# Herring

*(Clupea harengus harengus)*

## Quality Guide

Herring

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 herring, 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 herring 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.

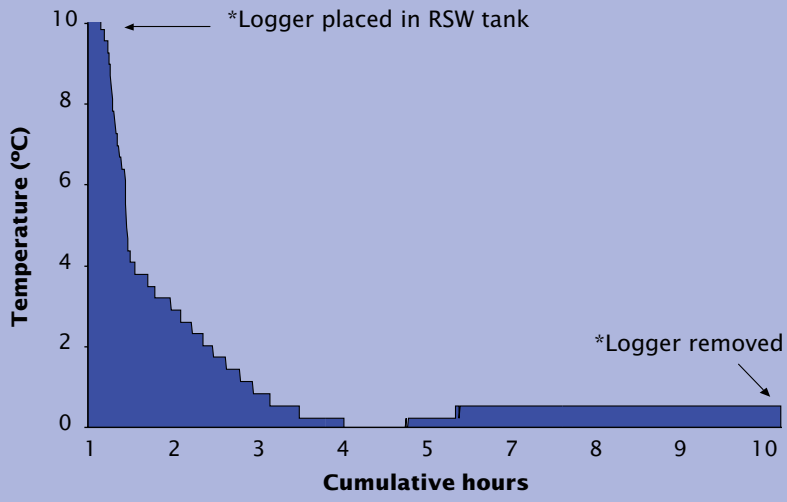
TVBN is used as an index of freshness. It measures the key products of bacterial spoilage (ammonia, dimethylamine and trimethylamine) from a sample of fish and is carried out using specialised laboratory equipment.

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

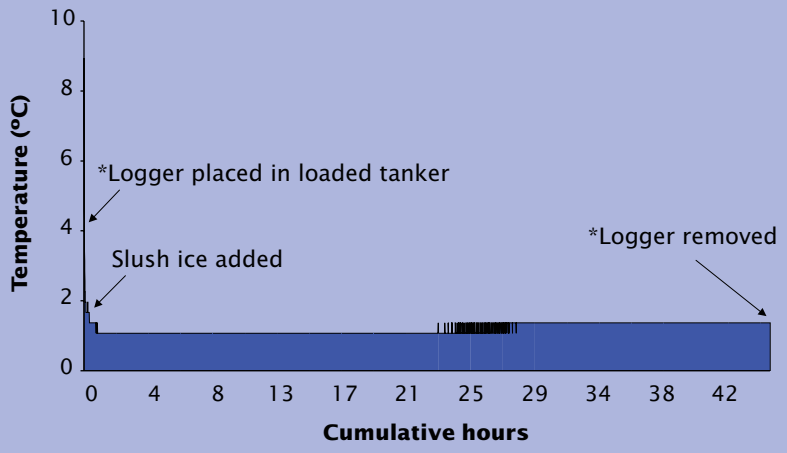
- If vessels are unable to ice or otherwise chill fish at sea, trips should be kept as short as possible and no longer than 8 hours.
- Refrigerated Sea Water (RSW) tanks should be pre-chilled to 0ºC prior to receiving fish at sea and the ratio of fish to RSW should be at a maximum of 80%: 20%.
- Fish 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.
- 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.
- A maximum of 400kg (equivalent to half a bin of fish) should be brailed in a single operation from dry hold vessels.
- Bins, when used, should be iced top, middle and bottom, in sufficient quantities to assist rapid chilling and should not be overfilled with fish.
- Only numbered, clean, undamaged bins should be used to enable batch identification at the processors.
- Adequately chilled tankers 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



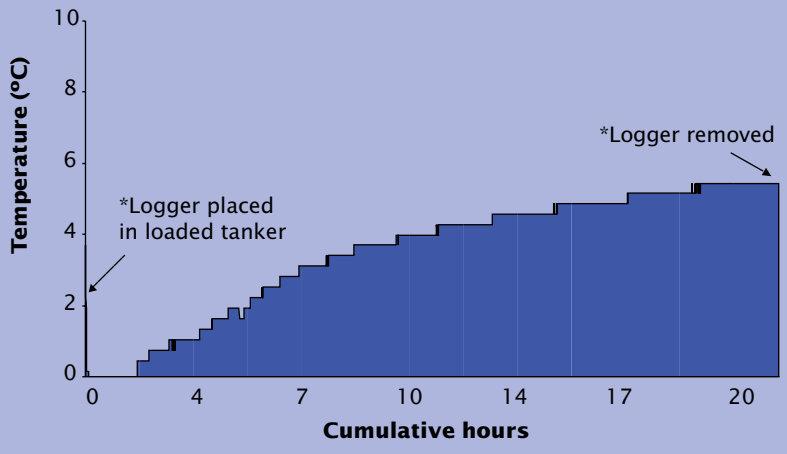

This graph illustrates good temperature management when fish are added to an RSW tank.

