

Whitefish Handling Guide

Best Practice



Bord Iascaigh Mhara
Irish Sea Fisheries Board

Introduction

Optimal handling and storage practices at sea and ashore, are essential elements in the management of fish quality and the achievement of maximum financial return on national and international markets.

The primary focus of this guide is to outline the basic handling and hygiene requirements for traditional vessels that simply gut, wash, grade, box, ice and chill at sea.

Additional requirements for freezer vessels are also outlined, along with requirements for factory vessels. Further details on these are provided in the 'User Friendly Guide to Gaining Onboard Approval' (BIM User Friendly Guide Series, No. 4, 2007).

Hygiene and Handling Recommendations

As food handlers, all fishermen are legally obliged to meet the minimum hygiene and handling requirements contained in the EC 'Hygiene Package', which came into effect on the 1st of January 2006.

The 'Hygiene Package' consists of five pieces of legislation [Regulations (EC) No. 852/2004, (EC) No. 853/2004, (EC) No. 854/2004, Directives 2002/99/EC, 2004/41/EC], which replace 17 older EC Directives and simplify the requirements for all food handlers.

They do, however, place a greater responsibility on fishermen, to ensure the production of safe food under hygienic conditions. The 'Hygiene Package' can be found on the Food Safety Authority of Ireland website (www.fsai.ie).

Basic Vessel Requirements

Layout and structure

A well laid out vessel with sound structures and fittings is very important in order to minimise contamination and to maintain hygiene. In particular, the following must be considered:

- The fish handling areas must be separate from the crew quarters and engine compartments;
- The layout must prevent contamination of fishery products by bilge water, sewage, smoke, or other objectionable substances;
- The intake of seawater should be positioned so that it avoids contamination of the water supply;
- Surfaces and equipment, which the fishery products come into contact with, must be easy to clean, durable and non-toxic;
- For vessels that keep fish onboard for more than 24 hours, the holds must maintain appropriate temperatures (0-2°C for chilled storage).

Training

It is essential that all crew undertake induction training so that they understand the food safety risks associated with handling fish.

All crew need to be trained in basic hygiene and handling to ensure the production of safe seafood. Following training, all crew should:

- Be aware of their legal responsibility to ensure safe seafood;
- Recognise how food can be put at risk by chemical, physical and biological hazards and be aware of differences between high and low-risk activities;
- Be aware of the need to keep appropriate records, if required (e.g. temperature);
- Be aware of appropriate waste management and pest control measures to minimise contamination.

Details on induction training are outlined in the 'Guide to Food Safety Training – Level 1' available from the Food Safety Authority of Ireland (www.fsai.ie).

BIM also provide specific courses on basic hygiene and handling of seafood. Further information can be obtained by contacting BIM, Marine Services Division (Tel. +353 (1) 2144 100).

Hygiene and Handling

Good hygiene and handling practices are vital in the production of superior quality, safe seafood. Care must be taken to maintain a clean and uncontaminated working environment and to ensure effective chill chain management.

Spoilage

Once a fish dies it is immediately exposed to spoilage from bacteria and enzymes.

Bacteria

There are millions of harmless bacteria present on the skin, gills and in the guts of healthy fish. Once fish are taken onboard, these and other bacteria invade and digest the flesh causing degradation or spoilage.

Under normal conditions (i.e. sea temperature) bacteria will multiply every 20 minutes. Once the fish dies and is removed from the water it begins to warm up and bacterial growth occurs rapidly. Chilling the fish immediately and holding fish at temperatures between 0-2°C greatly reduces the rate of spoilage and ultimately maintains fish quality and shelf life.

Bacteria can be killed through contact with bleach. Detergents and sanitizing agents should be from the approved list issued by the Sea-Fisheries Protection Authority (SFPA) and should be used according to instructions. As a result, washing down the hold thoroughly with bleach, can significantly reduce the number of bacteria present within this space. Although individual bacteria are much too small to be seen by the human eye, colonies of bacteria can be grown, under laboratory conditions, from swabs taken from contaminated surfaces.



This is bacterial growth in a hold cleaned without using bleach.

This is bacterial growth in a hold cleaned with bleach.

Dead fish can also be contaminated by harmful or disease causing, pathogenic bacteria, from unclean surfaces or poor personal hygiene. Such circumstances can result in serious risks to food safety and public health.

