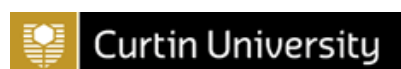
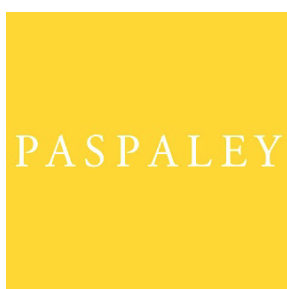


# New Opportunities for Seafood Processing Waste

## Appendix 10: Paspaley pearl meat: fresh versus frozen pearl meat shelf life and sensory determination

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# Pearl Meat fresh v Frozen

## Background

CESSH previously conducted a study on pearl meat as part of CRC 2009/709 and provided a series of recommendations for on board processing and storage options to improve product quality.

Paspaleys harvest pearl meat in several locations in NorthWest WA and off the coast in Darwin.

To develop export and domestic markets, Paspaley Pearls have upgraded their commercial on board processing of the pearl adductor muscle from the *Pinctada maxima* pearl oyster following recommendations from these quality optimization trials. The upgraded on board process has a strong emphasis on maximizing product quality at harvest including the removal of excess moisture, chilled in an ice slurry vacuum packing and snap freezing product. The pearl meat processed with this method is called 'harvested meat'. There are still some operations that process the pearl meat using the previous method, where there is less emphasis on quality and the meat is removed, chilled, washed and frozen in a commercial freezer in bags. The pearl meat processed using this method is termed 'fished meat'.

There are three different grades for the pearl meat, based on the age of the shell, each with slightly different characteristics making each size ideal for particular markets listed below:

- 1R (First Operation): 60 pieces/kg, best for restaurants. Sweeter and tenderer flesh generally harvested from younger pearl oysters. Sell for less if used for producing dried pearl meat.
- 2R (Second Operation): 45 pieces/kg, best for restaurants.
- 3R (Third Operation): 30 pieces/kg, best for producing dried pearl meat. Large and meat can be chewier.

The pearl meat currently harvested is sold to restaurants in the domestic market, with chefs serving them in raw sashimi style and cooked format. The company now has a focus to sell their product to premium food service establishments, both domestically and internationally. To export, the company must meet the requirements set by AQIS, FSANZ Food Standards Code and the regulatory requirements of the importing country. The product must have a best before date to be placed on the product before being exported. The company would also like to provide recommendations on best practice thawing and shelf-life of fresh and thawed product.

### 1.1 Aim

To determine effect of post-harvest treatment and fresh v frozen storage conditions on the shelf life and quality of pearl meat.

### 1.2 Methodology

#### 1.2.1 Materials

Pearl meat adductor muscle from the *Pinctada maxima* pearl oyster was freshly harvested from Gourdon Bay. The 1R pearl meat was shucked, cleaned and vacuum sealed into 250g bags. The vacuum packed pearl meat was stored in two different conditions:

1. Fresh refrigerated: Packs of pearl meat chilled in ice slurry between -1 to 4°C and kept at refrigerated conditions. Harvested on the morning of 30/09/15.-
2. Snap Frozen: Packs of pearl meat chilled in ice slurry, vacuum packed and snap frozen before storage at -17°C immediately after harvest. Harvested on the 29/09/15.

Samples were flown from Broome to Perth, at refrigerated conditions on the afternoon of the 30<sup>th</sup> September. A temperature logger was placed in the shipment to monitor the temperature during transit. Upon arrival, all samples were stored at 4°C.

## 1.2.2 Sensory Analysis

### Fresh vs Frozen

Sensory analysis of the fresh and snap frozen pearl meat was conducted to determine if there was a notable difference between the two treatments. Acceptability rating scales were used to assess the appearance, odour, texture, flavour and overall acceptability. The pearl meat was assessed the day after transport, either the fresh product or the frozen product following thawing (overnight at 4 C) . Pearl meat was assessed raw and cooked, with a target of 25 panelists. The forms the panelists completed are located in Appendix 1 and 2.

