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Pilot – Development of Seafood Nutritional Panels

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Pilot – Development of Seafood Nutritional Panels
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Executive Summary

Understanding the nutritional composition of seafood products is both a regulatory requirement and a consumer demand. Although a considerable body of data exists that covers key fish species, the majority of commercially important species within the wild catch sector still lack a basic nutritional profile. This knowledge gap impacts heavily on industry by providing hurdles for operators to meet their regulatory responsibilities and leaving consumers somewhat in the dark when it comes to understanding the seafood products they consume. To address this, extensive work was undertaken to develop nutrition panels for a minimum of 25 commercially important wild catch seafood species where none currently exist.

Researchers from QDAF worked closely with industry to identify and source a diverse range of commercially important fish and crustacean species. Samples were sourced from across the country to ensure results would have national impact. For scientific rigor composite samples were analysed with all analytical testing performed by a NATA accredited testing laboratory. The sampling regime and test reference methods were well documented so processes can be easily replicated to maintain consistency of data between current and any future work.

Overall, the project successfully delivered nutritional profiles for 25 finfish and 3 crustacean species. The data compiled consists of proximate, vitamin and mineral components for the 28 profiled species. Published results within this report have also been made available electronically to help preserve integrity during data handling.

Impact to industry of this valuable resource is broad and goes beyond simple nutrition information panels for the profiled species. Utilising the data generated through this project, stakeholders are better equipped to promote the health benefits of seafood consumption, overcome technical market challenges and regulatory requirements, counter any negative public perceptions or media claims, expand product innovation and further species utilisation.

It should be noted that, during the course of sourcing samples, several inquiries were made by industry representatives for nutritional data pertaining to specific species and whether certain species could be included for profiling. Due to project limitations not all requests could be met. From this indication of interest, it would appear beneficial to the whole Seafood Industry for nutritional profiles to be obtained for all of Australia's commercially important seafood species. Collectively, this work along with currently established datasets delivers comprehensive nutritional profiles for 41 key species within the wild-catch sector. To cover all commercially important species identified through the Status of Australian Fish Stocks (SAFS) reports, it is recommended at least a further 80 species be profiled.

Keywords

Nutrition information panel, nutritional profiles, proximate, vitamin, mineral, albacore, amberjack, barcheek coral trout, wild barramundi, bight redfish, crimson snapper, dusky flathead, eastern school whiting, goldband snapper, king threadfin, luderick, patagonian toothfish, red emperor, redthroat emperor, saddletail snapper, australian sardine, sea mullet, snapper, spanish mackerel, spotted mackerel, swordfish, tailor, west australian dhufish, western australian salmon, yellowfin bream, banana prawn, blue endeavour prawn, brown tiger prawn.

Introduction

There is a strong industry need for nutritional profiles of commercially important seafood species to enable seafood producers to meet customer needs and regulatory requirements. The main driver is the increasing pressure from consumers and regulators for the accurate and transparent labelling of food. This pressure is being reflected in national and international legislation through new, more demanding, standards.

Existing public health information is scattered, inconsistent and in some cases absent for many Australian seafood species. While some data already exists for some compositional profiles in some seafood products (including but not limited to Food Standard Australia New Zealand's Nutrition Tables (NUTTAB), the contaminants data collected by National Residue Survey (NRS), and data held privately by companies) there are shortcomings. These include:

- Inconsistent sampling and analytical methods between different data sources.
- Opportunistic sampling and very small sample size, leading to results that are not representative of product.
- Data that lacks the specificity required by industry stakeholders, e.g. of unknown or overseas origin and species generalisation.

This has created a need for a common baseline of information that provides easily accessible compositional profiles in a suitable format to enable stakeholders to meet their individual needs. The information needs to be robust, consistent and cover the minimum needs of a nutritional panel and contaminant information. Additionally, such a resource would also assist in meeting industry needs for:

- Promoting the public health benefits of seafood consumption more generally.
- Rapid access to credible information to counter negative media claims.
- Assist in addressing current and future technical market challenges.
- Anticipate and quickly respond to market access threats.

FRDC have previously funded two comprehensive studies that undertook oil analysis for 250+ Australian species with results published in Seafood the Good Food volumes 1 and 2 and further summarised by Yearsley et al, 1999. Proximates, fatty acids, water and fat-soluble vitamins and minerals of 21 key Australian seafood species have also been profiled through Seafood CRC project 2008/905. Although comprehensive, these works are not exhaustive. A need still exists in broadening this public knowledge to cover more species and include other nutritional elements. This project aims to help meet this need through profiling a range of wild caught key fish and crustacean species for proximate, vitamin and mineral composition.

Objectives

This project had a single objective.

- Create nutrition panels for a minimum of 25 seafood species where none exist.

Method

Sourcing

A total of 25 different fish and 3 crustacean species were sourced from the wild catch sector for nutritional profiling as per Table 1. Species were selected based on their commercial importance through consultation with industry and sourced from across the east and west coast, as well as tropical and temperate waters to ensure national representation. All animals (n ≥5 for each species) were received within three days from landing as either whole chilled or whole frozen. Patagonian toothfish was the sole exception. Frozen portions from five individual fish were supplied direct from the fisher's contracted processor. Detailed photographs were then taken of whole animals, for species identification, prior to further processing and sampling.

Sampling process

Only the edible portions were sampled for nutritional profiling. Specimens sourced frozen were quick thawed either by submersion in flowing tap water or under ambient air temperature. To start with, whole fish (chilled and thawed) were filleted and skinned following commercial practice. Fillets from fish weighing less than 1.5 kg were then diced into 1-2 cm cubes (Figure 1) and vacuum bagged. For larger fish, weighing more than 1.5 kg, a sub-sample from the head, middle and tail section off each fillet was portioned off, diced into cubes and vacuum bagged. Similarly, prawns were peeled, de-veined, diced and vacuum bagged. A minimum volume (1.5 kg) of diced pieces were prepared for each species. Samples were then blast frozen to -30°C and held at temperature until required for mincing. Prior to mincing samples were partially thawed at ambient under defined conditions. This allowed for easier handling and kept samples at low temperature through the mincing process. Mincing was performed manually with a #10 Edge hand mincer (Figure 2). After mincing, ground samples were gently mixed together to achieve homogeneity (Figure 3) before tightly packing into three 60 ml and three 120 ml plastic laboratory sample jars provided by the analytical laboratory. Remaining mince was placed into plastic containers for retention at DAF laboratories as replicate samples. Samples were then blast frozen to -30°C and held at temperature until couriered to the contracted laboratory for analytical testing.

Figure 1. Diced fillet pieces.

