Discussion Paper on Seafood Traceability

Fisheries Research and Development Corporation

Project 2020-093

Seafood is one of the most traded food commodities in the world (Reilly, 2018) and has a complex supply chain not just domestically, but globally with further pressures due to COVID-19 impacts. As such, traceability can be a minefield to navigate, but is necessary to build customer and end consumer trust while protecting your brand.

A 'traceable' seafood product can be tracked throughout its entire lifecycle from where it was first caught or farmed through to the end customer, including all transformations that the product undergoes throughout the process. Within Australia, Food Standards Australia and New Zealand (FSANZ), the regulatory body, requires a 'one up and one down' approach of tracing food products. 'One up' is where the business sold its outward goods to (a customer), and 'one down' is where the inward goods came from (a supplier). Internationally, there has been a shift in this approach towards 'end-to-end' supply chain traceability, with some calling it 'bait to plate'.

Traceability has become a fundamental part of Australian Government policy, with the newly published National Agricultural Innovation Policy Statement October 2021 (DAWE, 2021) detailing four priority focus areas. In particular, priorities one, three and four focus on building world-class traceability systems that provide confidence and assurance of Australian product(s) sold from catch/farm through to the end consumer both domestically and internationally.

This discussion paper defines traceability; explains why it is important; identifies barriers to adoption; documents laws, standards and guidelines; describes traceability element, systems and technologies; and suggests recommended actions and associated risks going forward. This paper is a living document that attempts to capture the complex and dynamic traceability environment. It will be used as a first version working document, with further updates every 12-18 months.

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Document Version 1: Final Report 12 November 2021
(*FRDC Project 2020-093: Discussion Papers on seafood traceability and labelling (Part A: Traceability*)

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ABBREVIATIONS & ACRONYMS

AA	Approved Arrangements
ACCC	Australian Competition & Consumer Commission
AGIFT	Australian Guide to Implementation Food Traceability
ASC	Aquaculture Stewardship Council
ASQAP	Australian Shellfish Quality Assurance Program
CoC	Chain of Custody
Codex	Codex Alimentarius
CoOL	Country of Origin Labelling
CTEs	Critical Tracking Events
DAWE	Department of Agriculture, Water and Environment
FAO	Food and Agriculture Organisation of the United Nations
FDA	Food and Drug Administration
FRDC	Fisheries Research and Development Corporation
FSANZ	Food Standards Australia and New Zealand
GHP	Good Hygiene Practices
GMP	Good Manufacturing Practices
HACCP	Hazard Analysis Critical Control Point
ISO	International Organisation for Standardisation
IUU	Illegal, Unreported and Unregulated
KDEs	Key Data Elements
MSC	Marine Stewardship Council
OECD	Organisation for Economic Co-Operation and Development
QA	Quality Assurance
ROI	Return on Investment
SME	Small-Medium Enterprises
SQF	Safe Quality Food Institute
SSA	Seafood Services Australia
TACCP	Threat Assessment Critical Control Point
VACCP	Vulnerability Assessment Critical Control Point
WA DPIRD	Western Australian Department of Primary Industries and Regional Development
WWF	World Wide Fund for Nature

1 BACKGROUND TO TRACEABILITY

"Seafood is one of the most traded food commodities in the world" (Reilly, 2018) and has a complex supply chain not just domestically, but globally with further pressure due to COVID-19 impacts. With multiple touch points and changes in product format, between landing of wild caught or harvesting farmed fish through to the end consumer, now more than ever, consumers and trading partners want to know exactly what they are buying (Department of Agriculture, 2019).

Traceability dates back to the 1930's, due to a need of verifying the origin of high-quality products (e.g. French champagne) (BSR, 2014) and further developed from food safety concerns and regulations (Hardt, 2016; Pahl, 2018). Typically, a traceability system, program or process has focussed on what is called 'one up and one down'. 'One down' is where did the inward goods come from (a supplier), and 'one up' is where the business sold its outward goods to (a customer) – noting the business can be at any position in the supply chain (FSANZ, 2017; Hardt, 2016).

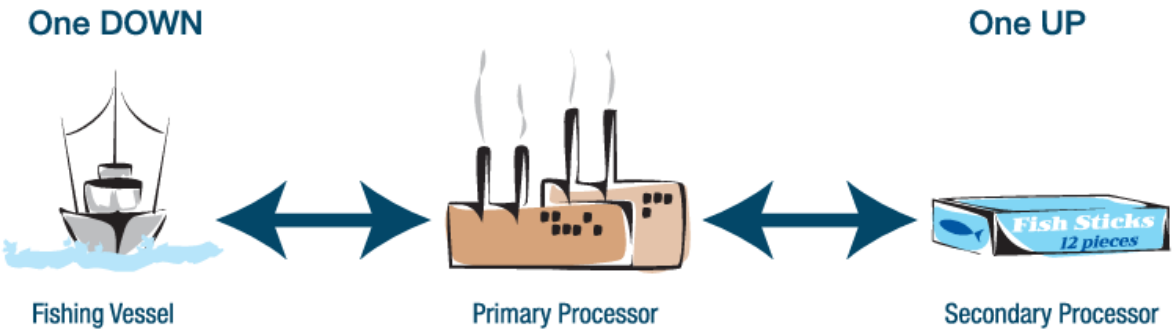


Figure 1. An example of the one up one down methodology[1]

The one up and one down methodology is fast becoming insufficient. There is a growing expectation for businesses to have full supply chain traceability, also known as end-to-end traceability, which is starting to be realised through a variety of third-party certification requirements.

With the evolution of the food ecosystem, there are greater risks where traceability can accidently or deliberately go wrong. An example of not utilising an end-to-end traceability system, and a deliberate act of food fraud to gain profit, was the UK horse meat scandal, where horse meat was substituted for beef in beef lasagne. Without an end-to-end supply chain review (e.g., documentation, records, DNA product testing results, technology data captured etc), it was challenging to verify there was an issue, as the incoming paperwork stated the ingredient was beef.

Now with the recent publication of the National Agricultural Innovation Policy Statement October 2021, there is a focus to deliver the following traceability elements outlined in priority one, three and four:

- Priority 1 – value chain area of processing:
  Adopting technologies and assurance systems (including traceability systems) to produce healthier and safer agrifood products and capture value from our international reputation.
- Priority 3 – value chain area of processing:
  World class traceability and quality assurance systems that underpin confidence in the safety of Australian products while ensuring any biosecurity risks can effectively be traced and managed.
- Priority 3 – value chain area of consumer:
  Monitoring, assurance and traceability systems provide confidence to domestic and international consumers, and increase responsiveness of the system to changing consumer demands.
- Priority 4 – value chain area of processing, distribution, export and retail, and consumer:

[1] *Source: Magera, & Beaton, 2009.*

Traceability assurance across the supply chain, from farm-gate to consumer. Demonstrating product assurance and characteristics in line with purchaser and consumer values such as sustainable, clean, provenance.

(DAWE, 2021)

2 WHAT IS TRACEABILITY

For the fishing and aquaculture community, using the 'one up and one down' traceability is fairly straight forward, however, end to end traceability is generally complex. There are few companies in Australia that are vertically integrated from vessel or farm through to the retailer or food service, whilst maintaining control over their traceability systems along the full supply chain (e.g. Austral Fisheries, A Raptis and Sons Pty Ltd (Raptis)). Even a business that is vertically integrated, they are still reliant on external logistical support, especially for exporting. A majority of businesses that sell their harvested or wild caught fish have multiple touch points throughout the supply chain and the complexity of traceability control can become increasingly difficult (Figure 2).