### Shelf Life

Thawed and fresh pearl meat stored at 4°C was assessed in house at Curtin University on days 1, 2, 4, 6, 8, and 10 to determine the sensory shelf life of the pearl meat. Any off flavours and odours, changes in texture and loss of flavour detected at any stage of the storage would indicate the end of the product shelf life. The pearl meat was assessed raw only.

## 1.2.3 Microbial Analysis

Duplicate samples of fresh and frozen pearl meat were sent for analyses at a NATA accredited laboratory. *E. Coli* and *Listeria Monocytogenes* were measured on the Day 1 and Day 10, to comply with the Food Standards Code. TPC was measured on days 1, 3, 5, 7 and 10 to determine the microbiological shelf life. Samples were stored at 4C for the duration of the testing. Testing regime is listed below.

Day	TPC	<i>E. coli</i>	<i>Listeria monocytogenes</i>
1	X	X	X
3	X		
5	X		
7	X		
10	X	X	X

**Table 1** Maximum allowable level of contaminants in non ASQAP molluscs, as outlined in the Food Standards Code Std 1.4.1(noting E.coli not necessary due to ASQAP exemption for this product).

Microbiological test	Maximum Level (cfu/g)
TPC	10 <sup>6</sup> /g
E.coli	<2.3/g
Listeria monocytogenes	Nd/25g

### 1.2.4 Contaminants

Duplicate samples of pearl meat were analyzed for inorganic arsenic, cadmium, lead and mercury in accordance with the Food Standards Code, Standard 1.4.1.

**Table 2 Maximum allowable level of contaminants in molluscs, as outlined in the Food Standards Code Std 1.4.1**

Contaminant	Maximum Level (mg/kg)
Arsenic (inorganic)	1
Cadmium	2
Lead	2

### 1.2.5 Colour

Photographs of the fresh and frozen pearl meat were taken at different stages of the product shelf life using the Canon EOS 50D. The pearl meat was on photographed on a sheet of white paper in black colour box, with the flash on at all times.

Digital photos were uploaded into Photoshop and pearl meat samples will be overlaid, resized, outlined, selected and a blur function chosen to obtain the average colour. Colour results will be presented as CIE L\*, a\* and b\* values.

### 1.2.6 Drip Loss

The drip loss of the pearl meat thawed from frozen was measured over 7 days of refrigerated storage by weight. Three pieces of pearl meat from each treatment group were placed in a zip lock bag.

## 1.3 Results and Discussion

### 1.3.1 Transit data

A temperature logger was placed with the fresh shipment delivered to Perth. Figure 1 show the results of the temperature logging with explanation.

