

# **BOOSTING FISHER RETURNS THROUGH SMART VALUE-ADDING AND GREATER USE OF UNDERUTILISED SPECIES**

**FRDC PROJECT 2016/224**

Final Report

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Boosting fisher returns through smart value-adding and greater use of underutilised species  
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## Glossary and Abbreviations

ABARES	Australian Bureau of Agriculture and Resource Economics and Sciences
ABS	Australian Bureau of Statistics
AFMA	Australian Fisheries Management Authority
AUD	Australian dollar
CIF	Corner Inlet Fishery (Victoria)
CRFFF	Coral Reef Finfish Fishery (Queensland)
CTH	An abbreviation of Commonwealth, meaning Commonwealth Managed Fishery
ECIFFF	East Coast Inshore Finfish Fishery (Queensland)
ECOTF	East Coast Otter Trawl fishery (Queensland)
EGF	Estuary General Fishery (New South Wales)
FAO	Food and Agriculture Organisation, an agency of the United Nations
FOB	Free-on-Board product value, excluding the cost of any freight, insurance, etc
FTF	Finfish Trawl Fishery (Queensland)
FRDC	Fisheries Research and Development Corporation
GLBF	Gippsland Lakes Bait Fishery (Victoria)
GLF	Gippsland Lakes Fishery (Victoria)
GVP	Gross Value of Production of landed seafood species
IAP	NSW Gov't Independent Allocation Panel, reported on new quota settings in 2018 for Australian Sardines, Blue Mackerel, and Yellowtail Scad
IUU	Fishery activity that is Illegal, Unreported and or Unregulated
ITF	Inshore Trawl Fishery (Victoria)
MMT	Million metric tonnes
Nominal	Currency (AUD, USD, etc.) has not been adjusted for annual impact of inflation
NSWPFA	Professional Fisher's Association of NSW
OF	Ocean Fishery (Victoria)
OHF	Ocean Haul Fishery (New South Wales)
OPSF	Ocean Purse Seine Fishery (Victoria)
OTF	Ocean Trawl Fishery (New South Wales)
OTLF	Ocean Trap and Line Fishery (New South Wales)
PPBWPF	Port Phillip Bay and Western Port Bay Fishery (Victoria)
QDAFF	Qld Department of Agriculture Fisheries and Forestry
RRFFF	Rocky Reef Finfish Fishery (Queensland)
SBT	Southern Bluefin Tuna
SCRC	Seafood Cooperative Research Centre, supported by the FRDC and industry
SAFS	Status of Australian Fish Stocks Reports
SESSF	South East Scalefish and Shark Fishery. The two sectors of this fishery are - CTS Trawl Sector, and GABTS - Great Australian Bight Trawl Sector
SF	Scalefish Fishery (Tasmania)
SFM	Sydney Fish Market, Australia's largest urban East Coast seafood market
SPF	Small Pelagic Fishery (Commonwealth)
SSJF	Southern Squid Jig Fishery (Commonwealth)
TAC	Total Allowable Catch is a retained catch limit set for a fishery year or season. TAC is an output control for maximum harvest, set in tonnes or number of fish.
TACC	Total Allowable Commercial Catch
TAE	Total Allowable Effort
TPA	Tonnes per annum
UTS	University of Technology, Sydney
VRLF	Victorian Rock Lobster Fishery (Victoria)
YEJune	Year Ending June 30th

## EXECUTIVE SUMMARY

### Purpose and Design

This project was commissioned by the FRDC with advice from New South Wales Professional Fisher's Association (NSWPFA), and the Australian Fisheries Management Authority (AFMA).

The project seeks to boost the returns of commercial wildcatch fishers on Australia's East Coast, in two ways: (i) by increasing the legal harvest and use of underutilised species, and (ii) increasing fishers' margins and returns through selective value-adding.

Designed as a high-engagement primary research process, the project adopted an action learning approach to work with fishers and chain partners to document and demonstrate pathways to increased fisher returns from both sources wherever possible.

This report comprises five parts:

1. About the report,
2. The meaning of 'underutilised species' and relevant context,
3. Identification of project target underutilised species,
4. Results from consultation and analysis of options for each target species,
5. Conclusions and discussion regarding the potential for each target species to boost returns.

A small team from Ridge Partners, Brisbane has undertaken the project over four years from July 2016 to June 2020, with guidance from experienced Steering Committee members and Curtin University.

The NSWPFA, fishers, cooperatives, supply chain partners, Australian Fisheries Management Authority, and New South Wales and Tasmanian agencies contributed to the delivery of the project.

### Engagement and Analysis

From an initial list of 132 underutilised wild caught commercial species, the project identified eleven representative east coast Target Utilisation Species and related supply chain partners (domestic and export) as potential candidates for further, in depth investigations. These eleven representative species are currently harvested commercially in east coast Commonwealth and State waters.

The project team invested significant time early on to identify and engage fishers, cooperatives, wholesalers and related parties (24 meetings and workshops) for the eleven short-listed species. Private meetings established relevant facts, built understanding of today's activities and barriers, discussed what might be possible, and tested the boundaries of fisher and stakeholder motivation to invest in change.

Where requested by individual stakeholders, formal confidentiality agreements were established between the project team and the stakeholder. As a result, some details of financial investment outputs for some species are not fully described in this report.

In parallel for each Target Utilisation Species, the project undertook detailed desktop research and analyses to document the relevant fisheries, seafood attributes and market drivers, stock status, seasonality, harvest methods, total allowable catch, catch history, supply chains profiles, processing procedures, product formats, value-adding research and innovation, market prices and returns, export and import trade, drivers for underutilisation, opportunities for increased utilisation, and related issues. To do this the project team established an inhouse dataset for each species to collate and integrate available data into a logical supply chain flow map. This process revealed gaps in data

integrity and industry knowledge, resulting in guided assumptions being made where appropriate. This thorough documentation approach also revealed gaps in industry capacity and capabilities.

## Findings by Species

The project finds that all eleven Target Utilisation Species have potential for increased commercial utilisation. But these utilisation pathways are diverse, as is their commercial 'bankability' - from a compelling business case through to a severe lack of data that precludes assessment.

Three species (Royal Red Prawn, Australian Sardines, Gould's Squid - in Group A), were found to potentially offer substantial boosts to fisher returns from both volume and value gains. Commercial proponents for these first three species were engaged at length by the project team to develop trials that integrated a range of market leverage objectives.

The trial objectives included: (i) improving landed product quality, (ii) product development upgrades to access sashimi markets, (iii) transition from bait markets to consumer markets, and (iv) transition from bulk commodity seafood into consumer seafood products, packaging, presentation and promotion.

A further six species (Silver Trevally, Blue Mackerel, Yellowtail Scad, Luderick, Ocean Jacket, Sea Mullet - in Group B) offer attractive commercial returns from both volume and value gains. At the conclusion of the project, these species have failed to attract sufficient support from fisher-processor-investors to progress them to test volume and value opportunities in demonstration trials. For example, Silver Trevally offers substantial potential to boost fisher returns when harvested by Trap or Line methods (as opposed to currently being Trawled), but did not attract any commercial support to undertake a demonstration trial. These species need to overcome individual development barriers, such as, lack of infrastructure, poor harvest practice, inadequate management of supply chain quality, low consumer market awareness, immature development of value-added options, and low species acceptance.

A final two species (Ribbon Fish and Catfish/Cobbler - in Group C) have not been fully assessed for volume or value-adding potential by the project. The project analyses show that both species have access to increased utilisation and value enhancement, but lack solid data to tease out and verify their respective pathways to higher returns. There is insufficient data available from agencies, fishers, supply chain partners or market sources to adequately assess their existing commercial market outcomes or potential at higher rates of utilisation.

## Issues & Implications

Documenting underutilised species' attributes and value-added opportunities builds shared knowledge, but does not catch more fish. The fundamental fact is fishery stocks are 'underutilised' because there are a range of issues and commercial risks that diminish fishers commercial motivation to harvest. Lack of market awareness and therefore demand is a major barrier to increasing the harvest, profitably. If increased fishery utilisation was risk-free, profitable and easy, fisher-investors would already be doing it.

Using the 11 Target Utilisation Species as case studies, this report documents how these ranging issues, risks and implications impact east coast fishers' choices and motivation to invest time and financial capital in harvest and value-adding activity.

Nationally, wildcatch underutilisation is a clear trend. Around 75% (44 of 59) of wildcatch species tracked annually by ABARES suffered reduced harvest tonnage between July 2007 to June 2017. The average tonnage across these 44 species over the decade declined by a staggering 39%. These declines arise due to a number of factors, including declining margins, climate change, fishery adjustments, management rules, fisher career paths, etc. But it is critical to note that 13 of the 44 species found ways to boost landed prices that more than offset tonnage declines - their average nominal GVP gain was a massive 46%. These net gains arose from both harvest volume growth and market price increases. Clearly, despite the complexity of issues impacting wild catch utilisation, there



are winners and losers as the underutilisation transition unfolds. Increased utilisation requires a profitable alignment (for fishers and their chain partners) of these issues and related risks for each fishery.

An Independent Allocation Panel conducted a NSW Fishery Review as this project progressed. Some species are common to the Panel and the project. Some fishers of Target Underutilised Species were unwilling to consider related investment or demonstration trials until the Panel's final report was tabled, revised agency policy was rolled out, and commercial investment implications for fishers and processors were assessed and known. The final report of the panel was tabled in June 2018 and investments are now progressing.

Most Target Underutilised Species are stronger flavour fish (e.g. Sea Mullet, Blue Mackerel, Luderick, and Catfish) due to their biology and/or habitat (estuarine or marine). As a consequence, most retail or food-service seafood consumers are not attracted to these species in traditional product formats. These species typically require processing at landing to mitigate their adverse flavour and quality issues.

Regional fishery cooperatives perform a vital function to maintain the infrastructure (i.e. receipt, freezing, sorting, supply chain bulk building, payment, despatch to wholesalers) required to support small and family-based fisheries. Cooperatives are also bound to accept harvest product from fisher-members under very loose quality specifications. Existing cooperative policies and practices are major barriers to increased fishery utilisation. The universal cooperative policy of averaging landed prices by species, irrespective of quality, sends adverse market signals and quality disincentives to fishers. These existing price and quality disincentives are major barriers to boosting harvest quality. As noted by many independent reviews identified in the report, these policies foster low quality landings, which reduce fisher prices and returns (and innovation), and ultimately drive down returns on supply chain capital and fishery utilisation.

A species by species approach seems the obvious pathway to boost east coast fishery underutilisation, but that is not the case where fisheries are dominated by single owner-operated vessels. Fishers must make trade-offs between available species, subject to their enterprise capability. This impacts species utilisation. The pelagic nature of wildcatch species means fishers must target, catch, retain, and market both primary and secondary species on each trip. For a small fisher business, the vessel (not the target species) is the profit centre. Fishers must manage the vessel to target, high-grade and optimise accumulated trip margin from hunting behaviour across multiple species. Larger vessels with more sophisticated search, target and harvest technologies, and vessels specifically rigged for a single species (e.g. Squid jigging) can obviously focus to a greater degree on individual species. A fishery seeking to increase utilisation must understand this commercial dynamic driving fisher behaviour.

There is a fundamental mismatch between the expectations of modern east coast seafood consumer markets (e.g. Sydney and Melbourne) for underutilised species, and the capacity of east coast fishers to service them. And the service gap between the two is getting wider.

On one side are modern consumers, who demand and enjoy a smorgasbord of global product choices based on their personal search preferences, food attitudes, product provenance<sup>1</sup>, and credence attributes. Any consumption preference can be met by a suite of available seafood products, fully described, certified, delivered, safe, at a competitive price, at a local monger, retailer or favourite restaurant.

On the other side are fishers, most of whom have already lost much of their capacity to invest, their capital (human and financial) is aged and less efficient every year, their traditional wholesale fresh

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<sup>1</sup> Provenance relates to the origin of a product. Credence entails additional levels of assurance consumers seek re ethical production, sustainably, environmental status, food safety, and product authenticity, etc.

market supply chain is inflexible. The fishers, at times, consider themselves to not be in the position to drive a value proposition that wins the sale to a modern consumer. The result is that competitors win the market (e.g. chilled and frozen Silver Trevally imported from New Zealand for eastern Australian markets), local fisher margins decline, and east coast fisheries go unharvested. The opportunity exists to pursue two pathways for change:

- Identify those few underutilised species with documented market potential and commercial backing. Develop comprehensive value propositions for the range of value-added products (both seafood and industrial) arising from these species targeted at consumer markets.
- Develop products and supply chains for markets outside the traditional wholesale chains dominated by Sydney and Melbourne urban markets. While this may require fresh capital, it will diversify and lower existing commercial risks for fishers and chain partners, enhance the seafood industry's offer to consumers, increase local employment, and increase fishery utilisation.

Addressing these issues and related implications detailed in this report should enable fishers and their chain partners to boost both market awareness and prices for selected species, and net returns along their respective supply chains to fishers. Raising awareness of unique species attributes in the market is key to raising their underutilised value in the water, and their value landed on a fishers' vessel.

This project provides the following recommendations to fast track and enhance commercialisation opportunities related to the selected Target Underutilised Species in particular, and other species in general.

## Recommendations

1. Engage commercial entities currently planning trials for High Potential Species (Group A - Royal Red Prawn, Australian Sardines, Gould's Squid) seeking to establish value-adding capacity in east coast underutilised fisheries.
2. Establish a project to assess and develop market opportunities for premium grade trap or line harvested Silver Trevally products in east coast waters.
3. Work with and support the commercial development of other underutilised species across Qld, NSW, VIC and TAS with value-adding potential (including Group B species - Blue Mackerel, Yellowtail Scad, Luderick, Ocean Jacket, Sea Mullet). This will include both seafood products and industrial (e. g. input feeds for aquaculture) products.
4. Invest in seafood science that will enhance harvest procedures and mitigate the stronger seafood flavours that consumers find unattractive. For this underutilised species project such an investment needs to be targeted at the point of capture/despatch/harvest and initial processing, for at least Sea Mullet, Blue Mackerel, Luderick, and Catfish.
5. Support cooperatives and leading fishers that seek to reshape their business model. The formal investment assessment is the first stage to changing the business model. This report therefore recommends that financial assistance be made available to support fishers/cooperatives seeking to assess and establish a new business model that involves underutilised species.
6. Confirm procedures with fisheries agencies to enable improved access to higher integrity fishery and species data (volume and value by year by species) for all commercial species on the east coast.
7. Drive financial capital renewal, and supply chain innovation.

**Keywords:** underutilised species, value-adding, commercial opportunity, under-caught, latent effort.

# 1. ABOUT THIS REPORT

## A. Introduction

### 1. BACKGROUND

Greater use of Australia's underutilised commercial fisheries will benefit the Australian seafood industry. It will increase regional employment and drive increased use of and returns from fishery capital (human and financial). It will also reduce Australia's reliance on imported seafood.

There is potential to increase the productivity and profitability of commercial fisheries by reducing or finding new ways of using byproduct, bycatch and waste streams; capitalising on under-valued, underutilised or bycatch species; making harvest strategies more effective; maximising resource use; value-adding; and by improving market access and accreditation.

In Commonwealth fisheries relevant to this project, an estimated 50-70% of the available catch is not caught<sup>2</sup>. Comparative data for State and Territory fisheries is not readily available but industry advice suggests that there are similar percentages of underutilised resources across jurisdictions.

### 2. NEED

Many Australian fisheries offer both yield and productivity growth, from two sources: (i) better use of their harvest, and (ii) broader harvest of underutilised species. Both options will deliver higher returns to fishers if collective planning and effort is harnessed with smart value-adding.

The relatively low value of the AUD makes export (and potential reimport) of these value-added products more attractive. Demand for seafood in Asian consumer markets (aside from the current Coronavirus pandemic – as of June 2020) continues to grow strongly, reflecting the emergence of the Asian middleclass. This global megatrend is now directly creating opportunities for Australian seafood suppliers and consumers.

Importers, who supply approximately 70% of seafood consumed in Australia (Dept of Agriculture, 2015 p. 4), are finding it increasingly difficult to compete (using a weak currency) with Asian consumers, to secure volume for their Australian based customers.

In recent years, many Commonwealth, State and Territory wildcatch fisheries have not harvested their allocated TACCs (Total Allowable Commercial Catch). For some SESSF (South East Scalefish and Shark Fishery) species less than 50% of the quota is landed (see footnote). In 2014/15 the SESSF landed 10,925 tonnes from a TACC of 26,086 tonnes, only 42% of the TACC.

In 2001, QLD Department of Primary Industries (QLD DPI), supported by the Fisheries Research and Development Corporation (FRDC) completed a study (FRDC 1999/347) identifying underutilised species attractive for export to Asian consumer markets. Many species and markets identified remain undeveloped. The strong growth of global aquaculture (especially in Asia) is one of the main reasons local fisheries remain undeveloped. Many proposed solutions to increase underutilised yield and fishery returns address only the costs of fishery access and the cost of the harvest (on boat costs, fuel,

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<sup>2</sup> The SESSF, SPF and SSJF are the three Commonwealth fisheries relevant to this project. In the SESSF total catches of quota stocks have been between 30% – 60% below the fishery wide TACs during the period 2005-06 to 2016-17 (Knuckey et al, FRDC 2014-216, page 7). AFMA Catch Watch Reports for the 2018-19 Season confirm that aggregate TACs were uncaught by 47% in the SESSF, and 83% in the SPF. The SSJF is a TAE managed fishery with ABARES noting for the 2017-18 Season that “although the level of gear latency (unused gear) has been variable in the SSJF, it has persisted at high levels since 1996” (ABARES Fishery Status Report 2019 p 278).

etc.). This project takes a different, strategic and novel approach, based on the real economic and competitive circumstances for the whole water to consumer chain.

### 3. PURPOSE

Domestic market consumers dominate (~67%) Australia’s fisheries and aquaculture harvest, after deduction of industrial products (~16%) and exports (~17%). But as our national seafood consumption is high relative to domestic production, seafood imports fill the supply gap. In 2016-17 Australia imported 226,386 tonnes of seafood, as a contribution to our apparent domestic seafood consumption of 341,092 tonnes (Mobsby, et al., 2018).

The Professional Fisher’s Association of NSW (NSWPFA), the proponent for this research report, takes the view that there is the potential to increase the productivity and profitability of commercial wildcatch fisheries by capitalising on under-valued, underutilised or bycatch species. This strategic approach addresses the significant challenges faced by NSW inshore fisheries, and also aligns with the large underutilised stocks in proximate east coast Commonwealth fisheries. Across jurisdictions there are many common underutilised species (e.g. Australian Sardine *Sardinops sagax*, Silver Trevally *Pseudocaranx georgianus*).

This project has worked with east coast fishers and processors in two ways:

1. To boost fishers’ harvest yield for commercial target species, and
2. To increase returns by better management and value-adding to that catch.

The project team has worked with the NSWPFA, the east coast wildcatch commercial fishing sector, AFMA (Australian Fisheries Management Authority) and the FRDC, to design and implement a project that demonstrates these two developmental aspects for selected underutilised species.

Over a four-year period (2016-2020) the project team engaged selected fishers, NSW Fishing Cooperatives, seafood processors, wholesalers, exporters and food service experts to document, demonstrate and (where possible) trial chain activities to boost harvests and increase fisher returns.

## B. Objectives

The project has addressed three objectives, and achieved a range of outcomes for each:

Objectives	Summary Outcomes
1. A demonstration to Australian fishers and enterprises of the <b>increase in the harvest</b> of unutilised yield in selected Australian fisheries	<ul style="list-style-type: none"> <li>• Convened and held mobilisation meeting in Sydney with Steering Committee – described outputs,</li> <li>• Accessed national underutilised species database from Curtin University base project – further developed and refined to suit needs,</li> <li>• Agreement with NSWPFA, FRDC and AFMA re target species,</li> <li>• Estimate existing underutilised volume foregone for eleven target species: 16,600 tonnes (10.3% of national wildcatch in 2017).</li> </ul>
2. A demonstration to Australian fishers of significant and sustainable <b>increase in the returns</b> to selected Australian fishermen from fishery yield growth and innovative value-adding	<ul style="list-style-type: none"> <li>• Met and engaged fishers/processors/agencies (24 meetings and workshops) to develop and collate harvest and supply chain data,</li> <li>• Accessed and analysed available data for each species supply chain to determine where possible, the viability of commercial leverage options,</li> <li>• Worked confidentially with proponents to develop utilisation pathways and demonstration trials where possible, for each target species,</li> <li>• Not able to document any trial outputs as no trials completed to date,</li> <li>• Estimate existing underutilised value (GVP) foregone for eleven target species: \$85.4 million (5% of national wildcatch in 2017).</li> </ul>

3. A demonstration to Australian fishers of increased utilisation, yield and margin of seafood production to **value-added formats** for new consumer markets.

- Worked with the three species and supply chains that attracted commercial proponents to pursue value-adding options,
- Where possible, undertook relevant desk research to support entity development, product format transformation, and commercial feasibility that would achieve increased margins and market appeal from underutilised species,
- Identified issues that are significant ongoing barriers to increased value-adding of underutilised commercial wildcatch species on the East Coast.

## C. Methodology

### 1. PROJECT TASKS

The Project Methodology required the selection of underutilised species relevant to NSW and east coast fisheries that would meet the three objectives defined above.

The Project Workplan underpinning this methodology was implemented progressively and refined based on fisher engagement and project team learnings. The main tasks in the methodology were:

1. The Principle Investigator worked with a Steering Committee comprising experienced fishery, wholesale and trade executives (NSWPFA, Sydney Fish Market, and Pacific West Foods). Collectively they brought extensive commercial seafood links and contacts with industry, NSW and domestic wholesalers, export processors and distributors.

Throughout the project, the Principle Investigator worked with the Steering Committee and industry participants to attend meetings, make presentations, report milestones, and draft progress and final reports to FRDC and the Steering Committee.

2. An existing underutilised species database (developed by Dr Janet Howieson at Curtin University for FRDC) was accessed by the project team, who then streamlined, updated, and prioritised the data base to guide Target Underutilised Species selection appropriate to this project.
3. Underutilised wildcatch species have been the subject of frequent research, by FRDC, Commonwealth agencies, and state and territory organisations and agencies for many years. The issue of low utilisation also arises frequently in contemporary fisheries management research and in commercial optimisation of fishery yield.

The project team undertook early desk research at a number of levels:

- To identify, collate and review historical and contemporary research regarding underutilised wild catch species across Australia's wildcatch commercial fisheries, that would, *inter alia*, support the selection of Target Species for this project,
- To identify, collate and review the latest in-depth research related to species selected for the project, for example the extent of value adding along Australian Sardine supply chains in WA and SA,
- To identify, review and analyse the production, volume, value and supply chain dynamics, market competitiveness and seafood development options for target underutilised species (e.g. Australia's trade in chilled and frozen catfish by product type) where possible.

The lack of data available for many wildcatch seafood species, including those target species selected for this project, demanded that desk research be as rigorous as possible. In this way desk research revealed gaps in knowledge or process, which were then filled wherever

possible via confidential discussions with industry practitioners, or conservative estimates by the project team based on available data.

4. The project team and FRDC developed the range of criteria to guide the project's species choices, including:
  - A manageable number (8-12) of species that the project could focus on with respect to the project objectives to be achieved,
  - Species representing the diversity of underutilised commercial species in east coast waters managed by the NSW and Commonwealth Governments, and with potential engagement with QLD, VIC and TAS fisheries (given the trans-boundary nature of some biological stocks),
  - A value spectrum including high value quota species through to unquoted emergent consumer species,
  - A volume spectrum including large tonnage commodity fisheries where underutilisation rates are high, through to small volume consumer species with evident underutilisation,
  - Species that have been known to be underutilised for some time and have attracted related research, through to novel species,
  - Offshore marine species, inshore marine species, and estuarine species,
  - Species that are currently harvested for existing consumer supply chains and others that offer export potential,
  - Species that are known to be targeted by recreational and Indigenous fishers,
  - Species that are known to be sustainable in all relevant fishery jurisdictions.
  
5. After considerable engagement with stakeholders (see Appendix 1) regarding the selection criteria and species preferences, the "initial shortlist" of 13 confirmed underutilised species for the project was agreed. Other species considered but rejected are also identified in Appendix 1. The task to agree these priority species task took far longer than expected, due to the complexity of issues, the need to ensure the focus was on species relevant to the NSW industry, and lack of accurate data.

Progressively over the life of the project the project team sought to access data relevant to Target Underutilised Species from agencies and supply chain members (on confidential terms where necessary).

For agency data, access was occasionally rejected or constrained as data was protected (i.e. confidential), or data systems were in transition from state publications to national datasets (e.g. NSW Government release of Status of the Fishery Reports replaced by FRDC/ABARES website).

For supply chain members, some species supply chains hold no common data (e.g. Ribbon Fish fishers and processors) or commercial operators (fishers, cooperatives wholesalers) are not willing to release supply chain data due to its commercial sensitivity.

Table 1 details the project assessment of these initial 13 species.

TABLE 1. SUMMARY OF UNDERUTILISED TARGET SPECIES PER SELECTION CRITERIA

SPECIES Common name		NSW Species	Habitat	State or Cwth waters	Aquatic animal types	Beach prices	Volume potential	Value-adding potential	Existing R&D	SAFS rated	TACC / Quota	Recreational	Indigenous
1	Royal Red Prawn	✓	Marine	Both	Crustacean	High	Low	High	✓	✓	✓	✗	✗
2	Ribbon fish	✓	Marine	Both	Finfish	Low	Low	Unknown	●	●	✗	✗	✗
3	Blue Mackerel	✓	Marine	Both	Finfish	Low	High	Med	●	✓	✓	✓	●
4	Silver Trevally	✓	Marine	Both	Finfish	Medium	Medium	High	●	✓	✓	✓	●
5	Australian Sardines	✓	Marine	Both	Finfish	Low	High	High	✓	✓	✓	✓	✗/ ●
6	Sea Mullet	✓	Marine	Both	Finfish	Low	Medium	Low	●	✓	✗	✗	●
7	Yellowtail Scad	✓	Marine	State	Finfish	Low	Medium	Medium	●	✓	✗	✓	●
8	Luderick	✓	Inshore	State	Finfish	Medium	Medium	Medium	●	✓	✗	✓	●
9	Catfish (forktail)	✓	Estuary	State	Finfish	Low	Low	Unknown	●	●	✗	✓	●
10	Estuary Cobbler	✓	Estuary	State	Finfish	Low	Low	Unknown	●	✓	✗	✓	●
11	Leather Jacket	✓	Various	Both	Finfish	Low	Medium	Medium	●	✓	✗	✓	●
12	Ocean Jacket	✓	Inshore	Both	Finfish	Medium	Medium	Medium	●	✓	✗	✓	●
13	Gould Squid	✗	Marine	Cwth	Mollusc	Low	High	Medium	✓	✓	✓	✓	●

Sources: Industry advice and [www.fish.gov.au](http://www.fish.gov.au) Key: ● no data or unknown, ✓ confirmed - positive ✗ confirmed – negative  
Any ratings assigned to species are those of the project team based on project consultation and learnings.

6. This initial list of 13 species was further refined by the Steering Committee and project team. Detailed investigation of the species, their genera, fish names used in agency and industry reporting, and fish names used by industry, revealed some confusion in classification of species in this underutilised target group. This issue highlights the value in using a standard name, such as those defined in the Australian Fish Names Standard ([www.fishnames.com.au](http://www.fishnames.com.au)).

The Steering Committee and project team established the final list of 11 Target Underutilised Species by combining the Jackets (monacanthids), and combining Catfish with Estuary Cobbler.

7. The project team identified stakeholders relevant to the 11 short listed Target Underutilised Species with assistance from NSW PFA, AFMA and FRDC and the Steering Committee. The

project team then engaged these stakeholders initially by telephone to introduce the project and discuss their potential interest in collaborating with the project team.

As a result of these initial phone discussions the project team consulted face-to-face in 24 meetings and workshops with relevant fishers and supply chain parties for each underutilised species. These consultations ranged from Yamba (NSW) to Hobart (Tasmania) given the spatial distribution of some species.

Face to face consultation with the Steering Committee and stakeholders was critical to achieving project objectives. There is no pre-existing publicly available agency source or report that collates relevant data or describes the issues related to the underutilisation of these target species. Fishery data by species in the two main state agencies (NSW Fisheries, Victorian Fisheries Authority) is confidential, and all but one of the cooperatives that record harvest by species by season also chose not to release data to the project team. It was therefore critical that the project team took every opportunity to engage and meet face to face with stakeholders and supply chain members (especially fishers, and cooperatives) who are active in the commercial fisheries and supply chains for these 11 Target Underutilised Species.

The consultation program included two road trips undertaken to include meetings in Hobart, Melbourne and along the entire east coast to Brisbane. Many private individual fishers (including those nominated by east coast cooperatives and processors), cooperatives and agency staff across these species discussed their business, their understanding of existing fishery use, their capabilities and expectations, and their views regarding barriers to increased utilisation and value-adding for these species. These diverse consultations also generated responses from the fishery coalface to guide strategies in pursuit of project objectives.

The discussions with individual businesses also revealed major barriers to increased fisher investment, including lack of human and financial capital, uncertainty regarding harvest policy (at that time), difficulties trading with cooperative fishing structures, or difficulties for younger fishers starting private fishing enterprises.

8. For each of the 11 Target Underutilised Species, the project team undertook desktop research to identify current harvest volumes and values, underutilised volumes by fishery, relevant harvest and value-adding research undertaken to date, supply chain volumes and values, and market product volumes and values. The team found that relevant NSW Gross Margin and Cost of Production industry data was not available from agencies and only limited data was available from supply chain parties. There was no publicly available fishery Gross Margin data for any species from fishers, agencies or chain parties.
9. As a result of the primary and secondary research undertaken across east coast fisheries related to the 11 Target Underutilised Species, the project team discovered that:
  - There is little processing or value-adding infrastructure available on the east coast,
  - Most family fishers have limited capacity to collate and provide business data,
  - Most NSW fishers/investors were not motivated to consider new capital investment until the Independent Allocation Panel (IAP) report and related policy adjustments were fully known,
  - Fishers and cooperatives are reticent to make relevant data available. This necessitated that the project team signed confidentiality agreements with stakeholders where requested.



10. At the species level, the project team worked with those willing stakeholder proponents to develop financial supply chain and gross margin data, design pilot project test options (for yield growth, value-adding, related fisher returns), and develop value propositions to suit identified markets as a basis for specific viability forecasts.
11. For those species where fishers and processors did not want to develop a trial, the project engaged and developed as much supply chain data and Gross Margin metrics as possible and made this available in confidence to each fisher. Their limited responses have guided the analyses.

## 2. CALCULATION OF THE VALUE OF UNHARVESTED RESOURCE

For each Target Underutilised Species in Table 1 the following steps were undertaken by the project team to assess, analyse and document the commercial landed value of each species.

### Annual production data by species by jurisdiction by fishery

Relevant east coast commercial fishery jurisdictions were identified for each species, followed by the last five years of landed commercial harvest for each jurisdiction. For some fisheries and jurisdictions, the landed commercial harvest volume is not available, because the data is confidential to the agency (e.g. Royal Red Prawn in Qld agencies) possibly due to the five boat rule, or the data is not recorded and/or released by agencies (e.g. Ribbon Fish). In these cases, the project team has considered all the data sources (state and Commonwealth agencies, IAP and other advisory panel reports, SFM, industry advice and published literature) and determined a conservative estimate for relevant years.

### Stock Status and TACC 2018 & 2019

Species stock status were collated from the ABARES Stock Status Reports, State agency reports, or FRDC's website ([www.fish.gov.au](http://www.fish.gov.au)). If the stock status was not defined or not otherwise available, the species was considered 'Undefined'.

The TACC data for 2018 and 2019 were collated from available agency records (AFMA, [www.fish.gov.au](http://www.fish.gov.au), Commonwealth Fishery Status Reports, and related state publications) and changes between years were assumed to represent recent volatility in TACCs that have been set. For example:

- For Silver Trevally in east coast Commonwealth waters, this volatility is certainly apparent as the TACC has been reset from 613 tonnes to 307 tonnes across the two-year period,
- For Australian Sardine in NSW waters the recommendations of the IAP established the TACC at 2,744 tonnes.

Many jurisdictions have not yet confirmed or defined a TACC for species on the Target Underutilised Species list (e.g. Silver Trevally, Luderick).

In NSW the IAP (Independent Advisory Panel 2018) has reviewed and published revised commercial harvest limits for three species - Blue Mackerel, Yellowtail Scad and Australian Sardine.

For Gould's Squid, stock status determination in south-eastern Australian waters is based on catch volume rates (TAC) and catch effort (TAE).

