



**Economic and Social
Council**

Distr.
GENERAL

TRADE/WP.7/GE.11/2005/12
1 February 2005

ENGLISH
Original: FRENCH

ECONOMIC COMMISSION FOR EUROPE

COMMITTEE FOR TRADE, INDUSTRY AND
ENTERPRISE DEVELOPMENT

Working Party on Agricultural Quality Standards

Specialized Section on Standardization of Meat
Fourteenth Session, 11-15 April 2005, Geneva
Item 13 of the provisional agenda

DRAFT PAPER ON FISH CUTS

Note by the secretariat: The secretariat has gathered information about the market for fish and the possibility of standardizing fish cuts.

DRAFT PAPER ON FISH CUTS

1. BIOLOGICAL ASPECTS

1.1 Classification

The classification of fish into cartilaginous and bony (the jawless fish are of minor importance) is important from a practical viewpoint, since these groups of fish spoil differently and vary with regard to chemical composition.

Furthermore, fish can be divided into fatty and lean species, but this type of classification is based on biological and technological characteristics as shown in table 1.

Table 1
Classification of fish

Scientific grouping	Biological characteristics	Technological characteristics	Examples
<i>Cyclostomes</i>	Jawless fish		Lampreys
<i>Chondrichthyes</i>	Cartilaginous fish	High urea content in muscle	Sharks, skate, rays
<i>Teleostei or bony fish</i>	Pelagic fish	Fatty fish (store lipids in body tissue)	Herring, mackerel, sardine, tuna, sprat
	Demersal fish	Lean (white) fish (store lipids in liver only)	Cod, haddock, hake, grouper, sea bass

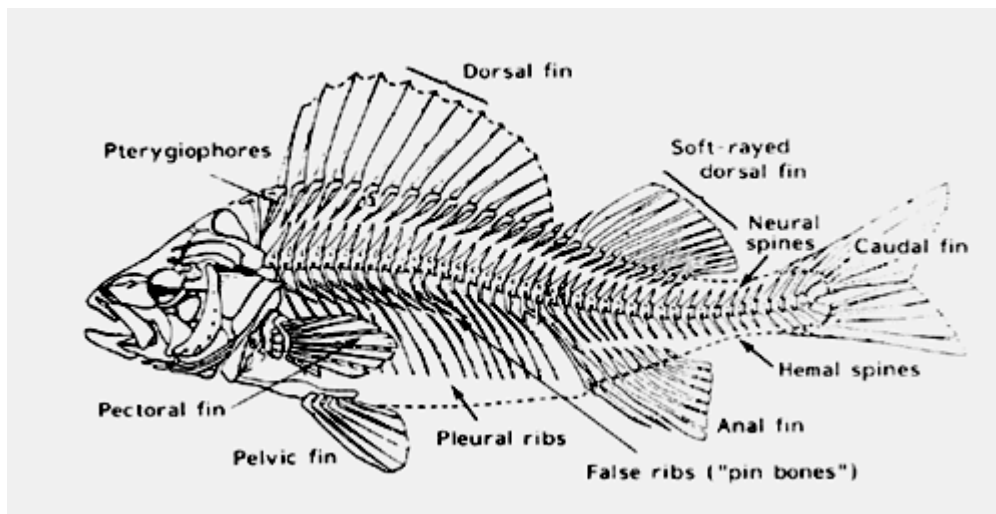
1.2 Anatomy and physiology

1.2.1 The skeleton

Being vertebrates, fish have a vertebral column - the backbone - and a cranium covering the brain. The backbone runs from the head to the tail fin and is composed of segments (vertebrae). These vertebrae are extended dorsally to form neural spines, and in the trunk region they have lateral processes that bear ribs (figure 1). The ribs are cartilaginous or bony structures in the connective tissue (myocommata) between the muscle segments (myotomes) (see also figure 2). Usually, there is also a corresponding number of false ribs or "pin bones" extending more or less horizontally into the muscle tissue. These bones cause a great deal of trouble when fish are being filleted or otherwise prepared for food.

