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A Review of Illegal, Unreported and Unregulated (IUU) Fishing Risk in Australia's Seafood Imports

Prepared for the Australian Department of Agriculture, Fisheries and Forestry

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About MRAG Asia Pacific

MRAG Asia Pacific is an independent fisheries and aquatic resource consulting company dedicated to the sustainable use of natural resources through sound, integrated management practices and policies. We are part of the global MRAG group with sister companies in Europe, North America and the Asia Pacific.

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About this Report

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EXECUTIVE SUMMARY

Background

Illegal, unreported and unregulated (IUU) fishing is a pervasive global problem which undermines the integrity of fisheries management systems, causes social and environmental harm and results in lost revenue for coastal States (e.g. FAO, 2001; Agnew et al, 2009; FAO, 2023a). Australia is a net importer of seafood by volume, with around 65% of domestic seafood consumption (by weight) currently supported by imports (Tuynman et al, 2023). The Australian Government has committed to examining the risks associated with IUU-derived seafood entering Australia's seafood import supply chains and whether additional measures are required to minimise the risk. To assist the Government's consideration, the Department of Agriculture, Fisheries and Forestry (DAFF) contracted MRAG Asia Pacific to undertake an initial review of IUU fishing risk in Australia's seafood imports. Broadly, the aims of the work were to:

- Characterise Australia's seafood imports, including the likely main source fisheries/farms from which Australia's seafood imports are harvested/produced, to the extent possible based on existing information;
- Examine the feasibility of estimating the volume and value of seafood derived from IUU fishing entering Australia and what datasets are available to achieve this;
- Describe qualitative reasons why certain supply chains may be more at risk of IUU fishing;
- Assess the relative risk of IUU-derived seafood entering Australia supply chains across the main species or species groups imported; and
- Identify existing data and methodological challenges, how issues can be addressed, and what additional work can be conducted to overcome these challenges.

Characterising Australia's seafood imports

An essential first step in evaluating the risk of IUU-derived product entering Australia's import supply chain is to identify the species being imported and the source fisheries/farms from which Australia's seafood imports are harvested/produced. For this review, we initially used Australian Bureau of Statistics (ABS) data based on importer customs declarations to identify the top 50 import country/commodity combinations by volume and value for the most recent complete five-year period (2018-2022). These combinations accounted for 85.4% and 82% of total imports by volume and value, respectively. For each of the top 50 country/commodity combinations, we then used both public (e.g. public fisheries production and trade data) and non-public (e.g. industry advice, customs declarations) information to identify the likely species being imported, the production method and, for wild catch fisheries, the likely source fishery/ies where possible. While these were cross-checked to the extent possible in the timeframe, substantial uncertainties remain for many categories. This is primarily because (i) products are often imported under generic codes (e.g. 'frozen fish – other') which offer little insight into the nature and provenance of the consignment and (ii) given the globally-traded nature of seafood, the country from which the product was imported is often not the country (or region) from which the fish was harvested (or farmed).

Feasibility of estimating volume and value of IUU

Our assessment is that it is not currently feasible to estimate the volume and value of IUU-derived fish in Australia's imports in a robust way using existing information. This is primarily for three reasons:

- Information on the sources of Australia's seafood imports is currently opaque, such that it is very difficult to identify the contribution of individual source fisheries from which to assess likely IUU volume in Australia's seafood imports;
- There are no robust estimates of IUU volume and value for most fisheries internationally such that, even if source fisheries/supply chains were known, the volume of IUU-derived fish emanating from them are not; and
- What's 'IUU' is often not straightforward and requires a very detailed understanding of legal frameworks and practices in each source fishery.

Given the complexity of global seafood supply chains and the covert nature of IUU fishing, combined with domestic data collection gaps, it is not currently possible to robustly estimate the volume and value of IUU-derived seafood entering the Australian market. Nevertheless, obtaining a precise estimate of IUU volume and value need not be a pre-requisite for taking further action to minimise IUU risk.

Factors influencing IUU risk

There are a very broad range of reasons why some supply chains may be more at risk of carrying IUU-derived fish than others. These are typically influenced by the unique nature of the source fishery and management arrangements/legal frameworks, the relative incentives and disincentives for non-compliance and the ease with which IUU-derived fish can enter (and remain in) supply chains. Nevertheless, in the context of analysing IUU risk in imports and the scope set out above, some of the main factors influencing risk include:

- **Production method** – for this initial review, aquacultured products have been considered lower risk, however we note this does not consider the extent to which IUU-derived fish may be used in the production chain (e.g. in aquaculture feed, broodstock);
- **Effectiveness of monitoring, control and surveillance (MCS) arrangements** – for wild catch fisheries, the effectiveness of the MCS system is a key factor influencing overall IUU risk and should be seen in the context of the nature and scale of the fishery;
- **History/evidence of IUU fishing** – although this is largely a function of MCS effectiveness at the fishery level, a demonstrated history of IUU fishing (in the absence of corrective measures) might signal a higher risk of IUU;
- **Opacity of the supply chain/product traceability** - While opaque and complex supply chains don't automatically equate to IUU, a lack of transparency creates opportunities for illegal products to be mixed with, or substituted for, legal products; and
- **Credible eco-certification** - fisheries that have been independently certified against a credible, third-party certification scheme (such as schemes recognised by the Global Sustainable Seafood Initiative) and from which products travel through a robust, certified chain of custody, will generally be lower risk for IUU.

Risk in Australia's seafood imports

For each of the top 10 imported species or species groups by volume in the 2018-2022 period, we examined the likely risk of IUU-derived seafood entering Australian supply chains. Each of these species/groups accounted for >1% of Australia's total seafood imports; species/groups ranked 11 or below accounted for <1%.

We first examined whether the main products were likely sourced from a wild catch fishery or aquaculture. In this exercise, aquaculture products were considered lower risk. The next step was to examine whether recent, robust studies estimating IUU or examining IUU risk were available for source fisheries. If so, these studies were used as a primary information source to inform a qualitative judgement about the overall level of risk. Where no recent studies of IUU existed, we used other available information on factors influencing IUU risk (e.g., effectiveness of MCS measures, likely opacity of the supply chain, certification) to inform a qualitative judgement on likely risk for each source fishery. Where products were likely sourced from multiple fisheries of varying IUU risk, we made an overall qualitative judgement of risk across the species/group based on the likely main source fisheries by volume.

Of the top 10 species/groups by volume, tuna, prawns, salmon, catfish, hake and mussels were considered lower risk overall, although some individual sources may be higher risk. For tuna, the majority of Australia's import volume is in the form of canned tuna, primarily skipjack and yellowfin tuna. A large majority will be sourced from the industrial purse seine fishery operating in the Pacific Islands region of the Western and Central Pacific Ocean (WCPO). The fishery has strong MCS measures in place, with 11 separate 'fisheries' in the area certified against the Marine Stewardship Council (MSC) Fishery Standard. Prawns, catfish and mussels imported into Australia are predominantly aquacultured and considered lower risk here. Salmon imports were broadly of two groups: (i) Atlantic salmon and trout farmed in Europe (e.g. Norway), and (ii) Pacific salmon likely originating in Alaskan (and to a lesser extent Russian and perhaps Canadian) wild catch fisheries. Farmed production was considered lower risk, while a substantial proportion of wild caught salmon is likely to be sourced from Alaskan fisheries which are MSC-certified and have strong MCS measures in place. While a number of Russian salmon fisheries are MSC-certified, the overall IUU situation is more complex. The substantial majority of hake products imported into Australia are likely to originate from the MSC-certified New Zealand, South African and Namibian hake fisheries.

Species/groups considered higher risk overall were squid and sardines. Importantly, a categorisation of 'higher risk' does not mean that product from these sources is IUU – simply that the available information indicates there is a higher relative risk that IUU-derived fish may be present. Both groups contain a large number of species harvested across a wide range of fisheries and jurisdictions, some of which will be lower risk. Discussions with importers indicated that the majority of squid (by volume) imported into Australia is likely to be jumbo flying squid ('gigas'), with smaller volumes of other species including Japanese flying squid ('pacificus'), neon flying squid ('bartrami'), arrow squid and Argentine shortfin squid ('Illex'). Several studies have estimated high rates of illegal fishing for some squid species, some high seas squid fisheries remain largely unregulated, and IUU fishing has been acknowledged as an issue in some RFMO convention areas in which squid species imported into Australia are harvested. Amongst the sardine fisheries, while products sourced from MSC-certified herring and European sprat fisheries from the North Atlantic and Baltic Sea are lower risk, the available evidence indicates products sourced from tropical sardine fisheries may be higher risk.

In addition to the species discussed above, around 24.6% of Australia's seafood import volume is imported under generic Harmonised Tariff Item Statistical Codes (HTISCs) for which there is often limited visibility of species, production method and source fishery. In practice, 'Fish (Generic)' products likely include both products sourced from well-managed fisheries and simple supply chains for which IUU risk is low (e.g. MSC-certified whitefish products, imported as 'frozen fillets – other'), as well as products with raw materials sourced from higher risk fisheries/supply chains. Of the products imported under generic HTISCs, the available information indicates that surimi products sourced from uncertified, tropical sources may be at higher risk of incorporating IUU-derived product.

Data challenges

The main impediment to more accurately assessing IUU risk from Australia's seafood imports is the lack of detailed publicly available information allowing for the identification of the species being imported, as well as the associated source fisheries (and farms) and supply chains. To better assess IUU fishing risk, good information is required on the details of the source fishery (e.g. species, gear type, catching area/management system) as well as each link in the supply chain between the harvester and the first point of landing in Australia (e.g. details of transhipment at sea, container transport, cold storage, processing, re-exporting etc.). Information on the source fisheries is required to assess the effectiveness of the MCS system and likelihood that the fish was harvested in an authorised way, while information on supply chains is required to assess the risk of mixing or substitution of legal and IUU fish.

1 INTRODUCTION

Illegal, unreported and unregulated (IUU) fishing is a pervasive global problem which undermines the integrity of fisheries management systems, causes social and environmental harm and results in lost revenue for coastal States (e.g. FAO, 2001; Agnew et al, 2009; FAO, 2023a). The impacts of IUU fishing are often hardest felt by developing countries with the least capacity to respond (MRAG, 2005). While monitoring, control and surveillance (MCS) systems to combat IUU have long been in place for many fisheries, attention has increasingly turned in recent years to using port and market State measures to complement 'on water' efforts (e.g. the FAO Port State Measures Agreement [PSMA][1]; the European Union's IUU Regulation[2]; the United States' Seafood Import Monitoring Program[3]).

Australia is a net importer of seafood by volume, with around 65% of domestic seafood consumption (by weight) currently supported by imports (Tuynman et al, 2023). While strong measures are in place to detect and deter IUU fishing in Australia's domestic seafood sector, comparatively few measures are currently in place to assess and minimise IUU risk for seafood imports as it enters the Australian market. In that context, the Australian Government has committed to examining the risks associated with IUU-derived seafood entering Australia's seafood import supply chains and whether additional measures are required to minimise the risk.

To assist the Government's consideration, the Department of Agriculture, Fisheries and Forestry (DAFF) contracted MRAG Asia Pacific to undertake an initial review of IUU risk in Australia's seafood imports. Broadly, the aims of the work were to:

- Characterise Australia's seafood imports, including the likely main source fisheries/farms from which Australia's seafood imports are harvested/produced, to the extent possible based on existing information;
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- Identify existing data and methodological challenges, how issues can be addressed, and what additional work can be conducted to overcome these challenges.

This report sets out the results of the analysis. Following this introduction, section 2 sets out the scope of the study, while section 3 sets out the approach used to characterise Australia's seafood imports. Section 4 then attempts to address each of the main study questions in turn.

2 SCOPE

For this analysis we have adopted the definition of IUU fishing set out in the FAO International Plan of Action for IUU (IPOA-IUU; FAO, 2001) (Box 1). We have focused primarily on examining the risk of illegal and unreported fishing, as well as unregulated fishing where it is conducted inconsistent with conservation and management measures of a relevant regional fisheries management organisation (RFMO) or high seas areas where no applicable RFMO exists (i.e. the first component of 'unregulated fishing' in Box 1). We have focused less on the component of unregulated fishing covering activities conducted in a manner inconsistent with State responsibilities under international law (i.e. the second component of 'unregulated fishing' in Box 1). This

[1] https://www.fao.org/port-state-measures/en/

[2] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32008R1005

[3] https://www.fisheries.noaa.gov/international/seafood-import-monitoring-program

component can be problematic to define (e.g. Tsamenyi et al, 2015) and is, in any case, typically best dealt with through capacity building and strengthened governance.

BOX 1: WHAT IS IUU FISHING?

Illegal fishing refers to fishing activities:

(1) conducted by national or foreign vessels in waters under the jurisdiction of a State, without the permission of that State, or in contravention of its laws and regulations;

(2) conducted by vessels flying the flag of States that are parties to a relevant regional fisheries management organization but operate in contravention of the conservation and management measures adopted by that organization and by which the States are bound, or relevant provisions of the applicable international law; or

(3) in violation of national laws or international obligations, including those undertaken by cooperating States to a relevant regional fisheries management organization.

Unreported fishing refers to fishing activities:

(1) which have not been reported, or have been misreported, to the relevant national authority, in contravention of national laws and regulations; or

(2) undertaken in the area of competence of a relevant regional fisheries management organization which have not been reported or have been misreported, in contravention of the reporting procedures of that organization.

Unregulated fishing refers to fishing activities:

(1) in the area of application of a relevant regional fisheries management organization that are conducted by vessels without nationality, or by those flying the flag of a State not party to that organization, or by a fishing entity, in a manner that is not consistent with or contravenes the conservation and management measures of that organization; or

(2) in areas or for fish stocks in relation to which there are no applicable conservation or management measures and where such fishing activities are conducted in a manner inconsistent with State responsibilities for the conservation of living marine resources under international law.

For this initial review, we have looked at the products of wild capture fisheries only. We have not looked at the risk of illegality in the production of aquacultured species, nor have we looked 'up the chain' (e.g. at the risk of IUU wild catch fish being used as aquacultured fish feed, or broodstock harvested through illegal practices).

Importantly, we have also not looked at issues around:

- seafood mislabelling and fraud, beyond considering the overall complexity/opacity of supply chains; or
- other types of illegality (e.g. labour rights abuses[4], other transnational crime).

We have also not considered imports of finished pet food products, cosmetics or supplements given the difficulty in determining the marginal contribution of seafood to overall import volume, as well as likely sources of raw materials.

