

A one day workshop to define oyster 'condition' and to review the techniques available for its assessment



CRC 2008/775

Author Francis Ryan

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The Australian Seafood CRC is established and supported under the Australian Government's Cooperative Research Centres Programme. Other investors in the CRC are the Fisheries Research and Development Corporation, Seafood CRC Company members, and supporting participants.

Non-Technical Summary

2008/775 A one day workshop to define oyster 'condition' and to review the techniques available for its assessment

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The workshop was held under the auspices of the Select Oyster Breeding Company of New South Wales (SOCo) and Australian Seafood Industries (ASI), companies involved with selective breeding programs for Sydney rock and Pacific oysters respectively. Its aim was to clarify and consolidate the views of researchers, oyster growers and marketers as to what constitutes oyster 'condition', in preparation for a research project to investigate aspects of oyster condition associated with selective breeding programs.

In summary, the conclusion of the workshop was that, for the purposes of the proposed project:

1. The term 'condition' should be replaced by 'marketability' or 'reproductive condition' throughout the project application, depending on the context.
2. The determining characteristics of 'marketability' should be:
 - meat quantity relative to shell cavity volume - measured by condition index (CI_w) determined using the soft tissue's wet weight
 - "fatness" and meat colour assessed by visual examination against a standard series of photographs
3. The determining characteristics of 'reproductive condition' should be:
 - meat quantity relative to shell cavity volume - measured by condition index (CI_d) determined using the soft tissue's dry weight
 - macroscopic gonad development.

and that

4. The project should, if possible, include preliminary observation of the sensory characteristics of some selected families within the breeding programs.

A one day workshop to define oyster 'condition' and to review the techniques available for its assessment

Tasmanian Technopark, Hobart - Friday 8th November 2008

The workshop was held at the Tasmanian Technopark, Hobart on Friday 8th November 2008.

Present:

Australian Seafood Industries

Mr. Barry Ryan (Chair) – Chairman, ASI

Mr. Matt Cunningham – General Manager, ASI

Mr. Ben Finn – Research Officer, ASI

CSIRO

Dr. Peter Kube – Quantitative Geneticist

Dr. Nick Elliott – Quantitative Geneticist

DPIF (NSW)

Dr. Wayne O'Connor, Senior Research Scientist

Dr. Mike Dove, Research Scientist

DPIF(Tas)

Mr. Graham Knowles, Fish pathologist

Tasmanian Industry

Mr. Colin Sumner - Pacific oyster grower & consultant

Mr. Hayden Dyke - Pacific oyster grower

NSW Industry

Mr. Ray Tynan - Sydney rock oyster grower and SOCo Chairman

Mr. Tony Troup - Sydney rock oyster grower and SOCo Director

SA Industry

Mr. Paul Dee - Pacific oyster grower and ASI Director

Mr. Gary Zippel - Pacific oyster grower and ASI Director

Oyster Hatcheries

Mr. Michel Bermudes – Shellfish Culture, Tasmania

Mr. Michael Cameron – Cameron of Tasmania

FRDC

Ms. Ana Rubio – Project Manager (Research)

Marketer/Processor/Restaurant

Mr. George Pitt (Tas) ex Tasea Manager Apology but contributed in writing

Mr. John Susman (NSW), Blue Harvest Ecofish, Seafood marketer & Oyster show judge

Mr. Martin Palmer(NSW) Seafood wholesaler & Oyster show judge

PhDs

Ms. Judith Fernandez Piquer, PhD Student, University of Tasmania, Hobart
Mr. Tom Maddigan, Research Scientist, SARDI, SA

Rural Development Services

Dr. Tom Lewis, Aquaculture consultant

Apologies:

Mr. Ian Duthie - Pacific oyster grower, Tasmania

Mr. Richard Pugh – Shellfish Culture, Tasmania

Mr. Terry Arhon (SA) Tim & Terry Oyster Supply, Vic Oyster Wholesaler & Processor

Dr. Graham Mair – Seafood CRC Program Manager

Proceedings:

Introduction

For the benefit of those unfamiliar with them the Chairman introduced Australian Seafood Industries (ASI) and the Select Oyster Company of NSW (SOCo) as companies involved with breeding programs for Pacific and Sydney rock oysters respectively. He said that ASI was in its eighth year of selective breeding along family lines and had achieved considerable success in improving the growth rate, shape and consistency of its selected stock. SOCo, in cooperation with NSW DPIF, had been operating since 2004. The company was continuing with the mass selection program initiated by the DPI which concentrated on developing resistance to the two major diseases affecting Sydney Rock oysters in NSW. The success of this mass selection program had been remarkable.

Both companies have now formed the view that the next step for their programs is the development of selection for condition and they intend, together with CSIRO and DPIF(NSW) researchers, to put forward a proposal to the Australian Seafood CRC for a project which focused on this. However, 'condition' in oysters is variously assessed. The present workshop is designed to identify what constitutes 'condition' in the eyes of marketers and growers, and how it might best be measured, so that the proposed project can be developed appropriately.