### Uncaught Volume per Year 2018 & 2019

For the years 2018 and 2019, the estimated uncaught volume was based on the available TACC, less the catch for the relevant year. For example, for Royal Red Prawns, the tonnage estimates are:

NSW waters:	The stock status is undefined and no TACC has been set. Based on the most recent actual harvest trends and project team discussions with industry, the conservatively estimated uncaught volume is 75 tonnes per year (see discussion below).
CTH Waters:	2018: 384 - 222 = 162 2019: 381 - 147 = 234
Estimated Total:	2018: 75 + 162 = 237 2019: 75 + 234 = 309

A review of the supporting literature and discussion with industry provides further guidance:

- For QLD waters, the FRDC's website ([www.fish.gov.au](http://www.fish.gov.au)) notes "the species has remained mostly unfished since 1991 with a peak catch of 30 tonnes in 1989, and little catch thereafter (QDAFF 2018). The commercial harvest of Royal Red Prawn only began again in 2016, but catch and effort remain low at 40 kg catch and two days effort in 2017" [QDAFF 2018].
- Total harvest of Royal Red Prawns in 1983-84 was over 600 tonnes (Poole, et al., 2019). Since then fishers have used the Royal Red Prawn as a fallback harvest species when prices for their main target species are low. According to Poole's research in NSW and QLD, this explains the fall and ongoing low harvests since 1984. Low prices are a function of lack of market awareness.
- On that basis the project team estimates the sustainable east coast annual harvest of Royal Red Prawns at 300 tonnes.

#### *Landed Price – Best Quality \$/kg*

Using Royal Red Prawns as an example, the value-adding research and premium market testing recently completed by Poole in 2019 indicates a premium market position for the species can be achieved if care is taken in presenting the product, possibly as sashimi. Market testing undertaken suggests a long-term landed price of \$20 per kg, significantly higher than current levels.

Best Quality Prices for other species are based on published prices and industry advice.

#### *Maximum Value of Underutilised Resource*

Across all estimated potential values that can be gained from increased utilisation of the Target Underutilised Species, the project team were conservative given the assumptions used at each stage of the calculation. For some species the final estimate of the Maximum Value of the Underutilised Resource is based on a much lesser figure than what might be obtained if the maximum estimated Uncaught Volume per Year was considered (e.g. Blue Mackerel, Australian Sardine, Yellowtail Scad).

This conservative approach also takes into account the fact that there will likely be supply chain infrastructure constraints (e.g. lack of regional processing capacity) that limit the optimal utilisation of harvest volume, especially for some high-volume species. By contrast the Sea Mullet and Gould's Squid supply chains are already more established (in relative terms to other species) to handle increased volumes.

For the case of Royal Red Prawns, as an example, based on the estimated uncaught volume (300 tonnes) and the landed price estimate for best quality (\$20/kg), the estimated maximum value of the underutilised (i.e. unharvested) Royal Red Prawn resource is \$6 million.

## 2. UNDERUTILISED SPECIES CONTEXT

### A. Definition

Defining underutilised commercial seafood species is complex. This complexity arises from the interaction of many variables, most uncontrollable, faced daily by wildcatch fishers. These variables include:

- Diversity of seafood species that are edible, and targetable across Australia's exclusive economic zone and related jurisdictional fisheries,
- Diversity of market price (and net fisher return) for each of these species in consumer markets,
- Fishers' personal motivation for and assessed risk related to fishing activity in licensed waters,
- Fishing capacity and capability of each fisher enterprise and its ability to manage costs (e.g. fuel, wages) and maximise financial returns from fishing, today and over a sustainable future,
- Seasonal variations in the aquatic environment and related fisheries, which influence the availability of inhabiting species,
- Consumers' level of awareness of seafood species (provenance and credence<sup>3</sup>, food safety, sustainability), which influences their demand for seafood, by location and season,
- Availability and price of seafood substitutes (farmed or imported seafood, and other non-seafood meal options) in consumer markets,
- Investors' risk-return expectations for seafood industry capital assets, including quota units.

Underutilisation of wild caught fish occurs globally and is an unavoidable consequence of commercial fishing. Underutilised fish species can be categorised under three headings (Stephens, 2018):

1. Fish caught but not used for human consumption. This may be due to their low market value, processing challenges, or being remotely harvested where infrastructure is not available. These fish are discarded at sea or used for low value fertiliser or bait.
2. Fish not caught even though quota is available or permits to harvest have been issued.
3. Fish neither caught nor included in current licensing arrangements yet might be caught in sustainable quantities.

Ultimately, choices regarding utilisation of commercial species are related to a market value proposition to be serviced by a fishing enterprise. Australian seafood supply chains prevent greater uptake of underutilised species for a range of reasons, including:

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<sup>3</sup> Consumers are increasingly interested in how and where their seafood is produced. There are two aspects to gaining consumers trust in products. Provenance relates to the geographical and temporal place of origin of a product from its resource base. Increasing food fraud is one driver for nuclear techniques to test and identify substitution and regulatory breaches. But for discerning consumers, credence entails additional levels of assurance their seafood was produced ethically, sustainably, in a clean environment, is safe to eat, and that the claims about the products are authentic. Molecular laboratory and sequencing techniques are increasingly able to verify provenance attributes. Credence attributes are typically not discernible using these techniques or by looking at the product.

- Low prices paid to fishers for underutilised species (often less than \$2/kg) means there is no commercial return from catching them,
- Low prices paid to fishers mean they may be inclined to break a supply agreement to a wholesaler if a better opportunity arises,
- Limited space on fishing vessels gives high value (and high margin) species priority,
- Lack of available proximate processor capacity,
- Seafood processors will not invest in creating demand for products that fishers will not supply,
- Some exporters and retailers are unaware of species diversity, palatability, seasonality, processing characteristics and price points,
- Small fishing companies that might target underutilised species have limited experience in negotiating supply arrangements with wholesalers,
- With cheap imported fish fillets available, there is no motivation for wholesalers to take risks to create a market for local underutilised species,
- Australians are disinclined to buy fish they do not recognise; underutilised species are likely to fall into this category (e.g. they are often referred to as 'lesser known' species),
- Small day-to-day harvest volumes mean that tuning processing facilities to meet throughput in most automated processes is not cost effective,
- Export of small volumes of Australian underutilised species must compete against low priced, high volume, diverse competitors,
- Under the precautionary principle, fishery regulations in a multispecies fishery will occasionally prohibit harvesting of some commercial species as a secondary consequence of protecting other target species,
- Strategic competitive advantage for some license holders to control quota, especially where quota holding costs are low,
- Activist pressure from uninformed social media and other groups that prompts politicians to limit access to sustainable harvest method in a sustainable fishery.

## B. Related Research

### 1. UNDERUTILISED SPECIES

There is ongoing commercial interest in increasing the utilisation of underutilised species, with considerable FRDC and private RD&E investment related to this topic in Australia. A 2018 report (Stephens, L, 2018) considered the main findings of these (FRDC-funded) projects, identifying that projects that successfully convert an underutilised species into a commercially viable product should contain the following three elements:

1. Projects should be initiated and led by a commercial operator accountable for outcomes assessed across strict commercial criteria,
2. Projects should be preceded by a financial analysis conducted by the commercial operator,
3. Research funds should only be used for research to fill knowledge gaps identified by the financial analysis.

The case studies for this project considered and variously adopted these criteria as follows:

- All case studies were described and developed with a preferred commercial operator who was already invested in the commercial production of their respective underutilised species.
- Where there were multiple operators active for a species the project team investigated the license holding, commercial capacity, and motivation of each operator and chose the candidate best placed and most willing to work on the case study. In no case did multiple fishers take up an opportunity (offered by the team) to work together on development of trials for a single species.
- The project team sought to establish an initial financial analysis for each case study prior to any trial activities. Across the case study portfolio, the development of these individual species financial analyses was undertaken in a number of ways:
  - The operator for at least one species had retained professional commercial advisors to undertake their financial costs benefit analysis. During the project this detailed analysis was made available to the project team on strict confidential terms.
  - Two other operators (each for a respective species) had assembled their own confidential data and were progressing financial analyses inhouse. These analyses were not made available to the project team.
  - One other large operator with existing harvest and development plans for multiple underutilised species (relevant to this project) was seeking to identify and access a regional development funding program to support the cost of retaining a financial consultant to undertake the necessary financial study for an integrated harvest, value-adding, and marketing investment. The project team provided advice to the operator regarding several government-funded industry development programs that may be appropriate.
  - All other operators engaged by the project team for relevant underutilised case study species had minimal capacity to undertake any preliminary financial analysis of their respective case study species opportunity. While most of these operators were commercially motivated to pursue the case study related to an underutilised species, they had limited access to relevant data or funds to progress the analysis. In these cases, the project team worked confidentially with the operator to understand the commercial opportunity related to the chosen underutilised species, collate desktop research, and build the financial model of the supply chain and related cost-benefit and returns.
  - For those operators with limited capacity (described in the preceding point), research funds from the project budget were used by the project team to work with operators one-on-one in an action learning process to develop their respective financial analyses as far as possible. In some cases, the operator relied excessively on the work of the consultant to progress the desktop research and complete the financial analysis, to a point where the project team was not able to finalise the financial analysis.

Further, the Stephens report recognises the paramount importance of financial supply chain metrics. Stephens noted that:

The fundamental objective of any such project must be to transform any given underutilised species to a food item for which there is a sustained market demand at a price point that provides a reasonable margin to all of the businesses involved.

## 2. NSW WILDCATCH COMMERCIAL FISHING

As is the case for many Australian wildcatch fisheries, the NSW inshore commercial fishing industry is under pressure to undergo reform. This regional industry comprises mostly small, family-run businesses, often working in isolation (MacDonald, 2015) using a variety of methods and gear types to catch a diversity of species. These businesses often operate at low levels of profitability based on relatively low catch volumes in multi-species, multi-method fisheries. As small businesses they typically service local cooperatives and are “price takers” rather than “price makers”, having limited or negligible market power.

A state-wide inshore fishery reform was driving industry adjustment during the stakeholder consultation stages for this project. In at least two of the 11 Underutilised Target Species cases, fisher/investors expressed concerns that anticipated reform outcomes were making commercial investment in harvest and value-adding too risky. As a result, they had put development projects related to increased catch and value-adding of underutilised species on hold.

An independent study by University of Technology Sydney (UTS) (Voyer, et al., 2016) found the economic viability of most (79%) NSW Fishing Cooperatives to be reasonable or below viability, with only three cooperatives considered to have future viability at a level that is “good”, or “very good”. Loss of members and throughput may force cooperatives to amalgamate or close.

This 2016 report covers the NSW Wildcatch professional fishing industry. Table 2 shows that while nominal GVP has increased 12%, all other economic metrics has declined by more than 50% in the three-year period. (Note: The UTS report does not provide a GVP data comparison (p. 15). GVP data is therefore drawn from the State’s reported data in ABARES Fisheries and Aquaculture Statistics Report). The report provides values across a range, for the 2013 year

TABLE 2. NSW COMMERCIAL WILDCATCH INDUSTRY 2013 & 2016

NSW Commercial Wildcatch Industry	2013	2016	Est. % Change
GVP \$ m. nominal (Source ABARES)	81	91	+12%
Total output	436-501	219	-53%
Value-added \$m	215-248	105	-55%
Household income	117-137	51	-60%
Full-time jobs	3,291-3,857	1,403	-61%

The survey results, appended to the UTS report (Voyer, et al., 2016) found that 90% of NSW coastal residents think professional fishing is an important industry for NSW, providing important employment opportunities in local towns. Eight out of ten people were concerned about potential job losses if further restrictions were placed on the industry.

Bait supply is a significant component of the industry. Professional fishers and NSW Recreational Fishers collaborate through the bait market, especially for Australian Sardines and Eastern School Prawns (*Metapenaeus macleayi*). Bait caught by the industry accounts for ~25% of the \$39 million spent on bait by recreational fishers in NSW.

The report found that NSW professional fishers can be classed into two categories with quite different needs, aspirations, and fishing practices.

- 1: Larger-scale, specialist fishers, and

- 2: Smaller-scale fishers, largely inshore, multi-method, multi-species fishers who seek to maintain non-commercial aspects of fishing in preference to business growth or expansion (sometimes referred to as “lifestyle fishers”).

Fishers in both classes increasingly use direct marketing to sell their products to local consumers, rather than via the Sydney Fish Market (SFM) or regional cooperatives.

This UTS Study made recommendations relevant to this underutilised species project, including:

- Conduct market research into value chains and interactions with the post-harvest sector, outlining the alternative marketing options available to fishers and tourism operators, including advice on accessing local markets and building connections with the tourism and hospitality industry,
- Support the ongoing delivery of the OceanWatch Master Fisherman program to develop and recognise the range of skills required by the local fishing industry, including small business management,
- Develop local branding strategies and traceability protocols and procedures to improve consumer awareness of seafood provenance, especially in wholesale, supermarket sectors,
- Develop opportunities for new entrants to enter the industry, within the relevant regulatory constraints on licence numbers and required shareholdings. These opportunities should aim at industry renewal as ageing fishers retire, for example, through trainee licences, a loans scheme or discounted licencing period to encourage new entrants to take up licences as they become available.
- Develop a promotional campaign for NSW seafood targeted at residents and visitors, promoting important species such as Australian Sardines, Mullet, Mud Crab and Octopus.

The UTS project surveyed and identified those fishers who had endorsements for the NSW commercial fisheries and compiled important aggregate data regarding their gross margins. This single-year data is presented in Table 3. The fisheries (Estuary General Fishery, Ocean Trap and Line Fishery, Ocean Haul Fishery, and Ocean Trawl Fishery) relevant to this Underutilised Species Project are highlighted.

However, over the course of this underutilised species project, it became evident that multi-year Gross Margin data was unavailable for NSW wildcatch commercial fishing or individual species. This baseline data is essential for assessing supply chain viability and investment return. Such data is well developed and available for most Australian agrifood industries. The project team undertook this task based on best estimates to the extent possible, for all Target Underutilised Species.

Table 3 below (line item 11) confirms that in 2013, the average NSW endorsed fishing business was achieving an annual profit at full equity between \$14,516 to \$20,154, with considerable unpaid labour, and (on the bottom line of the table) a non-viable average negative return on capital of -0.3% (Voyer, et al., 2016 p. 188).

TABLE 3. PROFESSIONAL FISHER BUSINESSES USING NSW LICENSE ENDORSEMENTS - AVERAGE RETURNS 2013

SURVEY Observations	10	12	46
NSW Fisheries	Estuary General / Ocean Trap & Line Fishery / Ocean Haul Fishery	Ocean Trap & Line Fishery / Ocean Trawl Fishery	Average Vessel
<b>1 Gross revenue</b>	<b>\$121,149</b>	<b>\$190,969</b>	<b>\$161,364</b>
<i>Less costs</i>			
Cooperative Commission	5,158	10,850	8,013
Bait	3,488	5,876	4,973
Boat fuel	11,561	30,387	16,588
Repairs and maintenance	10,318	12,245	8,399
Gear replacement	3,270	6,191	4,545
Protective clothing/other	1,559	942	1,202
Vehicle fuel	3,851	3,328	4,481
Freight	2,890	9,795	4,298
Labour - paid	8,439	33,840	31,390
2 Labour - unpaid	12,587	10,720	9,791
3 Total variable costs	63,120	124,173	93,679
Boat registration	1,843	2,961	2,156
Vehicle registration & repair	2,549	2,104	2,702
Insurance	3,213	7,009	4,306
Management costs	5,607	3,324	5,497
Licence fees	1,177	734	1,454
Accounting, legal & litigation	1,477	1,834	1,689
Telephone & power	3,568	3,130	5,102
Rates and Rent	2,150	2,661	1,796
Bank charges	173	352	404
Building/plant repair	494	833	2,221
Vehicle repair	1,032	1,182	1,180
Travel	461	1,120	915
Memberships/other	309	2,584	1,126
4 Interest	5,535	5,757	6,556
5 Leasing	300	4,132	7,711
<b>6 Total fixed costs</b>	<b>28,855</b>	<b>38,534</b>	<b>43,664</b>
7 Total boat cash costs (3+6)	91,975	162,707	137,342
<b>Boat Gross Margin (1-3)</b>	<b>58,029</b>	<b>66,797</b>	<b>67,685</b>
2 Unpaid labour	12,587	10,720	9,791
Gross operating surplus (1-7+2)	41,761	38,982	33,813
8 Boat cash income (1-7)	29,174	28,263	22,379
9 Depreciation (Economic)	20,493	17,997	22,384
10 Boat Business Profit (8-9)	8,681	10,266	627
<b>11 Profit at full equity (10+4+5)</b>	<b>\$14,516</b>	<b>\$20,154</b>	<b>\$12,363</b>
Boat capital	106,760	177,951	176,664
Licence value*	5,501	13,468	10,320
<b>13 Total Capital</b>	<b>112,261</b>	<b>191,419</b>	<b>186,984</b>
Rate of return on boat capital (11/12*100)	13.6%	11.3%	7.0%
Rate of return on total capital (11/13*100)	12.9%	10.5%	6.6%
Boat cash income (1-7)	29,174	28,263	22,379
Unpaid labour	12,587	10,720	9,791
Opportunity cost of capital (7%)	7,858	13,399	13,089
Depreciation	20,493	17,997	22,384
Interest	5,535	5,757	6,556
Leasing	300	4,132	7,711
Management fees	5,607	3,324	4,800
14 Net economic returns	-322	-642	-3,831
<b>Economic rate of return to capital (14/13*100)</b>	<b>-0.29%</b>	<b>-0.34%</b>	<b>-2.05%</b>



## C. Wildcatch Flows and Trends

### 1. SEAFOOD CHAIN FLOWS

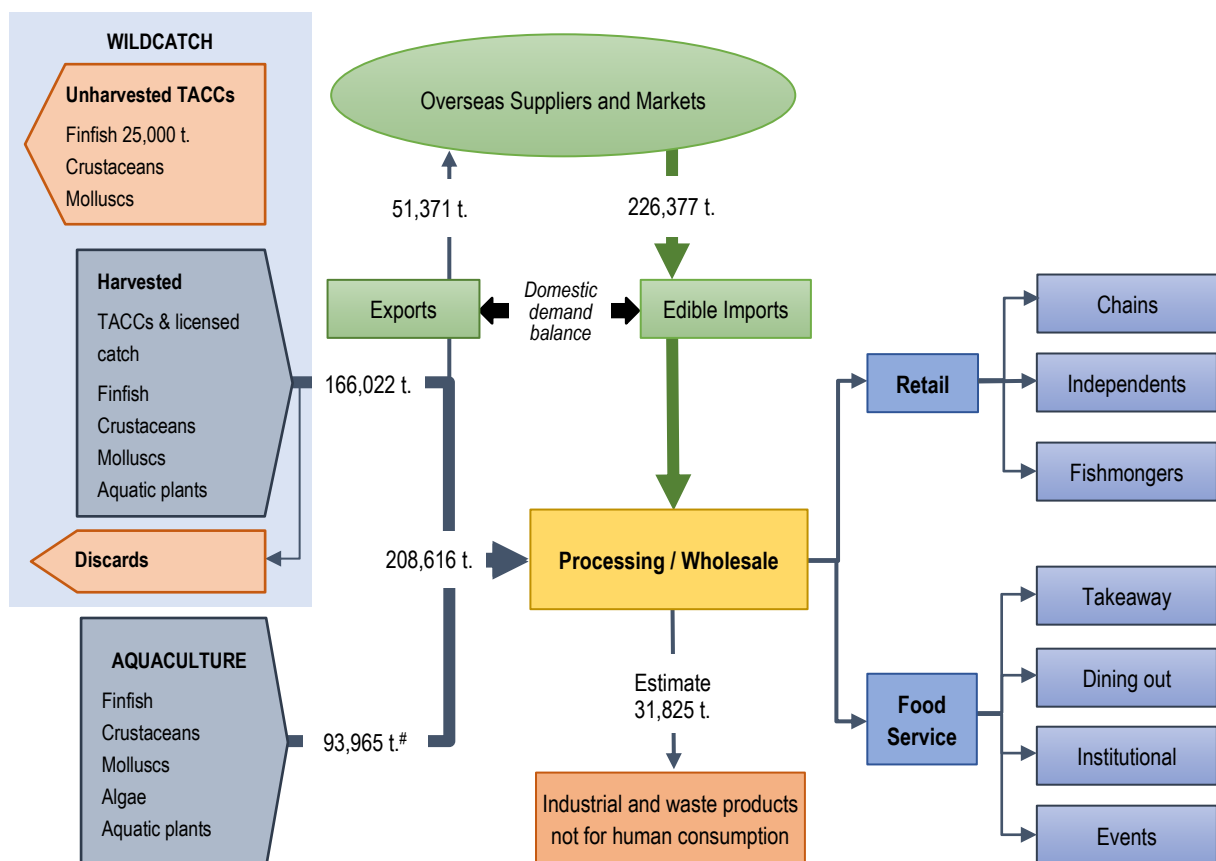
What is the scale of the underutilised commercial finfish sector?

In 2018, the Stephens' report (Stephens, L, 2018) noted that Australia produces approximately 50,000 tonnes of underutilised species per annum. The trawl fisheries produce the biggest proportion, comprising a wide range of species.

In 2019 a Curtin University report (Howieson, 2019) estimated that approximately 25,000 tonnes of finfish in Australia's wildcatch commercial fisheries is not harvested each year even though operators are licensed to do so within existing TACCs (Total Allowable Commercial Catches).

Subject to the broad scope of the definition of "Underutilised" discussed in the previous section, this product is referred to as underutilised. The unharvested TACCs volume for Crustaceans and Molluscs is unknown. The finfish volume alone is equivalent to approximately 12% of the annual domestic processed weight of all Australian seafood species.

Figure 1 identifies the flows of seafood product (where known) for 2016-17, based on ABARES data.



#Landed aquaculture production includes 4686 tonnes of Southern Bluefin Tuna harvested as juveniles from the wildcatch commercial fishery.

FIGURE 1. AUSTRALIA'S COMMERCIAL SEAFOOD FLOWS 2017

As previously notes, approximately 67% of Australia's fishery harvest volume is for domestic human consumption. The balance of domestic demand is filled by imports. Greater use of Australia's underutilised commercial fisheries will benefit the Australian seafood industry (e.g. via increased regional employment, and better use of and returns from fishery capital), and reduce Australia's reliance on imported seafood.

## 2. UNDERUTILISED SPECIES

ABARES publishes Gross Value of Production (GVP) data of key Australian seafood species enabling the tracking of trends in nominal GVP and catch volumes.<sup>4</sup>

Table 4 lists 46 wildcatch species (listed as a combination of species and species groups) in descending order by nominal Total GVP (i.e. wildcatch + aquaculture) for 2017. For each wildcatch species the GVP Growth for 2014-17 is shown, and the respective contributions (i.e. impact) to that GVP change due to wildcatch nominal average volume and/or price changes. Red text indicates declining GVP, volume or price.

In addition, there are other wildcatch species tracked but not published individually as they are minor species, or their data is confidential under the “five boat rule”. These are recorded by agencies as “Not Elsewhere Included” or “Other Finfish, Crustaceans or Molluscs”. The table also shows the wildcatch share of GVP as a share of total landed GVP for wildcatch only, and the volume and nominal price trends over the four-year period to 2017. Note that these trends are indicative only – they are based on ABARES averages for the whole year across all Australian commercial wildcatch fisheries of that species. Prices and GVPs are nominal and are not adjusted for inflation over the four-year period.

The largest GVP species are also those typically competing directly with domestic and imported aquaculture supplies (Prawns, Abalone, Southern Bluefin Tuna (*Thunnus maccoyii*,) and Barramundi (*Lates calcarifer*)). The data are focussed on wildcatch activity in order to assess the price and volume impacts for wildcatch species. The data in the table shows that:

- The top seven wildcatch species comprise over 74% of landed wildcatch GVP in 2017. These species have moderately rising nominal GVPs, except for Snapper (including tropical snappers) where GVP is flat and harvest volumes have been declining. Snapper fisheries in SA were recently closed in September 2019.
- Twenty-nine species experienced an increased nominal GVP over the four-year period 2014-17. For the Top 20 species, 90% experienced nominal GVP increases, with most enjoying growth in both volume and price. For the Bottom 20 species, only six (30%) experienced nominal GVP increases, and seven (35%) have experienced declines in both volume and price.
- The 18 species that experienced greater than 20% nominal GVP growth, have done so primarily (14/18) based on volume growth. Only four (Flathead, Scallop, Swordfish, and Black Jewfish *Protonibea diacanthus*) of these 18 species have increased nominal GVP primarily by increasing prices. This confirms that the bulk of GVP growth is coming from increased fishery utilisation, not nominal price gain.
- The bottom seven species are all experiencing declining GVPs, due primarily to declining harvest volumes, not price falls. The average decline in harvest volume for these species over the four-year period is 33%.

Note that the ABARES data is often available only by species group, which limits the drawing of detailed insights for species of interest.

The GVP data confirms that wildcatch underutilisation is a clear trend, primarily impacting the lesser known (to consumer markets) seafood species that are not directly competing against aquaculture.

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<sup>4</sup> The tracking of NSW fishery data in support of this project is not directly possible as the data is not publicly available from the relevant agencies. The project has therefore been limited for some species, to working primarily with national data sets from ABARES.

TABLE 4. WILDCATCH GVP SPECIES 2017 - NOMINAL PRICE AND VOLUME IMPACTS ON GVP 2014-17

Seafood GVP – Species by Rank		Wildcatch Landed 2017			GVP Impact 4 Years 2014-17			Comment
ABARES 2018 Publication		Nom. GVP \$'000	% share of Total GVP	Tonnes	GVP % Growth	Volume Impact	Nom. Price Impact	Re Nominal GVP growth, Volume and Nominal Average Prices
1	Rocklobster	673,113	39%	10,570	14%	3%	97%	GVP higher: strong price growth
2	Prawn	308,573	18%	20,982	12%	-10%	110%	GVP higher: lower volume + higher price
3	Abalone	142,672	8%	3,401	3%	-411%	511%	GVP flat: lower volume + higher price
4	Tuna	32,827	2%	3,857	35%	65%	35%	GVP higher: higher volume + higher price
5	Crab	57,179	3%	4,613	5%	-139%	239%	GVP higher: lower volume + higher price
6	Barramundi	11,241	0.7%	1,211	10%	-19%	119%	GVP higher: lower volume + higher price
7	Snapper	29,667	2%	3,703	0%	-1,448%	1,348%	GVP flat: lower volume + higher price
8	Coral Trout	27,800	2%	850	1%	98%	2%	GVP flat: higher volume + flat price
9	Australian Sardine	27,414	2%	44,151	29%	79%	21%	GVP higher: higher volume + higher price
10	Shark	26,416	2%	4,982	14%	4%	96%	GVP higher: flat volume + higher price
11	Flathead	25,459	1.5%	3,671	23%	45%	55%	GVP higher: higher volume + higher price
12	Scallop	23,890	1.4%	6,098	111%	34%	66%	GVP higher: higher volume + higher price
13	Mackerel	19,167	1.1%	2,752	32%	52%	48%	GVP higher: higher volume + higher price
14	Whiting (King George, Eastern School, Sand, Yellowfin)	17,054	1.0%	3,411	3%	744%	-644%	GVP flat: higher volume + lower price
15	Squid	14,732	0.9%	2,128	64%	128%	-28%	GVP higher: higher volume + lower price
16	Mullet (Sea, Yelloweye)	14,304	0.8%	4,561	-22%	-98%	-2%	GVP lower: lower volume + flat price
17	Swordfish	9,319	0.5%	1,116	30%	-23%	123%	GVP higher: lower volume + higher price
18	Perch (Bigeye, Pearl)	3	0.001%	1	-63%	-80%	-20%	GVP lower: lower volume + lower price
19	Pipi	6,144	0.4%	714	63%	62%	38%	GVP higher: higher volume + higher price
20	Emperor	5,826	0.3%	1,043	46%	114%	-14%	GVP higher: higher volume + lower price
21	Pink ling	5,218	0.3%	958	22%	95%	5%	GVP higher: higher volume + higher price
22	Bream (Black, Yellowfin)	5,077	0.3%	548	-17%	-85%	-15%	GVP lower: lower volume + lower price
23	Cod (Murray, Rankin)	4,637	0.3%	591	75%	72%	28%	GVP higher: higher volume + higher price

24	Blue Eye Trevalla	4,046	0.2%	450	23%	51%	49%	GVP higher: higher volume + higher price
25	Octopus	2,888	0.2%	359	11%	125%	-25%	GVP higher: higher volume + lower price
26	Australian Salmon	2,814	0.2%	1,462	5%	-442%	542%	GVP higher: lower volume + higher price
27	Threadfin Salmon	2,554	0.1%	544	-12%	-231%	131%	GVP lower: lower volume + higher price
28	Blue Grenadier	2,544	0.1%	1,419	-61%	-105%	5%	GVP lower: lower volume + higher price
29	Garfish	2,406	0.1%	264	-15%	-160%	60%	GVP lower: lower volume + higher price
30	Orange Roughy	2,215	0.1%	416	179%	55%	45%	GVP higher: higher volume + higher price
31	Black Jewfish	1,780	0.1%	173	246%	4%	96%	GVP higher: flat volume + higher NT price
32	Dory	1,707	0.1%	397	42%	115%	-15%	GVP higher: higher volume + lower price
33	Redfish	1,504	0.1%	343	-1%	1,069%	-1,169%	GVP flat: higher volume + lower price
34	Morwong	1,466	0.1%	298	-28%	-8%	-92%	GVP lower: lower volume + lower price
35	Eel	1,308	0.1%	93	-3%	-36%	-64%	GVP flat: lower volume + lower price
36	Leather Jacket	1,252	0.1%	569	94%	97%	3%	GVP higher: higher volume + flat price
37	Wrasse	1,138	0.1%	80	27%	79%	21%	GVP higher: higher volume + higher price
38	Marlin	1,020	0.1%	236	-17%	-31%	-69%	GVP lower: lower volume + lower price
39	Mulloway	766	0.04%	72	27%	97%	3%	GVP higher: higher volume + flat price
40	Cobbler/Catfish	223	0.02%	66	-21%	-33%	-67%	GVP lower: lower volume + lower price
41	Yellowtail Kingfish	669	0.04%	66	-46%	-84%	-16%	GVP lower: lower volume + lower price
42	Trevally	627	0.04%	108	-48%	-136%	36%	GVP lower: lower volume + higher price
43	Dhufish	622	0.04%	42	-39%	-97%	-3%	GVP lower: lower volume + flat price
44	Herring	533	0.03%	170	-6%	-676%	576%	GVP lower: lower volume + higher price
45	Warehou	498	0.03%	330	-54%	-84%	-16%	GVP lower: lower volume + lower price
46	Luderick	489	0.03%	197	-17%	-272%	172%	GVP lower: lower volume + higher price

In relation to selected outlier species where GVP is also significant:

- Black Jewfish GVP has risen strongly based on price alone due to Asian market demand for the species' unique airbladder used in Chinese medicine and cuisine. The species is sourced mainly in the Northern Territory.
- The Mullet harvest in 2017 was 4,561 tonnes comprising Sea Mullet (*Mugil cephalus*) and Yelloweye Mullet (*Aldrichetta forsteri*):
  - Sea Mullet contributed 4,131 tonnes, 85% of which is caught in eastern Australia,
  - Yelloweye Mullet contributed 430 tonnes, only 32 tonnes of which was harvested in eastern Australia.
  - In the decade to 2017 the combined eastern Australian Mullet harvest volume has declined 30% with both species declining by a similar amount.
  - Nominal landed average prices for Mullet have remained relatively flat.
- The Bream harvest in 2017 was 548 tonnes, comprising two species – Yellowfin Bream and Black Bream.
  - Eastern Australia contributed Yellowfin Bream (304 tonnes) and Black Bream (~15 tonnes from southern NSW, plus ~16 tonnes from the Gippsland Lakes, Victoria).
  - In the decade to 2017 the combined eastern commercial Australian Bream harvest volume has declined 49% (~661 tonnes down to ~335 tonnes) with big falls in the Gippsland Lakes Black Bream Fishery and the eastern Australian Yellowfin fisheries. By contrast the Recreational Bream harvest volume in eastern Australia was an estimated 480-500 tonnes in 2017 (Fish.gov.au, 2018). The Victorian Government has confirmed that the Gippsland Lakes commercial fishery will close in 2020.
  - Nominal average commercial Bream GVP has declined 17% in the four years to 2017.

Overall, the data table and discussion tell two stories:

1. There are fisheries that hold their commercial value in consumer markets (the top 15 or so species), and
2. Then there are many lesser volume and value species that are declining in harvest volume as a result of their decreasing prices (nominal and real), and/or failing market acceptance, demand and competitiveness.

### 3. FISHERY UNDERUTILISATION

There are many reasons for the declining trend in utilisation related to wildcatch species, nationally and on the east coast. The following discussion summarises these issues and trends.

#### Strategic Competitive Advantage for NSW Commercial Fishers

A Competitive Advantage (Porter) can be gained by offering the consumer a greater value than that offered by competitors. Industries or businesses can implement activities that create superior consumer value, and thereby ensure they are not imitated by competitors. The aim of a strategy based on competitive advantage is to increase the gap between the perceived value (not the price) of the product and the cost of delivering the product.

For east coast fishers of 11 Target Underutilised Species, the aim is to increase the perceived value of the species (and its related seafood products) in the mind of consumers. This can be done by understanding consumers' needs, and informing them of unique innate positive attributes (e.g. soft flesh, pleasant seafood taste, sustainable local fishery source) and extra value-adding to the product (e.g. habitat preservation, butterfly filleting, smoking, cool chain management, packaging).

