NC STATE UNIVERSITY

CMAST
The Center for Marine Sciences and Technology
Department of Food Science
Seafood Laboratory

Post Harvest Handling: Methods to Measure Product Quality at the Marketplace

North Carolina Aquaculture Development Conference
Greenville January 13, 2006

Durita Nielsen
North Carolina State University
Dept. of Food Science, Seafood Laboratory
Morehead City

Why be interested in quality?

- Increased consumer demands

- “High quality products”
- “Consistent quality every time”

- Good quality opens for increased market shares
- Higher price!

Many different methods, but...

- Require sample preparation (filleting, cooking..)
- Require very trained people
- Destructive (the fish can not be sold afterwards)
- Time consuming
- Too general (do not take species into account)

Quality Index Method

- No need for sample preparation (whole fish)
- Only minimal training needed
- Objective
- Not time consuming (30 seconds per fish)
- Not destructive (the fish can be sold afterwards)
- Can predict remaining shelf life
- Specific (one list of parameters to each fish species)

QIM for hybrid striped bass

- Fish from 2 farms
- Stored in ice for up to 16 days
- Trained panelists
- Evaluation of whole fish and cooked samples during storage period

What was evaluated?

Quality description

- Appearance
  - Whole fish, eyes, gills
- Odor
  - Whole fish, gills
- Texture
  - Whole fish

Shelf life determination

- Appearance
  - Color, blood
- Odor
  - Fishy, cloves
- Flavor
  - Fishy, sweet, cloves
- Texture
  - Firm, juicy, flaky

Quality Index Method (QIM) Scheme for Farmed Hybrid Striped Bass

Name_____ Date_____

Quality parameters		Descriptions	Point						
Whole fish	**Skin color/appearance**	Pearl-shiny, iridescent pigmentation all over	**0**						
		Less pearl-shiny, yellowish, stripes still distinct	**1**						
	Discoloration* ***(red spots, bruising) (body only)***	*Slight to none*	***0***						
		Minor (5 - 10%)	***1***						
		Severe (10 - 25%)	***2***						
	Odor	Neutral, pond, fresh fish, seaweed	**0**						
		Melon, cucumber, green grass	**1**						
		Cardboard, fishy, putrid, rotten	**2**						
	Texture	In rigor	**0**						
		Firm, resilient, finger mark disappears immediately	**1**						
		Soft, finger mark still persists after 3 seconds	**2**						
Eyes	**Pupil**	Black, clear, bright, iridescent	**0**						
		Dark gray, mat, dull	**1**						
		Milky, cloudy, hazy, light gray	**2**						
	Shape	Convex, bulging	**0**						
		Flat	**1**						
		Concave, sunken	**2**						
Gills	**Mucus**	Transparent, clear, none	**0**						
		Milky, clotted	**1**						
	Color/appearance	Bright red, red, burgundy	**0**						
		Pale red, pink, light brown	**1**						
		Brown, dull	**2**						
	Odor	Pond, fresh fish, fresh rain	**0**						
		Melon, cucumber, metallic	**1**						
		Musty, fishy, putrid, rotten	**2**						
Quality Index (total score)			**0-14***						

