



LIFE05 ENV/E000267-BE FAIR

BENIGN AND ENVIRONMENTALLY FRIENDLY FISH PROCESSING  
PRACTICES TO PROVIDE ADDED VALUE AND INNOVATIVE SOLUTIONS  
FOR A RESPONSIBLE AND SUSTAINABLE MANAGEMENT OF FISHERIES

**GOOD PRACTICE MANUAL FOR RECOVERY, HANDLING AND  
CLASSIFICATION OF DISCARDS AND BY-PRODUCTS ON FISHING  
FLEETS AND FISH AUCTIONS**

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**Diciembre 2006**

## **1. Preface**

This is a good practice manual elaborated in the framework of the project BE-FAIR of the Life programme from the DG Environment. The project aims the demonstration of a better and integral utilization of the fish resources through a rational management of the captures. The idea supporting this project is that everything harvested from sea should be treated as a valuable product, having always in mind that resources are limited and that fishery activity should be transformed in a sustainable activity. One of the aspects that will contribute to the sustainability of fisheries is the reduction and utilisation of the high amounts of discards and wastes. This manual addresses the operations and practices needed to change the current procedures on board towards a sustainable-sensitive fishing activity.

## 2. Introduction

### 2.1. Background

Production of wild fish resources are estimated to be around 85 million tonnes per year, and despite the growing demand for fishery products worldwide, there is evidence that the maximum long-term potential of marine capture fisheries, has been reached in a large number of stocks. In this way, one important contribution to the sustainability of fisheries could be made by reducing post-harvest losses. Furthermore, not all that is obtained from the sea is adequately used, and we can mention three clearly distinctive features: discards, organic wastage on board, and by-products and organic wastage on land.

Besides the fact that the loss of raw material that discards and organic wastes represent by itself as a potential food resource, or as source of basic compounds for the pharmaceutical and medical industry, there are ecological and environmental collateral problems derived from an unadequate management of these materials. Discards and by-products generated as a consequence of processing captures on board are usually thrown back into the sea, leading to a change in the overall structure of marine trophic webs and habitats. Also, we are keeping at sea toxic compounds derived from land: PCBs, dioxins, heavy metals, etc. and spreading parasites present in fish viscera, such as *Anisakis*.

Subproducts and wastage originated in land, as a consequence of the elaboration and processing of fishery products in industries and fish auctions, are causing environmental, pollution and disposal problems.

Much of this waste is already being handled, and some efforts have been made for the reutilization of all these wastage, but it is considered that this kind of handling is inefficient.

It is clear that the trend is to enhance returns by extraction and utilization of fishery by-products, but it is needed to address several problems when trying to implement and enforce management measures. These problems are related with the infrastructure needed both onboard and ashore, and also some logistical problems.

## **2.2 Objectives and scope of the manual**

The objectives of this manual are to:

- a) Serve as an instrument of reference to help to develop a regulatory framework required for the implementation of the practices, procedures and machinery to fishing fleets, regarding the reduction or elimination of discards and the strategies for the management of wastes onboard.
- b) Help the sector (ship owners, fishermen, etc.) with the best procedures to use in order to comply with this new perspective of the fishery activity, reducing also the costs of the procedures required.
- c) Promote standards of conduct in every sector involved in fishery practices, leading to a progress in the awareness of ecological and environmental protection.

- d) Develop and implement an efficient and integral waste management and processing practices both onboard (fishing fleets) and ashore (fish auctions and fishery industries) in order to recycle and to reuse wastes produced by the fishing activity, including efficient separation, classification, stabilization and conservation practices.
- e) Contribute to the minimization of the adverse ecological and environmental impact of fishing activities (onboard as well as ashore), by helping fleets, industry and auctions to comply with the so-called “no-discard” or “zero-waste” policy.

### **The scope of the manual**

The primary focus of the report is to help people involved in every sector of fishery practices susceptible of produce organic waste, to guarantee the appropriate management of the total organic material produced as a consequence of that activity. In particular this code applies to the fishing fleets.

Since there is a considerable diversity of fishing fleets, ship dimensions, fishing gears, catching areas, etc., this demonstration project will focus in two types of fishery: trawler and longliner. The aim is to show procedures which could be later extrapolated, with the needed adequation, to other fishing vessels, fishing gears or type of catch.

Every fishing vessel, as part of the food production chain, should have implemented an appropriate HACCP system. This manual will

contribute with general rules about procedures for treating fish waste and discards using the approach employed in HACCP manuals.

It is aimed to provide guidelines about handling fish specimens, which are currently discarded because of their size, appearance, quality, etc., with the objective of making use of them either as a commercial fishery product or as raw material for the production of fish meal, fish oil, fish hydrolizates or other interesting compounds with industrial applications.