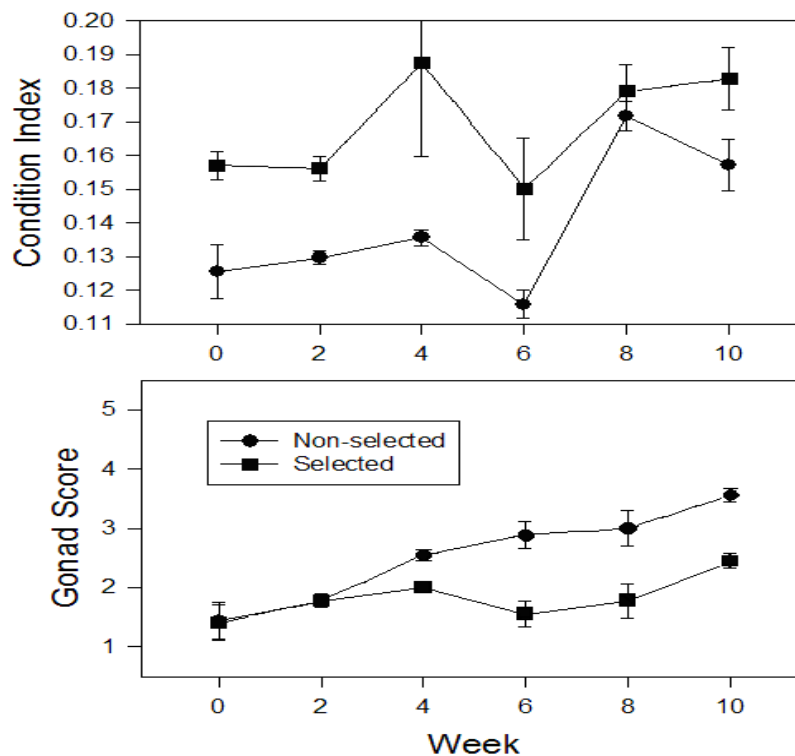
Technical issues

Is oyster condition heritable?

Dr Wayne O'Connor referred to Bayne et al. (1999) who found that the SRO Fast Growth lines, compared with controls, fed more rapidly, invested more energy per joule ingested, showed higher net growth efficiency and allocated less energy per unit of tissue produced. However, hatchery experience was that 'fast growth selected' lines were variable with respect to condition, and at some sites they were slower to reach reproductive condition.

The graphs below, taken from observations at the Port Stephens hatchery, demonstrate this with reference to the gonad scores of selected v. non selected lines. However, it is notable that the wet meat condition index did not follow the same pattern. This emphasizes the fact that the two methods of assessing 'condition' yield entirely different results.

Two methods of assessing SRO 'condition' – NSW Hatchery observations



Field studies in NSW indicated that the 'fast growth selected' lines were variable with respect to condition, but at some sites always showed lower wet meat condition indices than wild controls and that they lost condition more quickly.

From these observations Dr O'Connor concluded that wet meat condition index, the timing of condition as measured by the gonado-somatic index, the speed of conditioning and the transition between physical condition and reproductive condition were all likely to be genetically influenced in SRO, while it was unclear to what extent there was genetic influence on the variability of SRO condition.

He postulated that it might be possible within the SRO breeding program to select family lines which come into condition quicker, which maintain their condition longer, which are more or less variable, or which are able to meet special market requirements. To achieve this, the NSW program would need to focus more on family line production as distinct from the current emphasis on mass selection.

Dr Peter Kube said that the Tasmanian Pacific oyster breeding program had been run by ASI since the year 2000 and during this time data on meat yield had been collected from most families in most years. The data consisted of wet meat weights on most families and shell weights along with dry meat weights for some of the families.

Analysis of this data had reference to condition as represented by meat yield (i.e. wet meat weight / total weight). Meat yield was found to be moderately heritable ($h^2 = 0.2$) and

there appears to be less variation for meat yield than for other traits. If selecting only for meat yield then the maximum change would probably be about 4% per generation. For multi-trait selection, gains will be less than this. The analysis indicated that total weight and meat yield appear to be different genetic traits ($r_g = -0.1$) and therefore a breeding program would need to assess and select for both. There were moderate changes in meat yield family rankings between sites ($G \times E = 15\%$ of total variation) suggesting that some families may have a somewhat site specific response. Therefore there is a need to study genetic responses to condition across a range of sites.

A limitation of current ASI meat yield data is that measurements were made at only a single point in time. Therefore no information is available about seasonal variations or the rate at which condition was attained.

Measurement Techniques/Tests

Physical

Mr. George Pitt, former Executive Officer of the now non-operational Tasmanian oyster marketing company Tasea, was unable to attend the workshop, but provided information about the Tasea quality classification system* for both Pacific and Sydney Rock oysters. This information was relayed to the workshop by the Chairman.

The Tasea system relies on a combination of objective and subjective measurements (see below) taken by the grower over a random sample of 12 oysters per batch. The photographs used to standardise the subjective measurements are reproduced in the appendices, and the method of assembling the measurements to produce a classification score (similar for Pacific and Sydney rock oysters) is detailed below. The classification score is a composite indication of quality or marketability taking into account a quality index (the wet meat weight/shell length ratio), together with fat cover of the body, fat cover of the mantle and shell 'fullness'.

