Principles of Fish Quality Assessment (Cooked and Raw Schemes)

Optional subtitle here

Optional Presenter Name

Date

Agenda

- Overview:

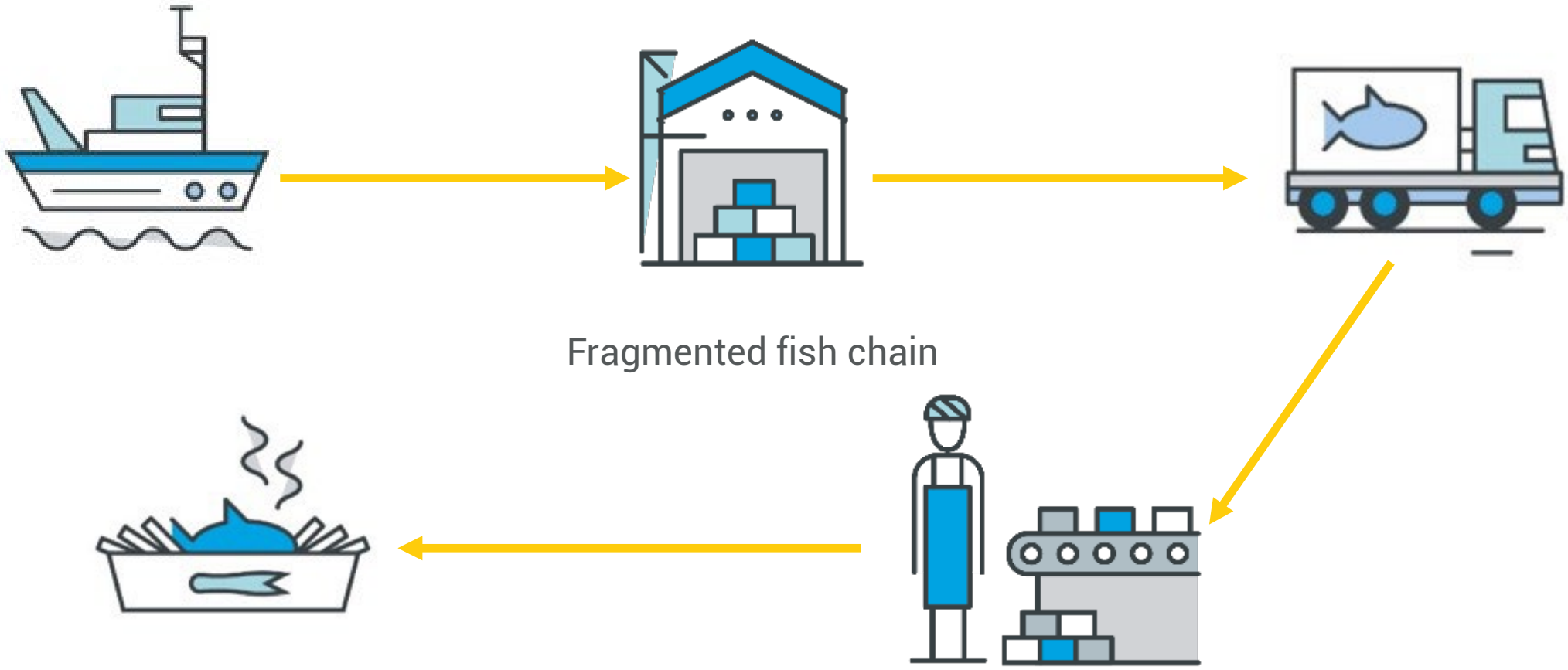
1. The fish chain
2. Background on fish quality
3. Principles of fish spoilage
4. Principles of sensory assessment
5. Torry scheme
6. Discussion

The fish chain

How do we source our fish?

- Chilled (wet)
- Frozen
- Farmed

The wet fish chain



Fragmented fish chain

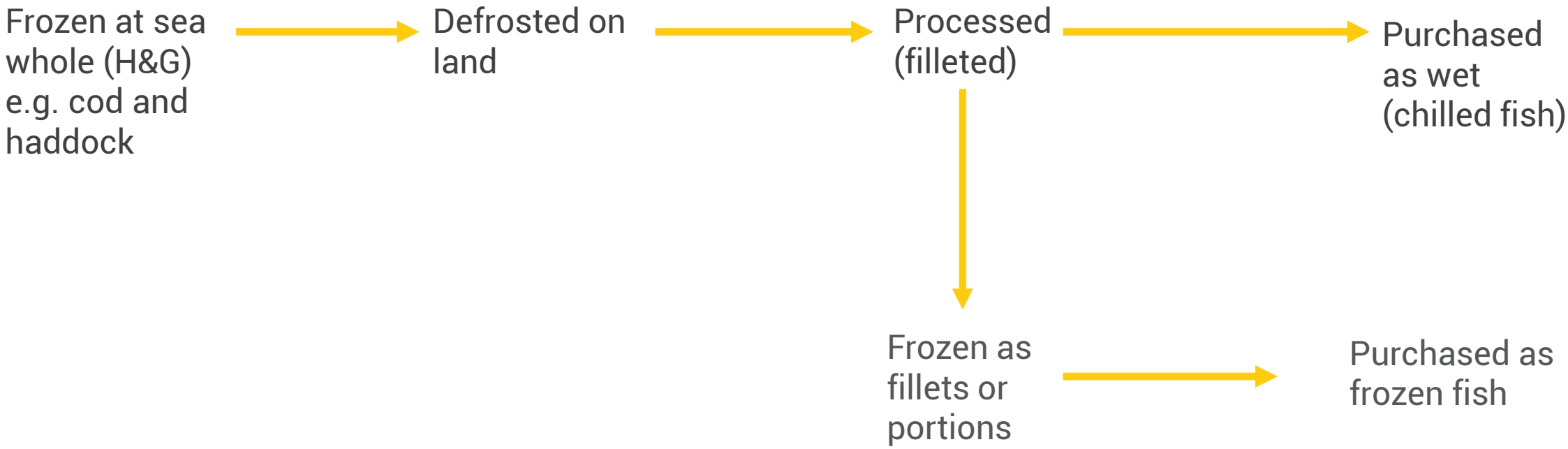
Frozen fish

- There are several forms in which fish can be frozen, processed and sold

Frozen fish

Caught and stored in ice → Processed (filleted) on land → Frozen usually as IQF fillets e.g. plaice → Purchased as frozen fish

Frozen fish


Frozen at sea whole (H&G) e.g. cod and haddock
Defrosted on land
Processed (filleted)
Purchased as wet (chilled fish)
Frozen as fillets or portions
Purchased as frozen fish

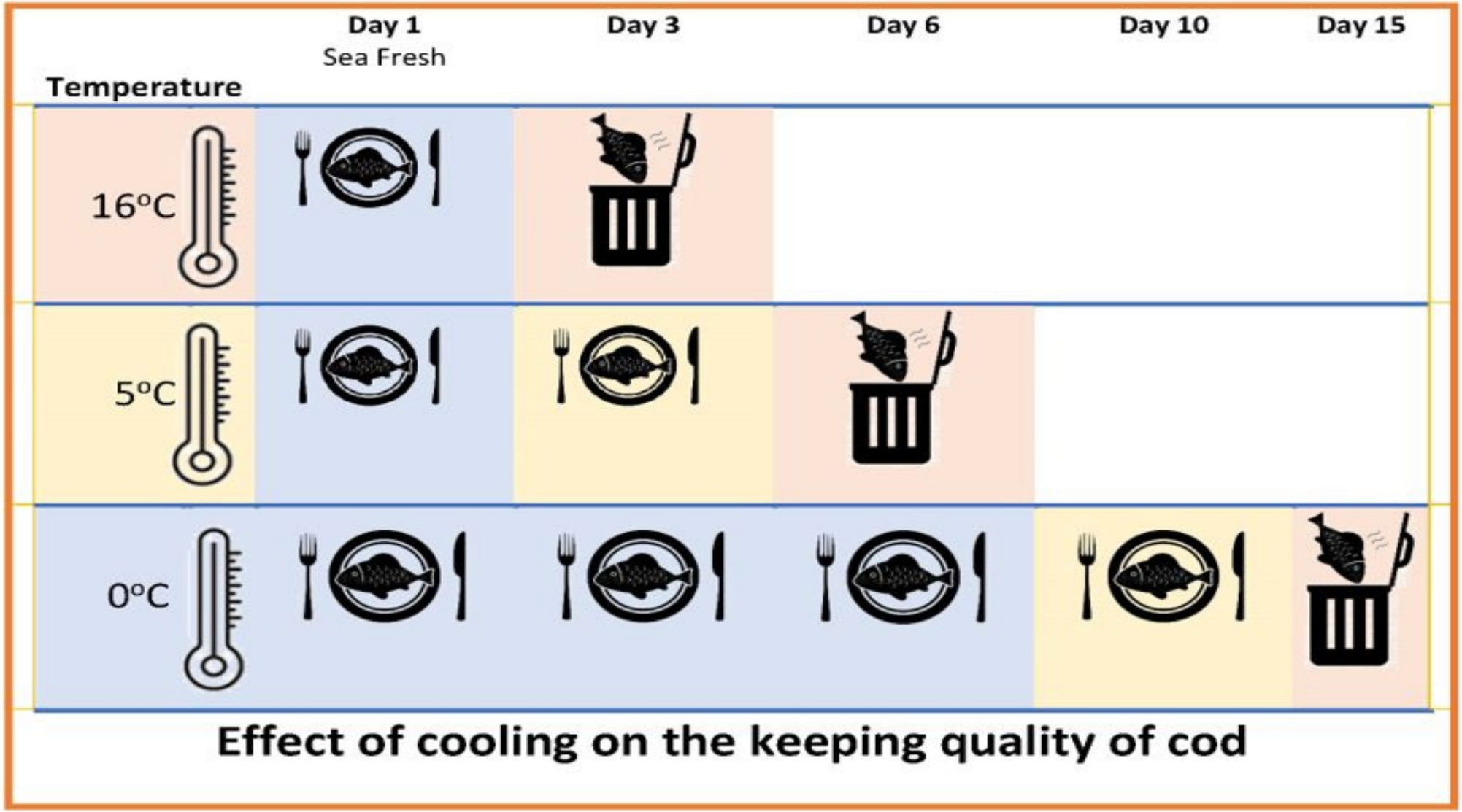
Frozen fish

Filleted at sea → Frozen at sea → Purchased as frozen fish (IQF or shatter pack)

Effect of temperature on shelf life

- Temperature is the most important criterion in maintaining fish quality
- Chilled fish should be maintained as near to 0˚C as possible, (the temperature of melting ice), at all stages of processing and distribution
- Commercially frozen fish is normally frozen at between -35ºC to -40ºC and should be stored at or below -25ºC to give the maximum shelf life

Effect of cooling on the shelf life of whole cod



Assessing fish quality

Effect of spoilage

- As fish spoils the flavours and odours increase in intensity and the fish becomes less and less acceptable

- Storage life of most white fish varieties of fish landed in the UK typically ~ 14 days at 0°C in ice

Fish quality (freshness)

- Freshness - most important single criterion for determining quality for most fish products
- Linked with value of the product
- Important to determine freshness of fish products along distribution chain (market, processor, shop)
- During storage, pleasant acceptable flavours progressively lost while unpleasant stale flavours slowly develop.
- Loss of freshness due to spoilage

How fish spoils

- Bacteria
- Enzymes
- Oxidation/rancidity

Microbial fish spoilage

- In iced fish spoilage is predominantly caused by the Pseudomonas family of bacteria
- Penetrate flesh and degrade tissue components, unpleasant odours and flavours associated with spoilage.
- Slowed by chilling
- Generally stopped by freezing

Enzymic fish spoilage

- Predominantly caused by enzymes present in the guts but also caused by enzymes released by bacteria

- Penetrate flesh and degrade tissue components:
    - producing unpleasant odours and flavours associated with spoilage

- Not stopped by freezing

Fish spoilage due to rancidity

- Rancidity is caused by the oxidation of the fats and oils present in the flesh – mainly affects pelagic species
- Much slower type of spoilage
- Not stopped by freezing but only by the exclusion of oxygen

Methods of assessment

Methods of assessment

- Microbiological (bacteriological) analysis
- Chemical analysis
- Electrical methods
- Organoleptic assessment

Bacteriological analysis

- Expensive
- Time consuming
- Not a good indicator of fish quality (total numbers of bacteria not a reliable measurement of quality)
- Important as indicator of food safety in RTE foods

Chemical analysis

- Based on the analysis of various breakdown products produced when fish spoil:
    - TMA (Tri-methylamine)
    - TVB (Total volatile bases)
    - Hypoxanthine
    - Peroxide value
- Expensive and time consuming

Electrical methods

- Based on the measurement of the changes in various electrical properties of the fish muscle when the fish spoils
- Three different machines have been developed
- Machines quite expensive to purchase (approx. £2000)
- Give instant result
- Results affected by outside factors - freezing, poor handling, storage in chilled seawater/saltwater ice

Organoleptic assessment

- Based on the human senses
- Two main methods of using the human senses
- Subjective or Hedonic schemes
- Objective schemes such as Torry

Hedonic scoring system

6

Like extremely

Like very much

Like

Neither like nor dislike

Dislike

Dislike very much

Dislike extremely

0

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Hedonic scoring system

- Very subjective
- Affected by personal preferences
- Unscientific

Objective schemes

- Based on the human senses
- Well-defined descriptions (relate to everyday odours and flavours)
- Personal preferences excluded

Sensory assessment of fish

- The quickest way used by buyers and inspectors on the market floor and in factories to assess fish quality
- Trained and experienced persons are generally needed to carry out tests properly
- Involves the use of human senses of sight, touch, smell and taste to detect the sequence of changes during spoilage
- Used to determine the fish quality at that point in time. Can also be used to determine the point at which fish quality will not be acceptable to the consumer (remaining shelf life)

Sensory assessment methods

- Three schemes:
  - EU (EAB) scheme (raw only)
  - Torry schemes (cooked and raw)
  - Quality Index Method – QIM (raw only)