** The score for "Discoloration" is not included in the Quality Index but reported separately.*

Total possible score

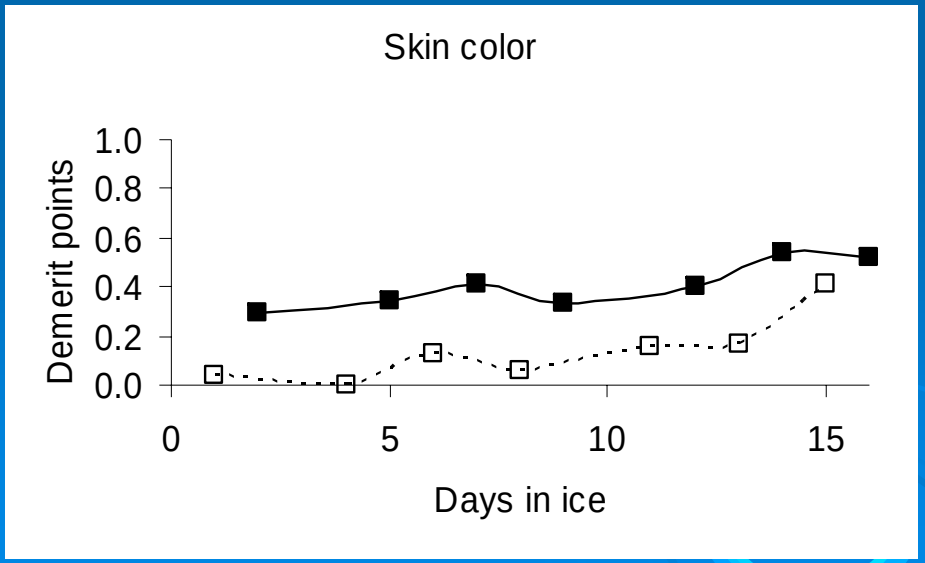
Whole fish

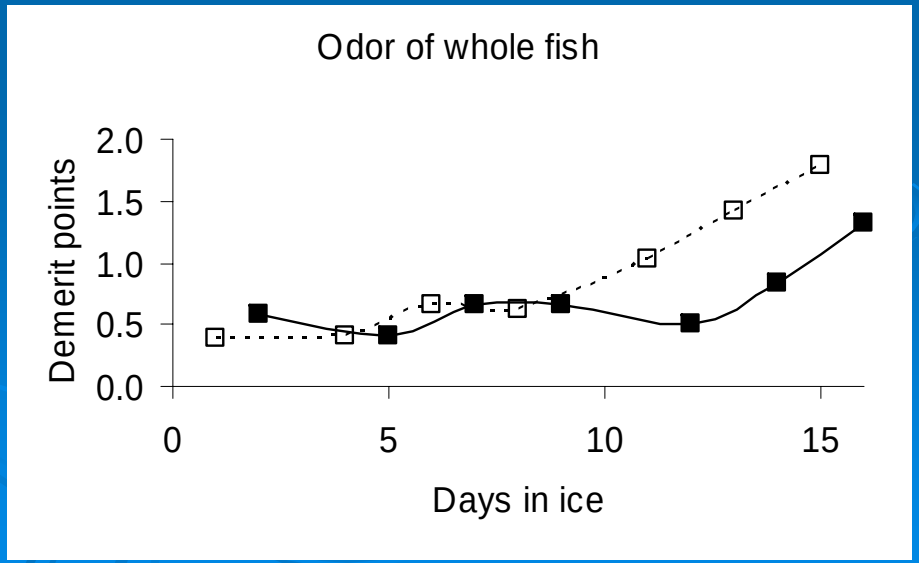
Parameter	Description	Points
Color and appearance of skin	Pearl-shiny, iridescent pigmentation all over	0
	Less pearl-shiny, yellowish, stripes less distinct	1
Discoloration (red spots, bruising)	Slight to none	0
	Minor (5-10%)	1
	Severe (10-25%)	2
Odor	Neutral, pond, fresh fish, seaweed	0
	Melon, cucumber, green grass	1
	Cardboard, fishy, putrid, rotten	2
Texture	In rigor	0
	Firm, resilient, finger mark disappears immediately	1
	Soft, finger mark still persists after 3 seconds	2

