

Sensory assessment scoresheets for fish and shellfish

- Torry & QIM

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1.0 Introduction

Using the appearance and/or properties of raw seafood enables the freshness quality to be determined i.e. freshness quality measurement.

Sensory assessment relies on using the appearance, odour and texture of the seafood to derive an overall score.

Several sensory assessment methods have been used in the UK over the past 30 years. These include the Torry Sensory Assessment scheme, the European E-A-B scheme and the Quality Index Method. Although there are variations in how these schemes work, they all rely on using the physical characteristics of raw seafood to determine a score or rating indicating the freshness quality of the seafood. In Torry and QIM the score is used to estimate the 'days on ice' of the seafood and (QIM only) estimate the remaining shelf-life.

All the schemes have been developed using seafood that has been produced according to good manufacturing practice (i.e. held in melting ice since capture). This makes it possible to identify seafood that shows atypical characteristics or which appears to have spoiled more quickly than expected, which can be linked to poor practices such as high temperature spoilage, inadequate icing etc.

This document provides copies of available Torry Assessment and QIM schemes. It will be updated when additional schemes become available.

2.0 TORRY SCORESHEETS

The following pages include the series of Torry Research Station sensory assessment schemes for a variety of fish and shellfish.

2.1. Definitions of some terms used in sensory assessment of fish

Seaweed	Fresh, sharp, clean odour associated with the seaside. May be qualified by 'stale' which is the odour of slightly rotten seaweed.
Shellfish	The odour of fresh bivalve shellfish when freshly gathered. Similar to seaweed and marine but a more rounded and richer odour.
Neutral	A weak indefinite odour or flavour without specific fresh or stale character.
Caprylic	The odour of goats or horses
Milky	The odour or flavour of fresh milk. Sweetish and slightly creamy. Not the flavour of sterilised or tinned milk.
Peppery	The odour or flavour of freshly ground pepper. Not the irritant action
Metallic	'Coin in the mouth' sensation
'Old boots'	The odour of old leather and sweat
Marine	An odour pertaining to the seaside
Mealy	The odour and flavour of raw potatoes and flour
Nutty	The full flavour of nuts, e.g. walnuts, hazelnuts
Rancid	The unpleasant odour or flavour of stale oil, stale fat
Aromatic	A fragrant sweet smelling odour
Acrid	A sharp, pungent, prickling sensation
Blown oil	The odour or flavour of stale fish oil
Green plant	The odour or flavour of young, tender shoots
Citric	The odour or flavour of oranges, limes etc.
Curry	A spicy, fragrant odour or flavour
Butterscotch	The odour or flavour of toffee
Butyric acid	The odour or flavour of stale butter
Acetic acid	The odour or flavour of vinegar
Lactic acid	The odour or flavour of sour milk
Tallow	The odour or flavour of animal fat, suet
Garlic	The pungent odour or flavour of freshly crushed garlic
Chloroform	An anaesthetic-like odour
Musty	An odour vaguely suggesting damp cellars, mildew or hay or ground oatmeal
Bready	The yeasty odour of fresh bread
Beery	A brewery odour
Grassy	The odour of composted grass
Fresh-cut grass	The pronounced, slightly sharp odour of freshly cut grass
Fruity	A sweet-acid odour, suggesting over-ripe fruit

2.2. Texture Profile

Initial Characteristics

Response to the properties of the material on the first bite.

Wateriness	The release of water on compression. This is the initial response and is to be distinguished from succulence. 0 no water released but not necessarily dry 5 wet, sample releases water very readily
Firmness	The force required to compress the material between the molar teeth or between tongue and palate. 0 very soft, very easily compressed 5 firm, high resistance to compression
Springiness	The ability of the material to return to its original shape after deformation. Compress the substance slightly between the molar teeth or between the tongue and palate and note how the material returns to its original shape. 0 completely plastic, retains its deformed state 5 springy, returns to its original shape

Secondary Characteristics

Response to the properties of the material after chewing a few times:

Fibrousness	Property of separating into filamentous structural elements 0 not fibrous 1 short fibres, almost mealy 5 long fibres
Smoothness	This is the alternative to fibrous in describing the geometry of the structural elements. fibrous crumbly, mealy, lumpy homogenous - smooth, pasty or jellyfish
Toughness	Resistance to breakdown on chewing to a state suitable for swallowing. very tender, very easily broken down very tough, needs chewing for a long time
Succulent	The sensation of juiciness in the mouth very dry, tends to reduce the moisture in the mouth succulent, juicy, tends to increase the moisture in the mouth
Other	Describe any other texture characteristics not covered by the defined scales – e.g. Tacky, oily, glutinous, brittle, and crisp.

2.3. Freshness Score Sheet For Iced Cod

Cod - Raw Fish

Score	Eyes	Skin	Texture and Effect of Rigor Mortis	Flesh and Belly Flaps	Kidney and Blood	Gills		Score
						Appearance	Odour	
10	Bulging, convex lens, black pupil, crystal-clear cornea	Bright, well-differentiated colours, glossy, transparent slime.	Flesh firm and elastic. Body pre-rigor or in rigor.	Cut surface stained with blood. Bluish translucency around backbone. Fillet may have rough appearance due to rigor mortis contraction	Bright red blood flows readily	Glossy, bright red or pink mucus	Initially very little odour increasing to sharp, iodine, starchy, metallic odours changing to less sharp seaweedy, shellfish odours.	10
								9
9	Convex lens, black pupil with loss of initial clarity.	Loss of brilliance of colour	Flesh firm and elastic. Muscle blocks apparent. In or just passing through rigor.	White with bluish translucency, may be corrugated due to rigor mortis effect.	Bright red, blood does not flow.			
8	Slight flattening or plane, loss of brilliance.		Firm, elastic to the touch.	White flesh with some loss of bluish translucency. Slight yellowing of cut surfaces of belly flaps.	Slight loss of brightness of blood.			Loss of gloss and brightness, slight loss of colour.
		7				Slight mousy, musty or caprylic,	7	
6	Slightly sunken, slightly grey pupil, slight opalescence of cornea.	Loss of differentiation and general fading of colours; overall greyness. Opaque and somewhat milky slime.	Softening of the flesh, finger indentations retained, some grittiness near tail.	Waxy appearance of the flesh, reddening around the kidney region. Cut surfaces of the belly flaps brown and discoloured.	Loss of brightness, some browning.	Some discoloration of the gills and cloudiness of the mucus.	Bready, malty, beery, yeasty	6
								5
4	Sunken, milky white pupil, opaque cornea.	Further loss of skin colour. Thick yellow knotted slime with bacterial discoloration. Wrinkling of skin on nose.	Softer flesh, definite grittiness.	Some opacity, reddening along backbone and brown discoloration of the belly flaps	Brownish kidney blood	Slight bleaching and brown discoloration with some yellow bacterial mucus.	Lower fatty acid odours (e.g. Acetic or butyric acids), composted grass, 'old boots', slightly sweet, fruity or chloroform like.	4
								3

Cod - Cooked Fish

Score	Odour	Flavour	Texture, Mouth Feel and Appearance	Score
10	Initially weak odour of sweet, boiled milk, starchy followed by strengthening of these odours	Watery, metallic, starchy. Initially no sweetness but meaty flavours with slight sweetness may develop.	Dry, crumbly with short tough fibres. Succulent, fibrous. Initially firm going softer with storage. Appearance originally white and opaque going yellowish and waxy on storage.	10
9	Shellfish, seaweed, boiled meat, raw green plant.	Sweet, meaty, creamy, green plant, characteristic.		9
8	Loss of odour, neutral odour	Sweet and characteristic flavours but reduced in intensity.		8
7	Wood shavings, wood sap, vanillin.	Neutral		7
6	Condensed milk, caramel, toffee-like.	Inspid		6
5	Milk jug odours, boiled potato, boiled clothes like.	Slight sourness, trace of 'off' flavours.		5
4	Lactic acid, sour milk, 'byre-like'.	Slight bitterness, sour 'off' flavours		4
3	Lower fatty acids (e.g. Acetic or butyric acids), composted grass, soapy, turnip, tallowy.	Strong, bitter, rubber, slight sulphide.		3