3 CHARACTERISING AUSTRALIA'S SEAFOOD IMPORTS

An essential first step in evaluating the risk of IUU-derived product entering Australia's seafood import supply chain is to identify the species being imported and the source fisheries/farms from which Australia's imports are harvested/produced. For wild capture fisheries, knowing the source fishery is important because each fishery has a unique mix of incentives and disincentives for IUU fishing, MCS systems of differing effectiveness and a specific framework of laws governing fishing and support activities (e.g. what might be IUU in one fishery

[4] While the concept of 'IUU fishing' has historically focused on acts done in contravention of fisheries management frameworks (e.g. FAO, 2023b), we note that RFMOs, national governments, NGOs and seafood markets have increasingly focused attention on crew welfare issues in recent years.

is perfectly legal in another). Each is also likely to arrive in Australia through supply chains which have differing risks of mixing IUU-derived with legal fish.

The best publicly available data on Australia's seafood imports by volume and value currently comes from customs declarations made by importers (or customs brokers), which are compiled by the Australian Bureau of Statistics (ABS). Specifically, imported seafood must be classified by the importer (or broker) according to Australia's Harmonised Tariff Item Statistical Codes (HTISC) (see Annex 1), commonly referred to as 'HS codes'. Nevertheless, these data have a number of significant shortcomings in being able to trace products back to source fisheries or farms (see section 4.4). Most notably:

- Products are often imported under generic codes which offer little insight into the nature and provenance of the consignment (e.g. 'frozen fish – other'). In the absence of additional information, this provides little useful intelligence around the species being imported, the production method (wild catch/aquaculture) and, for wild catch fisheries, the source fishery (e.g. gear type, fishing area). We note that in many cases generic HTISCs appear to be used, even where more species/family specific codes are available; and

- Given the globally traded nature of seafood, the country from which the product was imported is often not the country (or region) from which the fish was harvested (or farmed). Australia's largest seafood import by volume – canned tuna – is a good case in point. While the majority of Australian canned tuna is imported from Thailand, most of the raw material is harvested by the purse seine fishery operating within the Pacific Islands region. To that end, IUU risk is a function of both the arrangements in place for the Western and Central Pacific Fisheries Commission (WCPFC) purse seine fishery, as well as those to prevent infiltration of IUU-derived fish into the supply chain in Thailand.

While more detailed information on import species and provenance is available from customs (and individual importers), this data is not currently publicly available nor collected/stored in an easily searchable manner or verified for accuracy (see section 4.4). With additional time available, it is likely that an improved characterisation could be achieved through more extensive industry consultation and exploring other potentially useful datasets.

To that end, while ABS-compiled HTISC data provides the best available starting point, in order to better characterise the likely composition and sources of Australia's seafood imports, additional analysis is required. For this review, we first used HTISC information for the most recent complete five-year period (2018-2022) to identify the top 50 import country/commodity combinations by volume and value. HTISCs were assigned into commodities by the ABS based on the degree of specificity provided in individual codes (e.g. codes specific to tuna products were labelled 'tuna'; generic codes that captured a large range of possible species were labelled 'generic' – see Annex 1), and commodities that were imported by number rather than weight (primarily aquarium fish and pearls) were converted to an approximate weight. The top 50 'import country/commodity' combinations by volume and value (averaged across 2018-2022) are set out in (Figure 1). These combinations accounted for 85.4% and 82% of total imports by volume and value, respectively.

Of note, the distribution of Australia's seafood import sourcing is skewed, such that a small number of country/commodity combinations make up a relatively large proportion of import volume and value. Tuna products from Thailand (mainly canned tuna) accounted for the highest volume and value of imports at 14.4% and 11.6% respectively. Fish (Generic) from New Zealand (6.3%) and prawns from Vietnam (6.1%) accounted for the next highest import volumes, although prawns from Vietnam accounted for a higher proportion of import value (10.8%). Only four country/commodity combinations accounted for >5% of imports by volume and only 22 country/commodity combinations accounted for >1%. By contrast, the bottom 900 country/commodity combinations collectively accounted for only 0.7% of total import volume. Importantly, the number of commodities does not necessarily equate to the number of species imported into Australia – some commodities [e.g. Fish (Generic)] may comprise multiple species; similarly single species may appear in multiple commodities (e.g. tuna may appear in 'tuna' where it is specified; it may also appear in 'Other' where fish meal derived from tuna processing trimmings is imported under a generic HTISC).

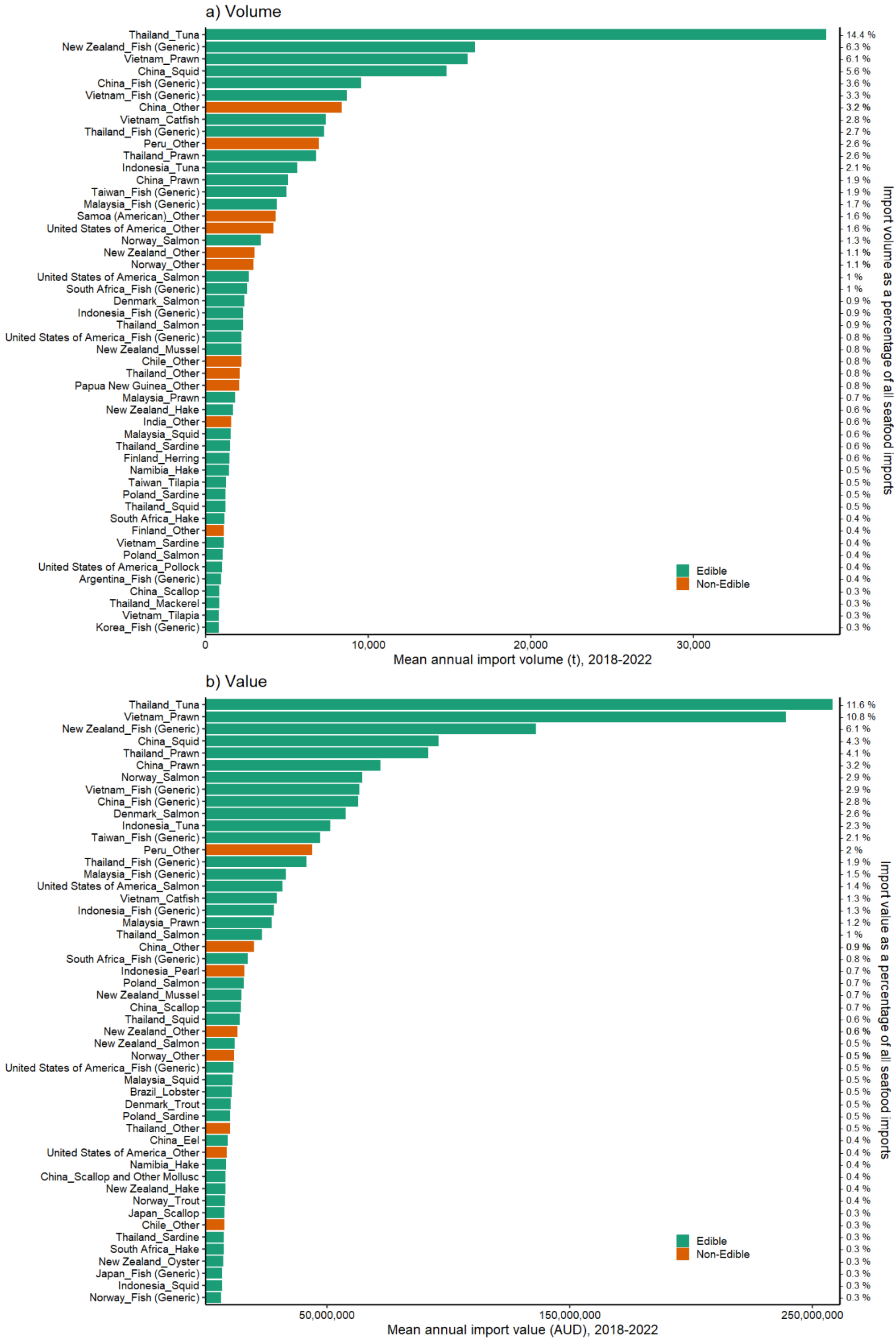

Figure 1: Top 50 import country/commodity combinations by volume (a) and value (b), averaged across 2018-2022 (Data source: ABS).

4 KEY QUESTIONS

4.1 Feasibility of estimating volume of IUU-derived seafood imported into Australia?

Our assessment is that it is not currently feasible to estimate the volume and value of IUU-derived fish in Australia's imports in a robust way using current information.

There are several reasons for this:

- **Information on the original source of Australia's seafood imports is currently opaque** – an essential prerequisite to being able to estimate the volume and value of IUU-derived seafood being imported into Australia is to have good information on the nature and original source of imports, as well as detailed information on post-harvest supply chains. In the context of wild catch fisheries, this means having good information on the species being imported, the catching location and method (i.e. gear type), and the management system/s governing the catch, as well as the supply chain between catching vessel and point of landing in Australia. As discussed above, the capacity to identify the species composition and source fishery for much Australia's seafood import volume from publicly available information is currently obscured by the high proportion of imports reported under generic commodity codes (e.g. 'frozen fish – other') and the unknown (but certainly high for some products) proportion of processing/re-exporting for many products. While individual importers are likely to have considerably more visibility back to product source through their commercial relationships – and some of this information is reported through the goods description free text field in customs declarations – the data is not currently coordinated through a central, publicly available source. It is also possible that for some products – particularly highly processed products (e.g. surimi, fish balls) – the source fisheries/species for the raw materials may be variable and not well-known to some importers. To that end, it is not currently possible from publicly available information to identify the relative contribution of individual source fisheries from which to assess likely IUU volume in Australia's seafood imports.

- **There are no robust estimates of IUU volume and value for most fisheries internationally** – even where source fisheries are known, the practical reality is that there are few robust estimates of total IUU volume and value at the fishery scale for most fisheries internationally. This is perhaps not surprising given the inherently challenging nature of estimating IUU fishing. Although good estimates of individual aspects of IUU fishing have been made for some fisheries (see for example FAO, 2023b), these are generally isolated and likely to cover only a small fraction of source fisheries for Australia's seafood imports. At the other end of the spectrum, a number of global and regional estimates have been made although these are often either dated (e.g. Agnew et al's (2009) widely quoted estimates of IUU are based on data to 2003), or the contribution of individual source fisheries to a regional estimate is unclear (and applying the regional IUU range – say in an FAO Area – universally across all fisheries within the region is likely to be highly fraught). While FAO and others are attempting to facilitate the production of robust fishery-scale estimates of IUU (e.g. FAO, 2023a, b, c), the relative absence of robust IUU estimates upon which to base an overall estimate of Australia's IUU imports is unlikely to change in the near future.

- **'IUU' is not always straightforward** – while the concept of IUU fishing is relatively clear in theory, applying it in practice for the purpose of estimating volume and value is often not straightforward (e.g. FAO, 2023a). Some forms of IUU fishing are 'black and white' (for example, illegal foreign fishing), while others are considerably 'greyer'. For example:
    - If the product being imported into Australia was taken legally, but the vessel also engaged in illegal activities during the same trip (e.g. shark finning, discarding), should the imported product be considered IUU?

- If a vessel fishes in a closed area for 10% of a trip, should the whole catch from the trip be considered IUU or just the catch from the closed area?
- If a vessel submits required catch and effort data but misses the deadline for submission, is that unreported?
- If a vessel catches fish consistent with relevant catch or effort controls and provides necessary data to the relevant management authorities, but the markings on the vessel are faded or flaking such that they don't comply with local regulations, is that catch illegal?

In any comprehensive estimate of IUU, these situations are myriad and often require judgement calls on the part of the estimator about what is, and is not, considered IUU. Many of these can have a large bearing on the final outcomes. Navigating these issues requires an excellent understanding of the relevant legal frameworks applying to source fisheries and judgement calls are best made in consultation with relevant stakeholders. We note that these same challenges around the 'greyer' areas of IUU also apply to the effective implementation of any import control scheme.

While estimates of IUU import volume have been attempted for some jurisdictions, methodological challenges limit their reliability and usefulness. For example, the United States International Trade Commission (USITC) (2021) attempted to estimate the volume and value of IUU-derived seafood imports into the US. Broadly, they based initial estimates of IUU on the unreported component of Sea Around Us (SAU) Project catch reconstruction data by fishery and categorised source fisheries into one of 12 'risk profiles' based on information on 'fishery' and 'fundamental' risk. They then assigned a likely range of IUU (by percentage) to each of the 12 possible risk profiles based on IUU estimates for different fisheries in Agnew et al (2009) and then adjusted the SAU unreported volume for each fishery based on whether the initial estimate was more or less than the assigned range for that risk profile. However, this approach has a range of limitations – many acknowledged by the authors – which make the estimates highly uncertain. Firstly, the SAU catch reconstructions are an attempt to estimate total removals and include volume that is not IUU (e.g. unreported catch where there is no requirement to report; e.g. MacFadyen et al, 2016) and have been subject to a range of external criticisms (e.g. Chaboud et al, 2015; Ye et al, 2017; Tilney et al, 2017). Secondly, the assigning of IUU ranges for each risk profile from the Agnew et al (2009) study is largely nominal with very little if any ground-truthing against contemporary primary data from the fisheries in question. To that end, the extent to which the estimates reflect the actual volume of IUU in imports is uncertain.

Other methodologies used for attempts at estimating total IUU import volume for other jurisdictions (e.g. Pramod et al, 2019) have similarly been the subject of controversy and technical criticism (e.g. Hilborn et al, 2019).

While each of the above factors limits our current capacity to credibly estimate the volume of IUU in imports, we note that having a precise estimate need not be a pre-requisite for taking further action. While having a baseline is clearly useful in monitoring the effectiveness of any measures, it is also plausible to structure the objectives of any future action around a more pragmatic objective – e.g. to reduce the risk of IUU products in Australian imports, with risk determined through an agreed process.

4.2 Qualitative reasons why certain supply chains may be more at risk of IUU fishing

There are a very broad range of reasons why some supply chains may be more at risk of carrying IUU-derived fish than others. These are typically influenced by the unique nature of the source fishery and management arrangements/legal frameworks, the relative incentives and disincentives for non-compliance, and the ease with which IUU-derived fish can enter and remain in supply chains. Nevertheless, in the context of analysing IUU risk in imports and the scope set out above, some of the main factors influencing risk include:

Production method – for this exercise we have looked at the likely source of the seafood imported into Australia at the point of production, and not further up the production chain. On that basis, aquacultured products have been considered lower risk in the context of the IPOA-IUU definition used here. Nevertheless, we note this does not consider the extent to which IUU-derived fish may be used in aquaculture feed, or broodstock harvested through illegal means. The extent to which any future import control scheme examines matters 'further up the supply chain' should be considered in the context of the objectives of the scheme and the practicality of sourcing relevant information.