Under a differentiated consumer marketing strategy sellers will target defined groups of buyers (i.e. market segments) who are most likely to purchase the product or service offered (Targetting Strategies and the Marketing Mix, 2020). These sellers will customise their offer to consumers in the segment by developing a superior level of awareness of these consumers' needs, promoting unique attributes of the offer to these consumers, building consumers' recognition of and trust in a brand that is uniquely tied to the product, and building consumer loyalty to the product and all its direct (e.g. healthy food) and indirect (e.g. environmental compliance) benefits.

Such differentiated consumer marketing strategies can and should be adopted in the seafood industry to boost consumer outcomes and fisher and farmer returns. As in other markets seafood consumers are far more inclined to trust and give preference to a "differentiated" product (e.g. local fresh seafood) in their buying choices, than a competing product (e.g. imported frozen seafood) that they know little about. This consumer preference will exist in many cases even though the price is higher than for a standard undifferentiated or low-cost consumer product. Informed consumers will place value above price in their seafood purchase decisions.

In this way east coast fishers have a unique attribute that cannot be replicated or easily dislodged by competitors – they are local fishers sourcing unique and attractive seafood from sustainable fisheries in pristine Australian waters. That is their strategic competitive advantage that no importer can fully imitate. And there are many urban seafood consumers who value this attribute highly (e.g. 74% of coastal tourists seek local seafood when in NSW (Voyer, et al., 2016)).

Using a strategic competitive advantage and consumer marketing strategies, NSW fishers can then establish and communicate a unique value proposition to their consumer target market(s) that has a significantly higher value, increased costs, and an increased net margin at the beach. However, currently this innate value proposition is not being fully exploited by NSW fishers, and the existing wholesaler dominated supply chain is not fully leveraging all attractive attributes of NSW commercial species. Note that attributes vary by species. Generally, across all Target Underutilised Species, net beach prices and margins are low, quality incentives are minimal, communication of a value proposition to consumers is negligible, there are no recognisable brands that differentiate locally harvested seafood, and therefore, competitors most often win the sale.

### Scope and Scale of Underutilisation

Project team analysis of the available historical records shows that utilisation of east coast stocks has been declining for some species (e.g. Royal Red Prawn, Australian Mullet, Luderick) for many years. Nationally and on the east coast, falling utilisation has been a problem emerging for decades as the following discussion will demonstrate. As noted by Voyer (Voyer, et al., 2016 p. 208), the declining capacity of east coast Fishers Cooperatives (receivers for many underutilised species) has been tracked since fishery deregulation in the 1990s.

Today what is increasingly evident from published reports, private discussions with stakeholders and site visits is that much of the human capital (professional fishers, governance systems, management practices) and financial capital (gear, technology, infrastructure, systems) that once enabled a profitable east coast commercial fishing sector is now aged, and not fit for purpose against strong seafood market competitors. Local value-adding plants have become non-viable and shutdown. As harvest volumes and throughput continue to decline the remaining capital base has become inefficient, unfit for purpose, and a significant portion is now commercially unviable.

These symptoms of east coast seafood industry decline reflect the findings of the 2016 report by UTS (Voyer, et al., 2016) especially those related to loss of output, value-added, household income, and employment summarised in Table 2.

At a national level, for the ten years from July 2007 to June 2017, a total of 75% (44 species) of the 59 wildcatch species listed by ABARES (Fishery and Aquaculture Statistics) suffered a reduced harvest tonnage. Across these 44 species the average tonnage decline was 39%. It was only due to increased harvest tonnage in 15 other wildcatch species that the national wildcatch decline was cut to a more modest 9% over the decade. Further, it is critical to note that 13 of these 44 declining tonnage species each found a way to increase their unit prices and record an increase in GVP over the decade. These 13 wildcatch species (mostly large capacity fisheries) averaged a 46% GVP gain. There are relatively few winners and many losers in the underutilisation transition underway in wildcatch fisheries.

In simple terms, many east coast wildcatch commercial fishery stocks are underutilised because fishers are not financially able or commercially motivated (relative to risk and return) to boost their business return by harvesting more fish from legally accessible fishery stocks. In a similar way many portside receivers and value adders of these species also lack the financial capacity and derisked motivation to invest in optimising returns from existing catches.

This problem is hard to reconcile – on one hand we have many underutilised east coast fisheries, and on the other hand we have access to a number of well managed stocks in pristine natural environments, which have the potential to offer alternative seafood products for modern consumers. Some of the explanation is that many of these species are not deemed attractive by seafood consumers (i.e. too oily or fish flavour is too strong). However, there are also underutilised east coast species that are highly attractive (e.g. Silver trevally, Australian sardine). There is a fundamental mismatch between the dynamic needs of seafood consumer markets, and the capacity of east coast fishers to service them. Unfortunately, the scale of this mismatch is increasing every year, as discussed below.

### Finfish Trade Flows and Per Capita Demand

Australian consumers access seafood from two sources: local producers (fisheries and farms), or imported seafood. Domestic market supply chain operators service local consumer demand by balancing local supply against imported supply. They do this subject to many criteria and commercial trade-offs including local availability and seasonality, import access, fishery sustainability, product format, quality, price and net return.

Table 5 summarises edible seafood trade trends for Australia from 1996-2017 drawn from ABARES Australian Fisheries Statistics records. It confirms that export trade of edible fisheries products has changed little (-7%) in volume since 1996, with modest gains in nominal average unit prices due to inflation. But import trade flows to Australian consumers have doubled in volume over the same period to 226,377 tonnes. Average nominal prices for imported edible seafood are increasing at more than twice the rate of export prices (58% compared to 28%).

TABLE 5. EDIBLE SEAFOOD TRADE TRENDS 1996-2017 (ABARES)

Edible seafood		1996	2009	2017	% change 1996-2017
<b>Exports</b>	Tonnage	55,030	46,901	51,371	-7%
	Value \$'000 nominal	\$1,113,349	\$1,145,348	\$1,332,576	20%
	Avg. Unit Value \$/kg	\$20.23	\$24.42	\$25.94	28%
<b>Imports</b>	Tonnage	112,706	193,458	226,377	101%
	Value \$'000 nominal	\$598,725	\$1,282,709	\$1,901,069	218%
	Avg. Unit Value \$/kg	\$5.31	\$6.63	\$8.40	58%

The key point is that domestic consumers are demanding increased seafood from overseas, and (based on this data) are prepared to pay higher prices for it.

It is informative to also assess the seafood product format flows by volume across the 20 years of edible seafood imports. Table 6 identifies the percentage change in volume of imports by species type and product format, reconciled to the 101% growth (see Table 5) in imports over the period. This data is also drawn from ABARES Australian Fisheries Statistics records.

The key points revealed by Table 6 relevant to this project are:

- Fresh, chilled or frozen finfish products (highlighted in green) are imported to Australia in increasing volume. These are the types of products that will compete directly with fresh wholesale finfish products harvested from the east coast fisheries and delivered via the existing wholesale supply chains to domestic consumers.
- Imports of these fresh, chilled or frozen finfish products have increased 50% from an aggregate 45,940 tonnes to 68,900 tonnes over the 20 year period,

TABLE 6. EDIBLE SEAFOOD IMPORT TRENDS BY PRODUCT TYPE 1996-2017 (ABARES)

Edible Seafood Import Trends		1996	2009	2017	% Change		
ABARES	Tonnes				1996-2009	2009-2017	1996-2017
Fish	Live fish	na	na	na	-	-	-
	Fresh or chilled	3,234	7,917	11,783	145%	49%	264%
	Frozen	42,706	49,375	57,117	16%	16%	34%
	Prepared or preserved	26,796	54,132	82,686	102%	53%	209%
	Smoked, dried or salted fish	2,871	3,690	5,178	29%	40%	80%
	Other fish preparations	7,005	18,445	149	163%	-99%	-98%
	Total	82,612	133,559	156,913	62%	17%	90%
Crustaceans & Molluscs	Prawns	12,887	12,828	15,751	0%	23%	22%
	Lobsters	279	429	1,178	54%	175%	322%
	Mussels	2,377	2,783	2,237	17%	-20%	-6%
	Scallops	555	2,170	2,715	291%	25%	389%
	Other	10,592	19,993	20,977	89%	5%	98%
	Prepared or preserved	3,404	21,696	26,886	537%	24%	690%
	Total	30,094	59,899	69,744	99%	16%	132%
<b>Total edible imports (tonnes)</b>		<b>112,706</b>	<b>193,458</b>	<b>226,657</b>	<b>72%</b>	<b>17%</b>	<b>101%</b>
Australian Population (million)		18.31	21.69	24.60	18%	13%	34%
Avg. Edible Imported finfish (fresh or chilled) consumption (kg/head)		0.18	0.37	0.48	107%	31%	<b>171%</b>
Avg. Edible Imported finfish (fresh, chilled or frozen) consumption (kg/head)		2.51	2.64	2.80	5%	6%	12%
Avg. Edible Imported finfish consumption (kg/head)		4.51	6.16	6.38	36%	4%	<b>41%</b>

- Prepared and preserved finfish products (mostly canned) have also grown strongly at 209%. This line includes the 80,000 tonnes (2017) of canned finfish (mostly tuna) that Australia imports annually.



- For the higher value fresh or chilled finfish products, import growth has been 264% for the period, well above the average growth for frozen finfish product (34%) and other imported finfish product formats.
- The per capita consumption of imported edible finfish has increased by 41% over the 20 year period, even though the Australian population has grown by a lesser 34%,
- The comparative increase in per capita consumption of fresh or chilled finfish is even more dramatic, at 171%. This means every Australian resident is now (2017) consuming almost half a kilogram (480 grams) of imported fresh or chilled finfish annually. They are also consuming over 2.3 kg of frozen imported finfish.

In summary, the volume of imported product (primarily finfish) that directly competes with the bulk of east coast underutilised edible species has increased dramatically over the last 20 years. Average consumption of imported finfish per capita has risen 41% from 4.51 kg/head to 6.38 kg/head. And the fastest growth in imports is in the fresh or chilled category that directly competes with many NSW underutilised fisheries.

The data above confirm that the trend for imported finfish is clearly strong and enduring, especially for fresh or chilled products. But this needs to be put in context of the competitive supply from Australia's wildcatch finfish fisheries. Table 7, drawing again from ABARES records, presents further evidence of trends.

TABLE 7. EDIBLE FINFISH (FRESH, CHILLED OR FROZEN) IMPORTS V LOCAL HARVEST 1996-2017 (ABARES)

Edible Finfish tonnes		1996	2009	2017	% Change		
ABARES tonnes					1996-2009	1996-2009	1996-2009
<b>Imports</b>	Fresh or Chilled	3,234	7,917	11,783	145%	49%	264%
	Frozen	42,706	49,375	57,117	16%	16%	34%
	Total Fresh chilled or frozen	45,940	57,292	68,900	<b>25%</b>	<b>20%</b>	<b>50%</b>
<b>Wildcatch</b>	NSW	14,783	12,715	7,771	-14%	-39%	-47%
	VIC	6,086	3,101	3,554	-49%	15%	-42%
	QLD	11,922	12,018	8,865	1%	-26%	-26%
	TAS	11,105	2,219	373	-80%	-83%	-97%
	<b>Subtotal East Coast states</b>	<b>43,896</b>	<b>30,053</b>	<b>20,563</b>	<b>-32%</b>	<b>-32%</b>	<b>-53%</b>
	SA	6,962	31,455	42,824	352%	36%	515%
	WA	25,967	10,159	9,420	-61%	-7%	-64%
	NT	2,906	5,532	6,448	90%	17%	122%
	CTH	39,988	37,059	31,553	-7%	-15%	-21%
	Total Finfish wildcatch	119,719	114,258	110,808	-5%	-3%	-7%
	<b>Total Finfish F&amp;A</b>	<b>132,775</b>	<b>160,009</b>	<b>179,243</b>	21%	12%	35%
	SA Sardine harvest	unknown	27,850	39,745			

The table confirms that:

- In 2017, total edible finfish (fresh, chilled or frozen) imports of 68,900 tonnes were greater than the combined finfish production of east coast States and all Commonwealth finfish

fisheries (20,563 tonnes + 31,553 tonnes). By contrast, in 1996 imports were only 55% of combined east coast and Commonwealth finfish production.

- Total wildcatch finfish production has remained relatively stable at 110,000 – 120,000 tonnes, but this now includes a ~40,000 tonne contribution from the South Australia Sardine Fishery which is used as feed for Southern Bluefin Tuna farms. Factoring that in, the edible component of the finfish harvest has fallen ~35% to around 70,000 tonnes, which is around the same as the level of edible finfish (fresh, chilled or frozen) imports. So, in round terms, every second meal of finfish (fresh, chilled or frozen) eaten in Australia comes from overseas.
- The red numbers in Table 7 highlight how the finfish volume harvest on the east coast state fisheries has declined 53% over 20 years. The decline ranges from 26% in QLD to 97% in TAS. Commonwealth finfish harvests have declined 21%.
- Total finfish production from wildcatch and aquaculture has increased by 35% due primarily to the strong growth in the TAS salmon farming industry.
- In 1996, imported fresh or chilled finfish products (the direct competitor against the NSW locally sourced product) were only 7% of east coast State harvests. Today they are 57%.

Imported finfish is outcompeting local harvests and fishers. The continuation of these finfish trade and harvest trends will see the loss of most of the domestic finfish market (and supply chain) to imported product. The only remaining local finfish harvests will be for species and products that have a unique and compelling value proposition that local domestic consumers are aware of and will pay for in a competitive market.

### Competitive Market Dynamics

The existing supply chain flows confirm that the supply is delivered (fresh, chilled or frozen) to consumers in the key urban markets of Sydney and Melbourne, other capitals, and large regional centres.

Consistent with preferences for other food products, these modern seafood consumers enjoy an expanding smorgasbord of seafood choices, driven by their personal search preferences, food attitudes, and product credence attributes.

A simple example of a seafood consumer's cascading purchase choices will include<sup>5</sup> (Brayden, et al., 2018):

- Need: a quick nutritious family meal (Barramundi), or an Easter celebration (Prawns),
- Type: finfish, crustacean or mollusc,
- Species: known (Salmon), unsure (Luderick), unknown (Ribbon Fish), default (white meat),
- Origin: aquatic habitat - marine, estuarine, or freshwater,
- Production: wildcatch or farmed,
- Seasonality: optimum harvest availability – quality is subject to season (e.g. mullet)
- Eat Quality taste, texture, colour, oiliness, etc subject to species origin, production, season,
- Source: local, interstate or imported,
- Credence: certified Marine Stewardship Council, - safety, sustainability, animal welfare, etc
- Recency: live, fresh, chilled, or frozen,

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<sup>5</sup> This is a demonstration list only, prepared by the project team from a selection of sources, including: Fish Magazine March 2017, Volume 25,1; (Brayden, et al., 2018 pp. 362-382), and (Alfnes, et al., 2017 pp. 1-26)

- Format: whole, trunks, filleted, butterfly, crumbed, battered, manufactured (e.g. sticks),
- Vendor: fish monger, supermarket, takeaway, food service or delivered,
- Label: organic, eco, Fair Trade,
- Nutrition: high omega, low GI,
- Cuisine: Western, Japanese, Chinese, Mediterranean,
- Transaction: instore or online,
- Price point: premium or commodity,
- Trust: Do I trust the product? Any previous experiences? Am I loyal to a related brand?

Leading seafood products (e.g. Prawns, farmed Southern Bluefin Tuna, farmed Atlantic Salmon *Salmo salar*, Abalone, Rocklobster, Patagonian Toothfish *Dissostichus eleginoides*) have been fully defined, researched, innovated, described and value-added using the market language of these purchase choices. Fisheries sometimes manage their value proposition and engagement nationally (e.g. wildcatch Abalone) or regionally (e.g. Spencer Gulf King Prawns). Either way these value propositions have been uniquely created, communicated, and promoted to existing and new consumer markets.

By contrast, underutilised east coast species have not adequately been defined, researched, innovated, described, value-added, communicated, or promoted as a value proposition to existing or new target consumers. Fishers, potentially lacking the financial capacity, expertise and motivation (relative to a risk-reward proposition), default to excessive reliance on their traditional wholesaler-controlled channel partners (cooperatives and wholesalers) to “push” the catch into the market.

It is clear from the long-term decline in domestic market demand (and harvest volume) for local east coast seafood, that Australia’s east coast urban consumers (in Sydney and Melbourne that dominate seafood demand) are increasingly choosing a competitors’ product.

Local east coast wildcatch seafood products are desirable for tourists and local economies<sup>6</sup> but for the bulk of seafood demand at markets (wholesale, monger, retail and food service markets), they are less competitive. The analysis of trade trends in the preceding discussion presents a challenging conclusion. It suggests many time-poor and price-sensitive Australian consumers (and their supermarket agents) are choosing imported or domestic farmed products over local wildcatch products. Aquaculture is an efficient competitor - Australia’s own aquaculture GVP surpassed that of wildcatch in 2017.

The complexity of consumers’ choices is a root cause for declining east coast wildcatch commercial fishery underutilisation. Seafood choice complexity leads to increased purchase risk for consumers who want to buy products that meet their expectations, every time. But the traditional wholesale value chain that services east coast underutilised species does not offer a comprehensive value proposition that derisks consumers’ choices. The supply chain does not actively engage a target cohort of consumers and inform them about the unique and attractive benefits of each product and other value-added products supplied by other supply chains. This gap is then increasingly compounded by lack of fisher capacity (human and financial) for investments with acceptable risk profiles.

### Drivers for Declining Utilisation

Drawing from industry discussion, desk research and formal published reviews, the following reasons are noted as some of the drivers of these trends and falling utilisation evident in eastern Australia.

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<sup>6</sup> The 2016 UTS Report (Voyer, et al., 2016 p. 16) highlights that 89% of NSW residents expect to eat local seafood when they visit the coast, and 76% feel that eating local seafood is an important part of their coastal holiday experience.

These drivers broadly impact fishers, cooperatives, and processors for all 11 east coast Target Underutilised Species identified in this project.

- Lack of access to capital to enable and enhance fishing capacity and efficiency,
- Poor financial returns and low viability of existing inshore wildcatch fishers and first line receivers (including cooperatives),
- Uncertain and difficult access to the fishery resource, often due to complexity or change in policy of fishery management arrangements,
- Increased competition for the resource from Recreational and Indigenous Fishers,
- Reduced access to the resource due to declarations of marine parks, reserves and non-commercial zones or reserves,
- Increasing level of red tape associated with accessing and operating a wildcatch commercial fishing license,
- Lack of access to processing infrastructure (e.g. loading docks, cold storage) and value-adding facilities that can cost-effectively transform the harvest into attractive seafood products,
- Advanced age of existing wildcatch fishers. A concern across many agrifood industries, this reduces fisher/producer motivation to invest in or adopt new practices that secure and enhance harvest and seafood supply chain quality (e.g. ice slurry use at harvest point),
- Lack of new entrants to the industry (including young people) who are motivated to establish a career in the wildcatch fishing and processing industry,
- Lack of consumer market awareness of unique consumer attributes and benefits of the target species and related seafood products,
- Lack of promotion of minor and underutilised wildcatch seafood species in domestic consumer markets,
- Large and increasing volumes of imported high-quality seafood into Australia, directly competing with local underutilised stocks,
- Rise of highly competitive local and global aquaculture systems that deliver value-added and consumer ready seafood meals along derisked supply chains (i.e. on time, on spec),
- Government and industry delays in promulgating fishery reforms that contribute to cooperative and investor uncertainty,
- The structure of existing cooperative and wholesale dominated supply chains that service minor east coast fishers.

In relation to NSW regional fishery cooperatives and related supply chains, published reviews have found these entities and chains are not well placed to remain viable and meet market impacts:

- Only nine of the 15 cooperatives existing in 2014 recorded an operating profit (GHD, 2014 p. 35),
- A 10% decline in throughput for each cooperative would result in only four remaining viable (i.e. a positive operating profit) (GHD, 2014 p. 35),
- "Rationalisation of NSW fishing cooperatives is likely to be beneficial in the longer term, particularly if it enables services to be maintained in regions where cooperatives are facing ongoing challenges to remain viable." (GHD, 2014 p. 44),

- Cooperative closures can result in a loss of competition and services in a region. However, evidence suggests that private companies or neighbouring cooperatives can evolve to service remaining fishers. A previous report (Mann Judd, 1996) recommended amalgamation of cooperatives as a means of ensuring ongoing financial viability. However, since then there have been no formal amalgamations, despite four cooperatives closing and others facing long term challenges to remain viable. (GHD, 2014 p. 43),
- Cooperatives have “a high reliance on the Sydney Fish Market (SFM), as well as wholesale, local retail and cooperative retail outlets” (GHD, 2014 p. 24). The 2016 UTS report (Voyer, et al., 2016 p. 203) estimated that SFM received 41% by weight (46% by value) of all commercial fish landed in NSW.
- Devolution of value-adding and processing outside the Sydney centric SFM chain, have the potential to provide NSW wildcatch fishers with a higher than net SFM price (Voyer, et al., 2016 p. 205).

Under these conditions, fishers (understandably) and many chain partners will not invest, are risk averse, and therefore prefer to push traditional commodity seafood at the existing customers. They are not able or motivated (based on commercial risk and reward) to develop and fund market strategies that “pull” innovative new products into new consumer markets. Review of reports and discussions with a range of stakeholders across regional east coast fisheries suggests that the existing commodity-based fresh-wholesale business model needs to diversify, and value add for the industry to rebuild and prosper. Over time this will drive increased sales for fishers, margin uplift, capital reinvestment, local employment, and higher fishery utilisation.

This report documents a range of issues, risks, and implications that impact fishers’ choice and motivation to invest time and financial capital in harvest and value-adding activity. If these issues, barriers, and causes are addressed and mitigated based on the defined competitive advantage of the east coast fisheries, then there is the potential to reverse declining fishery utilisation.

If there is no reliable data, it is impossible to make decisions to manage fisheries or develop value-adding or market initiatives. The project team has found it difficult to access and collate data for minor species, especially those for which the status is not assessed or a quota not assigned, across all relevant jurisdictions and wildcatch sectors (commercial, recreational and Indigenous). While fishery and seafood data sets are now greatly improved and accessible (e.g. [www.fish.gov.au](http://www.fish.gov.au)) many species do not yet have an established quota (Total Allowable Commercial Catch) and related data mining capabilities for all harvest jurisdictions. This is certainly the case for some species assessed in this project on the east coast.

In drawing conclusions related to the data above, the project team have resisted the temptation for “over-analysis”. Caution is required. While the available ABARES GVP estimates are in “nominal” terms, current inflation impacts are relatively low and therefore benign. However, there are many and varied dynamics at play in every fishery that drive fisher commercial motivation, harvest volume and sales value, and commercial return. For example, White Spot Disease in QLD prawn farms had a significant impact on local domestic market supply, import volumes and domestic market prices in 2017-18. And the rise of recreational fishers is having a real and direct impact on commercial Snapper (*Chrysophrys auratus*) and Bream fisheries, as noted above.

The project described in this report has used a sample of underutilised species on the east coast to investigate issues and test solutions. A more comprehensive project that enables greater engagement with fishers, supply chains, investors, and value adders, is needed to complete comprehensive fishery wide analyses, and develop strategies that drive selective east coast inshore fishery utilisation.

### 3. UNDERUTILISED SPECIES

#### A. Overview of Target Underutilised Species

The following discussion presents relevant and available summary information for the 11 Target Underutilised Species. The information has been accessed and collated from various sources including NSW Fisheries, NSWPFPA, FRDC, Commonwealth agencies, fishers, fishery cooperatives, processors, wholesalers, marketers, and bait supply partners.

#### 1. TARGET UNDERUTILISED SPECIES

##### Royal Red Prawn (*Haliporoides sibogae*)

(Image source: anima.net.au)

- Most catch taken between Ulladulla and Port Stephens, three active vessels targeting the species. 90% of CTH SESSF quota held by five fishing entities.
- Qld DAFF seafood researchers (Poole, et al., 2019) noted “the Royal Red Prawn has a clear point of difference to the majority of current commercial species of prawns.... this is not being adequately exploited by the current supply chain. If chefs could receive this prawn product in the form that they require, then the price premium they would be prepared to pay would be four to five times the current market price for Royal Red Prawns.”



##### Ribbon Fish (*Lepidopus caudatus*)

(Image source: alchetron.com)

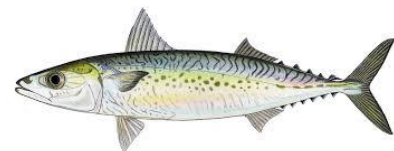
- Caught by deepwater trawlers, these fish are large (200 cm, 3 kg). Occasionally trawled in very large numbers exceeding 10 tonnes off the NSW coast.
- Species is not quotaed in any Australian jurisdiction. It is widespread on the continental shelf and slope, and around seamounts and offshore pinnacles. Commercially harvested off Newcastle NSW, and around south eastern Australia.



##### Blue Mackerel (*Scomber australasicus*)

(Image source: dpi.nsw.gov.au)

- Caught from northern NSW south and west to WA,
- Targeted in SPF, but only incidental catch in SESSF,
- Broad perception by fishermen that best use is as bait (used as both live and dead bait in domestic Tuna fisheries). This perception raises concerns among Recreational Sector fishers who target the species.



## Silver Trevally (*Pseudocaranx* spp.)

(Image source: rules.fish.gov.au)

- Silver Trevallies are a family of species that inhabit estuarine and coastal waters from northern NSW south and west to WA. They include *Pseudocaranx georgianus*, *P. sp. dentex*, *P. wright*, and *P. dinjerra*.
- *Pseudocaranx georgianus* is the dominant NSW species. It is a good quality eating fish, with an average processed yield of 35%. This species has a somewhat fishy flavour, high oiliness and dry, medium-textured flesh with fine flakes and few bones, which are easily removed.
- Also popular with recreational fishers, so there is potential risk of overfishing.



## Australian Sardine (*Sardinops sagax*)

(Image source: dpi.nsw.gov.au)

- Caught from Central QLD, south to northern TAS and west to WA (Shark Bay), the majority of the catch is derived from State waters,
- Popular as recreational fishing bait with 196 tonnes (86%) outside SFM. NSW recreational fishery demand for Australian Sardines as fishing bait exceeds local harvest supply.



## Sea Mullet (*Mugil cephalus*)

(Image source: dpi.nsw.gov.au)

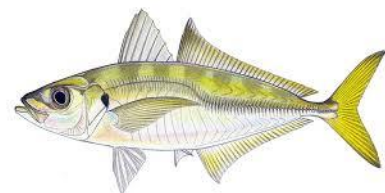
- Caught from Townsville QLD south to southern NSW,
- Flesh quality varies seasonally, with late summer through to late winter optimal. The species is typically low priced, with ocean-run fish higher priced than those caught in estuaries.



## Yellowtail Scad (*Trachurus novaezelandiae*)

(Image source: dpi.nsw.gov.au)

- Caught from southern QLD south and west to northern WA,
- Currently used at bait by tuna longline fishers in CTH Fisheries. Use as bait raises concerns among Recreational Sector fishers who target the species.



### Luderick (*Girella tricuspidata*)

(Image source: dpi.nsw.gov.au)

- Caught from shallow coastal and estuarine waters from southern QLD, down to northern TAS and across to SA,
- 80% of harvest occurs in winter.



### Catfish (*Cnidoglanis macrocephalus* & *Arius graeffei*)

Several species of Siluriformes (collectively referred to by NSW Fisheries' Reports and in this report as "Catfish") are harvested at low levels in NSW estuaries by both commercial and recreational fishers.

Four main commercial species are harvested:

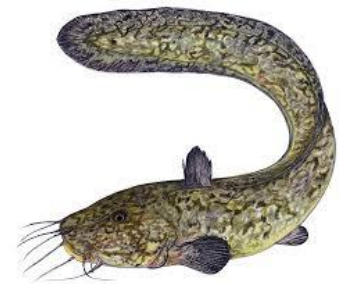
- Estuary Cobbler (*Cnidoglanis macrocephalus*) – eel tailed,
- Blue Catfish (*Arius graeffei*) – one of a number of species in the family Ariidae – fork tailed,
- Longtail Catfish (*Euristhmus lepturus*) – eel tailed,
- Striped Catfish (*Plotosus lineatus*) – eel tailed,

The 13 initial shortlist species for this project includes the two species predominantly exploited by commercial fishers – Estuary Cobbler and Blue Forktail Catfish.

#### **Estuary Cobbler** (*Cnidoglanis macrocephalus*)

(Image source: dpi.nsw.gov.au, and CSIRO)

- This eel tailed species is endemic to Australian waters and occurs along the east coast from southern QLD to southern NSW, and south and west across to southern WA.
- It inhabits estuaries and inshore coastal waters to a depth of about 30 m. and matures at about 45-50 cm in size and a weight of 2.5 kg.



#### **Blue Catfish** (*Arius graeffei*)

(Image source: dpi.nsw.gov.au, and CSIRO)

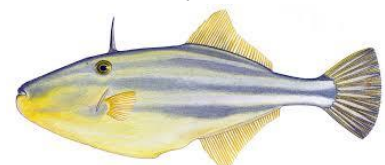
- This fork tailed species inhabits rivers, estuaries and shallow coastal waters of northern Australia and southern New Guinea. In NSW, it is only abundant in the Richmond and Clarence Rivers.
- It attains a maximum size of 50 cm and 3 kg in weight.



### Leather Jacket / Ocean Jacket (Monacanthids)

(Image source: dpi.nsw.gov.au)

- The term "Leather jacket" applies across multiple genera. It is an amalgamation of different species, including *Nelusetta*, *Thamnaconus*, and *Meuschenia*. SFM (Annual Report 2018) lists Ocean Jacket (*Nelusetta ayraudi*) as a top 20 species by volume.





- For this underutilised species project, Leather jacket is reserved as a general term, which includes the dominant commercial species Ocean Jacket illustrated.
- Stocks are found along the southern half of Australia, in NSW, SA and CTH waters.

### Gould's Squid (*Nototodarus gouldi*)

(Image source: dpiipwe.tas.gov.au)

- Caught in similar volumes by trawl (SESSF CTS) and jig (SSJF) methods from southern QLD to northern TAS and across to south-eastern WA,
- High inter-annual variability in abundance in state waters - recent low catches.



Table 8 builds on the discussion above regarding selection criteria and industry comments, to complete the baseline data of the 11 Underutilised Target Species, to include the relevant east coast jurisdiction, fishery, harvest method, SAFS sustainability rating, and the degree to which each species is shared across other wildcatch harvest sectors.