EU (EAB) scheme

- Commonly accepted within the EU and by law, is used on fish markets
- Does not take into account differences in fish species
- Not detailed enough for most applications
- No information on remaining shelf life
- Does introduce an element of physical damage

Torry scheme

- Widely used in UK for past 70 years
- Developed at Torry laboratory in Aberdeen
- Effective objective system for sensory evaluation of fish (QC and scientific trials)
- Gives detailed evaluation of organoleptic qualities of fish (cooked)
- Needs training
- Limited number of species covered

Quality Index Method (QIM) scheme

- Developed through concerted action project harmonising activities of three leading fish labs in Europe (Denmark, Iceland and Holland)
- Effective objective system for sensory evaluation of fish (QC and scientific trials)
- Needs training
- Large number of species covered

Fish sensory assessment for fillets

- Based on the following indicators:
    - flesh colour
    - flesh texture
    - flesh odour

EU (EAB) scoring system

Fish sensory Assessment for whole fish

- Based on the following indicators:
    - eyes – colour and form (shape)
    - gills – colour, mucus (slime) and odour
    - skin – colour and mucus (slime)
    - flesh – texture and colour
    - blood – colour and consistency

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The EU grading scheme

	E Grade , (Torry 10/9)	A Grade, (Torry 8/7.5)	B Grade, (Torry 7/6/5.5)	C Grade (Unfit) (Torry 5 and below)
Skin	Bright, shining, iridescent (not redfish) or opalescent, no bleaching	Waxy, slight loss of bloom, very slight bleaching	Dull	Dull, gritty, marked bleaching and shrinkage
Outer slime	Transparent, water, white	Milky	Yellowish-grey, some clotting	Yellow-brown, very clotted and thick
Eyes	Convex, black pupil, translucent cornea	Plane, slightly opaque pupil, slightly opalescent	Slightly concave, grey pupil; opaque cornea	Completely sunken, grey pupil opaque discoloured cornea
Gills	Dark red or bright red, mucus translucent	Red or pink, mucus slightly opaque	Brown/grey and bleached, mucus opaque and thick	Brown or bleached mucus yellowish grey and clotted
Peritoneum (in gutted fish)	Glossy, brilliant; difficult to tear from flesh	Slightly dull, difficult to tear from flesh	Gritty; fairly easy to tear from flesh	Gritty, easily torn from flesh
Gill and internal odours (not plaice)	Fresh, seaweedy, shellfishy	No odour; neutral odour; trace musty, mousy, milky, capryllic, garlic or peppery	Definite musty, mousy, milky, capryllic, garlic, peppery; bready, malty, beery, lactic, slightly sour	Acetic, butyric, fruity; turnipy, amines, sulphide, faecal
Gill and internal odours (plaice)	Fresh oil, metallic, fresh-cut grass, earthy, peppery	Oily; seaweedy, aromatic, trace musty, mousy, or critic	Oily; definite musty, mousy, critic, bready, malty, beery, slightly rancid, painty	Muddy, grassy, fruity, acetic, butyric, rancid, amines, sulphide, faecal

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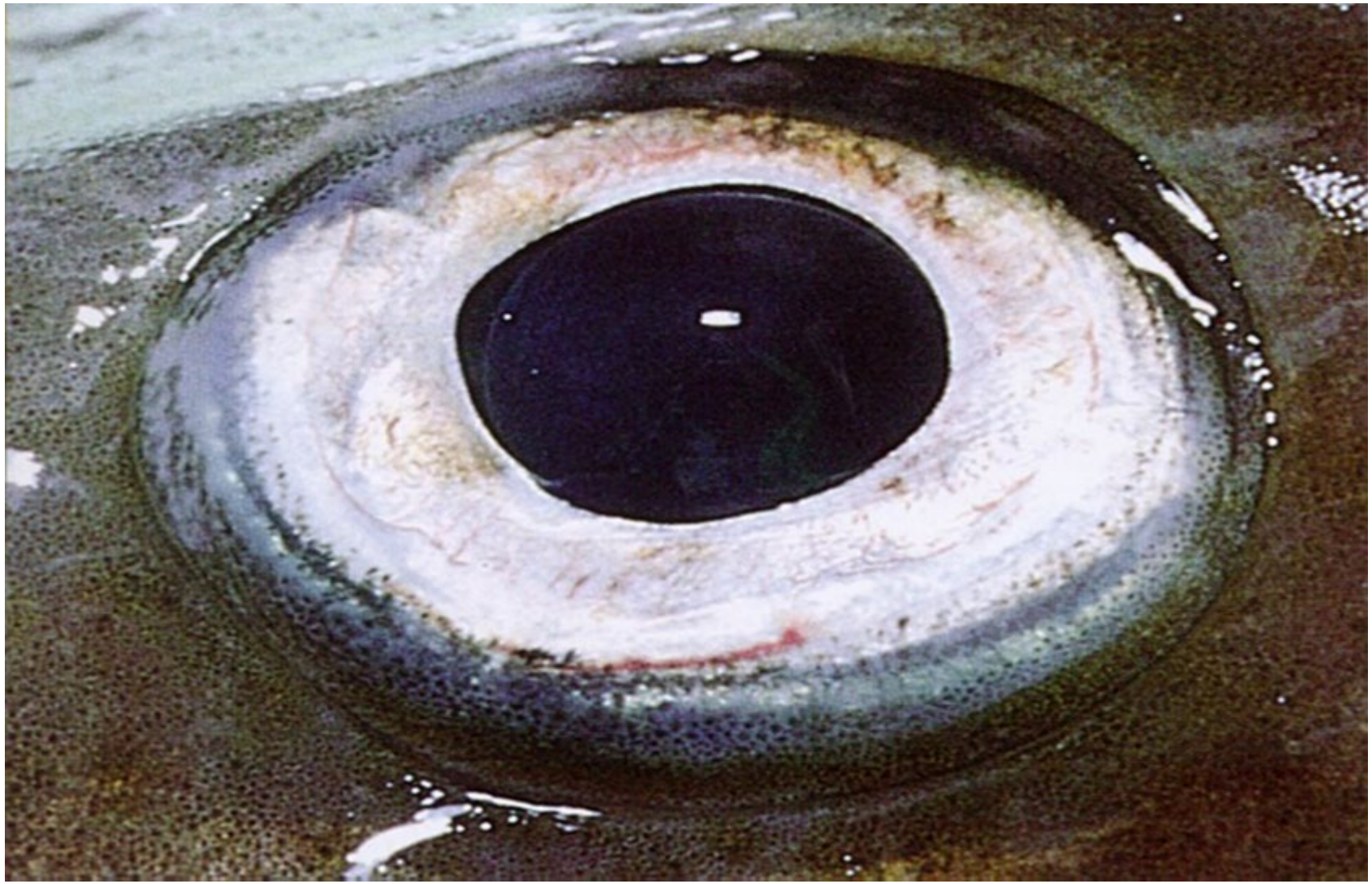
Torry scoring scheme (raw cod)

Principles of the Torry freshness scheme

- Based on objective evaluation of attributes of raw fish (colour of flesh)
- Indicator is given a score of 10 down to 0
- Storage time on ice and remaining shelf life can be estimated
- The higher the score, the fresher the fish

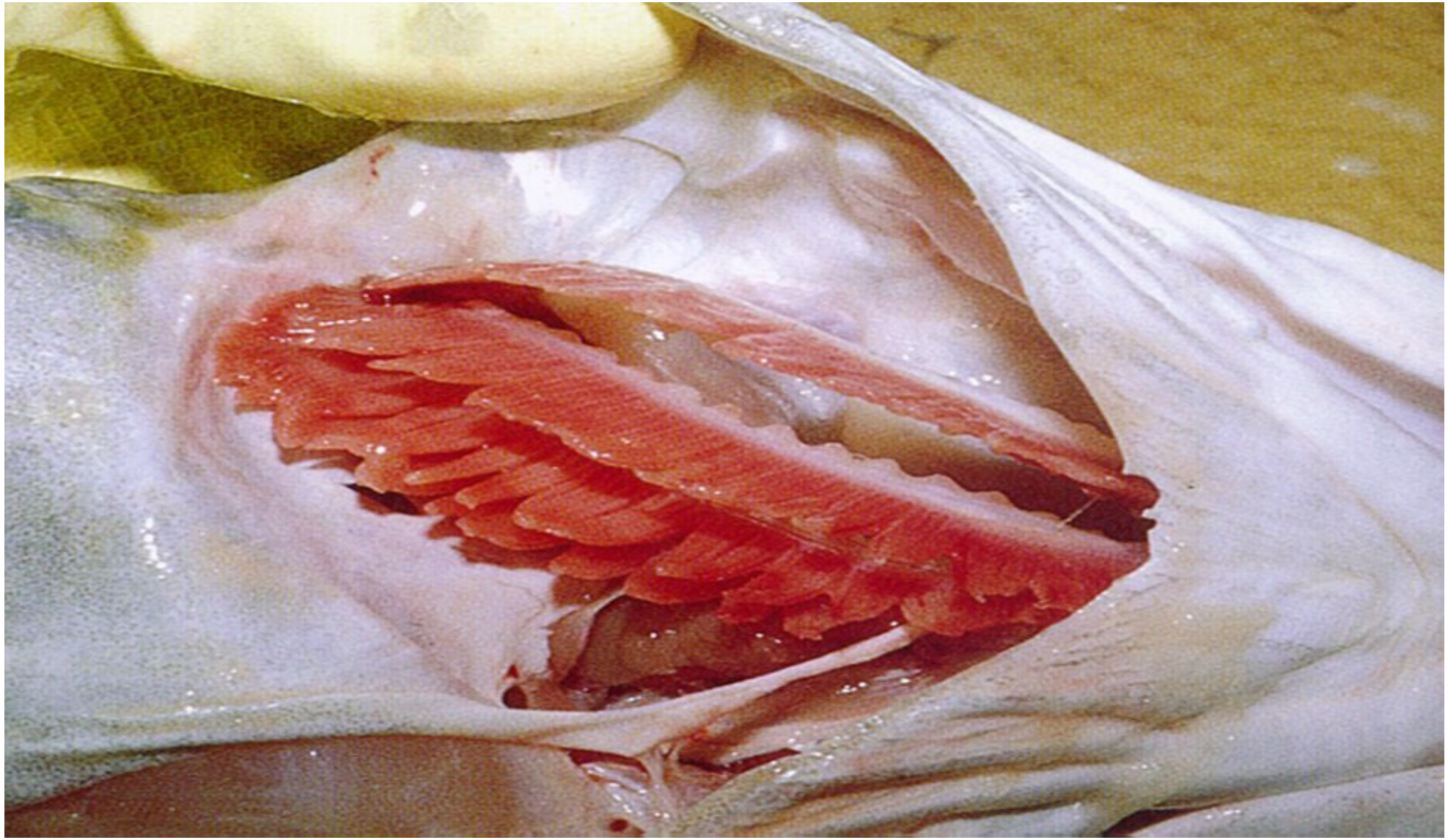
Torry freshness scores

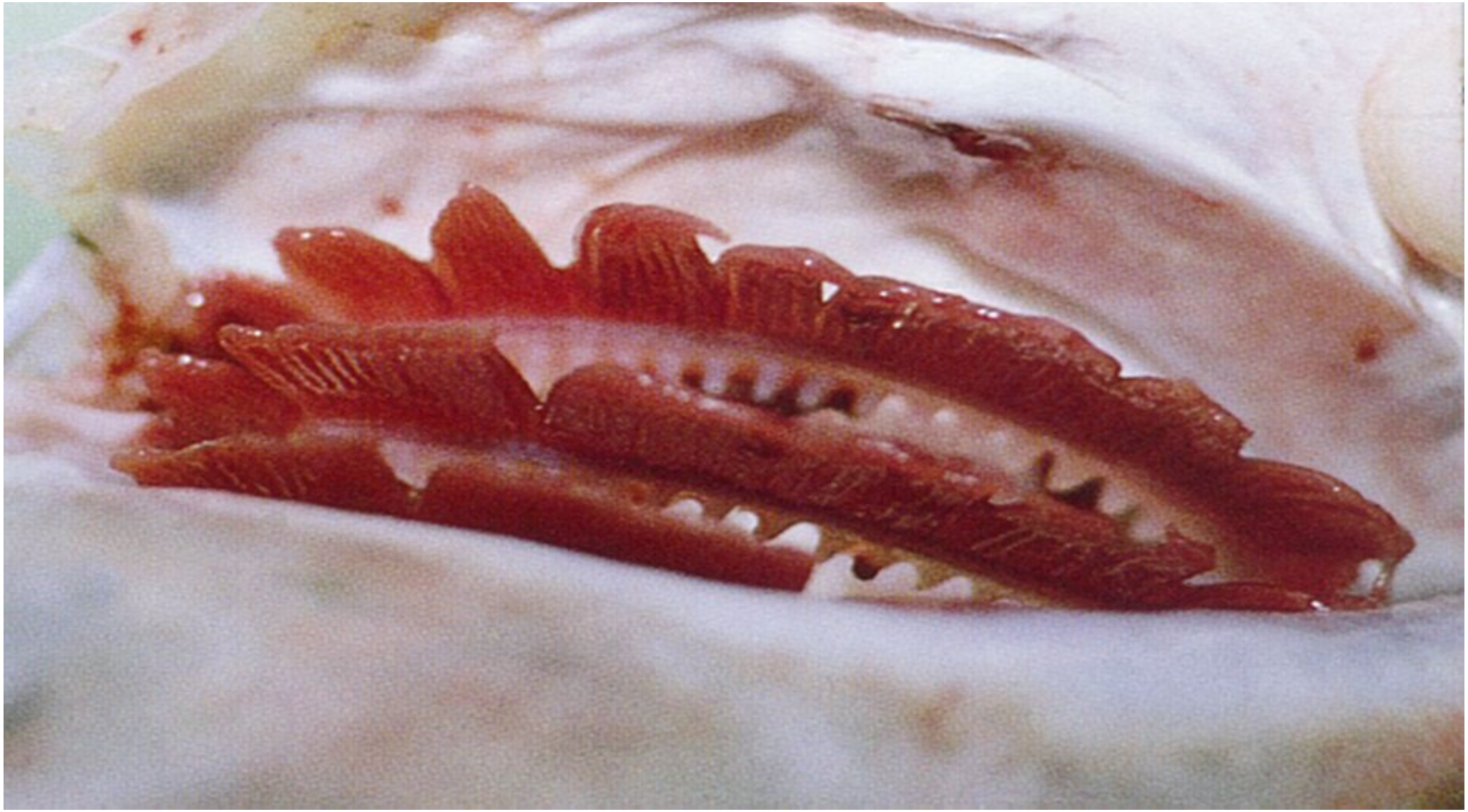
- Iced Cod ~ eyes:
    - 10 Eye bulging & convex. Pupil black. Cornea crystal clear.
    - 9 Eye still convex. Pupil black. Cornea slightly less clear.
    - 8/7 Eye slightly flatter. Pupil grey. Cornea less brilliant.
    - 6/5 Eye slightly sunken. Pupil grey. Cornea slightly opalescent.
    - 4 Eye sunken. Pupil milky white. Cornea opaque.