Figure 2. A simplified supply chain that brings product to the end consumer.[2]

To add to this, traceability can be a confusing area. There is no consensus for the definition of traceability and in some cases, there are conflicting definitions (Olsen & Borit, 2013). Also, our understanding of the traceability definition(s) and how it is applied in real world situations, can potentially change the meaning for an individual (Future of Fish, 2016).

[2] Boyle, 2012.

As the regulator, FSANZ sets the Australian national standard, against which all food businesses must comply. The FSANZ (2017) traceability definition is:

"Traceability is the ability to track any food through all stages of production, processing and distribution (including importation and at retail)."

Traceability should be traced one step backwards and one step forward at any point in the supply chain. For food processing businesses, traceability should extend to being able to identify the source of all food inputs such as (FSANZ, 2017):

- Raw materials,
- Additives,
- Other ingredients, and
- Packaging.

For World Wild Fund for Nature (WWF) Australia via the 'Australian Seafood Traceability Statement' launched in 2017, defines "A 'traceable' seafood product is one that can be tracked back through the supply chain to its source, be that a fishery or aquaculture operation, including all transformation of that product" (Knuckey *et al.,* 2017).

Looking at an international standard level, compared with FSANZ, International Organisation for Standardisation (ISO) the ISO 12875:2011 Traceability of Finfish Products, has an inclusive definition of traceability of the "Ability to trace the history, application or location of that which is under consideration." Traceability relates to:

- The origin of materials and parts,
- The processing history, and
- The distribution and location of the product after delivery.

(ISO, 2011)

This ISO definition is closely aligned to other ISO standards including ISO 22005:2007 Traceability in the feed and food chain, and ISO 9000:2015 Quality Management Systems.

Codex Alimentarius Commission (Codex) Principles for traceability/product tracing as a tool within a food inspection and certification system (2006), employs a set of traceability principles, defining traceability/product tracing as "the ability to follow the movement of a food through specified stage(s) of production, processing and distribution."

Food and Agriculture Organisation of the United Nations (FAO), as part of their 2017 Food Traceability Guidance document, goes a step further than Codex and defines traceability as "the ability to discern, identify and follow the movement of a food or substance intended to be or expected to be incorporated into a food, through all stages of production, processing and distribution."

Other definitions of traceability from the literature include:

- "The ability to systematically identify a unit of production, track its location and describe any treatments or transformations at all stages of production, processing and distribution" (Archipelago Marine Research Limited, 2005).
- "The ability to access any or all information relating to that which is under consideration, throughout its entire lifecycle, by means of recorded identification" (Olsen & Borit, 2013).

The above are a small selection of traceability definitions, that are unavoidably broad due to the complex nature of traceability and the food ecosystems it is applied to (Magera & Beaton, 2009).

Traceability is enabled by the structure of a traceability system and can be split into two main categories (Figure 3):

1. Internal traceability: the ability to trace what happens within a business, and
2. External traceability: the ability to trace what happens outside of that business in any part of the supply chain.

(Borit & Olsen, 2016; Derrick & Dillon, 2004; FishWise, 2015; Magera & Beaton, 2009; Sterling *et al.,* 2015).

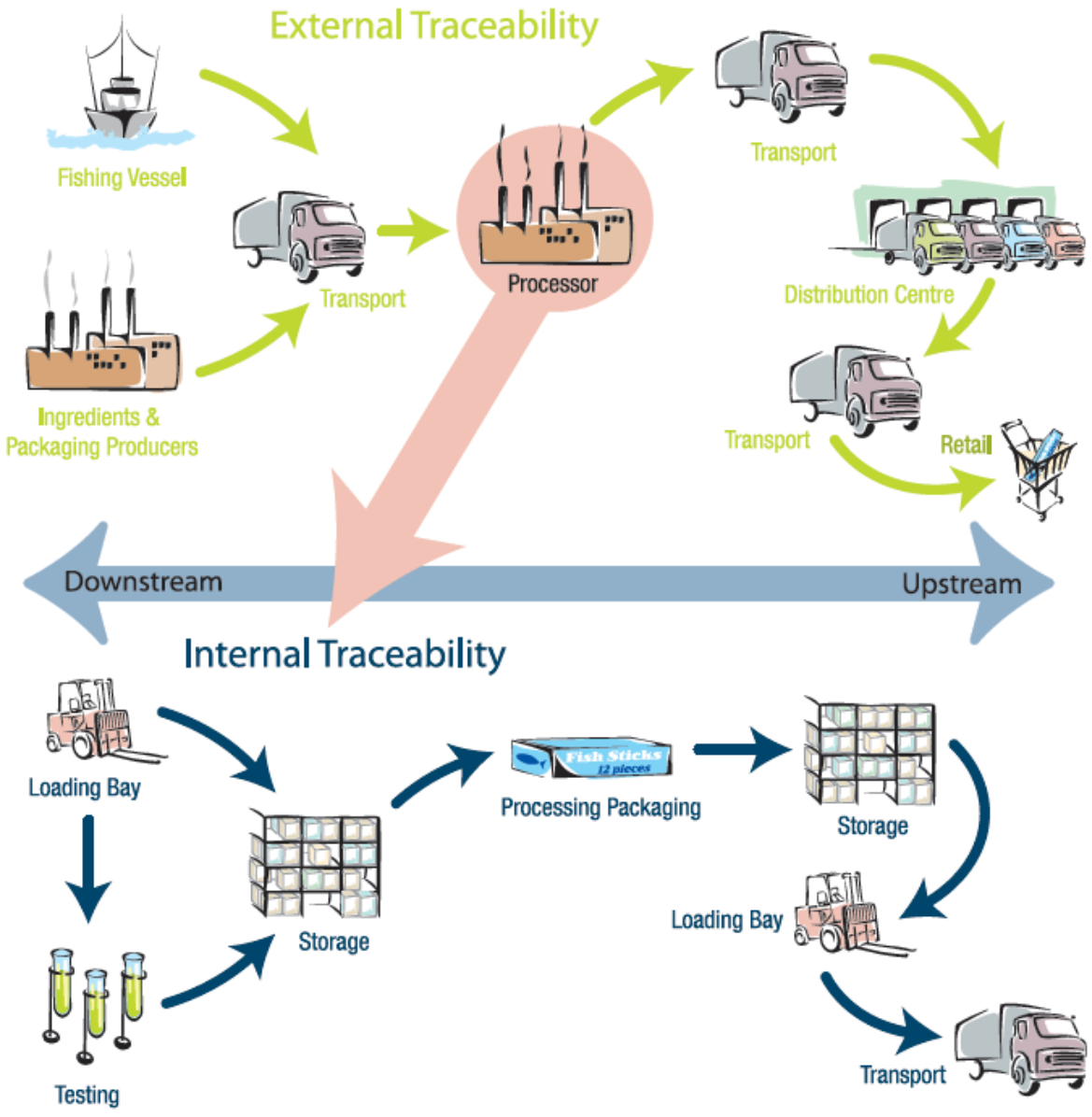


Figure 3. Internal and external traceability systems.[3]

[3] Magera & Beaton, 2009.

Traceability systems can be as simple as paper-based documentation and records, through to highly automated integrated technical system (Figure 4).

Manual paper-based records of the source, transformation, aggregation, destination, and other associated information related to seafood products for traceability purposes.	Computerised record keeping of the source, transformation, aggregation, destination, and other associated information related to seafood products for traceability purposes. Also includes web based storage solutions.	Integrated hardware (e.g. bar codes) implemented to capture the source, transformation, aggregation, destination, and other associated information related to seafood products for traceability purposes.

