Implementing
Australian Quality Index Schemes

Sue Poole and Mark Boulter

Project No. 2013/751

March 2015

This project was conducted by:
Department of Agriculture and Fisheries
Queensland Government
39 Kessels Road, Coopers Plains, Brisbane

In collaboration with:
Sydney Fish Market
Cnr Bank Street & Pyrmont Bridge Road
Pyrmont, Sydney

ISBN: 078-0-7345-0448-7

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

Office Mark Oliphant Building, Laffer Drive, Bedford Park SA 5042
Postal Box 26, Mark Oliphant Building, Laffer Drive, Bedford Park SA 5042
Tollfree 1300 732 213 Phone 08 8201 7650 Facsimile 08 8201 7659
Website www.seafoodcrc.com ABN 51 126 074 048

Australian Government
Fisheries Research and Development Corporation

An Australian Government Initiative
CRC AUSTRALIA

Non-Technical Summary

Seafood CRC 2013/751
Implementation of Australian quality index schemes in three seafood supply chains

PRINCIPAL INVESTIGATOR: Sue Poole
Innovative Food Technologies
Department of Agriculture and Fisheries
Queensland Government
Sue.Poole@qld.gov.au
Mob: 0428 101 032

ADDRESS:
39 Kessels Road, Coopers Plains
Brisbane QLD 4108

PROJECT OBJECTIVES

1. Update and distribute existing hardcopy Quality Index Manuals, incorporating the new schemes
2. Develop and test a mobile 'app' in three seafood supply chains
3. Evaluate success and prepare communication materials to enhance uptake

ABSTRACT

This project has raised awareness within targeted seafood supply chains of QI methodology and the advantages of use within quality assurance systems.

Initial focus centred on updating the existing Australian Quality Index Manual with all schemes developed for Australian fish species. Over two hundred hardcopy QI Manuals have been distributed to appropriate seafood businesses. The QI Manual provides a comprehensive resource for information on the QI technique, how to use it for quality assurance assessment and includes QI scoring templates, along with visual depiction of ice day storage correlated to QI score attained. Industry comment on the usefulness of the QI Manual recognised the value of a QA system formalised with background science, along with the benefit for audit purposes and the benefit of common language between industry participants.

The project's main goal was to provide QI method in a format that was most readily applicable in any environment at any point along the supply chain. To achieve this, an Australian Seafood Quality Index App (ASQI App) was created suitable for use on multiple devices.

Extensive effort went into design and functional features of the App to ensure that the end product was relevant to the broadest range of users. Other key factors were that it be highly intuitive to use and have upload capability for rapid communication of assessments. High quality images were created corresponding to each assessed attribute change during iced storage. This creates simplicity of use and increased objectivity in assessment decisions. However, it also dictates that image quality is critical as it forms the fundamental operating basis of QI scoring assessment.

The ASQI App currently contains QI schemes for 10 commonly traded seafood species and more will added in the future by Queensland DAF and SFM as and when we can obtain them. A website is being developed for the support and maintenance of ASQI, hosted for the next 3 years by the Sydney Fish Market. The App is available from the Apple and Android App stores from the first week in June, 2015 and download is free.

Industry comment on the ASQI App was very positive. In one supply chain, the QA Manager has immediately purchased iPads for the QA staff ready to download the finalised version of the App.

OUTCOMES ACHIEVED

- Australian Quality Index Manual, updated with four additional species, distributed to all relevant sectors of the Seafood Industry
- ASQI App built amended and tested within wholesale and retail Industry sectors
- ASQI webpage link with instruction guide and background information on QI
- QI assessment method incorporated into established QA systems of 2 major seafood supply chains
- Training on QI at the 2015 Australian Seafood Retailer's Network

OUTPUTS PRODUCED

1. 250 printed QI Manuals updated with four new schemes
2. An App (ASQI) functional for IOS and Android devices available in June 2015
3. Website link developed for user guidance and provision of background information on QI method

ACKNOWLEDGEMENTS

With enormous appreciation the PI acknowledges several people, including project team members, who have contributed way above and beyond the original tasks and thereby ensured the success of the project.

- Nick Paton and Joshua Jusuf (SFM) for their huge input into creating a beautifully functional App, undertaken in their own time with constant positiveness.

- Carl Paulo and Paul Exley (DAF) for intensive extended effort in obtaining fantastic images.

- Kerrie Abberton (DAF) for her cheerful and dedicated undertaking of the onerous task of collating and distributing the QI Manuals.

- Danny Loch and Rob Young (Gasoline, Sydney) for the excellent artwork design and printing.

- Shane Holzberger (Photographer, QLD) for very generous sharing of his expertise and professional photography skills.

- All those who expended special effort to provide perfect quality-specimen fish for image taking: Boat skipper (Cairns), Brett Wedding, Steve Grauf (DAF) and fishers; Huon Salmon (Tasmania); Shane Geary (Coff's Harbour Fishermen's Co-operative); John Paige (Fisherman, QLD).

And last, but definitely not least, the Australian Seafood CRC for the financial and operational support throughout.

1. Introduction and Background

The Quality Index (QI) method for assessment of fish freshness was developed directly from a previously established demerit scoring system created by Allan Bremner and co-workers within the then post-harvest fish unit at the CSIRO Tasmanian Food Research Unit laboratories (Bremner *et al.,* 1987). The advantages of the demerit point system was initially recognised in Europe, firstly Denmark and other Nordic countries then other major seafood trading countries. Further research was conducted on its applicability along seafood supply chains and it developed into a system called the Quality Index Method (Luten and Martinsdottir, 1997). Schemes for many European fish species have been developed and QIM Eurofish has been set up to oversee further developments. QI manuals for the European Seafood Industry were prepared in many languages and schemes were successfully translated into a mobile App format ("*How fresh is your fish?*"). QIM is now the standard reference seafood assessment method used in European fish technology institutes, by many seafood trading companies and wholesale auction markets.

The Quality Index (QI) method is a tool that can assist businesses to monitor supply chain performance and identify areas for improvement. The QI tool provides a consistent system, based on a universal language of quality descriptors, to assess freshness throughout the chain and determine remaining storage life of the product.

The original FRDC funded QI project (FRDC 2003-237) supported development of 14 QI schemes for Australian seafood species and the Seafood CRC has invested in developing an additional four schemes (Australian Salmon, Crimson Snapper, Blue-Spotted Emperor, Rosy Threadfin Bream) for its participants. However, there has been little uptake of the QI method within the Australian Industry to date, despite efforts (including commissioning SeaNet, FRDC 2010-305) to commercialise and raise awareness of the benefits of using QI.

1.1 Need

Within the Australian seafood industry there is no standard quality assessment system. Currently individual seafood businesses each have their own internal systems often dictated directly by market buyer product specifications. This is appropriate for the particular company's supply chain but engenders confusion between companies and across the marketplace.

A consultation meeting with the seafood processing industry sector to capture their high priority research needs, initiated by the Seafood CRC, April 2013, discussed the QI assessment method and the benefits to be gained by use of the QI tool. The original hardcopy QI Manual was presented and the EU App demonstrated. Keen interest was evidenced from the four major seafood companies present. Immediate reaction centred on the ready applicability within their company's QA systems and there was ready acknowledgement of the usefulness of a common language system across companies. Reservation was reserved only around the practical use of a paper based system within wet processing environments and off-site locations: "I see there are waterproof scoring sheets here, but the QI Manual is still not very suitable for day-to-day processing environments". Further discussion centred on the format of a mobile App and there was unanimous agreement that such a format would be ideal for practical use in all operational environments.