Effectiveness of MCS arrangements – for wild catch fisheries, the effectiveness of the MCS system is a key factor influencing overall IUU risk and should be seen in the context of the nature and scale of the fishery and associated supply chain. Larger, more complex fisheries will typically require larger, more sophisticated MCS systems and vice versa. For the purposes of assessing IUU risk in imports, the effectiveness of the MCS system should be seen in its widest context considering measures in place at all stages of the supply chain – e.g. coastal State, flag State, RFMO, port State, market State.

Importantly, the components of an effective MCS system will differ from fishery to fishery depending on the nature of the management system and objectives, as well as the incentives for non-compliance. For example, a quota managed fishery will require good systems in place to verify catch and landings, monitor high-grading and discarding (if illegal) and monitor and deter quota 'leakage'. An effort-controlled system will require good arrangements in place to monitor and control fishing effort at relevant scales. Fisheries vulnerable to illegal foreign fishing or unregulated fishing may require a strong aerial and surface surveillance presence, as well as strong sanctions to deter non-compliance. The most effective MCS systems are typically risk and intelligence-based and involve a balance of measures to encourage voluntary compliance and deter non-compliance.

Examples of MCS components that can contribute to an effective overall MCS system include:

- Effective legal framework/s – effective control of fishing activity requires effective legal frameworks in place at relevant levels (e.g. flag State, coastal State, high seas), including effective sanctions to deter non-compliance;
- Vessel record/identification – an effective process for recording and uniquely identifying vessels authorised to fish is a fundamental underpinning of most regulated fisheries systems;
- Logbooks – effective management of fisheries requires accurate information on catch, effort and other relevant activities, which should be verified through independent monitoring;
- Vessel monitoring – vessel monitoring can come in many forms – for example, vessel monitoring systems (VMS), human observers, electronic monitoring (EM), dockside monitoring, Automatic Identification System (AIS) – and should be sufficient to monitor compliance with key aspects of the management system;
- Catch monitoring/verification – in quota-managed fisheries, for example, mechanisms to verify actual weights of landed catch, often through authorised fish receivers, are essential;
- Catch documentation systems (CDS) – CDS have been applied across a number of species and markets, and can be an effective tool to track the legality of products through the supply chain;
- Inspections – an effective regime of inspections (e.g. at sea, dockside, port State) can be important in monitoring the extent of compliance with management measures, as well as deterring non-compliance;
- Surveillance – surveillance in its various forms (e.g. at sea, aerial, satellite) can be an effective deterrent, and is often the only way of detecting non-compliance when vessels are unable to be monitored through other means (e.g. illegal foreign fishers not fitted with VMS/AIS etc);
- Flag State controls – strong measures in place to manage and monitor fishing activity can exert strong control over a State's flagged vessels, even where coastal State MCS arrangements are limited or high

seas regulations are absent. The use of 'flags of non-compliance'[5] can mean less practical oversight of vessel activities, particularly where high seas or coastal State MCS arrangements are limited;

- Port State controls – even where coastal/flag State controls are weak, port State controls (including those through the PSMA) can prevent the entry of IUU fish into relevant supply chains.

In the context of assessing risk at the fishery level, the key questions are:

- Are there effective measures in place to ensure that only authorised vessels access the fishery?;
- Are there effective measures in place to ensure that authorised vessels comply with relevant legal frameworks, including any reporting requirements?; and
- Are there effective measures in place throughout the supply chain to ensure that no mixing or substitution occurs between legal and IUU product?

Products sourced from fisheries that have strong MCS systems in place with good controls and traceability throughout the supply chain will be relatively lower risk. Products sourced from fisheries that have weak MCS systems in place with poor controls through the supply chain will be higher risk.

Opacity of the supply chain/traceability – global seafood supply chains can be complex with multiple buyers, wholesalers, cold stores, processors, importers, exporters, transporters and other 'middlemen' between the harvester and the customer. Seafood products harvested in one country are frequently exported, processed and re-exported from different countries before reaching their final destination, often with limited visibility to the final customer. The details of suppliers can also be closely guarded secrets by those in the middle of the supply chain, concerned that they'll be bypassed if supply details are known. In addition, uncertainties relating to source fishery identification can become amplified with each step back in the supply chain.

While opaque and complex supply chains don't automatically equate to IUU, a lack of transparency creates opportunities for illegal products to be mixed with, or substituted for, legal products. Perhaps more importantly in the context of this exercise, the lack of visibility means that the original source of the product and legality are unable to be verified. Examples of supply chain characteristics that could create opportunities for mixing, substitution or otherwise obscuring provenance include:

- Fisheries landing into countries which are not a Party to the PSMA and/or are not fully implementing its requirements;
- Fisheries utilizing transshipment operations which do not provide the documentation called for under the FAO Voluntary Guidelines for Transshipment (FAO, 2023d);
- Fisheries which allow transshipments or landing of a portion of the haul (making it difficult to trace the origin and pathway of products from a given fishing trip);
- Use of cold store facilities for raw or processed products where rigorous lot identification and chain of custody procedures are not followed;
- Processing arrangements which cannot demonstrate strict segregation of different lots of materials;
- Processing arrangements that are not subject to government monitoring of yields (undertaken to verify that the full amount of imported raw materials were processed and re-exported under tariff-free arrangements);
- Fish products which reach their destination for processing or consumption as containerized goods without undergoing formal landings procedures from the point of containerization; and
- Fisheries with catch certification systems that allow certificates to be issued after the point of first landing (i.e. where legal provenance is most easily verified).

Credible, independent eco-certification – fisheries that have been independently certified against a credible, third-party certification scheme (such as schemes recognised by the Global Sustainable Seafood Initiative,

[5] https://www.europarl.europa.eu/RegData/etudes/BRIE/2017/614598/EPRS_BRI(2017)614598_EN.pdf

GSSI[6]) will generally be low risk for IUU. That's not to say that certified fisheries are free of IUU – most if not all fisheries internationally will have some level of illegal/unreported activity – however, credible certification processes require a robust and regular assessment of the fishery MCS system and evidence of compliance. For example, to receive an unconditional pass against the 'compliance and enforcement' performance indicator (PI) of the Marine Stewardship Council's (MSC) Fishery Standard (v2.01), fisheries are required to demonstrate:

- An MCS system has been implemented within the Unit of Assessment (UoA; i.e., the combination of target species, gear type, and the fishing fleets, groups of vessels, or individual fishing operators pursuing that stock) and has demonstrated an ability to enforce relevant management measures, strategies and/or rules;
- Sanctions to address noncompliance exist, are consistently applied and thought to provide effective deterrence;
- Some evidence exists to demonstrate fishers comply with the management system under assessment; and
- There is no evidence of systematic noncompliance.

Certified fisheries are then audited annually for the 5-year certification period for any material changes in the fishery, its management, product traceability, or information underlying the assessment. Stakeholder input is also sought, and audit reports are made publicly available on the MSC website.

Moreover, in the MSC's case, eligibility to sell fish using the MSC ecolabel requires each 'link' the supply chain to be certified against the MSC's Chain of Custody Standard, which ensures traceability and no mixing of certified and non-certified fish. The bait used in MSC fisheries must also be assessed against the standard. For these reasons, fisheries certified against a credible independent standard have been considered lower risk here. The main challenge for this exercise has been that, given the opacity in the information about the composition of Australia's seafood imports, it's not always possible from publicly-available import documentation to determine whether a product is sourced from a certified fishery (or farm in the case of aquacultured products).

Governance has often been considered a reasonable proxy for IUU risk (e.g. Agnew et al, 2009) and can certainly influence the effectiveness of coastal State, flag State or port State controls. Nevertheless, we note this is not always the case. For example, some Pacific Island members of the Parties to the Nauru Agreement (PNA) receive relatively low scores against several of the World Bank Governance Indicators (e.g. government effectiveness, regulatory quality)[7]. However, MCS in the PNA purse seine fishery (from which much of Australia's canned tuna imports are sourced) is strong and the free school sector of the fishery was the first major tuna fishery internationally to be MSC certified in 2011. In the PNA's (and broader Pacific Island Forum Fisheries Agency membership's) case, challenges associated with limited resources amongst small island governments have been overcome with strong, cost-effective cooperative MCS arrangements (MRAG Asia Pacific, 2021).

A number of other more specific factors are also often linked to IUU risk – for example, whether the product is transhipped at sea, use of 'flags of non-compliance' – although the extent to which these contribute to overall IUU risk can be captured in practice through a detailed assessment of the effectiveness of MCS measures in the source fishery/supply chain. Transhipment at sea, for example, need not automatically lead to increased IUU risk, but unmonitored transhipment at sea certainly does.

4.3 Relative IUU risk across the main imported species/groups

In addition to characterising Australia's seafood imports (Section 3), a key requirement of this work was to examine the relative risk of IUU-derived seafood entering Australian import supply chains across the main imported species or species groups. At the outset, we note that risk is rarely uniform across a species or

[6] https://www.ourgssi.org/
[7] https://info.worldbank.org/governance/wgi/Home/Reports

species group. Where a species is harvested across multiple fisheries in different jurisdictions, IUU risk levels may vary. Fish species A harvested in an MSC-certified fishery with strong MCS arrangements in place and short, transparent supply chains may be low risk, while the same species harvested in another jurisdiction with weak MCS, a history of IUU fishing and complex, opaque supply chains may be higher risk. This variation may be more pronounced amongst species groups (e.g. 'squid'), within which different species are harvested in markedly different fishing operations, jurisdictions and management systems. To that end, examining risk at the species or species group level will be less precise than assessing risk at the fishery or supply chain level.

We also note there is currently no internationally accepted standard methodology to assess the relative risk of IUU fishing for source fisheries and supply chains. While a number of authors have attempted to develop quantitative or semi-quantitative approaches to estimating IUU risk, these are often too coarse or too fine to be of practical assistance at the scale of individual fisheries or supply chains. For example, Macfadyen and Hosch (2021) attempt to estimate the '*degree to which states are exposed to and effectively combat IUU fishing*' at the country level through a global IUU Index. However, the index includes measures relating to both domestic production and imports as well as other more generic measures (e.g. size of EEZ, gross national income) and is of limited practical use in examining risk at the individual fishery scale. At the other end of the spectrum, a number of authors have proposed methodologies to assess risk at the individual vessel level (e.g. Ford and Wilcox, 2022, propose a method to assist in targeting port State inspections). Vessel-based approaches typically rely on detailed (often non-public) information at the individual vessel level (e.g. vessel movement data, crew information) and are therefore impractical to scale up across thousands of vessels in hundreds of source fisheries globally.

For the purposes of arriving at an overall assessment of relative risk across the main imported species or species groups, we have taken a pragmatic approach based on the factors influencing IUU risk described above. For each of the top 10 species or species groups by volume imported into Australia during 2018-2022 (Figure 2), we examined likely IUU risk based on the process outlined in Figure 3. Each of the top 10 species/groups accounted for >1% of imported seafood volume on average across the 2018-2022 period; species/groups ranked 11 and below accounted for <1% of total imported seafood volume.

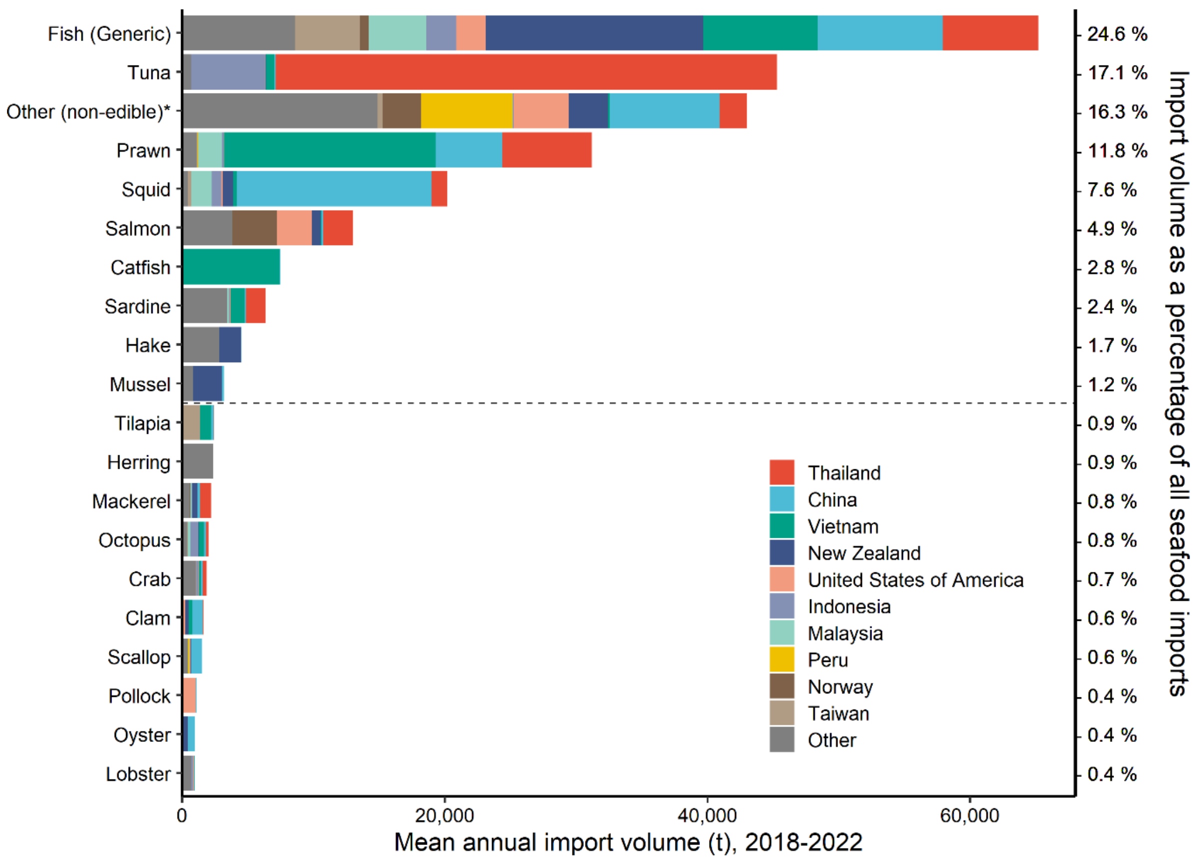

*Figure 2: Top 20 seafood commodities by volume imported into Australia across the 2018-2022 period. The top 10 exporting countries are ordered and coloured as per the legend; all other exporting countries are grouped and shown in grey. Dashed horizontal line separates the top 10 species groups comprising >1% of total imports. * 'Other' comprises >99.995% non-edible commodities. (Data source: ABS)*

Importantly, in any given fishery, even very well-managed ones, there is likely to be some degree of non-compliance. The important thing is whether effective MCS systems are in place to detect and respond to non-compliance, such that risks are minimised to manageable levels and the integrity of the overall fishery management system is maintained. To that end, the intent of the risk assessment exercise here is not to examine whether there is a risk of *any* IUU activity occurring in a fishery (or supply chain), but to determine whether there is a risk of systemic non-compliance (or at least the inability to demonstrate compliance) such that there is a systemic risk of IUU products entering the Australian imported seafood supply chain.