Enzymes

Enzymes are proteins involved in the building and breaking down of bodily substances (i.e. converting food into energy or building tissues and flesh).

After a fish dies, the enzymes continue to work but are no longer regulated within the body. They effectively run out of control and start to digest the body tissues of the fish (i.e. self-digestion). This results in a change in the tissue texture and taste, and exposes the flesh of the fish to invasion by bacteria.

Enzyme activity is largely controlled by temperature and is much reduced at low temperatures (around 0°C) typical of normal boxing and icing. An obvious sign of enzyme spoilage is the softening and staining of the flesh around the gut cavity, often referred to as 'belly burst'.

Rigor

Rigor is a natural process that occurs after death, during which the muscles of fish contract, causing the fish to become rigid and inflexible. After a period of time, the muscles pass through rigor and the fish becomes flexible again.

When in rigor, enzyme activity and spoilage are slowed and the shelf life of fish is prolonged. Temperature is the most important factor that affects the time a fish spends in rigor.



At lower temperatures, fish are held in rigor longer and muscle contractions are more gentle. At higher temperatures, however, fish undergo strong, rapid, muscle contractions, which can result in the tearing of the muscle blocks, and gapping of the fillet.

Rough handling or the straightening of fish in rigor will also cause fillet gapping.

Fish Quality and Grading

The quality of fish is directly related to the time of capture and how it is cared for during the handling process (gutting, washing, boxing and icing).

Determining the quality of a fish requires an understanding and assessment of a range of factors, many of which depend on market preferences such as: species, size, seasonal condition and freshness.

In the majority of quality assessment methods, individual fish are assigned a quality grade using pre-determined scoring systems. The key attributes of such systems are that they are clear and unambiguous to the user and minimise interpretation during the scoring process.

Sensory assessment remains the most popular method of assessing freshness. This type of assessment uses smell, texture, and visual appearance to determine quality by examining the condition of key parts of the fish, which changes as the quality of the fish deteriorates (e.g. skin, eyes, gills).

Sensory criteria used to determine freshness:

- **Skin** Colour, and nature of mucus (slime);
- **Eye** Convexity, brightness and transparency;
- **Gills** Colour, and nature of mucus (slime);
- **Blood** Colour;
- **Smell** Type of odour (e.g. of seaweed, neutral or sour);
- **Rigor** Degree of stiffness.

It is important to note that in addition to freshness, the presentation (gutting, washing, boxing and icing) will also strongly influence the financial returns of the final product.

Criteria used to assess handling:

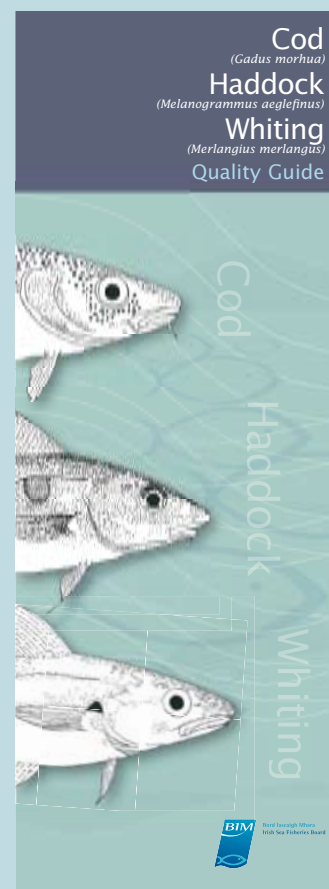
- **Gutting** The degree of gut material remaining in the body cavity and the precision of the cut;
- **Washing** Cleanliness of the gills and body cavity;
- **Boxing** Neatness and thoroughness of packing (i.e. fish in rows, cavity down, iced top, middle and bottom).

The official EC grading scheme (EC No. 2406/96) is the most commonly used quality assessment scheme in the EU. It grades fish of the highest quality as “E” (Extra), those of good quality as “A” and those of lesser quality as “B”.

Several other grading schemes have been developed, both nationally and internationally, to further refine the standards for quality assessment (e.g. QIM; Quality Index Method). These allow individual freshness characters to be numerically scored and the total score to be related to a quality grade.