The precise definition of procedures will depend both on the specific vessel features (length, width, hold size, fishing deck type, etc.) and on the ultimate utilization of the subproduct or waste stored. For instance, in some cases, it could be of interest to separate and store separately different fish parts (liver, eyes, cartilagues, etc.) and not in other cases.

Description of fish waste classification and separation procedures, appearing in this manual, may not be suitable for all cases.

Finally, a continuous update of this manual is expected until the end of this project taking into account both the feedback of the different stakeholders (some of them participating in the project, ship owners, fishermen, fish auctions, fish processors) and the potential commercial interest and posterior utilization of the obtained materials.

## **2.3Definitions**

*Discards*: Portion of the organic material of animal origin in the catch, which is thrown back into the sea either because of low value or legal

requirements. Discards could be dead or alive. Fish offal is not included.

*By-catch*: The unintentional capture of non-target fish species.

*By-products*: Solid or liquid parts of fish and other marine organism, generated by the industrial processing and consisting of unprocessed fish and parts of fish, such as heads, tails, fins, scales, bones, blood, skins, flesh, roe, viscera, as well as the organic parts of other marine organisms (shellfish, shells...), which are not intended to human consumption.

*Dumping*: Disposal into the sea of fish waste or organic materials resulting from the processing activities on board of vessels.

*Fish waste*: By-catch and by-products produced either on board, in land and industries. Also the incidental catch when is dead.

*Fish*: Includes all fishes and other aquatic species such as crustaceans, cephalopods and molluscs.

*Valorization*: Process by which a market value is given to fish waste (by-catch and by-product)

*Fishery* : Is the combination of a fishing area plus a fishing gear and a target species.

*Incidental catch*: Rare events as catches of marine mammals, turtles or seabirds.

*Handling* : The manner of elaborating fish and removing different by-products of each specimen (head, viscera, tails, fins, liver).

### 3. Fishing fleets

Commercial fisheries use a wide range of fishing methods and fishing gear such as surrounding nets, seine nets, trawl nets, dredges, lift nets, falling gear.

- Surrounding nets are surface nets in which the floatline is supported by several floats. There are two types of surrounding nets, with purse seiners also called purse seiners, and without purse seiners or lampara nets.



- Seine nets can be controlled either from the shore or from the boat. It consists on to surround an area with a long net which has two ropes fixed to its ends.
- Trawls consist on towed nets which have a cone-shaped body closed by a bag and extended at the opening by wings. Depending on the fishing depth there are bottom trawls or midwater trawls.
- Dredges are gears used to drag along the bottom, normally to collect molluscs.
- Lift nets are horizontal nets or a parallelepiped shaped bag with the opening facing upwards, which use light or bait to attract the fishes. The nets are lifted out of water by hand, or from the boat or shore mechanically.



Discard practices are well known although the precise volumes are difficult to estimate and there is a considerable variability (species, amounts, etc..) depending on the target species, fishing gear, catching area, season of year or even year to year variations, etc.

The present guide focuses only in two fishing gears, a longliner and a trawler, both defined by region and target species.

Among the different types of longliner, this guide will consider those working in the following FAO areas 21 (NW Atlantic), 27 (NE Atlantic), 31 (WC Atlantic), 34 (EC Atlantic). This fleet usually has as target species Swordfish, Blue shark, Shortfin mako, Silky shark, Bigeye tuna, Yellowfin tuna and Albacore.

In the other hand, the fishing areas considered for the trawler are the NAFO area, being the target species flatfish, especially the Greenland halibut.

#### **4. Fish auctions**

The very diverse nature of fish processing operations, local practices and availability of raw material, make very difficult to describe all types of fish auctions. Therefore, this guide will focus on an auction that could serve as model for general fish auctions. Obviously, the level of waste and by-products generated will be different, depending on the volume of landed fish, the number of different fish species and the type of processing carried out in the auction. Therefore, it should be necessary for each particular auction to define the number, type and location of waste containers and the corresponding logistic plan.

ANNEX I

**GOOD PRACTICE GUIDE FOR WASTE MANAGEMENT IN A LONGLINER**

## **1. Description of the fishing gear.**

In a longliner, fishes are attracted by natural or artificial bait located on a hook at the end of a line. The vessel under consideration uses mackerel, cattlefish and shark's bellyflap as bait. Vessels are 20-30 m length, generally, the fishing trip last for 60 days with about 40 effective hauls. Most of the captures are eviscerated and headed, afterwards they are transferred to the freezing tunnel at – 41 °C for 12 hours and then they are stored in the freezing hold ( -18°C) until unloading . The captures of the last days are treated as a fresh fish, so they are not eviscerated nor headed.