The first step was to examine whether the product was likely derived from a wild catch fishery or aquaculture. In this exercise, aquaculture products were considered lower risk, although as discussed above, this doesn't take account of the risk of IUU fish being used in aquaculture feed or other possible upstream illegality. For the products likely to be sourced from wild catch fisheries, the next step was to identify the likely source fisheries. Consistent with the approach used in section 3 above, this was done based on a combination of:

- The exporting country;
- The HTISC applied to the product and product type;
- Publicly available trade information;
- Discussions with a selection of importers on their source fisheries/locations; and
- The author's own knowledge of seafood supply chains.

Based on the likely source fisheries, we then examined whether recent, robust studies either estimating IUU or examining IUU risk were available for each main source fishery. Ideally, these should have been undertaken consistent with recommended principles and approaches for undertaking IUU estimation studies (e.g. FAO, 2023a,c) and based on data directly from the fishery. If so, these studies were used as the primary information source to inform a judgement about the overall level of risk. Where no recent, data-driven studies of IUU existed (which was the case for most fisheries), we used other available information on factors influencing IUU risk (e.g. effectiveness of the MCS system, fishery certification, likely opacity of supply chain) to inform a qualitative judgement on likely overall risk.

For this initial review, we have characterised each species or group into 'lower risk' and 'higher risk' categories based on information about the likely main source fisheries and supply chains. In addition to aquacultured products, lower risk sources were those for which the available information indicated strong MCS systems were in place, evidence indicated that systemic IUU fishing is unlikely to be taking place and the supply chain was likely to be relatively transparent. Consistent with the discussion in section 4.2., sources rated higher risk were those for which the likely source fisheries (i) had a demonstrated history of IUU fishing or otherwise well-characterised and high IUU risk, (ii) had either weak MCS systems or a lack of recent information on MCS effectiveness and/or (iii) passed through supply chains that were potentially complex/opaque, particularly where there was some prospect of using products from source fisheries with higher risk of IUU fishing. In practice, IUU risk for some products remained uncertain given insufficient information was available on source fisheries or supply chains to form a qualitative view.

Based on the outcomes of these assessments, an overall qualitative risk score was assigned to each species or species group. Species or groups with higher volumes of product likely sourced from higher risk fisheries were assigned an overall 'higher risk' score. Species or groups with higher volumes of product likely sourced from lower risk fisheries were assigned an overall 'lower risk' score. Where a species/group assigned an overall rating of 'lower risk' likely contains at least some sourcing from higher risk fisheries (and vice versa), this was noted.

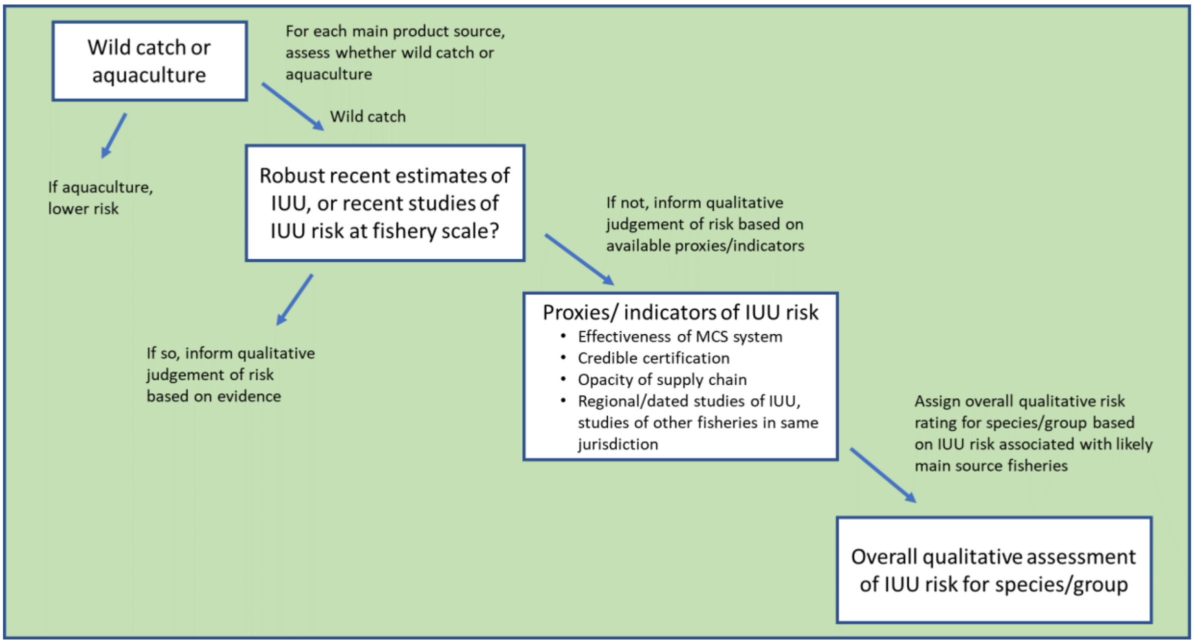

Figure 3: Process used to assess IUU risk at the species or species group level.

Importantly, the broad categorisation used for this initial review means sources rated 'lower risk' will include some which are, in practice, either low or very low risk (e.g. MSC certified fisheries with product passing through MSC certified chains of custody). Moreover, a categorisation of 'higher risk' does not mean that product from these sources is IUU – simply that the available information indicates there is a higher relative risk that IUU-derived fish may be present. In all cases, better information on actual source fisheries and supply chains is needed to more confidently assign risk ratings.

Given the opacity of information of source fisheries and the frequently limited information on factors influencing IUU at the individual fishery level, these results should be seen as an initial screen. More detailed assessments based on better information about source fisheries/supply chains and the effectiveness of measures in place to combat IUU are required to more accurately examine actual risk.

We note that this approach examines similar issues to those reportedly considered to identify the species 'vulnerable to IUU' when designing the US SIMP (NOAA, 2021). That 'principles-based' approach reportedly took into account issues such as 'enforcement capability, catch document scheme, history of fishing violations, complexity of chain of custody and processing', as well as issues relevant to seafood fraud (e.g. species misrepresentation or mislabelling, human health risks) which are not covered here.

The outcomes of this process for the top 10 species/groups by volume in the 2018-2022 period are discussed below.

4.3.1 Fish (Generic)

Seafood imported under HTISCs grouped as 'Fish (Generic)' by the ABS accounted for 24.6% of total seafood imports by volume in the 2018-2022 period. The Fish (Generic) codes incorporate a wide variety of product types, ranging from frozen fillets to fish balls and fish cakes, sourced from a very diverse range of fisheries. In many cases, the generic nature of the HTISCs used ('frozen fish fillets – other') mean that the species being imported, and the production method/likely source fishery, is often either completely obscured or very difficult to determine without additional information. Importantly, some species groups or product types which don't have more specific HTISCs (e.g. surimi) will be either fully, or primarily, incorporated into Fish (Generic) codes. In other cases, non-public customs declarations indicate that some products have been imported under Fish (Generic) codes even where more species or family specific codes are available.

It is also important to note that the use of generic HTISCs (for species/products that could otherwise be given a more specific code) distorts the presentation of import volumes by species in Figure 2. For example, non-public importer declarations sourced from customs and public export data from trading partners indicated that catfish (basa) fillets are often imported under generic 'frozen fillet -other' code (304890040), despite a specific HTSIC codes existing for these imports (304620012). To that end, the volume of catfish will be under-represented in practice in Figure 2. Similar distortions will occur for other species groups.

The generic nature of the HTISC used doesn't necessarily mean that the product is higher risk for IUU. For example, much of the volume being imported from New Zealand and China is likely to be MSC-certified whitefish reported under generic categories ('frozen fish fillets – other'). In the case of the New Zealand product, much of this is likely to be certified deepwater species such as hoki (blue grenadier), hake and southern blue whiting. In the case of product imported from China, a portion of the volume is likely to be from various MSC-certified 'whitefish' fisheries (e.g. Alaskan or Russian pollock, New Zealand deepwater species), for which substantial volumes are processed in China before re-report to other countries (e.g. Ashe et al, 2022).

The exporting country for Fish (Generic) products was diverse, reflecting the broad nature of the relevant HTISCs (Table 1). For each exporting country accounting for 5% or greater of the total volumes of Fish (Generic) products in the 2018-2022 period, we have sought to identify the most likely main sources of raw material, together with the production method and likely IUU risk, based on available information. The discussion has been structured according to exporting country because this is an important determinant of the fisheries products likely to be exported. A key aim of 'picking apart' the 'Fish (Generic)' category in some detail was to identify any species or species groups likely to be higher risk for IUU and which accounted for a sizeable proportion of Australia's overall imports.

Table 1: Average proportion of Fish (Generic) products imported into Australia between 2018-2022, by exporting country and main tariff codes. Percentages in the 'main tariff codes' column represent the proportion of 'Fish (Generic)' imports from that country reported under that particular tariff code. (Data source: ABS)

Country of origin/export	Contribution to total fish (generic) import volume 2018-2022	Main tariff codes	Likely species composition
New Zealand	25.4%	304890040 (frozen fillets; 31%), 302890050 (fresh/chilled; 30%), 304790029 & 304950073 (frozen fillets and meat of specific families; 17%), 1604190035 (prepared/preserved; 12%).	Hoki, snapper, southern blue whiting, ling, orange roughy, oreo dory, sharks.
China	14.7%	1604190035 (prepared/preserved; 44%), 304890040 (frozen fillets; 22%), 303890080 (frozen – other; 13%), 1604200070 (prepared/ preserved; 9%).	Primarily 'whitefish', including Russian and US Alaskan Pollock, Pacific cod, blue whiting and hoki. Lesser volumes of barramundi, tilapia, yellow croaker, pompano, pomfret, whitebait and shark.
Vietnam	13.3%	304890040 (frozen fillets; 71%),1604190035 (prepared/preserved; 8%), 304990080 (frozen fish meat; 7%).	Basa, barramundi, Argentinian flathead, snappers, threadfin bream, sweetlip species, whiting (originating in Australia), surimi.
Thailand	11.2%	1604200070 (prepared/preserved, incl. minced; 46%), 1604200066 (fishballs, fishcakes etc.; 35%), 1604190035 (prepared/preserved, not minced; 16%).	1604200070 & 1604200066: surimi, likely comprised of pollock or tropical species including threadfin breams, bigeye snappers, goatfishes, croakers, lizardfishes, ribbon fishes, sardines, barracudas, monocle breams. 1604190035: flathead (likely Argentinian), hoki, whiting, Alaskan pollock, barramundi, surimi.
Taiwan	7.6%	304890040 (frozen fillets; 69%), 303890080 (frozen - other; 20%), 1604200066 (fishballs, fishcakes etc.; 6%).	Primarily barramundi and in much smaller volumes tilapia, milkfish, Greenland halibut, Pacific saury.
Malaysia	6.7%	1604200070 (prepared/preserved, incl. minced; 51%), 1604200066 (fishballs, fishcakes etc.; 22%); 1604190035 (prepared/preserved, whole/in pieces; 15%).	1604200070, 1604200066: surimi (species as above for Thailand). 1604190035: primarily barramundi and smaller volumes of flathead (likely Argentinian).

New Zealand

Imports from New Zealand accounted for 25.4% of average 'Fish (Generic)' volume during the 2018-2022 period, with most product imported as frozen fillets (304890040) or fresh/chilled (302890050). A substantial proportion of products imported under 304890040 is likely to be hoki (*Macruronus novaezelandiae*), which accounted for around 25.5% of all NZ seafood exports to Australia in the 2020-22 period[8]. Over 95% of hoki imports are frozen fillets or frozen fillet blocks. Although hoki may be reported under a specific product category covering its family (Merlucciidae; 304790029), the volume of NZ hoki exports to Australia substantially exceeds imports of 304790029, so it is likely that hoki accounts for a proportion of frozen fish imported under the more generic 304890040 code. According to data from the DAFF Biosecurity Analytics Centre (BAC) derived from importer declarations, other key taxa imported under 304890040 during 2018-2022 include ling, sharks, orange roughy, smooth oreo dory, and southern blue whiting.

Snapper is likely the primary species imported fresh/chilled under 302890050 and accounts for the second highest volume of imports from NZ by species. According to BAC data, other key species imported fresh/chilled to Australia under 302890050 during the 2018-2022 period include ling, bluenose, john dory, flounders, and orange roughy.

Fisheries New Zealand (2023a) report that no information is available about illegal catch in the hoki fishery, but it is believed to be negligible. For snapper, Fisheries New Zealand (2023b) note that non-reporting of catch is assumed to be 10% of reported domestic commercial catch since the QMS was introduced in 1986. This accounts for under-recording of landed weights and the discarding of legal-size snapper. Fisheries New

[8] https://www.seafood.co.nz/publications/export-stats

Zealand (2023b) notes that vessels in SNA1 participated in a trial of electronic monitoring (EM) between 2016-2018 and discarding of legal sized snapper was unlikely during this period. Rollout of EM across up to 300 vessels in the inshore fleet is planned for 2023-24[9].

For ling, Fisheries New Zealand (2023c) report that some level of misreporting may have occurred up to the mid-1990s, although no commentary is made on recent levels of non-reporting. For rig, school sharks and bluenose, Fisheries New Zealand (2023a,c) report that there is no quantifiable information on illegal catch.

Simmons et al (2016) attempted to 'reconstruct' total catches from New Zealand's EEZ, including unreported landings and discards, although the outcomes have been strongly disputed by MPI and industry[10].

