FINAL REPORT

CRC Project No 2014/708

Stamping Quality Across the Australian Farmed Barramundi Industry

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AUSTRALIAN SEAFOOD COOPERATIVE RESEARCH CENTRE

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GLOSSARY

ACRONYM	DESCRIPTION
ABFA	Australian Barramundi Farmers Association
AGM	Annual General Meeting
DAF	Queensland Department of Agriculture
EU	European Union
FRDC	Fisheries Research Development Corporation
GM	General Meeting
PI	Principal Investigator
QI	Quality Index
QIS	Quality Index Scheme
QS	Quality Scheme
RD&E	Research, Development & Extension
SCRC	Seafood CRC Company Ltd
SFBCP	Sustainably Farmed Barramundi Certification Program
USC	University of the Sunshine Coast

1. NON TECHNICAL SUMMARY

Project: **2014/708: Stamping Quality Across the Australian Farmed Barramundi Industry**

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PROJECT OBJECTIVES:

1 Development of a whole of industry Quality Scheme for the Australian farmed barramundi industry.

2 Development of a process for incorporating a Quality Scheme into the industry Sustainably Farmed Barramundi Certification Program (SFBCP).

ABSTRACT

To improve viability, increase growth and maintain profitability, it was identified, through the Barramundi branding and repositioning program[1], that there needs to be a commitment to quality (along with sustainability) to justify the price differential between Australian farmed barramundi and *Lates calcarifer* provided by other suppliers.

The ABFA has committed to a quality scheme that will ensure that consumers can be confident that when they purchase ABFA farmed fish it is food safe, of a quality that presents well, and with no detectable odour or off flavour taint.

The Scheme has been adopted by Industry and provides clear industry benchmarks for product quality. Incorporating the scheme into the Sustainably Farmed Barramundi Certification Program (SFBCP) ensures that there is an independent auditable process for compliance.

The quality scheme covers 'whole barramundi on ice' and 'live barramundi'. Key attributes parameters which are used as a measure to ensure farmed barramundi meet the prescribed quality specification are;

- Fish appearance and physical attributes
- Ensuring no off flavour or taint present
- Fish are produced, harvested and stored in line with approved food safety plan and comply with food safety standard limits for antibiotics, chemicals and contaminants.

[1] Refer to 'SCRC Project 2008/794 Repositioning Australian Farmed Barramundi in the Domestic Market' and 'SCRC Project 2013/752: Setting directions for the Australian Barramundi Farmers Association'

The scheme will be reviewed annually and adjusted if new information or methodologies become evident, or if there is supply chain or farmer feedback that necessitates a revision of the scheme.

OUTCOMES ACHIEVED

The ABFA commitment to branding and repositioning farmed Australian barramundi, relies heavily on the sustainability component of the Sustainably Farmed Barramundi Certification Program (SFBCP). This will now also provide details to consumers extolling the values of the Quality Scheme. The Quality Scheme has been adopted into the independently audited SFBCP.

OUTPUTS PRODUCED

ABFA Quality Scheme covering 'whole barramundi on ice' and 'live barramundi' addressing key parameters of fish appearance and physical attributes, off flavour or taint and ensuring fish are produced, harvested and stored in line with approved food safety plan and comply with food safety standard limits for antibiotics, chemicals and contaminants.

Revised SFBCP Manual incorporating the Quality Scheme

Final Report to the SCRC

2. ACKNOWLEDGEMENTS

The members of Australian Barramundi Farmers Association (ABFA), Sue Poole of Queensland Department of Agriculture and Fisheries (Qld DAF), Meredith Lawley from the University of the Sunshine Coast (USC) all provided critical input to this project. We thank them for providing their valuable time, input and effort in working with the project team.

This project could not have taken place without the input and thoughts provided by David Thomason and the supply chain quality workshop he convened.

The assistance provided by the staff of the Seafood Cooperative Research Centre (SCRC) was greatly appreciated.

This project was funded by the Australian Government through Seafood CRC Project No. 2014/708.

3. INTRODUCTION

Australian farmed barramundi is generally recognised as a quality eating fish. Recently completed research undertaken through SCRC Project 2008/794 'Repositioning Australian Farmed Barramundi in the Domestic Market' highlighted the value that could be generated for the Australian farmed barramundi industry if correctly positioned.

In 2012, as part of that project, David Thomason also provided advice to the ABFA on growing demand. One of his key recommendations was the need to define a quality scheme for farmed Australian barramundi (i.e.; a quality scheme, a verification system, a supply chain program and a quality mark).

The members of the ABFA firmly believe that as part of developing a position for farmed barramundi there must be an industry quality scheme in place. This is considered critical for industry credibility and consumer confidence. As such, the ABFA supported a variation to SCRC Project 2008/794 to support the development of a quality standard for the Industry, this was not supported by the SCRC.

Prior to this decision, a whole of supply chain workshop (producers, marketers, retailers, researchers) was held to identify key quality issues and a possible way forward. The workshop outcomes highlighted that the aim was to develop a quality scheme that would fit within the current 3rd party certified Sustainably Farmed Barramundi Certification Program (SFBCP) and be focussed on the consumer perspective for eating quality and purchase appeal. Any quality scheme must be readily adoptable by farmers.

Outcomes would need to cover cool chain management and taint as a priority. This approach was supported by the ABFA and endorsed as a key priority at their March 2014 RD&E Strategic Planning meeting.

All ABFA pond and recircling producers have now commenced the SFBCP process and completed their initial audit. The SFBCP has also been adapted to cover Sea Cage operations.