2.4. Freshness Score Sheet for Haddock

Haddock - raw

Score	Eyes	Skin	Texture and Effect of Rigor Mortis	Flesh and Belly Flaps	Kidney and Blood	Gills		Score
						Appearance	Odour	
10	Bulging, convex lens, black pupil, crystal-clear cornea	Bright, well-differentiated colours, glossy, transparent slime	Flesh firm and elastic. Body pre-rigor or in rigor.	Cut surface stained with blood. Bluish translucency around backbone. Fillet may have rough appearance due to rigor mortis contraction	Bright red blood flows readily	Glossy, bright red or pink mucus	Fresh seaweed, sweet, musty, iodine, sugary-syrupy	10
9	Convex lens, black pupil with loss of initial clarity.		Flesh firm and elastic. Muscle blocks apparent. In or just passing through rigor.	White with bluish translucency, may be corrugated due to rigor mortis effect.	Bright red, blood does not flow.		Loss of freshness and seaweediness, green plant type odour	9
8	Slight flattening or plane, loss of brilliance.	Loss of brilliance of colour	Firm, elastic to the touch.	White flesh with some loss of bluish translucency. Slight yellowing of cut surfaces of belly flaps.	Slight loss of brightness of blood.	Loss of gloss and brightness, slight loss of colour.	Stale seaweed, bready-yeasty, sweet-yeasty.	8
7							Malty-bready, sharp, e.g. Pepper, lemons.	7
6	Slightly sunken, slightly grey pupil, slight opalescence of cornea.	Loss of differentiation and general fading of colours; overall greyness. Opaque and somewhat milky slime.	Softening of the flesh, finger indentations retained, some grittiness near tail.	Waxy appearance of the flesh, reddening around the kidney region. Cut surfaces of the belly flaps brown and discoloured.	Loss of brightness, some browning.	Some discoloration of the gills and cloudiness of the mucus.	Fruity-malty slight sour fruit, sweet turnips (methionine).	6
5							Sour, slight lower fatty acids, sharp, e.g. 'off' apples, rhubarb etc	5
4	Sunken, milky white pupil, opaque cornea.	Further loss of skin colour. Thick yellow knotted slime with bacterial discoloration. Wrinkling of skin on nose.	Softer flesh, definite grittiness.	Some opacity, reddening along backbone and brown discoloration of the belly flaps	Brownish kidney blood	Slight bleaching and brown discoloration with some yellow bacterial mucus.	Rotten vegetables, fruity faecal, sulphides, ammonia, lower fatty acids	4
3							Sour sink, sulphides, ammonia, strong lower fatty acids.	3

Haddock - Cooked

Score	Types of Flavour	Cooked Odour
10	Fresh meaty, sweet, watery, spicy-lemons, metallic	Fresh seaweed, sweet, fresh milk, faint iodine, fresh, tangy, lemons.
9	Loss of fresh meatiness and metallicness, nutty.	Melting margarine, spicy, shellfish, green plant type odour.
8	Sweet, neutral, slightly meaty	Bready-yeasty, boiling milk, woody.
7	Very slightly sweet, slight cardboard, creamy.	Caramel, sweet fruity-malty.
6	Sweet/sour, onions, lemons, fatty.	Fatty, sweet/sour.
5	Slight sourness, slight rancidity or bitterness.	Stale milk-jug, wet clothes.
4	Rancid, bitter	Milk-jug, rancid fat, slight ammonia.
3	Rancid cheese, bitter nuts.	Rancid cheese, ammonia, 'off' nuts.
2	Sulphides, strong rancid, strong bitter.	Sour, rancid, sweaty, strong ammonia.
1	Putrid, tasted with difficulty.	Faecal, sulphide, very strong ammonia.

2.5. Freshness Score Sheet for Iced Flatfish

Raw fish

SCORE	ODOUR - (Gills and Belly Cavity)	GENERAL APPEARANCE	FLESH	TEXTURE	SCORE
10	Fresh oil, metallic, roses, freshly-cut grass	Eyes full, bright or very slightly cloudy; Gills bright red or very deep pink with slight clear slim;	Translucent with blue or pink tinge. Dark purple in backbone	Firm and slimy	10
9	Metallic, oily, earthy, peppery	Slime on body clear to slightly milky			9
8	Oily, seaweedy, aromatic	Eyes slightly sunken, some opacity; Gills pale pink, slightly bleached with thick opaque slime;	Loss of translucency; Bluish or pinkish white; Slight waxyness. Backbone still purple	Loss of slime but no grittiness	8
7	Oily, citric, musty, mousy	Slime on body thick and opaque; Edge of gill cover slightly bleached and pinking and pinking on underside of body			7
6	Oily, bready, biscuity, malty, cut-flower stems	Eyes sunken and opaque; Gills bleached with thick grey or brown slime; Slime on body yellow and watery; Bleaching on back, particularly in head region and gill cover, pinking on underside	Waxy, slight yellowing, slight discolouration of body cavity. Backbone still well coloured (red-blue to purple)	Slight grittiness	6
5	Sour beer, slight rancidity, painty, cod-liver oil				5
4	Muddy, grassy, meaty, stale vegetables, 'old boots', fruity, sweaty, lower fatty acids	Eyes completely sunken or bloated and opaque; Gills very bleached with dirty grey or brown-yellow slime;	Some opacity, yellow or brownish discolouration extending in from fin rays. Reddening in backbone	Grittiness towards the tail	4
3	Rotten cabbages, sour sink, wet matches, rotten meat, rancid butter	Slime on body watery with yellow bacterial discolouration; Marked bleaching and pinking on body			3
2	Byre-like, singed hair, ammonia	Eyes totally collapsed; Gills badly bleached and badly discoloured with bacterial slime;	Marked opacity, yellow or brown discolouration and marked reddening in backbone	Marked general grittiness	2
1	H ₂ S, strong ammonia, sulphides	Body slime watery or scarce with marked bacterial discolouration, particularly in head region;	Marked discolouration particularly in body cavity. Blood almost completely diffused in backbone		1
0	Faecal, nauseating, indole	Gill covers very bleached; marked pinking on the underside			0

Cooked Flatfish

Score	Flavour	Odour	Texture
10	Meaty, shellfishy, earthy	Meaty, oniony, fresh butter or margarine, Worcester sauce, slight caramel	Firm and dry
9	Sweet and meaty (or oily fresh herring-like)	Oily, slightly aromatic, slight peppery, boiled clothes	
8	Sweet and meaty with curry, peppery or spice flavour	Curry, oily, peppery, damp clothes, baked smell	Crumbly, short, firm
7	Neutral or bland	Caramel, boiled potatoes, musty, butterscotch	
6	Rancid, slightly sour	Metallic, slightly sour acid, slightly sweaty boiled string	Soft but dry
5	Sour, rancid oil, rancid butter, fish meal	Sour bread, lower fatty acids, rancid butter, singed milk, smoky	
4	Sour or bitter	Slight amines, slight ammonia, sour beer, spoiled cheese	Soft and moist
3	Strong sour and strong bitter, rotten fruit	Ammonia, very sour, slightly faecal	
2	Very bitter, very sour	Strong ammonia and amines	Very soft and sloppy
1	Nauseating	Very strong ammonia, strong faecal, putrid cheese	

2.6. European Hake:

Raw Hake

Score	Eyes	Gills	Skin	Flesh	Odour	Texture
9	Flat or slightly convex; slightly grey pupil	Red, slight bleaching	Bright, clear colours	Slight translucency; no reddening along backbone	Seaweedy; lack of odour	Slightly soft,; smooth skin
8	Flat: slightly grey pupil	Dark red; some discoloration and bleaching	Loss of brightness; cloudy slime	Slightly opaque; no reddening along backbone	Slightly seaweedy; slightly musty; fresh oil	Soft; very slight grittiness of skin
7	Flat or slightly sunken; slightly cloudy	Pink; some discoloration and bleaching	Loss of brightness; cloudy slime	Slightly opaque; no reddening along backbone	Malty; musty; grassy; oily	Soft; slight grittiness of the skin
6	Slightly sunken; slightly cloudy	Pink; bleached discoloration	Discoloured slime on head	Opaque; slight reddening along backbone	Oily; grassy; slightly sour; leathery	Soft; grittiness of skin
5	Sunken; cloudy	Pale pink; marked bleaching; discoloured slime	Yellow slime on head	Opaque; slight reddening along backbone	Sour sink; leathery; composted grass	Soft; grittiness of skin
4	Sunken; collapsed; cloudy	Bleached with thick discoloured slime	Yellow slime on head and body; flesh shrinking around head	Opaque; slight reddening along backbone	Sour sink; slightly byre-like; slight ammonia	Very soft; grittiness of skin

Hake - cooked

Score	Odour	Flavour	Texture
9	Seaweedy	Sweet; meaty	Dry; mealy
8	Meaty; milky; creamy; cardboardy	Dry; fibrous; crumbly	Dry; fibrous; crumbly
7	Meaty; milky; musty; neutral.	Sweaty; meaty; creamy; musty	Dry; crumbly
6	Sour; slightly off; boiled potato	Musty, neutral	Soft; dry; crumbly; slightly fibrous
5	Sour; slightly rancid; slightly cheesy	Sour; musty/ slight cheesy	Dry; mealy; soft
4	Ammoniacal; faecal	Sour; bitter	Dry; mealy; soft.