TABLE 8. TARGET UNDERUTILISED SPECIES ON EAST COAST

Species	Other names	Commercial Fishery	Harvest Method	SAFS 2018	Recreational	Indigenous		
1	Royal Red Prawn	Lack-knife Shrimp, Redspot King Prawn	NSW	OTF	Unspecified	Sustainable	Nil	n/a
			CTH	SESSF (CTS)	Otter trawl	Sustainable	Nil	n/a
			QLD	ECOTF	Otter trawl	Undefined	Nil	n/a
2	Ribbon Fish	Frost Fish, Beltfish, Scabbardfish, (not Hairtail)	CTH	SESSF (CTS & GABTS)	Trawl bycatch, Handline	Undefined	Nil	n/a
3	Blue Mackerel (Eastern)	Pacific Mackerel, Slimy Mackerel	NSW	OHF, OTF, OTLF	Purse seine	Sustainable	125,000 fish 2014	Unknown
			CTH	SESSF (CTS), SPF	Trawl	Sustainable	n/a	n/a
			VIC	OPSF	Purse seine	Sustainable	Unknown	Unknown
			TAS	SF	Unspecified	Sustainable	5.2 t. 2013	Unknown
4	Silver Trevally	Skipjack Trevally, Blurter; Ranger, Sand Trevally; Silver Bream; Skippy, Skipjack Trevally, White Trevally.	NSW	EGF; OHF, OTF; OTLF	Hook & Line, Mesh net, Haul seine, Otter trawl, Fish trap, Unspecified	Depleting	27 t. 2014	Unknown
			CTH	SESSF (CTS)	Otter trawl	Sustainable	n/a	Unknown
			VIC	CIF; GLF, OF; OPSF, PPBWPF, ITF	Hook & Line, Net	Sustainable	37 t. 2003	Unknown
			TAS	SF	Gillnet, Unspecified	Sustainable	1.9 t. 2013	Unknown
			QLD	CRFFF, ECIFFF, RRFff	Hook & Line, Net	Undefined	2 t.	Unknown
5	Australian Sardine (Eastern)	Australian Pilchard, Picton Herring, Blue-bait	NSW	OHF, OTF,	Purse seine, Net, Unspecified	Sustainable	Unknown	Unknown
			CTH	SPF, SESSF (CTS)	Danish seine, Purse seine, Otter trawl	Sustainable	n/a	Unknown
			VIC	CIF, GLBF, ITF, OPSF, PPBWPF	Purse seine, Various	Sustainable	Unknown	Unknown
6	Sea Mullet	Bully Mullet, Hardgut Mullet, Mangrove Mullet, Poddy Mullet, River Mullet	NSW	EGF, OHF	Haul seine, Net, Mesh net, Haul Seine / Beach seine, Unspecified	Sustainable	Negligible	Unknown
			QLD	ECIFFF	Net	Sustainable	Negligible	Unknown
7	Yellowtail Scad	Scad, Yellowtail, Yellowtail Horse Mackerel	NSW	OHF, OTF, OTLF	Purse seine, Otter trawl, Hook & Line, Unspecified	Sustainable	15-60 t.	Unknown
			CTH	SESSF (CTS), SPF	Purse seine, Otter trawl	Sustainable	Unknown	Unknown
			QLD	ECIFFF, FTF	Hook & Line, Danish seine, Net, Trawl	Sustainable	Unknown	Unknown
8	Luderick	Black Fish	NSW	EGF, OHF	Mesh net, Haul seine, Beach seine, Unspecified	Sustainable	150 t. 2014	Unknown
			VIC	GLF	Net	Sustainable	Unknown	Unknown
			TAS	SF	Gillnet, Unspecified	Sustainable	<0.5 t. 2010	Unknown
			QLD	ECIFFF,	Hook & Line, Net	Sustainable	Unknown	Unknown
9	Estuary Cobbler / Catfish	Catfish (Longtail, Striped, Forktail)	NSW	EGF	Mesh net, Unspecified	Undefined	Unknown	Unknown
10	Ocean Jacket	Chinaman, Chinaman Leatherjacket, Chunks, Leatherjonnies, Yellow Jacket, Yellow Leatherjacket	NSW	OTLF, OTF, OPTF, EGF	Otter trawl, Fish trap, Unspecified	Sustainable	71,000 fish 2014	Unknown
			CTH	SESSF (CTS & GABTS)	Danish seine, Otter trawl	Sustainable	Unknown	Unknown
			TAS	SF	Unspecified	Negligible	Unknown	Unknown
			VIC	CIF, GLF, OF, PPBWPF, VRLF	Hook & Line, Net, Traps & Pots	Undefined	Unknown	Unknown
11	Gould's Squid	Aero Squid, Torpedo Squid	NSW	OTF	Otter trawl	Sustainable	Unknown	Unknown
			CTH	SESSF (CTS & GABTS), SSJF	Danish seine, Otter trawl, Squid jigs	Sustainable	Unknown	Unknown
			TAS	SF	Unspecified	Sustainable	21 t. 2013	Unknown

## B. Species Group Analysis

In order to improve our understanding of their respective risks, drivers and commercial opportunities, the 11 Target Underutilised Species and related market opportunities, are analysed from a number of perspectives.

### 1. ANALYSIS BY QUOTA AND HARVEST WATERS

Target species fall into two broad classes based on their quota status: quota and non-quota.

A further segmentation suggests each class could also be split into deep water and shallow water, or offshore and inshore. But the project team believes further delineation is not practical as some species or species groups. (e.g. Jackets) are not clearly partitionable.

- |                       |  |
|-----------------------|--|
| 1. Royal Red Prawn    | quota deepwater (350-550 m) marine species in CTH waters,        |
| 2. Ribbon Fish        | non-quota marine species typically caught as bycatch,            |
| 3. Blue Mackerel      | quota high-volume marine species in eastern CTH waters,          |
| 4. Silver Trevally    | quota marine species in estuarine and coastal waters (10-230 m). |
| 5. Australian Sardine | quota high-volume marine species in CTH and NSW waters,          |
| 6. Sea Mullet         | non-quota species in estuarine, coastal and marine waters,       |
| 7. Yellow Tail Scad   | non-quota species in estuarine and coastal waters,               |
| 8. Luderick           | non-quota species in estuarine and coastal waters,               |
| 9. Cobbler/Catfish    | non-quota species in estuarine waters,                           |
| 10. Ocean Jacket      | non-quota species in estuarine and marine waters (2-250 m).      |
| 11. Gould's Squid     | quota high-volume marine species in CTH, (TAS) and state waters, |

Discussion with industry confirms that the offshore species are targeted by fishery businesses that typically have significantly more operational and financial capacity to invest in the fishery and value add to their harvest than fishing businesses operating in near shore fisheries.

### 2. STRATEGIC ANALYSIS OF COMMERCIAL POTENTIAL

Figure 2 presents baseline data drawn from Table 4, plus additional project team insights, to demonstrate the potential for volume and value enhancement for the Target Underutilised Species.

The figure maps Australia's wildcatch species production volume and value by the percentage growth in both volume and nominal value over the indicative period 2013-2017. The horizontal axis measures Harvest Volume % change, and the vertical axis measures GVP Value % change. Sphere size measures relative GVP \$'000 illustrating the relative scale of each wildcatch species by 2017 GVP.

The data is mapped into four quadrants (Q1-Q4), subject to the growth experienced by each species over the four-year term to June 2017. Target Underutilised Species are highlighted in red. Green spheres are grouped minor species "not defined" due to confidentiality or irrelevance.

Note that there may be short-term outlier events (e.g. impact of China austerity program or Coronavirus pandemic) that do not easily fit the dynamic seafood patterns summarised below.

WILDCATCH SPECIES - Nom. GVP '\$000 2017, and Growth 2013-17 by Volume & Value

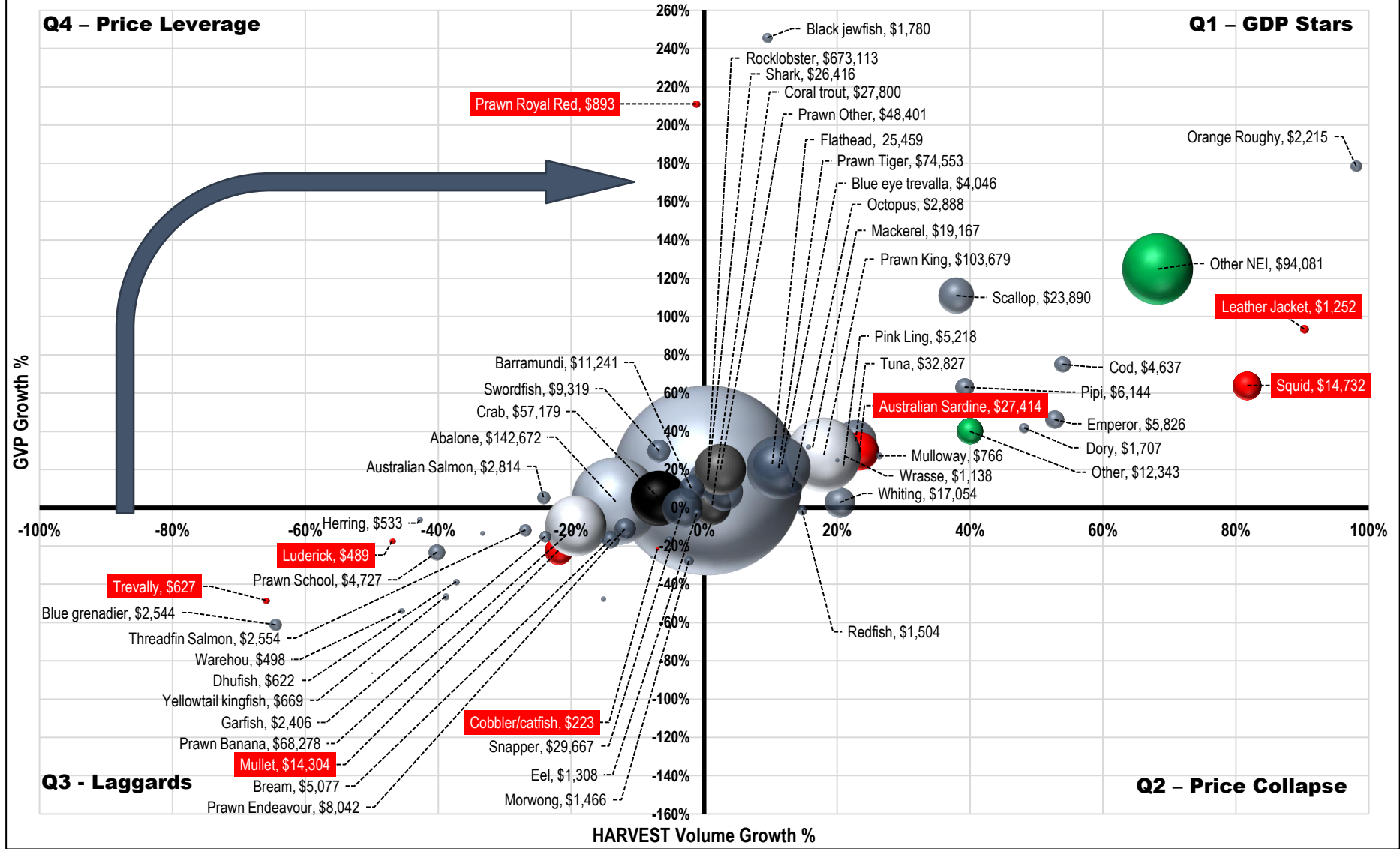


FIGURE 2. TARGET UNDERUTILISED SPECIES – STRATEGIC POTENTIAL

### Quadrant 1. – GVP Stars

In Q1, 28 species have grown in both volume and value – their performance is identified in the upper right quadrant. This is the consumer market sweet spot. These species are GVP Stars that boost fisher returns at two levels – volume and price.

Some of these species may have suffered price declines but that has been more than offset by volume increases, thereby increasing GVP. However, there is a risk for such species that ongoing harvest growth cannot viably offset price declines and margin losses. And it may well be the case that the existing markets for these species experience minimal to no growth.

Surprisingly, some species have increased harvest volumes by 40-80%, with commensurate increases in GVP. Black Jewfish is clearly driven by local price premiums for swim bladders.

In this quadrant there are also “Other NEI (not elsewhere included) Species” highlighted in green. These are categories determined by ABARES and State and Territory agencies. In the 2017, NSW wildcatch species included under this heading are Tiger Prawn (*Penaeus* spp.), Royal Red Prawn (*Haliporoides sibogae*) and Greasyback Prawn (*Trachysalambria* spp.), Balmain Bug (*Ibacus peronii*), Yabby (*Cherax destructor*), Nippers (*Trypaea* spp.), Cockle (*Katelysia scalarina*), Periwinkle (*Littorina littorea*), Whelk (*Pyrazus ebeninus*), Blue Mussel (*Mytilus edulis*), Australian Sardine, Blue Mackerel, Leatherjacket, Flathead (*Platycephalidae* spp.), Bonito (*Sarda australis*), Yellowtail Scad, Sandy Sprat (*Hyperlophus vittatus*), Tailor (*Pomatomus saltatrix*), Silver Biddy (*Gerres subfasciatus*), (*Anguilla* spp.), Beachworms (*Australonuphis* spp.) and Sea Urchin (*Echinoidea* spp.). Australian Sardines, one of the Target Underutilised Species is on this list, suggesting that the small volume of Australian Sardines harvested in NSW is protected data and not included in the \$27.414 million GVP reported by ABARES in the figure.

### Quadrant 2. – Price Collapse

In Q2, species will have an increased volume, which is overshadowed by price declines. As a result, the species has lost GVP while increasing harvest volume. This is not a good outcome.

There is only one species, Redfish (*Centroberyx affinis*), that has increased harvest volume but not increased nominal GVP over the trend period. And the GVP decline has been marginally negative.

### Quadrant 3. – Laggards

In Q3, species suffer a double whammy – decline in both the volume harvested (and sold) and the unit price achieved. Underutilised commodity species are found here.

Species that sit in this quadrant for extended periods will force their fishers, cooperatives, and supply chains into bankruptcy as returns on financial capital are permanently negative. No commercial fisher can withstand declining volume and declining price (i.e. falling GVP) in the long term. As a result, the commercial fishery for relevant species is underutilised, and ultimately not utilised.

There are 23 species highlighted, a number of which have significantly decreased harvest volume (>40%) and also recorded GVP declines (>40%). Four of these are Target Underutilised Species, highlighted in red.

### Quadrant 4. – Price Leverage

In Q4, six species have experienced falling volumes and rising GVPs. Only one of these fisheries includes a Target Underutilised Species – Royal Red Prawn. Note that for NSW data, this species is included as a NEI species (see Quadrant 1) and data is protected.

Species in the quadrant have increased GVP on the back of an attractive value proposition and consumer acceptance that has lifted prices, even though volume has fallen. Any fall in harvest volume has been more than compensated for, by understanding the customer and increasing the value (and price) of the product to them. GVP has increased as a result.

This quadrant will typically register wildcatch species that are directly competing with aquaculture (e.g. Prawn, Abalone, Barramundi) as they forego sales volume but lift price through a product differentiation strategy in their chosen market segments.

For species in Q4, if their strategy is fully achieved over time, they will keep prices up but also rebuild harvest volume to a new customer cohort that values their wildcatch product more than farmed product. This will enable a transition to from Q4 to Q1.

## Implications

Q1 & Q3 dominate by number of species and spread across the chart because wildcatch seafood is a commodity activity. When underutilised TACCs exist the easiest way to boost GVP for a commodity product is to increase fisher effort and harvest volume. As a sole trader or small fisher business it is far harder to lift prices on a permanent basis - this requires a customer who values your enhanced consumer value proposition. Accordingly, the clear trend evident in the chart is for wildcatch species to closely align with the volume axis (along the horizontal X axis) rather than the value axis (vertical axis). The visible and dramatic exceptions to this trend are the two seafood products which have grown GVP strongly based on market appeal and price, rather than volume growth (Royal Red Prawns and Black Jewfish). If the data for Rocklobster species (Tropical, Eastern Western, and Southern) was disaggregated there may be similar value driven evidence for some of them as well.

Q1 is the seafood consumer market sweet spot or Goal, where price and volume increase. But strategies to get there differ by quadrant and by species. Strategies to boost utilisation of Royal Red Prawns (a premium niche in global prawn markets) are different to strategies required for Gould's Squid (a global commodity), and for Silver Trevally (an underrated fully-fished local species with sashimi potential).

In Q1, both Australian Sardines and Gould's Squid have large unfished TACCs conservatively estimated (per Table 9) at 5,000 tonnes and 700 tonnes respectively. But both species need supply chain technology and capacity to value-add the harvest for new food-service consumers. Transitioning and repositioning Australian Sardines away from the bait market to a value-added seafood consumer would be a good first step.

Leather Jackets (i.e. Ocean Jackets) are more complex. Review of the national harvest data confirms that the harvest has recovered in the last four years back to a decade average of ~900 tonnes. However, the NSW catch continues a long-term decline since 2010 down from 600 tonnes to 227 tonnes. The relatively modest rise in SFM wholesale prices over this period suggests there is no scarcity of product in SFM and supply is being sourced from non-NSW fisheries.

In Q3, most species need strategies to reposition commodity products into higher margin consumer markets, and then build harvest and supply chain capacity and investment in volume. This pathway to Q4 and then Q1 (as per arrow shown) will drive up GVP via price first and then increase volume.

Silver Trevally is a good example species for an approach to increase GVP in this way. A good eating fish with soft flesh, the management of its harvest quality is critical to price and margin optimisation. The best quality results from trapping (~\$15/kg beach price) rather than trawling (\$4/kg) using purse seine or Danish seine methods. Ikijimi slaughter will also improve eating quality and push prices and margins up further. Regardless of the harvest method a fish must be immersed in ice slurry immediately it is landed and despatched, in order for quality to be improved. Strategies that control

the harvest, preserve eating qualities, and focus on premium consumer outlets will create greater returns to fishers who are prepared to put in the effort.

The wildcatch prawn industry in Australia is currently in a transition as domestic prawn aquaculture quickly builds from 5,000 tonnes to 20,000 tonnes, a similar volume to wildcatch. Wild catch prawns cannot lift harvest volume (due to TACC limits) so they must lift prices to achieve real growth. This can be done by segmenting (i.e. species are increasingly branded and marketed independently – e.g. Eastern King, Royal Red, Scarlet, Tiger) and differentiating their unique wildcatch market attributes (colour, size, taste, season and provenance). Their respective value propositions must also tell the wonderful story of Australian wildcatch prawns, a unique and appealing story from pristine ocean to target consumer. Figure 2 shows that some Prawn species (Tiger and King in Q1; and Royal Red in Q4) are leveraging higher prices more successfully than others large volume species (e.g. Banana and Endeavour in Q3) which are still considered commodities.

Mullet is a real commodity fish (high volumes, low prices) harvested with minimal investment in grading by gender or seasonality. Such grading (advocated by many respondents) would ensure consistent landed quality to attract a higher value consumer market. Luderick displays similar characteristics, but with far lesser volume. Its average harvest volume (excluding any confidential catch withheld by agencies) has fallen 50% in NSW since 2015. Consultation with industry leaders confirms a market relationship between wildcatch and aquaculture finfish, that may assist development of Sea mullet and Luderick. Boom-bust cycles in the wildcatch underutilised finfish fishery presents challenges for fishers, supply chains and markets. Markets invest to create attractive consumer offers (for a specific underutilised species) and then need harvest supply on a consistent and regular basis to monetise that offer. Historically fishers have often been unable to commit to ongoing supply for a range of reasons (lack of capital, seasonality of harvest, etc). As a result, the opportunity to leverage underutilised species is often lost and the market opportunity unfulfilled. Cryo-vac seafood technologies offer a means to overcome seasonality or fishery limitations by harvesting and holding when available for later release to marketers as required. Cryo-vac odourless smoking processes would be an option for species such as Mullet and Luderick. A further dynamic has been demonstrated by the recent emergence of farmed Kingfish as a mainstream consumer aquaculture species. It was not until proximate aquaculture came along and created a consistent year-round kingfish supply to restaurants that the wildcatch Kingfish prices also improved, product became more sought, and harvests increased. Not all underutilised species are candidates for farming, but “harvest and hold” technologies may create enable some species to move from Q3 to Q4.

NSW harvest records for Estuary Cobbler and Catfish are not available to the project team due to confidentiality reasons, making any strategic analyses and assessment impossible. The current harvest for this species is very limited at around 30 tonnes.

Blue Grenadier (*Macruronus novaezelandiae*; known as Hoki in NZ, where it is a major fishery) is listed in Q3. This species is also a candidate for increased seafood utilisation. Recent AFMA Catchwatch Report (31 March 2020) data confirms the available uncaught volume is 6,300 tonnes (51% of TACC). Development of the species in eastern Australia using approaches that have been successful in NZ, are constrained by lack of both vessel capacity and onshore processing capacity. However, the most recent team discussions with Industry leaders confirm that specialised NZ vessels are now retained to harvest Blue Grenadier in south east Australian waters for landing and marketing through Australian ports.

Many Q4 wildcatch species compete directly with low cost global and local aquafarms (e. g. Prawns, Barramundi, Abalone) and must differentiate their in-market offer to consumers in order to decouple from the commodity price base. Yellowtail Kingfish (*Seriola lalandi*) (Q3) is a recent example of an undervalued wildcatch species that is now farmed.

## 4. Results from Consultation and Analysis

This chapter summarises the results of the project desk research, consultation and analyses.

In summary, the opportunity exists to pursue two pathways to boost fisher returns:

- Identify those underutilised species with documented market potential and commercial backing. Develop comprehensive value propositions for related value-added products.
- Develop supply, products and chains to markets beyond urban wholesale markets. This will diversify risks for fishers / partners, increase local employment and increase fishery utilisation.

Table 9 presents summary data for the 11 Target Underutilised Species. Project team analysis found that the species fell into three groups subject to commercial attractiveness and potential for market development. The report discusses them further in the following sections.

TABLE 9. SUMMARY OF CONCLUSIONS BY TARGET UNDERUTILISED SPECIES

Underutilised Target Species	Additional Volume Available tonnes	Est. Beach Price Achievable \$/kg	Est. Yield and Value-added Gain \$m	Project Objectives - Demonstration Outcome	Project Commercial Attractiveness Rating	
Group A	a. Royal Red Prawn	300 t.	\$20.00	\$6 m	Trial to proceed in 2019-20 Yield demonstrated Value-added options demonstrated	High
	b. Australian Sardine	5,000 t.	\$3.40	\$17 m	Investor considering trial in 2019-20 Yield demonstrated Value-added options demonstrated	High
	c. Gould's Squid	700 t.	\$3.50	\$2.45 m	Investor considering trial in 2018-20 Yield demonstrated Value-added options demonstrated	High
Group B	d. Silver Trevally	350 t.	\$15.00	\$5.25 m	No trial established - but very attractive Yield demonstrated Value-added options demonstrated	High
	e. Blue Mackerel	8,400 t.	\$5.00	\$42 m	No trial established Yield demonstrated No value-added options demonstrated	Moderate
	f. Yellowtail Scad	500 t.	\$7.00	\$3.5 m	No trial established Yield demonstrated No value-added options demonstrated	Moderate
	g. Luderick	350 t.	\$10.00	\$3.5 m	No trial established Yield demonstrated No value-added options demonstrated	Moderate
	h. Ocean Jacket	450 t.	\$7.00	\$3.15 m	No trial established Yield demonstrated No value-added options demonstrated	Moderate
	i. Sea Mullet	500 t.	\$4.00	\$2.0 m	No trial established Yield demonstrated No value-added options demonstrated	Moderate
Group C	j. Ribbon Fish	50 t.	\$10.00	\$0.5 m	No trial established Yield demonstrated No value-added options demonstrated	Moderate - Indeterminant
	k. Cobbler / Catfish	No data	No data	Unknown	No trial established No yield demonstrated No value-added options demonstrated	Low - indeterminant
<b>Total</b>	<b>16,600 t.</b>		<b>\$85.4 m</b>			



## A. Classifications

### **Group A - High potential.**

Three species attracted commercial partner investment, and offer value-adding potential and strong market appeal:

- Royal Red Prawn,
- Australian Sardine,
- Gould's Squid.

### **Group B - Moderate potential:**

Six commercial species offer attractive commercial returns that could be tested under trials but failed to attract sufficient support from fisher-processor-investors during the project.

- Silver Trevally (line and trap landings of this species offer High Potential as in Group A),
- Blue Mackerel,
- Yellowtail Scad,
- Luderick,
- Leather Jacket / Ocean Jacket,
- Sea Mullet.

### **Group C – Limited or unknown potential:**

Two commercial species have not been assessed for value-adding potential as there is insufficient commercial support or data available from agencies, fishers, supply chain partners or market sources to assess this potential.

- Ribbon Fish,
- Estuary Cobbler / Catfish.

For each species, the summary of relevant results is discussed under four common headings, (following relevant introductory data and comments from industry stakeholder).

#### *1. Why the Species is Underutilised*

There are many causes contributing to seafood species underutilisation (refer to introductory comments above, and to (Stephens, L, 2018). Causes directly relate to the species in the fishery, and indirectly to the capacity of fishers, processors and supply chains.

#### *2. Opportunities to Boost Fisher Returns*

The profit margin received by wildcatch fishers per kilo of fish harvested must increase if their businesses are to survive, reinvest and continue to deliver seafood. Fortunately, there is real potential to achieve this through a number of pathways, including altering supply chain dynamics, offering diverse fresh and value-added product forms, and raising consumers' awareness of the benefits of local wild caught species. Wildcatch fishers create food from a variety of wild species in sustainable natural environments. These are great attributes that many modern seafood consumers value, want, seek out, and will pay premium prices for. This journey is different for every species, with some having better and more advanced prospects than others.

### 3. Barriers to Boosting Returns

Many of the potential opportunities to boost fisher returns also have inherent issues and barriers (many of those are listed earlier in this report), and are often species or operation specific, which need to be addressed to unlock this potential. Taking a closer look at the real operational problems facing each species is therefore required to understand what the barrier(s) are and means to overcome them.

### 4. Value of Underutilised Resource

This report analyses and estimates the current and potential commercial value for each Target Underutilised Species (mostly at the beach, and a little downstream). The potential value might be added if the proposed change(s) are made to the harvest and supply chain. It is intended that these estimated gains might be used to inform subsequent investment decisions that seek to capture this value in these Target Underutilised Species – i.e. is it worth pursuing?

### 5. Conclusion

Based on the discussion under these four classifications above, the project team assesses and ranks each species and its value creation prospects on a case by case basis.

## B. Analyses by Species

### GROUP A – HIGH POTENTIAL

#### 1. Royal Red Prawn

In 2017-18 the project team and partners developed a confidential pilot trial concept for harvest, snap freezing on board, and export to Asia. However, these plans were stalled awaiting the outcome of NSW-Commonwealth fishery regulatory reviews.

In the last few months (as of February 2020), changes to fishery regulations have been made in Commonwealth and eastern state waters that now clarify new and existing quotas and enable license holders for pelagic species to harvest with greater confidence. With these fishery management changes now in place the latest advice from the project team's fishery partners confirms that the pilot export trial for this species will proceed in the next 6 to 12 months (now delayed by the impacts of the Covid19 pandemic). However, the details and outcomes will not be made available to the project team.

Desk research and industry consultation reveal that:

- One harvest shot can yield 20 tonnes: 10% as high-grade sashimi @ \$20/kg + 90% @ \$12/kg,
- Discards of bycatch were ~1.9 tonnes per annum for 2013-16 seasons,
- Catch is constrained by lack of both processing plants and consumer demand. Unlike most prawn species, Royal Red Prawns are rarely cooked at sea. They are sometimes frozen at sea, but mostly they are just chilled and, once ashore, processed into frozen prawn meat.
- Harvest quality needs to rise – snap freeze trials are being undertaken on vessels. Product must be snap frozen at harvest due to the high activity of the PPO enzyme (Polyphenoloxidase), and its ability to induce melanosis (blackening of the cephalothorax) even at subzero temperatures,
- Average processed yield (head off) is 45%. This species has a mild flavour, low-medium oiliness and moist, soft flesh, which is pink even when raw.
- Royal Red Prawn license holders tend to hold multi-species licences and move between fisheries subject to viable returns. The fishery has traditionally been and remains an

opportunistic or swing fishery, operated only when other fisheries cannot access viable catches. The fishery reflects this pattern with catch rates reducing from 600 t. in 1983-84 to ~207 t. in 2016.

Project team analysis of available production and GVP data and related project estimates for the species, are summarised as follows:

TABLE 10. ROYAL RED PRAWNS - GVP AND LANDED PRICE TREND DATA (ABARES AND ESTIMATES)

	YEJune	2014	2015	2016	2017	2018	
<u>Production Tonnes</u>							
NSW	Estimate	10	16	24	45	10	
CTH	CTS, GABTS	ABARES	178	156	183	169	222
VIC	Estimate	0	0	0	0	0	
	<b>Total</b>	<b>188</b>	<b>172</b>	<b>207</b>	<b>214</b>	<b>232</b>	
<u>GVP \$'000</u>							
NSW	Estimate	17	33	40	32	32	
CTH	CTS, GABTS	ABARES	287	520	689	893	750
VIC	Estimate	0	0	0	0	0	
	<b>Total</b>	<b>304</b>	<b>553</b>	<b>729</b>	<b>925</b>	<b>782</b>	
<u>Indicative Nominal Landed Price \$/kg</u>		<b>\$1.62</b>	<b>\$3.22</b>	<b>\$3.52</b>	<b>\$4.32</b>	<b>\$3.37</b>	

The table data suggests the landed average nominal price per kilogram for Royal Red Prawns in 2018 was approximately \$3.37/kg. (\$782,000 / 232,000).

#### *Why the Species is Underutilised*

As noted above the species is not processed or handled at sea. Improved snap freezing processes are being developed by leading fishers, but the species quality is not currently preserved by snap freezing or cooking at sea.

The level of Australian trade in Royal Red Prawns cannot be determined from any datasets (FAO, ABS or ABARES), but is assumed to be negligible.

A deepwater species, Royal Red Prawns have typically been a swing target, only fished when prices for other mainstream seafood species were low. Prior to recent value-adding research completed by QDAFF (Poole, et al., 2019) specific to Royal Red Prawns, consumer market awareness of the attractiveness of the species was relatively low. Project team discussion with specialist east coast fishers (February 2020) and large seafood wholesalers in Melbourne (March 2020) confirms growing niche market interest in premium gourmet prawns harvested in eastern Australian waters, including<sup>7</sup>

<sup>7</sup> Harvest and trade in these species are currently subject to limited term approval under the Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act).

Royal Red Prawns, Giant Scarlett Prawns (*Aristaeopsis edwardsiana*) and Giant Red Prawns (*Ariseomorpha foliacea*).

### *Opportunities to Boost Fisher Returns*

Opportunity exists for Royal Red Prawn to be a sashimi prawn in local Five Star and northern hemisphere premium markets. The current harvest volume is small at 200 tonnes, but the addition of another 300 tonne currently uncaught will enable a commercially viable supply chain to domestic and export markets.

Woolworths Supermarkets chain currently offers a 300 gram retail pack of Royal Red Prawn meat (illustrated) at \$12.00 (equivalent to \$40/kg). The product is described<sup>8</sup> by the retailer as “succulent and full-flavoured prawn caught around the beautiful coastline of Australia. The Royal Red Prawn meat (which is naturally low in fat) is snap frozen to capture and maintain its flavour. The pack statement confirms the ingredients as Royal Red Prawn Meat, water and salt added, Preservative (222, 223)”



As an export product, the harvest and supply chain risks are relatively high and currently uncontrollable (e.g. currency volatility). While Japan will pay for the right premium seafood product, current Australian seafood standards (even at higher end sashimi level) are well below those in Japanese seafood markets. The best market strategy is therefore to develop the product supply and quality for the premium end of the domestic market.

Market development should commence trials (<100 kg) that snap freeze onboard at harvest to sort, pack, grade, size and then go to market. Normally product is served head-on, tail-on with centre meat peeled and deveined. Every prawn will need to present perfectly – e.g. be intact, clear colour, and with all feelers and legs.

Key trial partners will fish, freeze on board, pack off an agreed trial volume, then if accepted, work out an approximate boat sell price, and find a seafood merchandising company to store, distribute, and document the trial results. The trial would convert the best catch to sashimi, then review and build a volume marketing plan based on selected specifications for meat quality, soft and broken prawns, etc.

The trial should consider bringing together mutual investment interests in the hands of the main license holders for Royal Red Prawns (this approach was considered a longer-term objective of the project team). The high concentration (91% of CTH SESSF quota held by five family entities) of Royal Red Prawn fishery licences suggest it would be possible to develop a collaborative co-investment project to drive value supply chain quality improvements and investment in value-adding. The ownership and concentration of licences in state Royal Red Prawn fishery jurisdictions is not published or known.

Once the product development is satisfactorily advanced, a brand and selling strategy needs to be designed and implemented targeting selected consumer markets (e.g. premium hotels and food service). Harvest volume can then be expanded to fill these selected premium product supply chains.

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<sup>8</sup> <https://www.woolworths.com.au/shop/productdetails/744635/raw-prawn-meat>

Initial value-added supply chain gross margin analysis drafted by the project indicates that this sashimi Royal Red Prawn product has the potential to achieve an attractive commercial return on investment to fisher-processors, thereby driving optimal use of the unharvested TACC.

### *Barriers to Boosting Returns*

The main barriers to boosting fisher returns from this species are:

- Poor management of harvest to enable and promote optimum seafood quality, lack of onboard snap-freezing to -40°C, and limited product grading, resulting in lower average outturn quality and reduced market prices,
- Low awareness of the product in premium market segments.

### *Value of Underutilised Resource*

The development proposed above has the potential to add 300 tonnes per year to east coast Royal Red Prawn harvests that have collectively produced an average of 217 tonnes per year over the last three years.

The estimated landed value of this underutilised resource (i.e. GVP increase) is \$6.0 million, based on an estimated beach price of \$20/kg<sup>9</sup> for a current underutilised annual harvest volume in the order of 300 tonnes.

Leveraging the value add on the existing 217 tonnes will add further GVP gains not included in these estimates.

Current Avg. Annual Catch 2016-18	Est. Current Annual Value 2016-18	Est. Additional Catch/Yr	Est. Additional Catch Avg \$/kg	Est. Additional Value/Yr
217 tonnes	\$0.81 million	300 tonnes	\$20.00	\$6 million

### *Conclusion*

The project has demonstrated the potential volume yield and value-added formats for Royal Red Prawn. This project rates the commercial attractiveness of this underutilised species as “High”.

## 2. Australian Sardine

The project team has undertaken several meetings with major NSW based quota holders and processors for this species. These entities currently harvest for both bait and human consumption markets. The east coast quota for the species is held by many fishers including fisher-processors based in NSW who control quota in both CTH and NSW waters.

Project team discussion with existing Australian Sardine fisher-processor-investors confirms their keen interest to develop value-adding opportunities and facilities based on integrated control of their quota-harvest-landing-processing-grading-packaging-logistics, to domestic commodity and consumer markets. Shifting harvest volume out of the bait markets into higher value human consumption markets has long been and remains a key strategy across all Australian fisheries of this species.

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<sup>9</sup> Price average drawn from a leading urban Royal Red Prawn fisher/processor, and (Poole, et al., 2019 p. 56)

Desk research and industry consultation reveal that the extent of the developments today.

Current consumer supply of Australian Sardine products is primarily in frozen 15 kg boxes, which is not convenient to consumers (as compared to 4 kg packs). These smaller, more consumer-friendly packs might be able to secure a high \$ per kg return.