A number of attempts have been made over the years to initiate an industry quality standard, including Fisheries Research Development Corporation (FRDC) project 2002/404, but these have not been adopted. There are a number of reasons for this, but it was mainly due to industry immaturity and fragmentation, a lack of clear understanding of the potential benefits from such a scheme, and uncertainty about the delivery and audit vehicle.

These matters have now been addressed with the rationalisation of industry, data showing the benefits of such a scheme, and whole of industry support through a coordinated Research, Development & Extension (RD&E) strategy (see SCRC Project 2013/752: Setting directions for the Australian Barramundi Farmers Association), and there is now an auditable vehicle for implementation, the SFBCP.

4. CONSULTATION

Consultation has been across the ABFA membership at the ½ yearly workshop in March 2013, the August 2013 Annual General Meeting (AGM)/General Meeting (GM), and most recently at the ABFA ½ yearly workshop (March 2014), which incorporated a facilitated RD&E strategic meeting based on data collected from all ABF members under SCRC Project 2013/752.

A Quality Scheme was unanimously endorsed as a key outcome, and was considered an integral component of broader industry development.

It was agreed that funding for this component would be sought from the residual ABFA funding held by the SCRC.

A draft Scheme developed by Qld DAF was provided to ABFA members at their July 2014 GM, and this was unanimously supported at the March 2015 ½ yearly workshop.

5. NEED

For over a decade the barramundi industry has recognised that, in the face of price pressures from lower cost imports and in order to effectively undertake generic promotion of Australian quality farmed barramundi, there must be a consistent, minimum quality scheme across the industry to justify the price premiums required. This is a key component of industry's security and development philosophy.

The Quality Scheme was identified as a key strategic priority through its recently completed strategic planning process.

The ABFA did not have resources within its reserves to carry out this project and as such it relied solely on its residual SCRC funds to complete the project.

6. OBJECTIVES

1 Development of a whole of industry Quality Scheme for the Australian farmed barramundi industry.

2 Development of a process for incorporating a Quality Scheme into the industry SFBCP.

7. METHOD

The approach to this project involved a number of distinct but interrelated phases, described below.

7.1. Desk Top Analysis

There are a number of reports and published research that specifically address quality within the farmed barramundi industry, as well as other relevant seafood quality work.

The first phase of this project was to complete a desktop analysis of this work and develop a simple table outlining parameters such as essential quality areas, key concepts, and appropriateness and adoptability for the industry.

This process was to be outsourced to Qld DAF.

7.2. Adaption of the Quality Scheme into the SFBCP.

The ABFA agreed to utilise the SFBCP to highlight the industry's environmental performance and there was a desire to better address quality within the scheme. As such, the ABFA sought to adapt the SFBCP to hold the quality aspect of the program, making it readily auditable under the SFBCP.

This process was to be outsourced to EcoSustainAbility, the SFBCP developer.

7.3. Scheme Development Meetings

The information derived from the Desk Top Analysis, the SFBCP Adaption and from discussions with Industry and distributors, was to be presented for industry consideration at the ABFA GM, held on 6th August 2014.

The Principal Investigator (PI) was also to contact each member individually (by phone and/or email) to discuss the scheme prior to the Scheme Development Meeting, held as an agenda item at the August GM.

Subsequent to the meeting, any necessary revisions were to be incorporated in a revised scheme which was to be presented to members for ratification and adoption into the SFBCP at the ABFA ½ yearly meeting set for March 2015.

7.4. Scheme Launch

The finalised Scheme was to be developed so that it can be incorporated into the SFBCP and also available as a standalone document.

It is to widely posted on the ABFA websites, and distributed to all ABFA members, supply chain partners and other relevant stakeholders.

8. RESULTS AND DISCUSSION

8.1. Desk Top Analysis

This work was contracted to Qld DAF and was overseen by Principal Scientist, Sue Poole. This involved identifying previous work undertaken on barramundi quality, and scanning any additional reports or research that may be relevant (Table 1). These references are listed below.

Table 1: Barramundi Quality – Desktop Review Information

Year	Author	Context	Title
1997	*Ruello*	Best Practice	Handling and Value adding to farmed barramundi
1998	*Ruello*	Best Practice	ABFA post harvest Code of Practice
2000	*Poole et al*	Best Practice	Improving the Quality of Australian aquacultures barramundi through harvesting, handling and processing techniques
2004	*Young*	Best Practice	Product Quality Standards, Specifications and a Product Quality Management Framework to facilitate Market Expansion of Farmed Barramundi
2006	*Poole et al*	Best Practice	Australian Farmed Barramundi Strategic Plan 2007-2012 2008. Quality Index scheme for barramundi
2012	*Jones*	Best Practice	Uptake and depuration of off-flavour compounds
1998	*Ruello*	Market perceptions	Seafood Consumption Survey - Sydney
2000	*Ruello*	Market perceptions	Seafood Consumption Survey - Perth
2005	*Ruello*	Market	Seafood Consumption Survey - Melbourne