2.7. Mackerel Scoring Scales

Raw fish

SCORE	APPEARANCE			GILL ODOUR	SCORE
	SKIN AND BODY	EYES	GILLS		
10	Firm body with silky smooth skin. Lateral line and reticulations on upper surface well defined. Body colours iridescent with strong royal blue and turquoise colours on upper surface. Blue and violet on ventral surface with silvery sheen.	Bulging convex eye with protruding lens. Shiny jet-black pupil with metallic brown iris. Eye-cap water clear	Uniformly dark red with free blood and water-clear slime present	Weak, delicate odours, cloying sweet, sharp, pepper, seaweed, blood	10
9	Passing into rigor or in rigor.				9
8	Loss of colour definition. Some blood stains apparent. Passing out, or out of rigor	Convex eye lens plane with cornea. Pupil less shiny, iris green/ blue. Slight clouding of eye cap	Dark purple/maroon with paler edge. Congealed blood present with opaque slime	More definite odours as above, also fragrant, fresh grass, fruity, metallic, shellfish	8
7					7
6	Colours of dorsal surface paler, reticulations grey, ventral surface white with golden tinge. Patchy iridescence			Dull muddy odours, musty, mousy, malty, cardboard, linseed oil, cod liver oil, biscuits, blood	6
5	Washed-out colours, definite golden tinge to skin, patchy iridescence. Body soft with red/brown slime oozing from gill covers. Skin wrinkles on flexing	Flattening of eye but still convex. Pupil wrinkled with slight clouding of lens. Iris silvery and starting to wrinkle. Yellowing of eye cap	Loss of colour with red/brown slime	Stale odours as above, also butterscotch, wet cardboard, wet dogs	5
4	Fish limp and floppy with distinct ice marks. Washed-out colours with mottling or golden tinge	Eyeball plane with eye socket. Cloudy lens with silvery iris showing black specks	Browning of gills, patchy bleaching, increased slime and red/brown slime oozing from gill cover	Mixture of odours from above and below	4
3	Little distinction between upper and lower surfaces. Body very soft. Skin very wrinkled with distinct ice marks	Concave or flattening eye with cloudy pupil	Marked bleaching and browning of gills covered in black slime	Sweet-rotten odours, oil sweet-rotten fruit(grapefruit), old grass cuttings, sickly sour	3

Mackerel – cooked

Score	Flavour and Odour Descriptions (white and red flesh)	Odour	Flavour
9	White meat: sweet, starch, astringent, metallic, blood, meaty (cold lean beef), green plant, spicy, lemons, muddy, strong sweet oil Red meat: strong meaty, sweet		
8	White meat: sweet, oily chicken (white meat), dull blood, herbs (e.g. parsley), roast meat (cold lamb, pork), starch, astringent, insipid, earthy, mushrooms, onions/lemons Red meat: rich strong meat, apples	Shellfish, fresh seaweed, halogens (iodine), fresh blood, fresh lemons/chicken, sweet oil, muddy	Sweet, starch, astringent, metallic, blood, meaty (cold lean beef), green plant, spicy lemons, muddy, strong sweet oil. Red meat : Strong meaty, sweet
7	White meat: sweet, earthy, cardboard, slight curry, bland sweet oil, onions/lemons Red meat: strong meat	Fresh lamb stew, boiled potatoes, washing soda solution, onions, biscuits, sweet oil	Sweet, oily chicken (white meat), blood, herbs (e.g. Parsley), roast meat (cold lamb, pork), starch, astringent, insipid, earthy, mushrooms, onions/lemons. Red meat : Strong meaty
6	White meat: slightly sweet, weak meaty, just detectable rancidity, musty, wet paper, cardboard, neutral bland oil, new leather Red meat: strong meat, slightly rancid	Earthy, slight spicy, curry, white chicken meat, fresh mushrooms, cardboard	Sweet, earthy, cardboard, slight curry, bland sweet oil, onions/lemons. Red meat : Strong meaty
5	White meat: neutral bland oil, greasy cold chicken, slight rancidity, sweet/sour caramel, acidic after-taste Red meat: strong meat, rancid, sulphury	Waxy, new leather, wet paper, cardboard, dried meat extract, curry, just detectable rancidity	Slightly sweet, weak meaty, just detectable rancidity, musty, wet paper, cardboard, neutral bland oil, new leather. Red meat : Strong meaty, slightly rancid
4	White meat: slightly sour, rancid, stale roast meat, cold mutton stew, yeast burning sensation on sides of tongue, 'coin-in-mouth' sensation, acrid Red meat: strong rancidity, sulphury	Slight rancidity, caramel, yeasty, stale, musty, malty, greasy stale chicken fat/chicken skins	Neutral bland oil, greasy cold chicken, slight rancidity, sweet/sour, caramel, acidic after-taste. Red meat : Strong meaty, rancid, sulphury
3	White meat: sour, rancid, rotten (sweet sensation), chicken skins, charred paper, sulphides Red meat: strong rancidity, sultry, tasted with difficulty		Slightly sour, rancid, stale roast meat, cold mutton stew, yeast, burning sensation on sides of tongue, "coin in the mouth" sensation, acrid. Red meat : Strong rancidity, sulphury
2	White meat: strong rancidity, bitter, burnt/acrid, strong sulphides, rotten cabbages, rotten fruit Red meat: nauseating rancidity and sulphury	Sweaty, sour, rancid, stale cheese, sulphides, pickled herring, rotten fruit (sweet odour), charred	Sour, rancid, rotten fruit (sweet sensation), chicken skins, charred paper, sulphides. Red meat : Strong rancidity, sulphury, tasted with difficulty
1	Nauseating, ammoniacal, very strong sulphides, tasted with difficulty	Sulphides, burnt/acrid, rotten meat, vomit	Strong rancidity, bitter, burnt, acrid, strong sulphides, rotten cabbages, rotten meat. Red meat : Nauseating rancidity and sulphury

2.8. Iced Herring

Raw Herring

Score	Appearance				Odour	texture	Appearance of Belly Walls	Score				
	Eyes	Gills	Skin	Flesh								
10	Slightly convex, clear black pupil.	Dark red, purple, clear slime.	Bright colours, iridescent, few loose scales.	Glossy, rosy hue, fresh bright blood on fillet.	Oily, marine, fresh blood, sulphide, weak odour.	Firm, stiff, smooth	No belly burst	10				
9	Flat, slightly convex, clear black pupil.	Dark red, pink, slightly faded.	Bright, slight iridescence, few loose scales.	Slight translucency, rosy hue, bright blood on fillet.	Oily, marine, fresh fruit, sulphide.	Loss of stiffness, still firm, smooth.	No belly burst.	9				
8	Flat, slightly convex, slightly cloudy	Dark red, pink, slight brown, slight reddening on gill covers	Loss of brightness, some loose scales.	Slight translucency, slight discoloration of belly flaps.	Oily, musty, leathery, slight sulphide.	Loss of stiffness, slight softening, smooth.	No belly burst or very slight belly burst.	8				
7		Red, pink, slight bleaching, slight reddening on gill covers.	Dull, slight bronzing, some loose scales.	Slightly opaque, slightly brown, slight discoloration of belly flaps.	Oily, musty, sulphide, slightly sour.	Limp, slightly soft, slightly gritty.	Slight belly burst.	7				
6	Flat, slightly cloudy	Red, pink, brown, slight bleaching, reddening on gill covers.	Dull, slight bronzing, some dirty scales.	Opaque, dull, brown, reddening on belly flaps.	Musty, stale fruit, stale grass, malty, sour.			Definite belly burst.	6			
5	Flat, slightly sunken, slightly cloudy, grey pupil.	Pink, brown slime, bleached, reddening on gill covers.	Dull, bronzing, dirty scales.		Opaque, dull, brown, reddening on belly flaps.	Stale fruit, stale grass, sour, malty, slightly rancid.	Limp, soft, gritty.		Definite belly burst.	5		
4	Flat, slightly sunken, cloudy, bloodshot, discoloured.			Dull, bronzing, dirty scales.		Opaque, brown, discoloured belly flaps and tail.		Sweaty, sour sink, stale meat, H ₂ S		Limp, soft, gritty.	Definite belly burst.	4
3	Flat, slightly sunken, wrinkled, discoloured, bloodshot.							Pink, bleached, brown slime, bronzing on gill covers.				Dull, bleached, brown slime.

Herring - cooked

score	Odour	Flavour	Texture	Score
10	Fresh oil, marine, creamy, boiled potato, weak odour.	Fresh oil, sweet, meaty, creamy, metallic, green plant.	Firm, slightly dry	10
9	Fresh oil, meaty, creamy, boiled clothes, musty, characteristic.	Fresh oil, sweet, meaty, creamy, musty characteristic.	Becoming less firm but still quite dry.	9
8	Oily, musty, burnt, slightly brown oil.	Oily, sweet, meaty, creamy, burnt, neutral.		8
7	Oily, musty, slightly rancid.	Oily, sweet, meaty, creamy, musty, slightly rancid, slightly sour.		7
6	Oily, rancid, cheesy, slightly sour, boiled clothes.	Oily, sweet, stale meat, creamy, rancid, sour.		6
5	Rancid, sweaty, cheesy, sour, malty.	Rancid, sweaty, musty, sour.		5
4	Rancid, sweaty, cheesy, sour, stale meat.	Rancid, sweaty, cheesy, sour fruit, slightly bitter.		4
3	Rancid, sweaty, cheesy, sour stew, ammonia, vinegar.	Rancid, cheesy, sour, bitter, rotten fruit.		3

2.9. Salmon

Salmon - Raw Fish

Score	Odour of gills	Appearance of Eyes	Appearance of Gills
10	Marine, shellfish, seaweed, sharp.	Flat, convex, clear, bright	Dark red
9	Fresh cut grass, fresh fruit, floral.		
8	Oily, fresh cut grass.		
7	Musty, muddy, mousy.	Flat, clear.	Red/brown, slight bleaching
6	Leathery, beery, yeasty.		
5	Sour, sour milk.	Flat/slightly sunken, cloudy.	Brown, bleached.
4	Sour. Stale fruit, stale vegetables.		
3	Sour sink, rancid.	Sunken, cloudy, discoloured.	Brown, bleached, yellow slime.
2	Ammonia		
1	Putrid		

Salmon - Cooked Fish

Score	Odour	Flavour
9	Baked, meaty, oily	Strong, meaty, sweet, oily, metallic
7	Earthy, musty	Loss of sweetness, meaty, slightly musty.
5	Musty, sour	Sour, musty
3	Sour, stale fruit	Sour, bitter
1	Rancid, sweaty	Putrid, nauseating

Cold smoked Salmon - Freshness

Score	Description
10	Fresh sweet flavour, metallic, fresh oil
8	Loss of fresh flavours
6	Slight off flavours, stale oil but no sourness
4	Some sourness, stale oil
2	Strong, sour with some bitter flavours
0	Strong ammoniacal odours, sour and bitter flavour.