Figure 2. Hand mincing diced pieces.

Figure 3. Homogenised mince.

Table 1. Species sourced for nutritional profiling.

Fish species	**Scientific name**	**Catch location or Fishery**
Albacore	*Thunnus alalunga*	Eastern Tuna Billfish Fishery
Amberjack	*Seriola dumerili*	Abrolhos Islands
Barcheek coral trout	*Plectropomus maculatus*	Timor box area
Barramundi (wild)	*Lates calcarifer*	Darwin / Dundee local area
Bight redfish	*Centroberyx gerrardi*	Esperance
Crimson snapper	*Lutjanus erythropterus*	Timor box area
Dusky flathead	*Platycephalus fuscus*	Tuncurry
Eastern school whiting	*Sillago flindersi*	Ballina
Goldband snapper	*Pristipomoides multidens*	Timor box area
King threadfin	*Polydactylus macrochir*	Darwin / Dundee local area
Luderick	*Girella tricuspidata*	Tuncurry
Patagonian toothfish	*Dissostichus eleginoides*	Heard island
Red emperor	*Lutjanus sebae*	Timor box area
Redthroat emperor	*Lethrinus miniatus*	Abrolhos Islands
Saddletail snapper	*Lutjanus malabaricus*	Timor box area
Australian sardine	*Sardinops sagax*	Albany area
Sea mullet	*Mugil cephalus*	Moreton Bay
Snapper	*Chrysophrys auratus*	Abrolhos Islands
Spanish mackerel	*Scomberomorus commerson*	Exmouth
Spotted mackerel	*Scomberomorus munroi*	NSW central coast
Swordfish	*Xiphius gladius*	Eastern Tuna Billfish Fishery
Tailor	*Pomatomus saltatrix*	Moreton Bay
West Australian dhufish	*Glaucosoma hebraicum*	Abrolhos Islands
Western Australian salmon	*Arripis truttaceus*	Albany area
Yellowfin bream	*Acanthopagrus australis*	Tuncurry
Prawn species	**Scientific name**	**Catch location or Fishery**
Banana prawn	*Penaeus merguiensis*	Northern Prawn Fishery
Blue endeavour prawn	*Metapenaeus endeavouri*	Northern Prawn Fishery
Brown tiger prawn	*Penaeus esculentus*	Northern Prawn Fishery

Analytical testing

The choice of analytical laboratory was determined under Queensland Government procurement policy (see https://www.forgov.qld.gov.au/gov-procurement). The tender was a "Limited Process" due to the lack of laboratories that were capable of supplying the full suite of services required. Four laboratories were approached and requested to submit quotes. Of these four companies, only three companies submitted formal quotes for the work to be completed. Of the three formal quotes submitted, only one laboratory was capable of providing the full suite of analytical methods required to complete the work.

All analytical tests were contracted to the National Measurement Institute (NMI) (Canberra, ACT). Sample jars were couriered frozen to NMI overnight in eskies with ice bricks included to maintain sample temperature. Analytes tested are listed below along with the laboratory's corresponding reference methods and authoritative calculations from Food Standards Australia New Zealand (FSANZ) (Australian Food Composition Database – Nutrient details).

Energy (with and without dietary fibre)

- In-house NMI method calculated from section 1.2.8 of the Australia New Zealand Food Standards Code

Moisture (water)

- AOAC 16th Ed. 934.06, 964.22, AS2300.1.1

Protein

- AOAC 18th Ed. 981.10, 920.152, 990.03, 920.87 AS2300.1.2.1

Total fat

- AOAC 18th Edition 954.02, 948.15, 922.08

Available carbohydrate (without sugar alcohols)

- In-house NMI method
- Carbohydrate (g/100g) = 100 – (moisture + fat + protein + ash + total dietary fibre)

Starch

- Megazyme Total Starch Assay Procedure AA/AMG 11/01

Total sugars

- AOAC 18th Ed. 31.138-31.142

Dietary fibre

- AOAC 985.29
- AOAC 2001.03
- Total Dietary Fibre Assay Procedure, Megazyme

- DTS Method RMDX01 12.07, DIET04 12.07, PROT01 02.01
- DTS Equipment SOP CHQS EQ05 – Operation & Maintenance of Vacuum Pumps

Ash

- AOAC 18th Edn 2005, 923.03 and 900.02

Preformed vitamin A (Retinol)

- Analytical Methods Committee, Analyst, 110, 1019-1026 (1985)
- Brubacher, G., Muller-Mulot, W. & Southgate, D.A.T. (eds.) (1985). "Methods for the Determination of Vitamins in Food", Elsevier Applied Science Publishers Ltd
- De Leenheer, A.P., Lambert, W.E. and De Ruyter, M.G.M. (eds) (1985). "Modern Chromatographic Analysis of the Vitamins", Marcel Dekker Inc.
- Indyk, H.E. (1988). Analyst, 113, 1217-1221
- Tai-Sun Shin, J. Samuel Godber; "Isolation of four tocopherols and four tocotrienols from a variety of natural sources by semi-preparative high performance liquid chromatography". Journal of Chromatography A, 678 (1994) 49-58
- Official methods of Analysis of AOAC International 17th edition, 2000, chapter 50 Infant Formulas, Baby Foods, and Enteral Products, AOAC Official Methods 992.03, 992.04 and 992.06

Beta-carotene

- CRC Handbook of Chemistry and Physics, 56th Edition (1975-76) page C235
  Ibid, page C251

Pro-vitamin A (Beta-carotene equivalents)

- Calculation based on the Australia New Zealand Food Standards Code
- Beta-carotene + (Alpha-carotene* 0.5) + (Cryptoxanthin * 0.5)

Vitamin A retinol equivalents

- Calculation based on the Australia New Zealand Food Standards Code
- Retinol + (Beta-carotene/6) + (alpha-carotene/12) + (cryptoxanthin/12)

Alpha-carotene

- CRC Handbook of Chemistry and Physics, 56th Edition (1975-76) page C235
  Ibid, page C251

Cryptoxanthin

- CRC Handbook of Chemistry and Physics, 56th Edition (1975-76), page C235
  Ibid, page C251

- Application of a UV-Vis detection-HPLC method for a rapid determination of lycopene and b-carotene in vegetables. Food chemistry 95 (2006) 328-336

- Bushway, R.J. (1985). J. Liq. Chrom. 8 (8) 1527-1547

Thiamin (B1)

- European Committee for Standardisation, European Standard EN 14122:2003/AC, Foodstuffs – Determination of vitamin B1 by HPLC

- European Committee for Standardisation, European Standard I.S. EN 14152:2003/AC, Foodstuffs – Determination of vitamin B2 by HPLC