Figure 4. Levels of traceability systems[4].

The integrated part of the traceability system shown in Figure 4, now frequently includes interoperability, and is defined as "the ability of different information technology systems and software applications to communicate, exchange data, and use that information" (FishWise, 2015). Interoperability is increasingly significant as part of traceability technology. This matter is discussed latter in section 'Current Seafood Traceability Systems and Technologies'.

3 WHY TRACEABILITY IS IMPORTANT

Traceability has multiple facets, each to meet a different need or provide a different benefit depending on where its use is required in the supply chain (Hardt, 2016). The level of traceability within a supply chain is strongly associated with the resources available that can track and trace, which are the core components of an effective traceability system (Narsimhalu *et al*., 2015).

There are numerous reasons why businesses seek to utilise traceability, including:

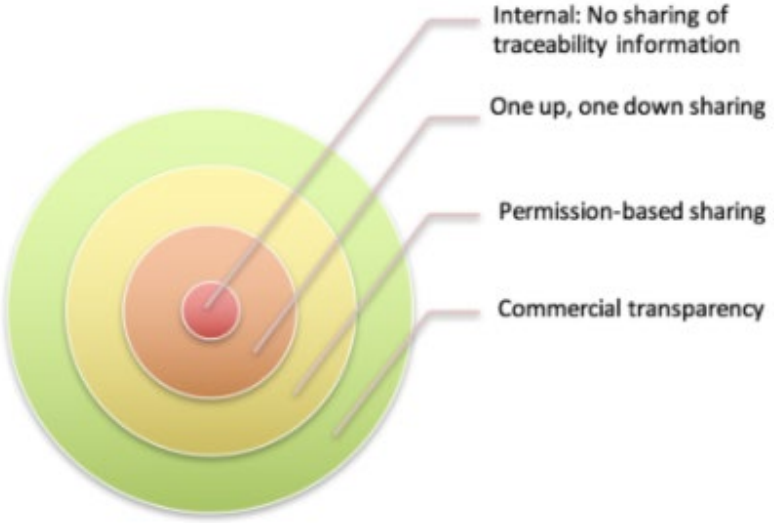
- Generally, mitigating business risks and corporate traceability,
- National and international importance to the "Australian" brand,
- Strengthening trading partnerships (both domestically and internationally),
- Concerns about human rights in supply chains,
- Regulatory compliance including 'due diligence' and 'truth in labelling,'
- Combatting illegal, unreported and unregulated (IUU) fishing,
- Preventing overfishing,
- Animal welfare practices,
- Biosecurity,
- Catch data (e.g. species caught, fishing area),
- Sustainability certification, including carbon footprint,
- Fishery improvement projects / other ecologically sustainable practices (if not using a certification),
- Export including export certificates and meeting importing country requirements,
- Better access to product information, that can also be in real time,
- Product auditing and certification,
- Vulnerability Assessment Critical Control Point (VACCP) and Threat Assessment Critical Control Point (TACCP),

[4] FishWise, 2015; Knuckey *et al.,* 2017; and Magera & Beaton, 2009.

- Supplier selection and supplier relationships for securing quality product supply including bait,
- Operation efficiencies and process consistency (e.g stock rotation: first in first out, GMP, GHP),
- Logistic management,
- Product claims (e.g. Species, standard fish name, country of origin labelling (CoOL), provenance, gluten free, good source of/high in omega 3),
- Food safety and quality assurance (QA) including mass balance, antibiotics, heavy metals, biotoxins, allergens etc,
- Product recalls / market withdrawals / public health trace -back,
- Consumer protection,
- Marketing and promotion,
- Meeting stakeholder / shareholder expectations and requirements, and
- Competitive advantage to be able to document any of the above.

(Borit & Olsen, 2016, BSR, 2014; Department of Agriculture, 2019; Department of Agriculture and Water Resources, 2018; FAO, 2017; Boyle, 2012; Hardt, 2016; and Knuckey *et al.,* 2017, Olsen & Borit, 2012).

Integral to the drivers for the use of traceability, is the level of transparency shared throughout the supply chain (Figure 5).



No sharing of information
Same as one up and one down traceability, but share the information
Agreement we businesses in the supply chain to share information
Agreement we businesses in the supply chain to share information

Figure 5. Continuum of Transparency for Traceability[5]

4 KEY BARRIERS FOR TRACEBILITY ADOPTION

Demand for improved traceability is challenging the way the industry shares information and data (including the Government). This will require investment and adoption of digital technology to stay relevant, with legislation updates to also support such changes (Department of Agriculture, 2019).

Businesses face two main groups that contribute to the barriers of traceability adoption:

1. Internal business barriers to adoption, including:
   - Lack of understanding of what traceability means and why it is important,
   - Lack of understanding that the whole supply chain should be traceable,
   - Data security concerns,
   - Lack of compelling evidence of return on investment (ROI),
   - Lack of trust among the industry,
   - Lack of willingness to share data openly within the sector or across other sectors,

[5] FishWise, 2015.

- The thought of losing a competitive edge,
- Outdated data, capture systems and management practices,
- How to trace work in progress products can be complex, especially when combining batch codes,
- Unsure how to streamline processes and create better efficiencies that can improve financial performance,
- Mid-supply chain black holes where incoming fish are grouped together or even have fraudulent paperwork pertaining to the species,
- Company culture
    - Doing bare minimum required,
    - Not a priority for the business,
- Information technology expertise required,
- Employee training requirements,
- Concerns on probable Government mandates differing to the investment already undertaken in traceability,
- Limited resource allocation,
- Cost of technology, especially on smaller companies,
- How to incorporate food service,
- Knowing what the minimum key data elements (KDEs) are,
- How to verify if the system is working,
- Applied inconsistently across the business, and
- Concerns with increased interaction with consumers and the repercussion on online platforms.

2. End-to-end supply chain barriers to adoption, including:
    - Information silos due to the lack of trust by industry to share,
    - Inconsistent data collected,
    - Complexity of the supply chain,
    - Industry fragmentation,
    - Lack of universal and consistent Standards,
    - Lack of interoperability,
    - Inconsistent global technology,
    - Timely review of policies to keep up-to-date with regulations, technology and industry best practice,
    - Inconsistent global language,
    - Who pays?
    - Lack of compelling evidence of ROI, and
    - Needing more than one technology to do end-to-end traceability.

(Borit & Olsen, 2016; Boyle, 2012; Future of Fish, 2014; Knuckey *et al.,* 2017).

5 CURRENT LEGAL TRACEABILITY REQUIREMENTS

Charlebois *et al*., (2014) assessed the comprehensiveness of traceability regulations for domestic and imported products for 21 Organisation for Economic Co-Operation and Development (OECD) countries. The following 11 countries are member of the European Union and were ranked as 'superior' (Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, Netherlands, Sweden and United Kingdom). In contrast, Australia along with Canada, Japan, New Zealand and the United States were ranked 'average', highlighting that Australia has an opportunity to further develop its legal requirement to align with international standards and guidelines.

The following summarises current legislative requirements for traceability in Australia.

5.1 Food Standards Australia and New Zealand

5.1.1 Labelling

Standard 1.2.1 Requirements to have labels or otherwise provide information - covers both retail and non-retail sales and in terms of traceability. There are at least three core labelling requirements including:

- Name of food,
- Lot identification, and
- Name and address of supplier.

Further information on labelling is provided in the "Discussion Paper on Seafood Labelling" (Colquhoun, 2021).