Mr Pitt reported that on occasion, price differentials were obtained by Tasea on the basis of the above grading system but more often the advantage of the system lay in better acceptance of the product by wholesalers.

Tasea Physical (Objective) Measures:

Top shell length (mm)
Meat weight (grams)
Meat/shell ratio (meat weight/shell length)

Tasea Subjective Measures:

Body condition (fat cover)]	
Score 0 - 3 (0 best)		
Mantle condition (fat cover)]	By comparison with standard
Score 0 - 3 (0 best)		photos
Shell fullness]	
Score 0 - 3 (0 best)		

* Subsequent to the workshop the Intellectual Property relating to the Tasea quality classification system was acquired by the Seafood CRC. Attached to this report are the quality grading charts reflecting the Seafood CRC ownership acquired in 2009.

Tasea SRO quality classification

Class	Top shell length	Quality index	Meat weight	Meat wt/ Shell length
Cocktail	45-55 mm Target Av 50 mm	A	Av 7 Min 6	Av 14 Min 10.9
		B	None < 6	None < 14
		C	None < 6	1-2 < 14 3-5 < 14
Bistro	55-65 mm Target Av 60 mm	A	Av 9 Min 8	Av 15 Min 12.3
		B	No meats < 9	None < 15
		C	1-2 meats < 9 3-5 meats < 9	1-2 < 15 3-5 < 15
Plate	65-75 mm Target Av 70 mm	A	Av 11 Min 10	Av 15.7 Min 13.3
		B	No meats < 11	None < 15.7
		C	1-2 meats < 11 3-5 Meats < 11	1-2 < 15.7 3-5 < 15.7
Standard	75-90 mm Target Av 82 mm	A	Av 13 Min 12	Av 15.8 Min 13.3
		B	No meats < 13	None < 15.8
		C	1-2 meats < 13 3-5 meats < 13	1-2 < 15.8 3-5 < 15.8
Large class also			Sample size 12	

Tasea Pacific oyster quality classification

Size	Top shell length	Quality Index	Meat Weight (grams)	Meat wt/ Shell length
Bistro	50 - 60mm Target Av: 55mm	A	Av ≥ 9 Min 7	Av ≥ 15.9 Min 14
		B	negotiated between farm, Tasea & customer 1-2 meats < 9	1-2 under 15.9
Buffet	60 - 70mm Target Av: 65mm	A	Av ≥ 11 Min 9 Ave	Av ≥ 16.5 Min 15
		B	negotiated between farm, Tasea & customer 1-2 meats under 11	1-2 under 16.5
		C	3-5 meats under 11	3-5 under 16.5
Standard	70 - 85mm Target Av: 77mm	A	Av ≥ 14 Min 12	Av ≥ 17.7 Min
		B	17.1	
		C	negotiated between farm, Tasea & customer 1-2 meats under 14 3-5 meats under 14	1-2 under 17.7 3-5 under 17.7
Large	85 - 100mm Target Av: 92mm	A	Av ≥ 20 Min 17	Av ≥ 20.6 Min 20
		B	negotiated between farm, Tasea & customer 1-2 meats < 20	1-2 under 20.6
Jumbo	100 - 120mm Target Av: 110mm	A	Av ≥ 24 Min 21	Av ≥ 21.4 Min 21
		B	negotiated between farm, Tasea & customer 1-2 meats under 24	1-2 under 21.4

Biochemical tests

Dr Wayne O'Connor said that a variety of biochemical tests could provide useful information about oyster condition:

Nucleic acid analysis:

The nucleic acids DNA and RNA are responsible for genetic coding and protein expression in oysters. The resulting proteins determine the oyster's genetic response. Study of oyster nucleic acids, and of their protein products, can provide genetic information such as which genes are being expressed, and the ratio between DNA and RNA can be used as a measure of approaching breeding condition in an oyster.

Gross chemical analysis

- Glycogen - is used to drive gametogenesis and is lowest at the time of spawning, having increased up to shortly before spawning. Glycogen levels can therefore be used as a measure of breeding condition.
- Lipid - some lipids accumulate (in eggs) and then decrease at spawning. Fatty Acid composition also varies with the reproductive cycle.
- Total protein - although percentage composition of protein may not vary greatly, total protein does increase as breeding condition advances and is highest at spawning.

Specific biochemical measures

Specific tests are available for hormone expression, egg protein and antibodies and these can provide valuable physiological insights, but they are often destructive and expensive. Some of the tests available can be used as markers for selective breeding. Irrespective of the characteristic under study, it is likely that a specific biochemical test is available.

Non Destructive Imaging

Dr Nick Elliott provided a brief summary of Dr Mike Turner's 'in house' (unpublished) work at CSIRO. He demonstrated that a wide range of non destructive techniques was theoretically available for imaging live oysters. These ranged from Gamma Rays and XRays which offered deep penetration and relatively high resolution but were impracticable because of cost and availability of necessary resources - to ultrasound which offered only shallow penetration, low resolution and appeared to be only marginally effective. Dr Turner had concluded that although one or two of the techniques warranted further investigation there is at present no simple, relatively inexpensive equipment suitable for measurement of oyster condition available for the project.