The BIM series of quality guides for pelagic (mackerel; horse mackerel; herring; blue whiting) and whitefish (cod-haddock-whiting; plaice-black sole-lemon sole; megrim-witch; turbot-brill-halibut; monkfish; hake) species, provide advice on the sensory assessment of freshness and recommendations for best practice in onboard handling, in order to achieve the highest quality standards for landed fish.

These guides can be obtained by contacting BIM, Fisheries Development Division (Tel. +353 (1) 2144 100).



Cleaning

After every haul:

- Wash the deck, hopper, boxes, gutting area, knives, oilskins, aprons and all other equipment, with seawater to remove fish blood, scales, offal, dirt and any other fouling substances.

At the end of every trip:

- Wash the deck, fish hold, hoppers, boxes, gutting area, knives, oilskins, aprons and other equipment, using a power hose and detergent to remove fish blood, scales, offal, dirt and any other fouling substances;



- Use a chlorine-based bleach to thoroughly clean working areas and equipment, and inhibit any further bacterial growth;
- Wash away all residual bleach with clean seawater;
- Detergents and sanitizing agents should be from the approved list issued by the Sea-Fisheries Protection Authority (SFPA) and should be used to the product specifications.

Waste management

- Ensure waste cannot contaminate fish or fish products by locating waste storage areas at an appropriate distance from the fish or fish products.

Pest control

- Minimise contamination from pests, such as seagulls, by maintaining clean surfaces and closing hatches;
- Store rubbish securely so that it does not attract pests.

Handling Practices

Careful handling reduces potential damage and quality loss of fish.



- Minimise tow times (4-5hrs) to prevent fish being crushed in the net;
- Release fish from the cod-end as close to the hopper or deck as possible;



- Do not stand on fish in the pound or on the deck;
- Do not leave fish exposed on the deck, particularly in the heat of the sun;
- Position sorting boxes and baskets to avoid throwing and bruising fish.

Gutting Practices

Careful gutting is essential to ensure that all gut material is removed, as required, and fillet damage is avoided.

- Wherever possible, gut fish immediately after capture;
- Remove all gut and liver material, unless the market specifies otherwise;
- Use sharp knives. Sharpen and wash these as required, throughout the gutting process;
- Make a precise cut to avoid damage to the fillet. Avoid nicking the gut cavity as this opens an avenue for the introduction of bacteria;
- Remove and discharge gut material through the waste hatch or store it in a separate container; guts release enzymes and bacteria, which will contaminate other fish and speed up spoilage;



- Avoid gutting fish over other fish;



- If liver or roe are to be kept for human consumption, keep them separate from primary products (e.g. gutted fish) and store them either under ice or frozen as requested by the market. Further details on this are provided in the 'User Friendly Guide to Tailing Monkfish for Spanish Markets' (BIM User Friendly Guided Series, No.3, 2007).

Grading Practices

Grading at sea minimises the disturbance, time and expense of fish being re-handled at the co-op or auction.

The co-op or auction will decide whether they re-grade landed fish, or leave it in mixed boxes. Mixed boxes will often sell at a lower price than graded fish.



Fish are generally sorted into three commercial size grades - S (small), M (medium) and L (large) based on species specific weights within each of these grades. To improve international standardisation of size grades, the EC have defined commercial size grade categories for the main commercial species (Regulation (EC) No. 104/2000).



Certain premium species may also have more specific size or weight grades. For example, monkfish and hake are usually graded by individual fish weight (kg), whereas prawns are graded according to number per unit weight (e.g. kg).

Washing Practices

As dirt and blood harbour bacteria, all fish should be washed thoroughly (i.e. external surfaces, gills and gut cavity) prior to icing and boxing.

- Some species can be washed solely in a fish washer, but certain species need individual hand washing to ensure that all dirt and blood is removed;
- Do not leave fish in water for more than 5-10 minutes, as the colour will leach out of the skin and gills.

Hand Washing:

- Flatfish, especially megrim and sole, are prone to a build up of dirt in the gills. After washing individually check each fish to ensure no dirt remains;



- Pay special attention to the cavity and gills of monkfish. If necessary, open the gills to ensure that all dirt is removed (Please note that this practice may be unacceptable to some foreign markets);



- Take special care when washing the gut cavity and gills of hake and large, gutted, round fish;
- Wash prawns (*Nephrops norvegicus*) in small quantities, either in a basket or washer.

Boxing Practices

Correct boxing is essential to minimise physical damage to fish during onboard storage and subsequent transport.