Figure 1

Skeleton of bony fish (Eriksson et Johnson, 1979)

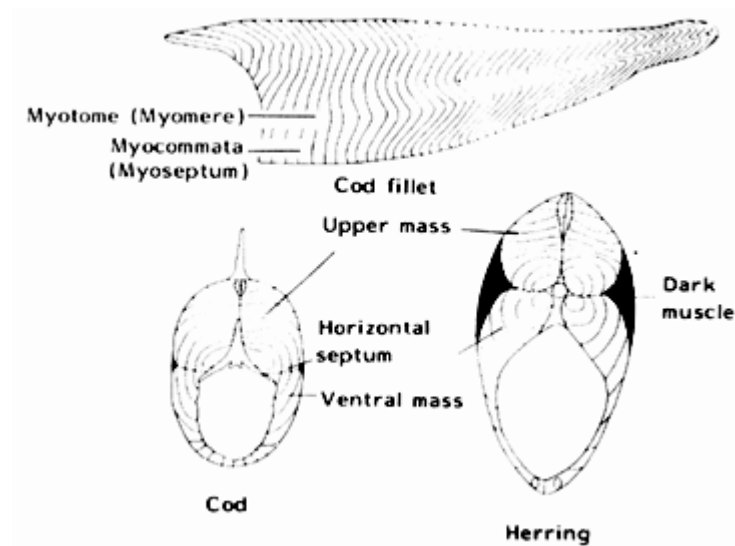


1.2.2 Muscle anatomy and function

The anatomy of fish muscle is different from the anatomy of terrestrial mammals, in that the fish lacks the system of tendons connecting muscles to the skeleton of the animal. Instead, fish have muscle cells running in parallel and connected to sheaths of connective tissue (myocommata), which are anchored to the skeleton and the skin. The bundles of parallel muscle cells are called myotomes (figure 2).

Figure 2

Musculature of a fish's skeleton (Knorr, 1974)



All muscle cells extend the full length between two myocommata, and run parallel with the longitudinal direction of the fish. The muscle mass on each side of the fish makes up the fillet, of which the upper part is termed the dorsal muscle and the lower part the ventral muscle.

Most fish muscle tissue is white but, depending on the species, many fish will have a certain amount of dark tissue of a brown or reddish colour. The dark muscle is located just under the skin along the side of the body.

The proportion of dark to light muscle varies with the activity of the fish. In pelagic fish, i.e., species such as herring and mackerel which swim more or less continuously, up to 48% of the body weight may consist of dark muscle (Love, 1970). In demersal fish, i.e., species which feed on the bottom and only move periodically, the amount of dark muscle is very small.

There are many differences in the chemical composition of the two muscle types, some of the more noteworthy being higher levels of lipids and myoglobin in the dark muscle. From a technological point of view, the high lipid content of dark muscle is important because of problems with rancidity.

2. CHEMICAL COMPOSITION

2.1 Principal constituents

The principal constituents of fish and mammals may be divided into the same categories, and examples of the variations between the constituents in fish are shown in table 2. The composition of beef muscle has been included for comparison.

Table 2
Principal constituents (percentage) of fish and beef muscle

Constituents	Fish (fillet)			Beef (muscle)
	Min.	Normal variation	Max	
Protein	6	16-21	28	20
Lipid	0.1	0.2-25	67	3
Carbohydrates		<0.5		1
Ash	0.4	1.2-1.5	1.5	1
Water	28	66-81	96	75

Source: Stansby, 1962, Love, 1970

The variation in the chemical composition of fish is closely related to feed intake, migratory swimming and sexual changes in connection with spawning. Species performing long migrations before they reach specific spawning grounds or rivers may utilize protein in addition to lipids for energy, thus depleting both the lipid and protein reserves, resulting in a general reduction of the biological condition of the fish. The variations in water, lipid and protein contents in various fish species are shown in table 3.