5.1.2 Country of Origin Labelling

Under the Australian Consumer Law, the CoOL legislation was introduced 1 July 2016 and became mandatory 1 July 2018 (FSANZ, 2017). The Australian Competition and Consumer Commission (ACCC) released a CoOL guide for business this year, to assist businesses comply with the requirements. The CoOL requirements apply to "the retail sale of food in Australia (e.g. food sold to the public in stores or markets, online or from vending machines), as well as packaged food sold by wholesalers. The Standard does not apply to non-food items, which includes pet food and other items not for human consumption" (ACCC, 2021). The foodservice industry was excluded from this labelling law, which is a limitation to the current legislation. In this situation, utilising traceability to confirm CoOL, especially with products that have multiple ingredients will support meeting the requirements.

5.1.3 Food Receipt Standard 3.2.2 section 5

- A food business must provide, to the reasonable satisfaction of an authorised officer upon request, the following information relating to food on the food premises:
  - the name and business address in Australia of the vendor, manufacturer or packer or, in the case of food imported into Australia, the name and business address in Australia of the importer, and
  - the prescribed name or, if there is no prescribed name, an appropriate designation of the food.

5.1.4 Product Recall 3.2.2 section 12

A food business engaged in the wholesale supply, manufacture or importation of food must:

- Have in place a system to ensure the recall of unsafe food,
- Set out this system in a written document and make this document available to an authorised officer upon request, and
- Comply with this system when recalling unsafe food.

This system should include records covering:

- Production records,
- What products are manufactured or supplied,
- Volume or quantity of products manufactured or supplied,
- Batch or lot identification (or other markings),
- Where products are distributed, and
- Any other relevant production records.

This information should be readily accessible, in order to know what, how much and from where product needs to be recalled (FSANZ, 2017).

5.1.5 Product Recall 3.2.2 section 11

In relation to 3.2.2 section 12 described above, all food that has been recalled is subject to 'food disposal', which involves:

A food business must ensure that food for disposal is held and kept separate until it is:

- Destroyed or otherwise used or disposed of so that it cannot be used for human consumption,
- Returned to its supplier,
- Further processed in a way that ensures its safety and suitability, or
- Ascertained to be safe and suitable.

'Food for disposal' means food that:

- Is subject to recall,
- Has been returned,
- Is not safe or suitable, or
- Is reasonably suspected of not being safe or suitable.

A food business must clearly identify any food that is held and kept separate in accordance with the above information, as returned food, recalled food, or food that is or may not be safe or suitable, as the case may be.

5.1.6 Seafood Tracing 4.2.1 section 11:

A seafood business must maintain sufficient written records to identify the immediate supplier and immediate recipient of seafood for the purposes of ensuring the safety of the seafood.

5.1.7 Bivalve Molluscs 4.2.1 section 16

As bivalve molluscs are generally ready-to-eat-products they fall into a high-risk category in terms of food safety and therefore, require additional requirements due to the level of risk. FSANZ refers to the Australian Shellfish Quality Assurance Program (ASQAP) Operations Manual, which can be found on the SafeFish website (https://www.safefish.com.au/reports/manuals-and-guidelines/the-australian-shellfish-quality-assurance-program-manual) and outlines further risk mitigation strategies and requirements.

5.2 Local Australian State and Territory Audits

Each State and Territory has its own standards and auditing requirements, to be able to produce food. These requirements can be inconsistent and not include any additional information than what is available from FSANZ. This can cause confusion when products across one or multiple State or Territory border(s) that have different requirements.

5.3 Import

All importers must comply with the Food Standards Australia and New Zealand Code. Compliance of imported food is under the jurisdiction of the Department of Agriculture, Water and Environment (DAWE).

5.4 Export (Approved Arrangements)

Export businesses must meet the legislative requirements (which includes the mandatory use of the Australian Fish Names Standard AS 5300) and be audited against the Approved Arrangements (AA) Standard. All export requirements are developed and managed with the DAWE.

In relation to AA and traceability, Section 12 of the AA Checklist is relevant (Figure 6).

Element	Act/Rules	Readiness	Comments / Considerations
12. Identification/Traceability			
The system in place at the establishment must be such that Production Records are kept enabling trace back to a lot of food & ingredients including: • A description of the food. • Quantity in the lot. • Unique lot identity. • Date of production. • Full details of all inputs (ingredients) • Trace back to the supplier of ingredients; and • Explanation of codes and ciphers used?	C5P1 S5-5 S-5		The auditor will check production records for completeness and where farm milk is received at the establishment, product must be able to be traced back to the tanker run/s used to produce the batch. Where re-work product is blended into a batch of product it must be traceable to its original batch. Ingredients must be traceable in both non reworked and reworked product
Recall			
The company must have a documented recall procedure in place.	C5P1 S5-5		The auditor will assess the recall procedure to ensure the following: • Responsibilities have been allocated for the various tasks. • Alternative delegations have been assigned. • Details of the recall procedure comply with the requirements of the FSANZ recall guidelines. • Procedure includes notification to key government agencies, including the State Regulatory Authority and The Department of Agriculture. • That the recall protocol is tested at least annually and that records are available to support activity. • Linked to corrective action, internal audit, and management review

Figure 6. Section 12 of AA Checklist[6]

The AA checklist also indirectly has traceability elements through approved suppliers, sourcing, ingredients and packaging requirements. Recently, the checklist has been updated and although it references dairy processing, it is to be utilised by all other exporting food sectors including the fishing and aquaculture industry.

5.5 Legislation Updates

Legislation updates generally occur as a result of a significant issue impacting the industry. For example, in 2002, the European Union's General Food Law arose due to uncontrolled outbreaks of disease suspected to be linked to food (e.g. foot-and-mouth disease). This Law (Regulation 178/2002, Article 18) states "The traceability of food, feed, food-producing animals, and any other substance intended to be, or expected to be, incorporated into a food or feed shall be established at all stages of production, processing and distribution" (Boyle, 2012; EU Legislation, 2021; Narsimhalu *et al.*, 2015).

[6] DAWE, 2021.

The U.S. Food and Drug Administration (FDA) in 2021 released proposed new rules relating to traceability of certain types of food as part of the campaign 'New Era of Smarter Food Safety'. This is the first step to implement new food traceability rules. The nuts and bolts of the proposed FDA rules is for those who manufacture, process, pack or hold foods on the 'FDA determined Food Traceability List'. This list contains mainly high-risk products or problematic foods (including melons, cheese, sprouts, seafood, ready-to eat salads etc.), and has been established to maintain records containing KDEs associated with different CTE (U.S. FDA, 2021). The proposed requirements would only apply to those foods on the FDA Food Traceability List, although the rules were designed to be suitable for all FDA-regulated food products.

6 STANDARDS AND GUIDELINES ON SEAFOOD TRACEABILITY

In line with global trends, the development and implementation of strategies and grants to progress traceability for Australian industry have been delivering tangible results.

In November 2017, the DAWE funded the National Traceability Project (phase one), to assess the current state of Australia's agricultural traceability systems across most agricultural commodities, and to review global drivers for the future. The report found:

- The current Australian traceability systems meet the domestic needs and those of trading partners.
- There are differences in the sophistication of systems between various industries, mostly due to their varying food safety and biosecurity risk, and the market access requirements of trading partners.
- There is an opportunity to enhance traceability systems to ensure the seafood industry is prepared for any future changes in requirements, and also to provide exporters with a competitive advantage.