Other Seafood CRC research has shown that there is significant potential for increased product storage life through supply chain management improvements. In one major West

Australian supply chain it has been demonstrated that ongoing savings of ~$150,000pa can be achieved through implementation of relatively simple improvements. In that study, the QI method was introduced to the company and the Australian QI manual is now used at various points in their distribution chain to assist supply chain monitoring.

With the commitment of major seafood supply chains to improving supply chain management processes the timing was favourable to work with these companies and re-introduce the QI method to meet their QA operational needs.

This current project directly addressed the challenge of attaining broad industry adoption of QI methodology by updating the hardcopy QI manual and developing a simple-to-use App.

1.2 Objectives

- Update and distribute existing hardcopy QI Manuals, incorporating four new schemes
- Develop and test a mobile 'App' in three seafood supply chains
- Evaluate success and prepare communication materials to enhance uptake

2. Methods

There are three components to this project:

1. Update and distribute the hard copy QI Manual broadly across industry
2. Develop and test a mobile "app" in three supply chains
3. Evaluate the results and prepare communication materials to support further extension of QI to other supply chains

The researchers undertaking this project are all fully conversant with QI methodology and its application within industry. They were involved in the project that developed the original set of QI schemes and have run extension forums on the use of QI to different sectors of the Industry.

Quality Index Manual

Output from a previous project (FRDC 2003-237) included 250 printed copies of the Australian Seafood Quality Index Manual., These were originally sold through Seafood Services Australia online bookshop and stock was held at the Sydney Fish Market. Outputs from several Seafood CRC projects include separate Quality Index schemes developed for a further four Australian fish species. The new QI schemes were art-worked and printed (250 copies of each, including waterproof pages for on-floor use) by the original publishing company, Gasoline (Redfern, Sydney). All the remaining stock of QI Manuals (250) stored at Sydney Fish Market were transported to DAF, Queensland where update of each with the new species schemes occurred by physical assembly.

Distribution occurred through mail-out to a prioritised list of appropriate seafood businesses. The accompanying letter of introduction sent with the QI Manual provided contact details of the project team for further information on the QI method and implementation use (Appendix 3).

App development and testing

App development was undertaken by a team from the Sydney Fish Market IT department outside normal work hours and commitment. The leader of this activity was Nick Paton, Manager of the SFM IT team, who had previously developed a prototype beta version App of an assessment system based on QI scoring.

With the QI scoring system in this format there is an excellent opportunity to provide imagery associated with each parameter change per species as they occur over iced storage. To maximise this unique opportunity, DAF researchers engaged the expertise of a professional photographer, Shane Holzberger (frequently contracted by the Seafood CRC) to advise DAF staff on suitable photographic equipment required and to train two staff on the necessary techniques to achieve excellent quality images.

Extensive discussion and planning went into the App design with respect to functional features and operation to ensure the widest fit for different seafood businesses.

Use within seafood supply chains

Three Australian seafood supply chains, Sydney Fish Market, MG Kailis and De Costi's were keen to be involved for initial implementation of the App. During development, all three companies had input into App design requirements ensuring that functional features were most suitable for intended use for the businesses. For the initial version of the App it was proposed to include six Australian species and these were selected by the industry co-investigators. Once the App was developed these companies test-used the App *in situ* during quality assessment of product. Amendments and adaption of the App features occurred in line with their feedback.

Communication materials are being prepared on the following:

- description of QI method and basis for application
- summarised science behind the method to provide understanding of storage life prediction
- comprehensive explanation and examples of use and benefit gained by QI method
- how-to instruction guide for use of App

Communication materials and the link to the Australian Seafood Quality Index (ASQI) App will be available on the SFM website. The App is available from the Apple and Android online app stores from the first week in June, 2015..

3. Results and Discussion

Quality Index Manual

Storage life data and quality parameter images were provided from Curtin University (Janet Howieson) for four additional QI Schemes relevant to Australian fish that had been developed within other Seafood CRC project work:

Australian Salmon (*Arripis truttaceus*)
Bluespotted Emperor (*Lethrinus* sp.)
Crimson Snapper (*Lutjanus erythroptus*)
Rosy Threadfin Bream (*Nemipterus furcosus*)

Raw data for QI score over time was prepared in format suitable for print publication to match similar data incorporated into the existing QI Manual.

It was considered expedient to contact and re-engage the artwork designer and the printer companies that undertook the original QI Manual publication. Accordingly, Gasoline (Redfern, Sydney) was briefed and contracted to provide the extra pages for the additional QI schemes for the four tropical fish species, along with other minor updating modifications. Artwork design and print parameters were kept the same as previously published schemes and for each scheme, copies were printed on waterproof paper allowing application for reference within a wet factory or processing environment. The final-proofed print copies were transported to DAF, Brisbane from the Sydney Fish Market.

The QI Manuals were updated by physical assembly, included removal of some original pages and replacement with those newly printed so as to keep all schemes within the QI Manual in alphabetical order. Pages of schemes incorporated as single loose waterproof sheets were similarly alphabetically ordered.

Dissemination to the Seafood Industry

As the available hardcopy QI Manuals were limited to 250 in number, there was a requirement to select seafood businesses that would likely gain most advantage from implementation of a formalised QI system. On this basis, Australian seafood companies were prioritised on the grounds of business focus, turnover and processing activity. A starting point for constructing the most appropriate list was the current (October, 2014) seafood industry 1000-strong contact list of the Seafood CRC. The final nominated companies were reviewed for relevance and omissions by the Seafood CRC, SFM and appropriate State Industry entities.

With recognition that many of the seafood businesses would not have heard of the QI method nor have an understanding of implementation or benefits to be gained from its use, the mail-out was accompanied by a letter of introduction to the QI system, including:

- a synopsis of benefits to be gained from implementation
- a simple how-to-use description of the scoring system
- contact details for assistance or enquires (Seafood team, DAF)
- reference to the forth-coming mobile App version for the QI schemes.

The QI Manuals were ready for distribution at the beginning of November 2014, however were sent out in January 2015. This decision was taken with full recognition that December is a very intense trading month for all sectors of the seafood industry and therefore the arrival of a hardcopy QI Manual describing a ‘new’ quality assessment system would be unlikely to receive full attention of QA personnel. There were a few requests for additional copies subsequent to the mail out but not a lot of comment from industry in general, which was not unexpected.

The exceptions were two major processing companies, MG Kailis (Western Australia) and A Raptis & Sons (Queensland). MG Kailis adopted the original QI Manual schemes and implemented the QI method at various points within their supply chain. This company highly appreciated the updated QI Manual as the newly developed schemes incorporated were all for tropical fish species which were commonly traded commodities within their operation. Hence the updated QI Manual was immediately adopted within the QA system for the company and feedback indicated the continued use, especially to identify non-conformance events with product and manage quality improvement. For A. Raptis & Sons, similar feedback

was received with the difference of first-time implementation of a universal QA tool within this company. Prior quality assessment was based on an internally developed paper-based parameter set according to customer needs and so the provision of the QI Manual as a formalised science-based QA tool was greatly valued. Again, for this company the QI schemes contained within the Manual were directly relevant to seafood species most commonly traded. To quote the QA manager of the company: “replacing the company’s quality assessment sheets with the QI schemes in the QI Manual was a no-brainer”.

Quality Index App development

The QI Manual is a valuable QA management document, particularly with respect to auditing requirements, however a criticism of the hardcopy QI Manual format is that it is somewhat cumbersome for daily use. Formal and auditable records require that photocopies of the QI scoring sheets need to be created for each quality assessment of a fish batch and while this is possible within in a processing operation, it is not suitable for different environments along the supply chain .

