, grease and other foreign material. Washing does not necessarily remove all bacteria, but should reduce it to a level where a sanitiser can be effectively used.
3. Sanitise	Reduce bacteria to low levels using sanitising chemicals or very hot water (70°C – 80°C). Follow sanitiser instructions as there may be a minimum contact time for effectiveness and the sanitiser may need to be rinsed off afterwards. If the wash step is not effective, the sanitiser stops working when the bacteria counts are too high.
4. Dry	Bacteria love water, so drying prevents them from growing or being transferred between wet surfaces. Ensure the tools you use are adequate for the job. For instance, make sure the deck hose has sufficient pressure to remove dirt/rinse, brushes are clean and complete, and chemicals are used in sufficient quantities.

A typical pre-harvest cleaning schedule would include the following:

- Ensure all sorting tables, tanks, baskets and buckets are cleaned, sanitised and rinsed with clean water. Even though it was washed the previous day it will accumulate new dirt, dust and bacteria.
- Always follow the manufacturer's instructions for the use of cleaning chemicals before landing first shot
- Any hot surfaces that the product may come into contact with will be hosed down and fill the main hopper with clean seawater in preparations for landing the shot.
- Ensure door/s between the processing area and the amenities and gallery/ accommodation is/are closed at all times during processing.
- Fill brine tank with clean seawater

2.1.7. Allergens

There are currently 10 allergens in Australia:

1. Peanuts
2. Tree nuts
3. Milk
4. Eggs
5. Sesame oil and seeds
6. Fish
7. Shellfish
8. Soy
9. Wheat
10. Lupin

If using sulphites, treat this like an allergen. It must be declared when using at a specific rate in the food and is outlined in the Food Standards Australia New Zealand (FSANZ) codes.

Other countries have their own list of allergens, which is important if you are exporting fish, to know what they are.

It is critical to know, that only manual scrubbing with appropriate detergent and through hand washing will remove allergens. Sanitiser has no impact on allergens, as they are not a microbiological organism.

Personnel and the vessel cook should also consider what food they bring aboard the vessel including what's in the galley and reduce or eliminate any allergens. For example; peanut butter, snickers bar and some Asian foods have sesame oil.

2.1.8. Scombroid Fish and Histamine Poisoning

Although barramundi is not a scombroid fish, you might have by-catch that is. Examples of scombroid fish include, Mackerel, Tuna, Bonito, Swordfish, Herring, Sardines, Mahi Mahi etc.

Scombroid fish have a naturally occurring chemical called Histidine (which is an amino acid) in their muscle structure and once the fish dies there is an enzymatic reaction that changes the Histidine to Histamine. This reaction is speed up by temperature and therefore handling the fish and getting the core temperature down to under 5^{o}C quickly and then holding at 0-2^{o}C for the rest of shelf is critical in stopping histamine developing.

Symptoms start from lip tingling and can grow to vomiting or even worse can cause death.

Histamine once accumulated (in the fish), cannot be killed during freezing, cooking or any other process. It is better to dispose of the fish if you think any temperature abuse has occurred including time from catch to chilling fish.

3. Gill Netting and Initial On-board Handling

Correct on board fish handling procedures must be undertaken to minimise product bruising, scale loss and other damage. Rough handling and bruising once on-board may result in bacterial contamination of fish and allow release of enzymes, speeding up the rate of spoilage and reducing shelf-life, resulting in customer product rejections or downgrading of product to lower money value.

3.1. Gill Netting

Netting must only occur in permitted zones under the relevant licence. All fish caught must meet all minimum, maximum and any other limits required.

Sometimes fish maybe damaged in the gill net before being loaded onto the deck, which is often evident in the form of scale loss and occasional lacerations. Such damage is the result of the turbulence within the net and caused by contact with other fish and with the net itself. In some circumstances, fish will perish in the net before being loaded onto the deck. The water and air temperature also have an impact on the fish and its quality.

Steps to reduce fish damage and fish death from the gill net, and increases fish quality include:

1. Handling and set-up of net in water

- Don’t set nets in strong currents, as this tends to stretch the new material causing damage to the flesh of any fish caught.

