

Sensory Characteristics for Hard Clams from Massachusetts to Florida



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Sensory Profiles for Product Characterization

- A new method has been developed to help judge and rate the romance of hard clams.
- This method is known as 'sensory profiling' which is simply a science-based approach to describing or characterizing the sensory attributes of raw hard clams.

Evaluations:

- Appearance
- Aroma
- Basic Tastes
- Flavor and Aftertastes
- Texture and Mouth-feels

Attributes:

- Quality
- Shelf-Life
- "Appellations"

Sensory Evaluations

Flavor, appearance, aroma and texture are extremely important attributes, but they are hard to measure.

- Have to use humans, not lab instruments; humans are variable.
- Lack of standardization: attributes can mean different things to different people.
- We do not speak the same sensory language.

Science-based Approach



- Pre-screened (25) & selected panelists (10)
- Train and Align communications & etiquette
- Experience product types
- Specific product orientations
- Develop specific products standards
- Present a wide range of the products
- Calibrate and Recalibrate

Evaluation Tools



"Standards"

Color Scale for the Shell



Light Gray



Gray

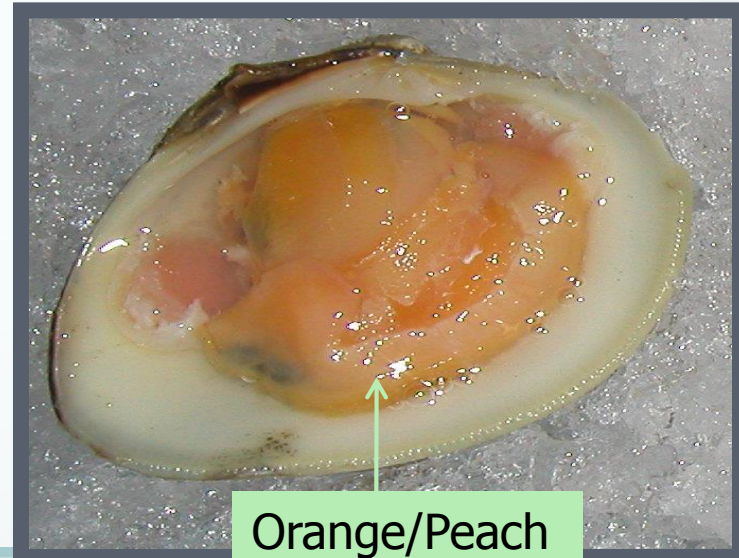
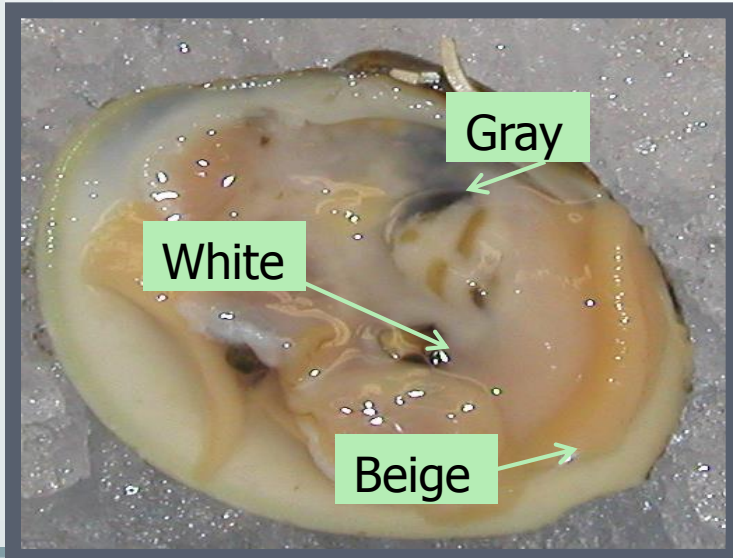
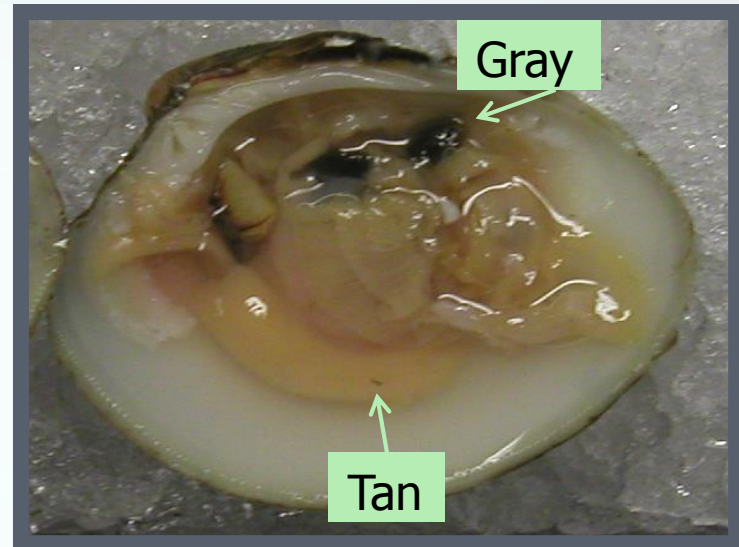
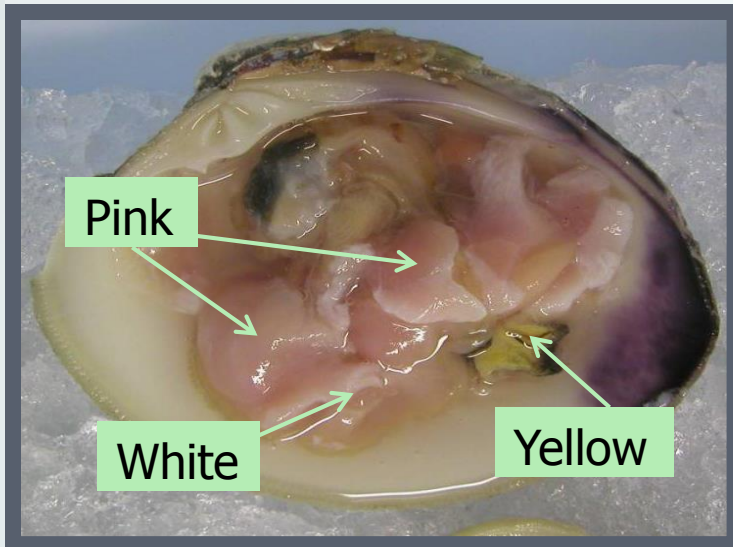