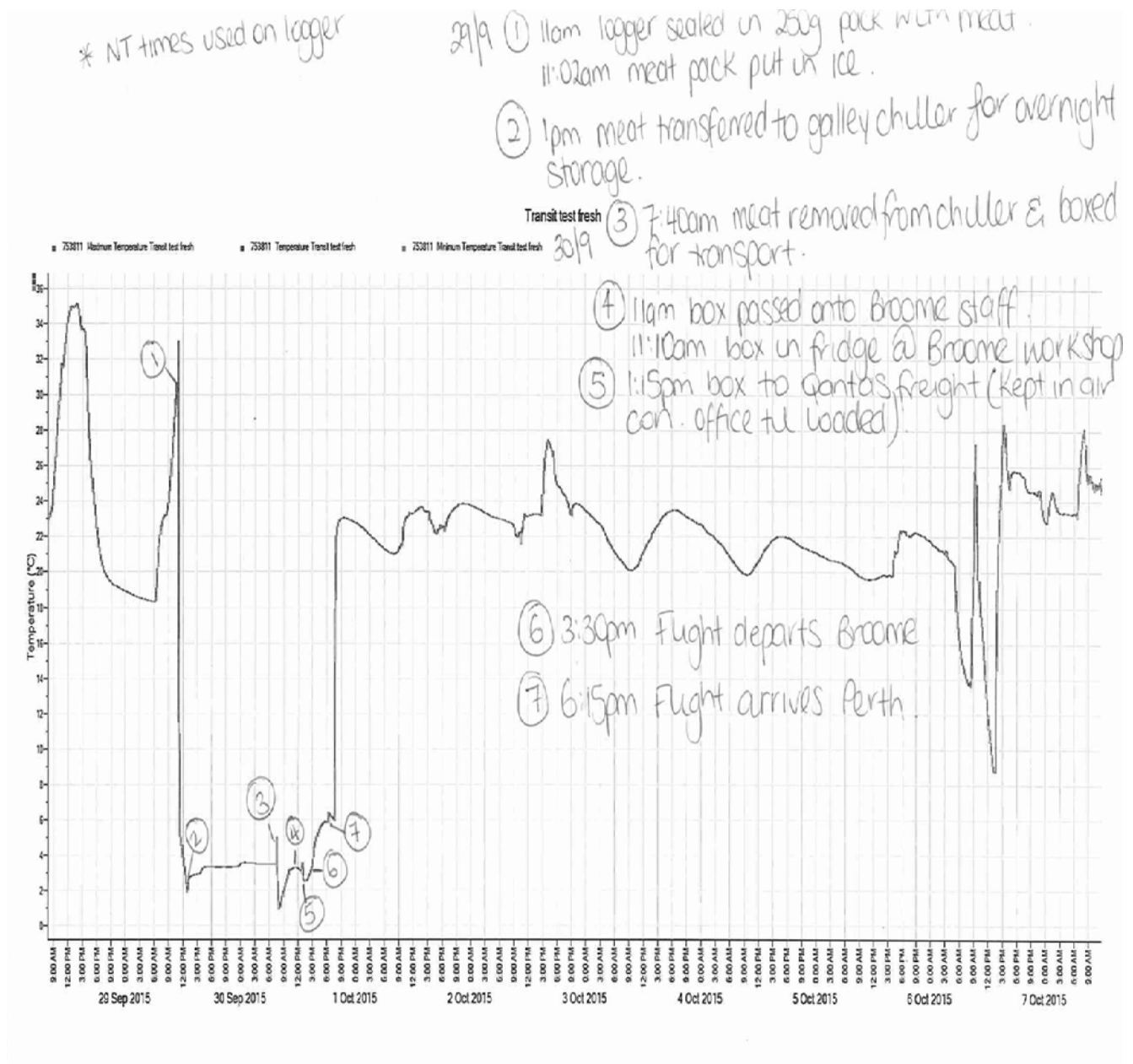


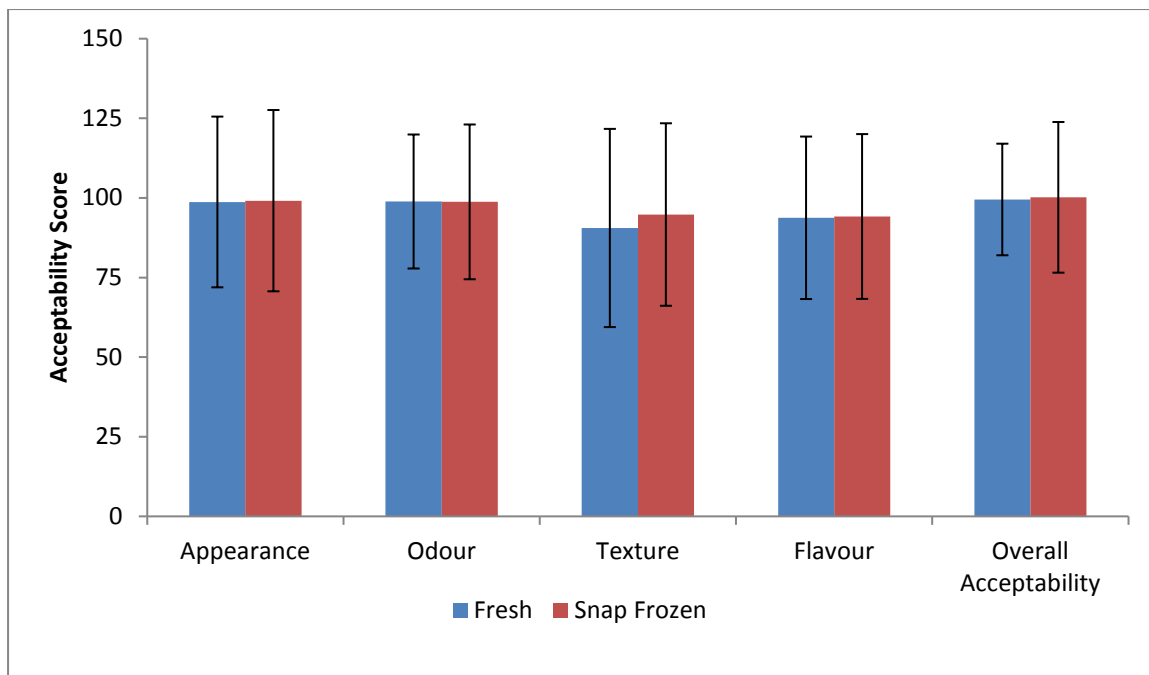
Figure 1: Temperature logging data for shipment from Perth.

### 1.3.2 Sensory Analysis

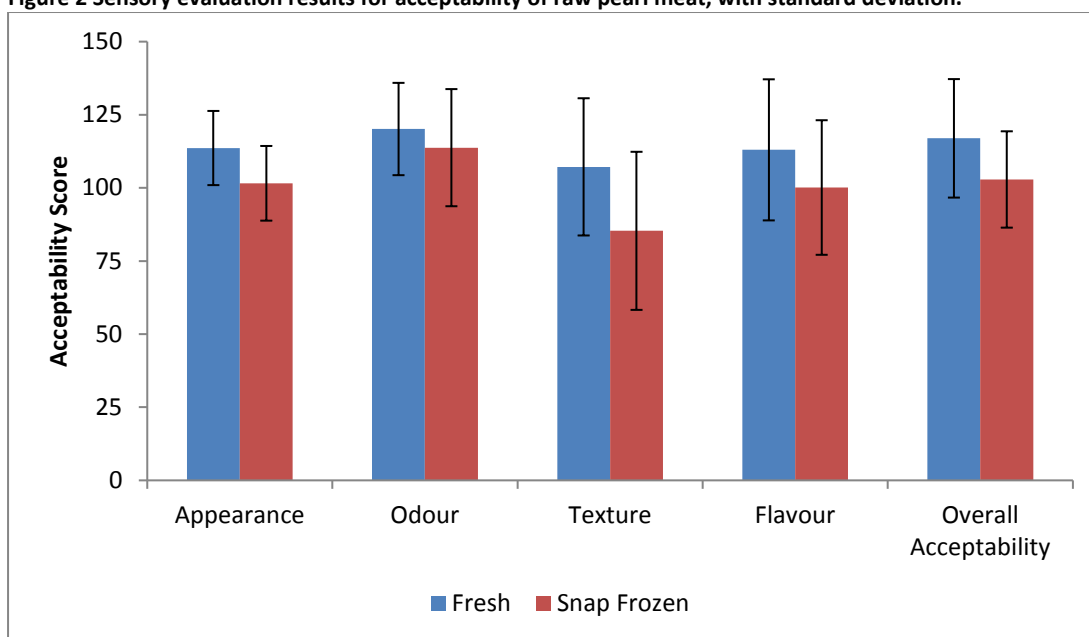
#### Fresh vs Frozen

Sensory analysis of the fresh and thawed pear meat was conducted with 16 participants for the raw pear meat and 8 participants for the cooked pear meat. The fresh pear meat was tasted over 24 hours after harvest and refrigerated storage due to the time required to transport the samples. The snap frozen pear meat was only stored refrigerated for 12 hours,

The results of the sensory analysis of the raw pear meat indicated there was no observable difference in preference of the fresh and frozen pear meat (Figure 2 and Figure Figure 3). Both fresh and frozen pear meat was rated acceptable in each sensory attribute.