Whole fish

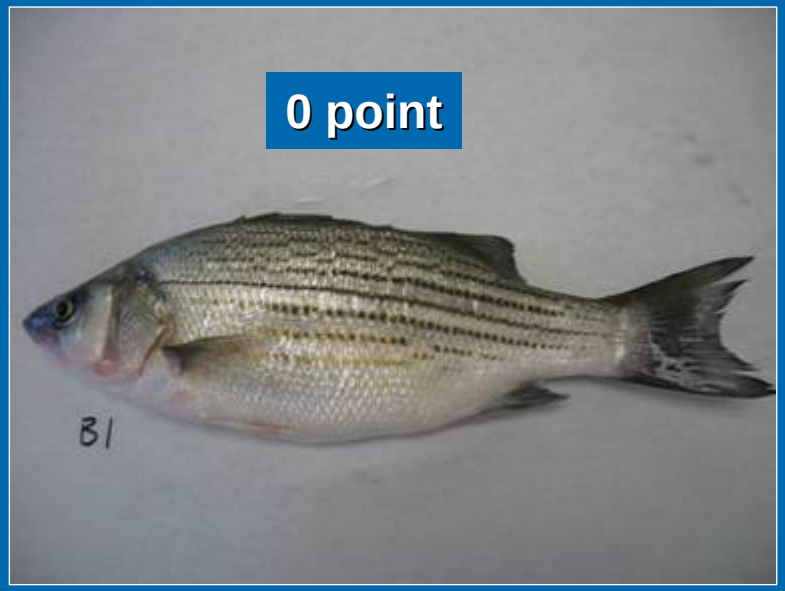

0 point
B11

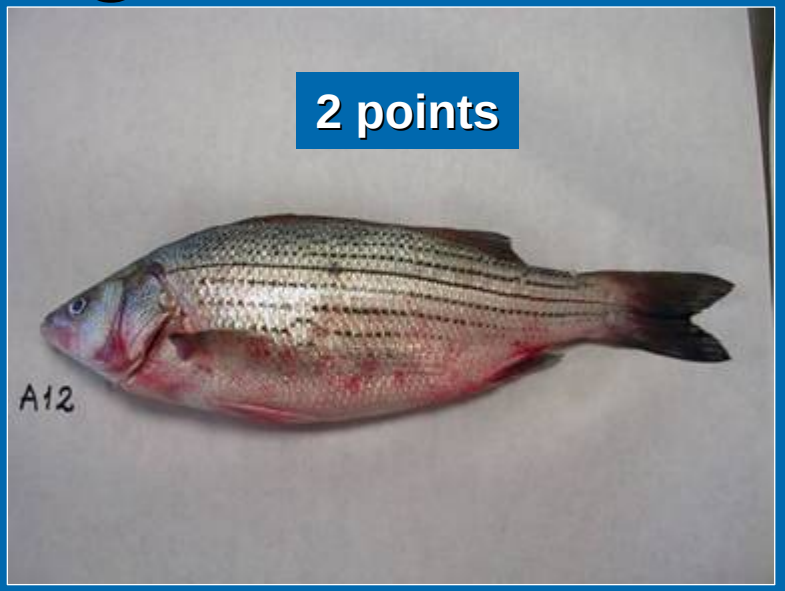

1 point
A5

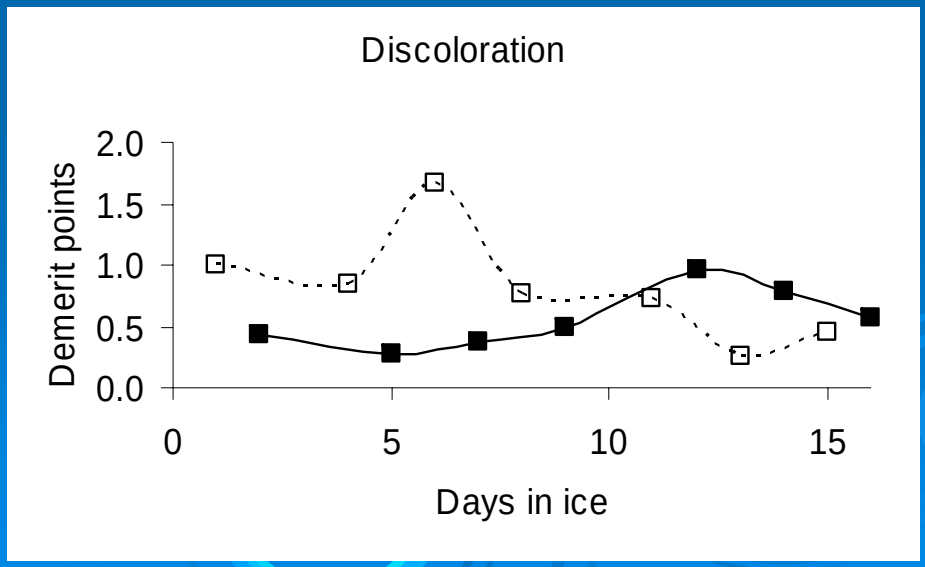

Skin color
Demerit points
1.0
0.8
0.6
0.4
0.2
0.0
0
5
10
15
Days in ice


Odor of whole fish
Demerit points
2.0
1.5
1.0
0.5
0.0
0
5
10
15
Days in ice

Bruising


0 point
B1


2 points