Browns



Brown & Orange

Color Scales for the 'Meat'



Standards for Volume of 'Meat'

Partial Cover (5)



Full Cover (10)



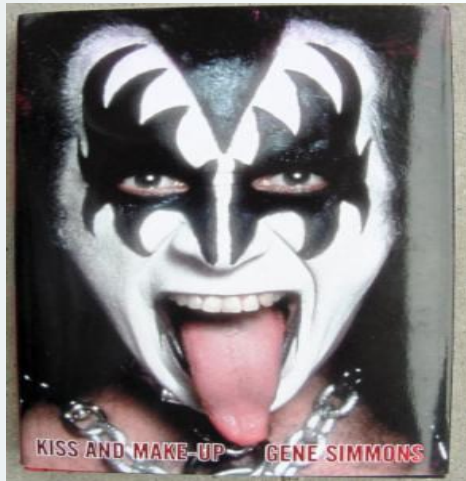
Aroma



- Briny
- Seaweed
- Metallic

Aroma	Standards
Briny & Seaweed	Std 5 & 10 - Ito - Wakame dried seaweed imported by Rhee Bros Inc., Columbia, MD
Metallic	Std 10 - 2 capsules of Sundown Iron 28 mg capsules in 440 ml of water. Rub on skin and smell; or shake bottle, open and smell.

Basic Tastes

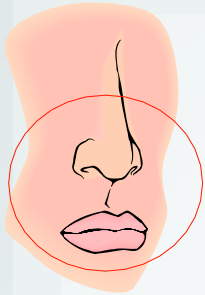


- Salty
- Umami
- Sweet
- Sour
- Bitter

Basic Tastes

Lexicon	Standards	Reference
Salty	Std 5 - 0.3% salt Std 10 - 0.55% salt Std 15 - 0.7% salt	(Meilgaard, Civille et al.)
Sweet	Std 4 - Ritz crackers	(Meilgaard, Civille et al.)
Umami	Std 5 - 1/4 tsp Accent in 500 ml of water Std 10 - 1/2 tsp Accent in 500 ml of water	Garrido et al.
Objectionable Basic Tastes		
Sour	Std 5 - 0.1% citric acid Presence or absence	(Meilgaard, Civille et al.)
Bitter	Std 10 - 0.08% Caffeine solution Presence or absence	(Meilgaard, Civille et al.)