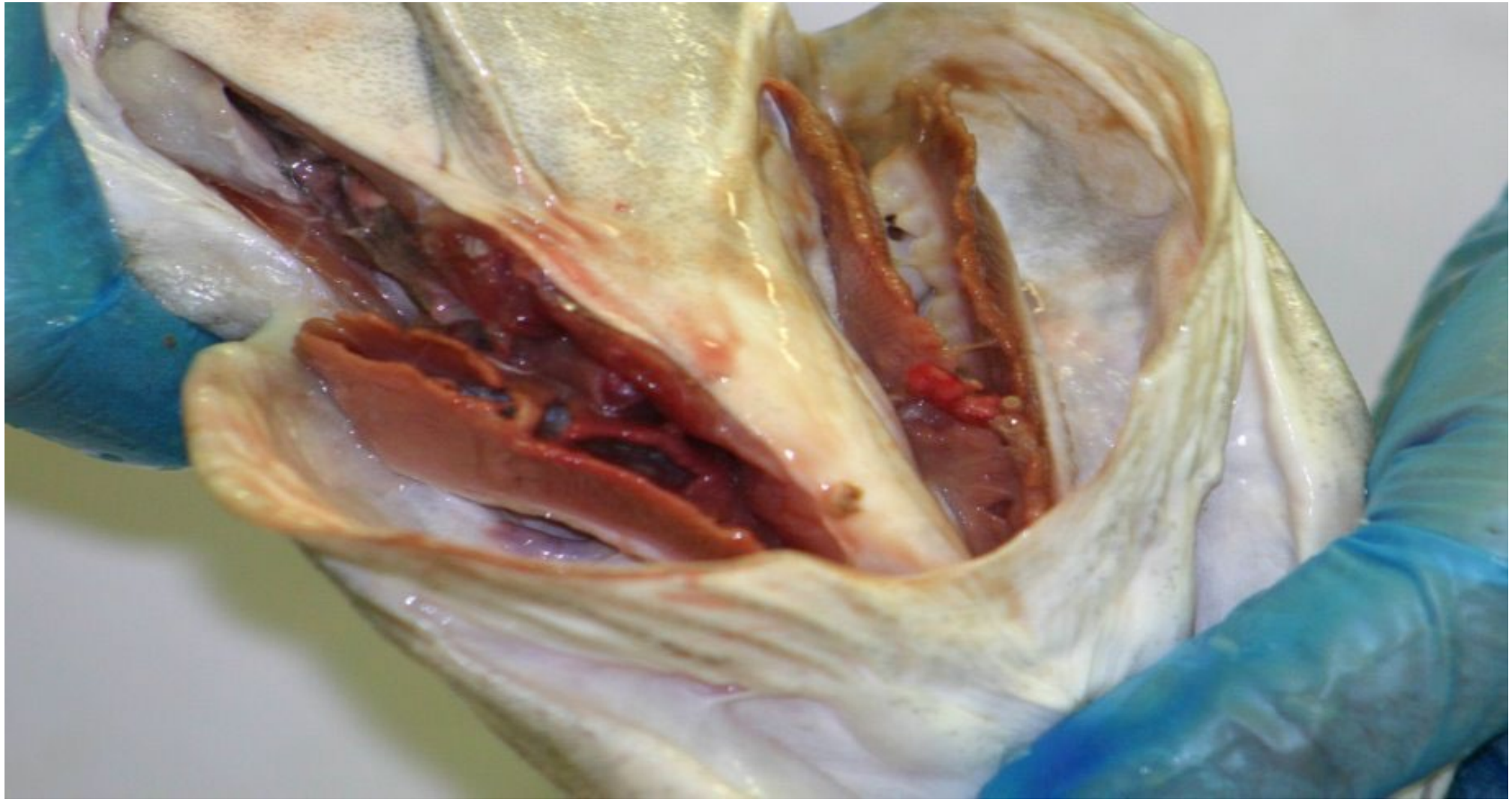


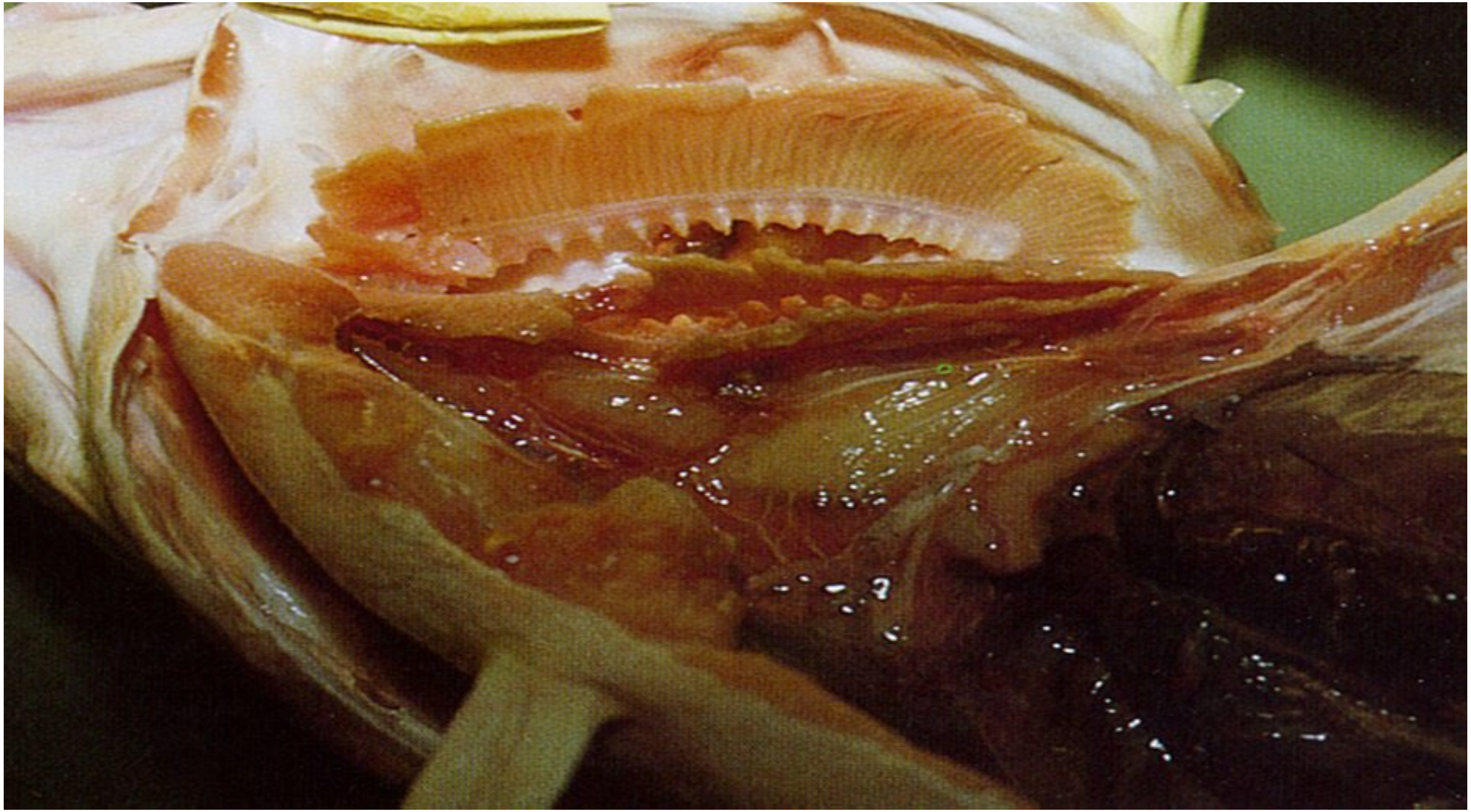
Torry freshness scores

- Iced Cod ~ appearance of gills:
    - 10/9 Gills glossy and bright red or pink. Mucus clear
    - 8/7 Gills less glossy and bright. Slight loss of colour
    - 6/5 Gills discoloured/brown. Mucus cloudy
    - 4 Gills bleached. Mucus brown









Torry freshness scores

- Iced Cod ~ odour of gills:
    - 10 Very little odour, increasing to sharp, iodine, starchy, metallic odours.
    - 9 Less sharp, seaweedy or shellfish odours
    - 8 Fresh cut grass. Seaweedy and shellfish odours just detectable
    - 7 Slightly mousy, musty, milky or caprylic odours.
    - 6 Bready, malty, beery, yeasty odours
    - 5 Lactic acid, sour or oily odours
    - 4 Acetic acid, composted grass, ‘old boots’ odours

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Torry freshness scores

- Iced Cod ~ skin:
    - 10/9 Colours bright and well differentiated. Slime glossy and transparent.
    - 8/7 Colours less brilliant. Slime turning slightly milky
    - 6/5 Colours fading and less well differentiated. Slime milky and opaque
    - 4 Further loss of skin colours. Slime thick and knotted and yellow. Skin on nose wrinkled

Torry freshness scores

- Iced Cod ~ flesh and belly flaps:
    - 10 Cut surface stained with blood. Bluish translucency especially around backbone.
    - 9 White with bluish translucency especially around backbone
    - 8 White flesh with some loss of bluish translucency
    - 7 White flesh with slight yellowing of cut surface of belly flaps
    - 6 Flesh has waxy appearance. Some reddening around kidney region
    - 5 Flesh creamy colour. Cut surfaces of belly flap brown and discoloured
    - 4 Some opacity and colour darkening. Reddening along the backbone and brown discolouration of the belly flaps

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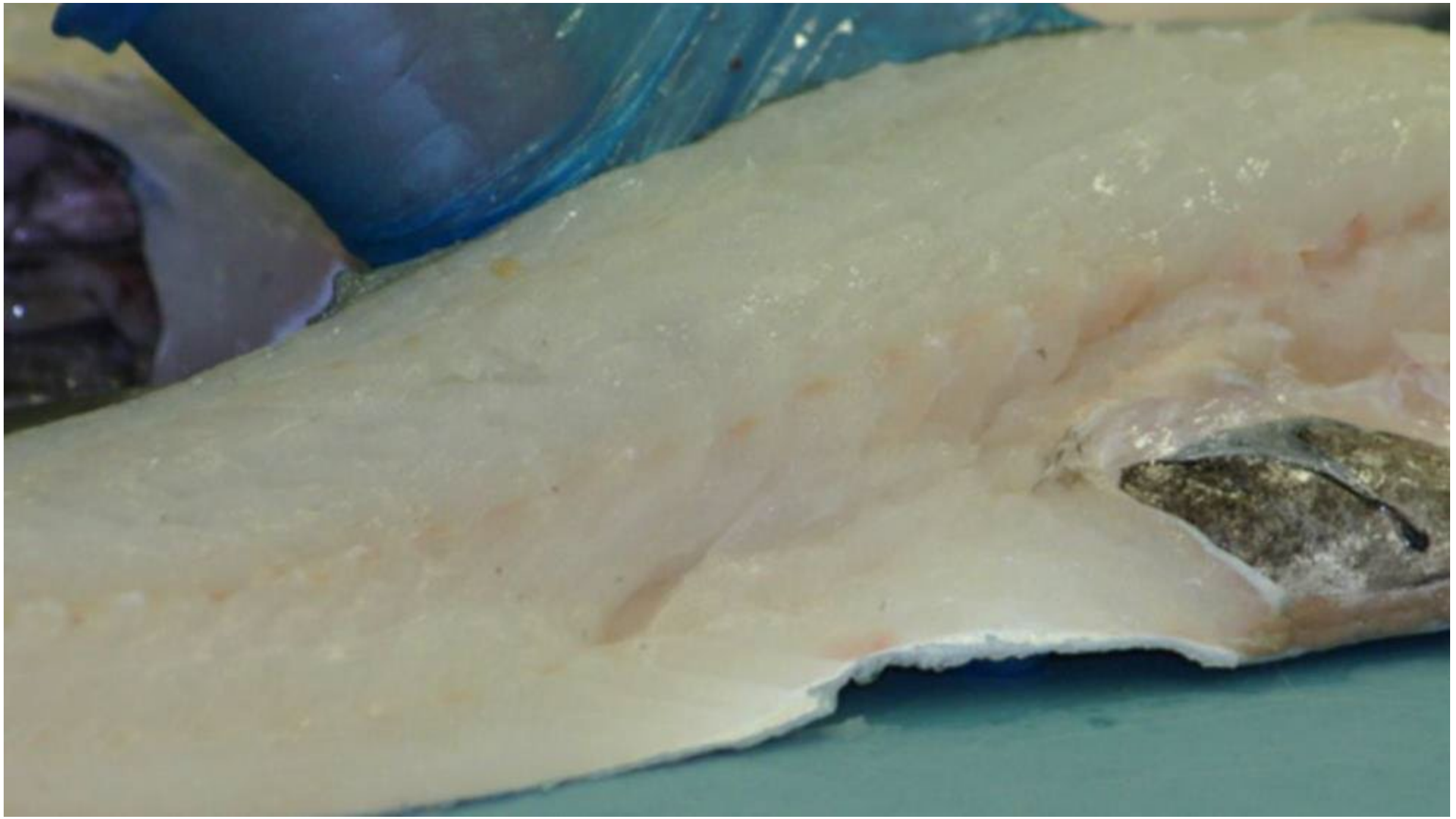