2. Soak time of gill net once in the water:
   - Warmer months - not to exceed 1 hour
   - Cooler months - 1.5 – 2.5 hours optimum, but up to a maximum 3 hours.

3.2. Hauling of Gill Net and Sorting

It is critical to limit the time of fish comes out of the water and into the brine tank to chilled product down. Beware of the sharp gill covers and dorsal spines of barramundi when handling them.

1. Pre-cool the deck
2. Ensure loaded bins are clean and have been re-sterilised before hauling net.
3. Net Hauling:

   3.1 Manual – remove fish one by one from the gill net. When removing fish from the net, hold fish by bottom jaw and pull head first through the net using a mesh puller or hook for assistance. The fish should come through with little effort. If it does not, then the fish may need to be taken backwards out of the net. If too much force is used to pull the fish through, damage will occur to the flesh e.g. bruising and redness in flesh.

   3.2 Hydraulic – Employees must be trained to use hydraulic new winches to ensure health and safety requirements are met, but also to limit the damage to the fish. Avoid placing too much strain on the net when winching especially in rough weather and strong winds. To reduce strain, idle the boat forward as winching net.

3. Separate dead fish
   - Keep the very recent dead and in good condition fish.
   - Dispose of dead and poor-quality fish, as per regulations.
4. Separate by-catch species
   - Dispose of unusable fish, as per regulations.
     - Generally, return to the water as soon as possible.
5. All market acceptable fish placed into a bin with sea water.
6. Fish to be out of the water for the least amount of time possible and if unavoidable, keep fish wet with a hose or buckets of fresh water.

3.3. Transfer Fish to Main Vessel

If a tender/dingy has been used to catch fish, there is a transfer of fish to the main vessel.

1. If transferring from a tender/dingy to a main vessel – do so quickly, but without damaging the fish.
2. Transfer generally to take only a few minutes.
3. Tender/dingy to be hosed down thoroughly after each use and drained to ensure no water remains.
4. Net to be hosed down/clean and stored correct.
5. Any new repairs to happen away from open product to reduce the risk of foreign body contamination

4. Initial Processing

Crew that undertake any processing must:

- Follow all hygiene and food safety requirements
- Be trained on how to use the processing equipment
- Understand that their handling can greatly affect the quality and shelf life of the product and therefore the price that can be achieved on sale.
- Must limit the time between landing fish and kill step.
- The total time the fish is out of temperature control is a maximum of 30 minutes.
- Fish must be out of direct sunlight.

4.1. Kill Step

Remember the sharp gill covers and dorsal spines of barramundi when handling them. There are two options to humanely kill barramundi:

- Brain spike (Iki jime) or
- Hard knock to the head

The brain of the barramundi is further back in the head compared to most other fishes, which must be kept in mind when using iki jime.

Both methods will kill the fish immediately – utilise the one that suits your own practices and business culture

4.1.1. Brain Spike (Iki Jime) – (https://www.ikijime.com/fish/barramundi/)

You can use a knife, sharpened screw driver, or a specifically design iki jimi tool. Quickly and firmly insert the spiking tool into the brain (Figure 3) and wiggle the tool around to destroy the brain. When performed correctly, the fish will be killed immediately and its body will go limp.

Figure 3: The white spot highlights where the brain is in a Barramundi (https://www.ikijime.com/fish/barramundi/).

There are also YouTube video's on how to iki jime a fish.

4.1.2. Knock on the Head

This can be an alternative to using the iki jime method for kill. Using a wooden club or 'priest', knock the fish on the head with one or more strong sharp blows to kill the fish.

4.1.3. Throat cut and Bleed

Once the fish if humanely killed, using a knife, cut the fish throat.

4.2. Washing Fish

4.2.1. Hose down fish in a to remove all physical contamination, remaining blood etc. Clean down the wash area after use

4.3. Chilling Fish to Temperature

It is imperative that the product is rapidly chilled as soon as possible after landing, to maintain fish quality and food safety. Therefore, immediately after kill, bleed and wash step the fish are to be either placed in an ice slurry or brine tank.

Following washing, whole fish, can go immediately into the slurry tank which is initially filled with clean seawater. It is recommended to stir the chilling fluid periodically to maintain even distribution of temperature and salinity.