Flavor



- Seaweed
- Chicken-liver (iron)
- Earthy

Lexicon	Standards	Reference
Seaweed	Relating to or having the characteristic to a flavor like seaweed.	Std 10- Ito-Wakame dried seaweed imported by Rhee Bros, Inc Columbia, MD
Chicken Liver- Iron	The iron flavor of cooked liver (organ) meat.	Std 4 - Chicken liver (Tyson's) Add to boiling water and keep boiling for 10 minutes
Earthy	Refers to the characteristics of damp soil, and wet plants.	Std 10 - Whole White Mushrooms with soil - cut in half and taste.

Aftertaste

- Metallic
- Astringent

Lexicon	Standards	Reference
Metallic	Relating to or having the characteristic of a metal.	Std 5 - 1 capsules of Sundown Iron 28 mg capsules in 440 ml of water.
Astringency	The chemical feeling factor combining three different aspects: drying of the mouth, roughing of oral tissues and drawing (shrinking) sensation felt in the cheeks and the muscles of the face.	Std 5- 1/8 teaspoon (0.5g) of alum (McCormick) in 500 ml of water. Std 5- Fresh Spinach (Ready Pac).

Texture & Mouthfeel

- Firmness
- Chewiness
- Detect Grit
- Detect Mud

Lexicon	Standards	Reference
Firmness Chewiness	Refers to consistency of how soft versus how firm in resistance the clam flesh holds. Amount of maceration required to comfortably swallow the clam..	Std 1- Jell-O-soft Std 3 -Canned Peaches-Diced- 4oz pull top cups (Del Monte) Std 5 -Tofu - Grill-Marjon original Std 6 - Jell-O hard Std 8 - Cooked Chicken Breast-salad topping (Plain-Purdue) Std 10 - Dried Apricots (Sunmaid - Mediterranean)
Grittiness	Presence of sand; detection	Actual Samples