Several of New Zealand's deepwater fisheries are currently MSC certified, including for species such as hoki, ling, southern blue whiting, hake and orange roughy[11]. The effectiveness of MCS measures is examined during assessments. While isolated incidents of non-compliance have occurred (and been sanctioned)[12], O'Boyle et al (2018) report that there have been no major issues of non-compliance in the hoki, hake, ling and southern blue whiting fisheries in recent years. For orange roughy, occasional violations of closed areas due to operator error were evident but investigations determined that these incursions were not systematic (Punt et al., 2022). Vessels are subject to compulsory VMS, e-reporting on all vessels >28m, and fish must be sold to a Licensed Fish Receiver (LFR) with accurate weights reported. Annual observer coverage in the hoki/hake/ling mixed trawl fishery has been 26% and 48% between 2015/16 to 2020/21, and between 59% and 100% in the southern blue whiting fishery between 2018/19 and 2021/22 (Ackroyd and Punt, 2022). O'Boyle et al (2018) awarded the fishery the highest possible score for the MSC compliance and enforcement PI concluding that a comprehensive MCS system has been implemented, there is a high degree of certainty fishers comply with the management system and no evidence of systemic non-compliance exists. Similarly, orange roughy was scored at 95 out of 100 for the relevant MSC compliance and enforcement PI (Punt et al., 2022).

By contrast, no New Zealand inshore fisheries are MSC certified. The MCS system is broadly the same as the deepwater fisheries, although the level of observer coverage has historically been very low. To that end, there have been fewer independent measures to verify fisher reporting in the inshore sector. Nevertheless, this should improve with the scheduled rollout of electronic monitoring throughout the inshore fleet[13].

Most seafood products imported into Australia from New Zealand are likely to be sourced through relatively simple, straightforward supply chains. Much of the processing of species such as hoki occurs on board factory processing vessels. Traceability under the QMS is strong, with fish sold using the MSC logo subject to strong post-harvest traceability.

China

Imports from China accounted for 14.7% of the Fish (Generic) volume entering Australia during the 2018-2022 period. While the majority of volume was imported as either prepared/preserved product (1604190035 – 44%) or as frozen fillets (304890040 – 22%) (Table 1), product in this category was imported under 34 separate codes in total.

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[9] https://www.mpi.govt.nz/fishing-aquaculture/commercial-fishing/fisheries-change-programme/on-board-cameras-for-commercial-fishing-vessels/#timeline

[10] https://www.nzherald.co.nz/nz/shelton-harley-science-ensuring-healthy-stocks/AKXAWAYS4YHFLVFMSJZSYYADHM/; https://deepwatergroup.org/wp-content/uploads/2017/06/Tilney-et-al-2017-SAU-Catch-Reconstructions-of-Deepwater-Fisheries.pdf

[11] Note that one part of the orange roughy fishery – ORH3B East and South Chatham Rise – has recently 'self-suspended' from the MSC program, for reasons unrelated to compliance. (https://fisheries.msc.org/en/fisheries/new-zealand-orange-roughy/@@assessments)

[12] e.g. https://www.stuff.co.nz/business/122237611/sealord-fined-24000-and-ordered-to-forfeit-vessel-for-trawling-in-protected-zone

[13] https://www.mpi.govt.nz/fishing-aquaculture/commercial-fishing/fisheries-change-programme/on-board-cameras-for-commercial-fishing-vessels/

Given the generic nature of the reporting categories and the fact that China imports a considerable proportion of its exports from other countries (Asche et al, 2022), piecing together the likely species and source fisheries is difficult from existing information.

Nevertheless, given the demand for whitefish in Australia, the very high volume of whitefish processed in China (e.g. Asche et al, 2022) and the absence of significant domestic whitefish catch in China, it is likely a substantial proportion of imports under 1604190035 and 304890040 originated from major foreign whitefish fisheries including Pacific cod fisheries, Russian and US Alaskan Pollock fisheries, as well as other whitefish fisheries such as blue whiting and hoki. However, based on existing information source fisheries cannot be identified with confidence.

Between 2018 and 2022, BAC data indicated that importers also declared that shark fillets originating in Australia and the USA, and barramundi and tilapia originating in China were imported from China under 1604190035 and 304890040. BAC data indicated that the key species imported under 303890080 ('other fish – other') during 2018-2022 included pompano, pomfret, yellow croaker and whitebait. Source fisheries for these species are unclear, although the most probable source is Chinese domestic fisheries.

For pollock fisheries, Russia's pollock fisheries broadly operate in two areas – the Sea of Okhotsk (SOO) and the Bering Sea. Fisheries in both areas have been MSC certified, with vessels fishing under the respective Units of Certification accounting for most of Russia's Far East production (Payne et al, 2018; Seiben et al, 2022; Japp et al, 2021; Nelson et al, 2021). Each assessment has scored highly for the relevant compliance and enforcement PI with a comprehensive MCS system in place, sanctions to deal with non-compliance that are demonstrably effective, and no evidence of systemic non-compliance. Seiben et al (2022) note that "*Although Far Eastern Russian fisheries were known for high IUU levels in 1990s-2000s, the situation has improved in all fisheries in the region over the last two decades and previous MSC assessments of similar Russian fisheries (Payne et al., 2018; Lajus et al., 2019) have found no evidence of systematic non-compliance in these fisheries*".

In the US jurisdiction, pollock is harvested in the Bering Sea/Aleutian Islands and the Gulf of Alaska, with almost all commercial catch MSC-certified (Wilson et al, 2020). The fisheries passed the relevant compliance and enforcement PI unconditionally.

Similarly, products with raw materials sourced from other MSC-certified whitefish fisheries (e.g. New Zealand hoki, southern blue whiting, Pacific cod) and sold under the MSC logo are likely to be lower risk.

Nevertheless, while the MSC certified fisheries are relatively well-positioned, given the uncertainty around the composition of product imported under this category and the associated source fisheries, there is limited capacity to effectively examine IUU risk.

Vietnam

Products from Vietnam accounted for 13.3% of the volume imported under Fish (Generic) HTISCs during the 2018-2022 period. This category contains 20 HTISCs, although 71% of the volume was imported under 304890040 – Frozen fillets of fish (excl. fish of HS 03046 and 03047, Pacific salmon, Atlantic salmon, Danube salmon, trout, flat fish, swordfish, toothfish, herrings, tunas, skipjack or stripe-bellied bonito, dogfish and other sharks, rays and skates). A further 15% is imported under:

- 1604190035 (Prepared or preserved fish, whole or in pieces, but not minced; 8%); and
- 304990080 (Frozen fish meat, whether or not minced; 7%).

While the species imported under the main HTISC (304890040) are not defined, basa (*Pangasius spp*.) (also often referred to as 'Pacific dory' or 'dory') dominate finfish volumes exported from Vietnam to Australia[14] and it is likely that much of the volume imported into Australia under this code is aquaculture produced basa

[14] https://seafood.vasep.com.vn/why-buy-seafood/export-potentials/vietnams-seafood-exports-to-australia-after-4-years-of-implementing-the-cptpp-27755.html

(despite the existence of more species-specific codes – 304620012 and 304320061). According to BAC data, basa is also commonly imported under 304990080, and occasionally under 1604190035. Barramundi is also imported from Vietnam in high volumes under 304890040 and 304990080. Much of this barramundi will likely have been farmed in Vietnam, but we understand a small proportion may have originated from Taiwanese aquaculture.

BAC data also indicated that smaller volumes of whiting (originating in Australia), flathead (originating in Argentina), and snappers, threadfin bream, and sweetlip species (unknown origin) were also imported under 304890040 and 304990080 between 2018 and 2022. Whiting from Australia may have been sourced from a number of State/Commonwealth fisheries, while 'flathead' (*Percophis brasiliensis*) is mainly caught in trawl fisheries within the Argentinian EEZ.

Accurately examining IUU risk in the Vietnam Fish (Generic) category is very difficult without better information on the composition of products and source fisheries involved. Much of the product is likely to be farmed basa and barramundi, which are lower risk using the approach adopted here. Nevertheless, other products (e.g. those derived from Vietnam's domestic wild catch fisheries) may be higher risk.

Dang et al. (2017) report that Vietnam's wild catch fisheries suffer from a lack of government capacity and high levels of non-compliance. Although Vietnam has made considerable efforts to combat IUU fishing in recent years, the results have been insufficient to remove the yellow card imposed on it by the EU in 2017. The key issues that remain are reportedly limitations in law enforcement, continued violations by Vietnamese vessels fishing in foreign waters, removing or turning off VMS devices, and failures to complete fishing logbooks (Phong and Pomeroy, 2022).

We did not find any estimates of IUU in Argentinian trawl fisheries for flathead. However, the MSC pre-assessment for the Fishery Improvement Project (FIP) for Argentine flathead notes that while a strong MCS system is in place for the 'coastal mixed-species fishery' in which the species is harvested (including compulsory VMS, e-reporting of catch logs and monitoring of fish landings), there are uncertainties around the extent to which sanctions are applied to the fishery and a lack of observers and inspectors means the level of at sea compliance is not well known (Godelman et al, 2023).

Thailand

Products from Thailand accounted for 11.2% of the seafood volume imported under Fish (Generic) HTISCs during the 2018-2022 period. This category includes 17 HTISCs, although the majority is imported under:

- 1604200070 - Prepared or preserved fish (incl. minced fish) (46%); and
- 1604200066 - Prepared or preserved fish in the form of fishballs, fish cakes, fish sausages and the like (35%).

Products in these codes are processed fish, likely in the form of surimi, fish balls and fish cakes.

Leadbitter et al (2020) report that Thailand sources fish for surimi production both from within its own EEZ and internationally. They note that the main tropical species used include threadfin breams (*Nemipterus spp*), bigeye snappers (*Priacanthus spp*), goatfishes (e.g. *Upeneus spp*), croakers (e.g. *Johnius spp*, *Pennahania spp*), lizardfishes (*Saurida spp*), ribbon fishes (hairtails) (*Trichiurus spp*), sardines (various genera), barracudas (Sphyraenidae) and monocle breams (*Scolopsis spp* but possibly other genera). Source fisheries are unclear, although domestic demersal trawl fisheries for these species occur in both the Gulf of Thailand and Andaman Sea areas of the Thai EEZ.

Other reports indicate that the Thai surimi industry is a heavy user of Alaskan pollock[15], and a number of importers interviewed for this study noted that Alaskan pollock was commonly used in their surimi production.

FAO (2016a; in Wilcox et al, 2021) report that low(er) value fish destined for some form of processing accounted for the largest volume and total value of the estimated IUU catch in the Asia-Pacific Fisheries Commission (APFIC) region. This included trawl fisheries/purse seiners for surimi products. In an updated 2021 study, Wilcox et al (2021) estimated, based on interviews, that roughly 65% and 70% of small demersals/low value bycatch in the Bay of Bengal/Andaman Sea/Malacca Strait and Gulf of Thailand/South China Sea areas respectively involved some form of illegal landings.

Leadbitter et al (2020) report that "*Illegal fishing is rife throughout SE Asia and is being driven by a wide range of issues, not the least of which is overfishing, which is driving fleets to seek fish where ever they can. The border between Thailand and Myanmar was identified as one of the largest IUU hotspots … with the catches being dominated by fish destined for surimi, fishmeal, frozen block and some small pelagics. The main destination for the fish was Ranong, Thailand*".

Thailand was issued a 'yellow card' by the EU in 2015, which was subsequently lifted in 2019 following comprehensive reforms to the management system. Reforms included strengthening the fisheries legal framework, reform of vessel registration systems, introduction of VMS across the industrial fleet, implementation of the PSMA and strengthening of traceability systems[16]. Thailand is also an active participant in the Regional Plan of Action to Promote Responsible Fishing Practices including Combatting Illegal, Unreported, and Unregulated Fishing Practices in the Region (RPOA-IUU), which seeks to promote and coordinate efforts to combat IUU fishing across participating countries[17].

Given the uncertainties around source fisheries, the extent to which IUU fishing remains a risk in Fish (Generic) products entering the Australian supply chain from Thailand is uncertain.

Surimi products using raw materials from MSC-certified fisheries including Alaskan pollock are likely to be lower risk, while the available information indicates surimi products sourced from domestic trawl fisheries may be higher risk.

Taiwan

Imports from Taiwan accounted for 7.6% of the volume imported under Fish (Generic) HTISCs during the 2018-2022 period. This category includes 15 HTISCs, although the majority is imported under:

- 304890040 - Frozen fillets of fish (excl. fish of HS 03046 and 03047, Pacific salmon, Atlantic salmon, Danube salmon, trout, flat fish, swordfish, toothfish, herrings, tunas, skipjack or stripe-bellied bonito, dogfish and other sharks, rays and skates) (69%);
- 303890080 - Frozen fish (excluding fish of HS 03031, 03032, 03033, 03034, 03035, 03036 and 03038; fillets and other meat of HS 0304 and edible fish offal of HS 03039) (20%); and
- 1604200066 - Prepared or preserved fish in the form of fishballs, fish cakes, fish sausages and the like (excl. goods of Chapter 03) (6%).

According to BAC data and advice from the FBIA, the significant majority import volume under this category likely comprise aquaculture produced barramundi. Some reports indicate that > 85% of Taiwan's barramundi fillet production is exported to Australia[18].

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[15] https://www.seafoodsource.com/news/supply-trade/thai-surimi-firm-doubles-capacity-seeks-new-fish-suppliers; https://apps.fas.usda.gov/newgainapi/api/report/downloadreportbyfilename?filename=Seafood%20Report_Bangkok_Thailand_5-8-2018.pdf

[16] See for example, https://www4.fisheries.go.th/local/file_document/20220912132213_1_file.pdf

[17] https://www.rpoaiuu.org/

[18] e.g. https://www.tridge.com/insights/wholeround-barramundi-export-drops-29-in-2020

Farmed tilapia and milkfish are also likely imported under these codes, based on free text field information provided by BAC, albeit in lesser volumes than barramundi. Customs data also indicated that between 2018 and 2022, relatively small volumes of generic 'frozen fillets' (declared as Chinese origin), Greenland halibut and Pacific saury (both of Taiwanese origin) were imported under these commodity codes. Pacific saury is likely sourced from the north western Pacific waters, albeit catch location – EEZ or within the high seas area managed by the North Pacific Fishery Commission (NPFC) - is unclear. Source fisheries for halibut and generic frozen fish are difficult to determine, based on the available information.

Given the main Fish (Generic) products imported from Taiwan (barramundi, tilapia, milkfish) are farmed, they are lower risk for IUU according to the definition used in this study. Some species imported in smaller volumes (e.g. Pacific saury) may be at higher risk of IUU (e.g. Ridings et al, 2022).