Year	Author	Context	Title
		perceptions	
2009	*Butler*	Market perceptions	Australian barramundi market report
2012	*Colmar Brunton*	Market perceptions	Consumer perception of barramundi
2012	*Lawley*	Market perceptions	Chef perceptions of barramundi
2012	*Thomason*	Market perceptions	Market-based quality standards for Australian farmed barramundi(workshop)
2012	*SFM*	Market perceptions	Sydney Fish Market product specifications for chilled seafood (raw)
2012	Lawley	Market perceptions	Outputs from the Market-based Quality Standards for Australian Farmed Barramundi Taskforce meeting held on 25th September 2012
1999	*Percival*	Specific research	Physiological stress response of barramundi (*Lates calcarifer*) (PhD thesis)
2003	*Paterson et al*	Specific research	Physiological responses of the Asian sea bass *Lates calcarifer* to water quality deterioration during simulated live transport: acidosis, red-cell swelling, and levels of ions and ammonia in the plasma.
2007	*Glencross et al*	Specific research	Sustainable development of barramundi cage aquaculture in Lake Argyle. –report to FRDC
2008	*Percival et al*	Specific research	Determining factors affecting muddy taint in farmed barramundi
2009	*Percival et al*	Specific research	Preliminary studies on reducing 2-methylisoborneol and geosmin flavour taint in farmed barramundi
2008	*Wilkinson et al*	Specific research	The effects of pre-harvest stress and harvest method on the stress response, rigor onset, muscle pH and drip loss in barramundi (*Lates calcarifer*)
2012	*Wilkinson et al*	Specific research	Benchmarking harvest methodologies in the Australian Barramundi Aquaculture Industry – impacts on stress, product quality and fish welfare. –Report to FRDC
In prep	Jones	Specific research	Barramundi flavour compounds- PhD thesis

From this scan and desk top analysis two tables were produced. These were presented to the ABFA members at their GM in August 2014 to provide guidance for developing the industry Quality Scheme.

Table 2 provides a synopsis of possibly relevant information contained in key documents identified in Table 1.

Table 3 identifies the key quality parameters, concepts in respect to a quality scheme, and adoptability and relevance to the ABFA.

The information derived from this process was used to identify key areas for inclusion in a scheme, and also which matters should be addressed through organisational/business best practice and existing legislative requirements.

Table 2: Barramundi Quality – Synopsis of Information Available

Document	Content	Relevant Quality Finding	Comment
Handling and Value Adding to Farmed Barramundi *Ruello 1997*	Effectiveness of commercial handling, packing and distribution • gall bladder stain • value adding opportunities for larger fish • fish cut liked by consumers • heads, wings, livers, air sacs and skins could be additional products	• packout temperature of fish too high – arriving at market 6.8°C • fish held at 1°C storage life of 15 days • fish held at 7°C storage life of 7-8 days • need quality assurance programme to manage temperature control	Recommends: • adoption of a Code of Practice and formal quality assurance programme • increase range of products • invest in promotion of products
ABFA Post Harvest Handling Code of Practice *Ruello 1998*	Code of Practice for Barramundi Industry – based on the above project (Ruello 1997) • describes general procedures and principles to achieve Best Practice • Government requirements for food safety • responsibilities of management and staff • hygienic work environment • processing aims and principles with guide how to achieve	• set of guidelines for harvesting, packing and distribution of farmed barramundi	• formed basis of specifications content in Young 2004
Improving the Quality of Australian aquaculture barramundi through harvesting, handling and processing techniques *Poole et al 2000*	• sensory profiles of fish from different growout conditions • purging trials – Freshwater and saltwater purge for flavour and bile duct • harvesting sedation practices: AQUI-S, CO_2, ice and dry ice slurry • chilling time methods	• sensory quality varied with growout system • purging reduced muddy/weedy taint level • Salt water purging extra benefit of reducing size of bile duct • alternative sedation method to ice slurry gave no added benefit to fish texture	

Document	Content	Relevant Quality Finding	Comment
Product Quality Standards, Specifications and a Product Quality Management Framework to facilitate Market Expansion of Farmed Barramundi *Young 2004*	• Develop industry agreed product quality standards • Develop industry agreed product specifications • Canvass the support for an industry quality label • Outline options for a management system that would validate the industry label. Quality accreditation, labelling and branding Explored opportunity for ABFA logo or label to differentiate product	• ABFA Quality Standard and Product Specifications – called the ABFA Standard Grade • established as a 'first step' – on-going review and amendment • recommended to barra industry for field trial • adherence voluntary • taste test for fish flavour – with method	Doc quote: *A primary objective of the ABFA* (at the time,2004) *is not to differentiate Australian farmed product from hostile competition but ensure that all products produced in Australia meet a certain quality standard*
Australian Farmed Barramundi Strategic Plan 2007-2012 *Young 2006*		Goal is for ABFA to be seen to have standards that exceed consumer expectations. major strategic challenge is marketing and added value - consistent quality and taste	
Quality Index Scheme for Barramundi *Poole et al 2008*	Development of a Quality Index scheme for barramundi • all fish quality attributes • quality loss over storage in ice • summative scoring system	scoring scheme for barramundi quality attributes	• suitable for all farmed fish as colour is not used for assessment • soon available as phone App
Uptake and depuration of off-flavour compounds in barramundi *Jones 2012*	Rate of uptake of geosmin and MIB at different pond water concentrations	Fish exposed to 14µg/l: • strong uptake in minutes • after 2 days flesh concentration was 9µg/l, still 2µg/l after 12 days depuration at flesh concentration 1.7µg/l – tasters could not detect taint after 8 days depuration	• purging is effective and reliable in removing off-flavour • fish exposed to 1.7µg/l will take 4-8 days to purge • time required is dependent on exposure history

Document	Content	Relevant Quality Finding	Comment
Quality Management Systems - various	HACCP SQF (safe quality food) ISO 9002 Other	food safety management systems management system for the business	• none of these directly address fish product quality
Seafood Consumption Surveys *Ruello 1998, 2000 and 2005*	Surveys conducted in Sydney, Perth, Melbourne, • data on consumption habits – frequency; in-home or out; species and product type; consumer and retailer perceptions; promotion	• wild caught fish believed superior taste and quality to farmed fish • consumers increasingly discerning and willing to pay more for fresh Australian product • aware of barramundi but mixed feelings about eating • farmed barramundi known to have muddy flavour and mushy texture. • quality of fish in supermarkets is poor so consumers look to other outlets	• opportunity to position barramundi as Australia's national fish
Australian Barramundi Market report *Butler 2009*	Overview of domestic Australian market and critical factors affecting Industry	• need for up-to-date information • noted that ~20,000 tonnes needed to supply domestic demand • fish sold whole product, equally into retail and foodservice chains • Australian farmed barra twice the price of imported product • little consumer or chef understanding of the barramundi category and no knowledge of dynamics of supply 1. quality inconsistency 2. positioning – brand, product and industry • fragmented structure, limited product and packaging	• first stage of Repositioning Australian Farmed Barramundi Project (Seafood CRC) • need for increased end-user awareness of Australian barramundi and Industry