Sexual Maturity

Spawning Control

Michel Bermudes said that triploidy offered a method of manipulating condition in Pacific oysters through a breeding program. Because triploids do not spawn they retain a relatively uniform condition index throughout the year, whereas the condition index in diploids drops off sharply in late January/February after spawning. Shellfish Culture produces a high quality triploid product in which fewer than 5% are diploid. The triploid lines grow quickly and require some education of growers to achieve the best results. They can be grown in a complementary way alongside standard diploids, to provide finished product during the period when diploid condition is low, or as a stand alone product. Because they expend less reproductive effort than diploids they are less prone to summer mortality and because they produce few if any spat they are favoured for growth

in areas where *Crassostrea gigas* is considered an exotic pest. For the same reason they have potential for the protection of genetic IP for export markets.

Mr Bermudes said that the tan pigmentation seen at times in triploid Pacific oysters was monitored by Shellfish Culture in 2007/08. It was prominent in December through February when resorption of developing gametes would have been occurring and thereafter the pigmentation score fell to zero.

The condition index referred to by Mr Bermudes is CI = 'meat weight/total weight'.

Meat v. gonad

Mr Matt Cunningham said that although no definitive observations had been made the ASI experience was that thoroughbred Pacific oyster broodstock were slow to reach breeding condition and that on the leases the oysters held their 'marketable' condition longer and spawned later than standard oysters. He suggested that the breeding program could focus on the rate of sexual maturation or on delayed spawning.

Dr Mike Dove concentrated on his experience with Sydney rock oysters (SRO). He said that condition in SROs was influenced by multiple factors, both environmental and genetic, and that it was closely linked with reproductive behaviour. Sexual maturation of the SRO is size dependent, taking place at a shell height of 30-40 mm, but SRO spawning is regulated by the seasonal temperature pattern and occurs at average temperatures of 22-24°C.

All of the various commonly used methods for assessing condition are destructive. The simplest is by macroscopic examination which is cheap and quick, but subjective. Histological examination is a useful method for critical assessment of the condition of oysters in terms of their reproductive status but it is slow and expensive. The 'Condition Index' is both quick, cheap and quantitative and is probably the best for general use. Dr Dove uses the gravimetric method (Crosby & Gale 1990) to determine the index:

$$CI = [1000 \times \text{dry meat weight (g)}] / \text{internal shell cavity capacity (g)}$$

Where internal shell cavity capacity = whole weight (g) – shell weight (g) (Lawrence & Scott 1982)
The CI calculated in this way therefore reflects meat weight relative to cavity volume. For some applications, wet meat weight could be used instead of dry meat weight.

Calculated in this way the maximum CI is 160 and the minimum CI for marketing recommended by Nell is 100.

Marketing Issues – What are the defining characteristics of good condition?

Mr George Pitt: (through the Chairman) Clearly the perception of Tasea was that marketability depends on a mix of fat cover of the body (and to a lesser extent of the mantle), shell fullness and a condition index calculated as meat weight/shell length. This is independent of size (i.e. the assessment can be made over a range of sizes). It is noted that the condition indices variously mentioned above take no account of fat cover.

Mr Michael Cameron showed a series of photographs emphasising the importance of lipid distribution (as per the Tasea scale) and shell fullness but noting that a buttery yellow discolouration of the fat was undesirable. He said that market preferences differed eg the New Zealand market was not very concerned with lipid distribution. In general discussion he commented that if oysters were bred to delay spawning too much, resorption of the gonad with

undesirable striation of the meat might be a problem. He also mentioned that the very large adductor muscle in triploids could be a problem in some markets.

Mr John Susman commented that the large triploid adductor was not a problem in his experience. He went on to say that ‘marketability’ might be a better term to consider for the project than conventional ‘condition’ because, in addition to the conventional characteristics, it includes characteristics such as flavour and texture. In their work as oyster judges for the Royal Agricultural Show Society (RAS) in NSW he and Mr Palmer regularly made an appraisal of flavour on the basis of a well developed protocol to which the Society, if approached, might allow the project access. While conventional condition remains the most important factor for marketers, flavour has become more significant for restaurateurs.

He said that the technique for assessment of flavour in oysters was much the same as the technique used in the wine industry. Despite the fact that wine flavours vary greatly depending on environmental influences it is possible to characterise and appreciate a growing area as a whole. Similarly, particular bays in which oysters are grown can have a defined character. Mr Susman said that the RAS was excited about this workshop and the potential which could flow from it.

He said that the market demand was growing towards a smaller (but still well conditioned) oyster, and restaurants were increasingly opening their own. The Kumomoto oyster is so popular overseas because it is small – only the size of a 50 cent piece – and because it is intensely flavoured.

The flavour profile drops off quickly after opening (which at least partially explains the move towards restaurants opening their own) and the shelf life of the unopened oyster thus becomes a very important research priority.

Mr Susman said that luxury, fashionable food is becoming valuable and there is a strong commercial demand for premium flavoured oysters. One NSW farm presells all of its crop at \$15 per dozen.

Mr Paul Dee said that he had noticed a growing consumer interest in the regional characteristics and taste of oysters.