Table 3
Chemical composition of the fillets of various fish species

Species	Scientific name	Water %	Lipid %	Protein %	Energy value (kJ/100 g)
Blue whiting (a)	<i>Micromesistius poutassou</i>	79-80	1.9-3.0	13.8-15.9	314-388
Cod (a)	<i>Gadus morhua</i>	78-83	0.1-0.9	15.0-19.0	
Eel (a)	<i>Anguilla anguilla</i>	60-71	8.0-31.0	14.4	
Herring (a)	<i>Clupea harengus</i>	60-80	0.4-22.0	16.0-19.0	
Plaice (a)	<i>Pleuronectes platessa</i>	81	1.1-3.6	15.7-17.8	332-452
Salmon (a)	<i>Salmo salar</i>	67-77	0.3-14.0	21.5	
Trout (a)	<i>Salmo trutta</i>	70-79	1.2-10.8	18.8-19.1	
Tuna (a)	<i>Thunnus spp.</i>	71	4.1	25.2	
Norway lobster (a)	<i>Nephrops norvegicus</i>	77	0.6-2.0	19.5	581
Pejerrey (b)	<i>Basilichthys bornariensis</i>	80	0.7-3.6	17.3-17.9	
Carp (b)	<i>Cyprinus carpio</i>	81.6	2.1	16.0	
Sabalo (c)	<i>Prochilodus platensis</i>	67.0	4.3	23.4	
Pacu (c)	<i>Colossoma macropomum</i>	67.1	18.0	14.1	369
Tambaqui (c)	<i>Colossoma brachypomum</i>	69.3	15.6	15.8	
Chincuiña (c)	<i>Pseudoplatystoma tigrinum</i>	70.8	8.9	15.8	
Corvina (c)	<i>Plagioscion squamosissimus</i>	67.9	5.9	21.7	
Bagré (c)	<i>Ageneiosus spp.</i>	79.0	3.7	14.8	

Sources: (a) Murray and Burt, (1969), Poulter and Nicolaides (1995 (a), (c)), Poulter and Nicolaides (1985 (b))

3. INTERNATIONAL FISH TRADE

Fish production, which declined in 1997 and 1998, mainly owing to lower catches of small pelagics caused by “El Niño”, returned to 1996 levels in 1999 and 2000. Global imports of fishery products continued to increase, exceeding US\$ 60 billion in the year 2000. Preliminary figures for exports in 2000 were US\$ 52.2 billion. It should be noted that fish products for food aid have declined over the years in line with the overall decline in food aid. The importance of maintaining the role of fish in food aid has been emphasized, and the Food and Agriculture Organization of the United Nations (FAO) has been encouraged to promote such use where feasible.

One third of world fish production enters international trade. Preliminary statistics for 2000 indicate a new record of 130 million tonnes, 28% of which derives from aquaculture. China is the world’s largest producer at 41.6 million tonnes in 2000. Peru is in second place with production of 10.7 million tonnes. Aquaculture is becoming increasingly important, especially for freshwater species such as carp.

In 2000, more than 80% of the total world import value was concentrated in the developed countries. Japan was again the major importer, accounting for about 27% of total import value. After flagging in recent years as a result of economic recession, Japanese

imports of fish and fish products seem to have regained the high levels of previous years. The European Union (EU) is increasingly importing as well as supplying fish. The United States of America, the world's fourth largest exporter, is also the second largest importer of fish.

3.1 Global Fisheries

Aquaculture makes a large and growing contribution to the economies of rural and maritime regions. Total world production of fish, shellfish and other aquatic animals was 125 million tonnes in 1999. Capture fisheries production amounted to $\pm$ 92.3 million tonnes (or 74%) whilst aquaculture production was 32.9 million tonnes (26%) in 1999. The major producing countries outside Europe are China, Thailand, Indonesia, and South American countries such as Ecuador (FAO).

