Mackerel

(Scomber scombrus)

Quality Guide

mackerel

BIM
Bord Iascaigh Mhara
Irish Sea Fisheries Board

Introduction

The objective assessment of quality is vital to enable industry agree and implement common trading specifications. Defining quality is not easy, as it can include a range of factors, which depend on market preferences such as: species, size, capture method, seasonal condition and freshness.

Of major importance to all consumers is freshness, a characteristic, which relates to the degree of spoilage a fish has undergone. Very importantly and unlike many other quality attributes, this is something that the fishing industry has certain control over.

Pelagic fish, such as mackerel, are much more susceptible to spoilage than whitefish species for several reasons. Under poor cold chain management, fast acting enzymes in the stomach, quickly digest the stomach wall after death, leading to rapid internal spoilage. Under similar conditions, the high fat content of the flesh is quickly oxidized, adversely affecting the taste and quality of the flesh. External spoilage also occurs on exposed surfaces in undesirable conditions and increases in rapidity as fish size decreases.

As a result of good manufacturing practices, spoilage at all stages in production and processing can be assessed and minimised. Tests used to regularly assess the freshness of mackerel include the determination of histamine and total volatile base nitrogen (TVBN).

Elevated levels of histamine can be indicative of bad handling practices and temperature abuse and are of importance to human health, as they can cause histamine poisoning in sensitive consumers.

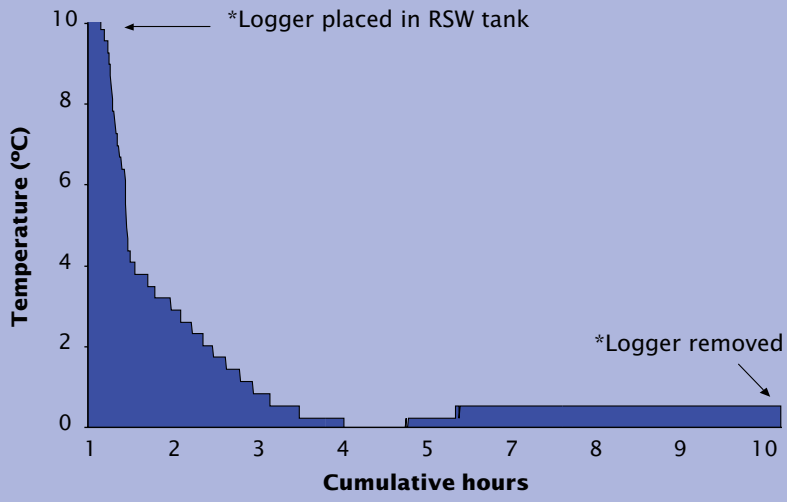
TVBN is used as an index of freshness. It measures the key products of bacterial spoilage (ammonia, dimethylamine and trimethylamine) from a sample of fish and is carried out using specialised laboratory equipment.

Sensory assessment remains the most popular method of assessing freshness. This type of assessment uses smell, texture and visual appearance to determine the quality of fish. It is a particularly useful technique as it is low cost and requires nothing other than careful and exact training. It is a widespread and reliable assessment method and provides the foundation for the design and application of this guide.

Recommendations

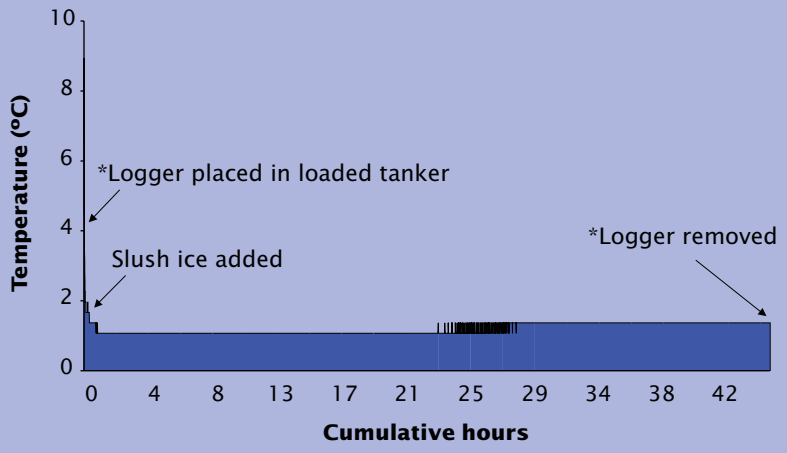
- Refrigerated Sea Water (RSW) tanks should be pre-chilled to 0ºC prior to receiving fish at sea. The ratio of fish to RSW should be 80%: 20%.
- Fish should not be discharged from RSW vessels, where their core temperatures are above 4ºC.
- Keeping fish in chilled RSW tanks is the most effective means of storage in order to maintain quality. Fish should only be discharged from the vessel when the processors are ready to process the catch.
- Only numbered, clean, undamaged bins should be used to enable batch identification at the processors.
- An appropriate ratio of pre-chilled water and brine to fish should be used in tankers transporting fish from RSW vessels to processors, in order to maintain the temperature of the fish or facilitate further chilling during transport.
- Adequately chilled tankers or bins should be transported to the processors immediately. The temperature of fish in transit should be regularly monitored and appropriate action should be taken to ensure that correct core temperatures are maintained.
- The temperature status of batches, upon arrival at the processors, should be recorded. Immediate action (the addition of ice or refrigeration) should be taken, if required, to reduce batch temperatures to acceptable levels.
- Fish should be rapidly processed to minimise storage duration in tankers or bins. Regular temperature checks should be undertaken of fish in storage, to ensure that the correct chill chain management is maintained.
- Adequate traceability should be implemented to allow batches with different time-temperature histories to be identified and segregated at processors. It should be possible to trace each batch back to the vessel for product recall purposes.