2.10. Trout Score Sheet

Trout - Raw Fish.

Score	Eyes	Skin	Gills	
			Appearance	Odour
10	Convex, clear, bright	Clear, sticky slime; iridescent; silvery /green	Bright; clean; dark red to pink	Weak; traces of freshly cut grass; seaweed; slightly sharp
9	Convex to flat; very slightly grey; clear	Slightly cloudy slime; slight loss of iridescence; silvery/green	Bright red to pink; some bleaching	Some strengthening of the odours
8	Flat; slightly grey; clear	Slightly cloudy, slime; slight loss of scales; iridescence; silvery/grey		Shellfish; cut flower stems; fresh oil; aromatic
7	Slightly sunken; grey; slight opacity	Some loss of scales; slightly gritty	Pink to reddish/brown with bleaching	Cardboardy; aromatic; malty; oily; acrid
6	Sunken; grey; slight opacity	Loss of scales; slightly gritty; dull colours	Pink to reddish/brown; bleached; slimy	Malty; beery; stale grass; slight rancid oil; putty
5			Pink to brown; bleached; sticky slime	Yeasty; stale beer; rancid oil; sour milk; boiled eggs; leather
4				Sunken; grey; opaque

Trout – cooked flavour

Score	Description
9	Metallic, sweet, fresh oil
7	Metallic, sweet, meaty, baked, slight herring like
6	Meaty, chicken-like, cardboard, slightly sour, stale oil
5	Stale oil, rancid, sour, acid, cardboard, yeasty, mealy, woody
4	Nutty, cheesy, lower fatty acids, turnipy

2.11. Shrimp Scoresheet - Pink and Brown

Raw

Score	Flesh colour and opacity	Head	Brown shrimp body	Connective tissue	Head	Pink shrimp body	Odours
5	Translucent	Light brown/grey through transparent casing	Pale grey, darker grey spots	Grey	Brown/dark red	Orange/pink (eggs turquoise)	Fresh seaweed; delicate; watery
4	Slight opacity towards anterior	Slight greening or yellowing	Grey/slight mauve tinge. Pale yellow ventrally	Duller grey	Darkening	Slight green/yellow tinge laterally. Pale yellow ventrally (eggs: dirty ferrous green)	Seaweed; sweet; milky; fresh cut grass; metallic; iodine
3	Opacity extended half way along flesh from anterior end which is beginning to turn yellow	Blackening			Dark green/Purple	Green/orange (eggs: grey/blue)	Tangy / sherbet lemon; "sharp"; musty-mouldy leaves; hay
2	May still show translucency at tips of tail. Anterior: yellow/green	Grey/green/yellow			Green/yellow		Compost; silage; rotting vegetables; humus; muddy; ditch-water; NH ₃
1	All opaque	Covered in large green/black blotches. Blackening of head extending along the body		Yellowing	Green/black	Dirty yellow / brown/orange. Covered in pale yellow slime	Urinal; doggy; amines; byres; sweaty; NH ₃

Shrimp - cooked

Score	Cooked Odours	Flavours	Texture
5	chestnuts; seaweed; tangy	"Characteristic"; milky/sweet	Firm; chewy
4	Milky-sweet - condensed milk; fresh urine; mealy; caramel; malty; mushroom sheds/dank	"Characteristic"; milky/sweet - creamy; meaty	
3	Leaf mould; peat; boiled vegetables	Still slightly sweet; sour/sweet greasy/fatty aftertaste	
2	Chlorine; sweaty; powder/plaster/cement; soapy water - clothes washing; manure; amines; NH ₃	Fishy; slightly sour; bland (pink shrimp); may still show very slight sweetness	Lumpy - readily falls into segments which are quite firm
1	Strong sweaty; rotting vegetables; NH ₃	Sour; bland; fishy	May still be lumpy but the segments are softer than for 2
0	Strong ammoniacal; faecal; urinal; acrid/scorched cloth; soapy	Soapy; bitter	Very soft; pulpy

2.12. Cooked Scallops

<u>Score</u>	<u>Cooked Odour</u>	<u>Cooked Flavour</u>	<u>Cooked Texture</u>
5	Sweet milky; condensed milk	Intensely sweet; cloying	Chewy; fibrous; rubbery
4	Slight milky sweet; seaweed	Less sweet; milky	
3	Neutral; musty	Neutral; slightly musty; some residual sweetness	Slightly chewy; slightly soft
2	Slightly sour	Sour; bitter; off; some sweetness may still be detectable	Soft; gelatinous; sticky
1	Sour; sweaty; ammoniacal		
0	Sulphide; faecal; stale cabbage	Very bitter; off; rubber; nauseating	

2.13. Nephrops shell-on tails

Nephrops - raw

<u>Score</u>	<u>Appearance</u>	<u>Odour</u>
5	Shells bright, clean, rosy pink. Telson and swimmerets clean. Flesh on ventral side clean, white and translucent.	Shellfish, marine, seaweed
4	Loss of brightness of shell with some dulling. Loss of translucence of flesh on ventral side. No blackening of shell apparent.	Slight shellfish, slight marine, very slight ammonia
3	Some darkening of shell along the joint between the segments. Shells appear dull. Some slight discoloration on the telson. Swimmerets showing some darkening.	Slight ammonia, loss of characteristic shellfish odour
2	Darkening of the shell more apparent. Dark lines between the segments extend and join together. Dark spots on telson. Swimmerets show intensive darkening and black spots.	Moderate ammonia, sour and off
1	Generalised blackening of the shell with discoloration from the segment joints spreading to the complete shell.	Strong ammonia, strong, sour and off, stale
0	Shells completely black.	Very strong ammonia, putrid

Nephrops - cooked

Score	Odour	Flavour	Texture, mouth-feel and appearance	Score
5	Milky-sweet, seaweed. Slightly sulphurous, characteristic shellfish	Intensely sweet, metallic	Very firm, crisp	5
4	Milky, creamy, slight ammonia	Very sweet, creamy, milky	Firm	4
3	Slight ammonia, loss of milkiness	Sweet	Slightly soft	3
2	Ammonia	Loss of sweetness, neutral	Soft	2
1	Strong ammonia	Sour, off, creamy-sour	Very soft	1
0	Strong ammonia, sour	Strong off-flavour, bitter, very sour	Sloppy, little texture	0

2.14. Cooked squid

Score	Cooked flavour of squid	Days in ice
10	fresh, characteristic of shellfish, sweet, meaty	0-1
9	slight loss of freshness, creamy, sweet, meaty, metallic	
8	slightly sweet, slightly meaty, creamy, milky	6-8
7	no sweetness, caramel	
6	neutral	8-10
5	slightly sour	
4	sour, musty, cabbage	
3	slightly bitter, overripe cheese, oily, slight sulphide	13-14
2	bitter, sulphide	
1	strongly bitter, putrid	

2.15 Cold Storage Deterioration

Score	Cold Store Flavour	Firmness	Dryness
0	Absent	Very soft	Sloppy, watery
1	Very slight	Softer than normal	Juicy (equivalent to 3 day old iced unfrozen fish)
2	Slight	Firm (equivalent to normal 3 day old iced unfrozen fish)	Slightly dry
3	Moderate	Slightly firmer than normal	Dry
4	Strong	Slightly tough	Extremely dry
5	Very strong	Tough	
6		Extremely tough	

Ideal Score =

0

2

1

2.16 Simple scoring system for smoked fish

Freshness	Characteristics of Chilled Fish	Characteristics of Frozen Fish	Cooked Eating Qualities
Good (Desirable)	<p>Appearance: no gaping or discolouration, cold smoked fillets glossy. Maybe less on smoked defrosted fish</p> <p>Texture: Cold smoked fish firm and elastic</p> <p>Odour: 'fresh', smoky</p>	<p>Frozen Appearance: No freezer burn or ice crystals on surface</p> <p>Thawed Appearance: Similar to chilled fish</p> <p>Thawed Texture and Odour: Similar to chilled fish</p> <p>Drip: Negligible release of drip on thawing</p>	<p>Chilled Fish Flavour: Mild, fresh smoky flavours Sweet flavours Flavour characteristic of species Not strongly salty</p> <p>Frozen Fish Flavour: As above No cold storage flavour</p>
Medium (Acceptable)	<p>Appearance: Cold smoked fillets less glossy. Maybe even less on smoked defrosted fish</p> <p>Texture: Cold smoked fillets less firm and elastic</p> <p>Odour: Slightly stale</p>	<p>Frozen Appearance: Could have some freezer burn and a few ice crystals on surface</p> <p>Thawed Appearance: Similar to chilled fish</p> <p>Thawed Texture and Odour: Similar to chilled fish</p> <p>Drip: Noticeable release of drip on thawing</p>	<p>Chilled Fish Flavour: Mild, smoky flavour Slightly stale flavour Not strongly salty</p> <p>Frozen Fish Flavour: As above Cold storage flavour just detectable</p>
Poor (Unacceptable)	<p>Appearance: Cold smoked fillets with no gloss. Gaping of fillets. Discolouration especially along lateral line and on belly flaps. Possible pink colouration of fillet</p> <p>Texture: Cold smoked fillets soft and inelastic</p> <p>Odour: Stale, rancid or putrid</p>	<p>Frozen Appearance: Obvious freezer burn with large quantities of ice crystals on surface</p> <p>Thawed Appearance: Similar to chilled fish</p> <p>Thawed Texture and Odour: Similar to chilled fish</p> <p>Drip: Copious quantities of drip released on thawing</p>	<p>Chilled Fish Flavour: Sour, bitter, rancid, acrid, resinous, musty or strong salty flavours Strong 'off' odours, ammoniacal</p> <p>Frozen Fish Flavour: As above Well developed cold storage flavour and texture tough and dry from cold storage</p>

3.0. QIM Schemes

The following pages include QIM sensory assessment schemes for a variety of species. These are taken from schemes published by various authors.