Mr Martin Palmer reinforced Mr Susman’s comments. He said that flavour, along with other factors and characteristics, could be used to define areas and regions where oysters were grown and the RAS has a good basis, which a breeding program could utilise, for assessing flavour.

Mr John Susman said that the technique for assessing oyster flavour, as with wine, was to mark down for faults rather than mark up for good qualities which were harder to define. On this basis the RAS judges had achieved less than 5% variation between themselves in oyster flavour scores and the technique was not hard for newcomers to learn.

Mr Gary Zippel noted that the art of wine tasting had preceded the identification of the chemical characteristics which contributed to the taste.

Mr Hayden Dyke said his view was that glycogen contributed to sweetness and the mantle contributed to ‘crunch’ or texture. Both could be exploited in a breeding program.

Dr Peter Kube said that although as with other traits, environmental factors would confuse the day to day outcomes, selection for quality and or texture components might enable product to express those traits to its maximum capability. However, at this stage we do not even know if the sensory traits are heritable.

Mr Paul Dee noted that in other breeding programs where flavour was ignored in the selection process, the eventual outcome was a tasteless product. Tomatoes and chicken meat were good examples of this. He suggested that the system outlined by Mr Susman provided a means by which sensory qualities could at least be monitored within oyster breeding programs.

Mr Michael Cameron asked whether there was likely to be age variation in the expression of sensory and conventional condition characteristics and whether these needed to be assessed within the project successively or on a once off basis.

Where should the project go?

Mr Hayden Dyke felt that the project should take advantage of the opportunity to investigate what technical characteristics are associated with flavour and texture. He also felt that there were strong, probably genetic, links between shell shape, shell density and condition and he commented that growers assess condition using physical measurements, visual impressions and finally taste.

Mr John Susman said that for the project the conventional methods of assessing condition remained highly significant but that the sensory aspects could be considered as well.

Mr Tony Troup considered that attainment of condition at an earlier age (ie fatten younger) to accommodate the market desire for good condition in smaller oysters, would be advantageous.

Mr Gary Zippel was enthusiastic about the sensory aspect of condition. He suggested that blood glucose measurement might be a non-destructive method which could be applied to this. He felt that breeding for flavour should be the primary goal of the project, looking for families which contribute to high flavour scores, with the remainder of the project concentrating on what factors contribute to this. Mr Zippel also emphasised that the project should restate the need for the ASI breeding program to increase in size to at least 50 families so that selection for an increased variety of traits could be accommodated.

Dr Peter Kube voiced his opinion that within the project flavour should be a component of measuring condition. At the very least lipid, as one of the factors thought to contribute to flavour, must be measured.

Mr Colin Sumner articulated a concern that concentration on market quality aspects of condition might dilute ASI's focus on its main breeding objective. The emphasis should be on getting more meat in the shell.

Dr Tom Lewis (absent – through the Chairman) had similar concerns, suggesting that breeding for condition would need to anticipate very substantial gains to warrant the displacement of existing traits in the program.

Dr Nick Elliott replied that there was need to consider 'market quality' as well as conventional condition within the project. Outcomes from the project would determine whether and to what extent market quality characteristics should be included as selection traits within the breeding programs of ASI and SOCo. At least, now that a means of monitoring flavour is available, it would seem to be wise to apply this to the programs in some way, even if is not used as a selection criterion.

In summary, the conclusion from the workshop was that, for the purposes of the proposed project:

1 The term 'condition' should be replaced by 'marketability' or 'reproductive condition' throughout the project application, depending on the context.

2 The determining characteristics of 'marketability' should be:

- meat quantity relative to shell cavity volume - measured by condition index (CI_w) determined using the soft tissue's wet weight
- "fatness" and meat colour assessed by visual examination against a standard series of photographs

3 The determining characteristics of 'reproductive condition' should be:

- meat quantity relative to shell cavity volume - measured by condition index (CI_d) determined using the soft tissue's dry weight
- Macroscopic gonad development.

and that

4 The project should, if possible, include preliminary observation of the sensory characteristics of some selected families within the breeding programs.

References

Bayne, B.L., Svensson, S. and Nell, J.A. 1999. "A physiological basis for faster growth in the Sydney rock oyster, *Saccostrea commercialis*." Biol. Bull. 197, 377 – 387.

Crosby, M P and Gale, L D (1990) "A review and evaluation of bivalve condition index methodologies with a suggested standard method" Journal of Shellfish Research, Vol. 9, No. 1, 233-237.

Lawrence, D R and Scott, G I (1982) "The determination and use of condition index of oysters" Estuaries Vol. 5, No. 1, 23-27.

SIZE SPECIFICATIONS (top shell length)

- JUMBO** 100 - 120mm
- LARGE** 85 - 100mm
- STANDARD** 70 - 85mm
- BUFFET** 60 - 70mm
- BISTRO** 50 - 60mm

GRADE (minimum)

A SUPREME

Very good condition oyster with full fat cover across the body and mantle, oyster fills shell and may rise above shell perimeter, consistent across shipment.

B PREMIUM

Noticeably plump, the condition cover extends across the oyster and preferably extending out into the mantle. Some stomach may be visible, limited variability across shipment.