Document	Content	Relevant Quality Finding	Comment
		development, limited processing capability, supply chain awareness and data availability	
Consumer Perception of Barramundi – important traits *Lawley* (Colmar Brunton data) *2012*	Consumers perceptions for barramundi from different sources and comparison to other fish species		
Chef perceptions of barramundi *Lawley 2012*	Brisbane (18) Perth (29) Sydney (21)	• limited direct purchase from supplier – mostly from wholesaler • purchase decision primarily based on: quality consistency consistency of supply supplier relationship • barramundi regularly on the menu: Brisbane 67% Perth 50% Sydney 30% • preferred product form- whole fish and fillets, chilled not frozen; skin on	• desire for information and communication with supplier
Market-based Quality Standards for Australian Farmed Barramundi *Thomason 2012*	• Develop an auditable quality standard for Australian farmed barramundi (based on consumer perspective for eating quality and purchase appeal); and • Develop a base level marketing campaign		Barramundi Quality Taskforce 2012 Barramundi Marketing Taskforce 2012
Sydney Fish Market Product Specifications for Chilled Seafood (uncooked) 2012	Fish quality attribute specifications for different grades	must be met for acceptance into this market	• market specific • ABFA quality standards likely to be more rigorous NB – SFM have changed their product receival temp: -1° to 2°C

Document	Content	Relevant Quality Finding	Comment
Physiological stress response of barramundi (*Lates calcarifer*) *Paul Percival* PhD thesis *1999*	Relevant factors that cause stress response • saltwater and freshwater fish • cortisol measurement • effect of stress on flesh quality	freshwater fish more susceptible than saltwater fish to stress stressors: hypoxia killing method non-stressors: shallow water moderate exercise	
Physiological responses of the Asian sea bass *Lates calcarifer* to water quality deterioration during simulated live transport: acidosis, red-cell swelling, and levels of ions and ammonia in the plasma *Paterson et al 2003*	Response to water quality in live transport of fish • saltwater fish • water quality parameters – DO, pH, CO_2, NH_3	• increase CO_2, (pH) and NH_3 important • parameters interlinked • buffering ph rise may reduce fish ability to excrete internal toxic NH_3	
Sustainable development of barramundi cage aquaculture in Lake Argyle *Glencross et al 2007*	• Presence of taint • Purging in freshwater in enclosed cage reduces	• MIB main taint compound present	
Determining factors affecting muddy taint in farmed barramundi *Percival et al 2008*	• Cause and pre-disposing factors of taint • freshwater purged and unpurged farmed fish, wild, saltwater farmed	• large fish more taint than small • taint highest in belly cut • taint detected readily at water MIB level3-5ng/L	
Preliminary studies on reducing 2-methylisoborneol and geosmin flavour taint in farmed barramundi *Percival et al 2009*	• Reducing taint through purging fish in clean water • Sensory and NIR assessments	• full flavour profiles after different treatment • NIR can predict sensory taint	
The effects of pre-harvest stress and harvest method on the stress response, rigor onset, muscle pH and drip loss in barramundi (*Lates calcarifer*)	• Effect of AQUI-S use during harvest on final flesh quality	• AQUI-S delayed full rigor onset (12 hour) compared 3 hour for conventional harvest (air exposure, crowding, rapid temperature change - slurry)	

Document	Content	Relevant Quality Finding	Comment
Wilkinson et al 2008		• flesh pH higher in rested harvest fish and remained for 18 hour post harvest • no difference in drip loss over 4 days storage (2-4°C) • fish allowed to recover from conventional harvest showed stress – elevated cortisol, glucose and lactate	
Benchmarking harvest methodologies in the Australian Barramundi Aquaculture Industry – impacts on stress, product quality and fish welfare *Wilkinson 2012*	• Looked at stress induced from different commercial harvesting systems - crowding, AQUI-S rested, commercial raceway and cage harvests - crowd and braille; • Cortisol, glucose, lactate, plasma pH, rigor, QI, • Identify critical points in harvest • Recommend best harvest practice for maintenance of quality attributes	• no effects from crowding - no difference in QI score • stress response to harvest methods moderate suggesting barramundi relatively robust to harvest stressors • due to limitation of study no specific industry best practice could be suggested	aims not achieved (author) • only 2 commercial harvests investigated – more needed • clear links between crowding density, duration to stress response and product quality • more on rested harvest and stunning techniques • impact of starvation on response to stress harvest • direct ice transfer as a slaughter method • more studies on fish respiration, flesh lactate and pH, plasma lactate and pH for understanding fish stress response to harvest

Table 3: Barramundi Quality –Physical, Sensory, Delivery Considerations for Scheme