In October 2018, Phase two of the National Traceability Project commenced to develop the National Traceability Framework, and Industry Action Plan template for enhancing Australia's agricultural traceability systems and was completed in October 2019. The outputs of the second stage were:

- The National Traceability Framework, and
- An Industry Action Plan template to put the framework in place.

Further support in traceability is also described in the newly released National Agriculture Innovation Policy Statement (DAWE, 2021), as previously outlined in the background to traceability of this paper.

6.1 Australian National Traceability Framework

The National Traceability Framework is not a policy document, but rather a tool to guide the development of traceability systems and promote the Australian brand. "The framework sets out a common vision, principles for traceability systems, roles and responsibilities of industries, governments and other stakeholders, suggestions for developing an industry action plan to implement the framework, traceability objectives and measures of success. It is the result of extensive collaboration between Australian agricultural industries and the Australian Government" (Department of Agriculture, 2019). If this framework could translate to a 'shop floor' implementation for seafood traceability, it would develop a solid foundation for the industry.

6.2 Australian Guide to Implementation Food Traceability (AGIFT)

AGIFT (2021) provides a 'how to' for undertaking end-to end traceability for food products. The guide is generic, relevant to any size business, is standards based, can be used with existing traceability systems or new technology and is designed for interoperability. The document is quite large and has 12 modules covering the supply chain. It could potentially be overwhelming for an inexperienced user.

6.3 FRDC Australian Fish Names Standard AS 5300

"The Food Standards Code does not define names for fish" (FSANZ, 2017). FSANZ mentions the Fish Names Standard as a guidance document. With the Standard being voluntary, it is unable to be enforced and

therefore there is opportunity for mislabelling / fraud (whether accidental or intentional) to occur. There is one area, that technicality could be used as enforcement of name mislabelling / fraud and it falls under the general criteria of 'truth in labelling', that the label describes the product correctly.

Without consistent labelling of fish species, it is difficult to standardised catch information, product promotion, traceability transparency, product recalls and other QA and food safety requirements. Also, inconsistent naming creates confusion in the supply chain and for consumers on what the correct Standard name is (especially if crossing State and Territory borders).

6.4 Northern Territory

The Northern Territory (NT) has been leading the way when it comes to traceability and labelling in the food service seafood supply chain. Since 2008, the NT Government introduced regulations to "make it a requirement for all venues to identify imported seafood at the point of sale to the consumer" (NTSC, 2021), meaning foodservice businesses in the NT using imported seafood must labelled such seafood as 'imported'.

6.5 Sustainability

6.5.1 Marine Stewardship Council (MSC)

MSC has a Chain of Custody (CoC) certification process that ensures the seafood product the customer/consumer buys with the MSC ecolabel and/or trademark has been caught within a certified sustainable fishery and handled in a segregated way throughout the supply chain. This process is third party audited to the relevant standard to verify the business can effectively show the traceability of the products throughout their supply chains. Although the CoC criteria doesn't cover food safety, if does have an equivalent requirement for a recall process for non-conforming product. MSC in Australia is not as readily accepted compared to the UK or EU. MSC has an equivalent standard for aquaculture called ASC, which follows a similar process of CoC certification.

6.5.2 World Wide Fund for Nature (WWF)

WWF Australia commissioned a series of industry workshops, to develop and implement an 'Australian Seafood Traceability Statement: The Australian seafood industry commits to traceability systems that can reliably identify the species, where it came from and how it was produced'. This statement enables industry to voluntarily sign up and commit to the WWF traceability, as best practice for their business. The workshop findings in the final report by Knuckey *et al.,* (2017) are still relevant and potentially could be used as a national document.

6.6 Codex Alimentarius – General Principles of Food Hygiene

Codex Alimentarius – General Principles of Food Hygiene, also colloquially known as Codex HACCP (Hazard Analysis Critical Control Point), is commonly used for food safety and doesn't specifically cover traceability. Although the data collected as part of any HACCP system could assist a traceability system. The other option could be to utilise the HACCP framework to include traceability by including in the risk assessments.

Additionally, Codex has their own international list of fish names and what those fish are called in a variety of countries. It would be desirable that the Codex Australian fish name list aligned with the Australian Standard of Fish Names (AS 5300) to support continuity.

6.7 UN Guide to Traceability

Similar to the AGIFT, the aim of this guide is to provide information on traceability that is multi-functional across industries, locations, commodities for microbusinesses through to large multinationals. The guide is separated into three parts:

1. Global alignment on traceability ,
2. Traceability in practice, and
3. Practical guide for companies to pursue traceability.

(BSR, 2014)

6.8 FAO Food Traceability Guidance

FAO's Food Traceability Guidance document (2017), aims to "assist in the adoption of consistent business practice among all trading partners to effectively manage traceability for the food industry." Unlike the other food traceability documents, the FAO provides practical examples for seafood industry from fishing and processes through to import/export including forms and templates, that are ready to be used by industry.

6.9 Global Dialogue on Seafood Traceability (GDST)

GDST was launched in 2017 as an international organisation established "to advance a unified framework for interoperable seafood traceability practices" (GDST, 2016). To date, GDST published the standards and guidelines for interoperable seafood traceability systems in 2020 with a fully supported resources area on their website.

6.10 Global Food Traceability Centre (GFTC)

The Institute of Food Technologist (IFT) set up GFTC in 2017, as a resource hub on traceability to strengthen the performance of the agriculture and food industry. The GFTC produces work for the GDST, WWF and other relevant industry stakeholders.

6.11 GS1 Foundation for Fish, Seafood and Aquaculture Traceability Guideline

This GS1 guideline "has been developed to aid in the adoption of consistent business practices to effectively manage traceability for the seafood industry" (GS1, 2019). It discusses implementing traceability in fish, seafood and aquaculture supply chains using the GS1 standards for identification, data capture and data sharing. The guidelines also defines and identifies; traceable objects, key data elements (KDEs), critical tracking events (CTEs), how the data is used and in what format. Overall, this guideline closely aligns with the FAO Food Traceability Guidance document, though utilises the GS1 systems and process for the practical delivery method (implementation).

Recently, GS1 Australia was commissioned by Western Australian Department of Primary Industries and Regional Development (WA DPIRD) to better understand the business benefits and costs of enhanced supply chain traceability for Western Australian (WA) food producers. The final report will be available late 2021.

6.12 Threat Assessment Critical Control Point & Vulnerability Assessment Critical Control Point

TACCP is the threat of malicious tampering of products (food fraud), whilst VACCP, is the threat of malicious product tampering/intentional adulteration (food defence) (Food Fraud Advisors, 2021). TACCP and VACCP emerged in the 2010's and are built on a risk assessment framework to understand where the threats and vulnerabilities are within the supply chain for products produced by a business. Importantly, traceability provides the information on exactly where in the supply chain these weaknesses can occur. Additionally, VACCP and TACCP are progressively being included into third party certification standards (e.g. SQF, BRC Woolworths supplier excellence program, FSSC 22000, Yum QSA and QPSA, McDonalds SQMP, CFMSR).

7 TRACEABILITY SYSTEM ELEMENTS

A traceability system can be developed using any combination of paper-based, systems and processes, tools, technology, platforms etc. To get started, here are five key questions on what is involved with traceability:

1. What does traceability mean for my business and what does it include? (e.g. definition and scope),
2. What data do I need available for my traceability system? (including for compliance/certification),
3. Where and when in the process will I collect this information? (catch dates, harvest dates etc),
4. How will I collect, store, and use this information? (e.g. utilising paper-based or technology), and
5. How will I sustainably resource the traceability system? (e.g. time, effort, money).