On the basis of the widespread success of the QIM Eurofish App and from the articulations of the four major Australian seafood companies, it was considered appropriate to pursue development of a similar App tool for the Australian QI schemes. The Seafood CRC invested in the opportunity to build on the prototype App platform developed previously by the Sydney Fish Market’s IT Manager, Nick Paton, and create a more useful QI tool format for the entire Australian seafood industry. Detailed discussion with SFM and Nick Paton established the development status of the prototype beta version platform and illustrated a strong enthusiasm to develop it further to commercial-readiness. An enormous operational advantage of using such IT expertise is the already existing knowledge of fish, spoilage patterns and storage life by the SFM IT team, along with knowledge of the varied application environments that occur in the seafood industry and in which the App needs to function effectively.

Design development

Extensive thought and discussion went into design and functional features of the App, based on knowledge gained during the prototype development and the needs for its application within different seafood businesses (see Tables 1and 2; Figure 1). A simple and clear structure for App pages was first created with consequent page by page content plan.

The initial App version included the following key features:

- 4 species with high quality images for each attribute.
- additional species could be included via download from a web service
- multiple assessments per batch
- a setting to turn off/on the display of attribute images to speed up the assessment process by experienced assessors
- functions for save, review, delete and amend assessments
- attachment of photos with assessments
- ability to email assessments or upload assessments and photos to Dropbox
- ability to set ice days limits or visual alarm thresholds per species
- a web service hosted at Sydney Fish Market for species updates

This version was created and sent out via test platform to QI-knowledgeable people for review of applicability for use as a QI assessment tool. Comments were thoroughly positive with respect to physical function and ease of use. Minor amendments were suggested and mostly around visual improvement.

Table 1. Summary of decisions taken for App features.

APP FEATURES			
	Required	**Comments/Modification**	**Decision**
Estimated days on ice Estimated remaining days of ice storage life	Yes No	User able to set Alert threshold score appropriate to their business for each species. Would be per device! Later build in multiple levels/thresholds – equating to Grade A B C for example Concern raised re inclusion of remaining storage life associated with a QI score due to potential misuse - Unanimous agreement	include noted not included
Storage of full or partial assessment	yes	Very useful	include
Export of results to PC, email, Cloud storage	yes	Include all	include
Ability to continue, modify saved assessment (block after export)	yes	Useful if interrupted (on boat, in factory) A time limit for continue to be incorporated (2h?) to avoid fish changing from start of assessment	include
Ability to delete old assessments	yes	Incorporate ability to check device storage space left useful No limit to photos taken during assessment	include
Images used for each visual attribute	yes	Images to cover each visual change for all listed attributes All visual ranks for any one attribute to be on one screen for ready comparison	include
Identification of assessment (start or finish) Date location assessor batch identifier, notes	yes	Unanimous decision: should add these at the finish – as only relevant to stored or exported assessments. When doing a rapid check and the fish score well – likely no need to store assessment Further comment emphasised importance of noting the seafood batch number as denoted at harvest – allows follow through supply chain	include
One QI scheme installed with App Download ability of extra selected species	yes	Discussion agreed the Pink snapper would be the default species Industry can then choose download for other species most relevant to their business	include

Table 2. Summary of decisions taken on design.

DESIGN CONSIDERATIONS			
	Required	**Comments/Modification**	**Decision**
Device type	yes	Suit Phones, Tablets, Phablets	agreed
Initial Splash page: Intro Instructions Do not show again		Content of screen – logos welcome credits Brief – with link referral to QI Manual Suggested SFM could host link to file containing the full pixel images should industry wish to view	agreed
Rotation	yes	For Tablets – as they are most likely used in that orientation in factory for phones - portrait screens will work best for multiple images of a specific attribute	agreed
Pinch zoom	yes	Which negates the need for rotation on phones Suggestion of one-point-hold enlargement action rather than pinch	agreed
Wizard or Selection screen	No yes	 Selection screen for each parameter score, with empty score box required to be filled with a numeral before calc key will function After each attribute is assessed, app will return to the attribute option screen until all have been completed	agreed
Future multiple language support	later	Relatively simple to translate as so few words within descriptors Languages mentioned: Vietnamese; Cantonese; Mandarin; Thai; Indonesian	agreed
Android stability issues O/S versions – limit to 4.0+	yes	Little relevance in designing for technology >2yrs old	agreed
Icon	yes	Needs design – Danny (Gasoline) ? Use same (v. similar icon as used on top RH page of QI Manual ?	agreed
Title	Yes	**What is this App called ???**	

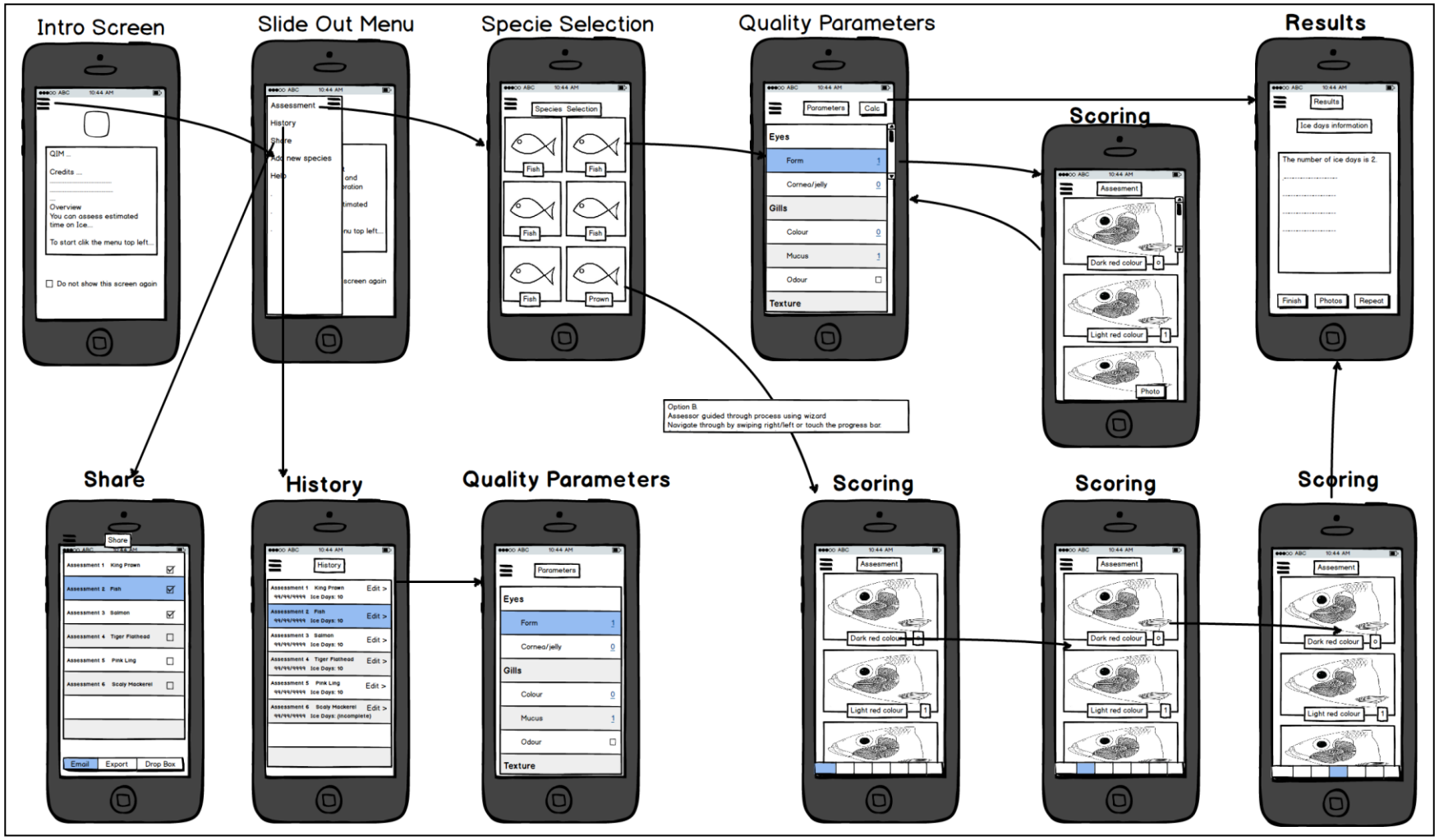

Figure 1. Schematic design pathways for discussion.