Malaysia

Imports from Malaysia accounted for 6.7% of the volume imported under Fish (Generic) HTISCs during the 2018-2022 period. Seafood products were imported under 19 HTISCs, although the majority is imported under:

- 1604200070 - Prepared or preserved fish (incl. minced fish) (excl. whole fish or fish in pieces; fish balls, fish cakes, fish sausages and the like; and goods of Chapter 03) (51%);
- 1604200066 - Prepared or preserved fish in the form of fishballs, fish cakes, fish sausages and the like (excl. goods of Chapter 03) (22%); and
- 1604190035 - Prepared or preserved fish, whole or in pieces, but not minced (excl. salmon; herrings; sardines, sardinella and brisling or sprats; tunas, skipjack and bonito (Sarda spp.); mackerel; anchovies; eels; shark fins, and fish of Chapter 03) (15%).

Between 2018 and 2022, BAC data indicated that imports under 1604200070 and 1604200066 comprised mainly surimi and various generic fish commodities in processed form. Importer declarations provided less information on commodities imported under 1604190035, but those importers that did identify the species primarily reported barramundi and, in lesser volumes, flathead (likely Argentinian).

Various fishes processed into surimi are used to make Malaysian fish balls, crackers, fish cakes and the like (Kok et al., 2013; Leadbitter et al., 2020). The source fisheries for products imported into Australia are unclear, although Leadbitter et al (2020) report that raw materials for surimi production in Malaysia are primarily caught by domestic trawl fisheries operating within the Malaysian EEZ. The main species used include threadfin breams (*Nemipterus* spp), bigeye snappers (*Priacanthus* spp), goatfishes (e.g. *Upeneus* spp), croakers (e.g. *Johnius* spp, *Pennahania* spp), lizardfishes (*Saurida* spp), Ribbon fishes (hairtails) (*Trichiurus* spp), sardines (various genera), barracudas (Sphyraenidae) and monocle breams (*Scolopsis* spp but possibly other genera). As with Thai surimi production, it is also possible that pollock and other species are used for some products.

Illegal fishing has reportedly been a longstanding challenge for Malaysia (e.g., APEC, 2008; Nuruddin, 2013; BOBLME, 2015). The Malaysian Department of Fisheries is reported to have estimated that, at one point approximately 980,000 tonnes of the country's seafood worth between RM3 billion and RM6 billion was 'lost' each year as a result of illegal fishing activities[19]. Issues including violation of licence conditions, encroachment by local and foreign fishing vessels, unauthorized fishing, misreporting of catch and the use of destructive fishing gears and methods have been long documented (e.g., Department of Fisheries Malaysia, 2013), however recent evidence on the prevalence of IUU is limited.

While the Malaysian fisheries governance framework is reported to have improved significantly in relation to combating IUU over recent years[20], including through strengthening regional cooperation with other ASEAN

[19] https://www.malaymail.com/news/malaysia/2019/09/04/fisheries-dept-malaysia-loses-rm6b-a-year-to-illegal-fishing/1787016

[20] https://www.nst.com.my/news/nation/2017/11/300933/fisheries-department-doing-all-it-can-manage-protect-malaysias-maritime;

countries[21], illegal fishing reportedly continues to occur, partly due to limited enforcement capacity (Ghazali et al., 2022). The extent to which this affects products imported into Australia is unknown.

The complexity of the supply chain for relevant Australian imports from Malaysia is also unknown, although may be complex for products such as surimi if raw materials are sourced from large numbers of smaller domestic trawl vessels.

While visibility of source fisheries for surimi products imported into Australia from Malaysia is limited, the available evidence indicates that these products should precautionarily be considered higher risk, at least until better information on sourcing and IUU risk is available.

4.3.2 Tuna

Tuna products accounted for 17.1% of total seafood imports by volume in the 2018-2022 period. Around 84.3% of tuna products were exported from Thailand, with a further 12.5% exported from Indonesia (Table 2). The overwhelming majority of volume from both countries was imported under a single HTISC – 1604140025 (Fish, whole or in pieces, but not minced; Tunas, skipjack tuna and bonito (Sarda spp.); Packed in air-tight cans, bottles, jars or similar containers). In practice, this will overwhelmingly be canned tuna (or similar preparations – e.g. pouches) in various forms, principally skipjack tuna and to a lesser extent yellowfin tuna. The dominance of Thailand as the source location is not particularly surprising given Thailand's position as the largest canned tuna processing centre globally (Havice and Campling, 2018). The remaining 3.2% of import volume is exported from 36 different countries.

Table 2: Average proportion of tuna products imported into Australia between 2018-2022, by exporting country and main tariff codes. (Data source: ABS)

Country of origin/export	Contribution to total tuna import volume 2018-2022	Main tariff codes
Thailand	84.3%	1604140025 (canned tuna; >98%)
Indonesia	12.5%	1604140025 (canned tuna; 94%)

The large majority of the canned tuna exported to Australia from Thailand is likely to be sourced from the purse seine fishery operating in the Pacific Islands region of the Western and Central Pacific Ocean (WCPO), which is the world's largest skipjack/yellowfin fishery by volume (WCPFC, 2023). For example, the John West brand has around 35-40% of the canned tuna market share in Australia[22] and sources it's skipjack tuna (which accounts for the majority of its volume) exclusively from MSC-certified purse seine fisheries within the WCPO (through a traceability program – Pacifical – owned in part by Pacific Island countries)[23]. Coles private label tuna had around 22% market share in 2021 and is also sourced exclusively from purse seiners operating in the WCPO[24]. Other brands (e.g. SAFCOL) also call out the WCPO or FAO Area 71 (which encompasses the WCPO[25]) on pack.

Two major studies of IUU fishing in tuna fisheries in the Pacific Islands region have been undertaken – an original attempt to quantify the volume and value of IUU in the purse seine and longline sectors in 2016 (MRAG Asia Pacific, 2016) and an updated quantification in 2021 (MRAG Asia Pacific, 2021). Both studies confirmed that strong MCS arrangements are in place for the main industrial WCPO purse seine tuna fishery – including 100% observer coverage, compulsory vessel monitoring systems with frequent polling to monitor

[21] https://www.nst.com.my/news/2016/06/151269/fishing-trawlers-be-fitted-ais-system-settle-accusations-encroachment-video

[22] https://www.pacifical.com/wp-content/uploads/Oceania-March-2021-1.pdf

[23] https://johnwest.com.au/sustainability

[24] https://www.colesgroup.com.au/sustainability/?page=responsible-sourcing

[25] While FAO Areas are large and FAO 71 encompasses other tuna fisheries – e.g. the domestic fisheries of Indonesia, Philippines and Vietnam – our experience is that the tuna processed in Thailand for export to Australia tends to be sourced from industrial vessels operating in the Pacific Islands region. This was confirmed by well-placed sources in the tuna trading sector and processing sector in Thailand.

fishing effort under the Parties to the Nauru Agreement (PNA) Vessel Days Scheme (VDS), and a requirement to undertake all transhipment in port, which allows for independent monitoring – with estimates of unlicensed fishing extremely low. The main issue identified was misreporting of catch, which accounted for 89% of estimated 'IUU' in the 2021 study, although the study notes that the estimate should be considered in context given weights reported by both the vessel and observers (which were compared to estimate reporting accuracy) are estimates made at sea.

Much of the skipjack and yellowfin tuna harvested in the WCPO purse seine fishery will be taken by vessels listed under at least one of the 11 MSC certificates covering different groups of vessels in the fishery[26]. As part of the certification process, independent examinations of the effectiveness of the MCS system operating in various sectors of the WCPO purse seine fishery have been undertaken by multiple assessment teams. Of the 11 certificates currently operating in the WCPO, seven received unconditional passes against the relevant compliance and enforcement PI, while four received conditional passes. In one of the most recent re-certifications (the WPSTA Fishery; November, 2023) the assessment team concluded "*Overall, fishers comply with the management system, including providing necessary supporting information. The WCPFC has a comprehensive MCS system in place supported by at-sea compliance monitoring and very high levels of coverage by trained scientific observers. This is recognised as contributing to generally strong compliance outcomes and improving the quality of both catch and effort and ecosystem related data collection*" (SCS, 2023).

To that end, skipjack and yellowfin tuna sourced from the WCPO purse seine fishery operating within the Pacific Islands region should be considered lower risk.

Importantly, this assessment relies on the maintenance of strong traceability arrangements through the supply chain, including at Thai processing facilities servicing Australian imports, to prevent the mixing of fish from different sources. While traceability arrangements within individual supply chains were not able to be reviewed for this project, we note that Thailand has strengthened traceability systems for both domestic and foreign fishing vessels in recent years, including the introduction of new electronic traceability systems and requiring that all foreign fishing (and carrier) vessels entering Thai ports are subject to risk assessment, inspection and offloading monitoring by Thailand's Department of Fisheries as part of Thailand's implementation of the PSMA[27]. In addition, several of the larger Thai processing companies (e.g. Thai Union, Sea Value) are signatories to the World Economic Forum's Tuna 2020 Traceability Declaration[28], which commits to ensuring full traceability of all tuna products in their supply chains to the vessel and trip by 2020, and many/most of the main Thai tuna processing companies/facilities (e.g. Thai Union Group Public Company Ltd, Thai Union Manufacturing Co. Ltd, Unicord Public Company Ltd 1 and 2, I.S.A. Value Co. Ltd, Kingfisher Holdings Ltd) are also certified against the MSC's Chain of Custody standard to process skipjack and yellowfin tuna[29].

We also understand that some volume of pole and line (P&L) caught fish (particularly yellowfin) from the Maldives tuna fishery may be packed in Thailand and imported into Australia. The skipjack component of the Maldives P&L tuna fishery is MSC-certified[30]. The yellowfin component is not MSC-certified although this is likely to be primarily related to the state of the yellowfin stock in the Indian Ocean (which is assessed as both overfished and subject to overfishing[31]) rather than compliance.

The source fisheries for canned tuna products imported from Indonesia are slightly more uncertain, although a number of the main tuna brands identifying Indonesia as the exporting country also identify the product as

[26] Note, however, that even though vessels may be listed as eligible under an MSC certificate, much of the volume harvested may not end up being sold under the MSC logo for a variety of commercial reasons.

[27] e.g. http://www.seafdec.or.th/traceability/traceability-workshop-2022/presentations/Agenda_5_Thailand_Traceability.pdf; MRAG Asia Pacific (2023)

[28] https://www.weforum.org/agenda/2017/06/tuna-2020-traceability-declaration-stopping-illegal-tuna-from-coming-to-market/

[29] https://cert.msc.org/SupplierDirectory

[30] https://fisheries.msc.org/en/fisheries/maldives-pole-line-skipjack-tuna/@@assessments

[31] https://iotc.org/sites/default/files/content/Stock_status/2023/Yellowfin_ES_2023.pdf

being P&L caught, primarily from FAO Area 71 (WCPO) and 57 (Eastern Indian Ocean). It is not clear whether some product is also sourced from domestic Indonesian purse seine fisheries, and/or WCPO purse seine fisheries.

The most probable source fishery for the P&L product is likely to be the domestic P&L fishery for tuna in the Indonesian EEZ. One component of the Indonesian P&L fishery for skipjack and yellowfin tuna in archipelagic waters (FMAs 713, 714, 715 and 716) is MSC-certified[32]. Another is in a Fishery Improvement Project (FIP), which is reportedly making advanced progress[33]. The extent to which these fisheries encompass all P&L catch from Indonesian fisheries in FAO area 71 is not known. One Thai processing company representative interviewed for the study considered there was a 'greater chance' that line caught tuna from Indonesia would be taken from the Indian Ocean side of its EEZ.

The information available on the strength of MCS systems and IUU in Indonesian tuna fisheries is mixed. The assessment report for the MSC-certified P&L fishery concluded that, notwithstanding some uncertainties around FAD registration and weaknesses in some provincial MCS arrangements, an MCS system is in place for the fishery which has demonstrated an ability to enforce relevant management measures and no systematic non-compliance was evident (Dignan et al, 2021). The pre-assessment for the FIP also noted that, while there may be issues around FAD registration and potential landing of prohibited species, "*there is not expected to be systematic non-compliance*" (Hough, 2018). Nevertheless, several studies have concluded that IUU risks in Indonesia's EEZ are high relative to others (e.g. Petrossian, 2015, BOBLME, 2015) and the MMAF has previously estimated that IUU fishing losses in Indonesia were up to US$4 billion annually[34]. FAO (2016a, in Wilcox et al, 2021) identified two 'IUU hotspots' within the Indonesian EEZ involving activities such as fishing without a license or using a fake license, under-reporting and misreporting, including for tuna species. Moreover, surveys of fisheries officers undertaken by Wilcox et al (2021) indicate a perception that landings of skipjack and yellowfin tuna in the region encompassing Indonesia involve some degree of illegal activity (although the extent to which Australian supply chains would be exposed is not known).

Based on likely current sourcing arrangements, our overall assessment is that the significant majority of the tuna imported into Australia is likely to be lower risk for IUU, although smaller volumes will be sourced through supply chains for which source fishery and IUU risk are more uncertain.

4.3.3 Prawn

Prawn products accounted for 11.8% of total seafood imports by volume in the 2018-2022 period. Imports from Vietnam, Thailand and China collectively accounted for around 90% of prawn import volume, with an additional 6% imported from Malaysia (Table 3). Of the product sourced from Vietnam, 44% was imported under 'prepared' and 'preserved' HTISCs (1605210081 & 1605290090), with a further third imported as uncooked, frozen, farmed product (306170033). Of the product imported from Thailand, approximately half was imported under 'prepared' and 'preserved' HTISCs (1605210081 & 1605290090), while 41% was imported as cooked, frozen (306170029). This profile was broadly similar for product imported from China, with close to half being imported as 'prepared' and 'preserved' HTISCs (1605210081 & 1605290090) and a further 30% imported as cooked or uncooked frozen product (306170034 & 306170029).