3.1. Quality Index Method (QIM) Scheme for Cod

Appearance	Skin	Bright, Iridescent pigmentation	0
		Rather dull, becoming discoloured	1
		Dull	2
	Stiffness	In rigour	0
		Firm, elastic	1
		Soft	2
		Very soft	3
Eyes	Cornea	Clear	0
		Opalescent	1
		Milky	2
	Form	Convex	0
		Flat, slightly sunken	1
		Sunken, concave	2
	Pupil	Black	0
Opaque		1	
Grey		2	
Gills	Colour	Bright	0
		Less Coloured, becoming discoloured	1
		Discoloured, brown spots	2
		Brown, discoloured	3
	Odour	Fresh, seaweedy, metallic	0
		Neutral, grassy, musty	1
		Yeast, bread, beer, sour milk	2
		Acetic acid, sulphuric, very sour	3
	Mucus	Clear	0
		Milky	1
Milky, dark, opaque		2	
Flesh, fillets	Colour	Translucent, bluish	0
		Waxy, milky	1
		Opaque, yellow, brown spots	2
Blood	Colour	Red	0
		Dark red	1
		Brown	2
Quality Index			0-23

3.2. Quality Index Method (QIM) Scheme for Haddock

Quality parameter	Description	Score	
Appearance	Skin	Bright, iridescent pigmentation	0
		Rather dull, becoming discoloured	1
		Dull	2
	Stiffness	In rigor	0
		Firm, elastic	1
		Soft	2
Very soft		3	
Eyes	Cornea	Clear	0
		Opalescent	1
		Milky	2
	Form	Convex	0
		Flat, slightly sunken	1
		Sunken, concave	2
	Pupil	Black	0
		Opaque	1
		Grey	2
Gills	Colour	Bright	0
		Less Coloured, becoming discoloured	1
		Discoloured, brown spots	2
		Brown, discoloured	3
	Odour	Fresh, seaweedy, metallic	0
		Neutral, grassy, musty	1
		Yeast, bread, beer, sour milk	2
		Acetic acid, sulphuric, very sour	3
	Mucus	Clear	0
		Milky	1
		Milky, dark, opaque	2
	Flesh, fillets	Colour	Translucent, bluish
Waxy, Milky			1
Opaque, yellow, brown spots			2
Blood	Colour	Red	0
		Dark red	1
		Brown	2
Quality Index		0-23	

3.3. Quality Index Method (QIM) Scheme for Redfish

Quality parameter	Description	Score	
Appearance	Skin	Bright, iridescent pigmentation	0
		Rather dull, becoming discoloured	1
		Dull	2
	Stiffness	In rigor	0
		Firm, elastic	1
		Soft	2
		Very soft	3
Eyes	Cornea	Clear	0
		Opalescent	1
		Milky	2
	Form	Convex	0
		Flat, slightly sunken	1
		Sunken, concave	2
	Pupil	Black	0
		Opaque	1
		Grey	2
Gills	Colour	Blood red	0
		Reminds of beef	1
		Reddish areas	2
		Rusty, dark brown	3
	Odour	Fresh, seaweedy, metallic	0
		Neutral, grassy, musty	1
		Yeast, bread, beer, sour milk	2
		Acetic acid, sulphuric, very sour	3
	Mucus	Clear	0
		Milky	1
		Discoloured, rusty, brown, clotted	2
	Flesh, fillets	Colour	Translucent, bluish
Waxy, milky			1
Opaque, yellow, brown spots			2
Viscera	Solution	Whole	0
		Beginning to dissolve	1
		Viscera dissolved	2
Quality Index		0-23	

3.4 Quality Index Method (QIM) Scheme for Farmed Salmon

Quality parameter	Description	Score	
Skin	Colour/ appearance	Pearl-shiny all over the skin	0
		The skin is less pearl-shiny	1
		The fish is yellowish, mainly near the abdomen	2
	Mucus	Clear, not clotted	0
		Milky, clotted	1
		Yellow and clotted	2
	Odour	Fresh, seaweedy, neutral	0
		Cucumber, metal, hay	1
		Sour, dish cloth	2
		Rotten	3
	Texture	In rigor	0
		Finger mark disappears rapidly	1
		Finger leaves mark over 3 seconds	2
Eyes	Pupils	Clear and black, metal shiny	0
		Dark grey	1
		Matt, grey	2
	Form	Convex	0
		Flat	1
		Sunken	2
Gills	Colour	Red/dark brown	0
		Pale red, pink/light brown	1
		Grey-brown, brown, grey, green	2
	Mucus	Transparent	0
		Milky, clotted	1
		Brown, clotted	2
	Odour	Fresh, seaweed	0
		Metal, cucumber	1
		Sour, mouldy	2
Rotten		3	
Abdomen	Blood in Abdomen	Blood red/not present	0
		Blood more brown, yellowish	1
	Odour	Neutral	0
		Cucumber, melon	1
		Sour, fermenting	2
	Rotten/rotten cabbage	3	
Quality Index		0-24	

3.5 Quality Index Method (QIM) Scheme for Coley (Saithe)

Quality parameter	Description	Score	
Appearance	Skin	Bright, iridescent pigmentation	0
		Rather dull, becoming discoloured	1
		Dull	2
	Stiffness	In rigor	0
		Firm, elastic	1
		Soft	2
		Very soft	3
Eyes	Cornea	Clear	0
		Opalescent	1
		Milky	2
	Form	Convex	0
		Flat, slightly sunken	1
		Sunken	2
	Pupil	Black	0
		Opaque	1
		Grey	2
Gills	Colour	Blood red	0
		Reminds of beef	1
		Reddish areas	2
		Rusty, dark brown	3
	Odour	Fresh, seaweedy, metallic	0
		Neutral, grassy, musty	1
		Yeast, bread, beef, sour milk	2
		Acetic acid, sulphuric, very sour	3
	Mucus	Clear	0
Milky		1	
Discoloured, rusty, brown, clotted		2	
Flesh, fillets	Colour	Translucent, bluish	0
		Waxy, milky	1
		Opaque, yellow, brown spots	2
Blood	Colour	Red	0
		Dark red	1
		Brown	2
Quality Index		0-23	

3.6. Quality Index Method (QIM) Scheme for Herring

Quality parameter	Description	Score	
Appearance	Skin	Very Shiny	0
		Shiny	1
		Matt	2
	Blood on Gill cover	None	0
		Very little (10-30%)	1
		Some (30-50%)	2
		Much (50-100%)	3
	Consistency	Hard	0
		Firm	1
		Yielding	2
		Soft	3
	Belly	Firm	0
		Soft	1
		Burst	2
	Odour	Fresh sea odour	0
Neutral		1	
Slightly secondary odour		2	
Strong secondary odour		3	
Eyes	Brightness	Bright	0
		Somewhat lustreless	1
	Shape	Convex	0
		Flat	1
		Sunken	2
Gills	Colour	Characteristic red	0
		Somewhat pale, on-glossy, opaque	1
	Odour	Fresh, seaweedy, metallic	0
		Neutral	1
		Some secondary odour	2
	Strong secondary odour	3	
Quality Index		0-20	

3.7 Quality Index Method (QIM) Scheme for Brill

Quality parameter	Description	Score	
Appearance	Dark side	Fresh, bright, no discolouration	0
		Rather dull and pale	1
		Green/grey spoilage tints around fins and cut surface	2
		Matt, discoloured, grey, green spoilage tints, green fins	3
	White side	Fresh, crème white, bronze glow, clear muscle segmentation	0
		Rather dull, less clear muscle segmentation	1
		Some green/grey spoilage tints around fins and cut surface	2
		Blue/green aura, purple spoilage tints	3
	Mucus	Clear, not clotted	0
		Slightly clotted and milky	1
		Clotted and slightly yellow	2
		Yellow and clotted	3
	Texture, Backside	Firm, elastic (In rigor)	0
Less firm, elastic		1	
Soft		2	
Very soft, skin seems loosened from the flesh		2	
Eyes	Form	Flat, eye socked convex	0
		Slightly sunken, eye socked shrunken	1
		Sunken and or swollen	2
	Brightness	Black and clear, golden rim around the pupil	0
Rather matt		1	
Matt, reddish		2	
Gills	Odour	Fresh, seaweedy, pepper	0
		Neutral, hint of musty odour	1
		Musty, yeast, bread, sour milk	2
		Rotten, sour, sulphurous	3
	Colour	Bright, red	0
		Slightly discoloured, brown/red	1
		Discoloured, brown/yellow/green	2
		Discoloured, dark brown/green	3
	Mucus	Slight traces of clear mucus	0
		Milky	1
Yellow, grey, brown, clotted		2	
Yellow, green, clotted		3	
Flesh, fillets	Colour	Fresh, crème white	0
		Slightly yellowish, waxy	1
		Yellow, brownish, discoloured	2
		Yellow, red/brown, greenish, discoloured	3
Quality Index		0-28	