Quality Parameter	Key Concepts	Adoptability	Comments
Physical			
Foreign matter	No weed, algae or foreign matter present	Best Practice (CoP)	
Deformities	Meet specifications	Best Practice (CoP)	
Scale loss and fish damage	Minimal obvious scale loss or skin damage Minimal broken fins	Best Practice (CoP)	• harvest method to minimise physical damage and fish stress
Residues	Contaminants, chemicals, antibiotics below limits	• Food Standards Code – 1.4.1 and 1.4.2 • EU standards	• analysis as required – EU testing regime • remedial action - withholding period prior to harvest
Sensory			
Appearance	Bright skin, scales firmly intact, Clear slime with freshwater odour, Eyes – convex, clear pupil Gills, bright dark red, transparent mucous, fresh pond water odour	• chill fish to <4°C rapidly (within 2h) • assessed using the Quality Index scheme for barramundi	• into ice-slurry pond-side ideal • ability to set a QI score threshold for premium quality fish • QI available as phone App soon
Odour	No offensive or spoilage odour present		
Flavour	No obvious earthy or undesirable flavour present	Taste test prior to harvest	• delay harvest • water exchange • purge fish in clean freshwater (Poole; Glencross; Jones docs) • manage through taint-minimising tools (water pH management; lysine; molasses)

Quality Parameter	Key Concepts	Adoptability	Comments
Fillet colour - raw	Flesh colour is translucent pale pink	• feedback process for now	• determined that 'grey' fillet appearance is due to presence of melanin • information on why this occurs and how to prevent unknown (pers comm. Janet Howieson)
Flesh texture	Raw flesh has no obvious gaping Cooked flesh is characteristically yielding but not mushy	• minimise harvest stress and live fish handling • feedback process for now	• freshwater fish more susceptible to stress than Salt water; stressors – hypoxia, killing method; non-stressors – moderate exercise, shallow water (Percival) • sedatives provide no greater benefit to texture than ice slurry (Poole) • barramundi relatively robust with respect to harvest stressors (Wilkinson) • prevention method for mushy flesh unknown as yet (pers comm. Janet Howieson)
Distribution			
Size grade	Fish graded to market	Best Practice (CoP)	• out of grade tolerance
Packout	Fish chilled to <4°C Close-packed, belly down, interwoven where size permits	Best Practice (CoP)	• close-packed restricts movement during transport • inclusion of chill packs or similar to ensure fish remain <4°C
Labelling	Product source, size Harvest and packout date Batch ID	Best Practice (CoP)	• allows traceability and branding

8.2. Adaption of the Quality Scheme into the SFBCP.

The SFBCP has been adapted by EcoSustainAbility to address two matters.

Firstly, to incorporate the use of Sea Cages into the program, so that this production methodology is covered and therefore auditable under the program (at the time of the initial Program development those involved in Sea Cage farming for barramundi had indicated they did not want to take part in the program - this is being reviewed as this report is finalised).

The criteria for sea cage farms has been developed on the basis of discussions in 2011 with the two sea cage farms which were operating at the time Australia and by benchmarking criteria from other finfish species cage aquaculture impact research and relevant guidelines/sustainability criteria.

A range of references[2] on environmental impacts and best practice sustainability for finfish sea cage aquaculture were reviewed to develop the criteria.

Secondly, the adapted Quality Scheme has been incorporated into the SFBCP and will be part of the annual auditing process in the coming full year's audits (2015-2016).

8.3. Scheme Development Meetings

The information developed from the Desk Top Analysis, the SFBCP Adaption, and from discussions with Industry was developed for industry consideration at the ABFA GM, held on 6th August 2014.

Sue Poole from Qld DAF provided information from the Desk Top Analysis as outlined in Tables 1, 2 and 3. The project PI facilitated an industry/researcher session to focus on;

- what are key quality areas?
- what fits into existing Best Practice/GMP/food safety or HACCP Plans?
- what is additional and should be incorporated into an ABFA Quality Scheme (QS)?
- what should be excluded (permanently or short term)?.

After discussion it was agreed unanimously to adopt the parameters as shown in Table 4 (based on physical, sensory and distributional parameters) and for the PI and Qld DAF to finalise a simple one/two page ABFA QS for incorporation into the SFBCP, and for EcoSustainAbility to incorporate the agreed ABFA QS into the SFBCP.

Resolution and agreement to the scheme was to be made at the ABFA ½ yearly held in February/March 2015.

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[2] Aquaculture Stewardship Council (2012) Salmon Standard, V1.0
Australian Marine Conservation Society (2015) Australia's Sustainable Seafood Guide, http://www.sustainableseafood.org.au
Good Fish Bad Fish (2015) Seafood and Sustainability – Environmental Impacts of Sea Cage Aquaculture http://goodfishbadfish.com.au/
Halwart M,Soto D. and Arthur J.R., (2007) Cage Aquaculture – Regional reviews and Global Overview, FAO Fisheries Technical paper
Mckinnon D. (2008) Environmental Impacts of Sea Cage Aquaculture in a Queensland Context – Hinchinbrook Channel Case
Study, Australian Institute of Marine Science report.
Price C.S. and Morris J.A. (2013) Marine Cage Culture and the Environment: Twenty First Century Science Informing a Sustainable Industry, NOAA Technical Memorandum NOS NCCOS 164

Table 4: ABFA Quality Scheme Parameters as Agreed at ABFA GM 6th August 2014

PARAMETER	KEY CONCEPTS	ADOPTABILITY
Physical		
Deformities	Minimal deformities - meets market specifications	**ABFA QS**
Scale loss/Fish damage	Minimal obvious scale loss, skin damage, broken fins - meets market specifications	**ABFA QS**
Residues	Contaminants, chemicals, antibiotics below any prescribed limits - undertake annual European Union (EU) residue testing	**ABFA QS**
Foreign matter	No weed, algae or foreign matter present	Best practice, legislative
Sensory		
Appearance	Bright skin, scales firmly intact, clear slime with freshwater odour Eyes – convex, clear pupil Gills, bright dark red, transparent mucous, fresh pond water odour. Assessed using the Quality Index (QI) scheme for barramundi.	**ABFA QS**
Flavour	No obvious earthy or undesirable flavour present. Taste test prior to harvest	**ABFA QS**
Odour	No offensive or spoilage odour present	Best practice, legislative
Fillet colour raw	Flesh colour is translucent pale pink	No Action at this stage - monitor market feedback
Flesh texture	Raw flesh has no obvious gaping. Cooked flesh is characteristically yielding but not mushy	No Action at this stage - monitor market feedback
Distribution		
Size grade	Fish graded to market requirements	Best practice, legislative, branding
Packout	Chilled to <4°C, Close-packed, belly down, interwoven where size permits	Best practice, legislative
Labelling	Product source, size, harvest and packout date.	Best practice, legislative, branding