[32] https://fisheries.msc.org/en/fisheries/indonesia-pole-and-line-and-handline-skipjack-and-yellowfin-tuna-of-western-and-central-pacific-archipelagic-waters/@@assessments

[33] https://fisheryprogress.org/fip-profile/indonesian-western-and-central-pacific-skipjack-tuna-pole-and-line

[34] https://www.reportingasean.net/illegal-fishing-costs-indonesia-3-billion-dollars-a-year/

Table 3: Average proportion of prawn products imported into Australia between 2018-2022, by exporting country and main tariff codes. (Data source: ABS)

Country of origin/export	Contribution to total prawn import volume 2018-2022	Main tariff codes
Vietnam	52%	1605210081 & 1605290090 (prepared/preserved; 44%), 306170033 (uncooked, frozen, farmed; 33%), 306170029 (cooked, frozen; 13%)
Thailand	22%	1605210081 & 1605290090 (prepared/ preserved; 49%), 306170029 (cooked, frozen; 41%).
China	16%	1605290090 & 1605210081 (prepared/preserved; 46%), 306170034 & 306170029 (cooked/uncooked, frozen; 30%), 306170033 (uncooked, frozen, farmed; 17%).
Malaysia	6%	306170033 (frozen, farmed; 62%), 306170029(cooked, frozen; 13%), 1605210081 (prepared /preserved; 10%).

In practice, the overwhelming majority of imports from these four countries are likely to be farmed prawns, principally vannamei (*Penaeus vannamei*) and to a lesser extent black tiger prawns (*P. monodon*). While public trade data between the countries provides little indication of production method, the fact that the overwhelming majority of imported prawns will be farmed was confirmed by each of the major importers interviewed (both in relation to their own supply chains, as well as generally). Relatively high volumes of imported prawns are supplied to both the retail and foodservice sectors, with farmed product favoured for price reasons, as well as better surety of production volumes.

While importers advised that some volume of wild caught product is imported – for example, some Australian wild caught prawns (e.g. 'soft and broken') are exported to Asia for processing and re-imported into Australia; some importers reported sourcing small volumes from the Argentinian Patagonian red shrimp fishery and domestic south east Asian trawl fisheries - they each noted that volumes would be very minor in comparison to farmed product.

On that basis, our overall assessment is that imported prawn are likely to be lower risk for IUU using the definition applied here, although some very small volumes may come from higher risk sources.

4.3.4 Squid

Squid (and cuttlefish) products accounted for 7.6% of total seafood imports by volume in the 2018-2022 period. Close to three quarters of the squid was exported from China, with virtually all product imported under two HTISCs (307430019 – frozen cuttlefish and squid; 1605540049 – prepared and preserved cuttlefish and squid) (Table 4). Although both codes include cuttlefish, importers confirmed that volumes of this product will be negligible in comparison to squid. Of the other exporting countries, Malaysia, Thailand and New Zealand accounted for 8%, 6% and 4% respectively of imports by volume during the same period.

Table 4: Average proportion of squid products imported into Australia between 2018-2022, by exporting country and main tariff codes. (Data source: ABS)

Country of origin/export	Contribution to total squid import volume 2018-2022	Main tariff codes
China	73%	307430019 (frozen; 76%), 1605540049 (prepared/preserved; 23%).
Malaysia	8%	1605540049 (prepared/preserved 93%), 307430019 (frozen; 6%).
Thailand	6%	307430019 (frozen; 84%), 1605540049 (prepared/preserved; 9%), 307490040 (fresh/chilled/live; 7%).
New Zealand	4%	1605540049 (prepared/preserved; 93%), 307490040 (fresh/chilled/live; 7%).

China is a major processing centre for squid fisheries internationally, often as part of complex supply chains (e.g. Ospina-Alvarez et al, 2022). While some raw material will come from domestic squid fisheries within its own EEZ (e.g. trawl fisheries for Japanese flying squid, *Todarodes pacificus*, and neon flying squid, *Ommastrephes bartramii*), a substantial proportion will come from China's distant water fishing fleets operating in different ocean basins (e.g. from the Chinese jigging fleet operating on the high seas of the South Pacific Regional Fisheries Management Organisation [SPRFMO] area targeting jumbo flying squid, *Dosidicus gigas*, the high seas jigging fleet targeting Argentine shortfin squid, *Illex argentinus,* in the south west Atlantic, or the more recently developed jigging/trawl fleet targeting purpleback flying squid, *Sthenoteuthis oualaniensis*, on the high seas of the NW Indian Ocean; see, for example, Seto et al [2023]) or from domestic fisheries of other countries. Asche et al (2022) estimated that 74.9% of China's seafood imports were re-exported, with around 10% of overall cuttlefish/squid sector production imported, mainly from Peru (26.3%), Indonesia (20.4%) and USA (6.9%). Chinese squid processing companies contacted for the study confirmed they regularly sourced squid raw material from domestic foreign fisheries including the Peruvian jumbo squid fishery for processing and export to third counties including Australia (although the main source for most species was likely to be the Chinese fleet).

While the source fisheries for squid imported from China are obscured by the relatively generic nature of HTISCs and the fact the China imports and re-exports substantial volumes of squid, importers interviewed for the study advised that the majority of squid being imported is likely to be jumbo flying squid ('gigas'), with smaller volumes of neon flying squid ('bartrami'), Japanese flying squid ('pacificus') and arrow squid. Some companies indicated they had previously sourced Argentine shortfin squid ('Illex'), but less so recently. Chinese squid processing companies also advised that some volume of purpleback flying squid is imported. Most Australian importers made the point that squid sourcing was heavily influenced by catching conditions and therefore price and availability fluctuations in global markets.

The jumbo flying squid fishery in the south east Pacific has developed rapidly over the past two decades and now sits as the world's largest invertebrate fishery by volume (FAO, 2022). Catches are dominated by the Chinese jigging fleet operating in the high seas and the Peruvian domestic jigging fleet operating in Peru's EEZ, with smaller volumes taken by the Chilean domestic jigging fleet and the Taiwanese and Korean high seas jigging fleets and Ecuador domestic fleet (SPRFMO, 2023). Importers interviewed for the study indicated the main source fisheries for Australian imports of 'gigas' were the Chinese high seas jigging fleet and the Peruvian domestic jigging fleet.

Both 'bartrami' and 'pacificus' squid are primarily harvested by a range of fleets across a geopolitically complex area in the north western Pacific Ocean. Both species are harvested by domestic fleets in China, Japan, Russia, South Korea, North Korea, and also on the high seas in the area of the NPFC. Chinese squid companies contacted for the study indicated they thought the main source of bartrami was likely to be the Chinese jig fleet in the NPFC area, as well as the Japanese and South Korean fleets operating both in their own EEZ and the NPFC area. For pacificus squid, Chinese suppliers indicated that the supply to the Australian market may come from the Chinese jig fleet in the NPFC area, as well as Japanese, South Korean and Taiwanese jiggers operating in the NPFC area, from the South Korean fleet operating in the own EEZ (mainly jig, but some other gear types) and Japanese and Taiwanese jiggers operating in the Japanese EEZ. Raw material from non-Chinese vessels was particularly sought for pacificus because the Chinese fleet catch on the high seas was unable to meet demand.

A number of importers noted that 'cheaper' sources of squid from this area are available, with the implication being the squid may be harvested outside of formal management frameworks.

The source fisheries for squid imported from Malaysia and Thailand are uncertain. At least one company importing from Malaysia indicated their main source of squid was jumbo flying squid from the Chinese high seas fleet in the SPRFMO area, with some product also sourced from the Peru fleet. The extent to which squid from domestic Malaysian and Thai fisheries (or other south east Asian countries) is used is unknown. In practice, the substantial majority (if not all) squid imported from New Zealand is likely to be arrow squid (*Nototodarus gouldi/sloanii*) harvested by the domestic SQU1T and 6T fisheries (Fisheries New Zealand, 2023a).

A number of studies have been undertaken attempting to examine/estimate IUU fishing in relevant squid fisheries, some of which occur in high seas areas without a relevant RFMO (e.g. south west Atlantic, north west Indian Ocean). For example, Seto et al (2023) conclude the vast majority of Chinese (light-luring) squid fishing effort occurs in 'unregulated' high seas fisheries, defined broadly as areas of the high seas with no RFMO, or where the competent RFMO has not adopted a regulation specifically pertaining to squid stocks. They note that while unregulated fishing is often not technically illegal, catch often goes unreported (or at least is not shared with other interested parties) and there are often links between unregulated fishing vessels and other illegal activities.

Park et al (2020) estimated that >900 vessels of Chinese origin in 2017 and >700 in 2018 fished illegally in North Korean waters, catching an estimated amount of Japanese flying squid approximating that of Japan and South Korea combined (>164,000 metric tons worth >$440 million).

Several other independent analyses have attempted to highlight discrepancies in reporting and vessel identities in specific squid fisheries (e.g. Stop Illegal Fishing, Trygg Mat Tracking and NFDS, 2017; Global Fishing Watch, 2021; C4ADS, 2022). Moreover, Welch et al (2022) identify areas of high Chinese squid jig vessel activity as 'hot spots' for intentional disabling of AIS transponders (e.g. SW Atlantic, adjacent to Peru EEZ) and Montecalvo et al (2023) highlight suspected illegal fishing in South American EEZs.

China has moved to strengthen its management and control of its distant water fishing fleet over time with improvements including the introduction of mandatory VMS (2011), the establishment of a 'blacklist' for people and companies involved in IUU activities (2017), a reduction in government subsidies for companies involved in IUU activity, improvements in reporting (including a rollout of e-reporting) and training on international fisheries laws for skippers and crew (e.g. Shen and Huang, 2021). More recently, it has also sought to cap the number of vessels in squid fisheries across different ocean basins. There is some evidence that fishing patterns have changed for some fleets indicating 'lower risk' behaviour (e.g. AIS analysis indicates Chinese flagged squid jig vessels operating on the high seas of the SPRFMO area have recently operated under self-imposed buffer zones around the Ecuador [Galapagos] and Peru EEZs, where there has been historical concern about border incursions) (Global Fishing Watch, 2021).

Nevertheless, we understand the mechanisms to independently validate fishing activity at sea remain limited (e.g. limited observer/EM coverage) and while we understand all Chinese carrier vessels carry observers, it is not known whether data collected are actively used for compliance purposes. Moreover, many vessels in the Chinese high seas squid fleet remain at sea for long periods (up to 2 years), transhipping their catch, making effective monitoring and inspection difficult.

In the NPFC area, an independent review of the performance of the Commission in 2022 dedicated considerable time to IUU, noting that "*IUU fishing is an acknowledged issue in the NPFC Convention Area, with particular concerns over the number of vessels that hide their identification and registry, effectively operate without a flag, yet appear to land or tranship their catch in the region*" (Ridings et al, 2022). Overall, the Review Team observed that "*the problem of IUU fishing in NPFC appears to be significant*" and invited the "*Commission to consider all possible measures and tools to cooperate to address the acute problem of stateless vessels found operating in the Convention Area, as such IUU activities continuously undermine the effectiveness of CMMs and the efforts to achieve the objective of the Convention*". Moreover, a conservation and management measure adopted by the Commission in 2023 covering Japanese flying squid and neon flying squid also agreed that "*Members of the Commission and CNCPs shall cooperate to take necessary measures including sharing information, in order to accurately understand the situation and eliminate IUU fishing …*" (CMM2023-11)[35].

Although now dated, BOBLME (2015) reviewed IUU risks in the Malaysian EEZ, reporting that "*unlicensed fishing is acknowledged as a major issue in Malaysia*", while also concluding the risk of other offences including misreporting, use of prohibited and destructive gears and transhipment, landing and trade of IUU

[35] https://www.npfc.int/system/files/2023-07/CMM%202023-11%20For%20Japanese%20Sardine%2C%20Neon%20Flying%20Squid%20and%20Japanese%20Flying%20Squid.pdf

products both domestically and abroad was high. According to the Malaysian Department of Fisheries, approximately 980,000 tonnes of the country's seafood worth between RM3 billion and RM6 billion was 'lost' each year as a result of illegal fishing activities[36]. The extent of compliance in squid fisheries is not known.

BOBLME (2015) reported extensive IUU in Thailand's fisheries prior to the introduction of fisheries reforms since 2015, however there have been no specific estimates made since that time. Thailand was issued a 'yellow card' by the EU in 2015, which was subsequently lifted in 2019 following comprehensive reforms to the management system[37]. Given the reported improvements in Thai fisheries governance, the extent to which IUU fishing remains a risk in source fisheries for products entering the Australian supply chain is uncertain.

Overall, given the weaknesses in MCS arrangements for many of the main source fisheries as well as the uncertain nature of sourcing and complexity of the supply chain, our assessment is that the squid category is likely to be higher risk for IUU fishing, albeit may include some sources (e.g. NZ arrow squid) that are lower risk.

4.3.5 Salmon

Salmon products made up 4.9% of total seafood imports by volume in the 2018-2022 period. Salmon imported from Norway, the USA, Denmark and Thailand collectively accounted for 83% of imports by volume, with imports from Poland accounting for a further 7% (Table 5). Imports from a further 23 countries accounted for the remaining 10% of import volume. Imports from the European nations were largely imported as either frozen fillets (304810030) or smoked product (305410051). Imports from the USA and Thailand were almost exclusively imported as prepared/preserved product (1604110050).

Table 5: Average proportion of salmon products imported into Australia between 2018-2022, by exporting country and main tariff codes. (Data source: ABS)

Country of origin/export	Contribution to total salmon import volume 2018-2022	Main tariff codes
Norway	26%	304810030 (frozen fillets; 76%), 305410051 (smoked; 20%).
United States of America	21%	1604110050 (prepared/preserved; 95%).
Denmark	18%	305410051 (smoked; 84%); 304810030 (frozen fillets; 14%), 1604110050 (prepared/ preserved; 3%).
Thailand	18%	1604110050 (prepared/preserved; 100%).
Poland	8%	304810030 (frozen fillets; 44%), 1604110050 (prepared/ preserved; 37%), 305410051 (smoked; 19%).

In practice, salmon imported into Australia can broadly be broken down into two principal sources. Salmon imported from Norway, Denmark and Poland will primarily be Atlantic salmon (*Salmo salar*) (and to a lesser extent rainbow trout, *Oncorhynchus mykiss*) farmed in Europe. Interviews with importers indicated that much of the Atlantic salmon used in their supply chains is farmed in Norway, although given the volumes from Denmark, and the fact that Denmark is also a major producer of farmed salmon and trout, it seems likely some Australian imported product is also farmed in Denmark. Poland is one of the largest re-exporters of salmon in the world, thanks to its large fish processing sector. In 2019, Polish domestic salmon production amounted to 2.4t, while salmon imports in the same year were 168,000t (Svanidze et al., 2022). Much of the salmon imported into Poland for processing originates from Norway, which accounted for 77% of salmon imports in 2018 (Svanidze et al., 2022).