- AOAC (1995) Thiamine Fluorometric Methods 942.23 Ch 45 pp. 6-8, 957 Ch 45 pp. 8-9

- Wehling, R.L. and Wetzel, D.L. (1984). J. Agric. Food Chem., 32, 1326-1331

- Wimalasiri, P. and Wills, R.B.H. (1985). J. Chromatography, 318, 412-416

Riboflavin (B2)

- See Thiamin (B1) for reference method(s)

Niacin (B3)

- AOAC Methods 18th Edition (2005), 43.045 "Fluorimetric determination of niacin in foods by HPLC with post-column derivatisation". S.Lahely, M.Bergaentzle,C.Hasselmann. Food chemistry 65 (1999) 129-133

- European Standard, EN 15652:2009 "Foodstuffs – Determination of niacin by HPLC"

Niacin derived equivalents

- Calculation based on the Australia New Zealand Food Standards Code

- Niacin + (Tryptophan in mg*0.017)

Folic acid

- Davis RE, Nicol DJ and Kelly A. An automated method for the measurement of folate activity. J Clin Path 23: 47, 1970

- Tamura T. Microbiological Assay of Folates. Folic Acid Metabolism in Health and Disease. Contemporary issues in clinical nutrition. Edited by Picciano MF, Stokstad ELR and GregoryIII JF. 1990 Wiley-Liss, Inc New York

- USDA. Agricultural Research Service. Nutrient Data Laboratory. Food composition and nutrition Resource document

- Note: Test method for Folic acid and Total folates is identical with the key difference being for Folic acid testing, only the first enzyme step is required, i.e. amylase

Folate, natural

- Calculation based on the Australia New Zealand Food Standards Code

- Total folate - Folic acid

Total folate

- See Folic acid for reference method(s)

Dietary folate equivalents

- Calculation based on the Australia New Zealand Food Standards Code
- Folate, natural + (Folic acid*1.67)

Vitamin B6

- 'Determination of Vitamin B6 in Food by HPLC' by M. Bergaentzle, F. Arella, J.B. Bourgnon & C. Hasslemann Food Chemistry, 1995, (52), 81-86

Vitamin B12 (Cobalamin)

- Kelly A, Herbert V. Coated charcoal assay of erythrocyte cobalamin levels. Blood 1967; 29:139
- Anderson BB, Sourial NA. The assay of serum cobalamin by Euglena gracilis. Methods in Haematology. The Cobalamins Ed C.A. Hall. 1983

Vitamin C (Ascorbic Acid)

- Various publications. Principally:
  G. Brubacher, W. Muller-Mulot and D.A.T. Southgate (eds), 'Methods for the Determination of Vitamins in Food', (1985) Elsevier Applied Science Publishers Ltd Ch 5

Alpha-tocopherol

- See Preformed vitamin A (retinol) for reference method(s)

Vitamin E

- Calculation based on the Australia New Zealand Food Standards Code
- Alpha tocopherol + (Beta-tocopherol/2) + (Gamma-tocopherol/10)

Calcium, Iron, Magnesium, Phosphorous, Potassium, Selenium, Sodium and Zinc

- USEPA Method 6010B & 6020
- In-house NMI NSW Method 2.46

Iodine

- In-house NMI method based on JAAS (Sept 1998, Vol 13, 977-982)

Cholesterol

- AOAC (1995). Cholesterol in Food Gas Chromatographic Method 976.26, Ch 45 pp. 68-70

- Punwar, J.K. (1975) JAOAC, 58, 804-810. International Olive Oil Council COI/T.20/Doc. No.10/Rev1 2001

- Joint Expert Committee on Food Additives (FAO/WHO) 69th JECFA (2008) FAO JECFA Monographs 5 (2008)

Tryptophan

- UPLC Amino Acid Analysis Solution System Guide, 71500129702 / Revision B, 2007 Waters Pty Ltd

Results and Discussion

At project commencement, a predefined list of finfish species was initially targeted for profiling. However, it quickly became apparent this approach was too restrictive. External factors were constantly encountered that made sourcing a set species list highly challenging. Weather, season, catch rates and spawning periods all heavily influenced the collection process. An industry guided approach was instead adopted after several unsuccessful attempts to source specific target species. Samples were selected from species that were actively being caught by industry at time of sourcing and had consistent and high volume catch rates. This approach guaranteed profiled species were relevant to industry and allowed them to shape the direction of the project. Future work should look to engage with industry to easily source species that are in season and commercially important.

Identification of fish and crustacean species was through the assessment of physical characteristics and aided by taxonomic resources like the Australian Seafood Handbook. However, this approach, in parts, can be difficult, subjective and open to individual interpretation. An alternative method that offers more reliability and definitive identification is DNA profiling. Although not covered within this work, the option is available to revisit all featured species and genetically profile the retained sub-samples held in frozen storage. Going forward, any future work should consider incorporating DNA profiling as a rapid and definitive method for species identification.

Table 2 to Table 8 lists the nutritional profiles for all 28 fish and crustacean species grouped alphabetically by common name. Results are presented to not more than three significant figures as stipulated by the Food Standards Code (Standard 1.2.8-7(3)). To align with FSANZ's nutrition information panel requirements (Standard 1.2.8) all results have been expressed per 100g. Results for particular analytes will also show different lower limits across species. This is an artefact of these analytes being derived from calculations that factor in both determined values and results that fall below the laboratory's limit of detection. Additional to this report, these results have also been submitted in an electronic format for easy capture, reproducibility and to limit any cross-transfer data entry errors.

To determine levels of vitamin A retinol equivalents and pro-vitamin A (beta-carotene equivalents) within samples the presence of both alpha-carotene and cryptoxanthin were required to be quantified. Similarly, determination of vitamin E required various tocopherol isomers to be known. Results of these additional analytes have been included within this report for completeness and transparency. The requirement to test for these additional analytes was not known at the time of project development. It did have a small impact on the overall project budget and should be considered for all future nutritional profiling tests.

Individual energy values (with and without dietary fibre) was determined to be the same for all species and is reported as such. The presence of dietary fibre was found to be below the limit of reporting and therefore negligible in calculating energy values.

Table 2. Nutritional profile of crustacean species.