## **2. Discards and by-products considered**

This type of longline (hook size) is very selective making incidental capture a rare event. Sometimes, turtles may be trapped in the main line but they are removed and returned to the sea alive.

Therefore, the only by-products produced will be heads, viscera, tails and fins from Swordfish, Blue shark, Shortfin mako, Silky shark, Bigeye tuna, Yellowfin tuna and Albacore. Shark's bellyflaps are retained on board since they are used as bait.

### 3. Guidelines for a good handling of fish sub-products and wastes

#### 3.1. Ship facilities

Facilities and equipment for the management of fish waste:

- clean area for heading and eviscerating
- area for heading and eviscerating with rised surface, slightly tilted to allow drainage of biological fluids (i.e. blood)
- heading and gutting area would have allocated enough space for the crew to dehead and to eviscerate fish, especially big ones.
- water supply close to heading and gutting surface
- adequate instruments for cutting fish parts (sharp knives, scissors, hooks, etc.)
- storage boxes for fins, heads, viscera, trims etc..placed close to heading and gutting area
- inner surface of storage boxes or containers should be waterproof and easy to wash and disinfect
- containers should be insulated, non corrosive, non-adsorbent, and have a proper lid and wheels
- a freezing room for the storage of fish waste containers with a temperature recording device is recomended

### 3.2. General recommendations

#### Recommendations for fishhandlers

- Fish handlers shall be fully trained to separate the different by-products in each species, and to dispose them in adequate places.
- Hygiene standards of ship and specific areas (holds, storage areas, gutting surfaces etc.) should be carefully checked by person in charge.
- Crew must follow a cleaning calendar specifying cleaning agents and their application.
- No smoking, eating, spitting or chewing gum when handling fish.
- Crew must have all handling equipment at hand and clean
- Crew (fish handlers) must keep themselves clean and should be trained in Food Hygiene Standards.
- Fish handlers must wear safety and protective clothes and gloves.



### 3.3. Handling fish subproducts

<p><b>Operations during hauling:</b></p> <ul style="list-style-type: none"><li>- unhook unused bait and drop it in a separate container</li><li>- unhook fish avoiding as much as possible any damaging bump</li><li>- incidental catch (birds, turtles, marine mammals) should be carefully treated and returned alive to the sea, whenever possible. If dead, keep it on board and manage it as waste.</li><li>- Any discards should be carefully unhooked and placed, depending on the species (small commercial or non commercial species), in the <b>discard box</b> or treated as target species (freezing or refrigerated).</li></ul>	
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**Operations during heading and gutting:**

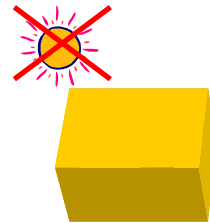
- all these operations should be carried out in the heading and eviscerating area
- do not mix fish wastes
- containers for fish waste should be labelled with the following information: vessel identification, type of content, date of capture
- open bellyflap with care not to injure viscera
- remove viscera and placed it in the labelled **viscera container**
- separate head from body and place in the labelled **head container**
- allow enough time for bleeding
- Head, viscera, fins and sword from swordfish, should be removed separately and disposed in adequate boxes
- After heading, gutting and bleeding fish, crew must clean the working surface with water.





### Operations for waste storage:

- Prolonged exposure of fish waste to room temperature or higher temperatures should be avoided
- when the different containers are filled, the contents of each of them will be transferred into appropriate big and **labelled box** which will be stored in a freezing hold
- **head box** should be placed in freezing tunnel and once frozen stored in the hold (-18°C)
- **viscera box** should be placed in freezing tunnel and once frozen stored in the hold (-18°C)
- **bait box** should be placed in freezing tunnel and once frozen stored in the hold (-18°C)
- **discard box** should be placed in freezing tunnel and once frozen stored in the hold (-18°C)
- contact of insects or other animals with the content of boxes should be prevented
- fish waste boxes shall be kept or stored away from non-edible products like soap, infectants, pesticides and other toxic substances areas



<b>Operations for waste landing:</b> <ul style="list-style-type: none"><li>- Information about the quantities and type of fish waste or by-products should be giving to competent waste manager ashore</li></ul>	

ANNEX II

**GOOD PRACTICE GUIDE FOR WASTE MANAGEMENT IN A TRAWLER**

## **1. Description of the fishing gear**

Trawler vessels are fitted with trawl winches and equipment necessary to haul the net on board and lift the cod-end over the deck. The typical fish detection equipment consists of a sonar and an echo-sounder. These ships are equipped with refrigerating plant and freezing equipment. The holds are insulated and refrigerated. Typically freezer holds of these ships could accommodate up to 1200 Tm of fish.