Torry freshness scores

- Iced Cod ~ texture and rigor mortis:
    - 10 Flesh firm or elastic. Body in rigor or pre-rigor
    - 9 Flesh firm or elastic. Muscle blocks apparent. In or just passing through rigor
    - 8/7 Flesh firm, elastic to the touch
    - 6/5 Softening of the flesh - finger indentations retained. Some grittiness of skin near the tail
    - 4 Softer flesh. Definite grittiness of skin near the tail

Torry freshness scores

- Iced Cod ~ kidney and blood:
    - 10 Blood bright red and flows freely
    - 9 Blood bright red but does not flow freely
    - 8/7 Blood slightly less red
    - 6/5 Blood less bright, with some browning
    - 4 Kidney blood brownish

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Torry freshness scores

- Whole Cod ~ days on ice:
    - 10 = Zero days on ice (fish pre-rigor)
    - 9 = 3 days on ice (fish in rigor or just passing out of rigor)
    - 8 = 6 days on ice
    - 7 = 9 days on ice
    - 6 = 12 days on ice
    - 5 = 15 days on ice
    - 4 = 18 days on ice

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Quality Index Method (QIM) (raw Cod)

Principles of QIM

- Based on objective evaluation of attributes of raw fish (appearance of skin, eyes, gills, flesh etc.)
- Indicators are given a score of 0 to 2 or 0 to 3 demerit points
- Scores added up to give overall quality index (increases linearly on a plot against storage time in ice)
- Storage time on ice and remaining shelf life obtained from a table or graph
- The lower the score, the fresher the fish

QIM – how it works

- Each fish species will have own scheme for determining its freshness
- Using Cod scheme as an example
- Quality parameters of the fish sample are scored to determine the quality index (total demerit points)

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

QIM – how it works

- Storage time and remaining shelf life on ice is determined from relationship between quality index and days in ice
- Remaining shelf life = shelf life - predicted storage time
- Where predicted storage time = number of days that fish has been stored in ice

Cod

Quality Index = 1,02 x 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

Comparisons of different methods of measuring fish quality - comparative values for iced Cod

Days in ice	Sensory score (Torry)	Hypoxanthine (mg/100g)	TMA (mg/100g)	TVB-N (mg/100g)	Days in ice
2	9	2	Less than 1	19	2
5	8	5	Less than 1	20	5
8	7	9	2	22	8
11	6	14	5	27	11
14	5	21	11	37	14
17	4	30	24	56	17
20	3	43	45	85	20

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Torry taste panel scheme (cooked Cod)

Torry taste panel scores

- Cooked Cod ~ odour:
    - 10 Weak odour of sweet, boiled milk becoming stronger
    - 9 Shellfish, seaweed, boiled meat, raw green plants
    - 8 Loss of odour or neutral odour
    - 7 Wood shavings, wood sap, vanillin
    - 6 Condensed milk, caramel, toffee
    - 5 Milk jug odours, boiled potatoes, boiled clothes, possible slight smell of ammonia.
    - 4 Lactic acid, sour milk, byre-like, stronger ammonia

Torry taste panel scores

- Cooked Cod ~ flavour:
    - 10 = Watery, metallic, starchy, meat flavours with slight sweetness developing
    - 9 = Sweet, meaty, creamy, green plant
    - 8 = Sweet and characteristic flavours but less intense
    - 7 = Neutral, little flavour
    - 6 = Insipid, no flavour as if chewing cotton wool
    - 5 = Slight sourness, trace of ‘off’ flavours
    - 4 = Sour, slight bitterness, definite ‘off’ flavours

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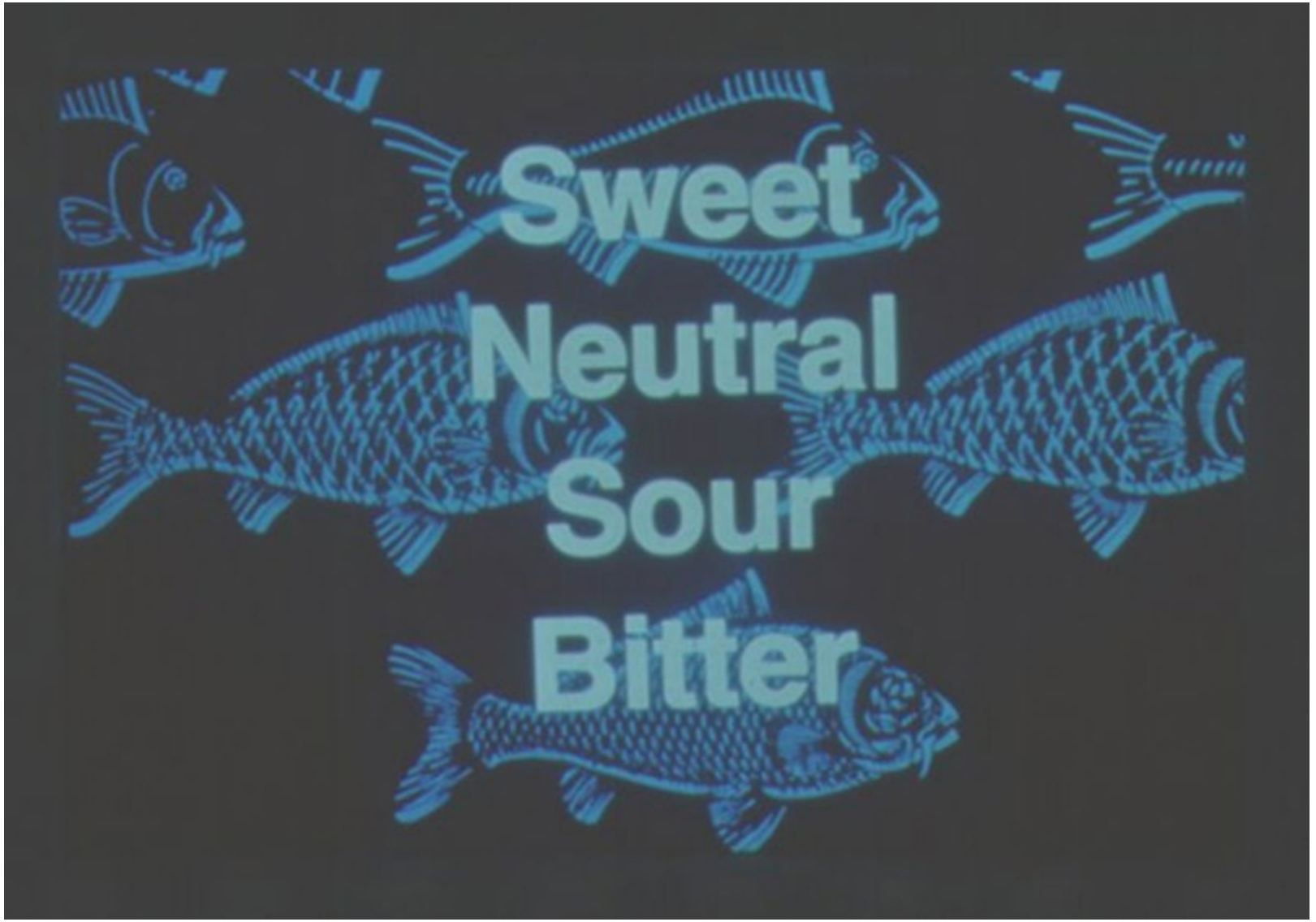
Torry taste panel scores

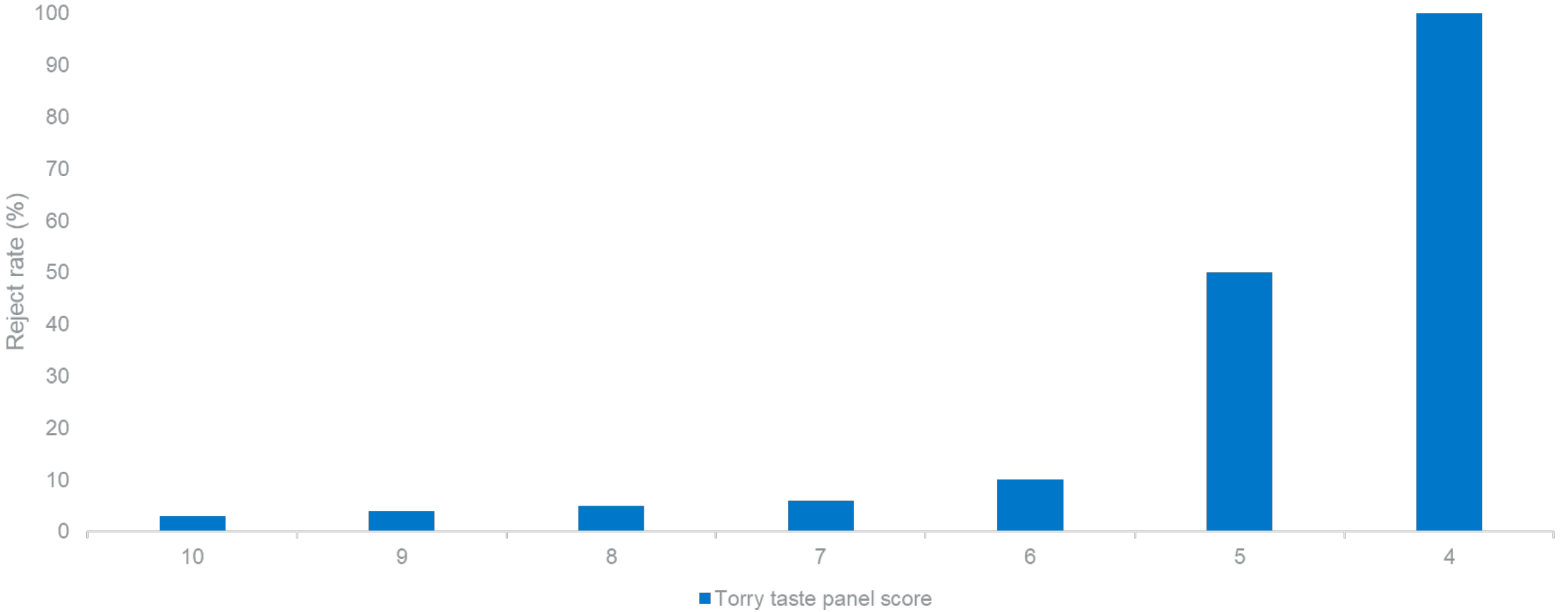
- Cooked Cod ~ texture and appearance:
    - 10 = Dry, crumbly texture with short tough fibres. Very white
    - 9 = Succulent, firm, slightly fibrous. Very white
    - 8 = Succulent, slightly less firm. White
    - 7 = Succulent, slightly soft. Less white
    - 6 = Succulent, softer. Colour creamy
    - 5 = Texture quite soft. Colour slightly yellow
    - 4 = Texture quite soft and slimy. Colour quite yellow


Sweet
Neutral
Sour
Bitter

Acceptable quality for fish

- What level of quality is acceptable?
- It should definitely have no ‘off’, sour or bitter flavours i.e. a minimum score of 6 on the Torry scheme
- It should ideally have a sweet flavour i.e. a score of 8 or above on the Torry scheme

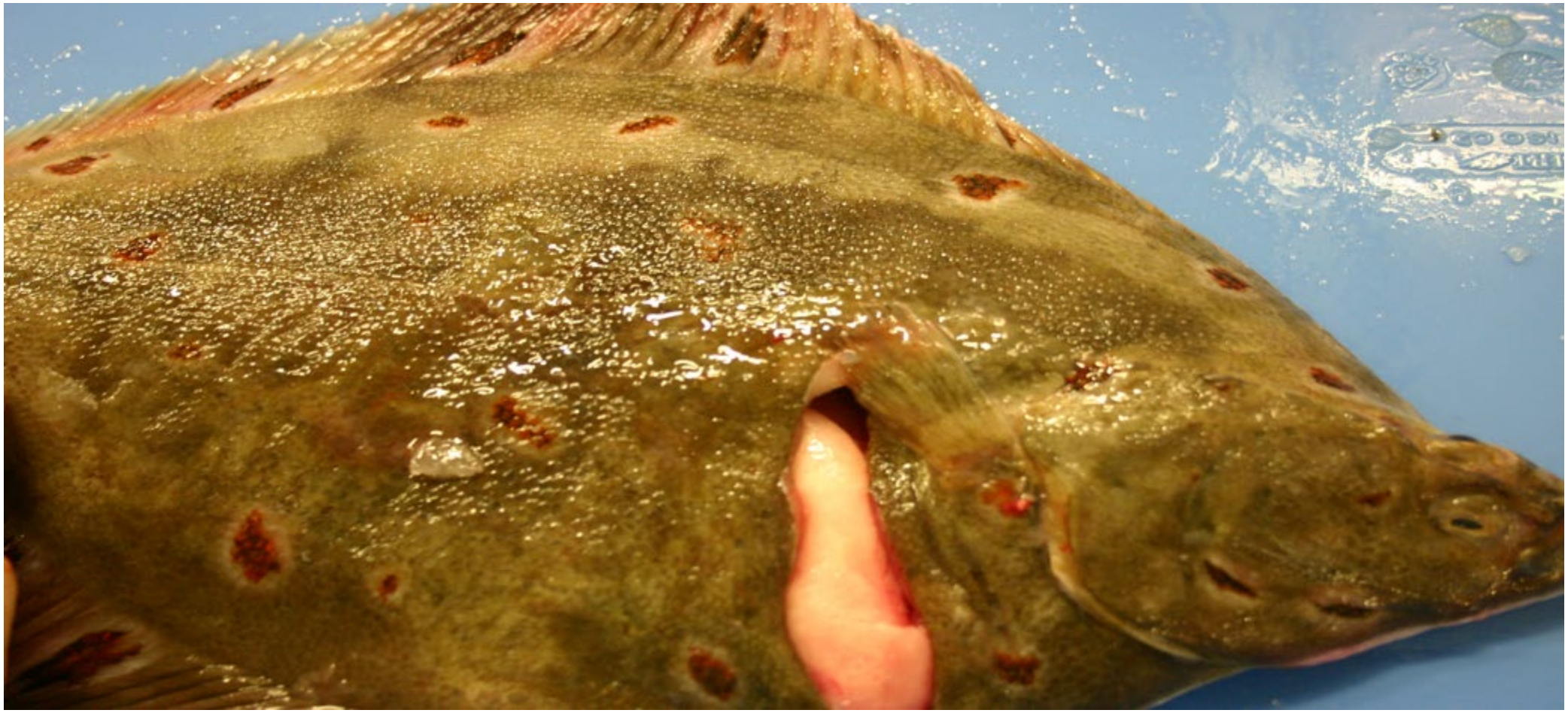
Plate waste related to quality



Torry scoring scheme (raw Plaice)