Additionally, the version was tested by a couple of 'GenY's, who are frequent App-users but have no knowledge of QI method, to gauge App design acceptability and similarity to expected App function.

Image capture

With the QI method tool in an App format, there is a unique opportunity to provide images associated with each parameter change over storage time for each species. This provides simplicity for use and increased objectivity in assessment decisions. However to achieve this, it was instantly acknowledged that image quality is absolutely critical as it forms the fundamental operating basis of QI scoring assessment.

In order to achieve the highest quality image set possible, we engaged the expertise of Shane Holzberger – a professional photographer previously contracted by Fuller (South Australia) and the Seafood CRC. With Shane's outstanding input we were able to understand and identify equipment appropriate to the required task. A full complement of equipment high-quality photographic equipment including camera, specific lenses, tripod, lights and software suitable to the task was purchased at DAF expense. Further a dedicated 'fish-portrait' studio was set up to expedite multiple image capture for multiple species within a short timeframe. Shane then provided his time and expertise to train two project staff in the essentials of obtaining exceptional quality images. The outcome was hugely successful! We have gained clear images illustrating each change for all the attributes defined within a QI scheme for a species. The images were large in size but able to be reduced a little for incorporation into the App without loss of definition. They are also of a quality that permits successful pinch-zoom capability on device screens.

One of the most critical factors in attaining a set of images of fitting quality for use as reference comparison in quality assessment and decision rating is obtaining fish as close to capture point as possible. A fish straight out of water has physical attributes of 'perfect' visual quality, barring physical damage caused by capture method. Of particular importance is eye clarity which should be revealed as clear and black, but that changes rapidly following immediate post-capture storage in ice or slurry. This presents a challenge when the images are to be taken elsewhere from the deck of the fishing vessel as images for the App were. To overcome this hurdle, fish species were sourced as locally to Brisbane as possible. Even in these cases, careful attention to 'ideal' handling was required including selection of experienced skippers and pre-determination of transport pathway. Another important aspect was to acquire fish examples at the height of the capture season to ensure high quality specimens more likely to retain quality through transport.

With these considerations in mind, fish were sourced as follows:

- within a 3h road travel distance from Brisbane – Tiger and King Prawns; Mullet
- commissioned fishing trips with DAF staff in Cairns for tropical species – Saddletail Snapper; Crimson Snapper; Goldband Snapper; Red Throat Emperor
- specific purchase direct from supplier – Atlantic Salmon; Snapper; Barramundi

To date there are full image sets for the contracted 6 species (Table 3, asterisked), as defined by the seafood industry participants and an additional 4 species due to their being in season during the period of photography. It was advocated that another 4 species be included to present those QI schemes newly developed under support of Seafood CRC projects:

Bluespotted Emperor (*Lehtrinus sp*)
Crimson Snapper (*Lutjanus erythropterus*)
Rosy Threadfin Bream (*Nemipterus furcosus*)
Western Australian Salmon (*Arripis truttaceus*)

Table 3. Australian species with full image sets.

Fish name	Species
Atlantic Salmon *	*Salmo salar*
Barramundi *	*Lates calcarifer*
Black Tiger Prawns (cooked) *	*Penaeus monodon*
Crimson Snapper	*Lutjanus erythropterus*
Goldband Snapper	*Pristipomoides multidens*
King Prawns (cooked) *	*Melicertus plebejus*
Mullet	*Mugil cephalus*
Red Throat Emperor	*Lethrinus miniatus*
Saddletail Snapper *	*Lutjanus malabaricus*
Snapper *	*Pagrus auratus*

Of the additional species, images for Crimson Snapper had already been taken. For Western Australian Salmon it was agreed that obtaining fish close to capture in WA water with transport to Queensland was unachievable at this point. However it may be possible at a future time to use the similar species caught on the Eastern seaboard (*Arripis trutta*) if colour, shape and spoilage characteristics comparison can be conducted. Additional funds were provided to obtain examples of Rosy threadfin bream and Blue spotted emperor, however due to unsuitable fishing weather (cyclones) examples of these species have not been obtained. DAF remains committed to completing image sets for both these species and fish should be obtainable during late April/May, 2015.

It is also the intention of DAF to continue to obtain the other fish species that have QI schemes developed, when and how possible as other work commitments allow. This will provide a complete set of images for all Australian species that have QI scoring systems and can be uploaded to the App website when feasible.

App website and maintenance

At project contacting time, it was agreed by all parties that SFM would host the App website for the first three years. The Australian Seafood Quality Index (ASQI) App will be made available from the Apple and Android App stores. It was agreed that at first download of the App, only one species should be included as this minimises download time and allows individual businesses to select further downloads for only those species relevant to their operations. The Seafood Industry decision is that the initial download species should be Snapper (*Pagrus auratus*) as it is a most commonly traded species around the country.

Beyond the free download link for the App itself, the website will provide:

- a comprehensive description of QI methodology and basis for application
- a detailed explanation of use with examples
- summarised science behind the method to allow understanding of typical fish spoilage patterns and storage life prediction
- benefits gained from implementing the QI system

Under this arrangement it will be readily possible to upload future image sets of fish with QI systems and future developed QI schemes for Australian fish. The ASQI design and

functionality will be amended as required, based on feedback obtained during further industry review and supply chain trials.

App trials within Industry

Relevant QA personnel in 4 different supply chains were sent the invitation to download the App from the testing platform site. This was preceded by an introductory alert email and followed up with another message a few days later. Additionally 6 members of the Seafood Retailers Network also received the invitation.

Industry feedback

Business: Harvester Wholesaler Retailer Processor
Business deals in whole product, processed and value-added products in chilled, frozen and cooked formats. Trades with all sectors of the seafood industry from major retailers to small seafood businesses and direct to the consumers through electronic sales.

Quality operations:
Full quality assurance (QA) systems in place to meet separate customer specifications. QA manager developed own paper-based assessment reference sheet for each seafood product. The internal system is used by all operational staff doing quality assessment. Where uncertainties occur, requires QA manager attendance and discussion for decisions.

Feedback – QI Manual

- Really pleased to have a 'formalised' reference
- QI Manual is currently used for the species available – replaces internal reference sheets for the relevant species
- Likes the existence of background information on storage life and ice-days concept provided in the QI Manual
- Commented that is a good resource to have for audit purposes
- Also considered that major retailers will respond positively to knowledge that QA is occurring underpinned by science. Increased respect and confidence in QA conducted in the business

Project team comments:

- *QA in the company has always been a focus, so concepts of scoring in a standardised way between fish batches etc is familiar concept in this business*
- *Readily see how the QI scoresheets replace the company's internal ones – so naturally QA manager responsive to the QI Manual*

Feedback – QI App

- QA manager was very impressed with electronic format of the QI Manual
- Had spent some time thoroughly exploring functions – liked them all
- Found it very intuitive to use with no functionality not comprehended
- "pictorial images of attributes great for instant reference and comparison – more than replaces my internal sheets"
- "Having each visual change shown was great"
- Considered that this resolved the need for QA manager attendance and discussion when quality of particular product was in doubt
- Calculation of QI score excellent – and appreciated the inbuilt calculation of ice-day equivalent

- Really pleased with the simpleness of real-time image capture for 'proof' and record storage
- Fully appreciated capability to send data direct to company computer system. The company has been pushing 'paper-less' for some time and the QI App has provided the perfect tool to operate electronically for quality assessment action within the business
- Valued the ability to send via email to clients also
- Understood the potential usefulness of being able to set QI score thresholds for species. Hadn't explored use of this function as yet but spoke of several instances where this was going to be a very useful function, including use in meeting major retailer specifications

A major positive on the existence of the QI App was in the area of training QA staff. Commented that this was a continual need with turnover of lower level staff and saw the App as a highly applicable tool for assisting with familiarisation of storage changes in fish species. The feature of visual images for quality parameter change through storage time was regarded as brilliant as it strongly reduced the need for gaining experience over an extended period.