A bottom otter trawl is a cone-shaped net consisting of a body, normally made from two, four and sometimes more panels, closed by one or two codends and with lateral wings extending forward from the opening. A bottom trawl is kept open horizontally by two otter boards. Bottom trawls usually have an extended top panel (square) to prevent fish from escaping upwards over the top of the net. The mouth of the trawl is framed by an headline with floats to open the trawl vertically and a ground gear, which is designed according to the bottom condition on the fishing ground so as to maximise the capture of targets living close to the bottom and, at the same time, protect the gear from damage and to facilitate movements across uneven bottom.

The type of trawler considered here is a low opening trawl, suitable for the capture of bottom species such as halibut, which is one of their target species. Greenland halibut is a groundfish resource distributed in both the western and eastern North Atlantic. In the Northwest Atlantic it is distributed from Davis Strait in the north to NAFO Division 3NO in the south and the Gulf of St. Lawrence. Most of these ships are processing onboard the catches (heading and gutting, filleting and freezing).

## **5.2 Discards and by-products considered**

Commonly discarded species in flatfish trawls are molluscs, echinoderms, crabs, rajids, cod, haddock, whiting, plaice, saithe, dab, dogfish, and shrimp.

Nowadays, after the catch is hauled and left in the deck, the crew separates the edible fish from the discards. The latter are thrown overboard by a conveyer while the target species are transported to the processing area (heading, gutting and filleting), in this area the offal are also conveyed and dropped in the sea.

Consequently, part of discards may be processed as target species and the remaining or part of it could be handled together with fish offal onboard.

### 3. Guidelines for a good handling of fish sub-products and wastes

#### 3.1. Ship facilities

Facilities and equipment for the management of fish waste:

- clean gutting pounds, washing machine or tank, conveyers
- containers for temporal storage of discards
- area for heading and eviscerating with rised surface, slightly tilted to allow drainage of biological fluids (i.e. blood)
- heading and gutting area would have alocated enough space for the crew to dehead and to eviscerate fish, especially big ones.
- water supply close to heading and gutting surface
- adequate instruments for cutting fish parts besides the pertinent machinery (sharp knives, scissors, hooks, etc.)
- containers for fins, heads, viscera, trims etc..placed close to heading and gutting area
- inner surface of storage boxes or containers should be waterproof and easy to wash and disinfect
- containers should be insulated, non corrosive, non-adsorbent, and have a proper lid and wheels

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| <ul style="list-style-type: none"><li>- a freezing room for the storage of fish waste containers with a temperature recording device is recommended</li></ul> |  |
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### 3.2. General recommendations

#### Recommendations for fishhandlers

- Fish handlers shall be fully trained to separate the different by-products in each species, and to dispose them in adequate places.
- Hygiene standards of ship and specific areas (holds, storage areas, gutting surfaces etc.) should be carefully checked by encargado
- Crew must follow a cleaning calendar specifying cleaning agents and their application.
- No smoking, eating, spitting or chewing gum when handling fish.
- Crew must have all handling equipment at hand and clean
- Crew (fish handlers) must keep themselves clean and should be trained in Food Hygiene Standards.
- Fish handlers must wear safety and protective clothes and gloves.





### 3.3. Handling fish subproducts

#### Operations during hauling:

- sorting and gutting should start as soon as possible after the fish are on the deck
- “discards” should be separated from edible fish by using a different conveyer
- “discards” should be further classified and disposed in appropriately labelled containers (grenadiers, flatfishes, gadoids, sharks, etc...)
- “discards” or “incidental catch” which remain alive (starfish, sea urchins, etc...) should be returned to the sea.



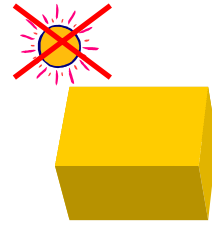
### Operations during heading, gutting and filleting:

- all these operations should be carried out in the heading and eviscerating area
- gutting pounds should be hosed down after each haul has been cleared and all discards and fish waste clasified
- do not mix fish wastes when appropriate
- containers for fish waste should be labelled with the following information: vessel identification, type of content, date of capture
- open bellyflap with care not to injure viscera
- remove viscera and placed it in the labelled **viscera container**
- separate head from body and place in the labelled **head container**
- place skins from the filleting machine in the labelled **skin container**
- place bones from the filleting machine in the labelled **bone container**
- in the case of not considering separation of wastes place them in the same container
- allow enough time for bleeding
- After heading, gutting and bleeding fish, crew must clean the working surface with water.