3.2 Aquaculture in the European Union

In 2000, EU-wide production from aquaculture of the main fin fish species was 876,265 tonnes, worth €2,959 million. In 1997 the EU produced about 8% by weight of worldwide aquaculture production. The main species are salmon, trout, sea bass and bream, carp, eels, turbot and cod.

France, Italy and the United Kingdom are the main producers in terms of value at between €350,000-400,000 followed by Spain at €212,000. All have a large production of shellfish and fin fish, although the latter are much the most important in the United Kingdom where salmon is the most valuable. Greece is the main producer of Mediterranean species of bass and bream and Germany is the largest producer of carp.

It is estimated that about 80,000 people (54,000 full-time) are employed in aquaculture activities in the EU, 3.3% of the active population. Each full-time worker accounts for approximately 20 tonnes of production including upstream and downstream activities. Ireland has the greatest proportion of its active population employed in aquaculture, followed by Spain and Greece (Macalister Elliott).

4. DRAFT STANDARD FOR WHOLE FISH AND FISH CUTS

The purpose of this standard is to define and describe commercial quality and merchandising requirements for fish and fish cuts moving into international trade as fit for human consumption. It is recognized that many other requirements of food standardization and veterinary control must be complied with. This standard does not attempt to prescribe those aspects which are covered elsewhere, and throughout the standard, such provisions are left to national or international legislation, or the requirements of the importing country.

This standard includes photographs of whole fish and selected commercial cuts to facilitate understanding, with a view to ensuring a wide application in international trade.

4.1 Field of application

This standard applies to saltwater and freshwater fish presented whole or in fillets, steaks (or slices) or chunks, in the raw state, deep-frozen or frozen, for international trade.

The standard contains references to other international agreements, standards and codes of practice which have the objective of maintaining quality after dispatch and of providing guidance to governments on certain aspects of food hygiene, labelling and other matters which fall outside the scope of this standard. Codex Alimentarius Commission Standards, Guidelines, and Codes of Practice should be consulted as the international reference on health and sanitation requirements.

4.2 Characteristics

A batch of frozen or deep-frozen product must comprise one and the same scientifically defined species.

The frozen or deep-frozen product shall be presented in accordance with the following terminology:

- (a) **Whole fish:** The fish in the state it was caught without any preparation except washing.
- (b) **Gutted fish:** A fish whose abdominal wall has been opened longitudinally, the viscera removed and the abdominal cavity washed out.
- (c) **Gutted fish without head:** Gutted fish with the head and gills removed.
- (d) **Fillet:** A band of muscle taken from the entire length or part of the length of the fish. The description “fillets of ...” is reserved for the result of the operation of manual or mechanical filleting. A product resulting from reconstitution or forming cannot be described as “fillets of ...”.

A fillet can be presented as cut portions.

The characteristics of a fillet are:

Preparation: **with or without the skin**

Where not removed, the skin should be carefully scaled and the fins removed.

Presentation:

- **individual**, sometimes designated by the abbreviation IQF (“individually quick frozen”);
- **readily separable** (the terms “interleaved” or “layer pack” are sometimes used): the fillets are presented in layers separated by a plastic film.

Quality:

“standard”: the fillets are cut and prepared without any systematic attempt to remove the intramuscular bones, which will thus vary with the species and size of the fish.

“boneless”: the fillets are cut and prepared in such a way as to eliminate practically all the bones.

The purchaser must specify the mode of preparation (with or without skin), the presentation (individual or readily separable) and the quality (standard or boneless).

Unless specified otherwise, the fillet is supplied without skin, in separable form and is of standard quality.

(e) **Steak:** A section of fish with the skin cut perpendicularly to the backbone. A steak is a slice of thickness between 15 and 25 millimetres, not normally exceeding one fifth of its greatest dimension.