Outcome:
The QA manager is very keen to implement the formal and the QI method and the App into their QA system. As illustration of this, IPads have already been purchased for as tool of choice and discussions held with the company's IT team to progress installation and interface of the App, appropriate to company policy, when the finalised version is available.

Project team comments:
Re 'ice-day' equivalent comment – the QA manager of this company is very experienced with has extensive knowledge of seafood quality and factors that affect it. She has been in QA role for a long time hence understands the importance for monitoring seafood quality. Therefore to have ice days calculated for a specific QI score attained had total meaning and use for her.

When asked whether remaining storage life should be calculated and provided within the App – the definitive answer was: "No – you have no control over how the product is stored by the purchaser and could lead to severe disputes." A suggestion that it was likely that major retailers would also choose to download and use the QI App – which she considered a good thing – but if specific remaining storage life is given in the App, she predicted an increase in inter-business disagreement ! This was exactly the conclusion that the project team came to after strong and long discussion on whether to include storage life remaining.

Our thinking: QI score is based on ice-day equivalents – meaning at $0^{o}C$ storage. Therefore a QI score is determined for that point in time that the product is assessed. Calculating this as ice-days stored is good and recognisably meaningful as well as valid. To state the calculated remaining storage life for that product is also valid from the scientific data used to develop the QI schemes. However this only holds true IF the product is stored at $0^{o}C$ consistently throughout the subsequent storage period. Given the lack of control over this action – it was deemed sensible to only provide a calculated ice-day equivalence at the point of assessment.

Web page importance – QA manager considered this to be useful and a good practical idea for providing background for less experienced industry personnel, For her, personally – the extra information was not of concern due to her established experience in QA of seafood. Did comment that would provide a useful resource to assist in training staff in QA.

So impressed with how applicable the QI App will be within the QA section that wanted MORE species available in that format. In fact, provided (with a smile) a long list of additional species preferences covering almost all the species the company trades in. Particularly eager for QI schemes for a range of fillets also.

Comments expanded into inclusion of related aspects:

- *QA in the company has always been a focus, so concepts of scoring in a standardised way between fish batches etc is familiar concept in this business*
- *Legal size limits*
- *Explanation of quality and spoilage*
- *Attribute issues for specific species – e.g. explanation of tough fish syndrome for saddletail snapper*
- *Standard fish names and alternatives*

Much discussion followed around the availability of this information, but it was agreed that while relevant to trading in and the 'quality' of fish product these areas did not directly belong within the fish freshness assessment system that QI is. Suggestion made that perhaps could have additional links provided on a back page on the website.

Overall comment: such a positive and interactive response made all the effort worthwhile :)

Retailers Network

The project team presented to the third Seafood CRC Retailers Network meeting in Sydney. The background and history of QI method development was given along with current status of QI methodology in Australia. Brief background science behind the method was described and instruction for how-to-use. This was immediately followed through with a hands-on demonstration using QI to assessment the quality of differently aged cooked black tiger prawns and snapper. All participants assessed the product individually with a common graphical representation of the scores obtained. QI Manuals were provided to each participant. Then a presentation of the ASQI app was given with positive response from the retailers, many of whom indicated that they could easily see how it could be incorporated into the business. Several of the retailers have been invited to test the App prior to version finalisation. This was only a couple of weeks prior to Easter trading and so, as yet, no response has been received.

4. Benefits and Adoption

The benefits of implementation of the QI assessment system for quality management improvement along supply chains within the Australian Seafood Industry include:

- an agreed basis for setting guidelines and product specifications
- a tool for evaluating quality handling performance of individual suppliers, trouble-shooting and dispute resolution
- a check on transport and distribution events to pinpoint areas for improvement
- support for remote buying and electronic trading
- a method for communication with retailers and supermarkets by using a universal language scientifically based on seafood quality parameters
- a formal technique for training, educational courses and workshops for staff and supply chain partners
- if used appropriately a prediction of remaining product storage-life

Illustration of these benefits occurring within the seafood industry is presented by the European experience where first a QI Manual was adopted across multiple seafood trading nations and, due to widespread uptake, the development of a mobile App version of the system for more ready use in varied operational environments.

Adoption of the QI method was encouraged within the Seafood Industry by production of two outputs from this project, the updated QI manual and a market-tested App to assist seafood companies in implementing QI assessment throughout their supply chains. The key messages for transfer to Industry for either format of the QI tool are the same:

- it provides a universal description language that identifies the quality status of product and can predict remaining storage life
- application of the QI method for product quality assessment is simple, rapid and reliable
- the specific points for effective application of QI assessment will be tailored to individual supply chains
- the benefits of QI method application

Two major seafood supply chains have readily adopted the QI assessment system. One has been using it within their QA system since the Australian QI Manual was first available and has greater use now that additional tropical fish QI schemes have been added. The other has already purchased iPads for the QA staff ready for download of the finalised version of the ASQI app.

The inherent nature of the QI method is its ability to be used by anyone with some knowledge of seafood but it is not necessary to fully understand the spoilage patterns for a particular species. Wider implementation will occur over time but this will require follow up and further encouragement for smaller businesses that do not have a formal QA system in operation. It is recognised that the most successful way to achieve adoption is through onsite conversation with individual businesses.

Ongoing accessibility of tools:

- the QI Manual will be made available through the project PI and, if printed copies run out, investigation of upload onto relevant websites - Seafood CRC, FRDC, SFM, DAF
- the ASQI app will be readily available from the Apple and Android App stores linked on the SFM website

5. Further Development

After conclusion of this project, there will be on-going support from both:

- the IT team at SFM for the website maintenance and App amendments and
- DAF project team for information support, operation advice and assistance with QI method

Project staff will be available to assist industry sectors and individual businesses with the implementation of QI methodology, including temperature monitoring as requested. This can include specific application of the QI method in setting product specifications, identifying handling and distribution chain trouble spots, supporting the methodology use for objectively settling quality disputes.

It is the strong intention of the DAF team to continue to encourage adoption and implementation of the QI system into business within all seafood sectors. As well, evaluation of benefits gained from implementation will be noted which provides industry-relevant examples for motivating additional uptake of the methodology.

Additionally, there is a commitment in DAF to continue to acquire full image sets for Australian fish species that have a QI developed but were not part of the work within this project. These will be undertaken as and when fish and staff are available, with the critical dictator being harvest season. The images sets can then be uploaded to the ASQI website and made available for download.

The QI scheme development and methodology platforms established present an opportunity for further Australian seafood species to be included. An awareness within future research projects involving different species will include assessing feasibility of developing a QI scheme for the species alongside the research focus of the project. This is inherently driven by industry as research work is centred on seafood species of most commercial importance to the industry. Hence additional QI schemes prepared and added to the ASQI will be of broad usefulness to most industry sector.