**Operations for waste storage:**

- Prolonged exposure of fish waste to room temperature or higher temperatures should be avoided
- when the different containers are filled, the contents of each of them will be transferred into appropriate big and **labelled box** which will be stored in a freezing hold
- **head box** should be placed in freezing tunnel and once frozen stored in the hold (-18°C)
- **viscera box** should be placed in freezing tunnel and once frozen stored in the hold (-18°C)
- **waste box** should be placed in freezing tunnel and once frozen stored in the hold (-18°C)
- contact of insects or other animals with the content of boxes should be prevented
- fish waste boxes shall be kept or stored away from non-edible products like soap, infectants, pesticides and other toxic substances areas



**Operations for waste landing:**

- Information about the quantities and type of fish waste or by-products should be giving to competent waste manager ashore

ANNEX III

**GOOD PRACTICE GUIDE FOR WASTE MANAGEMENT IN A FISH AUCTION**

## 1. Description of the auction.

The very diverse nature of fish processing operations, local practices and availability of raw material, make very difficult to describe all types of fish auctions. Therefore, this guide will focus on an auction which could serve as model for general fish auctions.

The building of the auction should have different areas designed in such a way that permits to work quickly and efficiently, allowing the easy flow of material (fish) through the whole installation. There should be a **landing area** where fish would be unloaded from vessels. Directly and easily connected with the quay there should be located the **auction area** itself. It would be a spacious area, where fish will be displayed and auctioned. Also, easily connected with the auction area and with the possible holds of fish processors, there should be a **common handling** area, where operations such gutting or heading will be carried out. Finally, there should be a **loading area**, where fish will be loaded into transport vehicles, after being processed in the fish processors or after being sold in the auction.

Fish working floor surfaces should be washable, well-drained, non-slip and resistant to possible attack from weak ammonia, fish oil and offal. The requirement of walls in general is that they are easily cleanable, smooth and waterproof. Also within the auction building, adequate space must be left for access and movement of fish, offal, ice, packaging materials, etc.

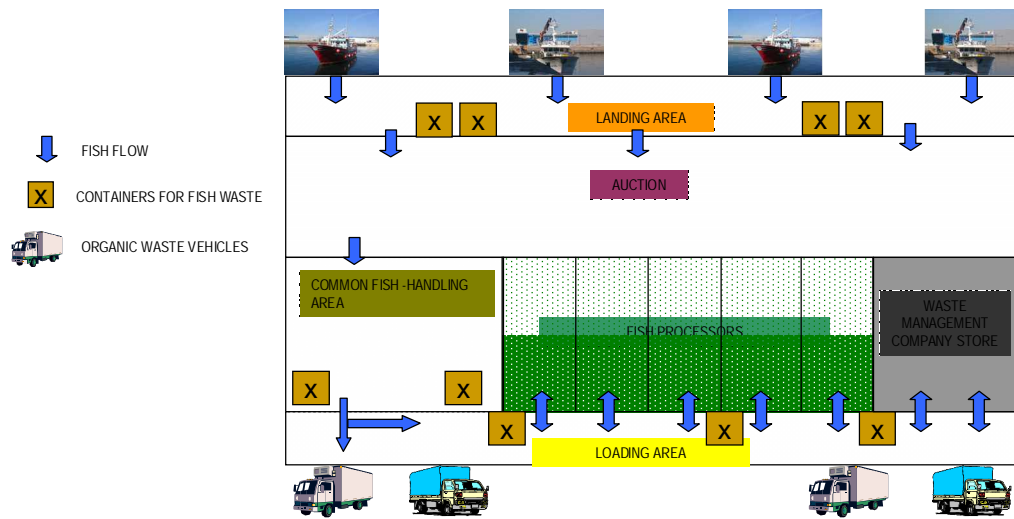
The fish auction should count on an authorized waste management company which will be responsible for organic and inorganic waste derived as a consequence of the activity developed on the whole fish auction. Also, the

company will be responsible for the cleaning at the end of the day of the whole building.

## **2. Waste and by-products considered**

The waste and by-products originated in a particular fish auction will depend on the type of material (fish) which is considered. Accordingly, the fish availability is very depending on several factors such as market, consumer's preferences, type of fish and the situation of the fishery. Therefore this guide will consider a wide variety of waste and by-products such as individuals or part of fish not suitable for the market, like guts, heads, sword of the swordfish, skin, bones, etc.