Torry freshness scores

- Iced Plaice ~ general appearance:
    - 10/9 Eyes full, bright or very slightly cloudy. Gills bright red or very deep pink with slight clear slime. Slime on body clear to slightly milky
    - 8/7 Eye slightly sunken, some opacity. Gills pale pink, slightly bleached with thick opaque slime
    - 6/5 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
    - 4/3 Eye completely sunken or bloated and opaque. Gills very bleached with dirty grey or brown-yellow slime. Slime on body watery with yellow bacterial discolouration. Marked bleaching and pinking on body

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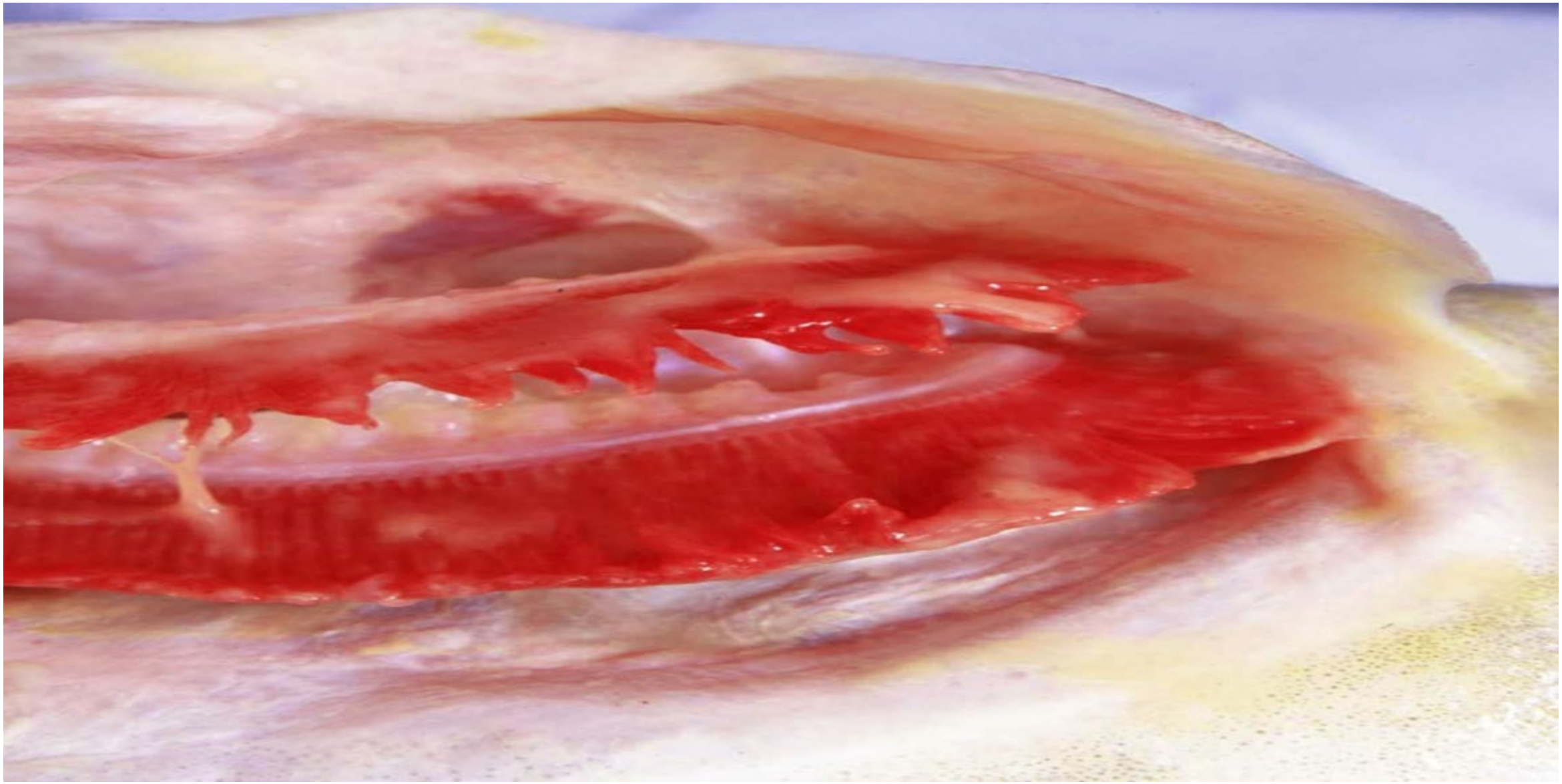
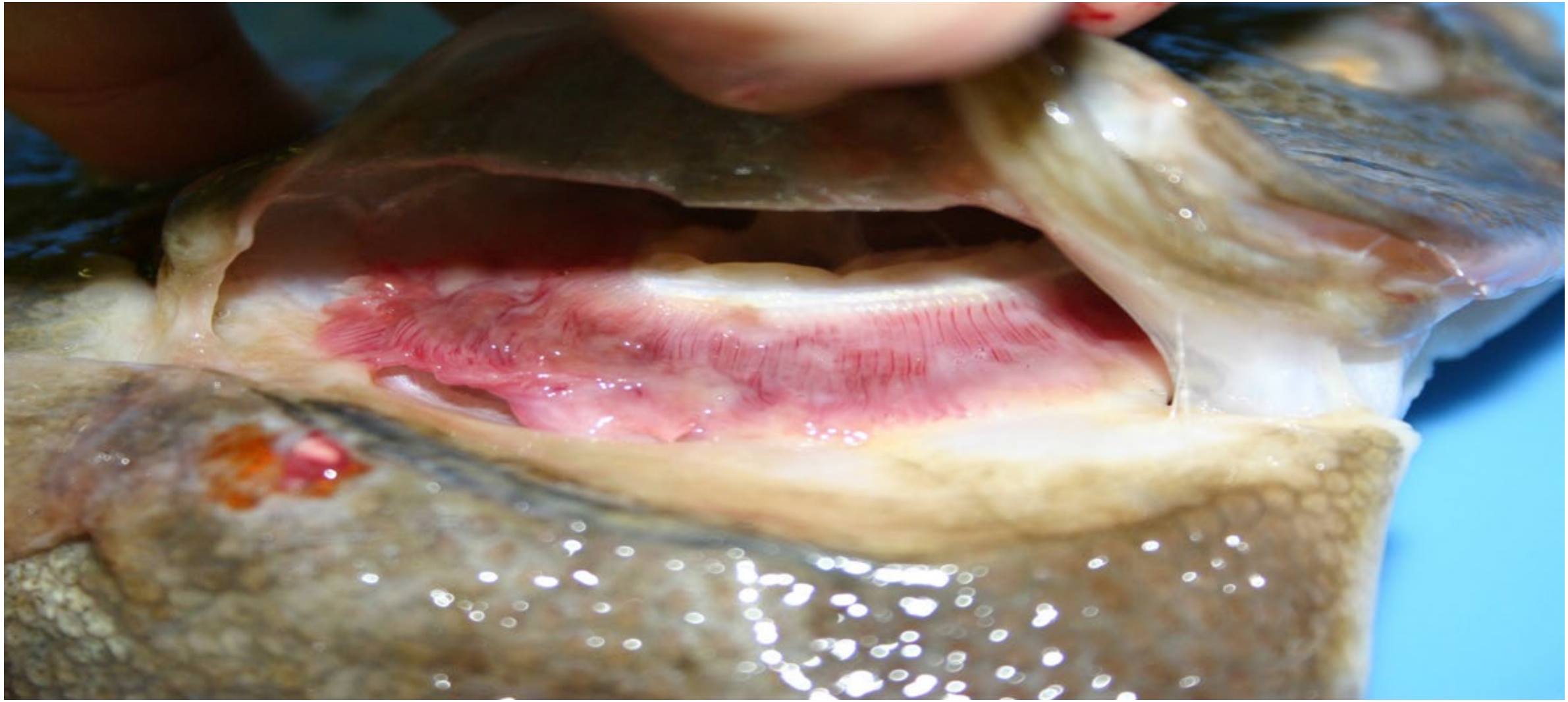
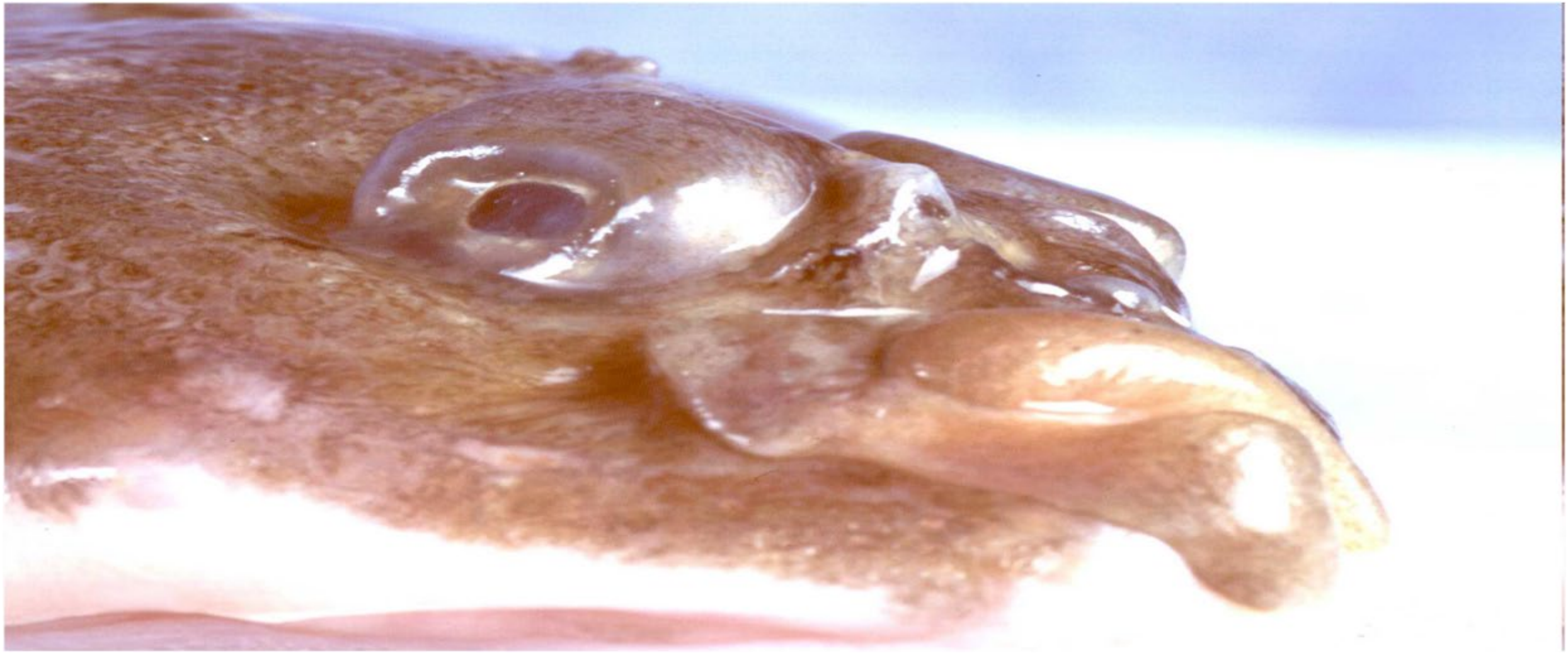
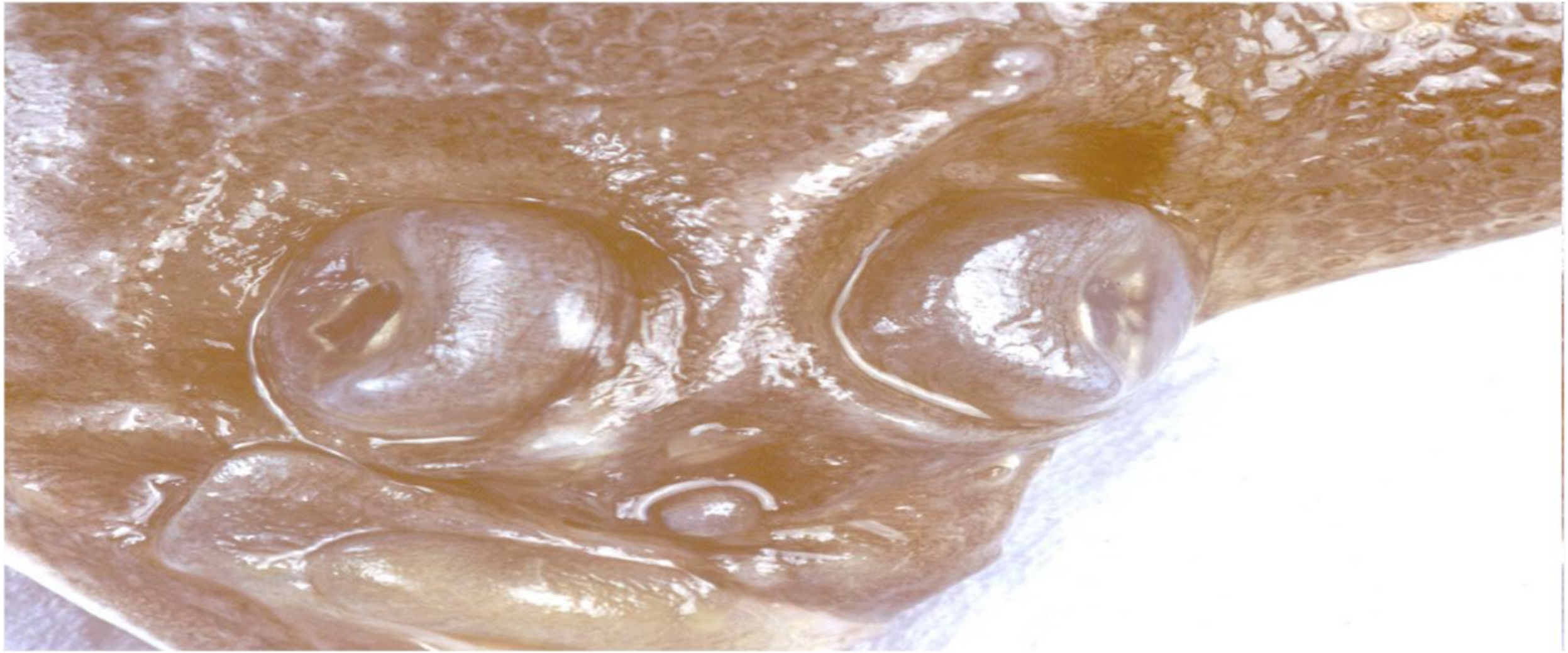
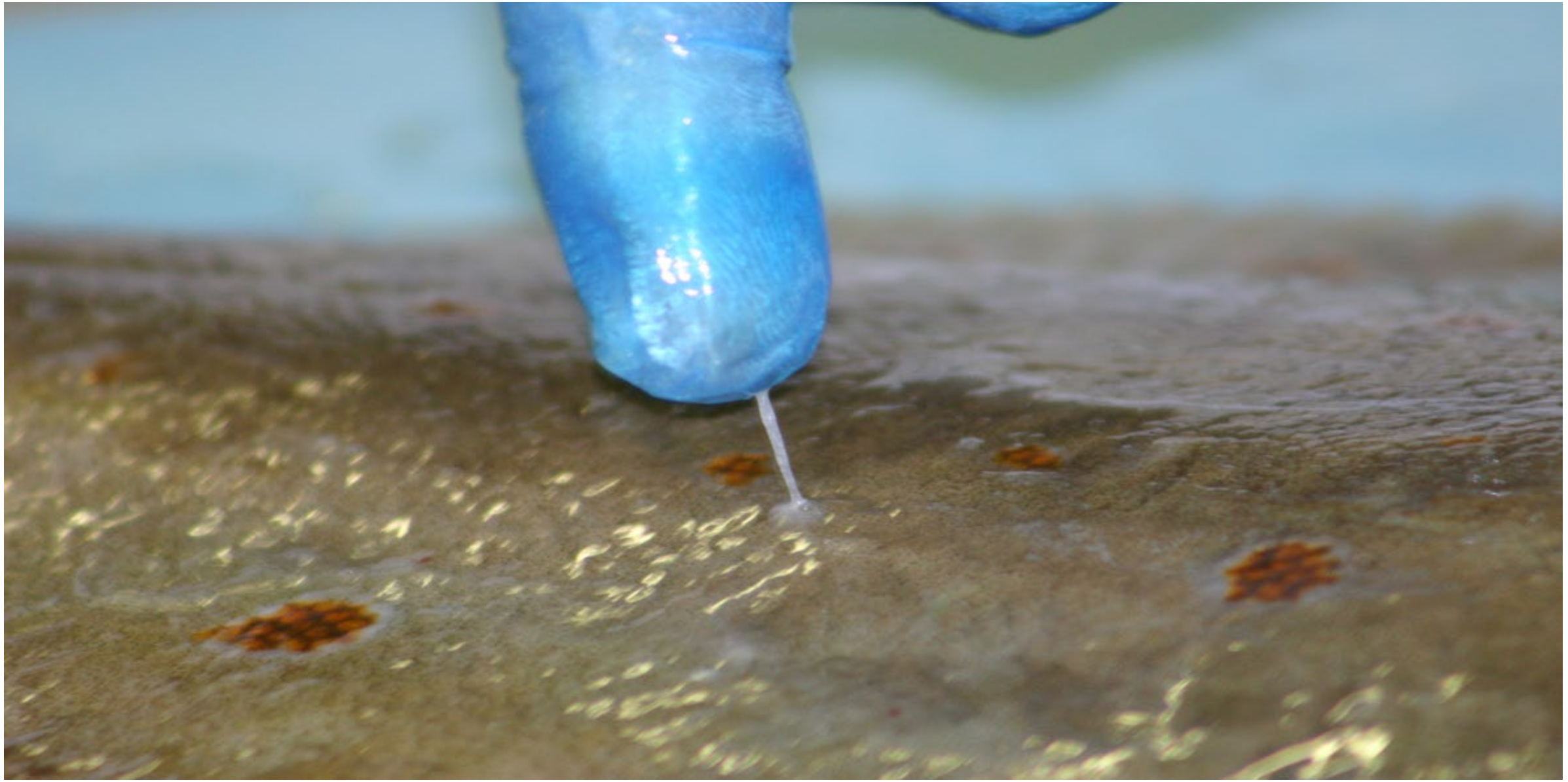
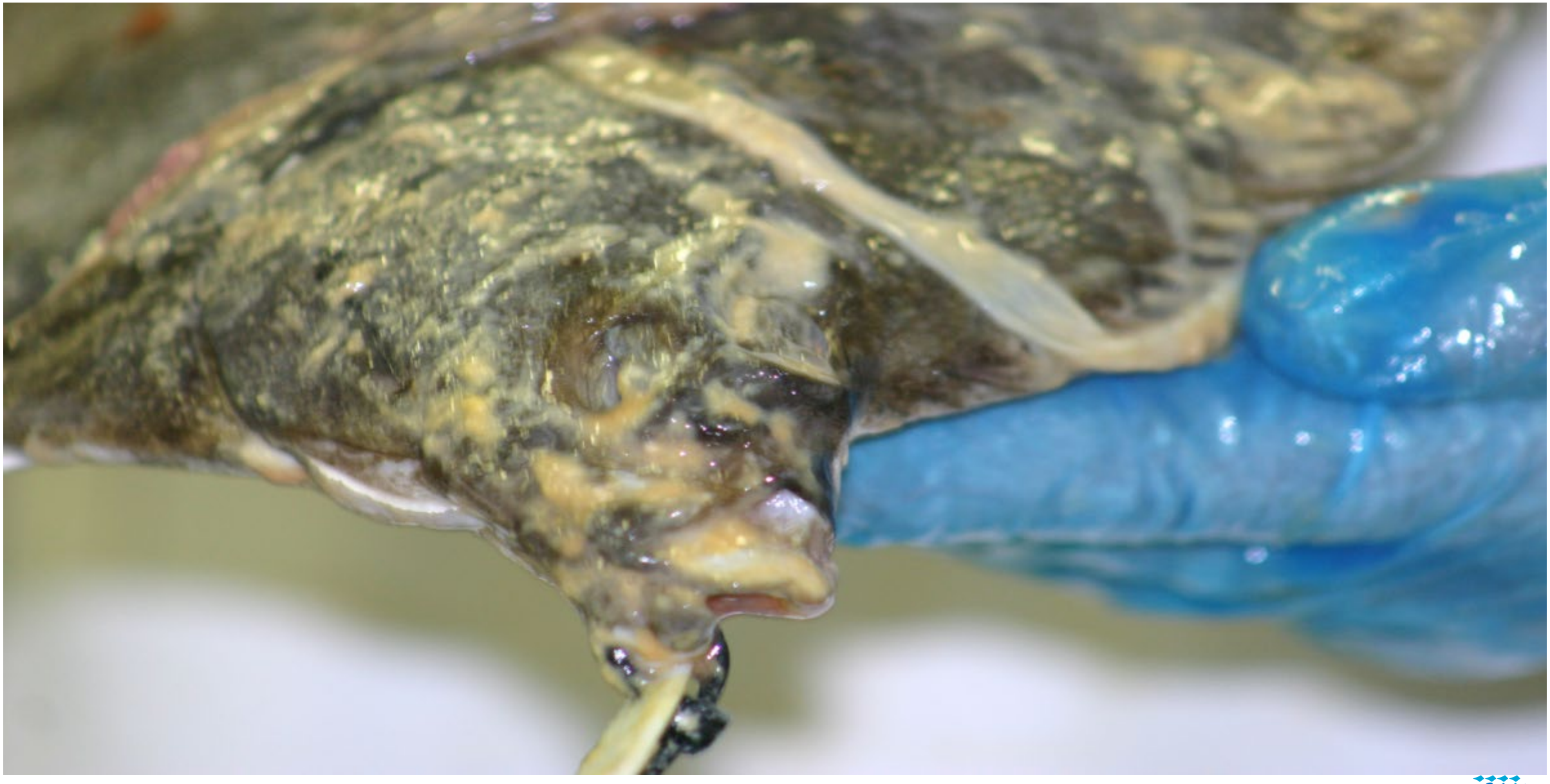