Other Observations

- Detect yellow siphon
- Detect mud
- Brittle shells



Yellow Siphon



Mud & Grit

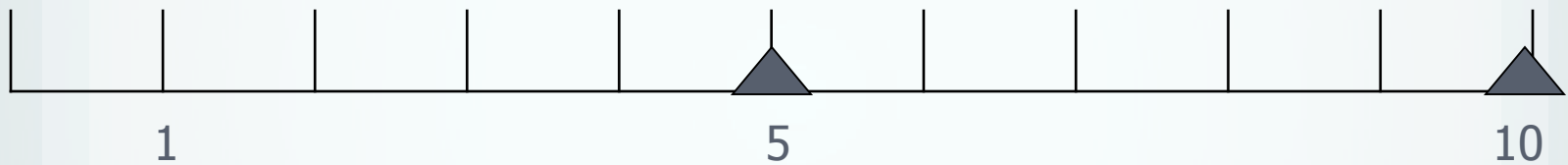
Score Sheets



Understanding the Form

Most attributes are rated using 0-10
point scale
For example,

Volume of Flesh



Standard 5



Standard 10

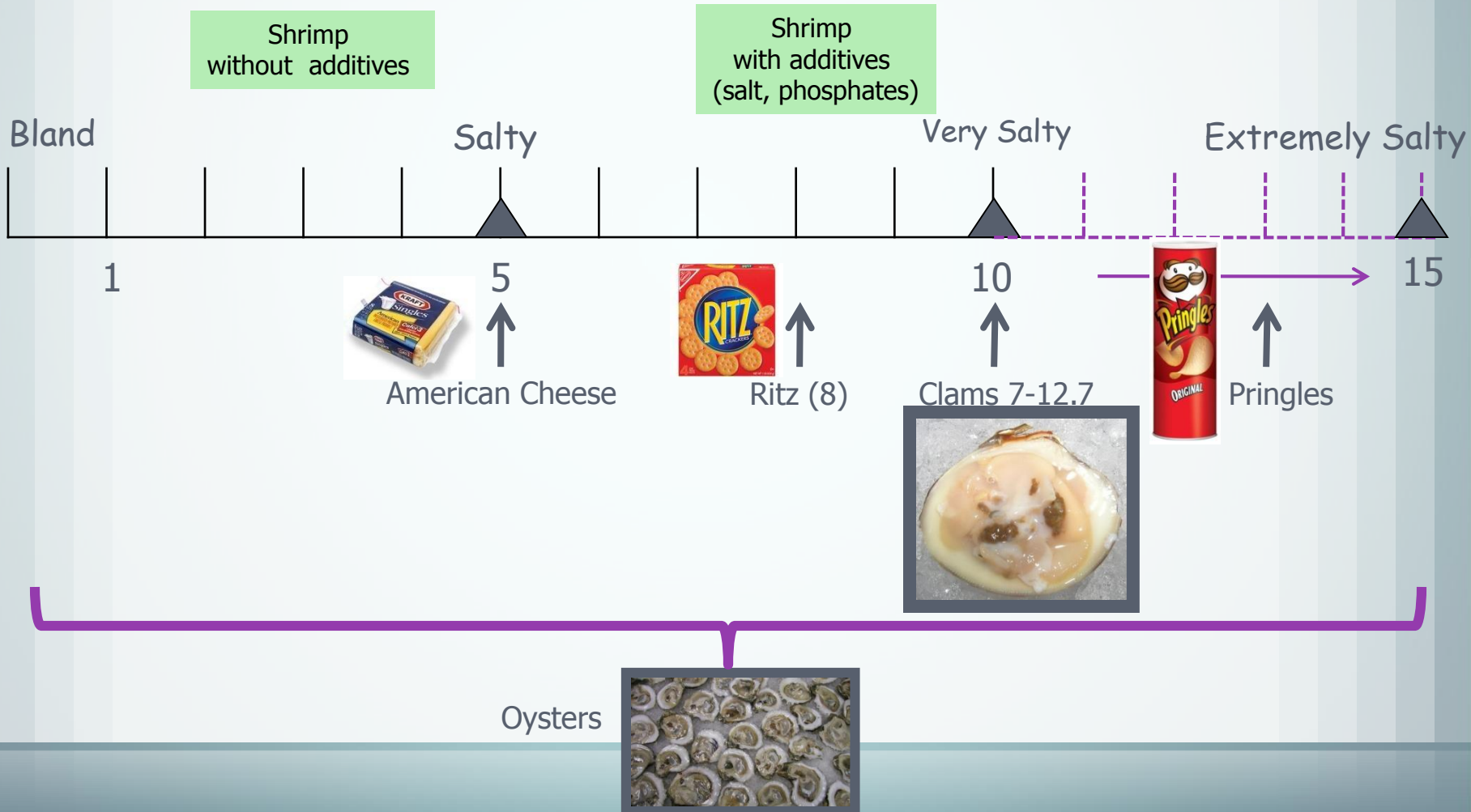


Understanding the Scales

Universal Scales (all foods)

0-10 or 0-15 point scale

For example,





Wellfleet, MA

Milford, CT

Greenwich, CT

Oyster Bay, Long Island

Oceanville, NJ

Cherrystone, VA

McClellanville, SC

Townsend, GA

Cedar Key,
FL

University of Florida



Samples Received

Location	#of samples received
Cedar key, FL	11
Townsend,GA	2
McClellanville,SC	2
Virginia	2
Greenwich,CT	2
Mildford,CT	2
Wellfleet, MA	2
Oceanville,NJ	1
Oyster Bay,Long Island,NY	2

Colors By Harvest Locations / State

Ratings	MA	CT	NY	NJ	VA	SC	GA	FL
Shell Color								
Gray	**	***	***	***	***	***	***	*
Brown		*	*			**		**
Light Brown	*			*				
Orange								*
'Meat' Color								
White				*		*	*	
Tan	**		*	*			*	*
Peach	*	*			**		**	*
Pink	***	***	***	*	**	**		*
Yellow				*		*	***	
Orange		*		*				*
Gray								*
Shell Strength								
Brittleness	*	*	*	*				

Overall Sensory Profile for Hard Clams



Ratings	Avg.	Range
Appearance		
Volume of Flesh	7.3	6.1 - 9.0
Plumpness	6.9	4.7 - 8.6
Aroma		
Briny	2.6	1.2 - 3.8
Metallic	1.0	0.1- 2.1
Basic Tastes		
Salty	9.7	7.0 -12.7
Umami	2.2	1.2 – 3.0
Flavor		
Seaweed	1.8	0.4 – 2.9
Chick..liver	2.2	1.0 – 3.6
Earthy	2.2	1.3 – 4.3
Aftertaste		
Metallic	2.6	0.5 – 3.7
Astringent	1.4	0.7 – 2.7
Texture, Meat		
Firmness	6.1	4.3 – 7.3
Chewiness	5.6	4.3 – 7.6
Mouthfeel		
Detect Grit	2.0	0.8 – 4.5