3.8 Quality Index Method (QIM) Scheme for Plaice

Quality parameter	Description	Score	
Appearance	Skin (both dark and white side)	Fresh, bright, metallic, no discolouration	0
		Bright, but without shine	1
		Matt, rather dull, slight green/blue or purple discolouration	2
		Dull, green/blue, purple discolouration	3
	Mucus	Clear, not clotted	0
		Slightly clotted and milky	1
		Clotted and slightly yellow	2
		Yellow and clotted	3
Eyes	Form	Convex	0
		Convex but slightly sunken	1
		Flat or swollen (like a balloon)	2
		Flat, sunken in the middle	3
	Brightness	Clear, black shining pupil	0
		Rather matt, black pupil	1
		Matt, opaque pupil	2
		Milky, grey pupil	3
Gills	Odour	Fresh oil, seaweedy, metallic, peppery	0
		Neutral, oily, grassy, slightly musty	1
		Musty, bread, beer, malt, slightly rancid	2
		Rancid, sour, rotten, sulphurous	3
	Colour	Bright, light red	0
		Slightly discoloured, especially at the end of gill filaments	1
		Discoloured	2
		Yellowish, brown, grey	3
	Mucus	No mucus	0
		Clear	1
		Yellowish, slightly clotted	2
		Yellow, brown, clotted	3
Flesh, fillets	Colour	Fresh, translucent, bluish	0
		Waxy, milky	1
		Dull, slightly discoloured, yellowish	2
		Opaque, discoloured, yellow, brown	3
Quality Index		0-24	

3.9 Quality index Method (QIM) Scheme for Sole

Quality parameter	Description	Score	
Appearance	Dark side	Fresh, bright, no discolouration	0
		Rather dull or pale, somewhat shrunken skin	1
		Dull, pale, some green or purple discolouration	2
		Dull, green and purple discolouration, very shrunken skin	3
	White side	Fresh, bright, no discolouration	0
		Some purple discolouration at the edges of the fins	1
		Dull, purple, yellow discolouration at fins and in the middle	2
		Yellow and purple discolouration	3
	Mucus	Clear, not clotted	0
		Slightly clotted and milky	1
		Clotted and slightly yellow	2
		Yellow and clotted	3
	Texture, Backside	Firm, elastic (In rigor)	0
		Less firm, elastic	1
		Soft	2
		Very soft	3
Eyes	Form	Flat, eye socked convex	0
		Slightly sunken, eye socked shrunken	1
		Sunken and/or swollen, eye socked shrunken	2
	Brightness	Black and clear, golden rim around pupil	0
		Rather matt, faint golden rim around the pupil	1
		Matt, purple/reddish	2
Gills	Odour	Fresh, seaweedy	0
		Neutral, metallic, rubbery	1
		Musty, sour	2
		Rotten, sour, sulphurous	3
	Colour	Bright, light red	0
		Slightly discoloured, gill cover light brown	1
		Discoloured, gill cover brown	2
		Yellowish, green/blue discolouration	3
	Mucus	No mucus	0
		Clear	1
		Milky, slightly clotted	2
		Yellow, thick, clotted	3
Flesh, fillets	Colour	Fresh, crème white	0
		Slightly yellowish	1
		Yellow, discoloured	2
		Yellow, brown, blue, discoloured	3
Quality Index		0-28	

3.10 Quality Index Method (QIM) Scheme for Turbot

Quality parameter	Description	Score	
Appearance	Dark side	Fresh, bright, no discolouration	0
		Rather dull or pale, somewhat darker and shrunken skin	1
		Dull, pale, fins are greenish and discoloured	2
		Dull, green and purple discolouration	3
	White side	Fresh, bright, wound near the tails is fresh red	0
		Rather matt, wound near the tails is yellow/brownish	1
		Matt, yellowish, wound near the tails is brown	2
		Yellow and purple discolouration	3
	Mucus	Clear not clotted	0
		Slightly clotted and milky	1
		Clotted and slightly yellow	2
		Yellow and clotted	3
	Texture, backside	Firm, elastic (In rigor)	0
		Less firm, elastic	1
		Soft	2
		Very soft	3
Eyes	Form	Flat, eye socked convex	0
		Slightly sunken, eye socked shrunken	1
		Sunken and/or swollen, eye socked shrunken	2
	Brightness	Black and clear, golden rim around pupil	0
		Rather matt, faint golden rim around the pupil	1
		Matt, purple/reddish	2
Gills	Odour	Fresh, seaweedy	0
		Neutral, metallic, rubbery	1
		Musty, sour	2
		Rotten, sour, sulphurous	3
	Colour	Bright, light red	0
		Slightly discoloured	1
		Discoloured, light brown	2
		Yellowish, green/blue, brown	3
	Mucus	No mucus	0
		Clear	1
		Milky, slightly clotted	2
		Yellow, thick, clotted	3
Flesh, fillets	Colour	Fresh, crème white	0
		Slightly yellowish	1
		Yellow, discoloured	2
		Yellow, brown, blue, discoloured	3
Quality Index		0-28	

3.11 Quality Index Method (QIM) Scheme for Gurnard

	Attribute	Description	Score
Appearance	Skin appearance	Fresh, bright red-orange colours, metallic/bronze side line, cream-white belly	0
		Less bright, less red-orange, some greyish discolouration	1
		Dull, greyish, putrefaction colour	2
	Skin mucus	Clear, not clotted	0
		Milky, slightly clotted	1
		Yellow, brown, clotted	2
Eyes	Eye form	Convex	0
		Flat, slightly sunken	1
		Sunken	2
	Eye clarity	Clear cornea, clear black pupil, clear yellow border around pupil	0
		Cornea slightly clouded, dull pupil, yellow border less defined	1
		Milky cornea, milky pupil	2
Grey or red cornea, grey pupil		3	
Gills	Gill odour	Fresh, seaweed, metallic grass	0
		Neutral, metallic, slightly musty	1
		Musty	2
		Sour, rotten, faecal	3
	Gill colour	Bright, red	0
		Less bright, red	1
		Discoloured, yellow spots	2
		Yellow / brown discolouration	3
	Gill mucus	No mucus or clear mucus, lamellae slightly sticky	0
Milky mucus, lamellae sticky		1	
Yellow brown mucus, lamellae sticky		2	
Flesh texture	Texture	In rigor	0
		Firm, elastic	1
		Less firm, less elastic	2
		Soft	3
Fins	Fins	Bright colours, colours well differentiated	0
		Less bright, colours less differentiated	1
		Grey-brown, colours not differentiated	2
		Total score	0 - 22

3.12 QIM scheme for farmed Atlantic halibut

	Attribute	Description	Score
Appearance	Dark side	Fresh bright, no discolouration	0
		Bright but without shine	1
		Dull, pale, some green discolouration	2
		Dull, purple, green, green spoilage tints	3
	White side	Fresh, bright, no discolouration	0
		Rather matt, wound near the tail is yellow	1
		Yellow / green discolouration at fins and in the middle	2
		Yellow and purple discolouration	3
	Mucus	Clear, not clotted	0
		Slightly clotted and milky	1
		Clotted and slightly yellow	2
		Clotted and yellow	3
	Texture	Firm, elastic	0
Less firm		1	
Soft		2	
Very soft		3	
Eyes	Pupils	Clear and black, golden rim around the pupil	0
		Rather matt, faint golden rim around the pupil	1
		Matt, opaque pupil, reddish	2
		Milky, grey pupil	3
	Form	Convex	0
		Convex and slightly sunken	1
		Sunken, swollen, eye socket shrunken	2
		Flat, sunken in the middle	3
Gills	Colour	Bright, red	0
		Slightly discoloured at the end of the filaments	1
		Discoloured, brown / yellow, grey	2
		Yellowish, brown, grey	3
	Mucus	No mucus	0
		Milky, clear	1
		Milky, yellow, slightly clotted	2
		Clotted, yellow, brown	3
	Odour	Fresh, seaweed	0
		Neutral, oily, grassy, metallic	1
		Musty, yeast, sour milk	2
		Rotten, rancid, sour, sulphurous	3
Flesh fillet colour	Colour	Fresh, translucent, bluish, cream	0
		Waxy, milky	1
		Yellow, brownish, discoloured	2
	QIM score		0 - 29

3.13 QIM scheme for raw, gilthead sea-bream

	Attribute	Description	Score
Appearance	Skin	Very bright	0
		Bright	1
		Dull	2
	Slime / mucus	Clear-transparent	0
	Slightly cloudy / cloudy	1	
Flesh	Elasticity	Elastic	0
		Marked by pressure	1
Odour	Odour	Fresh	0
		Neutral	1
		Fishy	2
		Off-odours	3
Eyes	Clarity	Clear translucent	0
		Slightly opaque	1
		Opaque, bloody	2
	Shape / Form	Convex	0
		Flat	1
	Concave	2	
Gills	Colour	Bright, dark red	0
		Brownish red / discoloured	1
	Odour	Fresh, seaweed	0
		Neutral	1
		Fishy	2
		Off odours	3
		QIM score	0 - 15