4.3.1. Brine Tanks Set-up

1. Brine tanks must be filled at a minimum of 10 km from the coast or estuary. If tanks have to be filled alongside the wharf for stability reasons, make sure the tanks are flushed at sea with clean seawater.
2. Fill tank(s) with saltwater.
3. The tanks should be pre-chilled between 0 - 2°C before the product comes aboard. Anything colder than 0°C can lead to fish damage and partial freezing (see 4.3.5 for more information).

4.3.2. Ice Making

Ice is produced on-board and is made from clean seawater or potable water. In some cases, ice is made with the addition of an antibacterial processing aid such as chlorine dioxide. Chlorine dioxide is a FSANZ approved processing aid.

If using ice produced on-land ensure there is no contamination risks that will impact fish quality and food safety e.g. using sterilised covered tubs that contain the ice. Ensure the supplier is on your company approved supplier list and meets all food safety and legal requirements.

4.3.3. Ice Slurry Set-up

These steps should be taken when preparing the slurry tanks for chilling the product:

1. The slurry tanks must be thoroughly cleaned and sanitised before use and only used to store product.
2. The tank should be either filled with potable (drinkable) water and food grade salt or more usually with seawater. For cool water fish a mix of 2 parts ice,; 1 part seawater can be used. Table 1 below shows the recommended changes in ice slurry recipes when water temperature increases.
3. When using seawater, the tanks must be filled at a minimum of 10 km from the coast or estuary. If tanks have to be filled alongside the wharf for stability reasons, make sure the tanks are flushed at sea with clean seawater.
4. The tanks should be pre-chilled to a maximum of 2°C before the product comes aboard and is stored. A check must be made on the fish core temperature once the product is stored to ensure it does not rise above 4°C.

Estimated fish landings (kg)	**Sea temperature (°C)**							
	12	14	16	18	20	22	24	26
100	13	15	17	19	21	24	26	28

500	64	75	86	97	107	118	129	140
1000	129	150	179	193	215	236	258	270

Table 1: Recommended Ice Usage Rates (kg) for Ice Slurry Tanks (modified from SQMI WA Finfish Handling Guide).

4.3.4. Handling of fish when transferring to tanks

Fish must be continually hose with fresh sea water before transferring to brine tanks. All handling of fish must not damage the fish.

4.3.5. Chilling of Fish

Initially you want to reduce the fish core temperature to 0°C within the first 2-3 hours from catch. The overall ideal storage temperature of fish is between -1.0°C and 1°C. Temperatures below -1.5°C may result in partial freezing.

To note, fish that are at -1.°C to -5°C have very little bacteria growth, but spoilage and shelf life impacts can still happen from enzymatic spoilage exacerbated by partial and slow freezing. Endogenous fish enzymes present in the fish can be released at such temperatures, and can continue to break down the fish even after death and therefore spoil the fish reducing their quality.

Record fish temperature when initially transferred to ice slurry or brine tank, hourly and then just before transfer for further processing. Fish core temperature must be colder than 5°C before further processing can occur.

5. Further Processing

Following adequate chilling for the core fish temperature to reach colder than 5°C in the brine tank, product is either transferred to the filleting table or storage bins for whole fish.

5.1. Chilled Whole Fish

Chilled whole fish used, must come from the last 3 days of catch only. Once fish has been placed in brine tank or ice slurry, the fish need to regularly monitored to ensure the core temperature has reached the desired temp range of 1-4°C. Once core temperature is achieved, then the fish must be transferred to the storage bins Fillets

Can be both skin on or skin off

Handling Process:

1. Use sufficient clean sea water whilst processing fish (ensuring gut is separated from fish correctly)
2. Use the hose to flush to any blood from the body ensuring the hose does not actually touch the fish.

5.1.1. Filleting and Defect Removal

How to fillet, handle correctly (e.g. don't bend fish), remove bruises / parasites / bones to minimise damage to fish. Wash fillets before moving to next step.

6. Ice Slurry Holding of Fillets

NEED MORE INFO HERE

Fillets in brine will toughen up.

Note – this is not glazing of product or any option that increases the weight of the product. Net product weight is less glaze and is a legal requirement.