Overall Sensory Profile for Hard Clams



A = average for all clam samples

H = above the average

L = below the average

D = depends on source or sample

Harvest Locations / State

Ratings	MA	CT	NY	NJ	VA	SC	GA	FL
Appearance								
Volume of Flesh	H	H	H	A	H	D	H	L
Plumpness	H	H	H	A	H	D	H	L
Aroma								
Briny	D	H	A	L	L	L	H	H
Metallic	D	H	A	L	L	L	H	H
Basic Tastes								
Salty	H	L	H	A	L	D	A	L
Umami	H	L	H	A	L	D	A	L
Flavor								
Seaweed	L	H	A	H	L	D	A	D
Chick..liver	L	H	A	H	L	D	A	D
Earthy	L	H	A	H	L	D	A	D
Aftertaste								
Metallic	A	H	L	L	L	L	L	L
Astringent	A	H	H	L	L	L	L	L
Texture, Meat								
Firmness	A	A	H	L	A	L	A	A
Chewiness	A	A	H	L	A	L	A	A
Mouthfeel								
Detect Grit	D	D	A	L	D	D	D	L

Harvest Locations within Florida

Ratings	Avg.	1	2	3	4	5	6
Appearance							
Volume of Flesh	7.3	A	L	A	L	L	L
Plumpness	6.9	L	L	L	L	L	L
Aroma							
Briny	2.6	L	HH	L	H	L	H
Metallic	1.0	L	H	L	A	L	H
Basic Tastes							
Salty	9.7	H	L	H	L	L	L
Umami	2.2	L	H	L	H	H	A
Flavor							
Seaweed	1.8	L	H	L	A	H	H
Chick..liver	2.2	L	L	L	L	A	H
Earthy	2.2	L	L	L	A	L	H
Aftertaste							
Metallic	2.6	L	L	L	L	L	L
Astringent	1.4	L	L	L	A	L	H
Texture, Meat							
Firmness	6.1	H	H	H	L	L	L
Chewiness	5.6	H	H	H	A	A	L
Mouthfeel							
Detect Grit	2.0	L	L	L	HH	L	LL

Results

- Outer shell color was the least variable, ranging from common grey-tones to more browns and some orange coloration associated with FL hard clams. All shell colors are typically expected and should not necessarily influence product preference. In contrast, shell strength, described as brittleness, was more obvious and a potential commercial concern for the clams from MA through NJ.
- The edible meat color was more variable per location than shell color, yet the meat colors should not present a negative impression and there is no evidence that consumers would prefer meats with more white or pink tones. Interestingly, the clams from FL and Ga were amongst types that exhibited more obvious variability in meat colors per individual clams from the same harvest. Meat color could be used in marketing efforts to embellish or distinguish products, but there was no evidence that any one color indicated a better or inferior product.

Results

- In terms of taste, ratings for “salty” were by far the most distinguishing attribute. This result is not unexpected and remains consistent with commercial experiences. In fact the standard 10 point rating scale had to be expanded to account for some very strong salty taste. The salty flavor would not necessarily distinguish regions, but it could reflect seasons and local weather conditions.

Conclusions

- This project contributed to provide industry and government with a formal sensory profile system for raw clams. This instrument can be used to evaluate traditional raw clams for a) process improvements, b) to establish shelf-life of a particular product, or c) to enhance market development appellations.
- The limited data showed constancy in the attributes of the clams contrary to oysters and fish (as found in previous research).
- Saltiness was the most dominant attribute in clams. High salinity tends to mask many of the flavors.
- Clams with brittle shells could be considered for cooking only (not for raw bars)

Appellations for FL Clams

- Pretty in Pink (pink/purple inner shells)
- Taste of the Sea
- Tastes Like Sunshine (orange color)
- Small But Mighty Tasty
- Blushing Pink
- The Salt of Florida
- Jewel of Florida
- Salty Girls
- Papa's Little Silver Toes
- Yummy Plus
- Love-Me-Tenders
- Tender Hearts
- Madame Umami

ACKNOWLEDGMENTS

Commercial:

- Cedar Key Aquaculture Association, Cedar Key, FL ^{1,2}
- Sapelo Seafarms, Townsend, GA¹
- Savannah Clam Company, Savannah, GA¹
- Livingston's Bulls Bay Seafood, McClellanville, SC¹
- Cherrystone Aqua-Farms, Cheriton, VA ¹
- Intracoastal Aquaculture, Tuckerton, NJ¹
- Ocean Rich Distributors, Brookhaven, NY¹
- F.M. Flowers Shellfish Distrib., Oyster Bay, NY¹
- Wellfleet Shellfish Company, S. Wellfleet, MA¹

University of Florida:

- Shellfish Aquaculture Extension Office, University of Florida
- FL Sea Grant College Program
- Food Science & Human Nutrition Department , University of Florida

1. Provided clams 2. Provided Funding