3.14 QIM scheme for thawed, whole cod

	Attribute	Description	Score
General	Texture	Firm texture, stiff and firm to finger touch	0
		Elastic to finger touch, marks disappear after a few seconds	1
		Fairly soft and plastic flesh, marks do not disappear	2
		Very soft, flesh is easily penetrated on pressure	3
	Remains of guts	No remains in the belly	0
		Few remains in the belly	1
		Many remains in the belly	2
	Shape of fish	Normal, round shape as freshly caught cod	0
		Fairly normal round shape with few marks after freezing	1
		Very damaged during freezing, very deformed	2
	Marks from fishing and handling	No marks	0
		A few small marks	1
Many marks		2	
Very many, big marks		3	
Odour	Odour	Fresh, marine and seaweedy	0
		Neutral	1
		Slightly sour and metallic	2
		Strong sour and metallic, Painty	3
Appearance	Appearance	Iridescent or opalescent, bright, shining, no bleaching	0
		Slight bleaching	1
		Dull and very bleached, no iridescent, freeze dried	2
Flesh colour in open spaces	Flesh colour	Open surfaces white and blood in throat cut red	0
		Open surfaces grey or slightly yellow	1
		Open surfaces yellow or brown	2
		Open surfaces very yellow and brown, milky	3
		surfaces are freeze dried	
QIM score			0 - 18

3.15 QIM scheme for fillet from thawed cod

	Attribute	Description	Score
General	Texture	Firm and stiff texture, no wateriness	0
		Slightly soft, initial wateriness	1
		Soft, wateriness noticeable	2
		Very soft and pronounced wateriness	3
	Odour	Neutral	0
		Slightly sour, off odour	1
		Very sour off odour	2
	Colour	Plain white	0
		Greyish	1
		Grey, starting yellow maybe slightly red	2
		Either yellow or very red, milky surfaces, freeze dried	3
	Blood stains	No stains	0
		A single stain (diameter less than 3mm)	1
		Single small stains (1-2 with diameter less than 5mm)	2
		Very discoloured from many stains or totally red	3
	Gaping	No gaping, coherent	0
		Slight gaping but still coherent	1
		Gaping noticeable, disrupted	2
		Gaping pronounced, disrupted	3
	Parasites	No parasites	0
One parasite		1	
More than one parasite		2	
	QIM score		0 - 16

3.16 QIM scheme for hake

	Attribute	Description	Score
Appearance	Surface	Bright, iridescent	0
		Dull, less bright	1
		Tenuous rosy-grey (pink shade in dorsal region)	2
		Tenuous yellowish rosy-grey (pink-yellow shade in dorsal region)	3
	Flesh firmness (dorsal region)	Firm, elastic	0
		Firm, less elastic	1
		Less firm, much less elastic	2
Soft		3	
Eyes	Clarity (cornea)	Transparent, bright	0
		Slightly opaque	1
		Opaque	2
	Pupils	Black, bright & circular	0
		Black, greyish, less bright	1
		Black, greyish distorted	2
		Milky grey and distorted	3
	Shape	Slightly convex	0
Plane		1	
Sunken, slightly concave		2	
Gills	Colour	Dark or bright red, little no mucus	0
		Dull red, clear mucus	1
		Brownish red, milky mucus	2
		Colourless, filaments stick together	3
	Odour	Fresh, seaweedy	0
		Fresh, slight seaweedy	1
		Slightly sweet, rancid	2
Off odours (acid, metallic, rancid)		3	
	QIM score		0 – 19

3.17 QIM scheme for frozen headed and gutted hake

	Attribute	Description	Score
General	Shape of fish	Normal round shape as freshly caught hake	0
		Mechanically damaged during freezing, deformed	1
	Surface appearance (ventral area)	Silver bright, bright shining, no bleaching	0
		Slight bleaching	1
		Dull and very bleached, freeze dried	2
	Odour	Fresh marine, seaweed	0
		Neutral, fruity	1
		Slightly sour, metallic or cold stored	2
		Strong sour and metallic, cold stored	3
	Dehydration roughness on head cut area	Between 0 – 10%	0
		Between 10 – 50%	1
		More than 50%	2
		Either yellow or very red, milky surfaces, freeze dried	3
	Firmness	Very firm	0
		Firm	1
		Soft	2
		Very soft	3
	Elasticity	Marked by pressure	0
		Not marked by pressure	1
Wateriness	None with slight pressure	0	
	Some with slight pressure	1	
	Much with slight pressure	2	
Remains of guts in the belly	None	0	
	Few	1	
	Many	2	
Catch handling (bruises or marks)	None	0	
	Few	1	
	Many	2	
		QIM score	0 – 19

3.18 QIM scheme for whole, raw octopus stored in crushed ice

	Attribute	Description	Score
Skin	Appearance / Colour	Very bright, well-marked colours, white in the clearest part of the body, skin elastic	0
		Bright, less coloured, slightly pink in the clearest parts of the body, skin with low elasticity	1
		Less bright, colourless, orange or brown spots, colour somewhat more orange, rose in the clearest parts of the body, shrunken skin	2
	Odour	Seaweedy, sea-fresh	0
		Slightly seaweedy, slightly grassy, neutral	1
		Metallic, grassy, acid, intense	2
	Mucus	Transparent, watery	0
		Slightly milk, viscous (sticky), moderate or absent	1
	Flesh	Texture	Firm, tense
Flaccid, soft			1
Eyes	Cornea	Translucent	0
		Slightly opalescent	1
		Opalescent	2
	Pupil	Black, shining	0
		Black, dark red, muddy	1
		Dark red, opaque, normally bloodstained	2
Mouth region	Colour	White, yellowish	0
		Slightly rose	1
	Odour	Seaweed or neutral	0
		Sulphurous, citric, sweet, acid	1
	Mucus	Clear	0
		Milky	1
Yellowish		2	
Arms / tentacles	Material in the sucker	As a film all over the sucker	0
		Starting to agglomerate in the centre of the sucker	1
		Completely agglomerated in the centre of the sucker	2
	QIM score		0 - 16

3.19 QIM scheme for cuttlefish (*Sepia officinalis*)

	Attribute	Description	Score
Superficial appearance	Dorsal face	Brownish with bright pigmentation, indistinct shell	0
		Still brownish, with pink tones, more distinct shell	1
		Brown to dark pink, perfectly distinct shell	2
	Ventral face	Iridescent bright white, flat mantle	0
		White with less iridescence, slightly sunken mantle, with few stretch marks	1
		Pink without iridescence, sunken mantle with stretch marks	2
	Skin	Well adherent to the flesh, resistant	0
		Slightly fragile but still adherent	1
		Fragile without adhesion	2
	odour	Seaweedy, fresh	0
Metallic or neutral		1	
Musty or grassy		2	
Ammoniacal, sour or rotten			
Eyes	Colour	Black	0
		Purple	1
		Lilac	2
		White, milky	3
	Eyelid	Clear transparent	0
		Opalescent, foggy	1
Milky opaque		2	
Head	Suckers	Well adherent, resistant	0
		Slightly detachable (3-5 per tentacle)	1
		Detachable, removable (>5 per tentacle)	2
	Tentacles	Resistant, doesn't break when pulled away	0
		Still resistant, break when pulled away	1
		Not resistant, break easily when pulled away	2
	Shape	Firm head, well defined ocular globe	0
		Head and ocular globe slightly sunken	1
		Head and ocular globe sunken and liquefied	2
Mantle cavity	Odour	Seaweedy, fresh	0
		Metallic or neutral	1
		Musty slightly sour	2
		Ammoniacal or rotten	3
	Flesh colour	Mother of pearl or pearly white	0
		Yellowish, ivory white	1
		Greyish, translucent	2
	Gills	Well defined, creamy colour	0
		Slightly liquefied, black (from the ink)	1
		Liquefied with only its filaments left	2
	Ink sac	Well defined, liquid ink	0
		Hard, thick ink	1
		Soft, waxy or gummy ink	2
QIM score		0 - 29	

3.20 QIM scheme for farmed arctic char

	Attribute	Description	Score
Skin	Colour / appearance	Pearl, shiny all over	0
		Less pearl-shiny	1
		Yellowish, mainly near the abdomen	2
	Mucus	Clear, no clotting	0
		Milky, clotted	1
		Yellow and clotted	2
	Odour	Fresh sea-weed, neutral	0
		Metal, cucumber, grass	1
		Hay, sour	2
		Rotten, dish cloth	3
	Texture	In rigor	0
		Finger mark disappears	1
		Leaves mark over 3 seconds	2
Eyes	Pupils	Clear and black, metal shiny	0
		Dark gray	1
		Matte, gray	2
	Form	Convex	0
		Flat	1
		Sunken	2
Gills	Colour / appearance	Red / flesh blood	0
		Pale pink, pink / light brown	1
		Gray-brown, brown, gray, green	2
	Mucus	Transparent	0
		Milky, clotted	1
		Brown, clotted	2
	Odour	Fresh, metal	0
		Metal, cucumber, grass	1
		Sour, mouldy	2
Rotten		3	
Abdomen	Blood in abdomen	Blood red / not present	0
		Blood brown, yellowish	1
	Odour	Neutral	0
		Cucumber, melon	1
		Sour, reminds of fermentation	2
	Rotten, rotten cabbage	3	
QIM score			0 - 24