A12


Discoloration
Demerit points
2.0
1.5
1.0
0.5
0.0
0
5
10
15
Days in ice

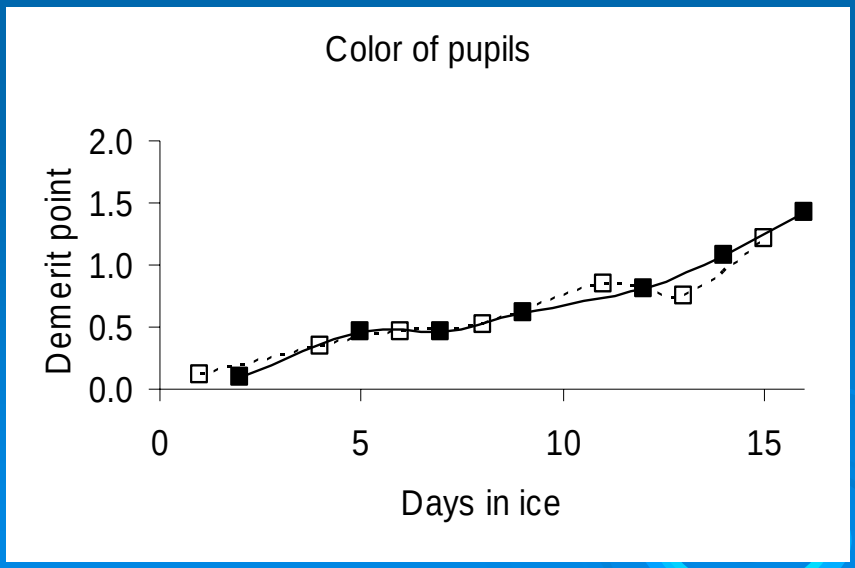
Eyes

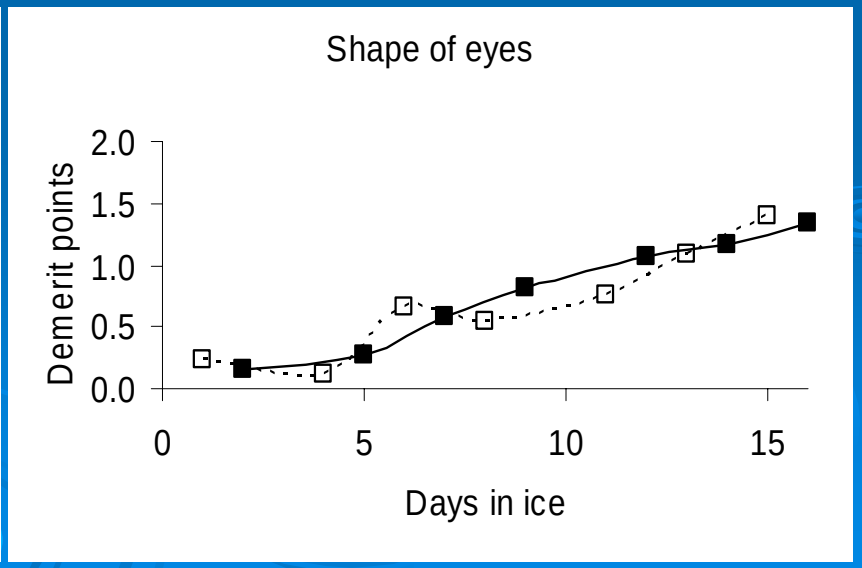
Parameter	Description	Points
Pupil	Black, clear, bright, iridescent	0
	Dark grey, mat, dull	1
	Milky, cloudy, hazy, light grey	2
Shape	Convex, bulging	0
	Flat	1
	Concave, sunken	2