RSW correct temperature profile



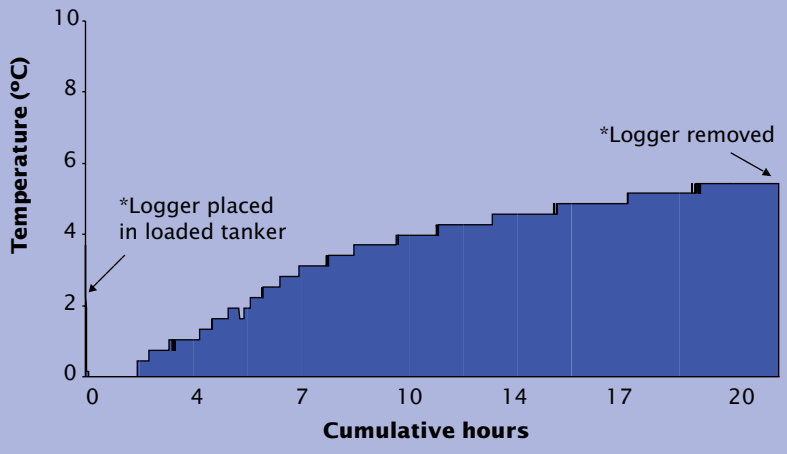
This graph illustrates good temperature management when fish are added to an RSW tank.

Slush ice in tanker



This graph illustrates how the addition of slush ice to a loaded tanker maintains good temperature management.

No ice in tanker



This graph illustrates how the temperature of fish in a loaded tanker rises rapidly, without the addition of slush ice.

**Temperature recorded using an automated temperature logger.*

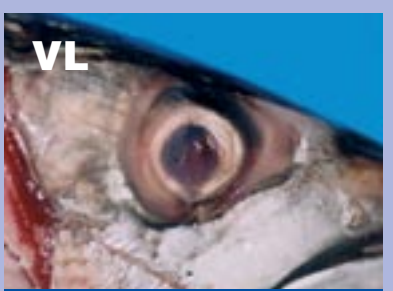
Eye

Very High: clear, black, stands out from head, convex.

High: beginning to cloud, slightly convex or flat.

Medium: 50% cloudy, flat or slightly concave, slightly wrinkled.

Low: opaque, concave, wrinkled.



Very Low: opaque, brown or dissolving, sunken, badly severely wrinkled.

Gill Colour

Very High: dark red, bright, mucus clear.

High: red, slightly bleached, mucus clear.

Medium: red with 30% bleached, mucus slightly opaque.

Low: red with over 50% bleached, mucus opaque or slightly cloudy.

Very Low: brown or putrid, mucus opaque or cloudy.

Internal (Gut Wall)

Very High: lining fully intact.

High: lining slightly faded.

Medium: lining slightly patchy and faded.

Low: lining patchy and faded.

Very Low: lining extremely patchy or faded.

Body Colour

Very High: bright colours, strong stripes, iridescence all over.

High: slight dulling or fading of colours, stripes and iridescence.

Medium: dull or fading colours and stripes, iridescence patchy.

Low: very dull or faded colours and stripes, iridescence very patchy or absent.

Very Low: body greying, golden hue, no iridescence.

Internal (Flesh)

Very High: no gaping or bruising of flesh.

High: minimal amount of gaping or bruising of flesh, minimal bloodspots.

Medium: medium amount of gaping or bruising of flesh, some bloodspots.

Low: bad gaping or bruising of flesh, obvious bloodspots.

Very Low: severe gaping or bruising of flesh, extremely obvious bloodspots.