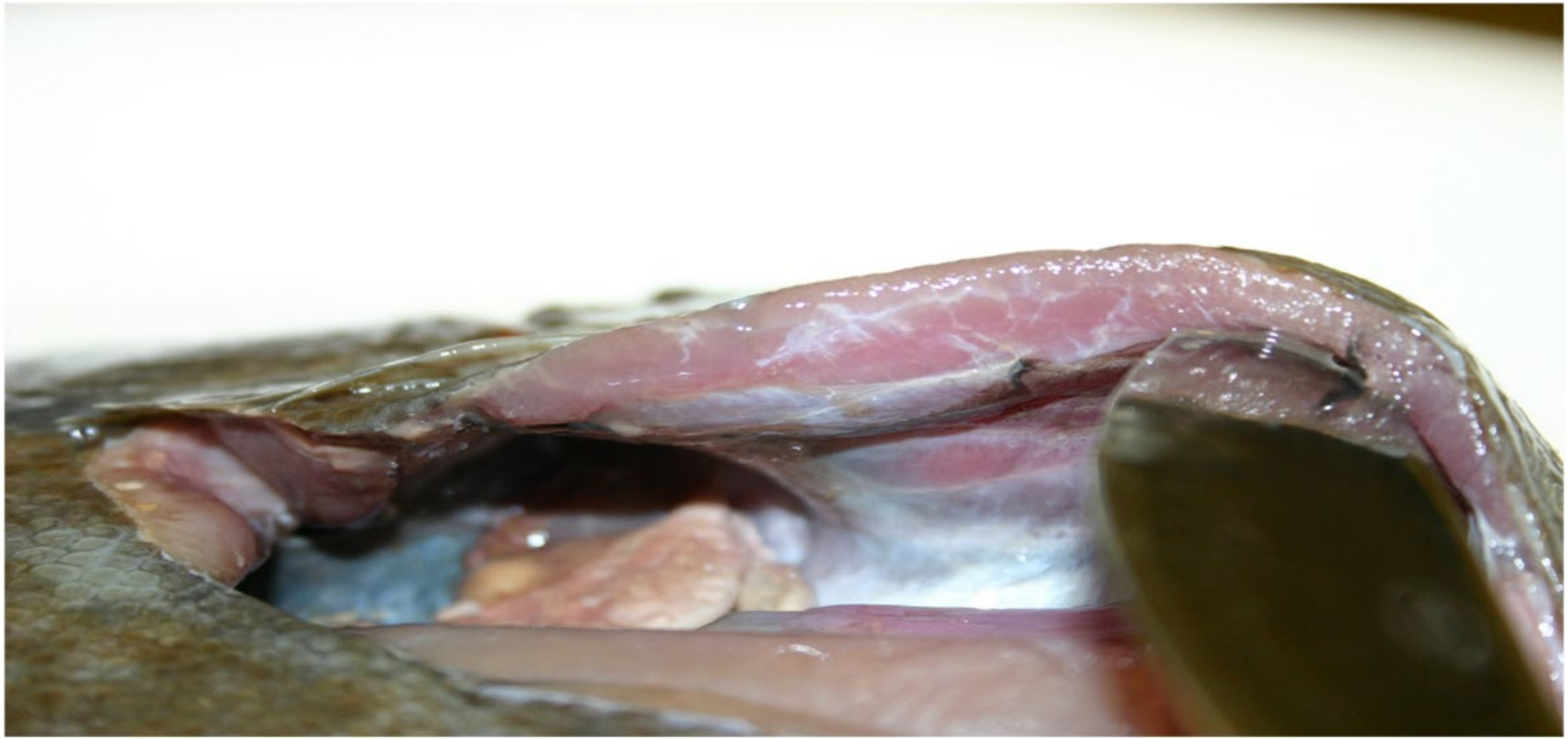


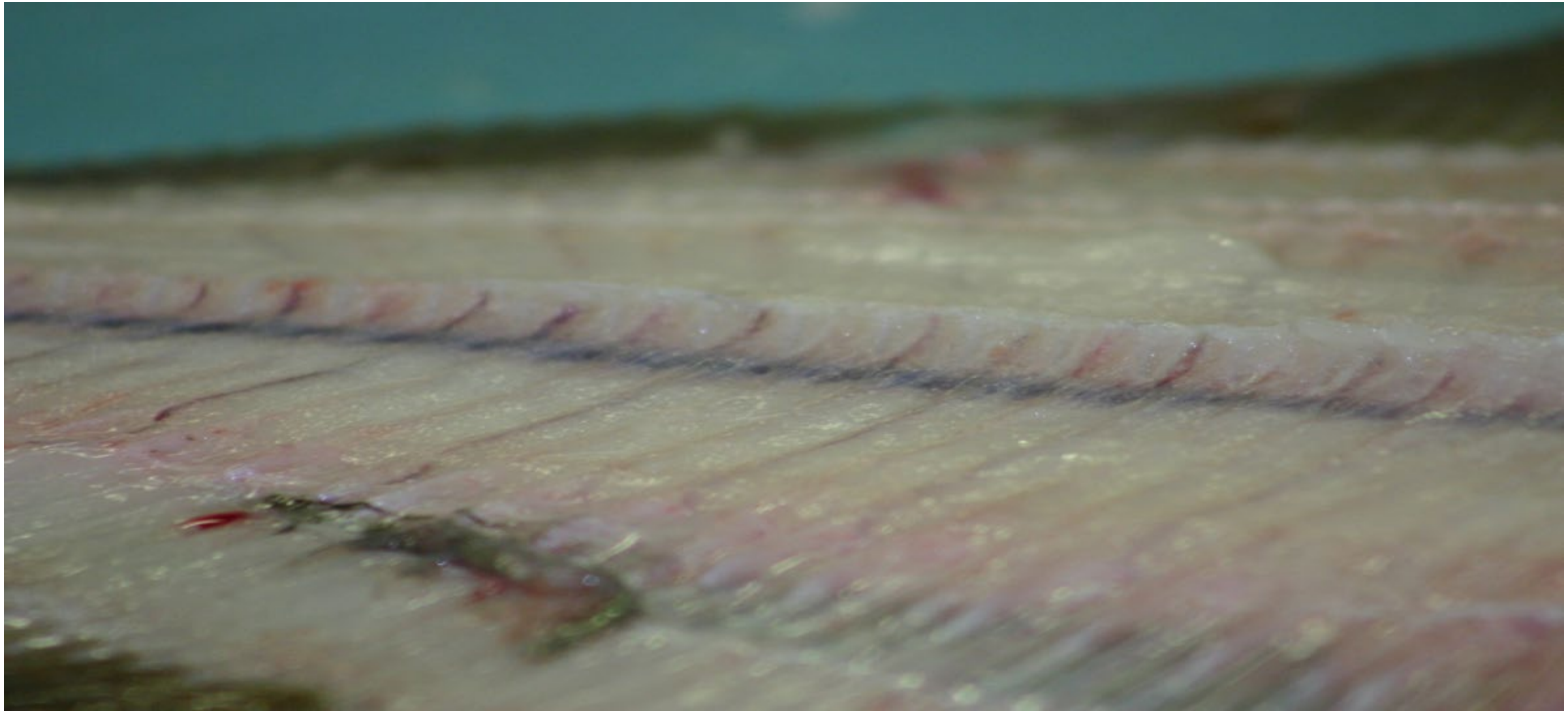
Torry freshness scores

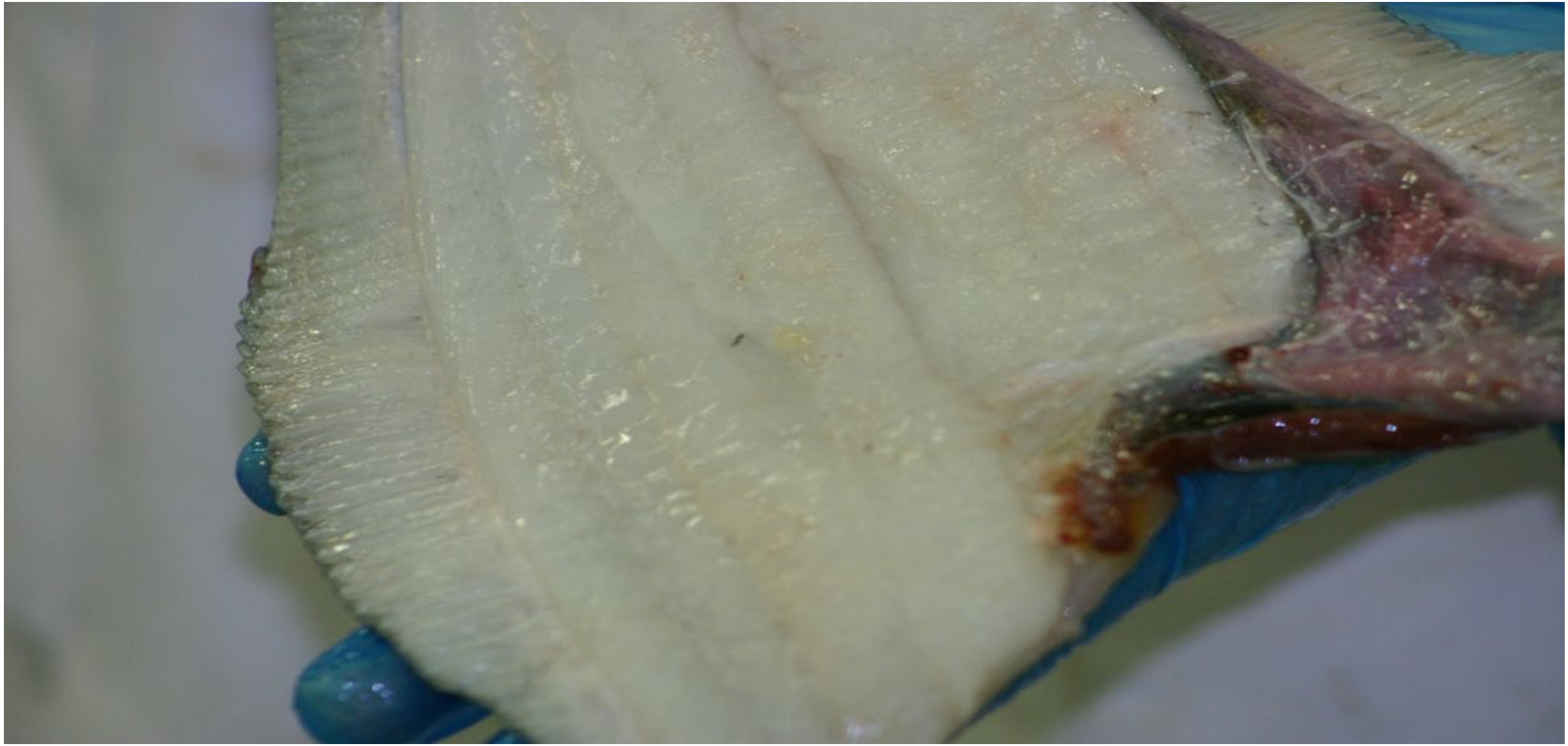
- Iced Plaice ~ odour (gills and belly cavity):
    - 10 Fresh oil, metallic, roses, freshly cut grass
    - 9 Metallic, oily, earthy, peppery
    - 8 Oily, seaweedy, aromatic
    - 7 Oily, citric, musty, mousey
    - 6 Oily, bready, biscuity, malty, cut flower stems
    - 5 Sour beer, slight rancidity, painty, cod-liver oil
    - 4 Muddy, grassy, meaty, stale vegetables, old boots, fruity, sweaty, lower fatty acids

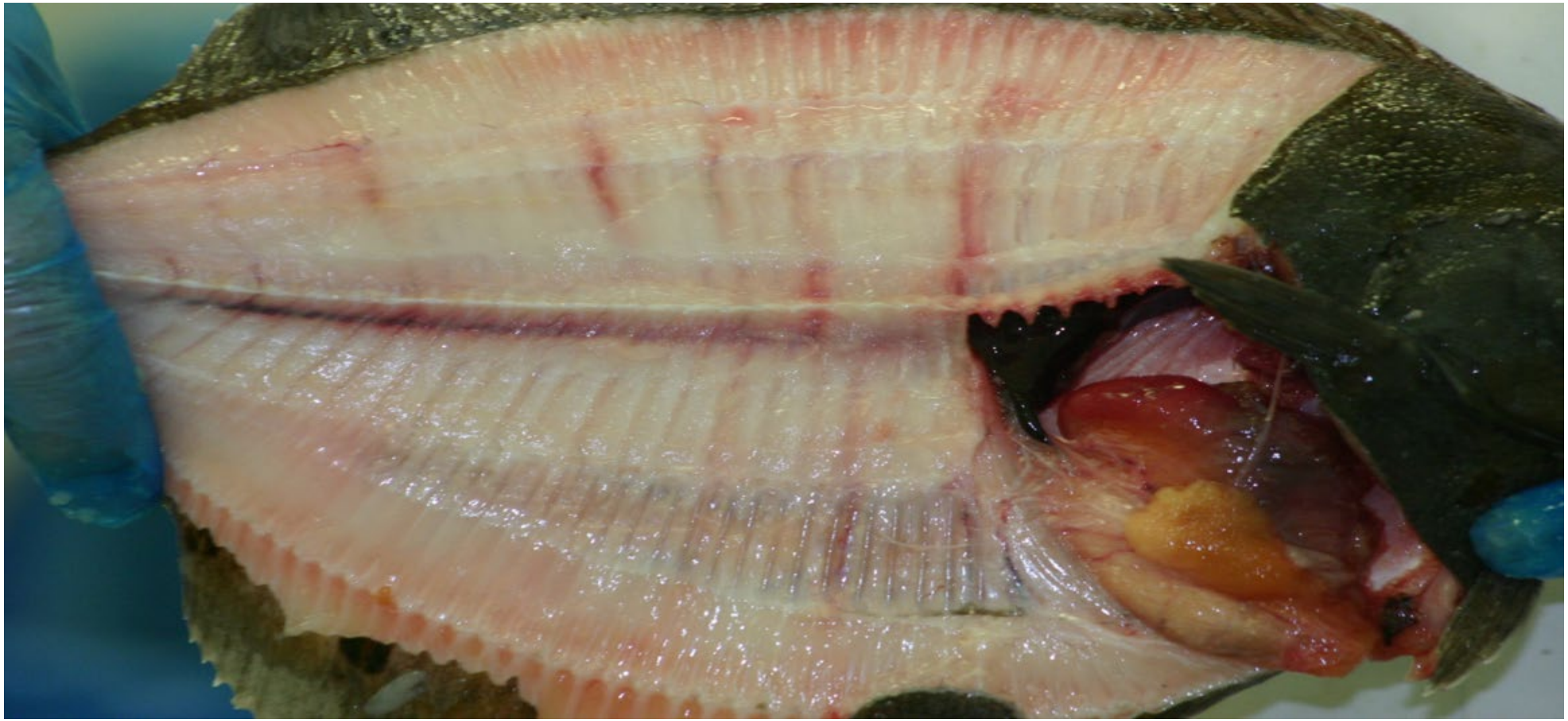
Torry freshness scores

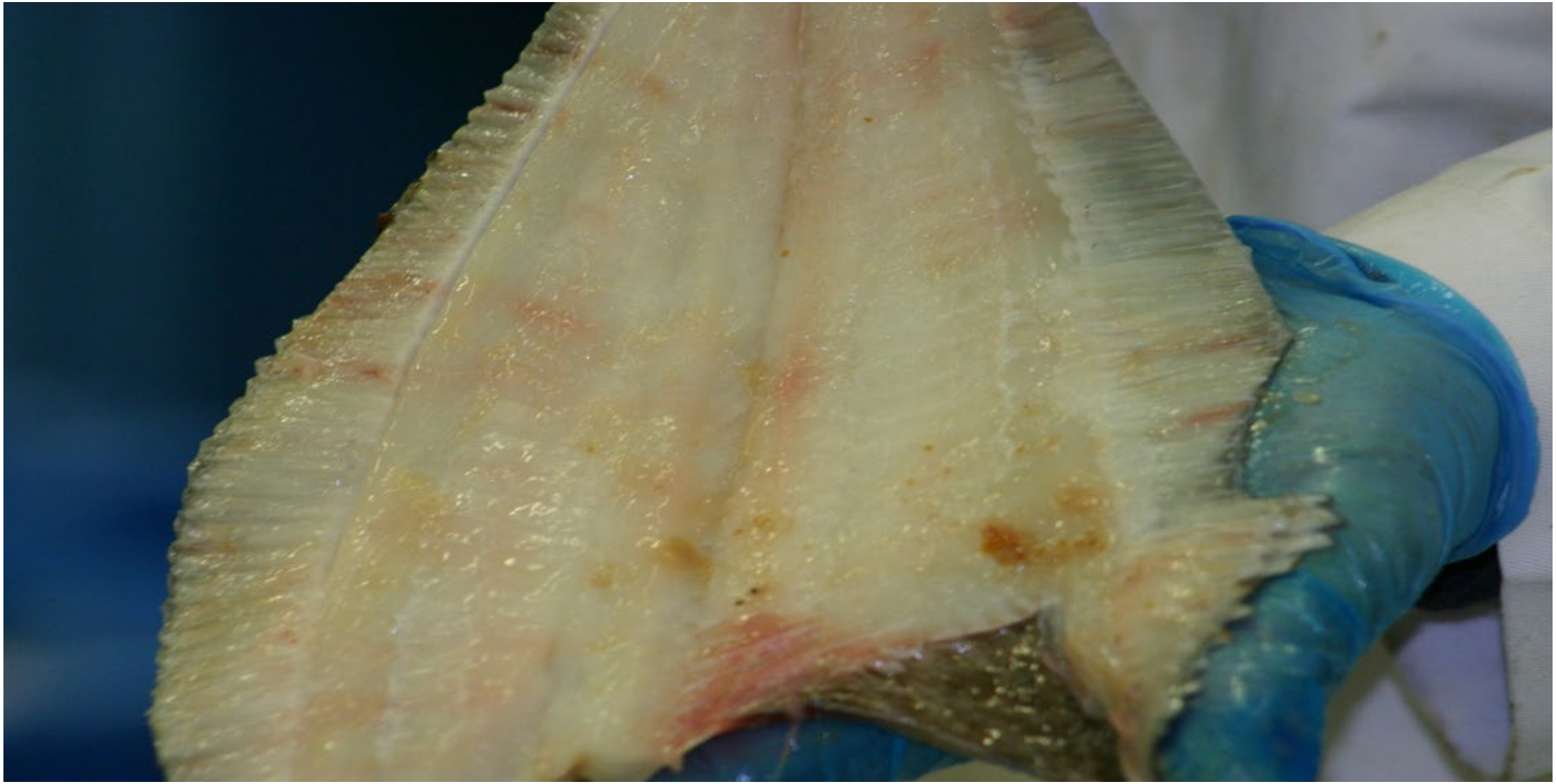
- Iced Plaice ~ flesh:
    - 10/9 Translucent with blue or pink tinge. Dark purple along backbone
    - 8/7 Loss of translucency. Bluish or pinkish white. Slight waxiness. Backbone still purple
    - 6/5 Waxy, slight yellowing, slight discolouration of body cavity. Backbone still well coloured (red-blue to purple)
    - 4/3 Some opacity, yellow or brownish discolouration extending from the fin rays. Reddening in the backbone