8.4. Scheme Launch

Subsequent to the GM, the PI contacted each ABFA member (by phone where possible and all by email) to discuss the draft scheme and to seek views on the scheme's content, any ideas for improvement, other issues, and also to seek feedback from their supply chain partners.

This led to some minor adjustments which were incorporated into the Scheme, including the development of a new Quality Commitment for 'Live Barramundi', as well as the one developed for 'Whole Barramundi on ice'.

The overarching principle was that ABFA farmed fish is safe for human consumption, presents well and has no detectable odour or flavour taint.

These details, as outlined in Table 5 and Table 6, were presented to members for ratification and adoption into the SFBCP at the ABFA ½ yearly meeting in March 2015.

The industry unanimous resolution was for the quality commitments for 'Whole Barramundi on ice' and 'Live Barramundi' to be incorporated into the SFBCP, for commencement in the following year's round of audits.

Each member is to be provided;

- an electronic copy of the quality commitment for Whole Barramundi on ice (Appendix I)
- an electronic copy of the quality commitment for Live Barramundi (Appendix II)
- an electronic copy of the quality index for barramundi as per the Australian Quality Index (QI) Manual
- A link[3] to the QI App for seafood, which includes barramundi, has images for each parameter over time.

The Quality Commitments are to be incorporated into the SFBCP. The SFBCP will be audited annually and members will need to comply with the rules to remain certified.

A three member independent Certification Panel (currently Nigel Preston of CSIRO, Mark Oliver of LMC Training, Trevor Anderson of Grofish Australia Pty Ltd) has been appointed and they grant Certification (or not), suggest administrative policy and provide any required interpretation to the ABFA board. An independent Auditor undertakes the audits.

In addition, the Quality Commitments will be posted on the ABFA websites and ABFA members will be responsible for distribution to their supply chain partners.

Members agreed to review the Scheme annually at the ½ yearly meeting to assess if any variation or adjustment is necessary.

3 Available after 25th May 2015 as a free download though the App Store.

Table 5: Product Commitment - Whole Barramundi on Ice

Criteria	Attributes	Application	Checked
1	Fish Appearance and Physical Attributes; - bright, with scales intact, clear mucus, convex eyes with clear pupil and gills bright red - deformity, damage or scale loss in line with agreed market requirements - no offensive or spoilage odour present	Product complies with attributes and/or Quality Index Scheme (QIS) Score completed. Note of compliance to follow shipment from Farm	
2	No off flavour or taint present	ABFA Test completed and to follow shipment from Farm	
3	All fish have been produced, harvested and stored in line with approved food safety plan. Fish comply with food safety standard limits for antibiotics, chemicals and contaminants.	Approved Plan in Place EU Residue Testing	

Guidance for Whole Barramundi on Ice

Fish quality is defined by specific attributes perceived relevant to the customer. Quality attributes are features of the fish that a consumer can recognise and that are important to the consumer's perception of total quality and preference for the product. These include;

Criteria 1 Fish Appearance and Physical Attributes

Meeting physical and sensory attributes for fish are critical for consumer's acceptance of product. A readily applicable and recognised tool to assess these attributes is through the Quality Index Scheme (QIS) for Barramundi (Australian Quality Index Manual 2009). This system provides a quality score that is universally understood throughout the supply chain. A Seafood QI App which has images for each parameter over time will be available at a the App Store.

Regardless of method, each shipment must have a notice of compliance completed.

It must be noted that individual farm processing operations have the ability to set their own higher threshold or benchmark for communication along the supply chain.

Criteria 2 Off Flavour and Taint

Acceptable flavour management is important for marketing of farmed barramundi. An off flavour is damaging for all producers.

To address this, all barramundi sold under the ABFA Sustainably Farmed Barramundi Certification Program (SFBCP) requires each shipment to be tested for taint. Every harvest must be sampled and subject to on-site flavour testing for taint by a trained taster, using the ABFA approved procedure.

Fish with detectable taint cannot be sold/distributed for human consumption with any reference to the ABFA logo or SFBCP process.

Under the SFBCP it is essential that farm staff undertaking the taint assessment retain sensitivity to the specific 'taints'. To ensure this, twice yearly farms accredited under the SFBCP will benchmark their sensory assessor.

Criteria 3 Approved Food Safety Plan and National Residue Survey

Consumer's rightly expect that the food they buy is safe to eat.

All fish provided under the SFBCP must be produced, harvested and stored in line with an approved Food Safety Plan.

This includes ensuring that fish comply with food safety standard limits for antibiotics, chemicals and contaminants. Schemes can include but not be limited to auditable plans such as HACCP, ISO, State/Territory Food Safety Plans, Woolworths, Coles, SFM etc.

Farms shall also take part in the National Residue Survey program.