7. Grade, Weigh, Pack & Label

Grading, Weighing, Pacing and Labelling can occur in various orders depending on the vessel set-up and equipment, but the principles and practices still apply. Remember to use correct handling techniques are used to decrease the risk of damage to the product. Reducing

7.1. Chilled Whole Fish

Whole fish are packed into storage bins with sufficient ice to last for time they are to be stored. Regular monitoring of the ice and temperature is critical to ensure the desired temperature is maintained throughout the whole storage time. Fish MUST not be stored in brine tanks for longer than necessary. Whole fish are usually weighed in tubs with no ice when they are being transferred from storage tubs to tuna coffins or pumpkin bins for transport.

7.2. Frozen Fillets

7.2.1. Grading

- Fresh fillets are graded visually and/or via scales as per the specification / customer requirements.

7.2.2. Weighing

- 'Tare' the scales. The scales may already be set up with a tare allowance.
- Carefully fill the basket / carton with correct grade of product until the required weight is reached. Allow a slight over pack so that the average weight will be at least the declared weight. Over pack should not exceed 100 g. Aim between 50-100 grams.

7.2.3. Packing

- Are cartons lined with a plastic sheet or large bag

- Check that all foreign matter is removed from the product before packing and that the fillet meets the size grade requirements
- Each fillet to be either individually wrapped in a plastic sheet or sleeve, ensuring that the fillet is not damage whilst handling. To note, the plastic should not be clear, it should be a contrasting colour to the product to ensure easy visual review for plastic foreign bodies on the fish it breaks/tares.
- Carefully place plastic wrapped fillets into the cartons, laying them straight and skin up or down and ensuring the carton is meeting the minimum net weight of product.

7.2.4. Labelling

- Once all fish is packed write the XXX, XXX, XXX etc on the box
- Add XX label

8. Plate Freezing

Plate freezers should be designed for each boats catching capabilities. They must have the capability to reduce the packed cartons core temperature to -18 ºC or colder as fast as possible.

The packaged fish should be 4 ºC or colder when placed in the plate freezer. The rate of freezing should be a drop in core temperature of no less than 5 ºC per hour to ensure the highest quality. The quicker this can be achieved the better the end product will be. Correct freezing practices increase shelf life. Size of plate freezer can also change times required etc. Must achieve core temp of -18ºC or colder

9. Fish Storage

Temperature is to be monitored with a calibrated instrument with a reading of accuracy of <+/-1 ºC. Temperature needs to be continuously monitored in the holds, (including fish core temperature) at intervals not exceeding 12 hours. Temperature data is to be recorded in the vessel log.

9.1. Frozen Fillets

Must be stored at -18ºC of colder. It is better if the frozen fish can be stored between -25ºC to -30 ºC.

9.2. Chilled Whole Fish

Optimal storage temperature is -1ºC to 1ºC with the limits being -1 ºC to 4 ºC. Chilled fish must be continually monitored to ensure the temperature range is maintained. If product temperature falls below -2°C or increases to >4 °C product is to be stabilised to correct temperature tolerance by removing or adding flake ice.

Product is then to be tagged ‘Q.C.Hold” & Vessel’s Operations Manager informed so that product can be assessed for suitability for further processing for human consumption. If necessary, Site Services Manager will arrange microbiological testing of fish. If product is ultimately determined to be unsuitable for human consumption, a nominated person will determine suitability for animal food or bait. If not suitable for above product will be dumped under written authority of a nominated person.

10. Unloading

At unload, attention needs to be given to ambient temperatures, unload times, handling and airflow on trucks to prevent spoilage through mishandling. Only approved transport contractors should be used. Trucks are to be clean and pre-chilled before loading. Every effort must be made to keep product cold, clean and avoid rough handling as they are handled many times between vessel and end consumer.

There are two major problems that can occur during the unloading process – temperature increase and physical damage. It is essential that care be taken when unloading or all the effort taken to produce a quality product during the trip will be lost.

10.1. Prior to Unload

Sufficient trained crew and/or casuals or are to be marshalled to ensure unload is carried out quickly and efficiently. The truck(s) is to be inspected for cleanliness and run down to temperatures prior to unload commencing. Conveyors, when used, are to be cleaned, set up and made secure, along with pallets and chilled whole fish packaging including ice (if require). Ensure the dock area is clean and tidy. Check all unloading equipment (conveyors, baskets, lifting devices, etc.) are in place and ready to go before the unloading begins.