C THRIFTY

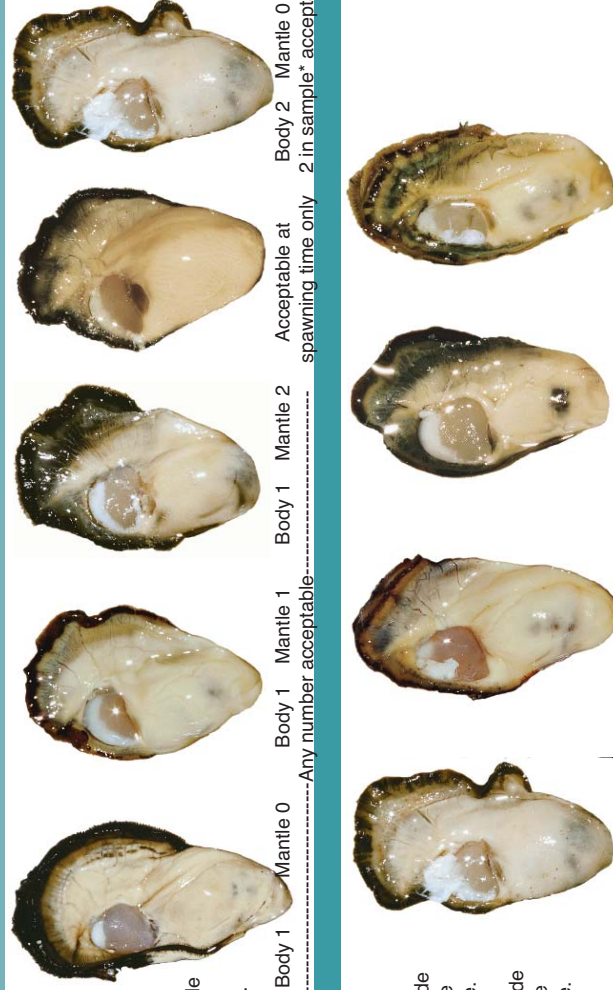
Generally a poorer condition oyster with less coverage over the body and mantle resulting in greater visibility of the stomach, poor shell fullness and greater variability in shipment.

SHELL SHAPE (preferred)

BODY & MANTLE CONDITION (this grading system applies to all size ranges)

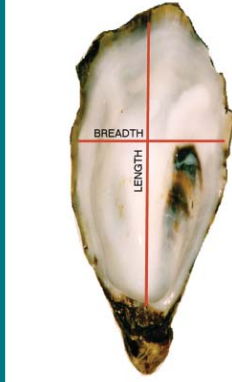


No B or C Grade oysters are acceptable.



Any A Grade oysters are acceptable.

Any A Grade oysters are acceptable.
Any B Grade oysters are acceptable.



LSBs
Minimum breadth/length ratio of 45%

SHELL FULLNESS (minimum)



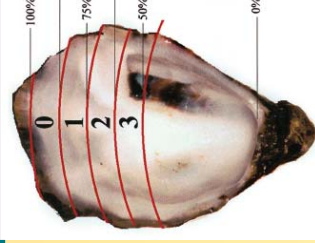
A Grade:
0 only
1 not acceptable
2 not acceptable



B Grade:
0 acceptable
1 acceptable
2 max 2 in sample* acceptable



C Grade:
0 acceptable
1 acceptable
2 max 4 in sample* acceptable



* sample size 12 oysters



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RESEARCH CENTRE

PACIFIC OYSTER GRADING SYSTEM

This grading system applies to all size ranges and is one part of the criteria to be assessed when packing oysters.

The other considerations

- are:
- consistency of shipments to the same customer in different weeks,
 - size - top shell length,
 - meat weights,
 - level of overcatch to industry standards,
 - shell cleanliness to meet customer expectations

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Size **Top shell length** **Number of dozen per bag** **Quality Index** **Meat Weight (grams)** **Meat to Shell Ratio % (meat weight divided by shell length)**

Bistro	50 - 60mm Target Ave: 55mm	TBA	A B	Ave ≥ 9	Min 7	Min 14
				to be negotiated between farm and customer	1-2 meats < 9	1-2 under 15.9
Buffet	60 - 70mm Target Ave: 65mm	TBA	A	Ave ≥ 11	Min 9	Min 15
			B	to be negotiated between farm and customer	1-2 meats under 11	1-2 under 16.5
			C	3-5 meats under 11	3-5 under 16.5	
Standard	70 - 85mm Target Ave: 77mm	TBA	A	Ave ≥ 14	Min 12	Min 17.1
			B	to be negotiated between farm and customer	1-2 meats under 14	1-2 under 17.7
			C	3-5 meats under 14	3-5 under 17.7	
Large	85 - 100mm Target Ave: 92mm	TBA	A	Ave ≥ 20	Min 17	Min 20
			B	to be negotiated between farm and customer	1-2 meats under 20	1-2 under 20.6
Jumbo	100 - 120mm Target Ave: 110mm	TBA	A	Ave ≥ 24	Min 21	Min 21
			B	to be negotiated between farm and customer	1-2 meats under 24	1-2 under 21.4

OTHER FACTORS TO BE CONSIDERED

- As a minimum the width of the oyster divided by the length should not be less than 0.45 (45%).
 - Consistency of quality and size across the consignment – it is preferable to not have major variation through a consignment.
- Shell shape – oyster shell shape should be as uniform as possible. The preferred shape is an oyster meeting a ratio of:
1 (cup depth) : 2 (width) : 3 (length).