Average processed yield is 42%. This species has a strong flavour, and medium oiliness. Smaller fish are considered better eating than larger ones.

Some large fishers are keen to invest in Australian Sardine value-adding but face current fishery policy/management and operational risks. A summary of previous interstate efforts to improve returns from Australian Sardines is informative:

- While the mean size of an individual Australian Sardine varies from stock to stock (Doubell, 2013), initial processing research has been undertaken by FRDC and the Seafood CRC with other Western Australian and South Australian Sardine fishers (Musgrove, et al., 2006), (Howieson, 2009), (Howieson, 2010).
- WA's Cape Le Grande Australian Sardines and Catalano Seafoods worked with the SCRC to create and market raw, frozen sardine fillets and lemon-flavoured, panko-crumbed frozen fillets to chefs in WA and cafes in Sydney and Melbourne. Harvested via purse seine nets and pumped straight from the net into an ice slurry, sardines are filleted on an imported (from Sweden) filleting machine at 0°C before being put into a blast chiller. Seafood products and market support includes:
  - Following these value adding initiatives, the seafood consumer market now offers a range of WA Australian Sardine consumer retail or food service products including crumbed, raw head off, and marinated or preserved. The products illustrated are variously available from Direct Seafood (Perth), Mendolia Seafood (Perth), and Clamms Seafood (Melbourne).<sup>10</sup>
  - Raw frozen fillets sold in 200 or 500 gram retail trays, and a 4 kg carton (eight 500-gram trays),
  - Crumbed fillets sold in 5 kg packs, providing portion control for restaurant kitchens. There are two crumbed products: one is flash fried, which allows for either oven frying, pan frying or grilling, while a different crumbed offering allows for deep frying. This easy-to-cook crumbed product is very popular with cafes, while the raw fillets appeal to creative chefs in high-end restaurants.



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<sup>10</sup> 1. Image crumbed cooked unpacked sardine fillets Fremantle Sardine Fillets – Direct Seafood O'Connor, Perth WA. <https://www.directseafoodsoconnor.com.au/.../fremantle-sardine-fillets> on 15 July 2020.  
2. Images of consumer sardine packs from Mendolia Seafoods, WA <https://www.mendoliaseafoods.com.au/products> on 15 July 2020  
3. Image of Albany Sardines pack: Clamms Seafood <https://clamms.com.au/product/albany-sardines-frozen-fillets-200g/> on 17 July 2020.

- The Albany Sardines fillet pack offers a vacuum pack (200 grams) of wild caught WA seafood for \$7.95 CIF (equivalent to \$39.75/kg). Prices for other products are not available via the website.



- In-store promotions have been very successful in raising awareness and demand.

Market feedback confirmed that consumers are still coming to grips with the oilier, strong flavour, the small bones and the traditional perception of the canned sardine variety.

### Why the Species is Underutilised

In global terms, Sardines / Pilchards are a global seafood commodity traded as frozen, and prepared and preserved seafood. While the species and product formats are difficult to split out in the data, the FAO (Fisheries and Aquaculture Information and Statistics Branch, 08/04/2020), and ABS (ABS Cat. 5465.0 08/04/2020) report the following trends:



- In 2016 global production of Sardines (*Sardinella spp.* and *Sardina Pilchardus*) totalled 3.6 MMT. These two species are in the top 11 global wildcatch species by volume. (FAO),
- Global exports of Sardines have fallen 43% during 2010 – 2017 from 708,000 tonnes to 403,000, (FAO),
- Exports from Australia have been negligible since 2010, but have increased to ~500 tonnes per year since mid 2018 in response to the weaker AUD (ABS),
- Imports to Australia are relatively stable at ~4,800 tonnes per year, the bulk of which is Prepared or Preserved product (ABS).

In Australia, SA manages a large Australian Sardine Fishery (40,000 tonnes, GVP \$25 m., 100% in state waters) which is clearly highly utilised. The market for this fishery is local feed input to Southern Bluefin Tuna aquaculture farms. By contrast, the east coast Australian Sardine fishery:

- Is small at 4000-5000 tonnes, and spread across a larger marine geography, with multiple jurisdictions, and multiple fisheries. Fisher costs for multiple licences are therefore relatively high for what is currently a commodity species with an animal feed price base. Industry advice is that most of the harvest is caught in state waters.
- East coast fishers currently default to bait markets to dispose of much of their harvest. This confirms the low-value commodity producer-push model for the existing NSW fishers. This outcome contributes to the broadly held consumer understanding and perception that sardines are a bait fish, and not desirable as seafood.
- Sardine fishers servicing the human consumption seafood market must also compete against imports of prepared and preserved sardines (4,867 tonnes in 2017) with a customs value of ~\$27 million.

- For NSW Sardine fishers, the fishery policy and structural adjustment process underway since 2012 (NSW Government Independent Review 2012) has created significant but transitional new capital risks for any new investment by commercial entities. The formal process culminated in June 2018 with declarations of NSW quotas for Australian Sardines, Blue Mackerel and Yellowtail Scad fishers by the IPA (McPhee, et al., 2018). The TACC set for Australian Sardines was 2,744 tonnes, well above the prevailing annual NSW harvest of ~60 tonnes.

Moreover, catches for the species are characterised as being highly variable, and at large volumes that require considerable infrastructure (which is lacking) to ensure eating quality is optimised.

Project team analysis of available production data and related project estimates for the species, are summarised in the following table. Production data is difficult to confirm as there are a number of fishery supply chains for the species across state and commonwealth waters. Some data is protected and not published. The GVP data is not included as the project team believes any estimate will be misleading due to landed price uncertainty for the range of fresh and processed sardine products, significant imported volumes of preserved and prepared product, as well as the value of the dominant SA bait fishery. Indicative nominal prices have not been calculated for that reason.

TABLE 11. AUSTRALIAN SARDINES – PRODUCTION TREND DATA (ABARES AND ESTIMATES)

			YEJune	2014	2015	2016	2017	2018
<u>Production Tonnes</u>								
NSW	OHF	ABARES		50	63	60	47	445
CTH	SPF	ABARES		100	161	118	140	102
	SESSF	Estimate		1	1	1	1	1
VIC		ABARES		1,076	863	1,524	2,344	2
SA		ABARES		33,197	36,020	41,103	39,745	40,630
WA		ABARES		1,516	1,763	2,161	2,062	1,932
<b>Total</b>				<b>35,940</b>	<b>38,871</b>	<b>44,967</b>	<b>44,339</b>	<b>43,112</b>
<u>Imported product</u>	Prepared & Preserved	ABARES		4,169	4,194	3,957	4,867	unknown

Australian Sardine has been underutilised in Australian fisheries because it competes directly with a globally traded Sardine / Pilchard commodity, Australia is an open trading economy, and landed costs for wildcatch Sardine fisheries in Australia are high relative to imported product prices, especially so in eastern Australian waters. In addition, the eastern Australian industry has limited processing infrastructure or capacity to value add, although there are enterprises that are now considering such investment.

#### *Opportunities to Boost Fisher Returns*

Global and Australian trade trends in Sardines noted in discussion above suggest an opportunity for Australian import replacement using value-added consumer products (other than prepared and preserved) in Australian markets.

At the domestic production level, opportunity exists for east coast Australian Sardines to be a seafood value-added product targeting domestic consumer markets with small packs of value-added product, at retail and food service outlets. Such an approach (reflecting the research noted above in SA and WA) will transition most of the east coast harvest away from bulk frozen packs (15 kg) of bait and



unprocessed seafood to higher value markets seeking consumer-ready retail and foodservice packs (2-4 kg packs).

A trial should consider bringing together mutual investment interests in the hands of the main license holders for Australian Sardines. The high concentration (91% of CTH SPF quota held by three entities) of Australian Sardine fishery licences suggest it would be possible to develop a collaborative co-investment project to drive value supply chain quality improvements and investment in value-adding. The ownership and concentration of licences in other Australian Sardine fishery jurisdictions is not published or known.

Initial value-added supply chain gross margin analysis drafted by the project indicates that the development of human consumption markets for value-added Australian Sardines will achieve an attractive commercial return on investment to fisher-processors. This will drive the optimal and increased utilisation of the unharvested TACC.

### *Barriers to Boosting Returns*

Leading fishers advise that recent joint east coast government policy changes, over the long term, will derisk potential private investment in seafood value-adding capacity.

Stephens (Stephens, L, 2018) notes that a 2008 FRDC Projects (2008-717 'Flow ice technology for sardines' and 2010-774 'Successful Sardines: Post Harvest Optimisation and New Product Development for Human Consumption') did not lead to any improved commercial outcomes, citing insufficient skills and erratic fish supply as barriers.

Other barriers to be resolved include:

- Lack of large fishing vessels with onboard freezing and processing facilities to fish the bulk of the quota,
- Consumer perceptions that sardines are cat food, and not desirable for human consumption,
- Slow uptake of Sardine seafood product development, including concepts discussed above (marinated local sardine, frozen sardine fillets and lemon-flavoured, panko-crumbed frozen fillets),
- Poor management of the Australian Sardine quality chain from water to market. Improvements are needed in order to optimise outturn quality. This research has been well progressed in WA and SA as noted above but needs to be focussed on any specific benefits or difficulties with NSW harvested product.
- Lack of investment support for proponent investors to undertake business and investment planning,
- Limited engagement with and endorsement by NSW regional and state politicians and bureaucrats, cooperatives and existing supply chain managers regarding the shared benefits of regional investment in seafood processing,
- Low consumer and market awareness of the attractive seafood attributes of NSW harvested Australian Sardines. This needs to be boosted through in-store promotions, supply chain engagement, etc.

### *Value of Underutilised Resource*

The development proposed above has the potential to add 5,000 tonnes per year to east coast Australian Sardine harvests that have collectively produced an average of 1,595 tonnes per year over the last three years.

The estimated east coast Australian Sardine GVP increase is up to \$17 million based on integrated value-added prices in the order of \$3.40/kg with an annual underutilised harvest volume of 5,000 tonnes.

Leveraging the value add on the existing 1,595 tonnes will add further GVP gains not included in these estimates.

Current Avg. Annual Catch 2016-18	Est. Current Annual Value 2016-18	Est. Additional Catch/Yr	Est. Additional Catch Avg \$/kg	Est. Additional Value/Yr
1,595 tonnes	\$2.13 million	5,000 tonnes	\$3.40	\$17 million

### Conclusion

The project has demonstrated the potential for both volume yield and value-added formats for Australian Sardines.

This project rates the commercial attractiveness of this underutilised species as "High".

### 3. Gould's Squid

The project team attended a Melbourne workshop (3 Nov. 2017) convened by the Squid industry and met with a number of leading trawl and jig fishers.

As a result of this meeting the project team engaged privately face-to-face with a number of quota holder-fisher-processor-investors who also had interests in squid value-adding and exporting. Several confidential discussions were undertaken where individual enterprises were developing concepts for integrated supply chain harvest, processing, and consumer product value-adding. A large China based seafood importer and a major Australian supermarket chain were engaged in the discussion. Product development options included high-quality ready-to-eat Gould's Squid for consumer markets in Australia and overseas, and dried Gould's Squid products for marketing in Asian tourist "high-traffic" outlets.

Desk research and industry consultation reveal that:

- Gould's Squid is harvested as a target species in the jig CTH SSJF in Bass Strait and is a regular by-product species in the trawl SESSF CTS. Consequently, dual licensed vessels tend to fish TAS waters in summer before returning to the SESSF.
- Optimum harvest is late summer to early autumn (peak in March). Best harvest quality is achieved prior to spawning (May-June) - postspawn quality decreases significantly,
- Modern vessels in the SSJF and SESSF CTS fleets do not have onboard freezing and need to stay near port to unload. In the 1970s, vessels did have onboard freezers and catches were much bigger (7,914 tonnes in 1980),
- There is current shortage of squid globally – Australian fishers must focus on quality and price,
- The current regional squid processing capacity is small and therefore limit supply chain and market volumes and awareness of the product,
- For best quality fishers must reduce catch temperature immediately at harvest. Jig harvested quality is much better than trawl quality, although average landed value per kilogram is not significantly different.
- Catch is currently processed into 'tubes' and frozen, with technologies available to dry whole squid, and produce dried squid chips,

- Gould's Squid has recorded a 47% increasing in commercial contribution to SFM sales:
  - 2017 - 150 t. @\$3.52/kg = \$528,000,
  - 2018 - 211 t. @\$3.71/kg = \$783,000.
- This species has been a major and rising wholesale product at SFM, but a lesser volume was wholesaled in 2019. The 2019 SFM report does not rank the product in its Top 20 traded species, and so is not publicly reported.

Project team analysis of available production data and related project estimates for the species, are summarised in the following table.

TABLE 12. GOULD'S SQUID – GVP \$'000 AND LANDED PRICE TREND DATA (ABARES AND ESTIMATES)

YEJune			2014	2015	2016	2017	2018
<u>Production Tonnes</u>							
NSW	OTF	Estimates	Unknown	10	10	10	8
CTH	SESSF CTS	ABARES	Unknown	455	527	553	569
	SSJF	ABARES	Unknown	330	385	206	213
TAS		ABARES	Unknown	31	325	176	315
<b>Total</b>				<b>826</b>	<b>1,247</b>	<b>945</b>	<b>1,105</b>
<u>GVP \$'000</u>							
NSW	OTF	Estimates	Unknown	27	26	27	21
CTH	SESSF CTS	ABARES	Unknown	1,247	1,403	1,538	Unknown
	SSJF	ABARES	Unknown	891	1,035	572	Unknown
TAS		Estimate	Unknown	84	1,118	488	Unknown
<b>Total</b>				<b>\$2,249</b>	<b>\$3,582</b>	<b>\$2,625</b>	
<u>Indicative Nominal Landed Price \$/kg</u>				<b>\$2.72</b>	<b>\$2.87</b>	<b>\$2.78</b>	

The table data suggests the landed average nominal price per kilogram for Gould's Squid in 2017 was approximately \$2.78/kg. (\$2,625 / 945).

#### *Why the Species is Underutilised*

Squids, Cuttlefish and Octopuses comprised a modest 3.8% of global seafood trade in 2016. China, Peru and India were the top exporters (FAO, 2018) while Japan, USA, Spain and Italy were the largest consumer markets for these species. China and Thailand are large importer-processor-(re)exporters. Poor catches in 2016 and 2017 meant tightened supplies, and traded prices rose strongly. The global interest in Spanish and Japanese foods is driving increased consumption of these species.

In the domestic market, Australia supplements its local production with imports of around 17,000 tonnes (Squid and Octopus combined) each year (ABARES). Around 4,800 tonnes (28%) of that total is Prepared or Preserved product (ABS Cat. 5465.0).

Gould's Squid has been underutilised in Australian fisheries for a number of reasons:

- Gould's Squid harvests are sporadic in south-eastern Australian waters due to the nature of the species (< 1 year lifespan). This year-to-year uncertainty increases the risk for onshore

investment in processing and value-adding, thereby promoting a commodity-based industry supply chain.

- Australia's Gould's Squid production competes directly with a globally traded squid commodity (frozen and prepared or preserved) and is non-competitive in those markets. Australia is an open trading economy and so imported product prices are significantly below landed costs for wildcatch squid fisheries in Australia. The opportunity to differentiate Australia's Gould Squid harvest in that context is difficult and requires united industry commitment to downstream market engagement and product and offer differentiation.
- The Australian Gould's Squid industry has limited infrastructure and capacity to value add its harvest, although there are private businesses currently considering such investment.

#### *Opportunities to Boost Fisher Returns*

The Global trade in Squid is quite volatile and there is a large import-process-export trade. As noted above opportunity exists for Australian import replacement using value-added Australian-harvested consumer products (not prepared and preserved) in Australian markets.

In January 2019, the Chinese government import authority confirmed that Gould's Squid had been added to their Eligible Seafood Species Import List, clearing the way for Australian Squid products to enter the China market.

Initial value-added supply chain gross margin analysis drafted by the project, with input from proponents, indicates that the development of value-adding human consumption markets (domestic and export) for Gould's Squid will achieve a satisfactory commercial return on investment to fisher-processors.

#### *Barriers to Boosting Returns*

Stephens (Stephens, L, 2018) notes that a 2007 SFM led FRDC Project (2007-703 'Intervention strategies to maintain the safety and quality in a range of value-added products made with underutilised SSSF species') trialled packaged, value-added products for Gould's Squid (among others) and launched onto the domestic market under its Market Pride brand. Stephens notes that it could be argued that the SFM and other project participants did not have all the skills to produce these products cost effectively and to market them. Ultimately the cost of production could not be met by sales income and the Market Pride concept and product range were terminated.

It continues to be very difficult for Australia's Gould's Squid fishers and processors to compete against lower priced imports of frozen and prepared or preserved squid products. The currently depressed Australian dollar may assist local industry returns, but any long-term market development strategy built on that volatile premise will be commercially uncontrollable and therefore untenable.

The primary barrier that can be proactively controlled and mitigated by Australian industry is to differentiate their product in local and selected overseas markets. This can be achieved by improving landed quality, downstream engagement and co-investment with processors, and promotion of products that are designed to shift their offer away from industrial commodities (e.g. frozen bulk and whole), to consumer retail packs (for supermarkets) and foodservice offers (e.g. dried squid chips).

#### *Value of Underutilised Resource*

The development proposed above will add 700 tonnes per year to east coast Gould's Squid harvests that have collectively produced an average of 1,099 tonnes per year over the last three years.

Assuming projected capture of most of the underutilised SSJF TACC, the estimated east coast Gould's Squid GVP increase is up to \$2.45 million based on prices in the order of \$3.50/kg with an annual underutilised harvest volume in the order of 700 tonnes.

In addition, improvement in the quality of the Gould’s Squid trawl harvest and related value-adding will add further GVP gains not included in these estimates.

Current Avg. Annual Catch 2016-18	Est. Current Annual Value 2016-18	Est. Additional Catch/Yr	Est. Additional Catch Avg \$/kg	Est. Additional Value/Yr
1,099 tonnes	\$3.10 million	700 tonnes	\$3.50	\$2.45 million

*Conclusion:*

The project has demonstrated the potential volume yield and value-added formats for Gould’s Squid. This project rates the commercial attractiveness of this underutilised species as “High”.

## GROUP B – MODERATE POTENTIAL

### 4. Silver Trevally

Consultation by the project team with a range of seafood stakeholders confirms that Silver Trevally is an attractive seafood opportunity for increased harvest and value-adding.

Desk research and industry consultation reveal that:

- In NSW waters the species is caught predominantly inside 3 nautical miles,
- There is some concern among NSW Fisheries agency staff regarding the sustainability of the stocks, due to the harvest of undersized fish, related to excessive targeting by commercial and recreational fishers.
- Australia’s largest fish wholesaler Sydney Fish Market currently imports sustainable seine net caught Silver Trevally product (chilled and frozen, whole and in fillet form) from New Zealand, where the TACC is 2,933 tonnes.
- The market price for best quality trap harvested product is in the order of \$15/kg whereas the trawl price is around \$4/kg.

Australian Silver Trevally is considered by the seafood chain to be a good candidate white-meat finfish for medium priced domestic seafood sashimi markets. Its closest competitor in this niche consumer market is a similar Carangidae Family member, the Yellowtail Kingfish (an emerging aquaculture species). For comparison purposes in 2015-16 the Sydney Fish Market turned over 536 tonnes of farmed Yellowtail Kingfish at an average price of \$16.09 totalling \$8,624,000. In 2018 farmed Yellowtail Kingfish was the second largest line (by both volume and value) handled by SFM at 607 tonnes @ \$16.99 for a sale value of \$10.3 million.

Project team analysis of available production data and related project estimates for the species, are summarised in the following table. Reliable GVP data is only available for the NSW and CTH fisheries, the two largest fisheries. Indicative nominal price trends are calculated for these two jurisdictions to demonstrate the price trends but to also demonstrate the significant variance between the two jurisdictional trends.

The table data reveals declining production and rising indicative nominal prices. Over the last four years the nominal data suggest that the NSW price has achieved an increasing premium over the CTH price, rising from 19% in 2015 to 46% in 2019. From almost an equal price position in 2014, NSW nominal prices have increased 63%, and CTH by 14%. This has occurred at a time when the TAC in

these two fisheries has been significantly reduced and harvest from each fishery has fallen 69% and 63% respectively, suggesting that landed prices are responding to lack of supply to consumer markets. The large harvest increase above trend in VIC fisheries in 2019 may also be in response to this price growth.

TABLE 13. SILVER TREVALLY – GVP \$'000 AND LANDED PRICE TREND DATA (ABARES AND ESTIMATES)

			YEJune	2014	2015	2016	2017	2018
<u>Production Tonnes</u>								
NSW	EGF, OTF, EGF	ABARES		168	85	89	60	52
CTH	SESSF CTS	ABARES		141	93	72	53	52
QLD		Estimates		Unknown	25	28	28	20
VIC		Estimates/ABARES		13	30	13	13	55
TAS		Estimates/ABARES		4	4	4	4	3
<b>Total</b>				<b>326</b>	<b>236</b>	<b>206</b>	<b>158</b>	<b>182</b>
<u>GVP \$'000</u>								
NSW	EGF, OTF, EGF	ABARES/Estimate		666	453	473	384	335
CTH	SESSF CTS	ABARES		549	415	293	243	230
<b>Total for NSW + CTH</b>				<b>\$1,215</b>	<b>\$868</b>	<b>\$766</b>	<b>\$627</b>	<b>\$565</b>
<u>Indicative Nominal Landed Price \$/kg</u>								
NSW				\$3.96	\$5.33	\$5.31	\$6.40	\$6.44
CTH				\$3.89	\$4.46	\$4.07	\$4.58	\$4.42
<b>NSW + CTH Average</b>				<b>\$3.93</b>	<b>\$4.88</b>	<b>\$4.76</b>	<b>\$5.55</b>	<b>\$5.43</b>
Est. NSW Price premium above CTH				2%	19%	31%	40%	46%

The drivers for this increased premium are uncertain, but the trend data suggests there may be significant upside (i.e. demand inelasticity relative to prices) in the margin potential for this species in consumer markets. Further analysis across a larger supply volume is required.

#### *Why the Species is Underutilised*

The east coast commercial fishing and seafood industry has limited infrastructure and capacity to value add to its harvest. Harvest quality is critical to deliver greater consumer demand to drive up utilisation of this species. This has not been prioritised in the Silver Trevally supply chain. This also requires changing to a more intensive handling and dispatching method to optimise quality.

The data in Table 13 and brief analysis suggest that consumers are prepared to pay significantly higher prices for the available harvest of this species. Subject to the changes in TAC over the next 3-5 years, a transition by this species to a premium value proposition and price point may be appropriate.

Recreational fishers also target Silver Trevally. ABARES ([www.fish.gov.au](http://www.fish.gov.au) July 2020) records recreational catches in NSW (27 tonnes in 2013-14) and VIC (37 tonnes in 2003).

#### *Opportunities to Boost Fisher Returns*

Industry stakeholders recommend that fishers targeting Silver Trevally increase their focus on product quality management on the water in four ways, by:

- Reducing the volume of each fishing shot so that the seafood quality in the water and entering the processing facility is increased, with subsequent improvement in the consumers' eating experience,
- Increase the priority for and use of harvest methods that reduce damage to fish in the water and preserve fish quality, rather than a preference for increased harvest volume. Trap and line, or Purse seine methods are recommended to boost eating quality. Current species harvest methods used by commercial fishers on the east coast include Hook and Line, Gillnet, Net, Mesh net, Haul Seine, Otter trawl, fish trap, Danish seine, and Unspecified.
- Immersing harvested fish in ice slurry immediately it is landed onboard,
- Slaughtering via the ikijimi process in small volumes for premium markets.

There is also a common agreed view among stakeholders that Australia needs to find a way to value-add a large portion of its Silver Trevally harvest, possibly into meal-ready portion consumer packs.

This solution will drive optimal utilisation of this large underutilised high-quality white-meat finfish. Clamms, a large Melbourne based seafood wholesaler/processor offers locally harvested Trevally fillets (see image) - 280 grams, skin on, boned, Kosher with a 9 day shelf life at <5°C for \$9.50 CIF (equivalent to \$33.93/kg).



The concentration (66% of CTH SESSF quota held by six entities) of Silver Trevally fishery licences suggests it would be possible to develop a collaborative co-investment project to drive value supply chain quality improvements and investment in value-adding. The ownership and concentration of licences in other Silver Trevally fishery jurisdictions is not published.

Initial value-added supply chain gross margin analysis has been undertaken by the project team, but is based on limited available data. That limitation aside, the preliminary analysis indicates that the development of value-adding human consumption markets (domestic and export) for Silver Trevally will achieve a satisfactory commercial return on investment to fisher-processors.

### *Barriers to Boosting Returns*

There is limited scope to increase fishery harvest volume in NSW waters as Trevallies in general are classified as 'Depleting' (SAFS 2018). However, stocks in VIC and CTH are classified as 'Sustainable'.

Quality and supply chain performance is the main barrier to returns. Sustained and superior product quality delivered to consumers, is the key to achieving higher returns to fishers and supply chain partners. The supply chain requires Trap, Purse seine or Danish seine harvest; ice slurry treatment onboard; and careful handling along the chain.

The market response during consultation suggests there is some perception that Silver Trevally flesh is too soft for traditional seafood consumer markets. But this shortcoming is offset by a near universal industry view that Silver Trevally is an ideal white-meat finfish for sashimi.

As previously noted, the Recreational Sector is a significant user of the Silver Trevally fishery. Available data shows that NSW recorded 27 tonnes harvested in 2013-14, and Victoria 37 tonnes in 2003 (www.fish.gov.au). If these catch rates were maintained in 2019 this aggregate recreational harvest of 64 tonnes would exceed any commercial fishery in any jurisdiction for the species. In 2013 the Victorian Recreational catch (38 tonnes) was similar to the state's commercial catch (42 tonnes).

The east coast commercial fishing industry has limited infrastructure and capacity to value add its harvest.

### *Value of Underutilised Resource*

The development proposed above will add 350 tonnes per year to east coast Silver Trevally harvests that have collectively produced an average of 182 tonnes per year over the last three years.

Estimated east coast Silver Trevally GVP increase is up to \$5.25 million based on trap-harvested/high quality product prices in the order of \$15/kg with an annual underutilised harvest volume in the order of 350 tonnes.

Leveraging the value add on the existing 182 tonnes will add further GVP gains not included in these estimates.

Current Avg. Annual Catch 2016-18	Est. Current Annual Value 2016-18	Est. Additional Catch/Yr	Est. Additional Catch Avg \$/kg	Est. Additional Value/Yr
182 tonnes	\$1.0 million	350 tonnes	\$15.00	\$5.25 million

### *Conclusion*

The project has demonstrated the potential volume yield and potential value-added format (sashimi) for Silver Trevally, trap harvested.

This project rates the commercial attractiveness of this underutilised species as “High” especially for market initiatives based on products targeting premium seafood niches.

## **5. Blue Mackerel**

Blue Mackerel is the largest species by harvest volume of the 11 Target Underutilised Species. For the group, it contributes 27% of the average harvest volume over the last three years, and 51% of the proposed additional harvest tonnage.

Desk research and industry consultation reveal the species is major wholesale product at SFM:

- 2016 - 358 t. @\$2.80/kg,
- 2017 - 283 t. @\$4.64/kg,
- 2018 - 307 t. @\$4.32/kg,
- 2019 – 331 t. @\$4.45/kg.

Project team analysis of available production data and related project estimates for the species, are summarised in the following table. Reliable GVP data is only available for the NSW and CTH fisheries, the two largest fisheries. GVP data are not published for CTH fisheries. An indicative nominal price trend has been estimated for the NSW harvest.

The table reveals available data for Production, GVP, TACC and Indicative nominal landed prices.

ABARES data confirms that production has been rising strongly especially in CTH SPF fishery. The percentage of TACC unharvested has declined to 2016. However, a large TACC increase in 2019 confirms the underutilised component of the TACC has risen again to 76%.

Available indicative nominal price data for NSW suggests that prices have been rising to 2017, a trend reflected in the SFM wholesale price data above.



TABLE 14. BLUE MACKEREL – GVP \$'000 AND LANDED PRICE TREND DATA (ABARES AND ESTIMATES)

			YEJune	2014	2015	2016	2017	2018
<u>Production Tonnes</u>								
NSW	EGF, OHF, OTF, OTLF	Estimate		372	389	291	197	295
CTH	SPF	ABARES		0	202	2,200	1,248	2,858
<b>Total</b>				<b>372</b>	<b>591</b>	<b>2,313</b>	<b>1,445</b>	<b>3,153</b>
<u>GVP \$'000</u>								
NSW	EGF, OHF, OTF, OTLF	Estimate		594	666	707	489	Unknown
CTH	SPF	ABARES		All GVPs are confidential and not published				
<u>TACC</u>	CTH SPF	ABARES		2,700	2,630	2,630	2,630	12,090
	CTH SPF	Unharvested %		100%	92%	16%	53%	76%
<u>Indicative Nominal Landed Price \$/kg</u>								
	NSW			\$1.60	\$1.71	\$2.43	\$2.48	Unknown
	CTH			Unknown				

#### *Why the Species is Underutilised*

Commercial fishers advised that “Utilisation in this fishery cannot increase until sophisticated harvest and processing infrastructure, capacity and supply chains are established by an investor. Until then, we cannot compete by processing onboard for human consumption, so we are left with one option – process it into animal feed.”

Other fisher-processors consulted by the project team noted that a change in fishery management policy would be good for the large “unharvested quota” component of the industry. Their proposed amended policy would place a higher holding cost per year on Blue Mackerel quota and similar underharvested species such as Blue Grenadier. Blue Grenadier is not currently utilised for commercial purposes in Australia but is a highly utilised species in NZ where it is called Hoki. The proposed change would, in certain quota species only, require underutilised quotas (ITQ Individual Transferable Quota) to be transferred annually (or biennially or triennially) to an open market available to all bidders. It is noted that some license holders hold quota for strategic competitive reasons, and also for multispecies risk management where nontarget species may be harvested. A similar quota use optimisation approach is used in Australia’s mineral industry to ensure optimal investment outcomes for publicly owned resources.

#### *Opportunities to Boost Fisher Returns*

Relevant points from stakeholder discussions regarding the opportunity for Blue Mackerel are:

- While Blue Mackerel has a strong fishy flavour, which may not suit many consumers, it also offers moderate-high oiliness and dry, firm flesh with large flakes and few bones which are easily removed,
- The price achieved by fishers to processors will depend on the oil content of Blue Mackerel flesh. At 8-18% oil content, fishers can achieve \$10/kg.
- The best option is for onboard processing where volumes are accessible (and a \$15 million processing vessel is available), but obviously large onshore processing facilities are preferred,

- The product is easy to sell, including as bulk frozen product to West Africa, as processed fish meal (a current product line of Australia's largest Blue Mackerel quota holder), or as frozen seafood to domestic or export wholesalers.

Significant industrial value-adding has been introduced in the fishery recently. Australian livestock and aquafeed feed company, Ridley Corporation has acquired quota in both the CTH Blue Mackerel and Jack Mackerel fisheries, and is developing its fish and poultry rendering business at the Maroota plant north of Sydney (Ridley Corporation, 2018). More recently the company stated "While markets have also been established at premium prices for the rendered meals and oils generated from the processing of whole mackerel, the ability to secure long-term, uninterrupted fishing agreements has to date proven to be problematic" (Ridley Corporation, 2019 p. 8). A new aquafeed extrusion plant in Tasmania is being developed jointly with Tassal Ltd input was commissioned in 2019-20. A new vessel to service the plant is to be based at Ulladulla.

Blue Mackerel quota holdings are highly concentrated in CTH waters, which comprises the bulk of the combined east coast fishery. The concentration (84% of CTH SPF quota held by 2 entities) of Blue Mackerel fishery licences suggests it would be possible to develop a collaborative co-investment project to drive value supply chain quality improvements and investment in value-adding. However, as these are large corporate entities with inhouse capacity to undertake value-adding initiatives unilaterally, there is too much unknown to speculate regarding their respective commercial advantage or motivation to collaborate. The largest quota holding (45% of quota) is controlled by NZ seafood interests. The project team contacted both parties but was able to establish only a limited perspective of their investment views. The ownership and concentration of licences in other Blue Mackerel fishery jurisdictions is not published or known.

Initial value-added supply chain gross margin analysis drafted by the project indicates that the development of value-added human consumption markets (domestic and export) for Blue Mackerel will achieve a satisfactory commercial return on investment to fisher-processors. However, harvest and processing infrastructure scale is critical to support any value-added supply commitments to large downstream buyers. This will drive the optimal utilisation of the unharvested TACC.

### *Barriers to Boosting Returns*

There are three major reasons why the Blue Mackerel Fishery is underutilised:

- The species is sold mainly whole (gilled and gutted) as the meat darkens very quickly once cut. Average processed yield is 50%.
- Fisher-processors consider Blue Mackerel to be a good eating fish but is undervalued by adverse consumer perceptions when compared with other low value commodity finfish seafood. In these consumer markets Blue Mackerel has a bad market perception due to its excessively strong fishy taste profile. In the absence of promotion of its benefits to consumers, the species often defaults to a commodity industrial product including as bait for NSW Rock Lobster fishers.
- The primary barrier to increase Blue Mackerel utilisation as seafood is the lack of Australian seafood processing infrastructure, both onboard vessels or land based.

