

# Sensory analysis

- It has been stated frequently that no single instrumental method is generally reliable for assessment of freshness and spoilage in seafood.
- To be useful in quality control, responses of instrumental methods should be causally related to sensory changes in seafood or they should at least correlate with sensory analyses.
- Sensory methods relying on trained assessors *i.e.* objective sensory methods are required for use in quality control for evaluation of freshness and for determination of remaining shelf life of seafoods

# EU scheme for freshness

(Council Regulation No 103/76 of January 1976; Council Regulation No. 2406/96 of November 1996)

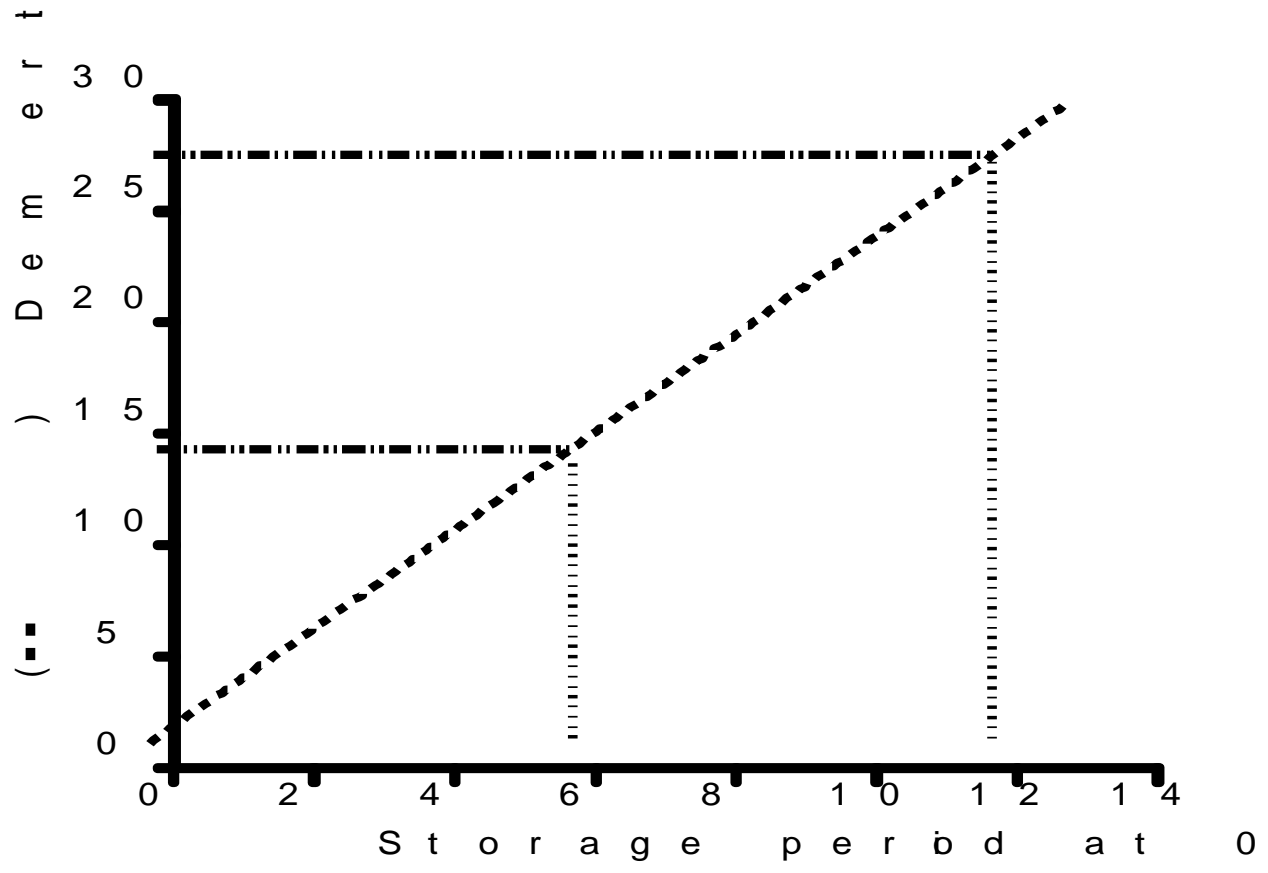
- The freshness grading of fishes in particular EU schemes usually carried out by trained personnel
- Whole and gutted fish are assessed for appearance, odour of skin, outer slime, eyes, gills and belly cavity.
- Fish are then placed in the grades Extra (E), A, B or Unfit (C) on the basis of schemes for different groups of species.
- It has been indicated by scientists that the EU sensory schemes have disadvantages because information on remaining shelf life cannot be obtained directly from the freshness grades, and because the schemes are too complicated