- The importance of communicating to the customer, prior to dispatch, of any variation of quality that may impact. For example, lower than expected meat quality, shell fullness or oysters suffering from things such as mud worm, discolouration and water blister.

QUALITY ASSESSMENT PROCEDURE

Prior to harvest, a representative sample of oysters must be randomly generated from differed locations along the rack/long-line to be harvested. The sample should represent the size of the stock to be harvested.

The required sampling rate is for one sample to be submitted for each size and grade of oyster to be harvested from each lease. It is assumed additional informal sampling will be done to validate stock quality.

An assessment form is required and it is essential that the data recorded on each line of the form represents information for a single oyster. Therefore, care must be taken in relation to the sequence followed in the quality assessment procedure.

Assessment process: sample size = 12 oysters

- 1 Prepare the necessary equipment – drying rack (if available), scales, splitting knife, gloves, assessment form. Use check weight to confirm scale accuracy .
- 2 Remove top shells placing them in a line, cut and turn the oyster, place the oyster in the shell next to its top shell.
- 3 Whilst splitting and if applicable, note the presence of blistering, spawning condition, re-absorption, gut exposure, discolouration on the form as indicated.
- 4 If there is any uncharacteristic discolouration or shape to the oyster meat/shell, note it on the form.
- 5 Undertake the body and mantle condition inspection and record the results on the form for each oyster. Refer to the photo chart if required.
- 6 Remove the oyster from the shell and place the oyster on a plastic mesh drying rack. Align the top shell with each oyster on the rack.
- 7 Measure the top shell length (mm) for each oyster and record the measurement.
- 8 Weigh the meats taking care to ensure it is in a sheltered area, as fluctuations in air circulation can give inaccurate weight readings. Record the results. Be sure to re-zero the digital scales and ensure there is minimal water on the oyster, as failure to recalibrate the scales and excess water will also give inaccurate readings.
NB: The top shell, body and mantle cover measurements for each oyster must be noted before weighing starts.
- 9 Review the results and assess which size and grade specifications it meets.

SIZE
(top shell length)

- LARGE** 90 - 100mm
- STANDARD** 75 - 90mm
- PLATE** 65 - 75mm
- BISTRO** 55 - 65mm
- COCKTAIL** 45 - 55mm

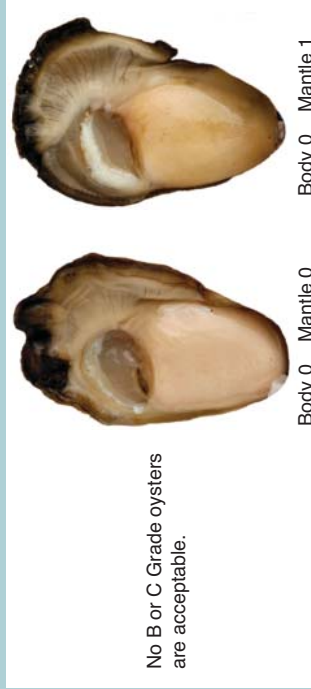
GRADE
(minimum)

A SUPREME
Very good condition oyster with full fat cover across the body and mantle, oyster fills shell and may rise above shell perimeter, consistent across shipment.

B PREMIUM
Noticeably plump, the condition cover extends across the oyster and preferably extending out into the mantle. Some stomach may be visible, limited variability across shipment.

C THRIFTY
Generally a poorer condition oyster with less coverage over the body and mantle resulting in greater visibility of the stomach, poor shell fullness and greater variability in shipment.

BODY & MANTLE CONDITION (this grading system applies to all size ranges)



No B or C Grade oysters are acceptable.



Any A Grade oysters are acceptable.

-----Any number acceptable-----
Acceptable at spawning time only 2 in sample* acceptable



Any A Grade oysters are acceptable.

Any B Grade oysters are acceptable.

SHELL FULLNESS
(minimum)



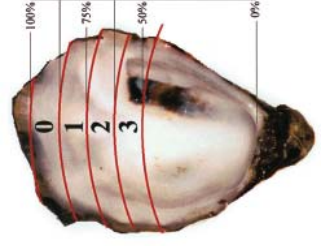
A Grade:
0 only
1 not acceptable
2 not acceptable



B Grade:
0 acceptable
1 acceptable
2 max 2 in sample* acceptable

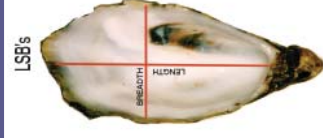


C Grade:
0 acceptable
1 acceptable
2 max 4 in sample* acceptable



Shell shape of stick-grown Sydney Rock Oysters will vary considerably depending on the amount of time they have been left to grow on the stick. This grading system acknowledges the shape variation that can exist in Sydney rock oysters grown on sticks for most of their life.