In summary, demonstration of value-added formats for Blue Mackerel is problematic for two reasons:

- The bulk of quota is held very tightly by competitive companies that likely have limited interest in discussing their opportunities, and
- The product development options relate to large volumes where viability is subject to manufacturing plant economics and scale in domestic or export markets. The optimal

product and market formats cannot be adequately defined until more is known about processing/manufacturing capacity and the related unit cost base.

#### *Value of Underutilised Resource*

The development options proposed by this project will add 8,400 tonnes per year to east coast Blue Mackerel harvests that have collectively produced an average of 2,680 tonnes per year over the last four years.

The project estimates east coast Blue Mackerel GVP can increase up to \$42 million based on landed nominal prices of \$5/kg with an annual underutilised harvest volume in the order of 8,400 tonnes. This nominal \$5 price assumption is considered to be conservative by the project team, as it is marginally above the average price achieved by SFM for 2019, as noted above. The more difficult assumption relates to the expected use of the harvest – either as low value bait, processed stock feeds or higher value seafood for human consumption. There is limited data available to guide these product mix assumptions. The nominal \$5/kg price assumption is therefore a weighted average price forecast for a range of seafood and industrial products derived from the diverse Blue Mackerel supply chains.

Current Avg. Annual Catch 2016-19	Est. Current Annual Value 2016-17	Est. Additional Catch/Yr	Est. Additional Catch Avg \$/kg	Est. Additional Value/Yr
2,680 tonnes	\$6.6 million	8,400 tonnes	\$5.00	\$42 million

#### *Conclusion*

The project has demonstrated the potential volume yield for Blue Mackerel, but not value-added formats. However, recent investment by Ridley Corporation confirms the attractive industrial use of the species as processed aquafeed. From analysis, the project team believes that the highest and best use for a significant portion of the underutilised volume is as seafood in markets that are aware of its attractive attributes.

This project rates the commercial attractiveness of this underutilised species as “Moderate”.

## 6. Yellowtail Scad

Harvested in the NSW Ocean Haul Fishery, Yellowtail Scad currently services low value seafood and bait markets in Commercial (e.g. CTH longline tuna fisheries) and Recreational Sectors. Trawl harvested Yellowtail Scad are of particularly poor quality and are often discarded.

The average wholesale product for whole fish at SFM ranges from \$3-\$4/kg.:

- 2016 - 250 t. @\$3.06/kg,
- 2017 - 262 t. @\$3.30/kg,
- 2018 – 229 t. @\$3.84/kg,
- 2019 – 238 t. @\$3.91/kg.

Project team analysis of available production data and related project estimates for the species, are summarised in the following table. Reliable production and GVP data is not published by ABARES; the best trend data available is for “Eastern Australia”, excluding confidential data ([www.fish.gov.au](http://www.fish.gov.au)). Data for the QLD Yellowtail Scad fishery is available and presented to confirm that the bulk of the aggregate east coast catch is in NSW waters. GVP data is not available.

TABLE 15. YELLOWTAIL SCAD – PRODUCTION TREND DATA (FRDC AND ESTIMATES)

	YEJune	2014	2015	2016	2017	2018
<u>Production Tonnes</u>						
Eastern Australia	FRDC	514	439	341	327	321
QLD	QFish database - State records		14	12	8	5

The table data reveals a declining production trend for the five years to 2018. The longer FRDC data set confirms an average annual production for Eastern Australia of 378 tonnes for the 11 years 2008-2018.

#### *Why the Species is Underutilised*

Harvest quality is critical to deliver greater consumer demand to drive up utilisation of this species. This has not been prioritised in the Yellowtail Scad fishery.

The east coast commercial fishing and seafood industry has limited infrastructure and capacity to process and value add the Yellowtail Scad harvest.

While the species has very good flesh for premium seafood, medium oiliness and dry, medium-firm flesh with few bones which are easily removed, it suffers the problem common to other species – a strong fishy flavour which is off-putting to some consumers.

Yellowtail Scad has a low average processing yield of 35%.

A lack of seafood supply chain and market awareness of the potential for Yellowtail Scad seafood means landed prices flowing back from markets to fishers are discounted to occasional use as bait by Tuna long-liners in east coast CTH fisheries.

#### *Opportunities to Boost Fisher Returns*

Project team discussion with fishers and industry stakeholders confirms that Yellowtail Scad is a good eating fish. It therefore offers a good opportunity for increased yield through both increased harvest of underutilised TACC, as well as through value-adding for the available harvest.

Best price and quality are achieved by immediate ice slurry treatment on board at point of harvest. Ice slurry treatment will enable a 7-day shelf life.

Premium quality Yellowtail Scad harvested via trap methods rather than trawl, will present very well and achieve \$8-\$9/kg at the beach, significantly above the average price achieved at wholesalers. Best quality Yellowtail Scad fillets from trap harvesting currently in excess of \$17/kg.

#### *Barriers to Boosting Returns*

There is some resistance to its existing and increased commercial catch of Yellowtail Scad, from the Recreational Sector which currently uses the species as bait. The FRDC data ([www.fish.gov.au](http://www.fish.gov.au)) currently estimates the harvest of the species by recreational fishers to be 15-60 tonnes annually.

Harvest and supply chain management of quality is poor and the much of the potential upside returns offered by the fishery are lost before the product reaches consumers.

The project team has found it difficult to establish initial value-added supply chain gross margin analysis for Yellowtail Scad. There is a lack of data forthcoming from existing agencies and fisher-processors of the species. The SFM data above, is a good guide but is insufficient to enable meaningful value-added gross margin projections.

### Value of Underutilised Resource

For a current revised NSW TACC of around 864 tonnes (per IAP Report), the SFM and other wholesalers process ~320-380 tonnes. The development options proposed by this project will therefore add ~500 tonnes per year to east coast Yellowtail Scad harvests that have collectively produced an average of 330 tonnes per year over the last three years.

Estimated east coast Yellowtail Scad GVP increase is up to \$3.5 million based on prices in the order of \$7/kg with an annual underutilised harvest volume in the order of 500 tonnes.

Leveraging the value add on the existing 330 tonnes will add further GVP gains not included in these estimates.

Current Avg. Annual Catch 2016-18	Est. Current Annual Value 2016-18	Est. Additional Catch/Yr	Est. Additional Catch Avg \$/kg	Est. Additional Value/Yr
330 tonnes	\$0.8 million	500 tonnes	\$7.00	\$3.5 million

### Conclusion

The project has demonstrated the potential volume yield Yellowtail Scad.

This project rates the commercial attractiveness of this underutilised species as "Moderate".

### 7. Luderick

Luderick is a prolific inshore and estuarine commercial species, with 80% of the harvest during winter. Harvest methods include mesh net, haul seine, and beach seine.

The record shows that catches for this species are at a historic low, being a somewhat ad hoc commercial seafood target.

Project team analysis of available production data and related project estimates for the species, are summarised in the following table.

TABLE 16. LUDERICK – PRODUCTION, GVP AND PRICE TREND DATA (ABARES, FRDC AND ESTIMATES)

			YEJune	2014	2015	2016	2017	2018
<u>Production Tonnes</u>								
NSW	EGF	ABARES		372	389	291	197	179
QLD		Estimate/FRDC		5	5	5	5	6
VIC		Estimate/FRDC		2	2	2	2	2
TAS	SF	Estimate		2	2	2	2	248
<b>Total</b>				<b>381</b>	<b>398</b>	<b>300</b>	<b>206</b>	<b>435</b>
<u>GVP \$'000</u>								
NSW	EGF	ABARES/Estimate		594	666	707	489	460
<u>Indicative Nominal Landed Price \$/kg</u>								
NSW	EGF			\$1.60	\$1.71	\$2.43	\$2.48	\$2.57

The data reveals a declining production trend dominated by NSW, with recent growth in the TAS fishery. For NSW the 1988 harvest was 800 tonnes, with an average for the three years to 2018 of 222

tonnes. The data suggest only modest gains have been achieved in indicative nominal prices, even though supply has been declining.

Luderick is also a target species for other fishing sectors. Recreational catch of the species in 2013-14 (latest data available at [www.fish.gov.au](http://www.fish.gov.au)) was 150 tonnes. The Indigenous harvest of the species is unknown.

#### *Why the Species is Underutilised*

Harvest quality is critical to deliver greater consumer demand to drive up utilisation of this species. This has not been prioritised in the Luderick fishery. A number of fishing cooperatives and leading fishers noted that Luderick is typically poorly treated by its fisher harvest-supply chain. Many industry responses also noted that the eating quality of the fish will improve greatly if the fish dies in an ice slurry promptly after harvest.

The east coast commercial fishing and seafood industry has limited infrastructure and capacity to process and value add the Luderick harvest.

Luderick has a low average processing yield of 33%.

#### *Opportunities to Boost Fisher Returns*

Luderick is a good quality eating fish. However, it has acquired an undeserved poor image in seafood markets. The adverse image is related to flesh quality and short shelf life. Luderick has a moist, soft white flesh and a distinct flavour. The species is predominantly herbivorous which means seafood taste will be influenced by the environment - those caught in estuaries are often a "weedier", muddier flavour than those caught in open water.

Optimum eating quality, postharvest shelf life, and landed price are achieved by ikijimi despatch and bleeding out before immediate ice slurry treatment onboard at point of harvest. Ice slurry treatment will enable a 7-day shelf life.

Smoked Luderick is a good seafood product according to a number of supply chain respondents. It is a potential species for cryovac food products. Industry leaders suggest the eating quality, shelf life and broader market appeal will be maximised by value-adding, notably smoking and cryovac treatment to enhance eating quality and shelf life.

#### *Barriers to Boosting Returns*

Management of seafood quality is the primary challenge along the Luderick supply chain. Discussion with fishers and cooperative receivers in NSW suggests fishers do not manage harvest quality adequately (minimal use of ice slurry at harvest point), partly due to the lack of capital and inadequate market price incentives.

Pin bones are another barrier for informed seafood consumers when faced with a retail fillet price of ~\$21/kg. Industry advice suggests that careful removal of pin bones will greatly enhance consumers appeal for Luderick fillets, with well-presented value-added fillets achieving prices about \$22/kg.

Industry leaders also highlight the need to change the name of the Luderick species to something that is more appealing to domestic seafood consumers. The common alternate name, Blackfish is not supported.

The project team has found it difficult to establish an initial value-added supply chain or value-adding gross margin analysis for Luderick. NSW Fisheries agencies do not develop or retain any gross margin data for the species nor is this data available from relevant fishery co-operatives in that state.

Individual fishers were unable to provide any further data regarding their costs to harvest or land the species. No data is available from Sydney Fish Market as it is a minor species in their business. The

only data of any economic value to this project is fishery average data noted in Table 3 above from a recent FRDC project (Voyer, et al., 2016). There is insufficient species-specific data to enable meaningful value-added gross margin projections.

#### *Value of Underutilised Resource*

The development options proposed by this project will add 350 tonnes per year to east coast Luderick harvests that have collectively produced an average of 314 tonnes per year over the last three years. Tasmania is a significant contributor to this new production.

Estimated east coast Luderick GVP increase is up to \$3.5 million based on prices in the order of \$10/kg with an annual underutilised harvest volume in the order of 350 tonnes.

Leveraging the value add on the existing 314 tonnes will add further GVP gains not included in these estimates.

Current Avg. Annual Catch 2016-18	Est. Current Annual Value 2016-18	Est. Additional Catch/Yr	Est. Additional Catch Avg \$/kg	Est. Additional Value/Yr
314 tonnes	\$0.6 million	350 tonnes	\$10.00	\$3.5 million

#### *Conclusion*

The project has demonstrated the potential volume yield for Luderick and pointed to possible value-adding product scenarios for domestic consumer markets. However, the available data is not adequate to analyse and demonstrate cost effective margin gain options for fishers.

This project rates the commercial attractiveness of this underutilised species as “Moderate”.

### 8. Leather Jackets / Ocean Jacket

Leather Jackets / Ocean Jackets (hereafter ‘Jackets’) derive their name from their skin, which should be removed before serving.

The species is a major commercial species widely harvested in estuaries, reefs and inshore waters off south east Australian (2-200 m), predominantly in NSW. Harvest methods include trawl, Danish-seine, hook (dropline, demersal longline), and trap.

In the 1950s, the NSW harvest was ~1,000 tonnes per year. In 2017 the NSW harvest was ~227 tonnes, continuing an annual decline trend that began at 611 tonnes in 2010. The NSW harvest occurs in both the commercial trawl fishery, and trap and line fishery, and in the recreational fishery.

The CTH SESSF CTS is also a significant fishery with landings at Eden, Sydney, Ulladulla, Hobart, Lakes Entrance and Portland. Over the last three years this fishery’s harvest has averages 186 tonnes.

Jackets are a major wholesale product at SFM with summary data as follows:

- 2016 - 344 t. @\$4.42/kg,
- 2017 - 295 t. @\$4.92/kg,
- 2018 - 262 t. @\$4.76/kg,
- 2019 – 282 t. @\$4.92/kg.

Project team analysis of available production, GVP and indicative landed price data, are summarised in the following table.

TABLE 17. JACKETS – PRODUCTION, GVP AND PRICE TREND DATA (ABARES, FRDC AND ESTIMATES)

YEJune			2014	2015	2016	2017	2018
<u>Production Tonnes</u>							
NSW	OTF, OTLF	ABARES/Estimate	383	329	306	227	218
CTH	SESSF CTS	ABARES/Estimate	245	237	246	203	203
VIC	CIF, GLF, OF, VRLF	Estimate/FRDC	11	15	14	14	14
TAS	SF	FRDC	3	2	1	3	2
<b>Total</b>			<b>642</b>	<b>583</b>	<b>567</b>	<b>447</b>	<b>437</b>
<u>GVP \$'000</u>							
NSW	OTF, OTLF	ABARES/Estimate	630	533	455	700	850
CTH	SESSF CTS	ABARES/Estimate	410	384	366	626	687
<u>Indicative Nominal Landed Price \$/kg</u>							
NSW + CTH		Estimate	\$1.66	\$1.62	\$1.49	\$3.08	\$3.39

The data table reveals declining production, especially in the NSW fishery, and significant recent rise in indicative landed prices. The most notable element of the trend data is a 25% fall in the 2017 harvest for NSW (the largest fishery) that coincides with a 106% increase in the average landed price. The fact that these prices have been sustained and increased marginally in 2018 suggests that product scarcity may have prompted consumers to increase market prices paid. However, more detailed analysis of additional confidential data is required to verify this consumer demand response for the species.

#### *Why the Species is Underutilised*

The species is underutilised because fishers cannot make a higher commercial return at the beach by harvesting more of this species due to the lack of onshore processing and value-adding infrastructure. This also limits the ability to cost-effectively present more fish to the market.

Jackets have a mild flavour, low oiliness and are moderately moist, with firm flesh. But these attractive consumer seafood attributes are lost if the fish is not fresh.

#### *Opportunities to Boost Fisher Returns*

The major existing markets for Jackets are as fresh and frozen seafood to Sydney and Melbourne fish markets. These metropolitan seafood markets are adequately supplied with Jackets and so ~450 tonnes of fish remain unharvested every year. If these underutilised fish are to be landed for profit, the industry must do two things:

- Either find consumers (new or existing) who want to buy more fresh Jacket seafood, possibly by in-market promotions; and/or
- Create new Jacket seafood products that will attract and motivate existing and new consumer demand.

The project team has spoken with several fishers in northern NSW regarding potential expansion of Jackets fisheries. Two leading fishers in northern NSW indicate they believe potential value-added markets exist for Jackets including head-off gutted trunks in frozen form, and potentially fillets in value-added consumer packs.



### *Barriers to Boosting Returns*

Freshness for Jackets is critical to driving consumer market demand and price. Therefore, supply chain quality must be improved.

There is minimal processing and value-adding infrastructure available for the Jackets around south eastern Australia. This will need to be addressed to improve product quality.

Jackets have a low average processed yield at 30% from whole fish, and 65% from trunks. However, a SA based processor Ferguson Australia, offers two value added consumer packs comprising Jacket cheeks (<https://www.fergusonaustralia.com/shop/fish/ocean-jacket/ocean-jacket-cheeks/>) at \$62.50/kg:



- 1.6 kg bulk frozen packs (8 x 200g) for \$100
- 200g frozen fillets for \$12.50

The project team has found it difficult to establish initial value-added supply chain or value-adding gross margin analysis for Jackets. NSW Fisheries agencies do not develop or retain any gross margin data for this species, nor is this data available from relevant fishery co-operatives in that state. Individual fishers were unable to provide any further data regarding their costs to harvest or land the species. The SFM data above, is a good guide but is insufficient to enable meaningful value-added gross margin projections. As noted above the UTS data is not specific to any species.

### *Value of Underutilised Resource*

The development options proposed by this project will add 450 tonnes per year to east coast Ocean Jacket harvests that have collectively produced an average of 484 tonnes per year over the last three years.

The estimated east coast Jacket GVP increase is up to \$3.15 million based on a landed price of \$7.00 a kilo with an annual underutilised harvest volume increase in the order of 450 tonnes.

Leveraging the value add on the existing 445 tonnes will add further GVP gains not included in these estimates.

Current Avg. Annual Catch 2016-18	Est. Current Annual Value 2016-18	Est. Additional Catch/Yr	Est. Additional Catch Avg \$/kg	Est. Additional Value/Yr
484 tonnes	\$1.5 million	450 tonnes	\$7.00	\$3.15 million

### *Conclusion*

The project has demonstrated the potential volume yield for Jackets.

There are some potential value-adding opportunities being identified by leading east coast fishermen. However, these are currently only broad concepts and therefore the demonstration of value-adding opportunities has not adequately been demonstrated to fishers by this project.

This project rates the commercial attractiveness of this underutilised species group as "Moderate".

## 9. Sea Mullet

Sea Mullet are harvested in large volumes in QLD and NSW fisheries. They inhabit marine waters, estuaries, lagoons and rivers, and can tolerate salinities from hyper-saline to freshwater. Because of this diversity of habitats, the species presents a range of eating quality to the consumer market.

The east coast commercial fishery harvest has averaged 3,638 tonnes over the last three years. Sea Mullet are widely available as competitively priced day-to-day seafood. Ocean run fish attract a higher market price than estuary caught fish due to the superior taste and flesh quality.

Whole Sea Mullet are processed into fillets. Sea Mullet roe is exported for a high price, and entrails are used for professional and recreational fishing bait.

Sea Mullet is a major wholesale product at SFM:

- 2016 - 557 t. @\$3.41/kg,
- 2017 - 478 t. @\$3.62/kg,
- 2018 - 464 t. @\$3.94/kg,
- 2019 – 445 t. @\$3.78/kg.

Project team analysis of available production, GVP and indicative landed price data, are summarised in the following table.

TABLE 18. SEA MULLET – PRODUCTION, GVP AND PRICE TREND DATA (ABARES, FRDC AND ESTIMATES)

			YEJune	2014	2015	2016	2017	2018
<u>Production Tonnes</u>								
NSW	OHF, EGF	ABARES		3,926	2,841	2,843	2,281	2,200
QLD	ECN	ABARES		1,681	1,938	1,520	1,864	1,730
<b>Total</b>				<b>5,607</b>	<b>4,779</b>	<b>4,363</b>	<b>4,145</b>	<b>3,930</b>
<u>GVP \$'000</u>								
NSW	OTF, OTLF	ABARES/Estimates		13,339	8,941	9,552	8,116	8,611
QLD	SESSF CTS	ABARES/Estimates		4,202	4,844	3,801	4,659	4,756
<b>Total</b>				<b>\$17,541</b>	<b>\$13,785</b>	<b>\$13,353</b>	<b>\$12,775</b>	<b>\$13,367</b>
<u>Indicative Nominal Landed Price \$/kg</u>								
NSW				\$3.40	\$3.15	\$3.36	\$3.56	\$3.91
QLD				\$2.50	\$2.50	\$2.50	\$2.50	\$2.75
<b>NSW + QLD</b>			<b>Estimate</b>	<b>\$3.13</b>	<b>\$2.88</b>	<b>\$3.06</b>	<b>\$3.08</b>	<b>\$3.40</b>

The data table reveals two elements in the trend:

- The decline in the NSW harvest, down 44% in the five years to 2018, possibly due to reduced demand by processors for roe, combined with a 20% decline in wholesale demand as evidenced by the declining volumes through the SFM (as noted above).
- The apparent higher price paid for NSW product at the beach, a premium of 35-45% of the five year period. Industry advice suggests this premium is due to the large established wholesale market at the SFM that services a large traditional urban Sea mullet consumer market.

### *Why the Species is Underutilised*

The project team engaged with a number of Sea Mullet fishers and receivers to discuss species development options. The main reason for species underutilisation is the current lack of attention paid by fishers to both fish grading by gender, and landed quality.

NSW fishery cooperatives confirm that fishers are not inclined to sort fish at the beach and therefore their potential price gains from female fish with roe, are typically forgone. Male fish are not valued by the seafood market and are typically used for bait (achieving a landed price of \$0.20-\$0.60/kg) or discarded.

Lack of market opportunity and demand for male Sea Mullet has long been and remains a major challenge for the industry. Lack of adequate grading at harvest, depresses market demand and market prices for all Sea Mullet landed.

### *Opportunities to Boost Fisher Returns*

Discussion confirms that existing Sea Mullet fisher-processors need to differentiate and sort male and female fish to enable the full value for females (with roe attached) to be achieved. Female Sea Mullet typically achieve beach prices of \$3-\$4.50/kg as human consumption seafood. Female Sea Mullet used for seafood and roe are processed by at least one NSW based processor for domestic and export markets.

Value-adding is also an option for Sea Mullet. A 2008 report (FRDC 2008-321 'Assessing the technology transfer and people skills requirements for the introduction of mullet processing on the east coast similar to Shark Bay WA frozen sea mullet fillets') was completed by the Clarence River Fishermen's Cooperative. The key points in the value-adding procedures were:

- Fish caught by bullring meshing and removed from net by fishers actually in the water,
- Fish placed in keeper nets to maintain freshness then they are placed into an ice slurry,
- Fish packed in 20 kilo crates, ice downed (below, between and on top),
- Crates road transported on ice to factory, weighed in and processed immediately or next day,
- Fish scaled in a trommel with ice, and repacked into crates with ice,
- Fish filleted - heads removed first, then filleted/boned out,
- Fillets weighed into 500 gram lots, packed into plastic bags, cryovaced and into blast freezer,
- Frozen packets road freighted to packaging centre for final pack in presentation boxes,
- Boxes road freighted to supermarkets.

Sea Mullet have an average processed yield at 45% from whole fish gut in.

Northern NSW Sea Mullet harvest is almost totally marketed outside of SFM (2,315 tonnes, 96%)

### *Barriers to Boosting Returns*

Poor management of harvest and processing quality is a major barrier to boosting fisher and processor returns. A number of industry stakeholders stated that the supply chain must make immediate ice slurry treatment mandatory at point of harvest to ensure optimal consumer quality.

The Sea Mullet harvest is already substantial, albeit with a possible addition of 500 tonnes currently unharvested. The main barrier to be overcome in boosting fisher returns is therefore to find ways to increase the market price and derived fisher price, through value-adding (especially grading, and quality improvement along the supply chain).

Project team consultation with fishers and supply chain parties confirms the common view that Sea Mullet (depending on the season) have a strong distinctive flavour, which may be off-putting to some seafood consumers. Flavour of the flesh also varies slightly according to species. A lighter-flavoured fillet can be produced by deep skinning the mullet and discarding the fatty layer of tissue immediately under the skin. Sea Mullet has a seasonally oil content profile, peaking during their migration (April and May), leading up to spawning.

Australia’s export volume and significant export value competes with USA supply on world markets. Fisher supply is only financially viable based on roe carrying females.

A significant threat to the Australian Sea Mullet fishery, is the risk that mullet (and roe) processing and exporting facilities (e.g. Markwells at Chinderah in Northern NSW) will close down in the face of import competition, especially from larger low cost international fisheries and related processors.

Australia imports significant and increasing volumes of fish roe and the import price competition for local is increasing. ABARES (Fisheries and Aquaculture Statistics 2017, p. 83) confirms that roe imports have risen 93% to 52 tonnes (customs value of \$0.6 million) in the three years ending 2017. During that period the nominal declared customs value of roe imports has declined 19% from \$13.78/kg to \$11.20/kg, demonstrating the price pressure on local processors.

The project has found it difficult to establish initial value-added supply chain or value-adding gross margin analysis for Sea Mullet. NSW Fisheries agencies do not develop or retain any gross margin data for the species nor is this data available from relevant fishery co-operatives in that state. Individual fishers were unable to provide any further data regarding their costs to harvests or land the species. The SFM data above, is a good guide but is insufficient to enable meaningful value-added gross margin projections. The only data of any value to this project is fishery average data noted in Table 2 above from a recent FRDC project (Voyer, et al., 2016). However, the analysis does substantiate the opportunity to harvest an additional 500 tonnes on the East Coast subject to market demand. This will drive the optimal utilisation of the unharvested TACC.

*Value of Underutilised Resource*

The development options proposed by this project will add 500 tonnes per year to east coast Sea Mullet harvests that have collectively produced an average of 4,146 tonnes per year over the last three years.

The estimated east coast Sea Mullet GVP increase is up to \$2.0 million based on a landed price of \$4.00 a kilo with an annual underutilised harvest volume increase in the order of 500 tonnes.

Leveraging the value add on part of the existing 4,146 tonnes will add further GVP gains not included in these estimates.

Current Avg. Annual Catch 2016-18	Est. Current Annual Value 2016-18	Est. Additional Catch/Yr	Est. Additional Catch Avg \$/kg	Est. Additional Value/Yr
4,146 tonnes	\$13.2 million	500 tonnes	\$4.00	\$2.0 million

*Conclusion:*

The project has demonstrated the potential volume yield for Sea Mullet. However, the demonstration of value-adding opportunities has not adequately been demonstrated.

This project rates the commercial attractiveness of this underutilised species as “Moderate”.

## GROUP C - LIMITED OR UNKNOWN POTENTIAL

### 10. Ribbon Fish

Ribbon Fish is a non-quota species in all State, Territory, and Commonwealth waters. It is harvested by both commercial and recreational fishers.

There is no up-to-date annual harvest or supply chain data available on the species from any Australian fishery agency. The most recent advice from the NSW Fisheries agency (NSW Fisheries, 2013/14 p. 171) notes the Ribbon fish (also called Frostfish) is a closely related species to the more common Largehead Hairtail (*Trichiurus lepturus*) which is a relatively small commercial and recreational fishery in the state.

#### *Why the Species is Underutilised*

Significant bycatch of Ribbon Fish occurs in southern NSW fisheries. However, little is retained due to the lack of infrastructure to snap freeze at harvest and prolong shelf life due to spoilage issues. Project team consultation with commercial fishers suggests this is a key disincentive to utilisation.

#### *Opportunities to Boost Fisher Returns*

In Australia, Ribbon Fish are a species consumed primarily in low-value Chinese cuisine. The potential to increase the volume of the Australian harvest landed is therefore driven by two options:

- Increasing the supply and quality to consumers of Chinese cuisine in the domestic market,
- Increasing the supply and quality to export consumers, primarily those where the species is known and valued.

The current low demand in domestic and export markets results in low non-viable net prices to fishers. Therefore, significant quantities are discarded at sea and only small quantities reach wholesale markets. One existing and substantial southern NSW fisher noted that a joint target strategy for Ribbon Fish and Blue Grenadier (both underutilised) may work as a complementary and viable vessel management strategy for some southern NSW vessels. Individual catches of Ribbon Fish per vessel can exceed 10 tonnes.

The pristine silver skin of the fish is an attractive buying point for customers, especially those Chinese consumers who know and value the species. The management of the catch (either line or trawl) and the silver skin appearance at harvest and along the chain is critical to preserve landed quality, consumer appeal and net price back to the fishing boat. Ribbon Fish caught by hand line and managed well along the chain will achieve \$20 per kg. For trawl harvested fish the net price back to fishers is far less, in the range of \$2/kg - \$3/kg.

Industry advice suggests the preferred opportunity for this underutilised species is to harvest with hook and line to maximise product quality, onboard snap freezing, and then seafood merchandising as a premium quality fish to markets familiar with the species (i.e. Chinese cuisine consumers). Industry confirms that hand line harvest product will achieve a viable net price back to fishers, but volume is hard to achieve, and supply chains are not currently set up to manage the product appropriately.

One project team meeting in NSW was held with the owner of a significant China based supermarket chain that handles large volumes of seafood from Australia. The executives confirmed their interest in buying large volumes of Ribbon Fish from Australia. This species (and others including Largehead Hair Tail is similar to species harvested in Chinese waters (e.g. East China Sea) and is common in China's consumer markets. The global catch of hairtail exceeds 1.5 million tonnes (NSW Fisheries, 2013/14 p. 172) and occurs mostly in waters off China and Korea. As a commodity product Australian

export supply could not compete in this commodity market, but as a high-quality line caught product the species would be differentiated and command a higher price.

#### *Barriers to Boosting Returns*

The market demand for the species is limited, delivered quality is variable and typically low, and therefore prices received by fishers are not viable.

Much of Australia’s current catch (as bycatch) of this species is discarded with no perceived commercial value. Raising the quality achieved in the market outturn, will raise the net price achieved by fishers, and drive increased utilisation.

Development of initial supply chain gross margin analyses for value-adding options for this species are very difficult to achieve due to the lack of existing harvest and supply chain data, and therefore current estimates would be somewhat meaningless.

#### *Value of Underutilised Resource*

The development options for this species are difficult to scope out, due to the lack of harvest and supply chain data available. But given the significant scale of unharvested stocks of the species, and the feedback from leading fishers, the project proposes an additional 50 tonnes per year be added to east coast Ribbon Fish harvests.

Based on the existing high awareness of the species in Chinese markets overseas it will be important to explore supply of premium grade Ribbon Fish to overseas Asian markets, potentially via a dedicated joint venture investment.

The estimated east coast Ribbon Fish GVP increase is up to \$0.5 million based on a premium quality landed price of \$10.00 per kg (conservatively estimated at 50% of the peak Hook and Line price of \$20/kg advised by fishers) with an annual underutilised harvest volume increase in the order of 50 tonnes.

Boat returns may be improved if Ribbon Fish are jointly targeted with other coproduct species.

Current Avg. Annual Catch 2016-18	Est. Current Annual Value 2016-18	Est. Additional Catch/Yr	Est. Additional Catch Avg \$/kg	Est. Additional Value/Yr
Unknown	Unknown	50 tonnes	\$10.00	\$0.5 million

#### *Conclusion:*

The project has demonstrated the potential volume yield for a developmental Ribbon Fish fishery. But there is insufficient data to analyse or demonstrate the value-added options related to this species.

This project rates the commercial attractiveness of this underutilised species as “Moderate - Indeterminate”.

### **11. Estuary Cobbler / Catfish**

Four Estuary Cobbler / Catfish (hereafter ‘Catfish’) species are harvested commercially in NSW. The underutilised subspecies of interest in this project are the dominant Estuary Cobbler (eel tail) and the lesser Forktail Catfish (fork tail) which are harvested in estuaries on hand lines and from estuary prawn trawlers.

Information regarding these Catfish has been drawn from discussion with NSW Fisheries<sup>11</sup>, latest published data (<https://www.fish.gov.au/report/187-Estuary-Cobbler-2018>) and consultation with industry stakeholders. The latest published Status of Fisheries Resources in NSW Report (NSW Fisheries, 2013/14 p. 54) notes that little information is available to establish exploitation status for related species. The project team spoke with two fishers regarding species development options, based on a limited harvest capacity.

Commercially harvested catfish are non-target, low-value species taken using mesh nets in the estuaries and silty bays of the Richmond and Clarence Rivers in northern NSW. Estuary Cobbler is taken largely as by-catch or by-product in the Estuary General Fishery. The majority of the Estuary Cobbler harvest is taken in a small number of NSW estuaries – the Clarence River estuary contributed 42% of the 2017 catch.

The recreational catch is mostly discarded and not consumed.

NSW commercial landings of Catfish species are relatively minor, ranging from 37 tonnes (2014), up to 39 tonnes (2017) and down to 30 tonnes (2019) (pers. comm. NSW DPI). Recent data updates from FRDC (<https://www.fish.gov.au/report/187-Estuary-Cobbler-2018>) confirm a declining annual harvest trend for the Estuary Cobbler in particular, from 28 tonnes in 2008 to 11 tonnes in 2018. Recreational landings are estimated to be around the same level.

#### *Why the Species is Underutilised*

While there are many species of Catfish native to NSW, as a general rule most have firm, white, boneless fillets (NSW Aquaculture Assn). But with other global commodity finfish species (e.g. Basa *Pangasius bocourti*, Nile Perch *Lates niloticus*) able to service the global freshwater white-meat seafood industry, domestic consumer markets place little value on their local Catfish species.