### 3. Guidelines for a good handling of fish sub-products and wastes





### 3.1. Waste management company

Facilities for the management of fish waste:

- The company is responsible for teaching all staff involved in fish handling, on the hygienic handling procedures and by-product separation.
- Only the staff of the company are licensed to move and relocate the containers.
- There should be a refrigerated room with a temperature recording device, to store all waste containers.
- There should be a storage room for cleaning, labelling and repairing the containers.
- As each container is filled, the company should guarantee that the container is closed and placed in a refrigerated hold for no more than 24 hours or until it could be transferred to the waste vehicle.
- The inner surface of containers should be waterproof and easy to wash and disinfect.
- Containers should be insulated, non



corrosive, non-adsorbent, and provided with a lid.

- Avoid excessive exposure of fish waste to room temperature.
- At the end of the working day every empty container should be cleaned with specific products and water.
- It is responsibility of the waste management company to make sure the fish handlers are fully trained to separate the different by-products of each species, and to dispose them in the adequate containers.
- Fish handlers must wear safety and protective clothes and gloves.
- Waste management company is responsible of cleaning common areas once a day from fish waste.
- Waste management company has to check labelled containers, which should specify type of by-product, their location, adequate number, particularly in the common handling area, and near of every fish processor storage area.
- Waste management company has to

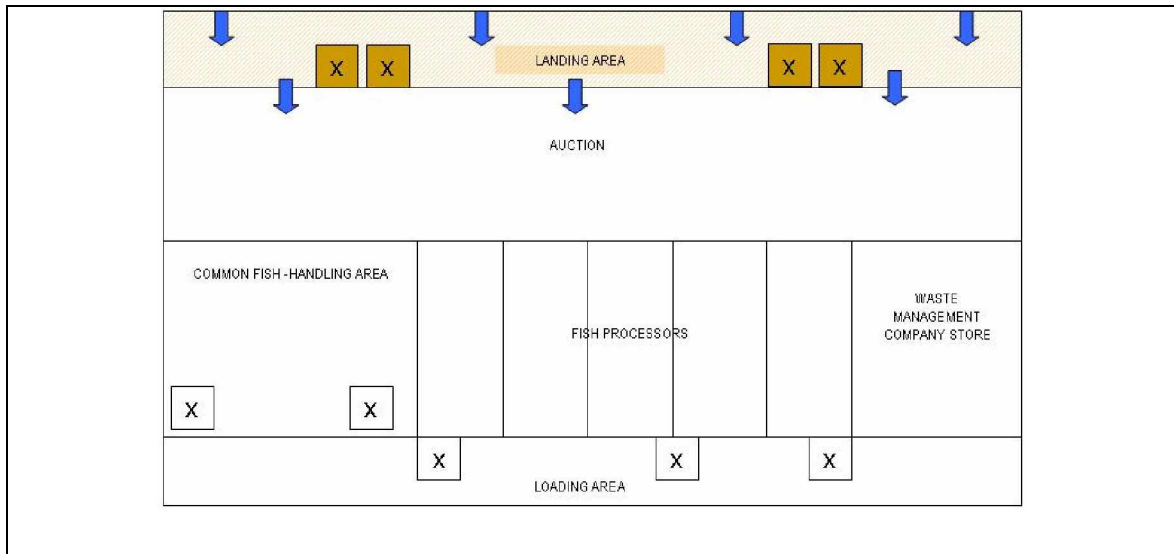


check if different waste and by-products are adequately separated and disposed in appropriate containers.

- Appropriate containers have to be located near the fish processors to assure the correct classification of derived waste and by-products originated.
- A waste vehicle should collect the organic waste every day.



### 3.2. Landing area



- Small fish will be landed in closed containers while big fishes as sharks or swordfish will be landed individually.
- When vessel arrives to port, crew must proceed to land first the edible catch in the **landing area**. Afterwards, if appropriate, containers with fish waste will be landed and treated the same way fish waste from the auction is treated.
- Containers should be placed throughout the landing area, where damaged or dropped fish, during the landing procedure, could be