**Figure 2** Sensory evaluation results for acceptability of raw pearl meat, with standard deviation.



**Figure 31** Sensory evaluation results for the acceptability of cooked pearl meat, with standard deviation

With the cooked product there appeared a slight preference for the fresh product however this was not statistically significant.

The recurring comments from the participants were: it was hard to distinguish a difference between the two products; and the pearl meat should be sliced in very thin pieces for future assessments.

### Shelf Life

Both fresh and frozen pearl meat was still acceptable after 4 days of storage at 4°C. There were no off odours or flavours detected, although the flavour was much milder for both samples. At day 6 the pearl meat was not acceptable for either the fresh or thawed samples.

### 1.3.3 Microbial Analysis

*E.Coli* and *Listeria Monocytogenes* was not detected in the frozen or fresh pearl meat in the initial samples. The TPC for both samples was also acceptable on the first and third day.

Awaiting the rest of the results.

### 1.3.4 Contaminants

Awaiting results.

### 1.3.5 Colour

There was no observable change in the colour of the fresh and frozen pearl meat over 6 days of refrigerated storage (Figure 3 and Figure 4).

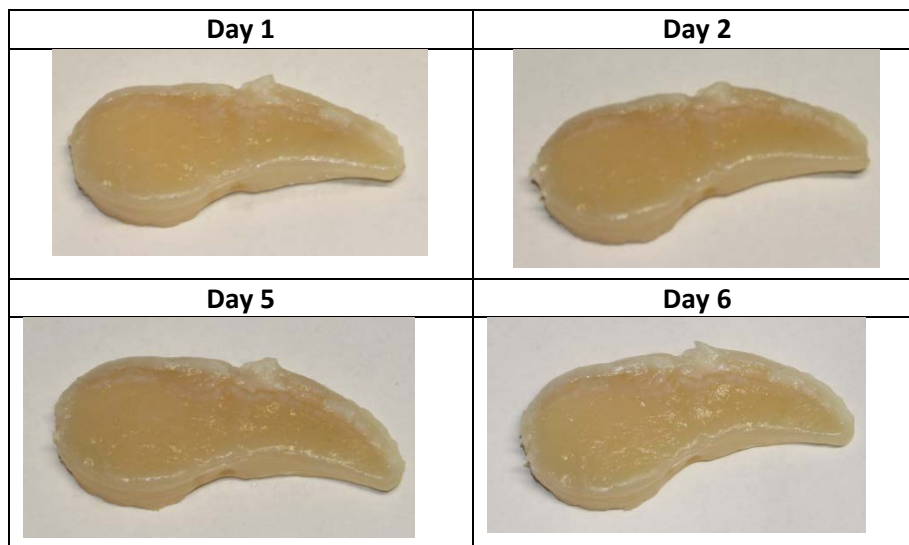


Figure 2 Fresh pearl meat colour over 6 days stored at 4C

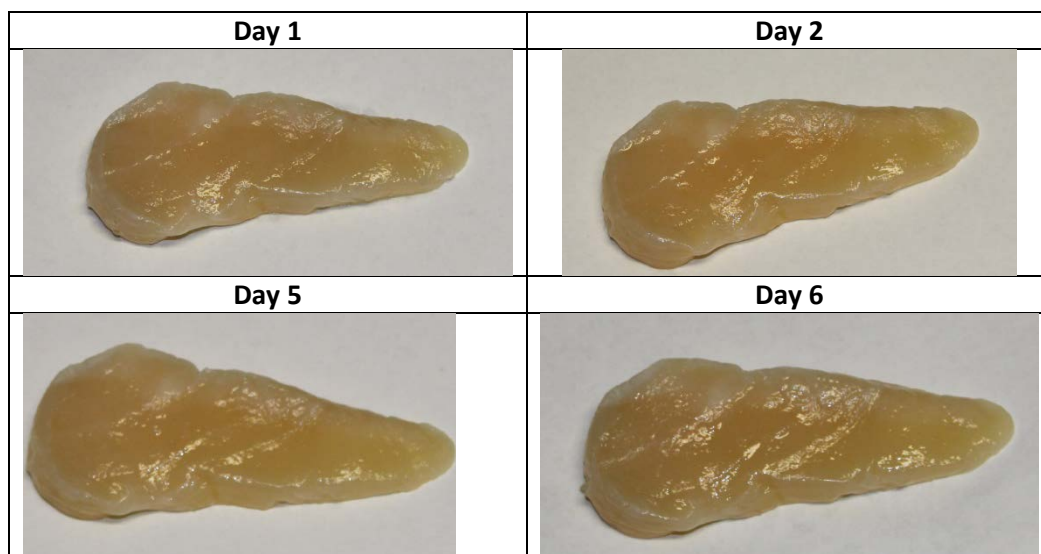


Figure 3 Snap frozen pearl meat colour over 6 days stored at 4C

### 1.3.6 Drip Loss

The drip loss was higher for the snap frozen pearl meat. Some drip loss had already occurred during transport of each 250g pack of the fresh pearl meat. This quantity was not taken into account as the pearl meat for the experiment was removed from the bag and placed into separated bags. This would account for the lower drip loss recorded for the fresh pearl meat in Figure 3. The frozen pearl meat was separated into the bags while frozen, retaining all moisture within the pearl meat structure, resulting in a higher drip loss.

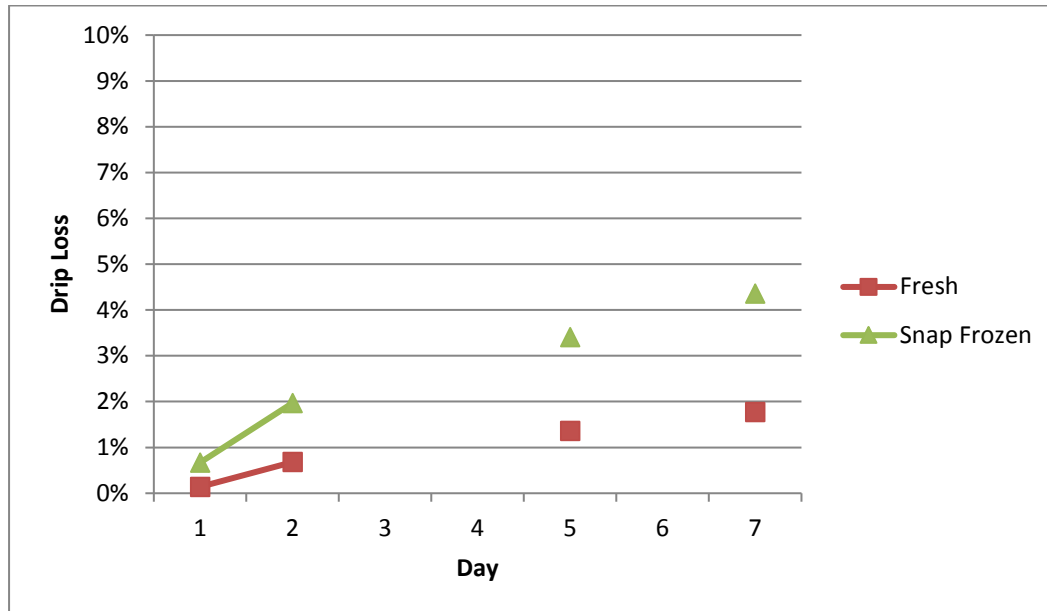


Figure 4 Drip loss of pearl meat during refrigerated storage over 7 days.