A small number of Catfish species are globally farmed and traded as one of the world's most prolific, white-flesh, commodity seafood products. Farmed in freshwater, primarily in Vietnam and China, these species reported total production at 1,840,444 tonnes in 2017 (FAO), exported mostly to the USA and Europe. In April 2020 the FAO's market report (FAO Globefish, 2020) noted:

- Viet Nam exported US \$2.3 billion in Catfish in 2019,
- By the end of 2019, export prices (FOB Ho Chi Minh City) for fillets were US \$2.20 per kg, marking a steep downward trend from the peak of US \$3.40 per kg reached in 2018. In the USA, the average import price over the first nine months of the year dropped by 11% to US \$4.00 per kg.
- The Outlook for Global Catfish production is expected to increase by some 3.8% in 2020 to around 2.7 million tonnes.

Project team analysis of selected Australian trade trends in that market is informative. Table 19 presents Australia's "catfish" seafood trade flows for the period 2013-17 (FAO FIGIS 2020), in volume (tonnes) and value (US Dollars nominal).

The data reveal four main points:

- Australia has large catfish imports relative to exports and domestic production, in both volume and value,

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<sup>11</sup> Personal discussion (2 April 2020) with Dr John Stewart NSW DPI, confirms that the NSW Status of the Fisheries Report was discontinued in 2015, and no commercial data on NSW fisheries is published or released in electronic form. All reporting of NSW commercial fisheries is now under the national annual report titled Status of Australian Fisheries Stocks (SAFS). Catfish are not currently a species identified in SAFS Reports.

TABLE 19. AUSTRALIAN CATFISH TRADE FLOWS 2013-17 (FAO 2020)

AUSTRALIAN CATFISH TRADE		2013	2014	2015	2016	2017
<b>Export</b>						
Catfish fillets, fresh or chilled	Tonnes	0	16	7	0	0
	USD	0	\$38,000	\$30,000	0	0
Catfish fillets, frozen	Tonnes	7	1	16	19	63
	USD	\$40,000	\$4,000	\$65,000	\$64,000	\$203,000
Catfish, frozen	Tonnes	14	9	0	0	1
	USD	\$39,000	\$34,000	0	0	\$2,000
<b>Total</b>	<b>Tonnes</b>	<b>21</b>	<b>26</b>	<b>23</b>	<b>19</b>	<b>64</b>
	<b>USD</b>	<b>\$79,000</b>	<b>\$76,000</b>	<b>\$95,000</b>	<b>\$64,000</b>	<b>\$205,000</b>
	Nom. US\$/kg	\$3.76	\$2.92	\$4.13	\$3.37	\$3.20
<b>Import</b>						
Catfish fillets, fresh or chilled	Tonnes	1,321	456	548	1,152	1,155
	USD	\$3,597,000	\$1,176,000	\$1,285,000	\$2,671,000	\$3,030,000
Catfish fillets, frozen	Tonnes	5,426	6,148	5,501	5,738	5,852
	USD	\$14,060,000	\$16,521,000	\$15,063,000	\$14,651,000	\$16,043,000
Catfish, fresh or chilled	Tonnes	20	2	12	44	53
	USD	\$36,000	\$15,000	\$51,000	\$189,000	\$181,000
Catfish, frozen	Tonnes	35	66	67	112	158
	USD	\$112,000	\$206,000	\$185,000	\$284,000	\$404,000
<b>Total</b>	<b>Tonnes</b>	<b>6,802</b>	<b>6,672</b>	<b>6,128</b>	<b>7,046</b>	<b>7,218</b>
	<b>USD</b>	<b>\$17,805,000</b>	<b>\$17,918,000</b>	<b>\$16,584,000</b>	<b>\$17,795,000</b>	<b>\$19,658,000</b>
	Nom. US\$/kg	\$2.62	\$2.69	\$2.71	\$2.53	\$2.72
<b>Catfish fillets, frozen</b>						
Export	Nom. US\$/kg	\$5.71	\$4.00	\$4.06	\$3.37	\$3.22
Import	Nom. US\$/kg	\$2.59	\$2.69	\$2.74	\$2.55	\$2.74

- Both the export and import flows are dominated by frozen fillets over the five-year analysis, but export product formats have shifted from commodity frozen fish, to processed frozen fillets. While care needs to be used in interpreting multicurrency trends analysed over a short five-year period, this data may reflect a possible niche export opening for processed formats of catfish, or simply a weakening of the Australian dollar and therefore increased competitiveness of Australian exports.
- The data presents a surprisingly large and stable import volume of fillets (fresh, chilled or frozen), suggesting a product format used in domestic retail packs (frozen) as well as domestic higher-margin food service consumer markets (fresh or chilled),
- Australia's average customs values per kilo (US\$ Nominal/kg) provide an indicative average price trend indicator for comparison to the largest like-for-like product format – Catfish fillets, frozen.

Average import prices for this format are relatively stable over large volumes. Average export prices for 2013 and 2014 are too small, dated and volatile to be indicative, but for the last three years (2015, 2016, 2017) volumes are much larger and prices trends more stable and reliable.



The average trade prices in the last three years confirm a consistently lower price for imported product than exported product. The imported product price is around 65% - 85% of the export price. From 2015 to 2017 the price difference is narrowing as Australian volume increases, and export prices fall to match the more stable import landed price. However, it is unknown (as noted above) if this price trend is driven by the declining AUD and/or increased efficiency of Australian processors. And it is not known if this export price fall is commercially viable for processors at these relatively small volumes, or if viability would improve with increased harvest and export volumes.

In this context, Australian wildcatch Catfish compete directly against farmed imported product. From the analyses above there would appear to be some but limited opportunity for increased commercial wildcatch fishery production in Australia to service domestic or export consumers. Import replacement and export niche targeting may be strategies that could be pursued viably.

One further uncertainty is the longer-term impact on the fishery of the recent NSW commercial fisheries consolidation policy. The FRDC website ([www.fish.gov.au](http://www.fish.gov.au)) notes "This harvest reduction (in Estuary Cobbler) was likely associated with reduced fishing effort as a result of the commercial fisheries consolidation."

But the bottom line is that any east coast Catfish harvested and value-added must deliver higher quality fresh or chilled product formats demanded by high-end retail or food service outlets.

#### *Opportunities to Boost Fisher Returns*

Domestic east coast seafood markets have traditionally treated locally harvested Catfish species as a white-meat seafood commodity product. Differentiation of Estuary Cobbler and fork tail Catfish species in wholesale markets over recent years is a welcome change, but the impact of this transition on net beach prices received by fishers is unknown. It is also unknown to fishers consulted and the project team if there is any domestic market differentiation between imported farmed Catfish and domestically harvested wildcatch Catfish. The trade and average price analysis discussed above suggests there may be.

Catfish may offer niche opportunity for some higher value consumer markets seeking local fish (as noted above) and/or a wild caught alternative, but desk research and consultation does not reveal any attractive differentiated eating qualities unique to the species.

Processed and filleted, wildcatch Catfish achieves a relatively low retail price of ~A\$8/kg, which is likely depressed by the large imported volumes of commodity white-meat seafood.

In the USA, there is a significant catfish consumer market supported by imports, and dedicated aquaculture and wildcatch fishing sectors. However, this consumer market catfish is based on the farmed species Channel Catfish (*Ictalurus punctatus*) native to the south eastern United States. Catfish is the leading aquaculture produced seafood product in the US (USA National Marine Fisheries Service), and farmed catfish is available in a variety of different forms:

- Whole fish that have been eviscerated (gutted) and headed with or without the skin intact are available in most markets,
- Fillets are cut to be skinless and boneless and do not contain the small pin bones found in many other fish,
- Smaller portions including nuggets, strips or chunks are cut from the whole fish or fillets,
- All product forms are available as fresh, refrigerated, or frozen raw fish or as products that may include breading, flavourings or other ingredients.

This project has found it impossible to establish initial value-added supply chain or value-adding gross margin analysis for Catfish species in NSW. NSW fisheries agencies do not develop or retain any gross margin data for the species nor is this data available from relevant fishery cooperatives in that state. Individual fishers were unable to provide any further data regarding their costs to harvest or land the species, and no data was available from SFM. As a result, there is insufficient data to enable meaningful value-added gross margin projections. The potential to increase the harvest and fisher margin of this species is unknown.

#### *Barriers to Boosting Returns*

Australia’s Catfish imports are large, relative to local production. It is clear that local east coast Catfish fishers must differentiate, and value add their consumer offer to compete in local markets. Research and consultation have not yet adequately revealed any competitive attributes of east coast wildcatch Catfish necessary to underpin the required differentiation strategy.

Development of initial supply chain gross margin analyses for value-adding options for this species are difficult to achieve due to the lack of existing harvest, supply chain or market data. Therefore, developing current estimates would be somewhat meaningless.

#### *Value of Underutilised Resource*

The development options for Catfish are difficult to scope out, due to the lack of harvest and reliable supply chain data available. As a consequence, the project has not proposed any additional harvest tonnes per year be added to east coast harvests.

Current Avg. Annual Catch 2016-18	Est. Current Annual Value 2016-18	Est. Additional Catch/Yr	Est. Additional Catch Avg \$/kg	Est. Additional Value/Yr
38 tonnes	Unknown	Baseline data not available	Uncertain	Unknown

#### *Conclusion:*

The project has broadly analysed the relevant market dynamics for Catfish and identified potential strategies to increase demand and landed prices. But the project has not been able to analyse nor demonstrate to fishers any volume yield or value-adding gain for Estuary Cobbler or Forktail Catfish in consumer markets.

This project rates the commercial attractiveness of this underutilised species as “Low-Indeterminant”.

## SUMMARY OF RESULTS

Table 20 below presents the estimated landed value (2019 prices) for the 11 Target Underutilised Species in east coast waters – a potential aggregate value of \$85.4 million – with an estimated unharvested catch of 16,600 tonnes.

The next chapter details the analysis, assumptions and conclusions that underpin the estimates of total available ‘fishable’ volume and commercial landed value for each Target Underutilised Species.

TABLE 20. TARGET SPECIES HARVEST – ESTIMATED VALUE OF THE UNDERUTILISED RESOURCE

Species (tonnes)	Production	2015	2016	2017	2018	2019	Stock Status and TACC 2018 & 2019	Uncaught Volume per Year 2018 & 2019	Landed Price - best quality \$/kg	Max. Value of Underutilised Resource
1 Royal Red Prawn	NSW	16	24	44.3	Est. 20	Est. 20	Undefined: no quota	Est. 75	\$12-\$20; QDAFF Report 2019 \$20	300 t. @ \$20/kg = \$6 m
	CTH	156	183	169	222	147	384 & 381	162 & 234		
	QLD	Confidential – data not available								
	Estimated Total	172	207	213	242	167		<b>237 &amp; 309</b>		
2 Ribbon Fish	CTH	No data	No data	No data	No data	No data	Undefined: no quota	Est. 50 t.	\$1-\$4; Handline \$20; SFM \$2-	50 t. @ \$10/kg=\$0.5
3 Blue Mackerel (Eastern)	NSW	389	291	197	228	Est. 228	758 (IAP)	Est. 530	Rocklobster bait \$1.80; Industry – best oil content ~\$10;	8,400 t. @ \$5.0/kg=\$42 m
	CTH	202	2,022	1,248	2,858	3,811	12,090 & 12,090	9,232 & 8,279		
	VIC / TAS	Confidential – data not available								
	Estimated Total	591	2,313	1,445	3,086	4,039		<b>9,762 &amp; 8,809</b>		
4 Silver Trevally	NSW	85	89	60	253	Est. 27	27 (IAP)	0	Industry \$5-\$8; Qld DAFF report \$2.84; NSW Fish. Trap \$15; Trawl \$4 SFM 2018 \$15.00 whole	350 t. @ \$15.00/kg =\$5.25 m
	CTH	93	72	53	55	8	613 & 307	558 & 299		
	VIC	30	13	13	13	Est. 13	Undefined	Est. 10		
	TAS	4	4	4	4	Est. 4	Undefined	Est. 0		
	QLD Est.	200	200	200	130	Est. 200	Undefined	Est. 50		
	Estimated Total	412	378	330	455	252		<b>618 &amp; 359</b>		
5 Australian Sardine (Eastern)	NSW	63	60	47	445	Est. 100	2,744 (IAP)	Est. 2,500	Industry \$2.50 - \$5.00; Oil content too high in pet food	5,000 t. @ \$3.40/kg =\$17 m
	CTH	161	118	140	102	132	9,550 & 9,510	9,448 & 9,378		
	VIC	863	1,524	2,344	2	Est. 300	Unknown	Est. 100		
	Estimated Total	1,087	1,702	2,531	549	532		<b>12,048 &amp; 11,978</b>		
6 Sea Mullet	NSW	2,841	2,843	2,281	2,200	Est. 2,100	Undefined	Est. 250	QDAFF Report \$2.50; SFM 2018 \$3.94	500 t. @ \$4.00/kg = \$2 m
	QLD	1,938	1,520	1,864	1,730	Est. 1,300	Undefined	Est. 250		
	Estimated Total	4,779	4,363	4,145	3,930	3,400		<b>500</b>		
7 Yellowtail Scad	NSW	500	Est. 380	Est. 380	Est. 380	Est. 380	864 (IAP)	484	SFM 2018 \$3.84 NSW Fish. best quality \$8-9	500 t. @ \$7.00/kg =\$3.5 m
	CTH	Confidential – data not available								
	QLD	14	12	8	5	Est. 7	100	95		
	Estimated Total	514	392	388	385	387		<b>579</b>		
8 Luderick	NSW	389	291	197	179	Est. 195	Undefined	Est. 195	NSW Coop. Whole \$8.90	350 t. @ \$10.00/kg =\$3.5 m
	VIC	2	2	2	2	2	Undefined	Est. 0		
	TAS	2	2	2	248	Est. 250	Undefined	Est. 150		
	QLD	5	5	5	5	5	Undefined	Est. 5		
	Estimated Total	398	300	206	434	452		<b>350</b>		
9 Cobbler / Catfish	NSW	34	39	39	36	30	Undefined	No data	No data	Unknown
10 Ocean Jacket	NSW	329	306	227	217	Est. 250	Undefined	200	NSW Coop. Whole \$6.00; SFM \$4.76	450 t. @ \$7.00/kg =\$3.15 m
	CTH	237	246	203	203	140	Non-quota	200		
	TAS	2	2	2	2	Est. 2	Undefined	40		
	VIC	15	14	14	14	Est. 14	Undefined	20		
	Estimated Total	583	568	446	436	406		<b>450</b>		
11 Gould's Squid (Eastern)	NSW	Est. 10	Est. 10	Est. 10	8	Est. 10	Undefined	0	Industry trawl \$3.00-\$3.50; ABARES \$3.33; SFM \$3.52	700 t. @ \$3.50/kg = \$2.45 m
	CTH SSJF	330	385	206	213	Est. 300	TAE	250		
	CTH SESSF CTS	455	528	553	569	Est. 550	TAE	250		
	TAS	32	325	176	315	Est. 200	Est. 400	200		
	Estimated Total	827	1,248	945	1,105	1,060		<b>700</b>		
<b>TOTAL</b>									<b>16,600 t @ Avg. \$5.14/kg = \$85.4 m</b>	

## 5. CONCLUSIONS AND DISCUSSION

### A. Commercial Potential and Attractiveness

The project commenced with an initial long list of more than 150 wild catch seafood species (see Appendix 1). Building on earlier research the project team used a co-designed selection criteria framework to identify eleven Target Underutilised Species in east coast waters from southern QLD south to TAS and across to Western VIC.

Based on the available data, industry consultation, and supply chain analyses the project team was able to assess the nominal commercial attractiveness of the 11 Target Underutilised Species.

From these assessments of commercial seafood development potential, the project team concluded that the selected species formed into three groups:

- A. High potential
- B. Moderate potential
- C. Limited or unknown potential.

The projects conclusions regarding the commercial attractiveness of the Target Underutilised Species are presented in Table 21 and following related discussion.

TABLE 21. PROJECT CONCLUSIONS REGARDING SPECIES COMMERCIAL POTENTIAL

	Underutilised Target Species	Additional Volume Available tonnes	Est. Beach Price Achievable \$/kg	Est. Yield and Value-added Gain \$m	Commercial Attractiveness Rating
Group A	1. Royal Red Prawn	300 t.	\$20	\$6 m	High
	2. Australian Sardine	5,000 t.	\$3.40	\$17 m	High
	3. Gould's Squid	700 t.	\$3.50	\$2.45 m	High
Group B	4. Silver Trevally	350 t.	\$15	\$5.25 m	High
	5. Blue Mackerel	8,400 t.	\$5	\$42 m	Moderate
	6. Yellowtail Scad	500 t.	\$7.00	\$3.5 m	Moderate
	7. Luderick	350 t.	\$10.00	\$3.5 m	Moderate
	8. Ocean Jacket	450 t.	\$7.00	\$3.15 m	Moderate
	9. Sea Mullet	500 t.	\$4.00	\$2.0 m	Moderate
Group C	10. Ribbon Fish	50 t.	\$10	\$0.5 m	Moderate - Indeterminant
	11. Cobbler / Catfish	No data	No data	Unknown	Low - indeterminant
	<b>Total</b>	<b>16,600 t.</b>		<b>\$85.4 m</b>	

## 1. GROUP A – HIGH POTENTIAL

Four species assessed by the project have been found to offer real value-adding potential. Three of these have been supported by fisher-investors as demonstration trial species (Royal Red Prawn, Australian Sardines, and Gould's Squid). These east coast species have well developed value-adding concepts that can leverage underutilised volumes and higher returns from existing strong consumer markets, locally and globally.

Royal Red Prawns are an attractive sashimi product, initially offered in a domestic market. There is a very compelling business case to fully use and value-add this well-known commercial species for that consumer market, and potentially for export.

Australian Sardines are an attractive species to transition from commodity seafood and bait markets, into consumer packs of processed seafood. Current parallel value adding initiatives in WA confirm the opportunity. There is a very compelling business case to fully use and value-add this well-known and abundant east coast commercial species.

Gould's Squid is a product with increasing global and local demand. Jig harvested Gould's Squid command a higher quality and price premium than trawl harvested product. The major development barrier is a lack of proximate processing capacity for the product.

As the project wrapped up, there were confidential commercial trials in various stages of development to progress these three species.

One additional species that was considered to offer high potential was trap and line caught Silver Trevally. Harvested via these methods to optimise product quality, this species offers all of the supply chain and consumer market attributes that would motivate commercial investors to develop a sashimi grade product. However, during this project, the species did not attract sufficient support from fisher-processor-investors to underpin development of a demonstration trial. The project team is firmly of the view that a detailed business assessment and trial are justified based on the initial analysis undertaken by this project.

## 2. GROUP B – MODERATE POTENTIAL

Six commercial species (Trawl harvested Silver Trevally, Blue Mackerel, Yellowtail Scad, Luderick, Jackets, Sea Mullet) assessed by the project offer attractive trial opportunities to:

- Capture underutilised volumes,
- Greatly improve the efficiencies of their supply chains, and
- Undertake a higher level of processing and value-adding.

But first there is and remains a need to overcome a number of product development barriers, variously including, lack of infrastructure, poor harvest practice and supply chain quality, low consumer market awareness, and low species acceptance.

As noted above, Silver Trevally caught by trap or line has significant consumer market appeal on paper, that would elevate it to the 'high potential' group.

## 3. GROUP C - LIMITED OR UNKNOWN POTENTIAL.

Two species have been found difficult to fully assess within this project.

Ribbon Fish, an undefined bycatch species, is favourably identified by stakeholders and offers a supply chain development pathway to serve Chinese cuisine niches. But this species currently lacks the data

(harvest, supply chain, and market) to leverage its underutilised status, or to compel a market investment and business case.

Estuary Cobbler and Forktail Catfish, the main species in an undefined east coast commercial minor-species Catfish group, present evidence in support of an export niche or import replacement strategy. But both of these Catfish species currently lack the data (harvest, supply chain, and market) to enable adequate assessment of their joint or separate underutilised status, or potential for increased harvesting or marketing.

## B. Boosting Fisher Returns: contributions from use and value-adding

This project has been tasked to assess the potential to boost GVP and fisher returns from two specific sources: fishery use and value adding. For both sources, (as discussed elsewhere in this report) east coast fishers' net returns will reflect the market response to their offer and its competitiveness against alternatives available to seafood consumers.

Gains in fisher returns from underutilised fisheries will arise from a mix of two strategies:

- a) Greater Use of Target Underutilised Species directly boosts fishers returns as a result of increased production volume at the existing price. This is welcome where TACCs enable such increases, at prices that are viable for fishers. But increased harvest volume alone may not be an acceptable strategy as the current landed price of the species may not be viable for fishers. Any additional harvest and supply may therefore reduce market prices (and returns to fishers) if existing customers continue to buy at current levels or new customers are not found.
- b) Smart Value-adding to the existing and expanded catch at points down the supply chain will potentially boost fisher returns. Importantly, this strategy changes the value proposition fishers and their partners offer to consumers. This will include value adding activities undertaken by fishers such as quality management from the harvest point, ice slurry application, grading of fish delivered to port side receivers, primary processing, down-stream manufacturing, improved packaging, product promotion, increasing consumer awareness and loyalty to brands, etc.
- c) Or a combination of a and b.

### 1. GREATER USE OF TARGET UNDERUTILISED SPECIES

This project has demonstrated for the identified Target Underutilised Species that there is potential additional GVP achievable through increased utilisation (i.e. volume increase) from ten species in an unmodified format (i.e. not value-added) in known commercial markets. These species are in Group A and Group B. plus Ribbon Fish.

One Group C species group (Estuary Cobbler/Forktail Catfish) could not be fully assessed due to insufficient data available to undertake analyses with adequate rigour.

### 2. SMART VALUE-ADDING TO UNDERUTILISED TARGET SPECIES.

For four species (Royal Red Prawn, Australian Sardine, Gould's Squid, Silver Trevally) the project has identified potential new product formats and value-added pathways that have the potential to leverage the net fisher landed price for both the existing harvest volume and the proposed additional harvest volume. Three of these species (Royal Red Prawn, Australian Sardine, Gould's Squid) attracted commercial support to undertake private market development trials during the course of this project.

For five other species (Blue Mackerel, Yellowtail Scad, Luderick, Leather Jacket/Ocean Jacket, Sea Mullet) the project has broadly identified value-adding pathways per species, but has not been able to adequately demonstrate the additional GVP value that could potentially be unlocked from such strategies. Each of these species needs to overcome individual development barriers, variously including, lack of infrastructure, uncertain chain financial metrics, poor management of quality along the chain, and low chain and consumer market awareness and acceptance. The project did not identify or motivate private commercial trials by fisher-processor-investors for these species.

Two other species (Ribbon Fish and Estuary Cobbler/Forktail Catfish) have been broadly assessed at a macro scale for value-adding pathways, but not for value-adding potential individually. There is insufficient data available to assess the potential of these species.

### 3. WHERE ADDITIONAL SEAFOOD VALUE IS CREATED

Figure 21 forecasts that additional aggregate GVP value of \$85.4 million per year will be created from increased utilisation and smart value-adding of these Target Underutilised Species. This represents approximately 5% of the current GVP of Australia's wildcatch sector (\$1.707 Bn).

#### Seafood Quality

Quality enhancement and capture are common themes through the discussion in this report. During consultations, many fishers, portside receivers and processors advised the project team that seafood quality is a fundamental issue and challenge for underutilised species. Stakeholders agree that east coast fishers of these underutilised species generally do not manage harvest quality well. This report draws two conclusions regarding how seafood quality is created.

##### *Quality Creation*

Firstly, product quality is fundamental to creating seafood value and boosting fisher returns. The need to improve product quality (in all its market manifestations – taste, texture, recency, etc) is a consistent theme and conclusion discussed for each of the 11 species assessed in this project. Quality management before, at, and after the harvest is a fundamental value adding strategy for fishers seeking to boost their returns. If seafood product quality is not locked in by the fisher at the harvest, it is not possible for the downstream supply chain to recreate – the result is that eating quality declines, and consumer trust is lost. Market prices and net returns decline as a result.

##### *Margin Capture*

Secondly, a fisher's ability to capture the sales margin benefits from their investment in improved quality depends on the supply chain that fisher serves. The existing dominant supply chains used by these 11 species do not serve all fishers well. It is clear from project research that each of the leading fishers in Group A (High Potential Species) has actively chosen to develop their own shortened, controllable supply chain for processing activities, value adding, branding, etc. These enterprises intend to integrate their businesses down their supply chain toward the market with a clear aim to better understand and get close to their final target consumer. This may require substantial new financial and human capital. Most fishers in Group B also aspire to a similar strategy but they lack the resources to invest. Their pathway to this goal is more difficult (i.e. their commercial attractiveness is lower).

Fisher's ability to capture a larger share of these forecast gains is complex and challenging – it will vary by fisher, by fishery, by species, by supply chain chosen, etc etc.

## Contribution Mix – Use or Value Add

The optional pathways ((a), (b) or (c) above) to boost fisher value and returns have been discussed throughout this report. For each of the 11 species the contribution mix from Strategy (a) or Strategy (b) varies greatly. This data is drawn from the project team’s analyses of options for each species.

Table 22 analyses and presents the project’s estimated GVP Gain in Value from each value boosting pathway – (a) Use, or (b) Value adding. Group C species lack the data to enable a complete analysis.

Table 22 identifies both the current and future volume and nominal average price for each Target Underutilised Species. The table also forecasts the additional value created from greater use of the fishery (a)<sup>12</sup> and from value adding activities (b) in each species supply chain. In the last column the table presents the total forecast value gain to be created from the strategies discussed in this report. These figures reconcile to Table 21 data.

TABLE 22. FORECAST CONTRIBUTIONS THAT WILL BOOST FISHERS NET RETURNS

Underutilised Target Species	Additional GVP from USE				Additional GVP from Value Added Prices				Total Gain in Value \$m	
	Current Total tonnes	Volume Gain tonnes	Forecast Total tonnes	Value Gain Created \$	Current Avg. Price \$/kg	Price Gain \$/kg	Forecast Avg Price \$/kg	Value Gain Created \$		
Group A	Royal Red Prawn	217	300	517	\$1.1 m	3.73	9.44	13.17	\$4.9 m	\$6.0 m
	Australian Sardine	1,595	5,000	6,595	\$6.7 m	1.34	1.57	2.90	\$10.3 m	\$17.0 m
	Gould's Squid	1,099	700	1,799	\$2.0 m	2.82	0.26	3.09	\$0.48 m	\$2.45 m
Group B	Silver Trevally	182	350	532	\$1.9 m	5.49	6.25	11.75	\$3.3 m	\$5.25 m
	Blue Mackerel	2,680	8,400	11,080	\$20.7 m	2.46	1.92	4.39	\$21.3 m	\$42.0 m
	Yellowtail Scad	330	500	830	\$1.2 m	2.42	2.76	5.18	\$2.3 m	\$3.5 m
	Luderick	314	350	664	\$0.67 m	1.91	4.26	6.17	\$2.8 m	\$3.5 m
	Ocean Jacket	484	450	934	\$1.4 m	3.10	1.88	4.98	\$1.8 m	\$3.15 m
	Sea Mullet	4,146	500	4,646	\$1.6 m	3.18	0.09	3.27	\$0.4 m	\$2.0 m
Group C	Ribbon Fish	Unknown	50	Unknown	n/a	Unknown		\$0.5 m	\$0.5 m	
	Cobbler / Catfish	38	No data	Unknown	n/a	Unknown		n/a	n/a	
<b>Total / Avg</b>		<b>11,085</b>	<b>16,600</b>	<b>27,685</b>	<b>\$37.3 m</b>	<b>2.68</b>	<b>1.48</b>	<b>4.16</b>	<b>\$48.1 m</b>	<b>\$85.4 m</b>

<sup>12</sup> The calculation of Value Gain Created from increased Use is: Volume Gain in tonnes x Current Average Nominal Price landed in \$/kg. The calculation of Value Gain Created from increased Value Adding is: (Forecast Average Price – Current Average Price) x Forecast Total Tonnes.



Using Royal Red Prawn as an example, the table concludes (based on the data discussed in this report) that increased sustainable production will add \$1.1 m to the existing GVP of \$810,000. However, by comparison, value adding activities will raise prices and add \$4.9 m. The total additional value created for the species as a result of strategies proposed in this study is \$6.0 m. Clearly the expected price gain (not the harvest tonnage gain) is the dominant factor driving up Royal Red Prawn sales prices, sales margins and therefore expected returns to fishers. This conclusion aligns with the research undertaken by QDAFF Poole et al noted in this report that existing market prices could rise to \$20/kg with a greater focus on value adding to sashimi grade product. Production gains for this species are important in the total value creation mix, but less so. It is not surprising therefore to see that leading fishers are investing in fishery access (e.g. quota) and value adding activities (e.g. on board snap freezing and grading capacity) that will enable them to develop and control their harvest, and inhouse processing and value adding to Royal Red Prawns.

Other species that exhibit dominant price-driven value adding potential (rather than harvest driven volume use potential) are Australian Sardine, Silver Trevally, Luderick and possible Yellowtail Scad. The respective value adding activities proposed for these species are outlined in this report.

The project concludes that Blue Mackerel seafood fishers can boost their returns by lifting harvest volumes (gain of \$20.7 m), and also by undertaking value adding activities (gain of \$21.3 m) in equal measure.

By contrast the project concludes that fishers of Gould's Squid and Sea Mullet will be best served by focussing their attention more on increasing harvest volume and catch management, and less on down-stream value adding activities. These species are seafood commodities and therefore sustained price gains are very difficult to achieve over large volumes. However, niche processors and value adders to Gould's Squid may well achieve good long term price gains in small domestic selected markets. Note that Gould's Squid is a global commodity species in Group A, but is still considered by the project team to be one of the most commercially attractive underutilised species if superior quality can lift it out of direct competition with imports.

Across all 11 Target Underutilised Species, the project team concludes that \$85.4 million of GVP value will be created / added, \$37.3 m (43%) of which will come from landed volume production gains, and the balance of \$48.4 m (57%) will come from value adding activities.

## C. Assumptions & limitations

It is important to understand the scope and scale of assumptions made by the project team in collating and analysing data presented throughout this report and in the summary tables below.

Data related to current landings and future harvest potential for each species are sourced from available fishery agencies. Harvest trend data and future TACCs for most species by jurisdictional fishery are available, but for some species has been assumed by the project team. Recent updates have been integrated as data has become known (e.g. NSW IAP Review). Consultations with agencies and industry has informed these volume assumptions and filled many gaps in knowledge in most cases.

The project assumes that underutilised fisheries are fishable, and that fishers and supply chain members will continue to make logical economic decisions that create an acceptable return on their commercial investment.

Data regarding the current seafood prices have been drawn from agencies (based on indicative nominal GVP values) and cross referenced with existing supply chains, wholesalers (e.g. SFM) and industry leaders.

Comparative trade data has been sourced where possible from existing reports (e.g. QDAFF for Royal Red Prawns, FAO for trade in squid), websites (e.g. WA production of value-added Australian Sardines) and industry scans (Catfish) conducted by the project team.

The forecast of future average nominal seafood prices (and therefore GVP values) has been undertaken conservatively by the project team, and always referenced to the latest available price signals from an expert or other credible market source (prior to the impact of Covid19).

Clearly it is not possible to determine the exact mix of increased harvest use and value adding that will be adopted by each underutilised species supply chain. The forecast prices and values are therefore the project team's best estimates guided by date, experience and expert advice where available. Where the team has not been able to establish its threshold level of confidence in data, this has been advised in the data and conclusions.

The impact of inflation is currently negligible and therefore has been ignored in these estimates of current and future value.

The analyses assume the Australian dollar will remain relatively stable against the relevant seafood trade economies (e.g. catfish product from Vietnam competing with Australian producers) that service the Australian consumer through imports to Australia.

These assumptions lead to limitations on the use of the analyses and forecasts from this report.

For Group A species the data are at a level that is supported by the industry proponents on confidential terms. They have determined to progress their trials and related activities privately as is commercially appropriate.

For Group B species much of the production data and related forecasts is adequate to undertake prefeasibility analyses for investment purposes. However, the market and value adding data for these species requires more in-depth reference and scrutiny by experienced seafood operators before it can support respective commercial investment proposals. It is hoped that, as a result of the analyses in this study commercial proponents may be prompted to privately review the commercial development of these species.

For Group C species the project has confirmed that the level of data available and its related integrity is not able to support any commercially relevant assessment of the use or value of these underutilised species.

## D. Barriers to Increased Utilisation

The following issues and impacts have been identified in discussions with fishers, cooperatives, wholesalers, stakeholders as influencing their ability and risk motivation to progress opportunities that will increase their use of Target Underutilised Species.

### *Lack of Raw Data*

The project has been constrained by a general lack of credible harvest and supply chain data. Where data gaps exist in both access and quality, it is due to the fact the data is not collated, it is not accessible publicly due to transitional data management arrangements, or it is withheld by agencies or supply chain parties due to confidentiality reasons.

After extensive engagement and discussion with stakeholders the project team has formed the view that development initiatives to make better use of some underutilised species can and are being stymied by external factors and processes. Policy and supply chain arrangements that excessively protect or reduce access to or transparency of commercial data (production, chain activity, demand)

raises risks for fishers, processors and investors to a level where otherwise beneficial development is precluded.