The size grading specification is to be applied where practicable during grading operations on the basis of best endeavours to obtain as uniform product as possible. The product must be represented accordingly. Body and mantle condition can be assessed using the above criteria.



MINIMUM BREADTH/LENGTH RATIO OF 45%



SHELL SHAPE
(preferred)

* sample size 12 oysters



AUSTRALIAN
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SYDNEY ROCK OYSTER GRADING SYSTEM

This grading system applies to all size ranges and is one part of the criteria to be assessed when packing oysters.

The other considerations are:

- consistency of shipments to the same customer in different weeks,
- size - top shell length,
- meat weights,
- level of overcatch to industry standards,
- shell cleanliness to meet customer expectations

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Size **Top shell length** **Number of dozen per bag** **Quality Index** **Meat Weight (grams)** **Meat to Shell Ratio % (meat weight divided by shell length)**

Cocktail	45 - 55mm Target Ave: 50mm	TBA	A B C	Ave ≥ 7 None < 6 None < 6 None < 6	Min 6 None < 6 None < 6 None < 6	Ave ≥ 14 None < 14 1-2 under 14 3-5 under 14	Min 10.9 None < 14 1-2 under 14 3-5 under 14
Bistro	55 - 65mm Target Ave: 60mm	TBA	A B C	Ave ≥ 9 None < 9 1-2 meats under 9 3-5 meats under 9	Min 8 None < 9 None < 9 None < 9	Ave ≥ 15 None < 15 1-2 under 15 3-5 under 15	Min 12.3 None < 15 1-2 under 15 3-5 under 15
Plate	65 - 75mm Target Ave: 70mm	TBA	A B C	Ave ≥ 11 None < 11 1-2 meats under 11 3-5 meats under 11	Min 10 None < 11 None < 11 None < 11	Ave ≥ 15.7 None < 15.7 1-2 under 15.7 3-5 under 15.7	Min 13.3 None < 15.7 1-2 under 15.7 3-5 under 15.7
Standard	75 - 90mm Target Ave: 82mm	TBA	A B C	Ave ≥ 13 None < 13 1-2 meats under 13 3-5 meats under 13	Min 12 None < 13 None < 13 None < 13	Ave ≥ 15.8 None < 15.8 1-2 under 15.8 3-5 under 15.8	Min 13.3 None < 15.8 1-2 under 15.8 3-5 under 15.8
Large	90 - 100mm Target Ave: 95mm	TBA	A B C	Ave ≥ 16 None < 16 1-2 meats under 16 3-5 meats under 16	Min 15 None < 16 None < 16 None < 16	Ave ≥ 16.8 None < 16.8 1-2 under 16.8 3-5 under 16.8	Min 15 None < 16.8 1-2 under 16.8 3-5 under 16.8

OTHER FACTORS TO BE CONSIDERED

- As a minimum the width of the oyster divided by the length should not be less than 0.45 (45%).
- Consistency of quality and size across the consignment – it is preferable to not have major variation through a consignment.
- Shell shape – oyster shell shape should be as uniform as possible. The preferred shape is an oyster meeting a ratio of:
1 (cup depth) : 2 (width) : 3 (length).

- The importance of communicating to the customer, prior to dispatch, of any variation of quality that may impact. For example, lower than expected meat quality, shell fullness or oysters suffering from things such as mud worm, discolouration and water blister.

QUALITY ASSESSMENT PROCEDURE

Prior to harvest, a representative sample of oysters must be randomly generated from differed locations along the rack/long-line to be harvested. The sample should represent the size of the stock to be harvested.

The required sampling rate is for one sample to be submitted for each size and grade of oyster to be harvested. From each lease. It is assumed additional informal sampling will be done to validate stock quality.

An assessment form is required and it is essential that the data recorded on each line of the form represents information for a single oyster. Therefore, care must be taken in relation to the sequence followed in the quality assessment procedure.

Assessment process: sample size = 12 oysters

- 1 Prepare the necessary equipment – drying rack (if available), scales, splitting knife, gloves, assessment form. Use check weight to confirm scale accuracy.
- 2 Remove top shells placing them in a line, cut and turn the oyster, place the oyster in the shell next to its top shell.
- 3 Whilst splitting and if applicable, note the presence of blistering, spawning condition, re-absorption, gut exposure, discolouration on the form as indicated.
- 4 If there is any uncharacteristic discolouration or shape to the oyster meat/shell, note it on the form.
- 5 Undertake the body and mantle condition inspection and record the results on the form for each oyster. Refer to the photo chart if required.
- 6 Remove the oyster from the shell and place the oyster on a plastic mesh drying rack. Align the top shell with each oyster on the rack.
- 7 Measure the top shell length (mm) for each oyster and record the measurement.
- 8 Weigh the meats taking care to ensure it is in a sheltered area, as fluctuations in air circulation can give inaccurate weight readings. Record the results. Be sure to re-zero the digital scales and ensure there is minimal water on the oyster, as failure to recalibrate the scales and excess water will also give inaccurate readings.
NB: The top shell, body and mantle cover measurements for each oyster must be noted before weighing starts.
- 9 Review the results and assess which size and grade specifications it meets.