Analytes	Unit	Banana prawn	Endeavour prawn	Tiger prawn
Proximate components				
Energy (without dietary fibre)	kJ/100g	450	430	430
Energy (with dietary fibre)	kJ/100g	450	430	430
Moisture (water)	g/100g	75	75.9	75.4
Protein	g/100g	24.5	23.7	23.7
Total fat	g/100g	1	0.8	0.8
Available carbohydrate (without sugar alcohols)	g/100g	<1	<1	<1
Starch	g/100g	<0.1	<0.1	<0.1
Total sugars	g/100g	<1	<1	<1
Fructose	g/100g	<0.2	<0.2	<0.2
Glucose	g/100g	<0.2	<0.2	<0.2
Sucrose	g/100g	<0.2	<0.2	<0.2
Maltose	g/100g	<0.2	<0.2	<0.2
Lactose	g/100g	<0.2	<0.2	<0.2
Dietary fibre	g/100g	<0.5	<0.5	<0.5
Ash	g/100g	2.1	2.1	2.1
Vitamin components				
Preformed vitamin A (Retinol)	µg/100g	<5.0	<5.0	<5.0
Beta-carotene	µg/100g	<5.0	<5.0	<5.0
Pro-vitamin A (Beta-carotene equivalents)	µg/100g	<6.67	<6.67	<6.67
Vitamin A retinol equivalents	µg/100g	<6.67	<6.67	<6.67
Alpha-Carotene	µg/100g	<5.0	<5.0	<5.0
Cryptoxanthin	µg/100g	<5.0	<5.0	<5.0
Thiamin (B1)	mg/100g	<0.02	<0.02	<0.02
Riboflavin (B2)	mg/100g	<0.02	<0.02	<0.02
Niacin (B3)	mg/100g	4.2	3.2	4.1
Niacin derived equivalents	mg/100g	7.6	6.09	6.82
Folic acid	µg/100g	<3.0	<3.0	<3.0
Folate, natural	µg/100g	<16.1	<3.0	<3.0
Total folate	µg/100g	16.1	<3.0	<3.0
Dietary folate equivalents	µg/100g	<21.2	<8.01	<8.01
Vitamin B6	mg/100g	0.09	0.07	0.08
Vitamin B12 (Cobalamin)	µg/100g	0.1	0.28	0.08
Vitamin C (Ascorbic Acid)	mg/100g	<1.0	<1.0	<1.0
Alpha-tocopherol	mg/100g	1.6	1.9	1.2
Beta-tocopherol	mg/100g	<0.1	<0.1	<0.1
Delta-tocopherol	mg/100g	<0.1	<0.1	<0.1
Gamma-tocopherol	mg/100g	<0.1	<0.1	<0.1
Vitamin E	mg/100g	<1.61	<1.91	<1.21
Mineral components				
Calcium (Ca)	mg/100g	42	52	45
Iodine (I)	mg/100g	0.12	0.092	0.034
Iron (Fe)	mg/100g	0.36	0.51	0.23
Magnesium (Mg)	mg/100g	61	57	51
Phosphorous (P)	mg/100g	380	380	340
Potassium (K)	mg/100g	440	440	420
Selenium (Se)	mg/100g	0.061	0.077	0.042
Sodium (Na)	mg/100g	210	250	240
Zinc (Zn)	mg/100g	1.3	1.4	1.3
Other components				
Cholesterol	mg/100g	150	170	160
Tryptophan	mg/100g	200	170	160

Table 3. Nutritional profile of fish species.

Analytes	Unit	Albacore	Amberjack	Australian salmon	Australian sardine
Proximate components					
Energy (without dietary fibre)	kJ/100g	500	450	500	410
Energy (with dietary fibre)	kJ/100g	500	450	500	410
Moisture (water)	g/100g	72.3	76.5	72.6	75.3
Protein	g/100g	28.1	22.8	25.1	20.8
Total fat	g/100g	0.4	1.7	2	1.4
Available carbohydrate (without sugar alcohols)	g/100g	<1	<1	<1	<1
Starch	g/100g	<0.1	<0.1	<0.1	<0.1
Total sugars	g/100g	<1	<1	<1	<1
Fructose	g/100g	<0.2	<0.2	<0.2	<0.2
Glucose	g/100g	<0.2	<0.2	<0.2	<0.2
Sucrose	g/100g	<0.2	<0.2	<0.2	<0.2
Maltose	g/100g	<0.2	<0.2	<0.2	<0.2
Lactose	g/100g	<0.2	<0.2	<0.2	<0.2
Dietary fibre	g/100g	<0.5	<0.5	<0.5	0.5
Ash	g/100g	1.2	1.4	1.4	2.2
Vitamin components					
Preformed vitamin A (Retinol)	µg/100g	<5.0	<5.0	<5.0	<5.0
Beta-carotene	µg/100g	<5.0	<5.0	<5.0	<5.0
Pro-vitamin A (Beta-carotene equivalents)	µg/100g	<6.67	<7.5	<7.5	<7.5
Vitamin A retinol equivalents	µg/100g	<6.67	<7.09	<7.09	<7.09
Alpha-Carotene	µg/100g	<5.0	<5.0	<5.0	<5.0
Cryptoxanthin	µg/100g	<5.0	<10.0	<10.0	<10.0
Thiamin (B1)	mg/100g	0.04	0.09	0.06	<0.02
Riboflavin (B2)	mg/100g	<0.02	0.03	0.05	0.1
Niacin (B3)	mg/100g	16	7.4	8.8	10
Niacin derived equivalents	mg/100g	22.12	10.8	13.9	13.74
Folic acid	µg/100g	<3.0	<3.0	<3.0	<3.0
Folate, natural	µg/100g	<3.0	<3.0	<3.0	<7.1
Total folate	µg/100g	<3.0	<3.0	<3.0	7.1
Dietary folate equivalents	µg/100g	<8.01	<8.01	<8.01	<12.2
Vitamin B6	mg/100g	0.52	0.13	0.14	0.12
Vitamin B12 (Cobalamin)	µg/100g	1.3	0.62	1.4	6.4
Vitamin C (Ascorbic Acid)	mg/100g	<1.0	<1.0	<1.0	<1.0
Alpha-tocopherol	mg/100g	<0.1	0.7	0.7	0.5
Beta-tocopherol	mg/100g	<0.1	<0.1	<0.1	<0.1
Delta-tocopherol	mg/100g	<0.1	<0.1	<0.1	<0.1
Gamma-tocopherol	mg/100g	<0.1	<0.1	<0.1	<0.1
Vitamin E	mg/100g	<1.06	<0.706	<0.706	<0.506
Mineral components					
Calcium (Ca)	mg/100g	4.2	6.1	4.4	69
Iodine (I)	mg/100g	0.021	0.078	0.056	0.025
Iron (Fe)	mg/100g	0.39	0.3	0.5	0.89
Magnesium (Mg)	mg/100g	38	33	30	36
Phosphorous (P)	mg/100g	280	250	230	290
Potassium (K)	mg/100g	480	530	440	430
Selenium (Se)	mg/100g	0.083	0.054	0.062	0.064
Sodium (Na)	mg/100g	47	48	25	440
Zinc (Zn)	mg/100g	0.39	0.27	0.37	0.81
Other components					
Cholesterol	mg/100g	41	43	40	35
Tryptophan	mg/100g	360	200	300	220

Table 4. Nutritional profile of fish species continued.