- Make sure boxes are clean, have drainage holes and are in good physical condition. Damaged boxes can harbour bacteria;



- Box gutted species gutted-side down, to ensure that any remaining blood (and bacteria) drains out of the fish;



- Box round fish belly up, as pressure on the gut cavity may cause the guts to rupture and release bacteria and enzymes into the cavity;
- Box fish in a head to tail orientation, this allows good packing of the box and prevents fish becoming bruised when entering rigor;
- Box fish using a layer of ice to separate each layer of fish. Do not squash the fish against the side of the box, as they will become bruised when they enter rigor;
- Do not overfill boxes, and remember to leave room for ice;
- Plastic or paper sheets may be placed on top of the fish to protect them from ice burn.

Icing Practices

Fish begin to spoil as soon as they are dead, so it is critical that fish are rapidly cooled to around 0°C as soon as possible after they are caught.

- Only use clean, fresh ice made from clean seawater or potable (drinking) fresh water;
- Use crushed or flaked ice, as hardened lumps of ice will mark the fish (ice burn) and will not cool the fish efficiently;



- Start with a clean box, and put a good layer of ice on the bottom;
- Half-fill the box with fish, and then add another layer of ice;
- Add more fish, leaving room on top for another layer of ice;
- Make sure the top layer of ice is not proud of the box. If boxes are stacked on top, they should sit on the plastic of the box below, not on the ice. If the box sits on top of the ice, it will crush and bruise the fish in the box below;
- Slush icing is important for certain species e.g. tuna, targeting premium markets;
- Slush ice ensures fast and even chilling of the fish, as it gives better contact with the surface of the fish compared to traditional icing;
- Slush ice also minimises bruising or pressure damage as it is a liquid medium;
- Flat fish such as megrim and witches are rapidly chilled in slush ice, which is ideal prior to packing onboard in small wax cartons;
- Care needs to be taken if chilling larger species in slush ice as longer immersion can lead to scale loss and eye damage referred to as “frozen eye”.

Dipping Prawns (*Nephrops norvegicus*)

Blackspot or melanosis causes unsightly blackening in prawns. Uncontrolled, it is a major problem, which can render landings largely unsaleable.

Sodium metabisulphite is an anti-oxidant, commonly used as an additive in the seafood industry to control the rate of blackspot. Sulphite is the active ingredient of this compound and is a substance of food safety concern.

Consequently, when sodium metabisulphite has been used to dip prawns, fishermen are legally required (Directive 2000/13/EC) to state the use of the antioxidant (E223), on the product label, when they are selling their catch.

A number of non-sulphite containing compounds also retard the development of melanosis. Some are classed as processing aids and do not require specific labelling.

It should be noted that dipping only inhibits blackspot or melanosis and does not reduce rate of spoilage.

Sodium Metabisulphite should never be applied as a powder for personnel and food safety reasons.

Dipping with Sodium Metabisulphite:

- Wear a protective mask throughout the dipping process;
- Mix a 4% solution (double dip) according to the manufacturer's instructions;
- Use a measuring jug to transfer the powder to the mixing vessel. The jug should be pushed below the surface of the water to allow mixing of the powder to occur;
- Immerse washed prawns in the solution for 5 minutes and occasionally agitate;
- Remove prawns after 5 minutes and drain;
- Change the dipping solution after every haul.



For further information please refer to the 'Sodium Metabisulphite in the Workplace Safety Guidelines for the Fishing Industry' guide produced by BIM.

Labelling and Traceability

In the event of a food safety incident that requires a product recall, EU Council Regulations [Regulations (EC) No. 178/2002, (EC) No. 104/2000, (EC) No. 2065/2001 & Directive 2000/13/EC] specify that a system must be in place, that allows fish to be traced back to the vessel.

Central to these requirements is appropriate labelling, which can be placed on the fish, the wrapping, the external surface of the container or the packaging. Details can also be added to a commercial document, such as an invoice, which accompanies the fish in transit.

The basic traceability information that is required is:

- The commercial designation (i.e. common name and scientific name);
- The production method (e.g. 'caught at sea');
- The catch area (e.g. 'FAO 27' or 'Northeast Atlantic').



Additional market information required:

- Size grade;
- Nett Weight;
- Country of Origin.