Funding sources will be sought for specific 'next-do' species – for example, Raptis were extremely keen to have all the major-traded prawn species with a QI scheme and added to the ASQI. There was equal keenness for a range of fish fillets to be included and this commodity would have very wide relevance to most sectors of the supply chain.

6. Planned Outcomes

Public Benefit Outcomes

Implementation of the QI method of assessment of fish quality will result in the outcome of higher quality product available to the consumer and reduce the extent of discounting occurring at retail level. While discounting practice is an acceptable action for moving product quickly, it is instinctively associated with a negative perception that the product is near the end of storage life with the loss of the visual and flavour characteristics typical of the fish species. Therefore the eating experience is not great, the consuming public may too readily 'lump' all seafood in this arena and purchase less frequently.

Private Benefit Outcomes

Four main outcomes will flow on from implementation of QI methodology:

1. Supply chain partners will have a common language as a basis to communicate QA specifications
2. Supply chain partners will have the ability to record product variations and objectively settle disputes regarding product freshness
3. Suppliers will be able to streamline their own QA systems and collectively help create more competitive supply chains
4. Reduced wastage throughout the supply chain resulting in improved buyer confidence in seafood product

Once implemented, the supply chains are expected to achieve ongoing efficiency savings and improved product storage-life, better meeting their buyer specifications.

Linkages with CRC Milestone Outcomes

Output 4.4:
Technology transfer leading to successful commercialisation and utilisation of CRC outputs
Milestones

4.4.3: Large, commercial-scale trials demonstrating technical and economic viability of selected research outputs completed

4.4.4: Implementation plan to ensure rapid industry adoption completed for the selected research outputs

Output 4.6:
Communication tools developed and delivered
Milestone

4.6.3: Communication tools, including media products, developed

7. Conclusion

This project has raised awareness within targeted seafood supply chains of QI methodology and the advantages of use within quality assurance systems.

The initial focus centred on updating the existing Australian Quality Index Manual with all the schemes developed for Australian fish species. Over two hundred hardcopy QI Manuals have been distributed to appropriate seafood businesses. The QI Manual provides a comprehensive resource for information on the QI technique, how to use it for quality assurance assessment and includes QI scoring templates, along with visual depiction of ice day storage correlated to QI score attained. Industry comment on the usefulness of the QI Manual recognised the value of a QA system formalised with background science, along with the benefit for audit purposes and the benefit of common language between industry participants.

The project's main goal was to provide the QI method in a format that was most readily applicable in any environment at any point along the supply chain. To achieve this a mobile App was created suitable for use on multiple devices. Extensive effort went into design and functional features of the App to ensure that the end product was relevant to the broadest range of users. Other key factors were that it be highly intuitive to use and have results upload capability for rapid communication of QI assessments. With the QI method in App format, there is a unique opportunity to provide images associated with each parameter change over storage time. This creates simplicity of use and increased objectivity in assessment decisions. However, it also dictates that image quality is critical as it forms the fundamental operating basis of QI scoring assessment.

The Australian Seafood Quality Index app (ASQI) has been successfully developed. It currently contains QI schemes for 10 commonly traded seafood species and more will added in the future. A website is being developed for the support and maintenance for ASQI, hosted

for the next 3 years at the Sydney Fish Market. The app will be available from the Apple and Android App stores and download is free.

Industry comment on the ASQI was very positive. In one supply chain, the QA Manager has immediately purchased iPads for the QA staff ready to download the finalised version of the app.

8. References

Bremner HA, Olley J and Vail AMA. 1987 Estimating time-temperature effects by a rapid systematic sensory method. In: Advances in Food Research: Seafood Quality Determination. Elsevier Press, pp 413-435.

FRDC 2003-237 Development of a Quality Index for Australian Seafoods. M. Boulter, A, Bremner, S. Poole, F. Kow, J. Weerasinghe, H. 2009.

FRDC 2010-305 Extension of OH&S and Quality Index project outputs to the post-harvest Australian Seafood Industry. L. Pryce. 2011.

Luten JB and Martinsdottir E. 1997 QIM: a European tool for fish freshness evaluation in the fishery chain. In: *Methods to determine the freshness of fish in research and industry. Proceedings of the final meeting of the concerted action "evaluation of fish freshness*. Ólafsdóttir G. *et al* (Eds), AIR3CT942283 (Fair Programme of the EU), Nantes Conference, International Institute of Refrigeration, Paris. pp 287-296.

9. Appendices

Appendix 1. Intellectual property

The primary purpose of the project was to disseminate the why and how of QI methodology as widely as possible to encourage maximum uptake and use within the Australian Seafood Industry. This goal obviates any IP retention for the two project outputs by parties within the project.

The only relevant IP aspects are those agreed within the Commercialisation Agreement (Schedule 4) of the project contract agreement, signed by all parties.

Appendix 2. Project Staff

Sue Poole - DAF, Queensland
Carl Paulo - DAF, Queensland
Paul Exley - DAF, Queensland
Kerrie Abberton - DAF, Queensland
Mark Boulter - Sydney Fish Market
Nick Paton - Sydney Fish Market
Joshua Jusuf - Sydney Fish Market
Janet Howieson – Curtin University, Western Australia

Appendix 3.

Mail out Letter and list of Industry members contacted

Letter of Introduction of Quality Index Manual

27 January 2015

Dear Seafood Industry Member

This Quality Index Manual has been sent to you as an easy-to-use tool that may assist with the quality assessment of your Australian seafood products. It is modelled on the successful QI method used in the EU "How fresh is your fish?". Currently, there is a Quality Index (QI) scheme for 18 commonly-traded Australian species and we plan to add further species in the future so hold onto your manual and keep it somewhere safe!

The QI is a scientifically based tool to provide a numerical QI score that equates directly to days stored in ice (0^{o}C). This QI system can provide:

- accurate grading
- estimation of elapsed storage life
- prediction of remaining storage life
- increased buyer certainty
- better management within the supply chain
- ease of resolving dispute
- and use in training staff

I'm Ready to Perform my own QI Assessment! What Do I Need to Do?
As QI is a simple visual assessment method based on different attributes of the fish species (e.g. eye clarity, gill colour and odour, skin appearance and flesh firmness) you can start assessing right now and it doesn't take long!

Assessment technique is mostly intuitive with each quality parameter scored according to the physical presentation of the specific attribute and then added up to get an overall number (this is your QI score). Every quality parameter must be scored to be accurate. Refer to pages 6 and 7 of the manual for a demonstration with greater technical information provided from page 19. The scheme for each fish species is presented on a separate page for ease of photocopying and scoring use, along with representative images of fresh, mid-life and 'old' fish. There are also waterproof scheme sheets included for ready reference and use in wet environments.