Eyes


0 point


1 point


Color of pupils
Demerit point
2.0
1.5
1.0
0.5
0.0
0
5
10
15
Days in ice

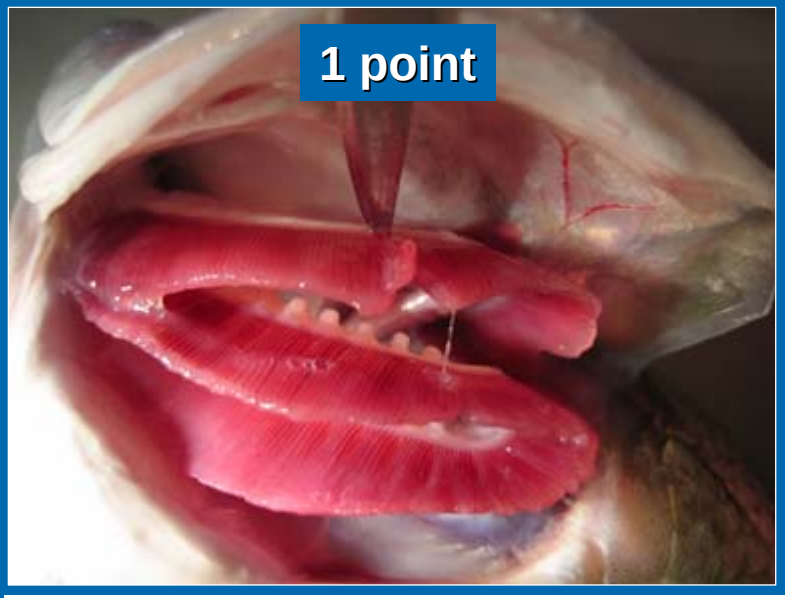

Shape of eyes
Demerit points
2.0
1.5
1.0
0.5
0.0
0
5
10
15
Days in ice

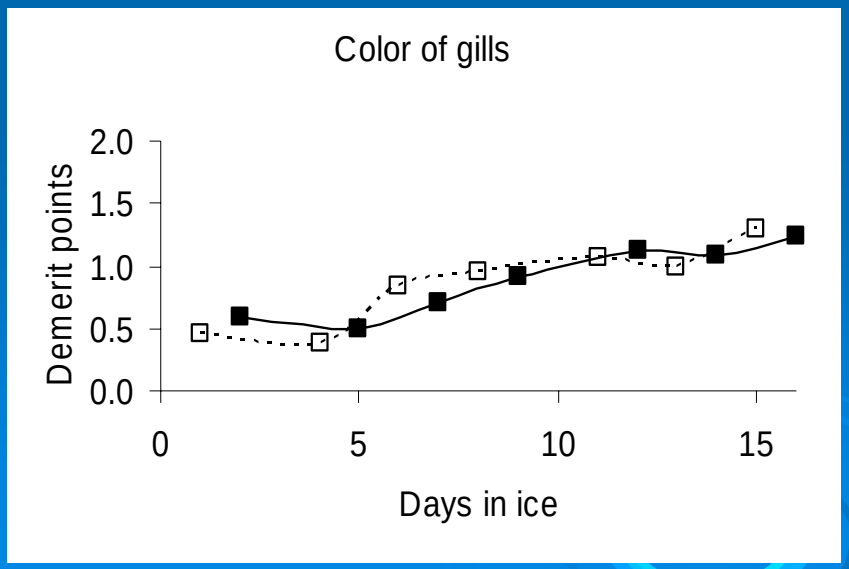
Gills

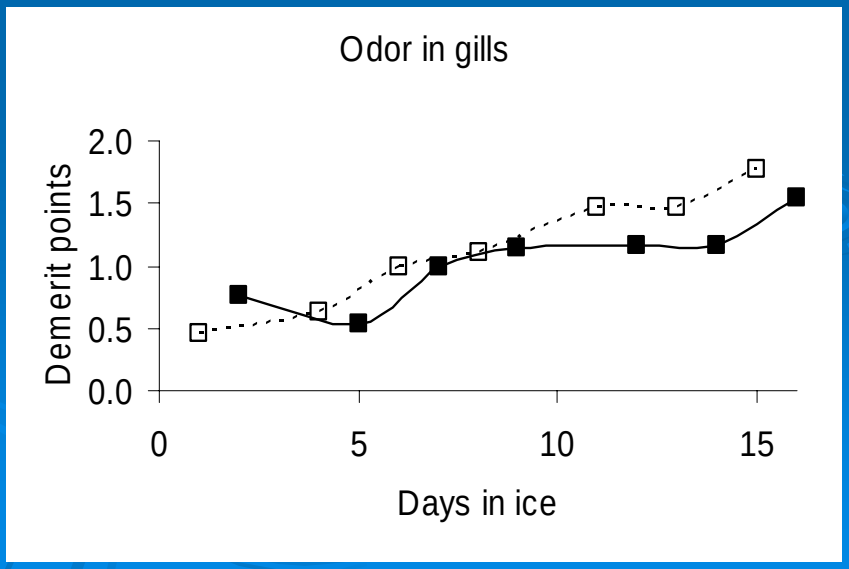
Parameter	Description	Points
Mucus	Transparent, clear, none	0
	Milky, clotted	1
Color/ appearance	Bright red, red, burgundy	0
	Pale red, pink, light brown	1
	Brown, dull	2
Odor	Pond, fresh fish, fresh rain	0
	Melon, cucumber, metallic	1
	Musty, fishy, putrid, rotten	2