**FRESH COD
(LARGE)**
Species: (*Gadus morhua*)
Caught at sea in FAO 27
Nett Weight: 38 kg
Origin: Ireland

If you are landing small quantities (less than €20 in value) of fish that you sell directly to the consumer, this information does not have to be passed on in a written document or label.

Chilled Storage Practices

Fish should be correctly stowed to maintain cooling, minimise physical damage and prevent contamination.

- Keep the fish hold at a temperature of 0°C - 2°C, to ensure the fish is kept chilled, but not frozen. Ice is most effective at cooling when it is melting;
- If practical, put one empty box on the bottom of each stack of fish boxes, as this raises the bottom box of fish off the hold floor, keeping it free of waste melt water. If you have plenty of ice, put some ice in the bottom box;



- Do not stack cartilaginous species (i.e. sharks and rays) above other fish, as they produce ammonia, which will contaminate whitefish;
- As a hold manager or hatchman you should maintain records or order the boxes in the hold in such a way, that when landing, the oldest through to the freshest fish can be identified;
- Protect empty boxes from contamination by storing appropriately.

Unloading practices

- Ensure that equipment used to unload fish is clean and well maintained;
- Avoid contamination of fish and fish products by unloading as quickly as possible to a protected environment, at an appropriate temperature, to maintain cold chain management;
- Make sure that all fish can be traced back to the vessel by ensuring the appropriate information is passed on to the next customer.

Freezer Vessel Requirements

Freezer vessels must adhere to specific obligations, for the freezing and storage of fish, which are above and beyond those for traditional vessels that simply gut, wash, grade, box, ice and chill at sea.

Freezer vessels must have:

- Freezing equipment (such as a blast freezer) that rapidly lowers the core temperature of fish to -18°C ;
- A storage freezer that can maintain the core temperature of fish at -18°C ;
- The ability to record the storage temperature manually or electronically to show the system is working correctly;
- Freezer maintenance and calibration records, to show appropriate, ongoing management of the system.

Training

Crew should undertake a two-day, FETAC approved course on 'Seafood Hygiene Management'. All training records must be retained for inspections.

Further information can be obtained by contacting BIM, Marine Services Division (Tel. +353 (1) 2144 100).

Labelling Frozen Products

If frozen products are being landed, specific information has to be documented on a label on the outside of the packaging.

This information includes a batch code, the best before date and storage requirements.

FROZEN PRAWNS	
Batch:	SA001
Species:	<i>Nephrops norvegicus</i>
Nett Weight:	9 kg
Best Before end:	May 2008
Caught at sea in FAO 27	
Store at min -18°C	
Do not refreeze if thawed	
Sodium metabisulphite used as preservative	

Traceability

If frozen products are being landed, a batch code must be added to the label so that the product can be traced. An explanation of the batch codes and contact information for customers and transport firms must be documented, and kept on file.

Factory Vessel Requirements

Carrying out activities, such as the tailing of monkfish, exposes fish to a higher risk of contamination. As a result, a fully documented Food Safety Management System (FSMS) is legally required.

In addition, an Approval Number is legally required. This is issued by the Sea-Fisheries Protection Authority once the necessary requirements of the vessel and the FSMS are fulfilled and verified by inspection.

BIM has produced a 'User Friendly Guide to Gaining Onboard Approval' (BIM User Friendly Guide Series, No. 4, 2007) to assist vessel owners in this area.

Training

Crew should undertake a two-day, FETAC approved course on 'Seafood Hygiene Management' and at least two crew must undertake a two-day, FETAC approved course on 'Risk based HACCP for seafood'. Training records must be kept.

Further information can be obtained by contacting BIM, Marine Services Division (Tel. +353 (1) 2144 100).

Labelling Products from an Approved Vessel

If you are landing products from an approved vessel, specific information has to be documented on a label on the outside of the packaging.



This information includes a batch code, the best before date, storage requirements, and the approval number of the vessel.

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For further information please contact

Frances O'Dwyer,
Resource Development and
Environment Section,
BIM Offices,
Killybegs,
Co. Donegal,
IRELAND.

Tel./Fax +353 (0) 7497 41093

whitefish



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Bord Iascaigh Mhara
Irish Sea Fisheries Board

P.O. Box No.12,
Crofton Road,
Dun Laoghaire,
Co. Dublin,
Ireland.

Tel +353 1 214 4100
Fax +353 1 284 1123
<http://www.bim.ie>

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