Instructions

1. Photocopy the assessment sheet to enable scores to be recorded.

2. Take a random sample of ten fish and score each one separately.

3. Take one fish and assess each quality category i.e. Eye, Body Colour, Rigor etc. separately.

4. Look at the first category, Eye, and decide which description matches the fish you are examining i.e. the Very High, High, Medium, Low or Very Low column.

5. When one of the five options has been chosen, place a tick in the shaded box directly below your choice.

6. Now move to the next quality category, Body Colour and repeat steps 4 and 5 for this category and all following categories for the fish.

7. You now should have one tick for each quality category.

8. Repeat steps 3-6 for nine more fish, ignoring any previous ticks from other fish examined.

9. After examining all ten fish, you should have a total of ten ticks for each quality category.

10. Now look at your columns i.e. Very High, High, in turn.

11. Add all cells in the column and put the resulting figure into the space at the bottom of the column.

12. Multiply this number by the appropriate weighting for the column, which is 5, for example, in the case of the 'Very High' column.

13. Repeat steps 11 to 13 for all columns.

14. Add the multiplied column totals and divide this number by 10 (the number of fish used) to achieve the average numerical quality score for the fish examined.

15. Divide the average score by 35 (maximum average score possible) then multiply by 100 to achieve the percentage score. This percentage score can then be changed into a quality grade using the scale provided (i.e.>80%, 80-60%, 60-41%, 40-21%, 20-0%).

16. Repeat the same procedure described above for the market specifications.

17. Note the approximate number of parasites (nematode worms) and their location (fillet, gonad, liver).

FRESHNESS ATTRIBUTES
Worked Example

	VERY HIGH	HIGH
EYE	Eye clear, black, stands out from head, surface of eye convex. Area in front of eye clear.	Eye beginning to cloud (30% cloudy). Surface of eye slightly convex/flat. Area in front of eye dull.
Results for 10 fish.	///// 5	///// 5
BODY COLOURS	Bright and vivid.	Slight dulling/ fading.
Results for 10 fish.	///// 5	///// 5
IRIDESCENCE	Pearly white belly, iridescence all over.	Belly white, iridescence reduced slightly.
Results for 10 fish.	///// 5	///// 5
FLESH TEXTURE	Flesh firm and elastic (springs back quickly into shape when pressed with thumb).	Flesh firm and a little less elastic (springs back into shape but not as quickly).
Results for 10 fish.	///// 5	///// 5
RIGOR	Fish pre-rigor/in rigor, rigid.	Fish out of rigor, still quite rigid.
Results for 10 fish.	///// 5	///// 5
GILL ODOUR	Fresh, sea water odour.	Neutral/no odour.
Results for 10 fish.	///// 5	///// 5
GILL COLOUR	Gills dark/bright red, mucus clear.	Gills red with slight bleaching, mucus clear.
Results for 10 fish.	///// 5	///// 5
COLUMN TOTALS	35	35
	x5 = 175	x4 = 140

Average score = (column 1 + 2 + 3 + 4 + 5)/10 = (175+140=315)/10 = 31.5
Quality score = Average score/35 x 100 = (31.5/35) x 100 = 90%

QUALITY GRADE	VERY HIGH	HIGH
	> 80 %	80 - 61 %

Quality grade = Very High (VH)

Mackerel Assessment Sheet

Mackerel Assessment Sheet

VESSEL NAME	SAMPLING LOCATION
DATE & TIME	HAUL NO.

FRESHNESS ATTRIBUTES

	VERY HIGH	HIGH
EYE	Eye clear, black, stands out from head, surface of eye convex. Area in front of eye clear and bright.	Eye beginning to cloud (30% cloudy). Surface of eye slightly convex or flat. Area in front of eye dull.
Results for 10 fish.		
BODY COLOURS AND RETICULATIONS	Bright and vivid.	Slight dulling and fading.
Results for 10 fish.		
IRIDESCENCE	Pearly white belly, iridescence all over.	Belly white, iridescence reduced slightly.
Results for 10 fish.		
FLESH TEXTURE	Flesh firm and elastic (springs back quickly into shape when pressed with thumb).	Flesh firm and slightly elastic (springs back into shape but not as quickly).
Results for 10 fish.		
RIGOR	Fish pre-rigor or in rigor, rigid.	Fish out of rigor, still quite rigid.
Results for 10 fish.		
GILL ODOUR	Fresh, sea water odour.	Neutral or no odour.
Results for 10 fish.		
GILL COLOUR	Gills dark red, bright, mucus clear.	Gills red with slight bleaching, mucus clear.
Results for 10 fish.		
COLUMN TOTALS		
	x5 =	x4 =