Gills


0 point


1 point


Color of gills
Demerit points
2.0
1.5
1.0
0.5
0.0
0
5
10
15
Days in ice


Odor in gills
Demerit points
2.0
1.5
1.0
0.5
0.0
0
5
10
15
Days in ice

What can this be used for?

- Quick quality evaluation
- Estimate the remaining shelf life

Quick quality evaluation

- You can do it without a lot of preparation
- Compare your fish to fish from other farms
- You and the costumer speak the same “language” – less risk of misunderstandings
- Evaluate the effect of changes in production on product quality
- Market your fish with measurable quality parameters
- Build trust – the costumer knows what s/he gets

Quality Grades

Quality Index	Quality Grade
0 – 5	high
6 – 9	medium
10 – 14	low

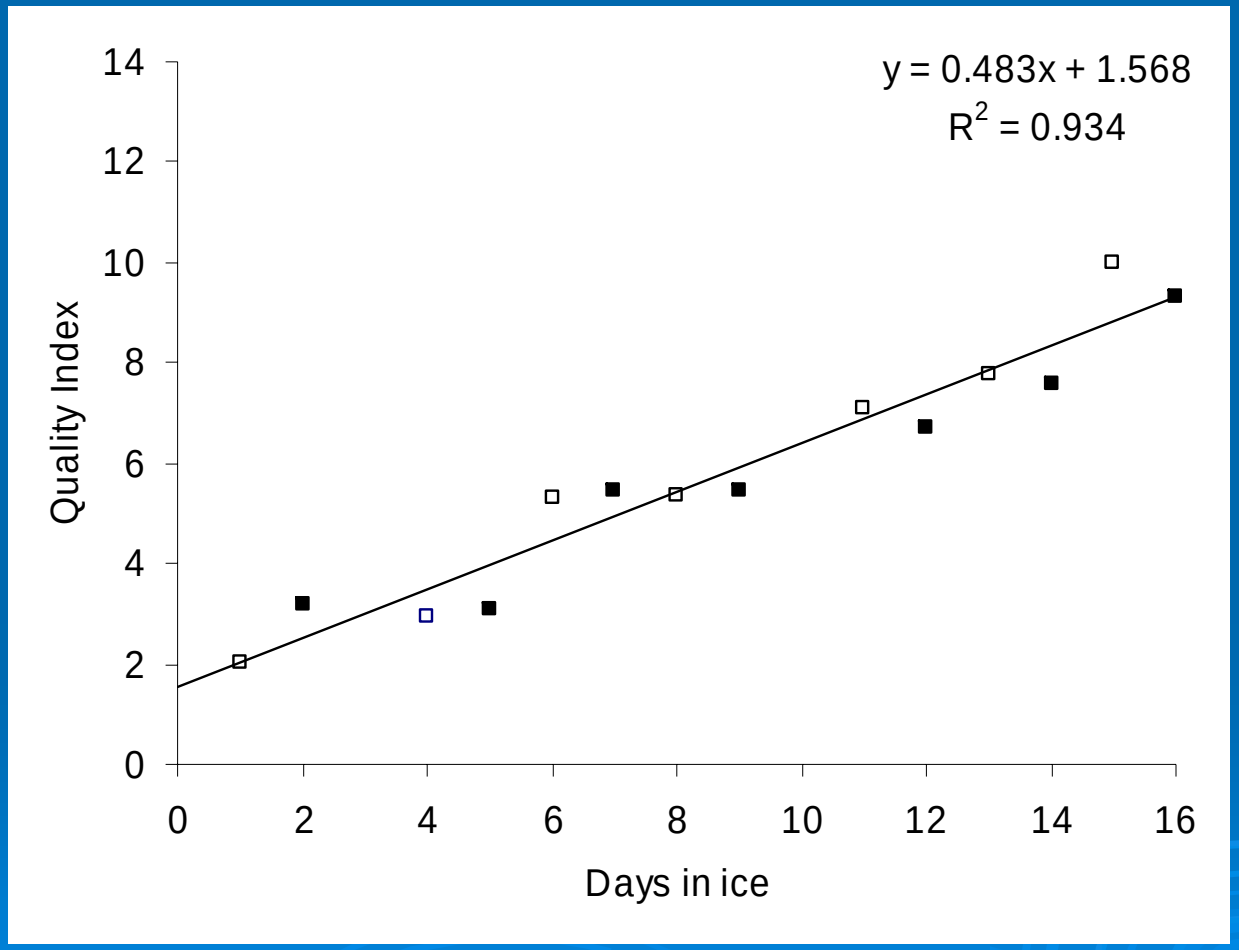
Estimate the remaining shelf life

- Use it to better plan sales or processing

- The total sum of all demerit points is called the Quality Index (QI)
- The QI correlates closely to storage time in ice (if each parameter in the QI increases over time)

- Need to know relation between QI and time
- Need to know the total shelf life

Quality Index and storage time



This is for hybrid striped bass only
Independent of farms and seasons

Shelf life?

- The sensory quality of cooked samples changed very little over the 16-day storage period
- Appearance and odor – no significant change over time
- Sweet flavor – decreased slightly over time.
- Firmness and juiciness - the parameters that changed the most. Fish softened and became dryer after app. 9 days.

- **Total shelf life – 14 days (“good quality” shelf life)**

How to do it?

1. Evaluate the fish and add the scores **-> QI**
2. Find the corresponding storage time from the figure
3. Calculate the remaining shelf life

   (equals total shelf life minus storage time)

EXAMPLE...

