



THE ASSESSMENT OF FRESHNESS USING TORRY and QIM SCHEMES

CHECKLISTS

TORRY Freshness Scoring System for Iced Raw Cod

SCORE	EYES	SKIN	TEXTURE AND EFFECT OF RIGOR MORTIS	FLESH AND BELLY FLAPS	KIDNEY AND BLOOD	GILLS - APPEARANCE	GILLS - ODOUR	SCORE
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	Bright red, blood flows readily	Glossy, bright red or pink, clear mucus	Initially very little odour increasing to sharp, iodine, changing to less sharp sea-weedy shellfish odours	10
9	Convex lens, black pupil with slight 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			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 surface of belly flaps	Slight loss of brightness, some browning	Loss of gloss and brightness, slight loss of colour	Freshly cut grass. Sea-weedy and shellfish odours just detectable	8
7								Slight mousy, musty, milky or caprylic
6	Slightly sunken, slightly grey pupil, slight opalescent 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	Loss of brightness, some browning	Bready, malty, beery, yeasty	6
5								Lactic acid, sour milk or oily
4	Sunken, milky white pupil, opaque cornea	Further loss of skin colour. Thick yellow knotted slime with bacterial discolouration. Wrinkling of skin on nose	Softer flesh, definite grittiness	Some opacity, reddening along the backbone and brown discolouration of belly flaps	Brownish kidney blood	Brown or bleached	Lower fatty acid odours(e.g. acetic or butyric acids) composed grass, 'old boots', slightly sweet, fruity or chloroform-like	4
3								Stale cabbage water, stale turnips, 'sour sink', wet matches

Quality Index Method (QIM) Scheme for Cod

Quality Parameter	Description	Score	
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
Waxy, milky			1
Opaque, yellow, brown spots			2
Blood	Colour	Red	0
		Dark red	1
		Brown	2
Quality Index		0-23	

QIM RAW COD FISH SCORE SHEET

Assessor Name: _____

Date: _____

Descriptor	Sample Codes and scores								
Appearance									
Skin									
Stiffness									
Eyes									
Cornea									
Form									
Pupil									
Gills									
Colour									
Odour									
Mucus									
Flesh, Fillets									
Colour									
Blood									
Colour									
Quality Index									

TORRY Freshness Scoring System for Iced Raw Flatfish

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

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	

QIM RAW PLAICE FISH SCORE SHEET

Assessor Name: _____

Date: _____

Descriptor	Sample Codes and scores				
Appearance					
Skin (Dark and white sides)					
Mucus					
Eyes					
Form					
Brightness					
Gills					
Odour					
Colour					
Mucus					
Flesh, Fillets					
Colour					
Quality Index					

TORRY Freshness Scoring System for Raw Mackerel

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. Passing into rigor or in rigor.	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					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

TORRY Freshness Scoring System for Raw Herring

SCORE	APPEARANCE					ODOUR	TEXTURE	SCORE
	EYES	GILLS	SKIN	FLESH	BELLY WALLS			
10	Slightly convex. Pupil clear and black	Dark red, purple. Clear slime	Bright colours, iridescent. Few loose scales	Glossy, rosy hue. Fresh bright blood on fillet	No belly burst	Oily, marine, fresh blood, sulphide, weak odour	Firm, stiff, smooth	10
9	Flat, slightly convex. Pupil clear and black	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 but still firm and smooth	9
8	Flat, slightly convex. Slightly cloudy	Dark red, pink, slightly brown. Slight reddening of gill covers	Loss of brightness, slight bronzing. Some loose scales	Slightly opaque. Slight discolouration of belly flaps	No or very slight belly burst	Oily, musty, slight sulphide	Loss of stiffness, slight softening, smooth	8
7		Red, pink. Slight bleaching and reddening of gill of covers		Slightly opaque. Slightly brown. Slight discolouration of belly flaps				
6	Flat. Slightly cloudy	Red, pink, brown and reddening of gill covers	Dull, slight bronzing. Some dirty scales	Opaque, dull brown. Reddening on belly flaps	Slight belly burst	Musty, stale fruit, stale grass, malty, sour	Limp, slightly soft, slightly gritty	6
5	Flat, slightly sunken. Pupil cloudy, grey	Pink, brown slime, reddening of gill covers	Dull, bronzing. Dirty Scales					
4	Flat, slightly sunken. Pupil cloudy, bloodshot, discoloured		Dull, bleached. Brown slime	Opaque brown. Discoloured belly flaps and tail	Severe belly burst	Sweaty, sour sink stale meat		4

Quality Index Method (QIM) Scheme for Herring

Quality parameter	Description	Score	
Appearance	Skin	Very Shiny	0
		Shiny	1
		Matt	2
	Blood on Gillcover	None	0
		Very little (10-30%)	1
		Some (30-50%)	2
	Consistency	Much (50-100%)	3
		Hard	0
		Firm	1
		Yielding	2
	Belly	Soft	3
		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, non-glossy, opaque	1
	Odour	Fresh, seaweedy, metallic	0
		Neutral	1
		Some secondary odour	2
	Strong secondary odour	3	
Quality Index		0-20	

Estimated Remaining Shelf Life

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.

Cod

Quality Index= $1,02 \times \text{days in ice} + 1,08$
($R^2 = 0.965$)

Quality Index	Storage Time in ice (days)	Remaining shelf life (days)
---------------	----------------------------	-----------------------------

1	1	14
2	2	13
3	3	12
4	3	12
5	4	11
6	5	10
7	6	9
8	7	8
9	8	7
10	8	7
11	9	6
12	10	5
13	11	4
14	12	3
15	13	2
16	13	2
17	14	1
18	16	0

Plaice

Quality Index = $1,28 \times \text{days in ice} + 0$ ($R^2 = 0,89$)

Quality Index	Storage time in ice (days)	Remaining shelf life (days)
---------------	----------------------------	-----------------------------

1	1	12
2	2	11
3	2	11
4	3	10
5	4	9
6	5	8
7	5	8
8	6	7
9	7	6
10	8	5
11	9	4
12	9	4
13	10	3
14	11	2
15	12	1
16	13	1
17	13	0

Herring

Quality Index = $2,3 \times \text{days in ice} + 0,97$
($R^2 = 0,740$)

Quality Index	Storage time in ice (days)	Remaining shelf life (days)
---------------	----------------------------	-----------------------------

1	0	8
2	0	8
3	0	8
4	1	7
5	1	7
6	2	6
7	2	6
8	3	5
9	3	5
10	3	5
11	4	4
12	4	4
13	5	3
14	5	3
15	6	2
16	6	2
17	6	2
18	7	1
19	7	1
20	8	0