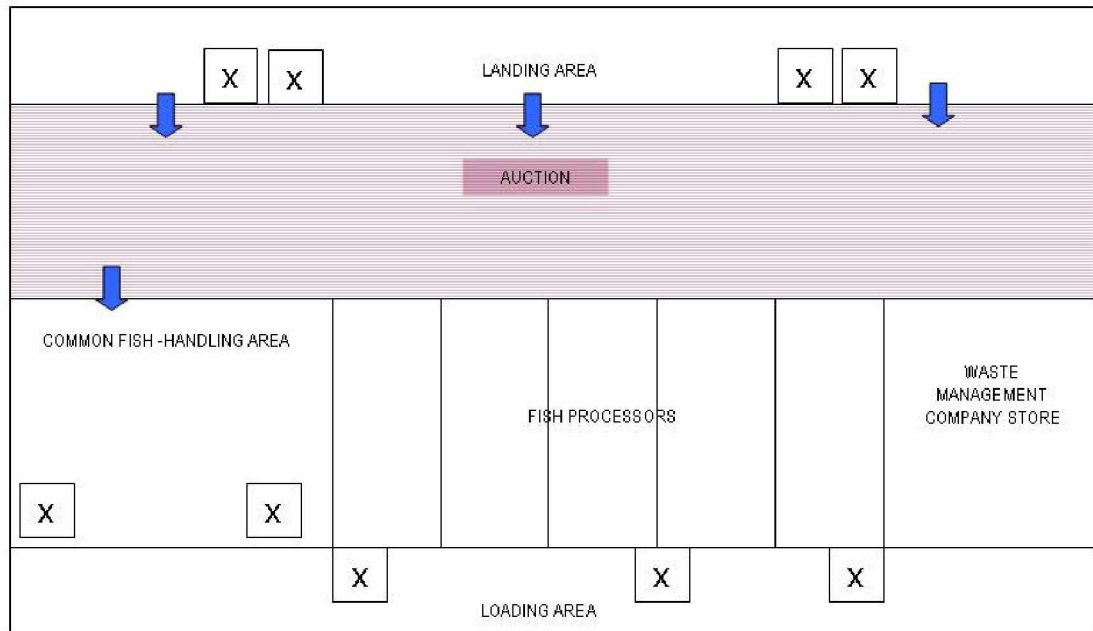


disposed.

- Fish will be transferred from the **landing area** to **auction area** preferably by pallet truck or fork lift trucks.



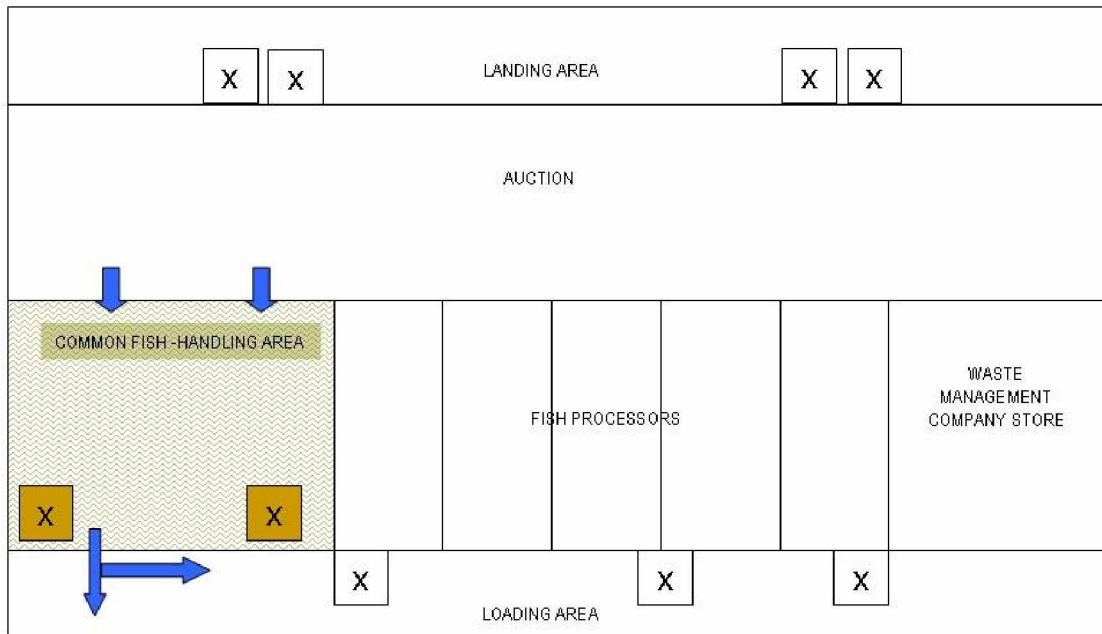
### 3.3. Auction area



- After landing, the catch is transferred into the auction area where it is forbidden to handle the fish.
- Fish will be displayed only using plastic boxes.
- In this area most of the containers will accommodate only inorganic residues. A few fish waste containers could be located for the occurrence of any damage fish.
- Keep the floor clean by hosing down periodically.