3.21 QIM scheme for red mullet and gold-band goatfish

	Attribute	Description	Score
Skin	Colour / appearance	Very bright	0
		Bright	1
		Matt	2
	Blood on gill cover	None	0
		Some	1
		Much	2
	Texture	Hard	0
		Firm	1
		Soft	2
	Texture of belly	Firm	0
		Soft	1
		Burst	2
Odour	Fresh sea odour	0	
	Neutral	1	
	Slight off-odour	2	
	Strong off odour	3	
Eyes	Appearance	Bright	0
		Somewhat lustreless	1
	Shape	Convex	0
		Flat	1
		Sunken	2
Gills	Colour / appearance	Characteristic red	0
		Somewhat pale, matt, brown	1
	Odour	Fresh, seaweedy, metallic	0
		Neutral	1
		Some off odour	2
		Strong off odour	3
		QIM score	0 - 18

3.22 QIM scheme for raw anchovy (*E. encrasicholus*)

	Attribute	Description	Score
General appearance	Surface appearance	Very bright, iridescence bluish violet	0
		Less bright, iridescence not bluish	1
		Slightly dull, not bright	2
	Mucus / slime	Transparent watery mucus	0
		Slightly cloudy mucus	1
		Plentiful (slippery) yellowish brownish mucus	2
	Skin	Intact	0
		Slightly broken or easy to break	1
		Torn and damaged	2
Eyes	Clarity (cornea)	Clear, transparent	0
		Slightly cloudy	1
		Opaque	2
	Pupils	Bright black	0
		Dull black, not so circular	1
		Grey	2
		Grey and distorted	3
	Form / shape	Convex	0
		Flat	1
Concave		2	
Sunken		3	
Gills	Colour / appearance	Bright red	0
		Dull-red	1
		Brownish red	2
		Discoloured	3
	Odour	Seaweedy	0
		Slightly seaweedy, neutral	1
		Slightly acrid, rancid or sweet, metallic	2
Abdomen	Post gill (belly burst)	Firm	0
		Burst (<50%) and soft	1
		Burst, very soft	2
Flesh	Appearance & colour	Velvety, translucent	0
		Waxy, pink	1
		Wax-like matt, dark red colour	2
		QIM score	0 - 23

3.23 Sensory assessment score for cooked anchovy

Score	Odour	Taste	Texture
10	Characteristic of cooked anchovy	Characteristic of cooked anchovy, very succulent	Firm and elastic
9	Characteristic, less-strong	Characteristic, less strong, succulent	Slightly firm and elastic
8			Less elastic
7	Neutral, slightly sweet	Neutral, slightly sweet	Dry
6	Sweet, fruity	Slightly metallic, dry	Pasty
5	Fishy	Slightly sour, acrid or rancid	Increase of anterior attribute
4	Very fishy, acrid, sour	Bitter, sour, rancid	
3	Lactic acid, ammoniac, rancid	Ammoniac to sulphides	

3.24 QIM scheme farmed sea bass

	Attribute	Description	Score
Skin	Colour / appearance	Bright, iridescent pigmentation	0
		Rather dull, becoming discoloured (head)	1
		Green, yellowish, mainly near the abdomen	2
	Odour	Fresh seaweedy, neutral	0
		Cucumber, metal, hay	1
		Sour, dish cloth	2
		Rotten	3
	Texture	In rigor	0
		Finger mark disappear rapidly	1
Finger leaves mark for 3 seconds		2	
Eyes	Pupils	Clear and black, metal shiny	0
		Grey	1
		Matt, grey	2
	Form	Convex	0
		Flat	1
		Sunken	2
Gills	Colour	Blood red / orange	0
		Pale red, pink / light brown	1
		Grey-brown, brown, grey	2
	Odour	Fresh, seaweed, neutral	0
		Metal, grass	1
		Sour, mouldy, dish cloth	2
		Rotten	3
	Mucus	Transparent	0
		Milky, clotted	1
Brown, clotted		2	
Flesh, fillets	Colour	Translucent, bluish	0
		Waxy, milky	1
		Opaque, yellow, brown spots	2
Viscera	Solution	Whole	0
		Beginning to dissolve	1
		Viscera dissolved	2
		QIM score	0 - 22

4. Estimated Remaining Shelf Life using QIM

Results from the well-controlled storage experiment carried out by fish research institutes in Iceland (IFL), the Netherlands (RIVO) and Denmark (DIFRES) are used to predict storage time and when the QIM score has been evaluated. The end of storage time is defined when a trained sensory panel detects spoilage flavour in cooked samples of the fish. A linear relationship between the Quality Index and storage time in ice has been found and the best fit of the regression lines calculated for each species and shown in the following tables. The regression lines are used to predict storage time in ice after evaluation of the Quality Index. The remaining shelf life is found by subtracting predicted storage time from estimated shelf life.

The following tables show estimated remaining shelf life for some species.

Cod Quality Index = $1,02 \times \text{days in ice} + 1,08$ ($R^2 = 0,965$)			Haddock Quality Index = $1,226 \times \text{days in ice} + 0,62$ ($R^2 = 0,986$)		
Quality Index	Storage Time in ice (days)	Remaining shelf life (days)	Quality Index	Storage time in ice (days)	Remaining Shelf life (days)
1	1	14	1	1	14
2	2	13	2	2	13
3	3	12	3	2	13
4	3	12	4	3	12
5	4	11	5	4	11
6	5	10	6	5	10
7	6	9	7	6	9
8	7	8	8	6	9
9	8	7	9	7	8
10	8	7	10	8	7
11	9	6	11	9	6
12	10	5	12	10	5
13	11	4	13	11	4
14	12	3	14	11	4
15	13	2	15	12	3
16	13	2	16	13	2
17	14	1	17	14	1
18	16	0	18	15	0

Redfish			Farmed Salmon		
Quality Index = 1,010 x days in ice – 1,41 (R2 = 0,941)			Quality Index = 0,692 x days in ice + 1,57 (R2 = 0,953)		
Quality Index	Storage time in ice (days)	Remaining shelf life (days)	Quality Index	Storage time in ice (days)	Remaining shelf life (days)
1	2	16	1	0	20
2	3	15	2	1	19
3	4	14	3	3	17
4	5	13	4	4	16
5	6	12	5	6	14
6	7	11	6	7	13
7	8	10	7	9	11
8	9	9	8	10	10
9	10	8	9	11	9
10	11	7	10	13	7
11	12	6	11	14	6
12	13	5	12	16	4
13	14	4	13	17	3
14	15	3	14	19	1
15	16	2	15	20	0
16	17	1			
17	18	0			

Coley Quality Index = 1,040 x days in ice + 0,0			Herring Quality Index = 2,3 x days in ice + 0,97 (R2 = 0,740)		
Quality Index	Storage time in ice (days)	Remaining shelf life (days)	Quality Index	Storage time in ice (days)	Remaining shelf life (days)
1	1	17	1	0	8
2	2	16	2	0	8
3	3	15	3	0	8
4	4	14	4	1	7
5	5	13	5	1	7
6	6	12	6	2	6
7	7	11	7	2	6
8	8	10	8	3	5
9	9	9	9	3	5
10	10	8	10	3	5
11	1	7	11	4	4
12	12	6	12	4	4
13	13	6	13	5	3
14	13	5	14	5	3
15	14	4	15	6	2
16	15	3	16	6	2
17	16	2	17	6	2
18	17	1	18	7	1
			20	8	0

Brill Quality Index = 1,3108 x days in ice +0 (R2 = 0,872)			Plaice Quality Index = 1,28 x days in ice + 0 (R2 = 0,89)		
Quality Index	Storage time in ice (days)	Remaining shelf life (days)	Quality Index	Storage time in ice (days)	Remaining shelf life (days)
1	1	13	1	1	12
2	2	12	2	2	11
3	2	12	3	2	11
4	3	11	4	3	10
5	4	10	5	4	9
6	5	9	6	5	8
7	5	9	7	5	8
8	6	8	8	6	7
9	7	7	9	7	6
10	8	6	10	8	5
11	8	6	11	9	4
12	9	5	12	9	4
13	10	4	13	10	3
14	11	3	14	11	2
15	11	3	15	12	1
16	12	2	16	13	1
17	13	1	17	13	0
18	14	0			

Sole			Turbot		
Quality Index + 1,85 x days in ice + 0 (R2 = 0,91)			Quality Index = 2,205 x days in ice + 0 (R2 = 0,89)		
Quality Index	Storage time in ice (days)	Remaining Shelf life (days)	Quality Index	Storage time in ice (days)	Remaining shelf life (days)
1	1	14	1	0	13
2	1	14	2	1	12
3	2	13	3	1	12
4	2	13	4	2	11
5	3	12	5	2	11
6	3	12	6	3	10
7	4	11	7	3	10
8	4	11	8	4	9
9	5	10	9	4	9
10	5	10	10	5	8
11	6	9	11	5	8
12	6	9	12	5	8
13	7	8	13	6	7
14	8	7	14	6	7
15	8	7	15	7	6
16	9	6	16	7	6
17	9	6	17	8	5
18	10	5	18	8	5
19	10	5	19	9	4
20	11	4	20	9	4
21	11	4	21	10	3
22	12	3	22	10	3
23	12	3	23	10	3
24	13	2	24	11	2
25	14	1	25	11	2
26	14	1	26	12	1
27	15	0	27	12	1
			28	13	0