(f) **Chunk:** A piece of fish with or without the skin cut perpendicularly to the backbone, where the thickness at least equals the width.

(g) **Portion:** A piece cut from a block of frozen or deep-frozen fillets¹, where the thickness is less than the other dimensions; the purchaser must specify the choice of standard or boneless quality, failing which the fish supplied shall be of standard quality.

(h) **Formed portion:** A piece cut from a block of frozen or deep-frozen fillets² that has been moulded to give it a shape. The purchaser must specify the choice of standard or boneless quality, failing which the fish supplied shall be of standard quality.

(i) **Cube:** A piece cut from a block of frozen or deep-frozen fillets,² the three sides of which are approximately identical. The unit weight shall be between 10 and 50 g. The buyer must specify the choice of standard or boneless quality, failing which the fish supplied shall be of standard quality.

4.3 Sizing and packaging

The purchaser shall specify the required sizing.

Packaging or pre-packaging shall conform to regulations in force for materials that come into contact with food products. All packaging in which products were supplied must be handed over to the intended recipient.

In some cases, fish may be covered by a film of ice (ice glazing) to extend the conservation period by preventing oxidation and desiccation.

¹ Deep-frozen block of fish fillet or fillet pieces: deep-frozen compacted oblong mass of fish fillets or fillet pieces containing no chopped flesh.

² Deep-frozen block of fish fillet or fillet pieces: deep-frozen compacted oblong mass of fish fillets or fillet pieces containing no chopped flesh.

4.4 Labelling

Labelling should include the following information:

- (a) The commercial name of the fish and its mode of presentation, supplemented where necessary by the description “frozen” or “deep-frozen”.
- (b) The use-by date. The month and year should be clearly marked, preceded by the words “best before”, or the day, month and year should be indicated after the words “best before”. Unless specified otherwise by regulations, it is the responsibility of the manufacturer or packer to estimate the product’s shelf life.
- (c) The name or registered name and the address of either the manufacturer or the packer, or a vendor established in the Community.
- (d) The health and safety label: this comprises the ISO country code and the establishment’s authorization number. It is affixed by the establishment undertaking the final packaging.
- (e) The batch number: It is the packer’s responsibility to affix this number.
- (f) The sizing, as per the purchaser’s specifications.
- (g) The instruction “store at -18° C”, or similar.
- (h) The net quantity: the declared weight refers to the net weight thawed (excluding glazing water).
- (i) The list of ingredients: additives must be indicated by their specific name or code number and must be preceded by their category name.
- (j) The place of origin, if omission of this information would cause confusion in the mind of the purchaser.

The following information is mandatory:

- *on the document accompanying the goods*, all the points listed above with the exception of (b), (d) and (e);
- *on the outer packaging*, points (a), (b), (c), (d) and (e);
- *on the pre-packaging*, points (b), (d) and (e).

The required information differs depending on whether it appears on the outer packaging, the pre-packaging or the accompanying document. According to regulations, this information may be mandatory or merely indicative.

The date of freezing can be used as the batch number if it contains the day and the month.

The labelling of cardboard boxes containing imported products often includes the name of the country of origin.

4.5 Storage and transport

The wrapped and packaged products must be cold stored at a temperature lower than or equal to -18° C. This requirement applies to all successive periods of cold storage.

The wrapped and packaged products shall be conveyed in trucks or equipment approved for that purpose; the temperature of the transported products must be lower than or equal to -18° C. The same requirement applies to the means of transport used to deliver the products.

For short periods limited to handling operations during the loading and unloading of the food products, a slight increase in temperature not exceeding 3 degrees celsius may be tolerated at the surface of the food product, so that the temperature at the surface shall never rise above -15° C.