We are currently in the final stages of developing a mobile version of the QI schemes that will be downloadable to mobile phones and iPads. This format is expected to be available in

March so we will let you know when that is ready for free download off the iTunes and App stores

We know the QI system will be of great use within your business and please simply contact us if you have any questions at all:

Sue Poole 07 3276 6028 sue.poole@qld.gov.au
Carl Paulo 07 3276 6027 carl.paulo@qld.gov.au
Mark Boulter 02 9004 1128 markb@sydneyfishmarket.com.au

Best Regards

Sue Poole

Principal Scientist
Seafood Team Leader
Innovative Food Technologies
Dept of Agriculture, Fisheries and Forestry
Health and Food Sciences precinct
Block 10, 39 Kessels Road, Coopers Plains, Brisbane

PO Box 156, Archerfield Q 4108

Seafood Businesses

Name		Business	Street Address	Locale		
Graeme	Hopkirk	A Fine Kettle o' Fish	Shed 4, Cnr Palmer and Toohey Sts	Portsmith	QLD	4870
Stefan	Diacos	A Raptis & Sons Pty Ltd	90 Colmslie Road	Colmslie Brisbane	QLD	4170
Leith	Harte	A Raptis & Sons Pty Ltd	90 Colmslie Road	Colmslie Brisbane	QLD	4170
		Bowen Fishermans Seafood Company P ty Ltd	Harbour	Bowen	QLD	4805
Luc's	Seafood	Brisbane Fisherman's Co.	101 Riverside Pl	Morningside	QLD	4170
Paul	Richards	Cardinal Seafoods Pty Ltd	93 Prosperity Pl	Geebung	QLD	4034
		Coral Sea Fishing	PO Box 197	Buddina	QLD	4575
		De Brett Seafood Ltd	21 Parkyn Pde	Mooloolaba	QLD	4557
Debbie	Ahern	Debbie's Seafood	24 David Muir Street	Slade Point	QLD	4740
		Fishmac Pty Ltd	15e Quay St	East Bundaberg	QLD	4670
		Horizon Seafood Pty Ltd	47 Tingira St	Portsmith	QLD	4870
		Independent Seafood Producers	1 Brant Close	Manoora	QLD	4870
		Innisfail Fish Depot	Fitzgerald Esp	Innisfail	QLD	4860
		Mackay Reef Fish Supplies Pty Ltd	2 River St	Mackay	QLD	4740
Nick	Moore	Gold Coast Marine Aquaculture	148 Marks Road	Woongoolba	QLD	4207
		Mooloolah Fisheries	PO Box 745	Mooloolaba	QLD	4557
Chris	Bourke	Moreton Bay Seafoods Pty Ltd	7 Snook St	Clontarf	QLD	4019
Rick	Morgan	Morgans Seafood	Po Box 519	Redcliffe	QLD	4020
Andre	Gorissen	Noosa Junction Seafoods	15 Warragah Parade	Yaroomba	QLD	4573

David	Caracciolo	NT Fish Pty Ltd	2 River St	McKay	QLD	4740
Paul	Beckett	Pantacchinis Seafood Wholesaler	10 Mac Peak Crescent	Smithfield	QLD	4878
		Rosslyn Bay Fishermen's	PO BOX 876,	Yeppoon	QLD	4703
Kristina	Georges	Samie's Girl	PO BOX 1255	Eagle Farm	QLD	4009
		Scarborough Trawler Fishing Co Pty Ltd	Bird of Passage Pde	Scarborough	QLD	4020
		Seafresh Australia Pty Ltd	7-9 Liberty St	Portsmith	QLD	4870
		Supafin Seafoods	21 Henricks Street	Hemmant	QLD	4174
Carol	Brown	Urangan Fisheries	Po Box 7146	Urangan	QLD	4655
		Supafin Seafoods	21 Henricks Street	Hemmant	QLD	4174
		A&T Trading Co	P.O box 3337	Wareemba	NSW	2046
		Ballina Fishermen's Co-op	Cnr Pacific Highway and Keppel Street	Ballina	NSW	2478
		Baview Seafood Pty Ltd	20 Mahogany Crescent	Taree	NSW	2430
		Bermagui Fishermen's Co-operative	P.O.Box 47	Bermagui	NSW	2546
Sam	Gordon	Blue Harvest	PO Box 195	Braidwood	NSW	2622
		Christie's Seafoods Pty Ltd	Sydney Fish Markets	Pyrmont	NSW	2009
		Claudio's Quality Seafood	Shop 29, Sydney Fish Market	Pyrmont	NSW	2009
Brett	Schofield	Clarence River Fishermen's Co-Operative Ltd	51-55 River Street	Maclean	NSW	2463
		Commercial Fishermen's Co-operative Ltd	PO Box 142	Wickham	NSW	2293
Shane	Geary	Coffs Harbour Fishermen's Co-Op	69 Marina Drive	Coffs Harbour	NSW	2450

George	Costi	De Costi Seafoods (Holdings) Pty, Limited	Head Office: 29 Bachell Avenue	Lidcombe	NSW	2141
Anthony	Mercer	De Costi Seafoods (Holdings) Pty. Limited	Head Office: 29 Bachell Avenue	Lidcombe	NSW	2141
		Doyles Seafood Market & Liquor	Sydney Fish Markets	Pyrmont	NSW	2009
		Felans Fisheries Sydney Fish Markets	Gipps St	Pyrmont	NSW	2009
		Fishermens's Wharf Seafoods	PO BOX 209	Nelson Bay	NSW	2315
		Hastings River Fishermans Co-op	Celararetinvcee St	Port Macquarie	NSW	2444
Jules	Crocker	JOTO Fresh Fish	PO Box 15	St Peters	NSW	2044
		Laurieton Fishermen's Co-Op Ltd	Mill St	Laurieton	NSW	2443
		Musumeci Seafoods	The Sydney Fish Markets, Bank St	Pyrmont	NSW	2009
		Northern Rivers Seafoods	Pacific Hwy	Ballina	NSW	2478
		Peters Fish Markets	Sydney Fish Markets Banks St	Pyrmont	NSW	2009
Jason	Rengger	Petuna Ocean Trout	Suite 3, Level 1, 19 Harris Street	Pyrmont	NSW	2009
		Poulos Bros Seafoods Pty Ltd	21- 29 Bank St	Pyrmont	NSW	8411
Stephen	Buckless	Southland Fish Supplies Pty Ltd	PO Box 558	Eden	NSW	2551
		Taree Fishermen's Co-Op Society Ltd	4 Pitt St	Chatham	NSW	2430
		Ulladulla Fishermens Co-Op Society	Latsdon St	Ulladulla	NSW	2539
		Wallis Lake Fishermen's Co-Op Ltd	1 Ray Street	Tuncurry	NSW	2428

		Wollongong Fishermen's Co-op Ltd	Belmore Basin	Wollongong	NSW	2500
Andrew	Averkos	Woolworths	PO Box 8000	Baulkham Hills	NSW	2153
Mark	Boulter	Sydney Fish Market Pty Ltd	Locked Bag 247	Pyrmont	NSW	2009
Gus	Doonan	Sydney Fish Market Pty Ltd	Locked Bag 247	Pyrmont	NSW	2009
		Apollo Bay Fishermen's Co-operative	Trafalgar Street	Apollo Bay	VIC	3233
		Lakes Entrance Fisherman's Co-operative	PO Box 1125	Lakes Entrance	VIC	3909
Steven	Mantzaris	Mantzaris	44-54 Cono Quay Fid	North Geelong	VIC	3215
		M&C Seafoods	1-3 Reserve Street	Preston	VIC	3072
		McLaughlin Consolidated Fishermen Ltd	133 Kensington Road	West Melbourne	VIC	3003
		Red Coral Seafoods	20 Michellan Crt	Bayswater	VIC	3153
		San Remo Fishermen's Co-operative	190 Marine Parade	San Remo	VIC	3925
Johnathon	Davey	Seafood Industry Victoria	133 Kensington Road	West Melbourne	VIC	3003
William	Mure	Mures Fish Centre	Mures Fishing P/L, Victoria Dock	Hobart	TAS	7000
Barry	Charles	Stanley Fish	3-5 Wharf Road	Stanley	TAS	7331
Trudi	Beveridge	Petuna Seafoods and Gourmet Pantry	134 Tarleton St	East Devonport	TAS	7310
Executive	Officer	Tasmanian Seafood Industry Council	P.O Box 878	Sandy Bay	TAS	7006
		Adelaide Fish Processors Pty	54 - 58 London Rd	Mile End	SA	5031