Torry freshness scores

- Iced Plaice ~ texture:
    - 10/9 Firm and slimy
    - 8/7 Loss of slime but no grittiness
    - 6/5 Slight grittiness
    - 4/3 Grittiness towards tail

Quality Index Method (QIM) (raw Plaice)

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, seeweedy, 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, slighly discoloured, yellowish	2
		Opaque, discoloured, yellow, brown	3
Quality Index			0-24

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Torry taste panel scheme (cooked Plaice)

Torry taste panel scores

- Cooked Plaice ~ odour:
    - 10 Meaty, oniony, fresh butter or margarine, Worcester sauce, slight caramel
    - 9 Oily, slightly aromatic, slightly peppery, boiled clothes
    - 8 Curry, oily, peppery, damp clothes, baked smell
    - 7 Caramel boiled potatoes, musty, butterscotch
    - 6 Metallic, slightly sour acrid, slightly sweaty, boiled string
    - 5 Sour bread, lower fatty acids, rancid butter, singed milk, smoky
    - 4 Slight amines, slight ammonia, sour beer, spoiled cheese, byre-like

Torry taste panel scores

- Cooked Plaice ~ flavour:
    - 10 Meaty, shellfishy, earthy
    - 9 Sweet and meaty (or oily fresh herring-like)
    - 8 Sweet and meaty with curry, peppery or spice flavour
    - 7 Neutral or bland
    - 6 Rancid, slightly sour
    - 5 Rancid oil, rancid butter, fish meal
    - 4 Sour and bitter, definite ‘off’ flavours

Torry taste panel scores

- Cooked Plaice ~ texture and appearance:
    - 10/9 Firm and dry, white
    - 8/7 Crumbly, short fibres, firm, white
    - 6/5 Soft but dry, turning yellow with possible brown discolouration
    - 4/3 Texture soft and moist/slimy. Colour quite yellow with definite brown discolouration

Oil rich fish (Pelagics)

Torry scoring scheme (raw Mackerel)

Torry freshness scores

- Iced Mackerel ~ skin and body:
    - 10/9 Firm body with silky smooth skin, lateral line and markings on upper surface well defined, body colours iridescent with strong royal blue and turquoise colours, blue and violet on under surface passing into rigor
    - 8/7 Loss of colour definition, some blood stains, passing out or out of rigor
    - 6 Colours of upper surface paler and markings grey, under side white with golden tinge, patchy iridescence
    - 5 Washed out colours, definite golden tinge to skin, patchy iridescence, body soft, skin wrinkles on flexing
    - 4 Fish limp and floppy with distinct ice marks, washed-out colours with mottling or golden tinge
    - 3 Little distinction between upper and lower surfaces, body very soft, skin very wrinkled with distinct ice marks


MACKEREL SAMPLE 5


MACKEREL SAMPLE 2

Torry freshness scores

- Iced Mackerel ~ eyes:
    - 10/9 Bulging convex eye with protruding lens, shiny jet black pupil with metallic brown iris, eye cap watery clear
    - 8/7 Convex eye, lens plane with cornea, pupil less shiny, iris green/blue, slight clouding of eye cap
    - 6/5 Flattening of eye but still convex, pupil wrinkled with slight clouding of lens, iris silvery and starting to wrinkle, yellowing of eye cap
    - 4 Eyeball plane with socket, golden eye cap, cloudy lens with silvery iris showing black specks
    - 3 Concave or flattened eye with cloudy pupil

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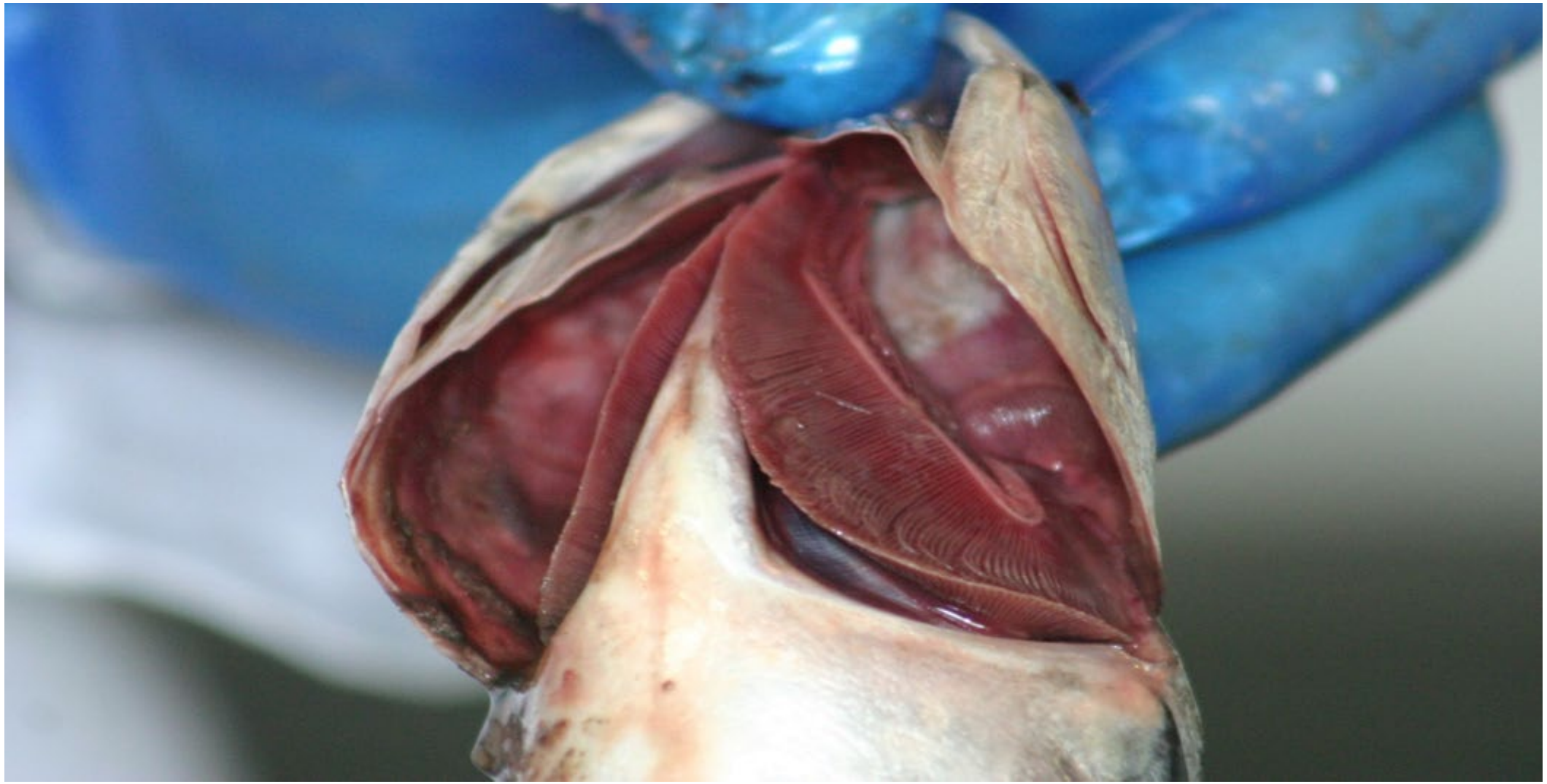
MACKEREL SAMPLE 2

Torry freshness scores

- Iced Mackerel ~ gills (appearance):
    - 10/9 Uniformly dark red with free blood, water slime
    - 8/7 Dark purple/maroon with paler edge, congealed blood with opaque slime
    - 6/5 Loss of colour with red/brown slime
    - 4 Browning of gills, patchy bleaching, increased slime and red/brown slime oozing from gill cover
    - 3 Marked bleaching and browning of gills, covered in black slime



Torry freshness scores

- Iced Mackerel ~ gill odour:
  - 10/9 Weak, delicate odours, cloying sweet, sharp, peppery, seaweed, blood
  - 8/7 Similar to above but stronger, fragrant, fresh cut grass, fruity, metallic, shellfish
  - 6 Dull muddy odours. musty, mousy, cardboard, linseed oil, cod liver oil, biscuits, blood
  - 5 Stale odours as above, also butterscotch, wet cardboard, wet dogs
  - 4 Mixture of odours found in 5 above and 3 below
  - 3 Sweet-rotten odours, oil, sweet-rotten fruit (grapefruit),old grass cuttings, sickly sour

Torry taste panel scheme (cooked Mackerel)

Torry scheme – cooked Mackerel

Flavour and odour descriptions (white and red flesh)	Score
White meat: sweet, starch, astringent, metallic, blood, meaty (cold lean beef), green plant, spicy, lemons, muddy, strong sweet oil. **Red meat**: strong meaty, sweet	9
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	8
White meat: sweet, earthy, cardboard, slight curry, bland sweet oil, onions/lemons. **Red meat**: strong meat	7
White meat: slightly sweet, weak meaty, just detectable rancidity, musty, wet paper, cardboard, neutral bland oil, new leather. **Red meat**: strong, slightly rancid	6
White meat: neutral bland oil, greasy cold chicken, slight rancidity, sweet/sour caramel, acidic after-taste. **Red meat**: strong meat, rancid, sulphury	5
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	4
White meat: sour, rancid, rotten (sweet sensation), chicken skins, charred paper, sulphides. **Red meat**: strong rancidity, sultry, tasted with difficulty	3
White meat: strong rancidity, bitter, burnt/acrid, strong sulphides, rotten cabbages, rotten fruit. **Red meat**: nauseating rancidity and sulphury	2
Nauseating, ammoniacal, very strong sulphides, tasted with difficulty	1

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Torry scoring scheme (raw Herring)

	APPEARANCE					ODOUR	TEXTURE
	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
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
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
7		Red, pink. Slight bleaching and reddening of gill of covers		Slightly opaque. Slightly brown. Slight discolouration of belly flaps	Slight belly burst	Oily, musty, sulphide, slightly sour	Limp, slightly soft, slightly gritty
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		Musty, stale fruit, stale grass, malty, sour	
5	Flat, slightly sunken. Pupil cloudy, grey	Pink, brown slime, reddening of gill covers	Dull, bronzing. Dirty Scales		Definite belly burst	Stale fruit, stale grass, malty, sour	Limp, soft, gritty
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	

seafish

Quality Index Method (QIM) (raw 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
		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	Characteristc 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

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Torry taste panel scheme (cooked Herring)

Torry scheme – cooked Herring

Flavour and odour descriptions (brown and white flesh)	Score
Fresh, sweet, seaweedy flavour	10
Less sweet, seaweedy flavour plus slightly oily flavour	8
Stronger oily flavour; some stale seaweedy flavour and some ‘blown oil’ flavour	6
Definite ‘blown oil’ flavour plus stale seaweedy flavour	5
Strong unpleasant ‘blown oil’, sweaty or rancid flavour, definitely stale	3
Repulsive flavour	1

Torry scoring scheme (raw farmed Salmon)

Torry scheme – raw Salmon

Score	Odour of gills	Appearance of eyes	Appearance of gills
10	Marine, shellfish, seaweed, sharp	Convex to flat, clear, bright	Dark red
9	Fresh cut grass, fresh fruit		
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		

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Quality Index Method (QIM) (raw farmed Salmon)

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 sea-weedy, 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

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100


230

Torry taste panel scheme (cooked farmed Salmon)

Torry scheme – cooked Salmon

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

Torry taste panel scheme (smoked farmed Salmon)

Torry scheme – smoked Salmon

Score	Freshness
10	Fresh sweet flavour, metallic, fresh oil
8	Loss of 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, bitter

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Deterioration of fish during freezing and cold storage

Deterioration during freezing

- What effect does freezing have on fish when it is cooked?
    - It will tend to be drier (less succulent)
    - It will tend to be more chewy (tougher)
    - It may become sloppy and watery
- *Speed is of the "essence".*

Deterioration during freezing

- Each time fish is defrosted and then refrozen the side effects caused by the freezing process will be increased:
    - It will become drier
    - It will become more chewy
- From the food safety aspect there is no reason why good quality raw defrosted fish should not be re-frozen

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Cold storage deterioration

- What affects cold storage deterioration?
    - Storage at the incorrect temperature
    - Poor temperature control (fluctuation of freezer temperature causes more rapid dehydration and development of cold storage flavour)
    - Inadequate wrapping of the fish (allows the surface of the fish to become dehydrated – freezer burn)

Cold storage deterioration

- What effect does poor cold storage have on fish when it is cooked?
    - It can be dry
    - It can be chewy
    - It can develop odd flavours which we call ‘cold store flavour'

Cold storage deterioration

- Freezer burn

- The dehydration of fish which causes freezer burn is non-reversible and the water that is removed from the cells cannot be replaced either by soaking fish in water or during the cooking process

Torry scores for frozen fish

Score	Cold store flavour	Texture - firmness	Texture - dryness
0	Absent	Very soft	Sloppy, watery
1	Very slight	Softer than normal	Juicy, normal (normal wet unfrozen fish)
2	Moderate	Firm (normal 2 to 5 days unfrozen fish)	Slightly dry
3	Strong	Slightly firmer than normal	Dry
4	Very strong	Slightly tough	Extremely dry
5		Tough	
6		Extremely tough	

Wet fish verses frozen fish

- Defrosted frozen fish will generally have a slightly firmer and drier texture than wet fish
- Frozen fish will always lose an appreciable amount of water during defrosting (drip) due to the damage caused to the cell structure during the freezing process
- Defrosted frozen fish may well have a slightly darker (grey/creamy) colour than wet fish due to less ‘bleeding’ time prior to freezing

Wet fish verses frozen fish

- Frozen fish maintains a predictable price
- Frozen fish is always available
- The quality of frozen fish is generally consistent

Parasites

Common fish parasites

- Cod worm – Phocanema decipiens
- Herring worm – Anisakis simplex
- Gill opepod – Lernaeocera branchialis

Discussion

Thank you

Optional contact details

Optional contact details

Here to give the UK seafood sector **the support it needs to thrive.**