4.6 Quality checking

Upon reception of the products, the purchaser shall proceed to carry out a quality check:

4.6.1 Routine inspection focuses on:

- (a) Conformity with specific terms and conditions.
- (b) The packaging, which must be intact and display no obvious signs of thawing (rings and stains).
- (c) Consistency between the labelling and the content.
- (d) The temperature of the product, which must not rise above -18° C (a temperature of at least -15° C at the surface of the product is tolerated, however).
- (e) The frozen condition: the fish and frozen or deep-frozen fillets must not present areas of severe dehydration (cold burns) that cannot be easily eliminated by scratching. The fillets must not be obviously infested with parasites.
- (f) The thawed condition: the fish and fish fillets must present the same sensory characteristics as those required of fresh fish and fish fillets. After removal of the glazing water, no exsudation should be obvious.
- (g) The cooked condition: the fish and fillets should not present odour/flavour characteristics associated with spoiling.
- (h) Cross-section of the frozen product: the flesh should be compact and waxy in appearance. No ice crystals or needles should be apparent. This inspection is not performed on all batches and its frequency should be determined by the purchaser.

5. NAME, CODE AND PRESENTATION OF THE MOST COMMONLY MARKETED PRODUCTS

Product	Commercial name	Scientific name of species	Code
Gutted fish	Rainbow trout	<i>Oncorhynchus mykiss</i>	
Fillet ¹	Cod Coalfish Alaska pollack Redfish Greenland halibut Hoki Ling Argentine hake Pink salmon Haddock	<i>Gadus morhua</i> ² <i>Pollachius virens</i> <i>Theragra chalcogramma</i> <i>Sebastes mentella/marinus</i> <i>Reinhardtius hippoglossoides</i> <i>Macruronus novaezelandiae</i> <i>Molva molva</i> <i>Merluccius hubbsi</i> <i>Oncorhynchus gorbuscha</i> <i>Melanigrammus aeglefinus</i>	
Steak	Chum salmon	<i>Oncorhynchus keta</i>	
Portion	Alaska pollack Argentine hake	<i>Theragra chalcogramma</i> <i>Merluccius hubbsi</i>	
Cube	Coalfish Alaska pollack	<i>Pollachius virens</i> <i>Theragra chalcogramma</i>	
Other: Wing Steak	Spiny dogfish Skate Tuna	<i>Squalus acanthias</i> <i>Raja sp.</i> <i>Thunnus albacares</i>	

¹ Unless specified to the contrary, fillets are supplied standard and without skin.

² The same commercial name can cover a number of different scientific species; the one indicated refers to the species offering the best value for money.

General classification

Product	Code	Presentation	Price
Redfish		Whole: - with or without head Fillet: - with bones (standard) - boneless - blocks in immediate packing	
Cod		Whole, with or without head Fillets: - <i>interleaved</i> or in industrial blocks, with bones (standard) - <i>interleaved</i> or in industrial blocks, boneless - individual or <i>fully interleaved</i> , with skin - individual or <i>fully interleaved</i> , without skin - blocks in immediate packing	
Haddock		Fillets: - <i>interleaved</i> or in industrial blocks, with bones (standard) - <i>interleaved</i> or in industrial blocks, boneless - individual or <i>fully interleaved</i> , with skin - individual or <i>fully interleaved</i> , without skin - blocks in immediate packing	
Alaska pollack		Fillets: - <i>interleaved</i> or in industrial blocks, with bones (standard) - <i>interleaved</i> or in industrial blocks, boneless	
Coalfish		Fillets: - <i>interleaved</i> or in industrial blocks, with bones (standard) - <i>interleaved</i> or in industrial blocks, boneless - individual or <i>fully interleaved</i> , with skin - individual or <i>fully interleaved</i> , without skin - blocks in immediate packing	

6. MOST COMMONLY MARKETING FILLETS OF SALTWATER FISH

1. Redfish

Description: Fillets, with bones (standard) or boneless
Latin name: *Sebastes Mentella*, *S. marinus*
Sizing: 50/130 g, 120-140 g
Glazing: Epic 10%
Packaging: 1 kg polybag