Analytes	Unit	Barcheek coral trout	Barramundi (wild)	Bight redfish	Crimson snapper
Proximate components					
Energy (without dietary fibre)	kJ/100g	390	380	380	390
Energy (with dietary fibre)	kJ/100g	390	380	380	390
Moisture (water)	g/100g	77.9	77.8	78.4	78.3
Protein	g/100g	21.6	21.3	20.7	20.2
Total fat	g/100g	0.7	0.4	0.9	1.3
Available carbohydrate (without sugar alcohols)	g/100g	<1	<1	<1	<1
Starch	g/100g	<0.1	<0.1	<0.1	<0.1
Total sugars	g/100g	<1	<1	<1	<1
Fructose	g/100g	<0.2	<0.2	<0.2	<0.2
Glucose	g/100g	<0.2	<0.2	<0.2	<0.2
Sucrose	g/100g	<0.2	<0.2	<0.2	<0.2
Maltose	g/100g	<0.2	<0.2	<0.2	<0.2
Lactose	g/100g	<0.2	<0.2	<0.2	<0.2
Dietary fibre	g/100g	<0.5	<0.5	<0.5	<0.5
Ash	g/100g	1.4	1.2	1.3	1.3
Vitamin components					
Preformed vitamin A (Retinol)	µg/100g	<5.0	<5.0	<5.0	14
Beta-carotene	µg/100g	<5.0	<5.0	<5.0	<5.0
Pro-vitamin A (Beta-carotene equivalents)	µg/100g	<7.5	<7.5	<7.5	<7.5
Vitamin A retinol equivalents	µg/100g	<7.09	<7.09	<7.09	<16.1
Alpha-Carotene	µg/100g	<5.0	<5.0	<5.0	<5.0
Cryptoxanthin	µg/100g	<10.0	<10.0	<10.0	<10.0
Thiamin (B1)	mg/100g	<0.02	0.06	<0.02	0.03
Riboflavin (B2)	mg/100g	<0.02	0.04	<0.02	0.02
Niacin (B3)	mg/100g	4.7	3.8	3.4	6.2
Niacin derived equivalents	mg/100g	8.1	7.2	7.48	10.45
Folic acid	µg/100g	<3.0	<3.0	<3.0	<3.0
Folate, natural	µg/100g	<3.0	<3.0	<3.0	<3.0
Total folate	µg/100g	<3.0	<3.0	<3.0	<3.0
Dietary folate equivalents	µg/100g	<8.01	<8.01	<8.01	<8.01
Vitamin B6	mg/100g	0.09	0.12	0.12	0.18
Vitamin B12 (Cobalamin)	µg/100g	0.57	0.38	0.48	0.56
Vitamin C (Ascorbic Acid)	mg/100g	<1.0	<1.0	<1.0	<1.0
Alpha-tocopherol	mg/100g	0.6	0.5	0.2	0.4
Beta-tocopherol	mg/100g	<0.1	<0.1	<0.1	<0.1
Delta-tocopherol	mg/100g	<0.1	<0.1	<0.1	<0.1
Gamma-tocopherol	mg/100g	<0.1	<0.1	<0.1	<0.1
Vitamin E	mg/100g	<0.606	<0.506	<0.206	<0.406
Mineral components					
Calcium (Ca)	mg/100g	7.4	7.2	9.7	8.8
Iodine (I)	mg/100g	0.053	0.044	0.026	0.013
Iron (Fe)	mg/100g	<0.2	0.4	<0.2	0.29
Magnesium (Mg)	mg/100g	34	29	29	37
Phosphorous (P)	mg/100g	230	200	190	220
Potassium (K)	mg/100g	510	460	430	480
Selenium (Se)	mg/100g	0.068	0.05	0.074	0.081
Sodium (Na)	mg/100g	68	53	56	68
Zinc (Zn)	mg/100g	0.31	0.32	0.25	0.27
Other components					
Cholesterol	mg/100g	40	55	41	56
Tryptophan	mg/100g	200	200	240	250

Table 5. Nutritional profile of fish species continued.

Analytes	Unit	Dusky flathead	Eastern whiting	Goldband snapper	King threadfin	Luderick
Proximate components						
Energy (without dietary fibre)	kJ/100g	360	370	400	340	400
Energy (with dietary fibre)	kJ/100g	360	370	400	340	400
Moisture (water)	g/100g	79.3	79.4	77.7	78.7	77.7
Protein	g/100g	20.3	20.3	22	19	20.8
Total fat	g/100g	0.4	0.7	0.6	0.6	1.4
Available carbohydrate (without sugar alcohols)	g/100g	<1	<1	<1	<1	<1
Starch	g/100g	<0.1	<0.1	<0.1	<0.1	<0.1
Total sugars	g/100g	<1	<1	<1	<1	<1
Fructose	g/100g	<0.2	<0.2	<0.2	<0.2	<0.2
Glucose	g/100g	<0.2	<0.2	<0.2	<0.2	<0.2
Sucrose	g/100g	<0.2	<0.2	<0.2	<0.2	<0.2
Maltose	g/100g	<0.2	<0.2	<0.2	<0.2	<0.2
Lactose	g/100g	<0.2	<0.2	<0.2	<0.2	<0.2
Dietary fibre	g/100g	<0.5	<0.5	<0.5	<0.5	0.6
Ash	g/100g	1.4	1.7	1.4	1.3	1.2
Vitamin components						
Preformed vitamin A (Retinol)	µg/100g	<5.0	<5.0	<5.0	<5.0	<5.0
Beta-carotene	µg/100g	<5.0	<5.0	<5.0	<5.0	<5.0
Pro-vitamin A (Beta-carotene equivalents)	µg/100g	<6.67	<6.67	<6.67	<7.5	<6.67
Vitamin A retinol equivalents	µg/100g	<6.67	<6.67	<6.67	<7.09	<6.67
Alpha-Carotene	µg/100g	<5.0	<5.0	<5.0	<5.0	<5.0
Cryptoxanthin	µg/100g	<5.0	<5.0	<5.0	<10.0	<5.0
Thiamin (B1)	mg/100g	<0.02	0.03	<0.02	0.04	0.08
Riboflavin (B2)	mg/100g	0.05	<0.02	<0.02	0.03	0.06
Niacin (B3)	mg/100g	2.3	3.3	4.6	3	4
Niacin derived equivalents	mg/100g	5.36	6.36	8.17	5.89	8.59
Folic acid	µg/100g	<3.0	<3.0	<3.0	<3.0	<3.0
Folate, natural	µg/100g	<3.0	<3.0	<3.0	<3.0	<3.0
Total folate	µg/100g	<3.0	<3.0	<3.0	<3.0	<3.0
Dietary folate equivalents	µg/100g	<8.01	<8.01	<8.01	<8.01	<8.01
Vitamin B6	mg/100g	0.09	0.08	0.15	0.1	0.18
Vitamin B12 (Cobalamin)	µg/100g	0.25	0.18	<0.03	0.37	0.69
Vitamin C (Ascorbic Acid)	mg/100g	<1.0	<1.0	<1.0	<1.0	<1.0
Alpha-tocopherol	mg/100g	0.2	0.3	0.2	0.5	0.6
Beta-tocopherol	mg/100g	<0.1	<0.1	<0.1	<0.1	<0.1
Delta-tocopherol	mg/100g	<0.1	<0.1	<0.1	<0.1	<0.1
Gamma-tocopherol	mg/100g	<0.1	<0.1	<0.1	<0.1	<0.1
Vitamin E	mg/100g	<0.206	<0.306	<0.206	<0.506	<0.606
Mineral components						
Calcium (Ca)	mg/100g	14	27	15	6.5	9
Iodine (I)	mg/100g	0.02	0.016	0.023	0.022	0.076
Iron (Fe)	mg/100g	0.33	0.37	0.61	<0.2	0.5
Magnesium (Mg)	mg/100g	33	42	37	29	39
Phosphorous (P)	mg/100g	210	230	230	190	230
Potassium (K)	mg/100g	470	390	410	440	480
Selenium (Se)	mg/100g	0.048	0.03	0.071	0.043	0.04
Sodium (Na)	mg/100g	70	220	110	43	72
Zinc (Zn)	mg/100g	0.46	0.27	0.3	0.27	0.5
Other components						
Cholesterol	mg/100g	48	95	42	20	59
Tryptophan	mg/100g	180	180	210	170	270