Buchanan *et al.,* (2012) outlined this succinctly into four main traceability system elements:

- Traceability entity / traceable object - e.g. a product unit, trade unit, box, pallet,
- Unique identifier for the traceable entity - a unique identifier that differentiates the traceable entity for other traceable entities e.g. catch date, batch code, barcode, label, tag etc,
- Key Data Elements (KDEs) - the piece(s) of information recorded and stored as the product moves through the supply chain, and
- Critical Tracking Events (CTEs) - the step in the supply chain where the KDEs is to be collected, e.g. landing, processing, packing, logistics).

In addition to the four main elements above, there needs to be a blend of the types of data collected. What this means is, "there is a significant difference between having traceability (ability to access any or all information) and verifying the claims in a traceability system" (Olsen & Borit, 2013; Olsen, 2017). Traceability requires a combination of both analytical and data recording methodologies, as analytical methods can verify the system is functioning correctly by providing results on seafood DNA, geographic location / providence, food product testing etc. Although, analytical testing can't provide information on product data, e.g. batch number, business name, labelling or packaging issues. Consequently, "data recording methods can make analytical sampling more efficient by indicating where, when and who to sample" (Olsen, 2017).

7.1 Further Traceability System Considerations

A previous review completed by Food Innovation Partners and Allan Bremner & Associates (2007) discussed six essential elements of traceability, to ensure an integrated food supply chain traceability system. These elements were:

1. Product traceability define the physical location of a product at any stage in the supply chain,
2. Process traceability ascertains the type of activities that have affected the product during the growing and post-harvest operations (what, where and when),
3. Genetic traceability determines the genetic composition of the product and includes information on the type and origin (source, supplier),
4. Input traceability determines type and origin (source, supplier) of inputs, e.g. fertilizers, additives used for preservation or transformation of the raw materials into processed products,
5. Disease and pest traceability traces the epidemiology of microbiological hazards and pests, which may contaminate food products, and
6. Measurement traceability relates individual measurement results through calibrations to reference standards and assures the quality of measurements by observing various factors which may have impact on results (e.g. environmental factors, operator etc.).

Progressing into a digital data recording and integrated traceability world, the following should also be considered:

- What, where and how the information is recorded digitally,
- Ability to retain control of the business Key Data Elements (KDEs),
- Easy access to the information, including the exporting of data outside of the system utilised,
- Ability to grant others conditional access to KDEs,
- Analytical method to verify the data recording system,
- Maintaining integrity of the product tracking throughout the system,
- Can the system standardise / harmonise with other systems – the interoperability with other third-party technology solutions,
- Data mining tools for analysing and visualising the information to assist business performance,
- Mass balancing and yield calculations,
- Secure storage of data (e.g. encrypted / cloud based),
- Resources available to meet system requirements (costs, time, and staff),
- Expertise and training requirements,

- Interoperability requires standardised definitions and names including KDEs, CTEs,
- An option to trial the product before you buy, and
- If the technology / tool fails, what is plan B.

(Borit & Olsen, 2016; Future of the Fish, 2014; Olsen & Borit, 2013)

8 CURRENT SEAFOOD TRACEABILITY SYSTEMS AND TECHNOLOGIES

In terms of digital options for traceability, there are an infinite number of ways each technology can be utilised and integrated with each other and therefore are currently impossible to describe. Taking this into consideration, and the fact that methodologies have been previously discussed by Pahl (2018) and that the 'Traceability Chooser' tool (section 9.2) will soon be released, this discussion paper will not be covering an in-depth description.

This paper categorises the variety of traceability systems and technologies into two groups (1) data recording methods and (2) analytical methods based on Olsen (2017).

8.1 Types of data recorded

Below is a list of examples of where a business could be collecting traceability data (the KDEs):

- Business details,
- Fish vessel name and number,
- Catch area / harvest tank, pond, cage,
- Catch date / harvest date,
- Certified seafood (or not),
- Landing port,
- Goods received - date, raw material type, net weight, intact / undamaged, to business specifications,
- Product name,
- Scientific name,
- Batch code / lot number / business unique identifier,
- Product temperature (generally multiple points through the full supply chain),
- Processing date(s) / time,
- Raw material codes / batch information utilised to produce final product, includes ingredients and packaging,
- Amount of raw material used to create final product,
- Cook temperature and times,
- Time to chill / freeze product to correct temperature,
- Work in progress (WIP) code,
- Pack date / time,
- Product label checks,
- CoOL,
- Quality checks including size, grade, mortalities if live product, as per customer specification,
- Amount of finished product made for the day / batch / product run,
- Goods dispatched - Customer details, date, time, net weight,
- Risk assessment information,
- Customer complaints, and
- Corrective actions for non-conforming products.

8.2 Data recording methods

Data recording methods can include anything from paper-based, electronic-based, integrated and complete interoperability (Figure 4):

- Vessel monitoring system (VMS) – location data,
- Fishery logbooks – what was caught where, and how much,
- Forms / templated, e.g. for processing and packing,
- Barcodes and labels – e.g. GS1, QR codes,
- Serialisation,
- Tags (e.g. can be clipped onto or into the fish, tamper proof, nano tag),
- Radio-Frequency Identification (RFID),
- Dataloggers – Capturing data points including, time, temperature, location,
- Internet of Things (IoT), and
- Blockchain:
    - Open – all participants can read (collect and analyse) the data,
    - Closed – only select participants can read (collect and analyse) the data,
    - Public – system accessible to anyone to contribute to the data and can be open or closed, and
    - Private – system only accessible to specific parties who have been given access to contribute and can be open or closed.

8.3 Analytic methods

There are a multitude of analytical methods, with associated tools and instruments, that can be applied to measure specific physical and biochemical properties of a product (Borit & Olsen, 2016). Outlined below are some current analytical methods available:

- Sensory assessment – visual, taste, smell (can be human senses or capable technology),
- Product testing – shelf life, microbiological, allergen testing, chemicals etc,
- Elemental Analysis – geographic authenticity / provenance (expensive and is better suited for farmed fish or fish in particulate lakes. Not yet proved with commercial ocean catch), and
- DNA – speciation (currently not commercially available in Australia, but ingrained in the UK).

This area of traditional laboratory technology and methodology for analytical testing is progressing to on-site business environment with advancing digital systems.

8.4 Verification

Analytic methods verify that the traceability system is working by providing instantaneous measurements, whereas the data records provide the actual location in the supply chain where the system is not compliant. Another tool used for verification is mass balance, a core requirement to complete during a third-party audit. A mass balance calculates the raw materials entering the system and then leaving the system (e.g. product waste, finished product yields, rework etc). The limitation of mass balance is based on the correct information in the one up and one down process. If there is fraudulent documentation of receipt of goods into the business, it will not be able to demonstrate this (e.g. the EU / UK horse meat scandal, where the good inwards fraudulently stated beef, not horse).

9 SEAFOOD TRACEABILITY METHODS IN DEVELOPMENT

As technology is improving rapidly and becoming more innovative in what it can deliver, including reduced costings, there is continual flow of trials, pilot programs and case studies the industry will see. The following summarises an initial selection of traceability methods in development.

9.1 Traceability Grants Program

In 2019, the Australian Government Department of Agriculture, Water and the Environment announced the Traceability Grants Program. This Grants Program will run over a four-year period finishing in 2023. The objectives of the program are:

- Support industry projects that will enhance our agricultural supply chain traceability systems. This includes developing and trialling technologies that digitise information flow,
- Provide an advantage for our exporters in overseas markets that will assist them to maintain their competitive edge, and
- Increase opportunities to export Australian commodities.