## 1.4 Conclusion

There was no significant difference between sensory characteristics of the fresh and snap frozen pearl meat; therefore the snap frozen pearl meat preservation method is recommended to limit the risk of cold supply chain issues that would spoil the pearl meat if it was transported fresh.

## 1.5 Next Steps

- Develop best practice Instructions of thawing conditions- parameters for thawing at room temp- set parameters
- Shelf life of frozen pearl meat stored for longer periods than in Trial 1 need to be conducted in order to develop a best before date for the product.

## Appendix

### Appendix 1 Informed Consent Form

### Information Sheet



The aim of this research project is to determine acceptability of pearl meat adductor muscle from *Pinctada maxima*.

The whole process will be carried out by Centre of Excellence Science Seafood and Health (CESSH) staff and students under the supervision of Dr Janet Howieson. The panellists will be asked to taste up to 6 samples and rate them based on their preference. The time required for each panellist taste will be approximately 10 minutes. All recruited panellist will be allowed to taste except those with seafood allergies and intolerance.

To participate in this study is completely voluntary. Any participant is free to withdraw from this evaluation at any time with no negative consequences or prejudice. All personal information from the panellists will not be identifiable and stored with all data obtained from this study in a secure location within the CESSH, Curtin University for a period of 5 years. All the electronic data will be stored in the secure network within Curtin University.

Approval for this research has been obtained from the Human Research Ethics Committee at Curtin University (Approval Number RD33-13). The committee contact details are provided below for more information about the ethical baseline of this study. For any other enquires do not hesitate to contact Dr Janet Howieson.

#### **CONTACT DETAILS**

<b>Human Research Ethics Committee,</b> Phone: 9266 2784 Email: <a href="mailto:hrec@curtin.edu.au">hrec@curtin.edu.au</a> Mail: Office of Research and Development, Curtin University of Technology GPO Box U1987, Perth WA 6845.	<b>Dr. Janet Howieson</b> 7 Parker Place, Technology Park. Phone: 9 266 2034/0423840957 Email: <a href="mailto:j.howieson@curtin.edu.au">j.howieson@curtin.edu.au</a>
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### **Product Sensory Evaluation Panel Consent Form**

**I signing this form I confirm that:**

- ❖ I have been informed and understand the purpose of this study
- ❖ I have been given opportunity to ask questions
- ❖ I understand that I can withdraw from the study at any time without prejudice or negative consequences.
- ❖ I understand that any information from this study that might potentially identify my personal detail will not be published.
- ❖ I understand that all data from this study will be treated as confidential and stored in secured location within the Centre of Excellence for Science, Seafood and Health at the Curtin University of Technology Bentley campus.
- ❖ I declare that I am not allergic or intolerant to seafood's.

**I agree to participate in the study as outlined to me.**

**Name:** \_\_\_\_\_

**Signature:** \_\_\_\_\_

**Date:** \_\_\_\_\_

### 3.1 Appendix 2 Sensory Analysis Forms

#### Sensory Analysis- Pearl meat

**Instructions:** Before tasting each new sample, please take a sip of the water and take a bite of the cracker. Taste the samples from left to right.

After tasting each sample, you are asked to mark the horizontal scale with a vertical dash ( | ) to correspond to your preference on the scale with the sample number noted above the line.

#### **SASHIMI**

##### **Appearance**

Dislike extremely

Like extremely

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##### **Odour**

Dislike extremely

Like extremely

---

##### **Texture**

Dislike extremely

Like extremely

---

##### **Flavour**

Dislike extremely

Like extremely

---

##### **Overall Acceptability**

Dislike extremely

Like extremely

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Please provide any other comments below:

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# **COOKED**

## **Appearance**

Dislike extremely

Like extremely

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## **Odour**

Dislike extremely

Like extremely

---

## **Texture**

Dislike extremely

Like extremely

---

## **Flavour**

Dislike extremely

Like extremely

---

## **Overall Acceptability**

Dislike extremely

Like extremely

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Please provide any other comments below:

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