# Quality Index Method (QIM)

- QIM was developed at CSIRO in Hobart, Australia.
- A relatively large number of fish quality attributes are evaluated in sequence by sight, smell and touch.
- Each attribute is scored from 0 to 3 (typically) by experienced assessors with low scores indicating the best quality.
- The sum of all attribute scores is called demerit points, or QIM index points, and
- This value increases linearly with storage time of a given fish.
- The direct relationship between QIM scores and storage time makes it easy to calculate remaining shelf life of fresh fish when stored at 0°C

# Quality Index Method (QIM)

Quality parameter		Point
General appearance	Surface appearance	0 - 3
	Skin	0 - 1
	Slime	0 - 3
	Stiffness	0 - 1
Eyes	Clarity	0 - 2
	Shape of pupil	0 - 2
Gills	Colour	0 - 2
	Smell	0 - 3
	Slime	0 - 2
Flesh colour	Open surfaces	0 - 2
Blood	In throat cut	0 - 2
Sum of demerit points		



- **In chemical methods of quality assessment, Various product of spoilage in fish muscle are quantitatively determined and correlated with sensory characteristics**
- **Reasons of spoilage are autolytic enzymes ,putrefactive micro-organism or lipid oxidation**
- **During spoilage compounds gradually accumulate in the flesh and their determination provides a measure of the progress of spoilage**

# Quality indices classification

- **Volatile bases-** Ammonia, TVBN, TMAO & TMA
- **Nucleotides-** degradation product of ATP such as IMP, Hypoxanthine and K-value
- **Lipid Oxidation Product-** Peroxides, Hydroperoxides and Aldehydes

# Total volatile base N

- The most common index of quality used universally for deciding the state of freshness of fish. Total volatile bases refers to TMA and Ammonia
- A level of 35-40 mg TVB-N/100g of muscle is the limit of acceptability
- Critical limits of 25, 30 and 35 mg-TVN/100g were established for different groups of fish species.
- In processed, lightly or semi preserved, seafood levels of TVB-N at sensory product rejection are more variable.
- For example, 30-40 mg-TVN/100g has been found at sensory rejection of sliced vacuum packed cold-smoked salmon but lower levels of 10-20 mg-TVN/100g were determined in modified atmosphere packed, cooked and brined shrimps.
- However, in sugar salted herring as much as 75 mg-N TVN/100g was determined in products of acceptable sensory quality.
- These variable levels of TVB-N at time of sensory rejection support the view that off-flavours in spoiling seafood cannot be caused by TVB-N alone.



# TMA

- It is used as a more specific index of bacterial spoilage
- Development of TMA in seafood depends primarily on the content of the substrate trimethylamine-oxide (TMAO) in the fish raw material
- Its level increase with time of storage at ambient temperature
- 10-15 mg/100 g of muscle is taken as limit of acceptability

# Indole

- Indole production is an indication of spoilage in shrimp
- USFDA limit less than 25 microgam/100g

# Hypoxanthine (Hx)

- The end product of nucleotide degradation
- Therefore, its presence clearly indicates spoilage
- Hx converted into uric acid by enzyme xanthine oxidase and measures at 290 nm.
- Fish with more than 2.5 micromoles/g is regarded as spoiled

# K-Value

- Defined as the ratio of the sum of inosine and Hx to total concentration of the other nucleotides. It is expressed as percentage
- The K-value was suggested by Japanese researchers in 1959 as an objective index of fish freshness. In Japan, a K-value of 20% is used as a critical limit for fish to be consumed raw
- Adenosine triphosphate (ATP) is degraded into adenosine diphosphate (ADP), adenosine monophosphate (AMP), inosine monophosphate (IMP), inosine (Ino) and hypoxanthine (Hx) during processing and storage of fresh and lightly preserved seafood.
- IMP is formed by autolytic enzymes whereas spoilage bacteria contribute to Ino and Hx formation.
- Rejection usually above 50-60 %

# Instrumental analysis

- The Intellectron Fishtester, the Torrymeter and the RT-Freshtester represent instruments with increasing degrees of sophistication.
- Readings from all instruments reflect di-electrical properties of fish and they decrease with storage time, almost following a straight line
- Based on these rapid and non-destructive measurements, the RT-Freshtester allows automatic grading of 60-70 fish per minute.
- These instruments need calibration depending on the season and fish handling procedures
- The high cost of the instruments limits their practical use in the seafood sector for freshness evaluation.