Below is a list of currently funded traceability projects, with seafood related projects highlighted in blue:

ROUND 1 APPROVED PROJECTS		
Project title	**Summary**	**Lead recipient**
Enhancing horticultural supply chain traceability and digital promotion of Australian horticultural products in overseas markets.	The development of an operational cloud-based system with one management application and one end-user application focussed on the traceability of Australian fruit marketed to China.	University of Tasmania
Enable adoption of an end to end traceability system with a pilot focus on high risk horticulture in domestic and export markets.	A pilot of an end to end traceability system – tracing high-risk, horticultural products from paddock to plate using technology.	Freshchain Systems Pty Ltd
National pilot traceability project for plant industries	Engaging with the plant industry to prepare an inventory of the existing management of plant produce in supply chains. Conduct a desktop review of how other countries manage plant produce through supply chains, with the aim of identifying a system suitable for consideration by industry and government for adoption in Australia. Conduct a pilot plant industry traceability project.	Department of Primary Industries and Regional Development (previously Western Australian Agriculture Authority)
Review of traceability systems across the Australian wool and sheep industry supply chains.	The review and supply chain mapping of traceability systems across the Australian wool and sheep industry supply chains.	Wool Producers Australia Limited
On-the-ground traceability for the seafood supply chain using handheld x-ray fluorescence technology.	The development of a portable method for determining seafood provenance using a handheld X-ray fluorescence scanner, usable with minimal training.	Australian Nuclear Science and Technology Organisation
Improving international competitiveness of the Australian Table Grape export supply chain.	The trial of data logging technology to trace table grape shipments through the supply chain.	AND Fresh Pty Ltd
Oz Group Punnet and Tray Traceability Project	The installation of printing and labelling equipment that will enable products to be traced back to the farm level/growers.	OZ Group Co-op Limited
Traceability Systems Chooser	The development of an interactive decision support tool to assist agriculture, fishing and aquaculture producers identify what traceability system is the best fit for their business.	Honey & Fox Pty Ltd

Pilot study into the use of electronic Radio Frequency Identification Device (RFID) readers in small-stock processing	A pilot study into the use of electronic Radio Frequency Identification Device (RFID) across a number of sheep and goat processors.	Australian Meat Industry Council
Assessing commercial traceability solutions for their suitability and adoption along fresh produce export chains using melon industry as a pilot.	The trial of technology to trace fresh produce through export supply chains, with the melon industry used as a pilot.	Australian Melon Association Inc.
TruckTracker by Direct Livestock	The development of an App to enable real time tracking of animals from the farm to their destination, and providing access to information concerning those animals to entities within the supply chain who require it.	Direct Livestock Pty Ltd
Delivering quality assured Australian Honey Bee Products	The development of a strategy to characterise pure honey bee products for biological identification, develop a batch numbering system that aligns to current quality assurance processes, track, trace and inform the industry of anti-counterfeiting packaging strategies to assure customers of provenance.	B-QUAL Australia Pty Limited
To help fund a study to establish whether trace mineral/isotope analysis can reliably distinguish a cider made with 100% Australian grown apple and pear juice from a cider containing imported juice or juice concentrate.	A study to test whether the authenticity of cider made with Australian juice can be confirmed though a chemical 'finger print' (trace mineral/isotope analysis).	Cider Australia
Technology roadmap for automating export compliance for Australian Agrifood.	The integration of regulatory compliance into 3rd party digital tracing platforms.	Commonwealth Scientific and Industrial Research Organisation
Improving traceability in the Australian Egg industry through the provision of software tools and targeted extension.	Improving traceability in the Australian egg industry though the provision of software tools and extension materials (training and communications etc.) to improve the effectiveness of traceability.	Australian Eggs Limited
ROUND 2 APPROVED PROJECTS		
Project title	**Summary**	**Lead recipient**
Australian seafood traceability project	To develop and release a digital/physical experience that allows overseas consumers to verify provenance and authenticity for traceable Australian seafood products.	Seafood Industry Australia Limited
Tracebase DNA for timber	Development of a reliable database to collect, store, analyse, and classify data relating to timber DNA as a means of verifying type and origin of timber.	Interpredata Pty Ltd
Seed and Plant Traceability Platform and Framework	Creation of a traceability platform and framework for Australian seeds industry, including digitisation of certifications information.	Australian Seeds Authority Limited

Accelerate adoption of modern supply chain traceability solutions by vegetable producers of low, medium, and high-risk vegetable export crops	Supply chain mapping of fresh vegetable export crops to accelerate the adoption of modern supply chain traceability solutions across the vegetable industry.	Ausveg Ltd
Indigenous Certification and Bushfood Traceability and Provenance Project	This project will develop a framework combining two leading technologies in provenance and traceability within an auditable certification system for Indigenous native food producers.	Mamabulanjin Aboriginal Corporation
Robust Digital Technology for End-to-End Traceability in Australian Grain Export Supply Chain	This project will address this critical knowledge gap by studying and developing: 1) a trusted blockchain-based traceability technology, and 2) relevant food safety assessment techniques from physical visual and organic chemical traits.	Federation University Australia
Cross-sector Operational Biosecurity Risk Assessment (COBRA)	Development of a real-time, data driven approach to assessing biosecurity risk, the project will enable biosecurity data from across supply chains to be shared and analysed in new ways to improve our ability to detect and manage emerging risks sooner.	Exoflare Pty Ltd
Australian wine traceability - Isotopic fingerprinting to define provenance and authenticity	This project aims to develop a robust traceability tool to isotopically fingerprint Australian premium shiraz.	University of Melbourne
Macropod data harvesting application	Development of an app to record real-time harvesting data of macropods from point of origin to a processing facility and to allow for provenance and traceability to grow a robust international export market.	Western Game Processing Pty Ltd
Sensor-based livestock traceability	Development of a sensor-based livestock traceability system - linking emerging on-animal tracking technologies with meat quality and marketability outcomes.	Central Queensland University
Australian wool industry supply chain traceability	Implementation of a supply chain traceability system for the Australian wool industry benefiting information flow, logistics efficiencies, provenance, biosecurity, animal welfare & sustainability, adding value & improving the industry's competitive edge.	Australian Wool Exchange Limited
Dried fruits real time traceability system	Creating real-time traceability in the Australian dried fruits supply chain to improve export market Maximum Residue Limit compliance.	Dried Fruits Australia Inc.
Hide and leather traceability system	Installation of the hide and leather industry's first traceability system and sharing of IP across the industry	Australian Hide Skin & Leather Exporters' Association Inc.
LIVEXCollect electronic application	Development of a smart device application to replace the current computer-based mechanism and fully digitise livestock health and welfare data collection. This advancement would enable the introduction of further measurements and	Australian Livestock Export Corporation Ltd

	information with a stronger traceability, commercial and trade focus.	

Figure 7. DAWE traceability projects currently funded [7]

9.2 Traceability Chooser

As part of the Australian Traceability Grants Program, Honey and Fox have developed an interactive decision support tool to assist agriculture, fishing and aquaculture producers identify what traceability system is the best fit for their business and will be launched this year.

This decision tool considers the following:

- Business size,
- Level of business systems currently in place,
- Systems currently used,
- Reasons why a business wants to use traceability,
- The importance of the integration level for the business,
- The transparency and interaction level required for the consumer,
- Markets domestic and international,
- Digital capability level,
- Connectivity level (internet / Wi-Fi / satellite/ mobile coverage, as most technology requires a certain level of connectivity to function), and
- Time and resources available.