10.2. During Unload

- All bunkering of fuel and oil to cease during unload.
- Tubs/Cartons/Fish to be handled with care. No dropping or throwing.
- Damaged and dropped product are to be put aside so a decision can be made on their status later. Any damaged product or packaging can be repacked, if there is no risk to food safety and quality.
- Make sure tubs/cartons are not place directly on ground, but are correctly stacked on conveyor belts, pallets or other unloading devices.
- Keep tubs out of sun at all times and covered to prevent contamination from birds/dust etc.
- Temperature:
  - The core temperature of the product must be maintained at <5°C for whole fish or -18oC or colder during unloading. Anything warmer will not be unloaded.

- Products to be tested for core temperature at commencement of unload and the core temperatures recorded.
- Do not leave products on deck whilst other product is taken from the chiller storage area.
- Shut doors and hatches to the chiller/freezer areas and turn refrigeration units back on when there is a break in unloading.
- Truck to be closed and any product on deck returned to the chiller/freezer hold until unloading can resume; if the delay should exceed 15 minutes.
- Time spent out of cold storage must take into account the ambient temperature.
- Make sure wet or chilled product goes straight into bins with chilled ice.
- Pallets with stacked cartons must be shrink wrapped before moving or loading ono a truck, including any large cartons (pumpkin bins) to stop contamination from fork lifts, leaking water and the ground.

10.3. After Unload

- Clean and sanitise all equipment so it is ready for the next day's fishing.
- Clean all toilets, hand basins and other crew amenities and replace soap, towels, nailbrushes, wash linen and tea towel etc., as required.

At the end of each fishing trip:

1. Empty the hold
2. Clean with a high-pressure hose and pump out
3. Remove all grates
4. Scrub grates and floor with sanitiser (Saniclean®)
5. Empty all screens on sumps
6. Backflush sumps with sanitiser (e.g. Saniclean®)
7. Rinse with clean seawater
8. At the end of each trip brine tanks are cleaned with Saniclean®
9. Brine tank pipes are cleaned with Saniclean®
10. The brine tank circulating pump in the engine room requires the filter to be cleaned and sterilised at the end of each trip using Saniclean®

11. Critical Equipment

Product temperature and weight are critical to food safety and regulatory requirements. It is important to ensure the equipment is fit for purpose – in working

order, can measure levels at the correct intervals for products. For example, don't buy a set of scales that measure in whole kilograms, if your product is 500g.

Rule of thumb is annual testing for such equipment or test pieces, and you will need to ensure you have a spare in working order whilst it is being certified.

All equipment should be cleaned thoroughly as per good hygiene practices including any covers that it may have and stored correctly.

11.1. Thermometers

Temperature is a food safety requirement and can impact quality significantly.

To be able to gain the core temperature of a fish, you will need a probe that you can insert into the first, not the one that takes the surface skin temperature of the fish.

To test the accuracy of the thermometer, there are two options:

- Ask the thermometer supplier for their directions or
- Half fill a cup with distilled fresh water and add top up with the vessel ice. When the last bit of ice melts, insert the probe and wait until the reading stabilisers. The reading should be 0^{o}C.
- Record results on a company process or temperature sheet.

11.2. Scales

Weights are a regulatory requirement as part of catch reporting and quota information.

There are bespoke scales suitable for at sea usage, as conditions can get rough whilst fishing and normal scales are not suitable.

Scale use:

- Before weighing of any haul can start, use the verified test scale pieces to check the scales are accurate.
- Test pieces are a weight that represents the average weights you use for your product. They can be 100g, 1Kg, 10Kg, 20Kg are externally certified to confirm they are that exact weight.
- Record the test piece(s) results before starting a new shot.
- If there is an issue, you have two options:
    - Note how much the scales is out and adjust records at a later date – this might mean a land base team member can assist
    - Or use a back-up set of scales that does work correctly
- Record results on a company process or temperature sheet.
- When weighing product, it is key that tare the weight of any packaging. This means placing the fish tub on the scales and pressing the tare button – the scales then should read 0.