Average score = (column 1 + 2 + 3 + 4 + 5)/10 _____

QUALITY GRADE	VERY HIGH	HIGH
	> 80 %	80 - 61 %

Quality grade = _____

MARKET SPECIFICATIONS

	VERY HIGH	HIGH
FLESH DAMAGE	No visible rips, tears, bruises or ice marks on flesh.	1 - 2 slight defects (e.g. small cuts, tears, ice marks).
Results for 10 fish.		
GUT CONTENTS	Empty.	Less than 50% ingested grey material (bones, scales etc.).
Results for 10 fish.		
INTERNAL (GUT WALL)	Lining fully intact.	Lining slightly faded.
Results for 10 fish.		
INTERNAL (FLESH)	No gaping and bruising of flesh along vertebral column. Bloodspots totally absent.	Minimal gaping and bruising of flesh along vertebral column. Small amount of bloodspots.
Results for 10 fish.		
COLUMN TOTALS		
	x5 =	x4 =

Average score = (column 1 + 2 + 3 + 4 + 5)/10 _____

QUALITY GRADE	VERY HIGH	HIGH
	> 80 %	80 - 61 %

Quality grade = _____

LOCATION AND ESTIMATED NUMBER OF NEMATODES

Fish No.	1	2	3	4
FILLET				
LIVER				
GONAD				

	FAT CONTENT
	ASSESSOR

MEDIUM	LOW	VERY LOW
Eye about 50% cloudy. Surface of eye slightly flat or slightly concave, slightly wrinkled. Area in front of eye dull and rosy.	Eye opaque. Surface of eye concave, wrinkled. Area in front of eye rosy.	Eye opaque. Brown, and dissolving. Sunken, badly wrinkled. Area in front of eye bloody.
Body colours dull and faded.	Body colours very dull and faded.	Body greying, colours not visible.
Belly white, patchy iridescence.	Belly white but with some golden patches, iridescence patchy or absent.	Belly with golden hue, no iridescence.
Flesh softening (doesn't spring back fully on pressing, small thumb print remaining).	Flesh soft (doesn't spring back at all on pressing, thumb print remaining).	Flesh very soft (doesn't spring back at all with flesh easily extruded through skin).
Fish out of rigor, not stiff but not limp.	Fish out of rigor, going limp.	Fish out of rigor, limp.
Slight metallic or musty odour.	Strong metallic or musty odour.	Pronounced 'off' odour.
Gills red with pronounced bleaching (up to 30%), Mucus slightly opaque.	Gills with large amount of bleaching (50%+), mucus opaque or slightly cloudy.	Gills brown and putrid, mucus opaque, cloudy.
x3 =	x2 =	x1 =

Quality score = Average score/35 x 100 _____ %

MEDIUM	LOW	VERY LOW
60 - 41 %	40 - 21 %	20 - 0 %

MEDIUM	LOW	VERY LOW
3 - 5 small defects (e.g. cuts, tears, ice marks).	> 5 small defects (e.g. cuts, tears, ice marks) or a single large cut.	Carcass badly distorted, cut or torn.
Greater than 50% ingested grey material (bones, scales etc.).	Less than 50% orange feed (crustaceans etc.).	Greater than 50% orange feed (crustaceans etc.).
Lining slightly patchy and faded.	Lining patchy and faded.	Lining extremely patchy or faded (almost completely absent).
Medium gaping and bruising of flesh along vertebral column. Medium amount of bloodspots.	Bad gaping and bruising of flesh along vertebral column. Bloodspots obvious.	Severe gaping and bruising of flesh along vertebral column. Blood spots extremely obvious.
x3 =	x2 =	x1 =

Quality score = Average score/20 x 100 _____ %

MEDIUM	LOW	VERY LOW
60 - 41 %	40 - 21 %	20 - 0 %

(i.e. 0, 1-10, 11-20, >21)

5	6	7	8	9	10

Acknowledgements

Bord Iascaigh Mhara and Killybegs Fishermen's Organisation would like to extend their thanks to those directly involved in the development of this quality guide. Gratitude is expressed to the pelagic fishermen in the northwest of Ireland who facilitated onboard analyses and who provided both samples and feedback. Particular appreciation is also extended to: the processors in the Northwest who gave invaluable advice on various drafts of this guide, The Northwest Pelagic Management Advisory Committee who provided a forum to present and discuss the guide with industry and Marine Institute personnel in Killybegs, who provided invaluable assistance and feedback on the content and presentation of this guide.

NDP
NATIONAL DEVELOPMENT PLAN

Funded by the Irish Government and part-financed by the European Union under the National Development Plan, 2000-2006.

FINANCIAL INSTRUMENT
FOR FISHERIES GUIDANCE

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