#### *Policy Transition*

A NSW review (Independent Allocation Panel) of quota allocation has been underway during this project. The review was relevant to some species in this project. Some active fishers said they were unable to consider further investment in underutilised species until this committee had completed its advice (June 2018), final policy rolled out, and commercial investment implications for fishers and processors were assessed.

#### *Confidentiality*

A number of fishery operators requested strict confidentiality agreements with the consultant in order to discuss potential investment options. These limit the extent of detailed discussion available in subsequent FRDC meetings and in this report.

#### *Lack of East Coast Processing Capacity*

Large Australian seafood market players have approached the NSW PFA regarding offtake (i.e. future purchases under contract) volumes for some of these TUS, but there is no capacity for the fishing industry to respond to these opportunities. Lack of seafood processing capacity and high processing costs are a major barrier to greater utilisation of these species.

#### *Strong Flavoured Species*

Most of the Target Underutilised Species are stronger flavour fish (e.g. Sea Mullet, Blue Mackerel, Luderick, and Catfish), either due to their biology or to their harvest habitat (estuarine or marine). Therefore, they are not attractive to most retail or food-service seafood consumers. They typically require labourious processing at the time of capture to mitigate some of the adverse flavour and quality issues. Industry consultation and the available evidence suggest that strong seafood flavours can be overcome if there is sufficient demand from wholesalers & consumers to warrant the effort to invest in food science and fishery procedures to address the issue. Targeted research at the point of capture, despatch, and initial processing would be a good first step to mitigating if not resolving much of this issue for marketers and consumers.

#### *Limited Linkage between Research Base and Proponents*

It is clear in the report that some species (Royal Red Prawn, Australian Sardine) have established a portfolio of existing research documenting their fishery management, production, value adding options, market product attributes, consumer market perceptions etc. These are primary candidates for development. Then there are other species that offer compelling commercial prospects (as concluded by this study for example, for Silver Trevally, Luderick) that have only limited existing research reports, data and analysis to fully demonstrate their commercial potential. Clearly not all species can or should attract grants or subsidies to assess their commercial potential. But this project demonstrates that as an industry, seafood can and should be more proactive and articulate in its identification, selection and discovery of the best underutilised species candidates. The report by Stephens Report (Stephens, L, 2018) provides a basis for going forward. From that review the key point that resonates for this project is to establish early a co-investment partnership with experienced fisher/processor investors who are guided by commercial risk management and market outcomes. That confidential investment mantra was central to the design of this project and the structure of the Steering Committee guiding the work. The approach has been somewhat successful as evidenced by

the commercial proponents supporting the three Group A species and selected others (Blue Mackerel). But for other species in Group B, it was not possible to find a seafood co-investment champion sufficiently motivated to drive each species project to the trial level.

The Group B species are all opportunities that should be pursued to the next step. This would enable detailed commercial analyses based on better data that enables a go - no go commercial outcomes jointly with experienced seafood co-investors on confidential terms.

#### *Cooperative Structures with Low Returns and Capital Constraints*

Regional fishery cooperatives perform a vital function is establishing and maintaining the basic infrastructure (receiving, freezing, sorting, bulk building, payment, despatch to wholesalers) required to support small and family-based fisheries.

However, the major drawback identified in a number of fisher consultations is the universal cooperative policy of averaging prices across all catches for a single species of fish, irrespective of quality. Cooperatives are also bound to accept harvest product from fisher-members under very loose quality specifications. These are major barriers to incentivising those fisher-members and others who invest in harvest quality (e.g. immediate ice slurry on board after landing, ikijimi). Until this problem is addressed, it will be difficult for cooperatives (and fishers more broadly) to lift quality across a species and therefore lift prices for their fishers. Current indications (and research cited in this report) confirm that the cooperative fishery business model and down-stream supply chains are under increasing pressure to service their capital costs, while remaining competitive against emerging online water-to-market seafood trade models.

#### *Fisher Enterprise Scale and Capability*

An investment focus on underutilised species one-by-one will not be viable as a harvest strategy for most vessels. Wildcatch harvest risk means the average vessel needs to be prepared to harvest a range of target and coproduct species on any given fishing trip, in order to be viable. The only exceptions may be for large volume species where vessels can specifically rig for and target a single species and method (e.g. Squid jigging).

## E. Recommendations

The project team draws the following recommendations from the project conclusions, assumptions and discussion.

1. Engage commercial entities currently planning trials for High Potential Species (Group A - Royal Red Prawn, Australian Sardines, Gould's Squid) seeking to establish value-adding capacity in east coast underutilised fisheries.
2. Establish a project to assess and develop market opportunities for premium grade trap or line harvested Silver Trevally products in east coast waters.
3. Work with and support the commercial development of other underutilised species across Qld, NSW, VIC and TAS with value-adding potential (including Group B species - Blue Mackerel, Yellowtail Scad, Luderick, Ocean Jacket, Sea Mullet). This will include both seafood products and industrial (e. g. input feeds for aquaculture) products. Consider collaborative commercial co-investment scenarios and initiatives that bring the major quota holders and down-stream market partners together to develop value adding ventures.
4. Invest in seafood science that will enhance harvest procedures and mitigate the stronger seafood flavours that consumers find unattractive. For this underutilised species project such an investment

needs to be targeted at the point of capture/despatch/harvest and initial processing, for at least Sea Mullet, Blue Mackerel, Luderick, and Catfish. Other species may also benefit from such research subject to their market allocations. Targeted research would be a good first step to mitigating if not resolving much of this issue for marketers and consumers.

5. Support Cooperatives and leading fishers that seek to reshape their business model. The mounting evidence over the last two decades suggests the current business model is not working for fishers or cooperatives, and average levels of capital replacement and viability continue to decline.

Research for this project confirms that fishers' cooperatives in NSW have long been the subject of frequent industry reviews and industry reform initiatives. Private investment under such circumstances is challenging, if not fraught. This report also concludes that existing cooperative policies and practices continue to be a major barrier to increased fishery utilisation and viable long-term cooperative returns. But as this formal cycle for change and reform appears to be moderating (if not passing), opportunity arises for targeted investment in line with a fresh business model.

This study finds there is a narrow commercial pathway available to those few fishers and or cooperatives that hold a clear comparative advantage directly related to underutilised commercial species (i.e. proximate fishery access for attractive underutilised species). Such fishers/cooperatives could collaborate and coinvest with selected commercial supply chain partners to identify consumer market segments that value and leverage their unique underutilised species, including those listed in this report. Experienced fishers and chain partners together could design the consumer products and value adding processes, upgrade the harvest procedures, investigate the price points and achievable margins, and assess the minimum sustainable harvest volume and supply quality that will consistently deliver better investment returns along the chain.

A thorough and professional inhouse investment assessment will reveal the scale of fishery resources, human capacity and financial capital required, and the attractiveness (or not) of the preferred short-listed scenarios and investment pathway.

Commercial banks and other funding institutions will not invest in early stage seafood studies, nor are they likely (based on historical trends) to finance commercial wildcatch seafood ventures. Fishers and cooperatives must therefore invest privately and seek financial support elsewhere.

The formal investment assessment is the first stage to changing the business model. This report therefore recommends that financial assistance be made available to support fishers/cooperatives seeking to assess and establish a new business model that involves underutilised species.

6. Confirm procedures with fisheries agencies to enable improved access to higher integrity fishery and species data (volume and value by year by species) for all commercial species on the east coast.

7. Drive financial capital renewal, and supply chain innovation.

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# Appendix 1. Database of Underutilised Species

## DRAFT DATABASE

The starting point for this project was a wildcatch fishery species database developed by Curtin University (from a previous FRDC project) and made available to the project. (Microsoft XL spreadsheet - File V6. dated 4 May 2016).

The database identified:

- A total of 132 commercial species across 100 fisheries in Commonwealth, State and Territory waters,
- TACC data where available at that time,
- A range of harvest, processing and market challenges and opportunities by species and fishery.
- 32 species as underutilised across 78 fisheries. The criteria employed by Curtin University to establish species status as underutilised are based on available TACC utilisation, processing potential and market potential. These criteria broadly align with criteria subsequently described and defined by Stephens (Stephens, L, 2018)

## PRIMARY CRITERIA

Starting with the data set, the project team developed and refined the database for this project, based on data available from various sources, including ABARES, [www.fish.gov.au](http://www.fish.gov.au), state agency publications and industry advice.

The Project Workplan required the selection of underutilised species relevant to NSW and east coast fisheries that would enable:

1. A demonstration to Australian fishers and enterprises of the increase in the harvest of unutilised yield in selected Australian fisheries,
2. A demonstration to Australian fishers of significant and sustainable increase in the returns to selected Australian fishermen from fishery yield growth and innovative value-adding,
3. A demonstration to Australian fishers of increased utilisation, yield and margin of seafood production to value-added formats for new consumer markets.

## SECONDARY CRITERIA

Prior to project mobilisation, the project team established a process to engage stakeholders and select a workable number of underutilised species relevant to NSW fisheries (as the project proponents) to develop as demonstration case studies. Over a number of weeks the project team held at least two rounds of face to face meetings with the industry proponent (NSWPFA), as well as the FRDC, AFMA, Dr Janet Howieson from Curtin University, and the Project Steering Committee in order to better refine the target species to be assessed as case studies.

As an output from this process the following table lists an extract from the updated national database, prioritised by species by fishery, for NSW and east coast wildcatch fisheries. The original listed species (prior to the consultation rounds) are identified by fishery in the top 76 items. However, stakeholder advice confirmed the need to add species outside this shortlisted group so that the project would "demonstrate" the harvest, viability, and value-adding options and gains required by the Project Workplan.



Stakeholders noted the need to include species that would:

1. Be predominantly NSW Fisheries specific and more broadly from the east coast of Australia,
2. Be representative of a range of habitats from estuarine brackish, to marine, both nearshore and offshore,
3. Be harvestable in State and Commonwealth marine waters in eastern Australia,
4. Include three types of aquatic animals - finfish, molluscs and crustaceans,
5. Comprise a range of landed beach prices per kg, from premium to commodity products,
6. Include fishery potential from high volume existing fisheries, to low volume potential species,
7. Include species that would demonstrate a broad range of seafood value-adding options, including transition from bait markets,
8. Include species where value-added seafood research has been undertaken,
9. Include species that had been and not been assessed relative to their stock status per SAFS,
10. Include species that had quota assigned (in at least one east coast fishery), and had not been assigned quota,
11. Include species that are also harvested by the Recreational and Indigenous Sectors.

The 13 initial shortlist of species confirmed for this project are as follows, referenced to the 11 criteria listed above:

#	Fish name generic	NSW	Habitat	State + Cwth waters	3 Aquatic animal types	Beach prices	Harvest volume potential	Value-adding potential	Existing R&D	SAFS rated	TACC / Quota	Recreational species	Indigenous species
		1	2	3	4	5	6	7	8	9	10	11	11
4	Royal Red Prawn	✓	Marine	Both	Crustacea	High	Low	High (sashimi)	✓	✓	✓	✘	✘
2	Ribbon fish	✓	Marine	Both	Finfish	Low	Low	Unknown	●	●	✘	✘	✘
3	Blue Mackerel	✓	Marine	Both	Finfish	Low	High	Medium	●	✓	✓	✓	●
4	Silver Trevally	✓	Marine	State	Finfish	Medium	Medium	High (bait)	●	✓	✓	✓	●
5	Australian Sardines	✓	Marine	Both	Finfish	Low	High	High	✓	✓	✓	✓	✘/●
6	Sea Mullet	✓	Marine	Both	Finfish	Low	Medium	Low	●	✓	✘	✘	●
7	Yellowtail Scad	✓	Marine	State	Finfish	Low	Medium	Medium	●	✓	✘	✓	●
8	Luderick	✓	Inshore	State	Finfish	Medium	Medium	Medium	●	✓	✘	✓	●
9	Catfish (forktail)	✓	Estuarin	State	Finfish	Low	Low	Unknown	●	●	✘	✓	●
10	Estuary Cobbler	✓	Estuarin	State	Finfish	Low	Low	Unknown	●	✓	✘	✓	●
1	Leather Jacket	✓	Varied	Both	Finfish	Low	Medium	Medium	●	✓	✘	✓	●
12	Ocean Jacket	✓	Inshore	Both	Finfish	Medium	Medium	Medium	●	✓	✘	✓	●
13	Gould's Squid	✘	Marine	Cwth	Mollusc	Low	High	Low	✓	✓	✓	✓	●

Sources: Industry advice and [www.fish.gov.au](http://www.fish.gov.au) ● no data or unknown, ✓ species confirmed - positive ✘ species confirmed -

The full list of database species (rated and unrated) is presented in the following table. The 13 initial short listed species agreed by fishery, for the project are highlighted in red text.

Extract from Database of Underutilised Species

#	Fish name generic	Scientific Name	Rating (1 = High)	Primary Fishery
1	Gould Squid (Arrow)	<i>Natotadarus gouldi</i>	1	CTH Southern and Eastern Scalefish and Shark Fishery
2	Gould Squid (Arrow)	<i>Natotadarus gouldi</i>	1	CTH Scalefish Fishery
3	Gould Squid (Arrow)	<i>Natotadarus gouldi</i>	1	CTH Southern Squid Jig Fishery
4	Gould Squid (Arrow)	<i>Natotadarus gouldi</i>	1	CTH Torres Strait Fishery
5	Blue Grenadier (Hoki)	<i>Macruronus novaezelandiae</i>	2	CTH Southern and Eastern Scalefish and Shark Fishery
6	Blue Morwong	<i>Mnemadactylus valencleennesi</i>	2	NSW Ocean Trap and Line Fishery
7	Blue Morwong	<i>Mnemadactylus valencleennesi</i>	2	WA South Coast Demersal Scalefish Fishery
8	Blue Morwong	<i>Mnemadactylus valencleennesi</i>	2	WA Temp. demersal gillnet & demersal longline fisheries
9	Latchet fish	<i>Pterygotrigla polyommata</i>	2	QLD Gulf of Carpentaria Inshore Finish Fishery
10	Latchet fish	<i>Pterygotrigla polyommata</i>	2	CTH Southern and Eastern Scalefish and Shark Fishery
11	Octopus spp.	<i>Octopoda</i>	2	WA Cockburn Sound Line and Pot managed Fishery
12	Octopus spp.	<i>Octopoda</i>	2	WA Developing Octopus Fishery
13	Octopus spp.	<i>Octopoda</i>	2	WA Exmouth Gulf Prawn Managed Fishery
14	Octopus spp.	<i>Octopoda</i>	2	CTH Northern Prawn Fishery
15	Octopus spp.	<i>Octopoda</i>	2	WA North Pilbara Prawn Trawl
16	Octopus spp.	<i>Octopoda</i>	2	WA Shark Bay Prawn and Scallop Managed Fisheries
17	Octopus spp.	<i>Octopoda</i>	2	CTH Southern and Eastern Scalefish and Shark Fishery
18	Octopus spp.	<i>Octopoda</i>	2	TAS Scalefish Fishery
19	Octopus spp.	<i>Octopoda</i>	2	VIC Ocean Purse Seine Fishery
20	Octopus spp.	<i>Octopoda</i>	2	WA West Coast Rocklobster Fishery
21	Ribaldo	<i>Mora moro</i>	2	CTH Southern and Eastern Scalefish and Shark Fishery
22	School Whiting	<i>Sillago flindersi</i>	2	CTH Southern and Eastern Scalefish and Shark Fishery
23	School Whiting	<i>Sillago flindersi</i>	2	NSW Ocean Trawl Fishery
24	Silver Trevally	<i>Pseudocaranx georgianus. Pseudocaranx spp</i>	2	CTH Southern and Eastern Scalefish and Shark Fishery
25	Blue Mackerel	<i>Scomber australasicus</i>	3	CTH Southern and Eastern Scalefish and Shark Fishery
26	Blue Mackerel	<i>Scomber australasicus</i>	3	CTH Small Pelagic Fishery
27	Blue Mackerel	<i>Scomber australasicus</i>	3	NSW Ocean Trap and Line Fishery
28	Blue Mackerel	<i>Scomber australasicus</i>	3	CTH Small Pelagic Fishery
29	Blue Warehou	<i>Seriola lalandi</i>	3	CTH Southern and Eastern Scalefish and Shark Fishery
30	Boarfish spp.	<i>Pentacerotidae</i>	3	NSW Ocean Trap and Line Fishery
31	Boarfish spp.	<i>Pentacerotidae</i>	3	CTH Southern and Eastern Scalefish and Shark Fishery
32	Boarfish spp.	<i>Pentacerotidae</i>	3	WA Temp. demersal gillnet & demersal longline fisheries
33	Boarfish spp.	<i>Pentacerotidae</i>	3	CTH Western Deep-Sea Fishery
34	Deepwater Bugs	<i>Ibacus spp.</i>	3	CTH Western Deepwater Trawl Fishery
35	Elephant fish	<i>Callorhynchus milii</i>	3	CTH Southern and Eastern Scalefish and Shark Fishery
36	Gemfish	<i>Rexea solandri</i>	3	CTH Southern and Eastern Scalefish and Shark Fishery
37	Jackass Morwong	<i>Nemadactylus macropterus</i>	3	CTH Southern and Eastern Scalefish and Shark Fishery
38	Knifejaw	<i>Opegnathus woodwardi</i>	3	CTH Southern and Eastern Scalefish and Shark Fishery
39	Mantis shrimp	<i>Stomatopoda</i>	3	NSW Estuary Prawn Trawl Fishery
40	Mantis shrimp	<i>Stomatopoda</i>	3	NSW Ocean Trawl Fishery
41	Mantis shrimp	<i>Stomatopoda</i>	3	WA West Coast Rocklobster Fishery
42	Mirror Dory	<i>Zenopsis nebulosa</i>	3	CTH Southern and Eastern Scalefish and Shark Fishery
43	Red Gunnard	<i>Chelidonichthys kumu</i>	3	CTH Southern and Eastern Scalefish and Shark Fishery
44	Red Gunnard	<i>Chelidonichthys kumu</i>	3	CTH Western Deep-Sea Fishery
45	Ribbon Fish (Frost)	<i>Lepidopus caudatus</i>	3	CTH Southern and Eastern Scalefish and Shark Fishery
46	Royal Red Prawn	<i>Haliparoides sibogae</i>	3	QLD Coral Reef Finfish Fishery
47	Royal Red Prawn	<i>Haliparoides sibogae</i>	3	NSW Ocean Trawl Fishery
48	Royal Red Prawn	<i>Haliparoides sibogae</i>	3	VIC Ocean Purse Seine Fishery
49	Royal Red Prawn	<i>Haliparoides sibogae</i>	3	CTH Southern and Eastern Scalefish and Shark Fishery
50	Samsonfish/ Amberjack	<i>Seriola hippos</i>	3	QLD Rocky Reef Finfish Fishery
51	Samsonfish/ Amberjack	<i>Seriola hippos</i>	3	WA South Coast Demersal Scalefish Fishery
52	Samsonfish/ Amberjack	<i>Seriola hippos</i>	3	WA Temp. demersal gillnet & demersal longline fisheries
53	Silver Warehou	<i>Seriola punctata</i>	3	CTH Southern and Eastern Scalefish and Shark Fishery
54	Alfonsino	<i>Beryx splendens</i>	4	CTH Southern and Eastern Scalefish and Shark Fishery
55	Amberjack	<i>Seriola dumerili</i>	4	QLD East Coast Inshore Finfish Fishery
56	Amberjack	<i>Seriola dumerili</i>	4	QLD Gulf of Carpentaria Inshore Finish Fishery
57	Grey mackerel	<i>Scomberomorus semifasciatus</i>	4	QLD East Coast Inshore Finfish Fishery
58	Grey mackerel	<i>Scomberomorus semifasciatus</i>	4	WA Mackerel Fishery
59	Grey Morwong	<i>Nemadactylus douglasii</i>	4	NSW Ocean Trap and Line Fishery
60	Grey Morwong	<i>Nemadactylus douglasii</i>	4	CTH Southern and Eastern Scalefish and Shark Fishery
61	Grinners, Lizard fish	<i>Synodus spp</i>	4	WA North Pilbara Prawn Trawl Fishery
62	Jack Mackerel	<i>Trachurus declivis</i>	4	CTH Southern and Eastern Scalefish and Shark Fishery
63	Jack Mackerel	<i>Trachurus declivis</i>	4	CTH Small Pelagic Fishery
64	Leather Jacket	<i>Nelussetts/Monacanthidae/Meuschenia /Triacanthus spp</i>	4	NSW Ocean Trap and Line Fishery
65	Leather Jacket	<i>Nelussetts/Monacanthidae/Meuschenia /Triacanthus spp</i>	4	WA South Coast Demersal Scalefish Fishery
66	Leather Jacket	<i>Nelussetts/Monacanthidae/Meuschenia /Triacanthus spp</i>	4	WA South Coast Nearshore and Estuarine Finfish

67	Leather Jacket	<i>Nelusets/Monacanthidae/Meuschenia /Triacanthus spp</i>	4	CTH Southern and Eastern Scalefish and Shark Fishery
68	Luderick	<i>Girella tricuspidata</i>	4	NSW Ocean Haul Fishery
69	Ocean Jacket	<i>Nelusets ayraudi</i>	4	CTH Southern and Eastern Scalefish and Shark Fishery
70	Oreos	<i>Pseudocyttus spp.</i>	4	CTH Southern and Eastern Scalefish and Shark Fishery
71	Scaly Mackerel	<i>Sardinella lemuru</i>	4	WA South Coast Nearshore and Estuarine Finfish
72	Sea mullet	<i>Mugil cephalus</i>	4	NSW Ocean Haul Fishery
73	Sea mullet	<i>Mugil cephalus</i>	4	NSW Ocean Trap and Line Fishery
74	Sea mullet	<i>Mugil cephalus</i>	4	WA South Coast Nearshore and Estuarine Finfish
75	Smooth Oreos	<i>Pseudocyttus maculatus</i>	4	CTH Southern and Eastern Scalefish and Shark Fishery
76	Yellowtail scad	<i>Trachurus novaezelandiae</i>	4	WA South Coast Nearshore and Estuarine Finfish
77	Albacore tuna	<i>Thunnus alalugna</i>	Not rated	
78	Atlantic Mackerel	<i>Scomber scombrus</i>	Not rated	
79	Angel Shark spp	<i>Squatina australis</i>	Not rated	
80	Australian bonito	<i>Sarda australis</i>	Not rated	
81	Australian Salmon	<i>Arripus trutta; &amp; arripus truttaceus</i>	Not rated	
82	Australian Sardine	<i>Sardinops sagax</i>	Not rated	Australian Eastern Zone
83	Australian Sardine	<i>Sardinops sagax</i>	Not rated	NSW Ocean Fishery
84	Australian Sardine	<i>Sardinops sagax</i>	Not rated	VIC Port Phillip Bay Fishery
85	Australian Sardine	<i>Sardinops sagax</i>	Not rated	SA Sardine Fishery
86	Australian Sardine	<i>Sardinops sagax</i>	Not rated	WA South Coast Purse-seine Fishery
87	Australian Sardine	<i>Sardinops sagax</i>	Not rated	CTH Southern and Eastern Scalefish and Shark Fishery
88	Australian Sardine	<i>Sardinops sagax</i>	Not rated	CTH Small Pelagic Fishery
89	Australian Sardine	<i>Sardinops sagax</i>	Not rated	WA West Coast Purse-seine Fishery
90	Banded Morwong	<i>Chirodactylus spectabilis</i>	Not rated	
91	Barcod/banded rock cod	<i>Cephalopholis sexmaculata</i>	Not rated	
92	Barracouta	<i>Thyrsites atun</i>	Not rated	
93	Bastard trumpeter	<i>Latridopsis forsteri</i>	Not rated	
94	Bight redfish	<i>Centroberyx gerrardi</i>	Not rated	
95	Blacktip Shark	<i>Carcharhinus tilstoni</i>	Not rated	
96	Blue eye Trevalla	<i>Hyperoglyphe Antarctica. Schedophilus labrinthica)</i>	Not rated	
97	Blue spotted goatfish	<i>Upeneichthys vlamingii</i>	Not rated	
98	Blue threadfin	<i>Eleutheronema tetradactylum</i>	Not rated	
99	Bony bream	<i>Nematalosa erebi</i>	Not rated	
100	Bream spp.	<i>Acanthopagrus butcheri</i>	Not rated	
101	Bugs	<i>Thenus australiensis; T. parindicus</i>	Not rated	
102	Bugs & slipper lobsters	<i>Scorllaridae</i>	Not rated	
103	Catfish (forktailed)	<i>Arius graeffei</i>	Not rated	TAS Scalefish Fishery
104	Champagne Crab	<i>Hyposalassia acerba</i>	Not rated	
105	Chinamanfish	<i>Latridopsis nemataphorus</i>	Not rated	
106	Cods spp.		Not rated	
107	Coral Prawns	<i>Solenocera australiana</i>	Not rated	
108	Crystal Crab	<i>Chaceon bicolor</i>	Not rated	
109	Crystal Crab	<i>Chaceon bicolor</i>	Not rated	
110	Cuttlefish spp.	<i>Sepiidae</i>	Not rated	
111	Dart spp		Not rated	
112	Deep Water Flat Head	<i>Platycephalus conatus</i>	Not rated	
113	Deepwater sharks east		Not rated	
114	Deepwater sharks west		Not rated	
115	Duckbill	<i>Bembraps filifera</i>	Not rated	
116	Estuary Cobbler	<i>Cnidoglanis macrocephalus</i>	Not rated	NSW Estuary General Fishery
117	European carp	<i>Cyprinus carpio</i>	Not rated	
118	Flame Snapper	<i>Etelis coruscans</i>	Not rated	
119	Flathead spp	<i>Platycephalidae</i>	Not rated	
120	Flounder spp.	<i>Pleuronectidae</i>	Not rated	
121	Frypan bream	<i>Argyrops spinifer</i>	Not rated	
122	Gabo whiting	<i>Argyrops spinifer</i>	Not rated	
123	Giant Crab	<i>Pseudocarcinus gigas</i>	Not rated	
124	Goatfish spp	<i>Mullidae</i>	Not rated	
125	Grass emperor/sweetlip	<i>Lethrinus laticaudis</i>	Not rated	
126	Gummy Shark	<i>Mustelus antarcticus</i>	Not rated	
127	Hammerhead Shark	<i>Sphyrna spp</i>	Not rated	
128	Hapuka	<i>Polyprion oxygeneios</i>	Not rated	
129	Javelin	<i>Pamadasys spp</i>	Not rated	
130	John Dory	<i>Zeus faber</i>	Not rated	
131	King Dory	<i>Cyttus traversi</i>	Not rated	
132	Lavender snapper	<i>Pristipomoides sieboldii</i>	Not rated	
133	Mackerel icefish		Not rated	
134	Mahi Mahi	<i>Coryphaena hippurus</i>	Not rated	
135	Mangrove Jack	<i>Lutjanus argentimaculatus</i>	Not rated	
136	NZ Dory		Not rated	

137	Ocean Perch	<i>Trachyscorpia eschmeyeri</i>	Not rated	
138	Orange Roughy	<i>Hoplostethus atlanticus</i>	Not rated	
139	Ornate Angel Shark	<i>Squatina tergocellata</i>	Not rated	
140	Pearl perch	<i>Glaucosoma scapulare</i>	Not rated	
141	Pike	<i>Dinolestes lewini</i>	Not rated	
142	Pink Ling	<i>Genypterus blacodes</i>	Not rated	
143	Queenfish	<i>Scamberoides commersonianus</i>	Not rated	
144	Rays spp.	<i>Lutjanus argentimaculatus</i>	Not rated	
145	Redbait	<i>Ermelichthys nitidus</i>	Not rated	
146	Redfish/ nannygai	<i>Centroberyx affinis</i>	Not rated	
147	Ribbon fish	<i>Lepidopus caudatus</i>	Not rated	NSW Ocean Trawl Fishery
148	Rusty Jobfish	<i>Aphareus rutilans</i>	Not rated	
149	Saw Shark	<i>Pristiophorus cirratus</i>	Not rated	
150	Scad		Not rated	
151	School mackerel	<i>Scamberomorus queenslandicus</i>	Not rated	
152	School Prawns		Not rated	
153	School Shark	<i>Galeorhinus galeus</i>	Not rated	
154	Seasweep	<i>Scorpius aequipinnis</i>	Not rated	
155	Sharkfin guitarfish/sand shark		Not rated	
156	Silver Dory	<i>Cyttus australis</i>	Not rated	
157	Silver sweep	<i>Scorpius lineolata</i>	Not rated	
158	Skates	<i>Rajidae</i>	Not rated	
159	Small trawl reef fish		Not rated	
160	Southern Calamari		Not rated	
161	Southern frost fish	<i>Lepidopus caudatus</i>	Not rated	
162	Southern Garfish	<i>Hyporhamphus melanochir</i>	Not rated	
163	Spotted mackerel	<i>Scamberomorus munroi</i>	Not rated	
164	Squid		Not rated	
165	Stargazer (milkfish)	<i>Uranoscopidae</i>	Not rated	
166	Striped Trumpeter	<i>Helates sexlineatus</i>	Not rated	
167	Tailor	<i>Pomatomus saltatrix</i>	Not rated	
168	Tarwine	<i>Rhabdosargus sarba</i>	Not rated	
169	Teraglin	<i>Atractoscian atelodus</i>	Not rated	
170	Threadfin spp.	<i>Polydactylus spp</i>	Not rated	
171	Trevally spp	<i>Carangidae</i>	Not rated	
172	Triggerfish spp.	<i>Abalistes stellaris</i>	Not rated	
173	Tropical snapper		Not rated	
174	Trumpeter / Grunter spp	<i>Teraponidae</i>	Not rated	
175	Wahoo	<i>Acanthocybium solandri</i>	Not rated	
176	White bait spp		Not rated	
177	White trevalla	<i>Seriola Caerulea</i>	Not rated	
178	Whiting spp.	<i>Sillago spp.</i>	Not rated	
179	Wrasse spp.	<i>Notalabrus</i>	Not rated	
180	Yelloweye mullet	<i>Aldrichetta forsteri</i>	Not rated	

## Appendix 2. Industry and Stakeholder Consultation

The project team engaged the following industry stakeholders during the project as part of the development of this report. The project Steering Committee is identified at the beginning of the list.

1. Richard Bagnato NSW PFA, Steering Committee member, Sydney, NSW
2. Tricia Beatty NSW PFA, Steering Committee member, Coffs Harbour, NSW
3. Troy Billin NSW PFA, Steering Committee member, Yamba NSW
4. Gus Dannoun Sydney Fish Market, Steering Committee member, Sydney, NSW
5. Michael Steele Pacific West Foods, Steering Committee member, Sydney, NSW
  
6. Hamish Allen Seafood Executive, Woolworths, Sydney, NSW,
7. Geoff Blackburn Fisher, Coffs Harbour Fishing Coop, Coffs Harbour, NSW,
8. Simon Boag Manager, South East Trawl Fisheries Industry Association, VIC
9. Marty Bramble Fisher, Smiths Lake, NSW,
10. Steve Buckless Southland Fish Supply, Eden, NSW,
11. Dr Doug Ferrell NSW Fisheries, Sydney, NSW,
12. Rob Gauta Manager, Commercial Fishing Coop, Newcastle, NSW,
13. Gerry Geen Fishery advisor, Seafish Tasmania, TAS,
14. Greg Golby Fisher/processor, Forster, NSW,
15. Andre Gorissen Consumer Seafood Innovator, Noosa Heads, QLD,
16. Danny Green Fisher, Coffs Harbour, NSW,
17. Louis Hatzimihalis Fisher, Lakes Entrance, VIC
18. John Jervis Fisher, Eden, NSW
19. Graham Kempshall Fisher, Maclean, NSW,
20. Wayne Kerr Fisher/processor, Kerr Fisheries, Iluka, NSW,
21. Dr Ian Knuckey Fisheries Research Consultant, Queenscliff, VIC
22. Frank Musamecci Fisher/processor, Better Choice Fisheries, Wollongong, NSW,
23. Dr Sue Poole Qld DAFF food science research scientist, QLD
24. Stan Soroka Seafood processor, Eden, NSW,
25. Dr John Stewart NSW Fisheries, Sydney, NSW,
26. Gary Warren Fisher, Eden, NSW,
27. Debbie Wisby Fisher/processor, Orford, TAS,

The project team convened and attended 24 workshops and meetings, mostly confidential and face-to-face, in order to implement the project. The objective for each meeting was to engage specific industry parties along relevant supply chains, understand the current and potential issues, opportunities and barriers related to increased utilisation, and to share and check data.

The number of meetings (in brackets) has been identified for each of the jurisdictions visited.

- |          |  |
|----------|--|
| NSW      | Eden (3), Wollongong (2), Sydney (3), SFM (3 workshops), Newcastle (2), Smiths Lake, Forster, Coffs Harbour (2), Maclean, Iluka (2), |
| Tasmania | Hobart (2),  |
| Victoria | Melbourne (Workshop), Lakes Entrance.  |