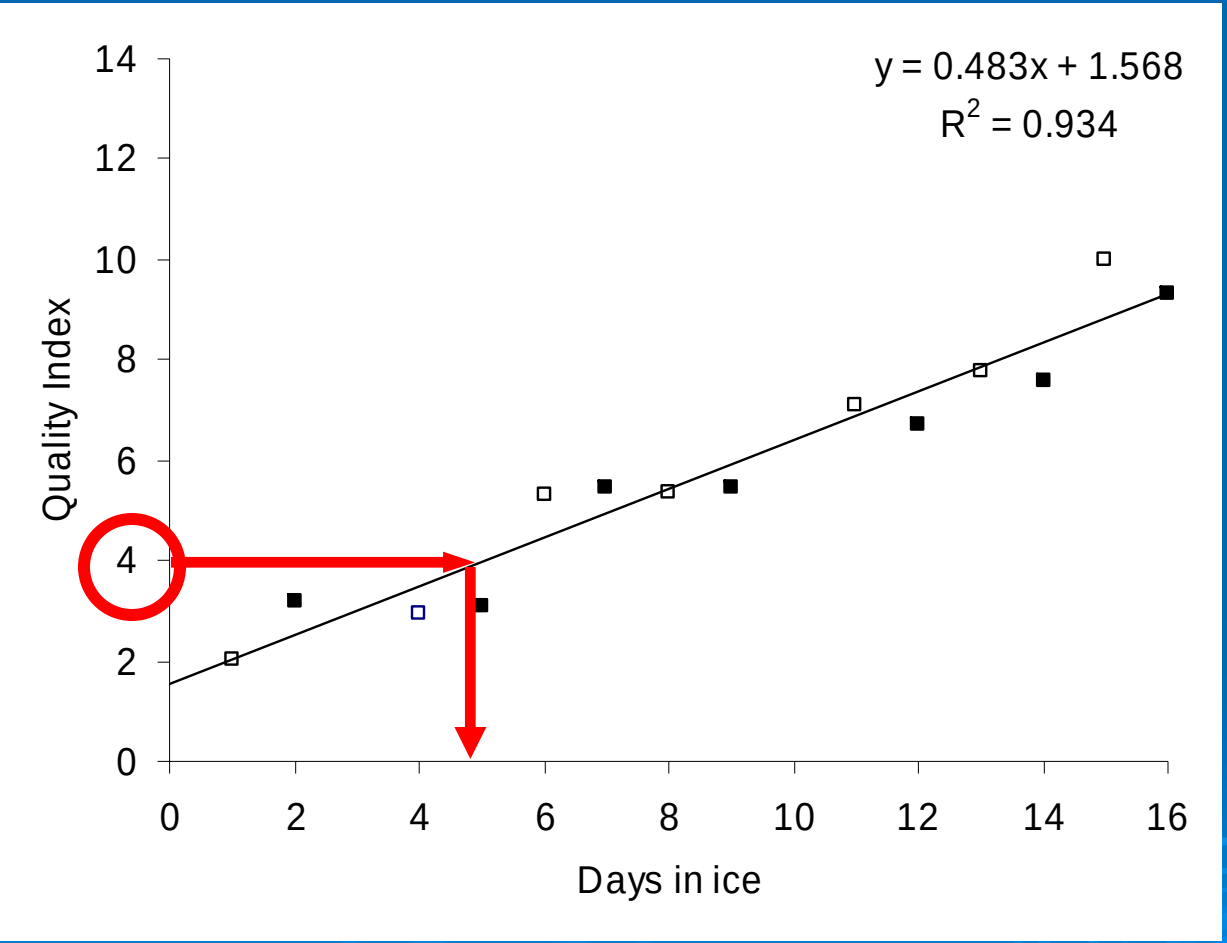
Quality Index Method (QIM) Scheme for Farmed Hybrid Striped Bass

Name_____ Date_____

Quality parameters		Descriptions	Point						
Whole fish	Skin color/appearance	Pearl-shiny, iridescent pigmentation all over	0	0					
		Less pearl-shiny, yellowish, stripes still distinct	1						
	Odor	Neutral, pond, fresh fish, seaweed	0	0					
		Melon, cucumber, green grass	1						
		Cardboard, fishy, putrid, rotten	2						
	Texture	In rigor	0						
		Firm, resilient, finger mark disappears immediately	1	1					
		Soft, finger mark still persists after 3 seconds	2						
Eyes	Pupil	Black, clear, bright, iridescent	0						
		Dark gray, mat, dull	1	1					
		Milky, cloudy, hazy, light gray	2						
	Shape	Convex, bulging	0						
		Flat	1	0					
		Concave, sunken	2						
Gills	Mucus	Transparent, clear, none	0	0					
		Milky, clotted	1						
	Color/appearance	Bright red, red, burgundy	0						
		Pale red, pink, light brown	1	1					
		Brown, dull	2						
	Odor	Pond, fresh fish, fresh rain	0						
		Melon, cucumber, metallic	1	1					
		Musty, fishy, putrid, rotten	2						
Quality Index (total score)			0-14	4					

QI is 4 !!

Example



The fish is 5 days old!

Example

Remaining shelf life

= total shelf life - storage time

= 14 days - 5 days

is 9 days !

You only need the QI

Quality Index	Storage time	Remaining shelf life
1	0	14
2	1	13
3	3	11
4	5	9
5	7	7
6	8	5
7	11	3
8	13	1
9	15	0

Margin of error ±1 day

Some additional findings

- Earthy/muddy off flavors occur occasionally
  - Why do they occur?
  - Is this only a seasonal problem?
  - How do we prevent it from occurring?
- Fish from different farms look different
  - Color of skin, intensity of the stripes, degree of bruising...
  - How can this be controlled better?
  - Can we “design” fish with certain quality parameters to certain markets?

Acknowledgments

- David Green and Greg Bolton, NCSU Seafood laboratory
- The Fish Connection Cooperative
- The sensory panels
- Mike Frinsko, NC Cooperative Extension Service

Funding:

- North Carolina Cooperative Extension Service
- North Carolina Sea Grant