2. Atlantic cod

Description: Fillets, with bones (standard) or boneless. Fillets with or without skin
Latin name: *Gadus Morhua*
Sizing: 120/140 g, 100/200 g, 200/400 g
Glazing: Epic 10%
Packaging: 1 kg polybag

3. Coalfish

Description: Fillets, with bones (standard) or boneless. Fillets with or without skin
Latin name: *Pollachius virens*
Sizing: 100/200 g, 200/400 g, + 450 g
Glazing:
Packaging:

4. Alaska pollack

Description: Fillets, with bones (standard) or boneless
Latin name: *Theragra chalcogramma*
Sizing: 50/120 g
Glazing: 10%
Packaging:

5. Greenland halibut

Description: Fillets, with bones (standard) or boneless
Latin name: *Reinhardtius hippoglossoides*
Sizing: 200/400 g, 400/800 g
Glazing: 10%
Packaging:

6. Haddock

Description: Fillets, with bones (standard) or boneless. Fillets with or without skin
Latin name: *Melanogrammus aeglefinus*
Sizing: 80/140 g, 140/225 g, 225/450 g, 200/400 g, 400/800 g
Glazing: 10%
Packaging:

7. Pink salmon

Description: Fillets, with bones (standard) or boneless. Fillets with or without skin
Latin name: *Oncorhynchus gorbuscha*
Sizing: 170/270 g, 270/330 g, 350/450 g
Glazing: 10%
Packaging:

8. Sole

Description: Fillets, with bones (standard) or boneless
Latin name: *Solea vulgaris*
Sizing: 80/120 g
Glazing: 10%
Packaging:

9. Ling

Description: Fillets, with bones (standard) or boneless. Fillets with or without skin
Latin name: *Molva molva*
Sizing: 400/800 g
Glazing: 10%
Packaging:

**Commercial names of the principal species of saltwater and
freshwater fish presented as fillets**

Family	Commercial name	Scientific name
1. Saltwater fish		
Salmonidae	Sea trout (fished or farmed at sea) Atlantic salmon	<i>Salmo trutta</i> . <i>S.gairdneri</i> <i>Salmo salar</i>
Scophthalmidae	Megrim Brill	<i>Lepidorhombus whiffiagonis</i> <i>Scophthalmus rhombus</i>
Pleuronectidae	Grey sole Dab Lemon sole Plaice	<i>Glyptocephalus suspensorius</i> <i>Limanda limanda</i> <i>Microstomus kitt</i> <i>Pleuronectes platessa</i>
Soleidae	Sole	<i>Solea vulgaris</i>
Merlucciidae	Hake	<i>Merluccius merluccius</i>
Gadidae	Cod Haddock Whiting Pollack Coalfish Bib Ling Blue ling	<i>Gadus morhua morhua</i> <i>Melanogrammus aeglefinus</i> <i>Merlangus merlangus</i> <i>Pollachius pollachius</i> <i>Pollachius virens</i> <i>Trisopterus luscus</i> <i>Molva molva</i> <i>Molva dypterygia dypterygia</i>
Scorpaenidae	Redfish	<i>Sebastes mentella</i> <i>S. marinus</i>
Sparidae	Sea bream Common pandora Common dentex Black sea bream	<i>Sparus parvus parvus</i> <i>Pagellus erythrinus</i> <i>Dentex dentex</i> <i>Spondylusoma cantharus</i>
Clupeidae	Herring	<i>Clupea harengus</i>
Scrombridae	Chub mackerel Mackerel	<i>Scomber japonicus</i> <i>Scomber scombrus</i>
2. Freshwater fish		
Cyprinidae	Carp	<i>Cyprinus carpio</i>
Salmonidae	Trout (rainbow) Trout (brown)	<i>Salmo gairdneri</i> <i>Salmo trutta</i>
Percidae	Perch	<i>Perca fluviatilis</i>