### 3.4. Common handling area



- Sold fish are transferred from the auction area, either directly to the fish processors or to the **common fish handling area**.
- The common fish handling area is a common space for handling the fish, and it is the responsibility of each user to make a correct use of it and leave it clean after use.
- The common fish handling area should be equipped with an easy cleaning table where staff can be able to handle the fish conveniently.
- There should be enough labelled containers specifying type of by-product to dispose, in the



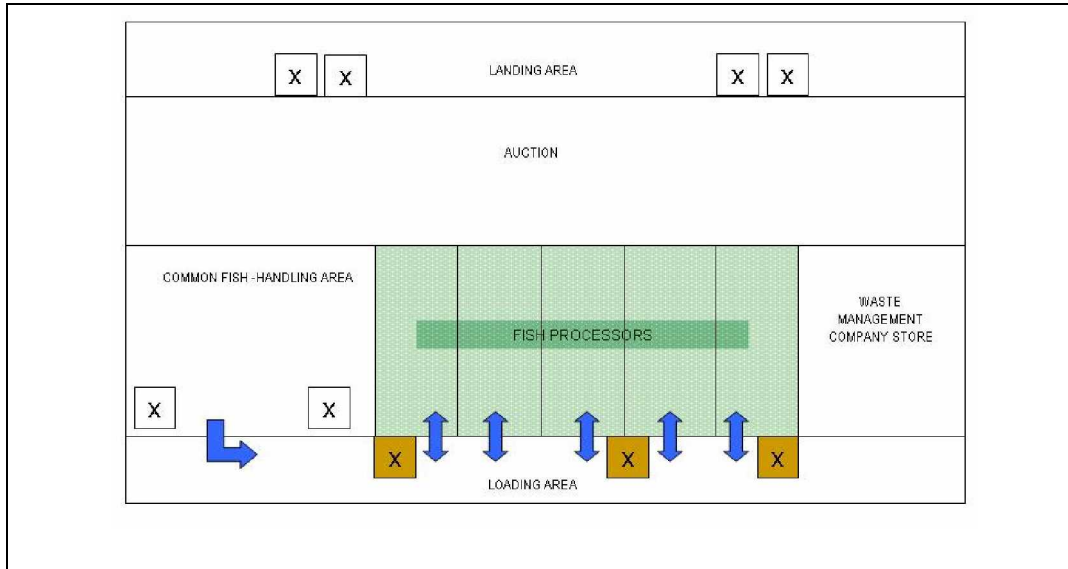
entire room.

- Make sure to dispose each different by-product in the adequate container.
- Do not throw to the floor fish waste or fish by-products.





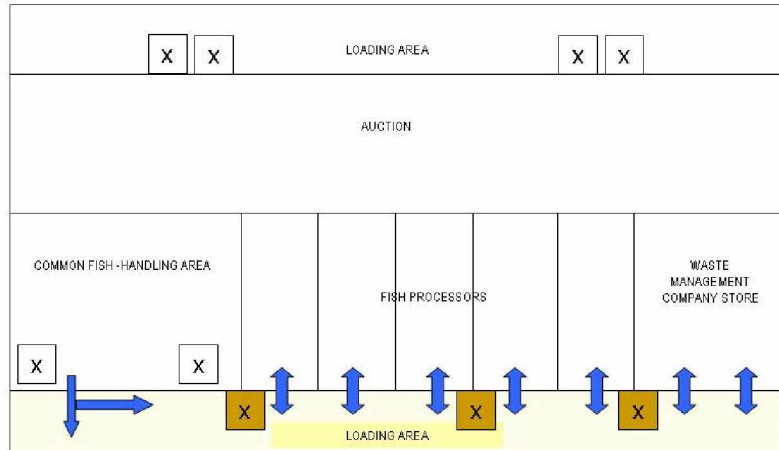
### 3.5. Fish processors



- If fish processors are located in the port-auction area have to follow the rules about fish waste treatment, imposed by the waste management company.
- Fish processors have to be equipped with an easy cleaning table where staff must be able to handle the fish conveniently.
- Organic and inorganic waste should never be mixed.
- When handling fish, staff must separate fish waste and different by-products, and dispose them in adequate containers.



### 3.6. Loading area



- Throughout the loading area containers should be placed due to fishes which may drop during the loading of the catch into vehicles.
- Throughout the loading area there should be containers for inorganic residues, thus, organic and inorganic waste have to be at all times separately.

### 3.7. Hygienic Recommendations

- Do not throw to the floor any fish or fish by-product.
- No smoking, eating, spitting or chewing gum in all areas.
- Fish handlers must wear safety and protective clothes and gloves.
- Throughout all the activity on fish auction there should be a clear separation and classification between edible fish and fish waste.
- Always keep the floor and surface areas reasonably clean and disinfected.