Table 6: Product Commitment - Live Barramundi

Criteria	Attributes	Application	Checked
1	Fish Appearance and Physical Attributes; - bright, with scales intact, clear pupils - deformity, damage or scale loss in line with agreed market requirements	Product complies with attributes. Note of compliance to follow shipment from Farm	
2	No off flavour or taint present	ABFA Test completed and to follow shipment from Farm	
3	All fish have been produced, harvested and stored in line with an approved food safety plan. Fish comply with food safety standard limits for antibiotics, chemicals and contaminants.	Approved Plan in Place EU Residue Testing	

Guidance for Live Barramundi

Fish quality is defined by specific attributes perceived relevant to the customer. Quality attributes are features of the fish that a consumer can recognise and that are important to the consumer's perception of total quality and preference for the product. These include;

Criteria 1 Fish Appearance and Physical Attributes

Meeting physical and sensory attributes for fish is critical for consumer's acceptance of product.

With live fish, processes are applied to optimise survivability and fish quality. Farms must ensure that operations are in place to ensure that oxygen levels, water temperatures and transport systems are in place to meet the criteria and minimise stress.

Each shipment must have a notice of compliance completed.

It must be noted that individual farm processing operations have the ability to set their own higher threshold or benchmark for communication along the supply chain.

Criteria 2 Off Flavour and Taint

Acceptable flavour management is important for marketing of farmed barramundi. An off flavour is damaging for all producers.

To address this all barramundi sold under the ABFA Sustainably Farmed Barramundi Certification Program (SFBCP) requires each shipment to be tested for taint. Every harvest must be sampled and subject to on-site flavour testing for taint by a trained taster, using the ABFA approved procedure.

Fish with detectable taint cannot be sold/distributed for human consumption with any reference to the ABFA logo or SFBCP process.

Under the SFBCP it is essential that farm staff undertaking the taint assessment retain sensitivity to the specific 'taints'. To ensure this, twice yearly, farms accredited under the SFBCP will benchmark their sensory assessor.

Criteria 3 Approved Food Safety Plan and National Residue Survey

Consumer's rightly expect that the food they buy is safe to eat.

All fish provided under the SFBCP must be produced, harvested and stored in line with an approved Food Safety Plan.

This includes ensuring that fish comply with food safety standard limits for antibiotics, chemicals and contaminants. Schemes can include but not be limited to auditable plans such as HACCP, ISO, State/Territory Food Safety Plans, Woolworths, Coles, SFM etc.

Farms shall also take part in the National Residue Survey program.

9. BENEFITS AND ADOPTION

Members believe that providing a quality product to consumers is a key area of differentiation from its competitors for the Australian farmed barramundi industry.

The ABFA members have benefitted directly from this project as there is now a clear, minimum quality commitment from farmers for Whole Barramundi on Ice and Live Barramundi.

The Scheme has been adopted by ABFA members and will be a part of their annual audit under the SFBCP.

As with the development of the ABFA Strategic Plan, this process has given ABFA members improved industry cohesiveness through the inclusive and consensus based process used to develop the scheme.

10. FURTHER DEVELOPMENT

The ABFA have incorporated the quality commitments through its websites, member contacts and supply chain partners.

The quality commitment will be reviewed annually at the ABFA ½ yearly meeting and be revised if and when necessary, particularly if new information or methodologies become evident, or if there is supply chain or farmer feedback that necessitates a revision of the scheme.

Individual ABFA members continue to develop their own quality value as part of their individual branding and market positioning.

A QI App for seafood, which includes barramundi, has images for each parameter over time. It will be available after 25th May 2015 as a free download though the App Store.

11. PLANNED OUTCOMES

The Quality Scheme has been adopted into the SFBCP, which is an auditable process.

Members acknowledge that without a quality scheme it will be more difficult over time to maintain the premium price demanded for locally produced farmed fish over other *Lates calcarifer.* Consumer acknowledgment of the quality of Australian farmed

barramundi will be demonstrated by ongoing consumer commitment to a price differential between Australian farmed barramundi and other *Lates calcarifer* supplied to the market.

The ABFA commitment to branding and repositioning farmed Australian barramundi, which relies heavily on the sustainability component of the SFBCP, will now also provide details to consumers extolling the values of the Quality Scheme.

12. CONCLUSION

The Australian Barramundi farming industry has seen constant growth in production over the last 10 years, but the industry is facing threats from a number of sources.

To ensure viability, increase growth and maintain profitability, it was identified, through its branding and repositioning program, that there needs to be a commitment to quality (along with sustainability) to justify the price differential between Australian farmed barramundi and *Lates calcarifer* provided by other suppliers.

Through research, industry has identified quality as a key attribute that influences consumers' decision making process. As such, ABFA has committed to a quality scheme that will ensure that consumers can be confident that when they purchase ABFA farmed fish it addresses key quality attributes which consumers recognise and are important to the consumer's perception of total quality and preference for the product; that is, it is food safe, of a quality that presents well, and with no detectable odour or off flavour taint.

The scheme has been adopted by Industry and provides clear industry benchmarks for product quality. Incorporating the scheme into the SFBCP ensures that there is an auditable process to ensure compliance, and also provide a means to annually review the scheme and adjust if new information or methodologies become evident, or if there is supply chain or farmer feedback that necessitates a revision of the scheme.

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14. APPENDICES

Appendix I: Quality Commitment for Whole Barramundi on Ice

Product Commitment

Principle

Fish is food safe and of a quality that presents well, with no detectable odour or flavour taint.