Table 6. Nutritional profile of fish species continued.

Analytes	Unit	Patagonian toothfish	Red emperor	Redthroat emperor	Saddletail snapper
Proximate components					
Energy (without dietary fibre)	kJ/100g	1,010	360	420	340
Energy (with dietary fibre)	kJ/100g	1,010	360	420	340
Moisture (water)	g/100g	64.6	78.7	77.3	80
Protein	g/100g	15.1	20.6	23.2	18.8
Total fat	g/100g	20.5	0.4	0.7	0.5
Available carbohydrate (without sugar alcohols)	g/100g	<1	<1	<1	<1
Starch	g/100g	<0.1	<0.1	<0.1	<0.1
Total sugars	g/100g	<1	<1	<1	<1
Fructose	g/100g	<0.2	<0.2	<0.2	<0.2
Glucose	g/100g	<0.2	<0.2	<0.2	<0.2
Sucrose	g/100g	<0.2	<0.2	<0.2	<0.2
Maltose	g/100g	<0.2	<0.2	<0.2	<0.2
Lactose	g/100g	<0.2	<0.2	<0.2	<0.2
Dietary fibre	g/100g	<0.5	<0.5	<0.5	<0.5
Ash	g/100g	0.9	1.5	1.4	1.3
Vitamin components					
Preformed vitamin A (Retinol)	µg/100g	390	<5.0	<5.0	<5.0
Beta-carotene	µg/100g	<5.0	<5.0	<5.0	<5.0
Pro-vitamin A (Beta-carotene equivalents)	µg/100g	<6.67	<7.5	<7.5	<7.5
Vitamin A retinol equivalents	µg/100g	<392	<7.09	<7.09	<7.09
Alpha-Carotene	µg/100g	<5.0	<5.0	<5.0	<5.0
Cryptoxanthin	µg/100g	<5.0	<10.0	<10.0	<10.0
Thiamin (B1)	mg/100g	<0.02	<0.02	0.03	<0.02
Riboflavin (B2)	mg/100g	<0.02	0.02	<0.02	<0.02
Niacin (B3)	mg/100g	1.2	4.8	5.2	4.3
Niacin derived equivalents	mg/100g	3.07	8.54	8.6	7.53
Folic acid	µg/100g	<3.0	<3.0	<3.0	<3.0
Folate, natural	µg/100g	<3.0	<3.0	<3.0	<3.0
Total folate	µg/100g	<3.0	<3.0	<3.0	<3.0
Dietary folate equivalents	µg/100g	<8.01	<8.01	<8.01	<8.01
Vitamin B6	mg/100g	0.04	0.17	0.16	0.14
Vitamin B12 (Cobalamin)	µg/100g	0.05	0.28	0.72	0.45
Vitamin C (Ascorbic Acid)	mg/100g	<1.0	<1.0	<1.0	<1.0
Alpha-tocopherol	mg/100g	2.8	0.6	0.3	0.3
Beta-tocopherol	mg/100g	<0.1	<0.1	<0.1	<0.1
Delta-tocopherol	mg/100g	<0.1	<0.1	<0.1	<0.1
Gamma-tocopherol	mg/100g	<0.1	<0.1	<0.1	<0.1
Vitamin E	mg/100g	<2.81	<0.606	<0.306	<0.306
Mineral components					
Calcium (Ca)	mg/100g	4.7	8.3	6.7	11
Iodine (I)	mg/100g	0.0044	0.023	0.1	0.014
Iron (Fe)	mg/100g	0.21	<0.2	<0.2	0.27
Magnesium (Mg)	mg/100g	20	31	32	55
Phosphorous (P)	mg/100g	160	210	220	240
Potassium (K)	mg/100g	300	470	480	480
Selenium (Se)	mg/100g	0.064	0.056	0.069	0.074
Sodium (Na)	mg/100g	86	85	52	100
Zinc (Zn)	mg/100g	0.3	0.27	0.28	0.27
Other components					
Cholesterol	mg/100g	55	44	40	56
Tryptophan	mg/100g	110	220	200	190

Table 7. Nutritional profile of fish species continued.