The decision tool generates a personalised report for the individual user that includes where you could start, based on your decisions and capability levels, with suggestions for future growth areas for traceability. There will also be a resource area that provides further information. The tool will be available at https://www.traceabilitychooser.com.au/.

9.3 Drones

Pilot programs are underway in Queensland and the ACT for drone food delivery. Although drones are regulated by the Civil Aviation Safety Authority (CASA), there is no clear requirements or standards within current food regulations or other guidelines, that cover this type of delivery method. Ubers and other similar food delivery businesses also fall into this same gap. Further information should be requested on how the products will be traced appropriately, but more importantly how is food safety managed?

AlphaBeta (2018) highlighted a number of benefits for using drone technology, including the positive impacts for local businesses, consumers, and the society. There is a lack of information on how drones form part of the supply chain, ensure food safety, how to audit, how to incorporate traceability and what happens when things go wrong. However, this is not unusual for new technology to have unknown information, although, part of the development and commercialisation stages should reflect and overcome such challenges before being released to the market. To note, Amazon has completed the 'one drone delivery project' and faced many set-backs due to poor planning and management.

With a slightly different view, an initial conversation between Deakin University and FRDC occurred, in terms of the wild catch sector and the potential use of drones to create efficiencies for product movement between vessels or vessels and the port. For example, some vessels have a number of 'steaming days' to get to and from the relevant catch areas and this time impacts the quality of product especially for fresh seafood. Hence, drone opportunities could include:

- fish transferred from vessel to land effectively and efficiently to allow vessels to continue fishing, and

[7] DAWE, 2021 (Traceability Grants Program).

- the replenishing of supply items (e.g. food) and spare parts, that are delivery straight to the vessel, without it requiring to dock.

This shows the benefits for the potential use of drones for the industry, however, it requires through research, testing and business planning to provide assurance and transparency there is no risk to the business, industry, customer and end consumer.

9.4 Australian AgriFood Data Exchange (OzAg Data)

"The Australian AgriFood Data Exchange will act as a trusted and secure interconnected data highway for the exchange of vital information between organisations and systems within the agriculture and agribusiness supply chain" (KPMG, 2021). This means having one platform for industry data to enable:

- The permissioned exchange of data between AgriFood industry participants,
- Timely access to information that supports decision making for the AgriFood value chain,
- Release management capacity,
- Standardisation and consistency of industry data assets,
- The capacity to adapt, incorporating new use cases for data exchange that deliver value and support resilience of AgriFood value chain participants, and
- Increased transparency of AgriFood industry data to support multiple use cases (e.g. regulatory compliance, collaboration between public and private data sets).

The OzAg data has received AUD $4 million funding from a consortium of AgriFood partners, where FRDC is a Tier 2 partner and on the advisory council to the steering committee. FRDC is leading a seafood case study in the segment of: Use Case 4 - supply and origin traceability for Rock Lobster and/or Prawn traceability.

Further information can be found here: https://www.integritysystems.com.au/ozdata

9.5 MasSpec Pen

The MasSpec Pen was originally developed as part of cancer research to easily find cancer cells during surgery. Gatmaitan *et al*., (2021) found an additional use for the technology and trialled the MasSpec Pen, as part of their study of rapid analysis and authentication of meat and fish. The pen is a hand-held device connected to a mass spectrometer (hence the name), creating a droplet of solvent at the end of the pen when touched to the sample. This starts the chemical analysis, taking approximately 15 seconds to determine if food fraud has occurred or not.

10 CASE STUDIES

Further case studies are outlined in Pahl (2018) and the yet to be published GS1 report (see section 6.11).

10.1 Northern Territory Tagging

The Northern Territory (NT) had challenges around black-market products (e.g. Jewfish swim bladders) and has subsequently implemented a tagging system to address the issue. The fishers buy the coded tags from NT fisheries and then tag the appropriate fish (or fish part) with the tag. This system is successful within the NT, but a limitation occurs when the at-risk product for potential sale on the black market, are transported outside of the NT. No other State or Territory recognises the tagging and would benefit from a national tagging system rather than a local one to close the gap.

10.2 Sydney Fish Market (SFM)

SFM are upgrading from the traditional in-person markets with auction floor quality staff checking products before they are sold, to a digital trading platform. This new system involves an innovative Blockchain-enabled Fish provenance And Quality Tracking (BeFAQT) trial system. It replicates what the buyer wants in terms of product attributes, and also the quality inspection checks.

BeFAQT brings together a number of different technologies to streamline the handling and QA checks of the products. The system is comprised of:

- Blockchain-enabled fisherman mobile app (catch origin and data including photos, videos etc, and this starts the blockchain),
- Smart tag temperature and location tracker (IoT sensing – supply chain tracking),
- Image processing (e-eye image recognition software – visual inspection),
- Electronic nose (e-nose freshness assessment – fish smell), and
- Online trading system (the platform).

(Food Agility, 2021)

BeFAQT is developed for both SFM suppliers and the buyers, with the suppliers adding data records (e.g. location of catch, pictures of the catch) with other QA data added at SFM (e.g. imaging and electronic nose results). This allows the buyer to 'see' what they are getting (like they are there physically checking the fish in person). The supplier can access the QA and other product data that can assist with any areas of improve to achieve a better market price.

This seafood tracking and traceability project was developed and launched by Food Agility CRC, SFM and the University of Technology Sydney and recently won the 2020 NSW iAward for Business Service Markets.

11 CURRENT RISKS

There are a number of key risks to consider when implementing traceability systems.

11.1 Business Level

- Lack of visibility on costs involved with traceability technology,
- The level of digital capability / skillsets of personnel to manage the traceability systems, and
- Resources required to develop, implement, and manage a traceability system, especially for SME where one person has multiple roles within a business.

11.2 Industry Level

- Security of the data and technology systems, and
- Lack of enforcement to verify traceability systems work.

12 RECOMMENDATIONS

The following actions are recommended for the Australian Seafood Industry based on the discussion paper findings.

Proposed Focus Areas		Who	Recommended Actions / RD&E
Policy / Government Impact	National and global alignment	SIA / FRDC / FNC / FSANZ / ACCC / DAWE / Local State & Territory Councils	• Support to deliver traceability priorities within the national Agriculture Innovation Policy Statement. • Stay informed and where possible, align with relevant global developments, • Review and modernise the current traceability definition. • Describe a minimum list of criteria that each traceability system must meet and a list of standardised traceability system and technology terminology. • Extension of current CoOL requirements to include food service. • Consider legislation of the Australian Fish Names Standard. • Explore the possibility of the Codex Australian fish name list aligned with the Australian Standard of Fish Names (AS 5300) to support continuity. • Traceability policy and implementation to address wider issues than food safety. • Engage directly with all States and Territories to create one national seafood traceability standard.
Trade Impact	Focused research	FRDC / DAWE / SIA / AgriFuture / DAF / RDCs / PIRSA and similar	• Engage and maintain open communication with traceability key stakeholders on all current and future traceability projects to maximise resources, share information, review current information available on traceability and highlight the relevant seafood industry research gaps and/or utilised currently available information. • Funded projects to focus on practical implementation at the business level. • Access to an Australian commercial DNA testing facilities.
Industry Awareness and Strategy	Shared area and resources where industry can find all traceability information	FRDC / SIA / Other Industry Associations / Business Campions	• One national platform to access all information and further links to other sites. • A simple, user-friendly best practice guide to assist industry. • Training modules. • Business level resources / templates that are easily implementable based on legislative requirements and best practice. • Communication to industry – one clear message on traceability and updates on traceability developments both nationally and globally.

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