Whole Barramundi on Ice

Criteria	Attributes	Application	Check
1	Fish Appearance and Physical Attributes; - bright, with scales intact, clear mucus, convex eyes with clear pupil and gills bright red - deformity, damage or scale loss in line with agreed market requirements - no offensive or spoilage odour present	Product complies with attributes and/or QIS Score completed. Note of compliance to follow shipment from Farm	
2	No offlavour or taint present	ABFA Test completed and to follow shipment from Farm	
3	All fish have been produced, harvested and stored in line with approved food safety plan. Fish comply with food safety standard limits for antibiotics, chemicals and contaminants.	Approved Plan in Place EU Residue Testing	

Guidance

Fish quality is defined by specific attributes perceived relevant to the customer. Quality attributes are features of the fish that a consumer can recognize and that are important to the consumer's perception of total quality and preference for the product. These include;

Criteria 1 Fish Appearance and Physical Attributes

Meeting physical and sensory attributes for fish re critical for consumers acceptance of product. A readily applicable and recognised tool to assess these attributes is through the Quality Index Scheme (QIS) for Barramundi (Australian Quality Index Manual 2009). This system provides a quality score that is universally understood throughout the supply chain.

Regardless of method each shipment must have a notice of compliance completed.

It must be noted that individual farm processing operations have the ability to set their own higher threshold or benchmark for communication along the supply chain.

Criteria 2 Offlavour and Taint

Acceptable flavour management is important for marketing of farmed barramundi. An off flavour is damaging for all producers.

To address this all barramundi sold under the ABFA Sustainably Farmed Barramundi Certification Program (SFBCP) requires each shipment to be tested for taint. Every harvest must be sampled and subject to on-site flavour testing for taint by a trained taster using the ABFA approved procedure.

Fish with detectable taint cannot be sold/distributed for human consumption with any reference to the ABFA logo or SFBCP process.

Under the SFBCP it is essential that farm staff undertaking the taint assessment retain sensitivity to the specific 'taints'. To ensure this, twice each year farms accredited under the SFBCP will benchmark their sensory assessor.

Criteria 3 Approved Food Safety Plan and National Residue Survey

Consumer's rightly expect that the food they buy is safe to eat. All fish provided under the SFBCP must be produced, harvested and stored in line with an approved Food Safety Plan.

This includes ensuring that fish comply with food safety standard limits for antibiotics, chemicals and contaminants. Schemes can include but not be limited to auditable plans such as HACCP, ISO, State/Territory Food Safety Plans, Woolworths, Coles, SFM etc.

Farms shall also take part in the National Residue Survey program.

Appendix II: Quality Commitment for Live Barramundi

Product Commitment

Principle

Fish is food safe and of a quality that presents well, with no detectable odour or flavour taint.

Live Barramundi

Criteria	Attributes	Application	Check
1	Fish Appearance and Physical Attributes; - bright, with scales intact, clear pupils - deformity, damage or scale loss in line with agreed market requirements	Product complies with attributes. Note of compliance to follow shipment from Farm	
2	No offlavour or taint present	ABFA Test completed and to follow shipment from Farm	
3	All fish have been produced, harvested and stored in line with an approved food safety plan. Fish comply with food safety standard limits for antibiotics, chemicals and contaminants.	Approved Plan in Place EU Residue Testing	

Guidance

Fish quality is defined by specific attributes perceived relevant to the customer. Quality attributes are features of the fish that a consumer can recognize and that are important to the consumer's perception of total quality and preference for the product. These include;

Criteria 1 Fish Appearance and Physical Attributes

Meeting physical and sensory attributes for fish is critical for consumer's acceptance of product.

With live fish processes are applied to optimise survivability and fish quality. Farms must ensure that operations are in place to ensure that oxygen levels, water temperatures and transport systems are in place to meet the criteria and minimise stress.

Each shipment must have a notice of compliance completed.

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To address this all barramundi sold under the ABFA Sustainably Farmed Barramundi Certification Program (SFBCP) requires each shipment to be tested for taint. Every harvest must be sampled and subject to on-site flavour testing for taint by a trained taster using the ABFA approved procedure.

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Consumer's rightly expect that the food they buy is safe to eat. All fish provided under the SFBCP must be produced, harvested and stored in line with an approved Food Safety Plan.

This includes ensuring that fish comply with food safety standard limits for antibiotics, chemicals and contaminants. Schemes can include but not be limited to auditable plans such as HACCP, ISO, State/Territory Food Safety Plans, Woolworths, Coles, SFM etc.

Farms shall also take part in the National Residue Survey program.

Appendix III: Australian Quality Index (QI) Manual for Barramundi

QUALITY INDEX FOR BARRAMUNDI (POND)

(Lates calcarifer) – **whole, gut in.**

QUALITY PARAMETER		DESCRIPTION	SCORE
Skin	**Colour/ appearance**	Bright, iridescent	0
		Loss of brightness or matt	1
	Scales	Intact and firm	0
		Removable from dorsal region	1
		Loose or easy to pull out	2
	Slime	Clear/slightly cloudy or milky	0
		Cloudy brown under pectoral fin	1
	Odour	Freshwater pond	0
		No smell	1
		Spoilage odour	2
	Texture of flesh	Firm (anterior dorsal), bounces back when pressed	0
		Slightly soft, finger mark disappears slowly	1
	Rigor	In-rigor	0
		Post	1
Eyes	**Form**	Convex	0
		Flat	1
		Concave or bulging	2
	Cornea/jelly	Clear	0
		Cloudy	1
		Fully opaque, burst/blood	2
	Pupils/Iris	Pupil: dull black/transparent / irridescent/orange Iris: white/silver/bronze	0
		Pupil: cloudy, white/grey Iris: cream	1
		Pupil: cloudy, white/grey Iris: fully burst/bloody	2
Gills	**Colour/appearance**	Dark red/bright red	0
		Dark red-brown or some discolouration, brown edges	1
		Brown &/or discoloured/bloody	2
	Mucus	Clear/transparent	0
		Cloudy beige	1
		Brown on gill edge	2
	Odour	Wet grass/weedy/fresh pond water	0
		Not so fresh, no odour	1
		Off odour	2
		Spoilage	3
Quality Index			**0 - 21**