		Ltd				
Michael	Angelakis	Angelakis Bros. Ocean Catch	30 Field Street	Adelaide	SA	5000
Margaret	Young	Angelakis Brothers Ocean Catch	30 Field Street	Adelaide	SA	5000
		Cappo Seafood	16 Glen Osmond road	Parkside	SA	5063
Trent	D'Anitgnana	Clean Seas	P0 Box 159, 7 North Quay Boulevard	Port Lincoln	SA	5606
Spiro	Markantonakis	Dover Fisheries Pty. Ltd.	23 Wilson Street	ROYAL PARK	SA	5014
		The Fish Factory	Beach Rd	Beachport	SA	5280
		S.A. Smoked Seafood Company	54- 58 London Rd	MILE END	SA	5031
Rick	Mezic	SA Prawn Cooperative Ltd	SAFCOL Central Fish Market Building, 54-58 London Road	Mile End	SA	5031
		Samtass Bros Seafoods	201- 203 Richmond Rd	Richmond	SA	5033
Alison	Turnbull	SARDI	Plant Research Centre, GPO Box 397	Adelaide	SA	5001
Simon	Clark	Spencer Gulf & West Coast Prawn Fishermen's Association	PO Box 8	Port Lincoln	SA	5606
		Thevenard Fish Processors Pty Ltd	303 Bergmann Drive	Thevenard	SA	5690
William	Ferguson	Fergusons Australia	16 Circuit Drive	Hendon	SA	5014
Dylan	Skinns	Austral Fisheries Pty Ltd	PO Box 42	Hawthorn	WA	6915
Simon	Little	Australia Bay Seafoods	PO Box 780	South Fremantle	WA	6720
Graeme	Stewart	Australian Council of Prawn Fisheries Limited	PO Box 393	Floreat	WA	6014
Garry	Bevan	Bevans (WA) Pty Ltd	104 John Street	Albany	WA	6330

		Bremer Fish Processors Pty Ltd	11 Anderson Pl	Albany	WA	6330
Paul	Catalano	Catalano Seafoods	301 Collier Rd	Bassendean	WA	6054
Richard	Buczak	Central Seafoods	Unit 3 / 1 Townsend Street	Malaga	WA	6090
		Didyabringabeer Fish Processors	Garden Rd	Esperance	WA	6450
		Esperance Fish Processors	Lot 1 Bandy Ck	Esperance	WA	6450
Brett	Hogan	Focus Fisheries	2 / 146 Carrington St	O'Connor	WA	6163
		Geraldton Fishermen's Co-operative Ltd.	Ocean Street	Geraldton	WA	6530
Tony	Abbott	Kailis Bros Pty Ltd	23 Catalano Rd	Canning Vale	WA	6155
Theo	Kailis	Kailis Bros Fish Markets and Café	101 Oxford Street	Leederville	WA	6007
Clayton	Nelson	MG Kailis Pty Ltd	50 Mews Road	Fremantle	WA	6160
		Nor West Seafoods	12 Mews Road	Freemantle	WA	6160
Louis	Lynch	Seafresh Fish Market	Shop 1A, 388 Scarborough Beach Rd	Innaloo	WA	6018
		Shark Bay Fish Factory	Dampier Rd	Denham	WA	6537
		WA Fish Processing	Unit 9 12 Parkinson Lane	Kardinya	WA	6163
Bean	Goh	Australia Bay Seafoods	PO Box 780	South Fremantle	WA	6720
Drew	Martin	Sealanes	178 Marine Terrace	South Freemantle	WA	6162
Steve	Lodge	Geraldton Fish Market	365 Marine Terrace	Geraldton	WA	6530
John	Sharland	Endeavour Foods	12 Emplacement Crescent	Hamilton Hill	WA	6163
Mr	Glauert	Festival Fish	13 Hunt Street	Malaga	WA	6090
Alex	Ogg	WAFIC	Level 1, 56 Marine Terrace	Freemantle	WA	6160
Rick	Indrisie	Select Seafoods	96 Burswood road	Victoria Park	WA	6100
Carlo	Todaro	Direct Seafoods	16 / 378 South St(cnr Stock road)	O'Connor	WA	6163

Allan	**Miles**	**Selim Processors**	**1141 Caves Road**	**Quindalup**	**WA**	**6281**
		Austop Fisheries	**Unit 8 / 30 Frances Bay Drive**	**Darwin**	**NT**	**0800**
Carmel	**McCaskill-Ball**	**Darwin Fishmarket**	**Francis Bay Drive, Fishermans Wharf**	**Darwin**	**NT**	**0800**
		Mr Barra	**Shop 20, Fishermen's Wharf**	**Frances Bay**	**NT**	**0800**
		Neptune's Warehouse	**1 / 7 Cato Street**	**Winnellie**	**NT**	**0820**
Katherine	**Winchester**	**Northern Territory Seafood Council**	**GPO Box 618**	**Darwin**	**NT**	**0800**
Dr. Patrick	**Hone**	**Fisheries Research and Development Corporation**	**PO Box 222**	**Deakin**	**ACT**	**2600**
Jenny	**Jones**	**Ocean Fresh Seafoods**	**Shop 1/12 Dalby St**	**Fyshwick**	**ACT**	**2609**
Retailers Network - 3rd SYDNEY Feb 2015						
Chloe, Brett	**Bauer**	**Bowen Fishermans Seafood**			**QLD**	
Craig	**McCathie**	**The Fresh Fish Place**			**SA**	
Sandy	**Harder**	**The Fresh Fish Place**			**SA**	
Dimitri	**Hari**	**Trans Tasman Fisheries**			**NSW**	
Emily	**Mantilla**	**Australian Seafood CRC**			**SA**	
Jayne	**Gallagher**	**Australian Seafood CRC**			**QLD**	

Jenny	**Jones**	**Ocean Fresh**			**ACT**	
Joanne	**Howarth**	**Fishermens Wharf Seafoods**			**NSW**	
lauren	**O'Flynn**	**Fishermens Wharf Seafoods**			**NSW**	
Felicity	**Denham**	**Curtin University**			**WA**	
Kathy	**Harriman**	**Seafood King**			**QLD**	
Mathew	**Harriman**	**Seafood King**			**QLD**	
Keith	**Dever**	**Samies Girl Seafood**			**QLD**	
John	**Crowley**	**Samies Girl Seafood**			**QLD**	
Kristy Keeley	**Fishermens Wharf Seafoods**				**NSW**	
Maria		**Malekou**	**SeaFresh Tuggerah**		**NSW**	
Samantha	**Burns**	**SeaFresh Tuggerah**			**NSW**	
Leah	**Ewings**	**SeaFresh Tuggerah**			**NSW**	
Miles	**Toomey**	**2Me Solutions**			**NSW**	
Peter	**Horvat**	**Fisheries Research & Development Corporation**			**ACT**	
Rhiannon	**Humphris**	**Gladstone Fish Market**			**QLD**	
Ramon	**Humphris**	**Gladstone Fish Market**			**QLD**	
Sharen	**Cartwright**	**Inland Seafoods**			**SA**	
Ian	**Cartwright**	**Inland Seafoods**			**SA**	
Stephanie	**Callagher**	**Seafood on George**			**VIC**	
Nick	**Tate**	**Seafood on George**			**VIC**	
Sue	**Poole**	**Dept of Agriculture and Fisheries**			**QLD**	
Sylvia	**Gale**	**Bremer Fish**			**WA**	
Tim	**Russell-Jarvie**	**Bayside**			**TAS**	
Tracey	**Martin**	**Petuna Seafoods**			**TAS**	
Trudi	**Beveridge**	**Petuna Seafoods**			**TAS**	