## 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, 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.

## Gill Cover Colour


Very High: silver, no discolouration.


High: slight golden hue or patch.


Medium: golden hue or patch.


Low: slight blood spotting.


Very Low: bloody.

## Flesh Damage


Very High: no damage marks evident.


High: 1-2 slight defects.


Medium: 3-5 small defects.


Low: >5 defects or a large defect, commencement of belly burst.


Very Low: carcass badly distorted or torn, belly burst evident.

## Roe


**Very High: bright and golden, extremely soft, no blood present, plump.**


**Low: pink, firm, bloody, elongated.**


**Very Low: red, very firm, extremely bloody, long and thin.**

(VH), (H), (M) roe are accepted as "A" grade roe and (L), (VL) are not processed.

## Peeling

**This is an example of the dark coloured lining peeling from the gut wall when the fillet is not fresh.**

## Fillet

**This is an example of a badly bruised herring flap resulting from poor handling.**

## Iridescence

**This is an example of the brilliant colouration or iridescence on the skin of a freshly caught herring.**

# 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).

18. Repeat the same procedure described above for the roe quality when fish are being considered for roe extraction.

## 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)

Herring Assessment Sheet

# Herring 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** | 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 a 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. No belly burst. | 1 - 2 slight defects (e.g. small cuts, tears, ice marks). No belly burst. |
| Results for 10 fish. | | |
| **GILL COVER COLOUR** | No discolouration. | Very slight hue overall or in patches. |
| Results for 10 fish. | | |
| **GUT CONTENTS** | Empty. | Less than 50% ingested grey material (bones, scales etc.). |
| Results for 10 fish. | | |
| **INTERNAL (FLESH)** | No bruising of flesh along vertebral column. | Minimal bruising of flesh along vertebral column. |
| 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** | | | | |

## ROE QUALITY: To be considered if herring is intended for r

| | VERY HIGH | HIGH |
|---|---|---|
| **ROE COLOUR** | Bright and golden. | Yellow. |
| Results for 10 fish. | | |
| **ROE TEXTURE** | Extremely soft. | Soft. |
| Results for 10 fish. | | |
| **BLOOD** | Blood totally absent along the roe. | Small amount of blood along the roe. |
| Results for 10 fish. | | |
| **ROE SHAPE** | Plump and full in shape. | Slightly thinning, still plump in shape. |
| Results for 10 fish. | | |
| **COLUMN TOTALS** | | |
| | x5 = | x4 = |

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

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

Roe quality grade = _____

| | |
|---|---|
| | 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). No belly burst. | > 5 small defects (e.g. cuts, tears, ice marks) or a single large cut. Commencement of belly burst. | Carcass badly distorted, cut or torn. Belly burst very evident. |
| | | |
| Golden hue overall or in patches. | Slight blood spotting. | Bloody. |
| | | |
| Greater than 50% ingested grey material (bones, scales etc.). | Less than 50% orange feed (crustaceans etc.). | Greater than 50% orange feed (crustaceans etc.). |
| | | |
| Medium bruising of flesh along vertebral column. | Bad bruising of flesh along vertebral column. | Severe bruising of flesh along vertebral column. |
| | | |
| | | |
| 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 |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |

## oe extraction

| MEDIUM | LOW | VERY LOW |
|---|---|---|
| Pale yellow, slightly pink. | Pink. | Red. |
| | | |
| Slightly firm. | Firm. | Very firm. |
| | | |
| Medium amount of blood along the roe. | Roe bloody. | Roe extremely bloody, completely red. |
| | | |
| Slightly elongated in shape. | Elongated in shape. | Long, thin and stringy in shape. |
| | | |
| | | |
| x3 = | x2 = | x1 = |

Quality score = Average score/20 x 100 _____ %

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

**Acknowledgements**

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FINANCIAL INSTRUMENT
FOR FISHERIES GUIDANCE

BIM
Bord Iascaigh Mhara
Irish Sea Fisheries Board

P.O. Box No.12,
Crofton Road,
Dun Laoghaire,
Co. Dublin,
Ireland.

Tel +353 1 214 4100
Fax +353 1 284 1123
http://www.bim.ie

KFO
Killybegs Fishermen's
ORGANISATION LTD.