Analytes	Unit	Sea mullet	Snapper	Spanish mackerel	Spotted mackerel
Proximate components					
Energy (without dietary fibre)	kJ/100g	480	380	430	720
Energy (with dietary fibre)	kJ/100g	480	380	430	720
Moisture (water)	g/100g	75.1	77.5	76.4	68.5
Protein	g/100g	21.2	20.7	22.0	21.3
Total fat	g/100g	3.2	0.7	1.6	9.6
Available carbohydrate (without sugar alcohols)	g/100g	<1	<1	<1	<1
Starch	g/100g	<0.1	<0.1	<0.1	<0.1
Total sugars	g/100g	<1	<1	<1	<1
Fructose	g/100g	<0.2	<0.2	<0.2	<0.2
Glucose	g/100g	<0.2	<0.2	<0.2	<0.2
Sucrose	g/100g	<0.2	<0.2	<0.2	<0.2
Maltose	g/100g	<0.2	<0.2	<0.2	<0.2
Lactose	g/100g	<0.2	<0.2	<0.2	<0.2
Dietary fibre	g/100g	<0.5	<0.5	<0.5	<0.5
Ash	g/100g	1.2	1.4	1.5	1.4
Vitamin components					
Preformed vitamin A (Retinol)	µg/100g	<5.0	<5.0	<5.0	19
Beta-carotene	µg/100g	<5.0	<5.0	<5.0	<5.0
Pro-vitamin A (Beta-carotene equivalents)	µg/100g	<6.67	<7.5	<7.5	<6.67
Vitamin A retinol equivalents	µg/100g	<6.67	<7.09	<7.09	<20.7
Alpha-Carotene	µg/100g	<5.0	<5.0	<5.0	<5.0
Cryptoxanthin	µg/100g	<5.0	<10.0	<10.0	<5.0
Thiamin (B1)	mg/100g	<0.02	0.13	0.02	<0.02
Riboflavin (B2)	mg/100g	0.05	0.03	0.07	<0.02
Niacin (B3)	mg/100g	7	6	9.5	7.3
Niacin derived equivalents	mg/100g	11.42	9.74	14.94	10.7
Folic acid	µg/100g	<3.0	<3.0	<3.0	<3.0
Folate, natural	µg/100g	<3.0	<3.0	<3.0	<3.0
Total folate	µg/100g	<3.0	<3.0	<3.0	<3.0
Dietary folate equivalents	µg/100g	<8.01	<8.01	<8.01	<8.01
Vitamin B6	mg/100g	0.22	0.18	0.18	0.16
Vitamin B12 (Cobalamin)	µg/100g	3	0.48	0.8	0.13
Vitamin C (Ascorbic Acid)	mg/100g	<1.0	<1.0	<1.0	<1.0
Alpha-tocopherol	mg/100g	0.8	0.7	0.6	0.5
Beta-tocopherol	mg/100g	<0.1	<0.1	<0.1	<0.1
Delta-tocopherol	mg/100g	<0.1	<0.1	<0.1	<0.1
Gamma-tocopherol	mg/100g	<0.1	<0.1	<0.1	<0.1
Vitamin E	mg/100g	<0.806	<0.706	<0.606	<0.506
Mineral components					
Calcium (Ca)	mg/100g	8.5	12	4.2	4
Iodine (I)	mg/100g	0.66	0.043	0.024	0.02
Iron (Fe)	mg/100g	0.72	<0.2	0.2	0.22
Magnesium (Mg)	mg/100g	30	31	41	34
Phosphorous (P)	mg/100g	230	250	300	280
Potassium (K)	mg/100g	470	510	620	510
Selenium (Se)	mg/100g	0.019	0.067	0.05	0.039
Sodium (Na)	mg/100g	45	58	49	18
Zinc (Zn)	mg/100g	0.34	0.28	0.28	0.27
Other components					
Cholesterol	mg/100g	61	39	42	58
Tryptophan	mg/100g	260	220	320	200

Table 8. Nutritional profile of fish species continued.

Analytes	Unit	Swordfish	Tailor	WA dhufish	Yellowfin bream
Proximate components					
Energy (without dietary fibre)	kJ/100g	540	530	360	430
Energy (with dietary fibre)	kJ/100g	540	530	360	430
Moisture (water)	g/100g	75.9	74.1	78.6	76.9
Protein	g/100g	19.2	21.5	20.1	20.1
Total fat	g/100g	5.9	4.6	0.4	2.3
Available carbohydrate (without sugar alcohols)	g/100g	<1	<1	<1	<1
Starch	g/100g	<0.1	<0.1	<0.1	<0.1
Total sugars	g/100g	<1	<1	<1	<1
Fructose	g/100g	<0.2	<0.2	<0.2	<0.2
Glucose	g/100g	<0.2	<0.2	<0.2	<0.2
Sucrose	g/100g	<0.2	<0.2	<0.2	<0.2
Maltose	g/100g	<0.2	<0.2	<0.2	<0.2
Lactose	g/100g	<0.2	<0.2	<0.2	<0.2
Dietary fibre	g/100g	<0.5	<0.5	<0.5	<0.5
Ash	g/100g	1.5	1.2	1.5	1.3
Vitamin components					
Preformed vitamin A (Retinol)	µg/100g	75	20	5.1	<5.0
Beta-carotene	µg/100g	<5.0	<5.0	<5.0	<5.0
Pro-vitamin A (Beta-carotene equivalents)	µg/100g	<6.67	<6.67	<7.5	<6.67
Vitamin A retinol equivalents	µg/100g	<76.7	<21.7	<7.09	<6.67
Alpha-Carotene	µg/100g	<5.0	<5.0	<5.0	<5.0
Cryptoxanthin	µg/100g	<5.0	<5.0	<10.0	<5.0
Thiamin (B1)	mg/100g	0.05	0.07	0.03	0.09
Riboflavin (B2)	mg/100g	0.03	0.26	<0.02	0.16
Niacin (B3)	mg/100g	5.2	7.2	3.8	5
Niacin derived equivalents	mg/100g	8.77	11.62	7.03	8.74
Folic acid	µg/100g	<3.0	<3.0	<3.0	<3.0
Folate, natural	µg/100g	<3.0	<3.0	<3.0	<3.0
Total folate	µg/100g	<3.0	<3.0	<3.0	<3.0
Dietary folate equivalents	µg/100g	<8.01	<8.01	<8.01	<8.01
Vitamin B6	mg/100g	0.19	0.25	0.12	0.17
Vitamin B12 (Cobalamin)	µg/100g	0.94	1.8	0.35	1.2
Vitamin C (Ascorbic Acid)	mg/100g	<1.0	<1.0	<1.0	<1.0
Alpha-tocopherol	mg/100g	2.8	0.9	0.2	0.7
Beta-tocopherol	mg/100g	<0.1	<0.1	<0.1	<0.1
Delta-tocopherol	mg/100g	<0.1	<0.1	<0.1	<0.1
Gamma-tocopherol	mg/100g	<0.1	<0.1	<0.1	<0.1
Vitamin E	mg/100g	<2.81	<0.906	<0.206	<0.706
Mineral components					
Calcium (Ca)	mg/100g	6.8	8.4	6.8	8.2
Iodine (I)	mg/100g	0.022	0.043	0.047	0.032
Iron (Fe)	mg/100g	0.39	0.51	<0.2	0.27
Magnesium (Mg)	mg/100g	36	32	31	38
Phosphorous (P)	mg/100g	250	240	220	250
Potassium (K)	mg/100g	440	470	470	520
Selenium (Se)	mg/100g	0.067	0.062	0.06	0.062
Sodium (Na)	mg/100g	150	39	45	64
Zinc (Zn)	mg/100g	0.56	0.84	0.25	0.4
Other components					
Cholesterol	mg/100g	77	65	36	69
Tryptophan	mg/100g	210	260	190	220

Future Research

This work is a sub-component of a broader project with the end goal of expanding the information offered on FRDC's Fishfiles website (fishfiles.com.au). An initiative of FRDC, Fishfiles is a central repository that provides accurate and informative information on Australian seafood. The nutritional profiles of listed species will be migrated over to Fishfiles to be made publicly available. Stakeholders would then have open access to the data to utilise according to their individual needs. Additional to Fishfiles, it would be of benefit to publish information through other channels to further build out industry awareness and adoption. The Australian Food Composition Database (previously NUTTAB) is an ideal channel that is well referenced by the whole food industry. The database currently lists profiles of raw samples across 42 seafood species with several listed being highly generic, *e.g.* tuna, mackerel, oyster, prawn. Inclusion of the 28 species profiled within this project would significantly expand this public dataset and contribute to increasing its level of species specificity. Hosting this data on FSANZ's reference database would also facilitate in driving adoption outside of direct users of Fishfiles.

From interactions right across the sector, it also appears that there is strong industry interest to expand this current work and cover all Australian commercial seafood species. Initially, this project was intending to profile the nutritional composition of solely finfish species. However, through the course of sourcing samples numerous requests were received from various sectors of the industry for inclusion of non-finfish and underutilised species. The first of these requests, to profile three crustacean species, was catered for. Later requests unfortunately were not met due to the project scope limiting the number of available species that can be profiled. Additionally, requests to profile specific commercially important finfish species also exceeded the project's limits. Suffice to say, the volume of demand and requests received far exceeded what the project could deliver.

Furthermore, to date, there is piecemeal data around the nutritional composition of seafood. Including the 28 species within this study, an additional 21 species (13 of which were from the wild-catch sector) were profiled through Seafood CRC project 2008/905. The Australian Seafood User Manual lists limited nutritional information, covering energy, protein, cholesterol, sodium, fats and omega fatty acids, across 45 finfish and 22 non-finfish species. The Australian Food Composition Database is another established source with comprehensive nutritional data covering 42 species. However, it lacks species specificity and includes several species that are commercially less significant. Oil compositions of over 250 species have also been profiled through previous FRDC projects.

Considering the combined work done to date, there is still a substantial knowledge gap around compositional data and fish nutrition across the whole wild-catch sector. The Status of Australian Fish Stocks (SAFS) reports is a comprehensive assessment of Australia's wild-catch fish stocks. The latest SAFS reports conducted in 2018 lists 120 species across 406 individual stocks as commercially important, accounting for 90% of all species commercially fished. With 41 species comprehensively profiled to date, there is still a need to establish, or further expand on, nutritional datasets for a further 80 species to cover all commercially important species identified through SAFS. Additionally, the SAFS report is looking to expand its coverage to 180 species. Forming nutritional profiles for these additional 60 species would also be highly recommended.

Undertaking the necessary work to profile those species not currently covered, or only partially, by existing datasets would be simple and straightforward. Strong rapport has been developed with a fully accredited and proven testing laboratory. A national network of willing fishermen and suppliers has also been established that can be leveraged to source fresh samples quickly. If undertaken, work could commence immediately with results following soon after.

References

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FRDC FINAL REPORT CHECKLIST

Project Title:	Pilot – Development of Seafood Nutritional Panels		
Principal Investigators:	Carl Paulo, Andrew Forrest, Paul Exley, Sue Poole		
Project Number:	2017/145		
Description:	The project delivered nutritional profiles for 25 finfish and 3 crustacean species from the wild catch sector. The data compiled consists of proximate, vitamin and mineral components for the 28 profiled species. These nutritional information of listed species will be migrated over to FRDC's Fishfiles website (fishfiles.com.au) to be made publicly available. Stakeholders would then have free access to these nutritional profiles to utilise according to their individual needs.		
Published Date:	16/12/2019	**Year:**	2019
ISBN:	978-0-7345-0462-3	**ISSN:**	n/a
Key Words:	Nutrition information panel, nutritional profiles, proximate, vitamin, mineral, albacore, amberjack, barcheek coral trout, wild barramundi, bight redfish, crimson snapper, dusky flathead, eastern school whiting, gGoldband snapper, king threadfin, luderick, patagonian toothfish, red emperor, redthroat emperor, saddletail snapper, australian sardine, sea mullet, snapper, spanish mackerel, spotted mackerel, swordfish, tailor, west australian dhufish, western australian salmon, yellowfin bream, banana prawn, blue endeavour prawn, brown tiger prawn		

Please use this checklist to self-assess your report before submitting to FRDC. Checklist should accompany the report.

	Is it included (Y/N)	**Comments**
Foreword (optional)	No	
Acknowledgments	Yes	
Abbreviations	No	Not relevant therefore omitted from report.
Executive Summary	Yes	
– **What the report is about**		
– **Background – why project was undertaken**		
– **Aims/objectives – what you wanted to achieve at the beginning**		
– **Methodology – outline how you did the project**		
– **Results/key findings – this should outline what you found or key results**		
– **Implications for relevant stakeholders**		
– **Recommendations**		
Introduction	Yes	
Objectives	Yes	Taken direct from the project contract agreement
Methodology	Yes	
Results	Yes	Results and discussion combined into single section
Discussion	Yes	Results and discussion combined into single section
Conclusion	No	Incorporated into a single section titled

		Future Research
Implications	No	Incorporated into a single section titled Future Research
Recommendations	No	Incorporated into a single section titled Future Research
Further development	No	Project delivered in full. No additional research or action required. Therefore, section omitted from report.
Extension and Adoption	No	Incorporated into a single section titled Future Research
Project coverage	No	Project was not covered in any media or public articles. Therefore, section omitted from report.
Glossary	No	
Project materials developed	No	Project did not generate any relevant materials. Therefore, section omitted from report.
Appendices	Yes	Listed as References