[36] Fisheries Dept: Malaysia loses RM6b a year to illegal fishing | Malay Mail

[37] See for example, https://www4.fisheries.go.th/local/file_document/20220912132213_1_file.pdf

Norway is the world's largest producer of Aquaculture Stewardship Council (ASC) certified farmed salmon (Vormedal and Gulbrandsen, 2020), with much of the product sold through ASC certified chains of custody that are regularly audited to ensure identification, segregation, and traceability of product at every stage. Salmon feed in ASC farms must be traceable back to the source fishery and comply with ASC requirements on the responsible sourcing of feed.

Salmon imported from the USA and Thailand will principally be canned and will be dominated by Pacific salmon (pink salmon, *Oncorhynchus gorbuscha*, red salmon, *Oncorhynchus nerka*) originating from the MSC-certified Alaskan salmon fishery, and to a lesser extent other sources (e.g. Russian wild catch Pacific salmon fisheries, many of which are MSC-certified). Products originating from the USA often refer to 'Alaskan' product on pack and are frequently, although not always, sold under the MSC logo. Products canned in Thailand also frequently identify Alaskan fisheries as the source of raw material, with some sold under the MSC logo. One interviewee indicated that very little, if any, Russian-sourced salmon would be imported into Australia since the commencement of the war in Ukraine.

The MSC certification of the Alaskan salmon fishery effectively covers all catch for five main species (pink salmon, red salmon, chum salmon, *Oncorhynchus keta*, coho/silver salmon, *Oncorhynchus kisutch* and chinook salmon, *Oncorhynchus tshawytscha*), and has been in place since 2000. A comprehensive MCS system has been implemented in the fishery and non-compliance with fishery and hatchery management regulations is rare in Alaska salmon fisheries (Stern-Pirlot et al, 2020). The most recent MSC assessment for the fishery scored all guideposts in the compliance and enforcement PI at the highest possible level, concluding that "*There is a high degree of confidence that fishers comply with the management system under assessment*" and that "*the Alaska fishery is monitored for compliance by ADF&G staff and State Troopers. Commercial harvests, including retained non-salmonids, must be documented on fish tickets. Fishermen may occasionally fail to abide by regulations but there are strong incentives that prevent this behaviour from becoming systematic or wide-spread. Violations are effectively addressed. There is no evidence of systemic non-compliance*" (Stern-Pirlot et al., 2020). Product sold under the MSC logo must travel through a CoC that is independently audited to ensure identification, segregation and traceability at each stage of the CoC.

The compliance situation around any Russian sourced salmon is likely to be more complex, with a patchwork of MSC-certified and uncertified catchments/fisheries in the Russian far east. Beamesderfer and Lajus (2023) report that "*illegal fishing has long been a serious problem for salmon in Kamchatka (Clarke 2007; Clarke et al. 2009; Dronova and Spiridonov 2008)*". Illegal activity primarily consisted of industrial poaching (i.e. exceeding quotas from fishing companies) and criminal poaching (i.e. organised illegal fishing on an industrial scale). Industrial poaching focused on both fish and roe, whereas criminal poaching focused largely on roe. Large scale illegal harvesting became worse after the dissolution of the USSR in 1988 and in 2002-2006, illegal harvests were estimated to equal or exceed legal harvests (Beamesderfer and Lajus, 2023). Since then, reforms to fisheries management and increased commitment to enforcement from State agencies and individual fishing companies have reportedly reduced the scale of illegal harvests. In particular, a move away from ITQs (under which companies had an incentive to misreport or underreport catch) to 'Olympic' catch arrangements (where companies have an incentive to report all catch as a basis for receiving fishing allocations in future years) is credited with reducing illegal harvests. While illegal harvests are estimated to have reduced since 2009, Beamesderfer and Lajus (2023) report that "*Criminal and common illegal harvest continues at a chronic background level. Illegal harvest in the traditional sector has increased. However, there is a net decrease in total illegal harvest due to the decrease in the commercial sector*". On that basis, they noted that "*the occurrence of illegal fishing in the Russian Far East suggests a need for robust chain of custody to mitigate the risk of product from a non-certified source entering the supply chain*". To that end, Russian salmon harvested under an MSC certificate and travelling through MSC-certified chain of custody are likely to be lower risk for IUU, while uncertified Russian salmon is likely to be higher risk.

Accordingly, given that most salmon imported into Australia is likely to be ether farmed or sourced from an MSC-certified wild catch fishery, our overall assessment is that salmon is likely to be lower risk for IUU. Nevertheless, some sources (e.g. uncertified Russian salmon) may be higher risk.

4.3.6 Catfish

Catfish products made up 2.8% of total seafood imports by volume in the 2018-2022 period. Around 98% was exported from Vietnam, with eight other countries accounting for the remaining imports (Table 6). Virtually all product from Vietnam was imported as fillets, primarily frozen (304620012 - Frozen fillets of catfish (*Pangasius* spp., *Silurus* spp., *Clarias* spp., *Ictalurus* spp.).

Table 6: Average proportion of catfish products imported into Australia between 2018-2022, by exporting country and main tariff codes. (Data source: ABS)

Country of origin/export	Contribution to total catfish import volume 2018-2022	Main tariff codes
Vietnam	98.4%	304620012 (frozen fillets; 88%), 304320061 (fresh/chilled fillets; 8.4%).

Both importers and BAC data confirmed that catfish imported from Vietnam will almost exclusively be 'basa' (*Pangasius spp*.), which is a farmed whitefish product widely used in both retail and foodservice applications.

Given the farmed nature of the product, this category is likely to be lower risk for IUU based on the definition applied in this study.

4.3.7 Sardine

Sardine products made up 2.4% of total seafood imports by volume in the 2018-2022 period, with sourcing amongst the most varied of all seafood commodities. Imports from Thailand, Poland and Vietnam collectively accounted for 61% of total volume, although the remaining 39% was split across an additional 42 countries. The vast majority of product (~85.4%), irrespective of source country, was imported under a single HTISC (1604130052 - prepared or preserved fish, whole or in pieces, but not minced - sardines, sardinella and brisling or sprats).

Table 7: Average proportion of sardine products imported into Australia between 2018-2022, by exporting country and main tariff codes. (Data source: ABS)

Country of origin/export	Contribution to total sardine import volume 2018-2022	Main tariff codes
Thailand	24%	1604130052 (prepared/ preserved; 100%)
Poland	20%	
Vietnam	17%	1604130052 (prepared/ preserved; 94%), 303530055 (frozen; 6%)

In practice, the 'sardine' group (Family Clupeidae) comprises a very large and diverse range of species harvested across a wide variety of fisheries and geographies internationally (Birge et al, 2021; Hilborn et al, 2022). Birge et al (2021) note that marine clupeiformes are found in every ocean except the Southern Ocean, while freshwater clupeiformes are found on every continent except Antarctica.

The source of raw material for the sardine products imported from Thailand and Vietnam is not clear from the information available to us. Both centres act as low cost processing hubs, handling raw material sourced from a range of locations internationally. For example, Thai Union, Thailand's largest fish processor, reports sourcing a number of different sardine species from fisheries across Europe, North Africa and North America, including several MSC-certified fisheries[38] (although the extent to which these are imported into Australia is unknown). Another supplier to one canned sardine brand found in an Australian supermarket and listing its product as being packed in Vietnam indicates that it uses 'Sardinella sp.' from the 'tropical Pacific Ocean' as its

[38] https://www.thaiunion.com/files/download/sustainability/policy/sourcing-transparency.pdf

source of sardines[39]. In the tropical Pacific, Sardinella spp. are harvested across a range of coastal fisheries including in Vietnam (Noorul-Azliana et al, 2019; Hunnam, 2021). The Vietnam Association of Seafood Exporters and Producers (VASEP) report that Australia was Vietnam's 5th largest export market for domestically produced 'herring', with domestic catches readily available[40]. Another product which accounted for a significant proportion of the imported product packed in Thailand during the 2018-2022 period (but may no longer be produced) identified on pack that they used "*Sardinella longiceps, Sardinella gibbosa wild caught in Pacific or Indian Ocean*". *Sardinella longiceps,* or 'Indian Oil Sardine', and is typically found in Indian coastal waters and the eastern part of the Arabian Peninsula[41]. To that end, the raw material is likely to be sourced from important domestic fisheries in India (or nearby countries). *Sardinella gibbosa* is widely distributed throughout coastal waters of the Indo-west Pacific region[42], supporting significant domestic fisheries in a number of countries, including Thailand (SEAFDEC, 2022). To that end, likely source fisheries remain difficult to identify without additional information. Other canned sardine brands advertised for sale in Australia offer little indication of species and source fishery (many simply list 'sardines').

Accordingly, it is possible that sardines imported into Australia from Thailand and Vietnam are sourced from a number of different fisheries ranging from temperate northern hemisphere fisheries to tropical domestic fisheries.

Although now dated, BOBLME (2015) estimated risks of unlicensed fishing and underreporting catch as high in both inshore and offshore sectors of the Vietnamese fleet. Overall, they reported "*based on the reported FAO catch data the total illegal and unreported catches represent on average between 501,103 and 1,377,792 t per annum (i.e. 32.98% and 90.69%). Illegal catches contribute an estimated 23-71% and unreported catches 10-20% in addition to the reported catch*". The contribution of small pelagic fisheries to these figures is not known, as is the extent to which they reflect the current situation. As described above, although Vietnam has made considerable efforts to combat IUU fishing in recent years, the results have not yet been sufficient to remove the yellow card imposed on it by the EU.

While Thailand has made significant progress in combating IUU since a yellow card was raised against it in 2015 by the EU (e.g. Naiki and Rakpong, 2022) (later lifted in 2019[43]), recent information on compliance and MCS measures in the fleet catching sardines could not be found. Similarly, high rates of IUU fishing have historically been estimated in India's EEZ (e.g. Pramod, 2010; BOBLME, 2015), but limited specific information is available on the current situation in domestic Sardinella fisheries. Nevertheless, Peacock (2018) identified a number of gaps in the MCS framework for the Indian oil sardine fishery off the states of Maharastra and Goa, and the Indian National Policy on Marine Fisheries (2017) acknowledges that "*existing mechanisms in place for a sound and effective MCS regime for marine fisheries sector need further strengthening*"[44].

Of the products imported from Poland, it is likely that much of the import volume will be European sprats (*Sprattus sprattus*) (also often referred to as 'brisling sardines') and herring (*Clupea harengus*), sold in Australia as 'sardines' (small individuals) or 'kippers' (larger individuals) by a number of brands. A number of the products sourced from Poland are sold using the MSC logo. A search of the MSC's supplier database based on Chain of Custody certificate code included on pack for one major Australian brand indicated the Polish suppliers' MSC scope included both European sprat and herring, but no other 'sardine' species. To that end, sprat are likely to be sourced from one of a number of MSC-certified fisheries in the north Atlantic/Baltic, while herring may come from any one of nine MSC-certified fisheries in the north Atlantic including several in the Baltic Sea adjacent to Poland. While the MSC-certification for the Poland sprat fishery is currently suspended (for reasons other than compliance), the assessment report scored the relevant compliance and enforcement PI the highest possible score noting that "*the (MCS) system is comprehensive and has demonstrated a*

[39] https://www.patayafood.com/en/sardine_mackerel.php

[40] https://seafood.vasep.com.vn/key-seafood-sectors/other-marine-products/news/vietnam-earns-40-million-usd-from-herring-exports-annually-24209.html

[41] https://www.fishbase.se/summary/Sardinella-longiceps.html

[42] https://www.fishbase.se/summary/Sardinella-gibbosa.html

[43] https://ec.europa.eu/commission/presscorner/detail/en/IP_19_61

[44] https://faolex.fao.org/docs/pdf/ind177473.pdf

consistent ability to enforce relevant management measures" and "*there is no evidence of systematic non-compliance*" (Donnelly et al, 2021).

North Atlantic/Baltic herring and sprat fisheries have long had challenges with misreporting of catches, both in terms of total catch quantities and species composition (ICES, 2013; Hentati-Sundberg et al. 2014). Nevertheless, as prescribed in 2016 by the Article 13 of the Baltic Multiannual Plan Regulation 2016/1139, a margin of tolerance for misreporting of 10% of the total catch is permitted in the Baltic. While species composition misreporting is reportedly an ongoing issue for herring and sprat catches (Fishsec, 2019; EU, 2022; Lassen et al., 2022), as long as total landings/ logbook catch is within tolerance, this is not illegal under EU law (Lloyd's Register, 2020).

Other countries which accounted for >2% of total sardine imports to Australia, 2018-2023, include Japan, the United Kingdom, the Philippines and Latvia.

Overall, given the likely diversity of sources of raw material for Australia's 'sardine' imports, IUU risk is likely to be complex and variable. Some sources (e.g. MSC-certified fisheries, with strong MCS arrangements) are lower risk, while others are likely be higher risk, or at best uncertain. On the basis that a substantial proportion of product is imported from countries for which source fisheries for raw materials is currently uncertain, with the possibility of being sourced from some higher risk sources, we have precautionarily rated sardines higher risk.

4.3.8 Hake

Hake are a 'whitefish' species, used in both retail and foodservice applications. Hake products accounted for 1.7% of imports into Australia by volume during the 2018-2022 period. Imports from New Zealand, Namibia and South Africa collectively accounted for 95% of all volume, with virtually all product imported under a single HTISC (304740023 - frozen fillets of hake) (Table 8). A further eight countries accounted for the remaining 6% of import volume.

Table 8: Average proportion of hake products imported into Australia between 2018-2022, by exporting country and main tariff codes. (Data source: ABS)

Country of origin/export	Contribution to total sardine import volume 2018-2022	Main tariff codes
New Zealand	37%	304740023 (frozen fillets of hake; >99%)
Namibia	32%	
South Africa	26%	

Imports from New Zealand are likely to be southern hake (*Merluccius australis*), sourced from the MSC-certified hake trawl fishery in quota management areas HAK 1, HAK 4 and HAK 7. Collectively, these QMAs account for all New Zealand hake catch (Fisheries New Zealand, 2023a). The most recent full MSC assessment report for the fishery scored the relevant compliance and enforcement PI the highest possible score, noting that "*the New Zealand deep-water management system has a documented, comprehensive and effective monitoring, control and surveillance system…*" (O'Boyle et al, 2018). While area misreporting, under-reporting and discarding have been known to occur in the past (Fisheries New Zealand, 2023a), there has been no recent concerns and, O'Boyle et al (2018) report that "*there have been no major non-compliances since the fishery has been MSC certified*".

Imports from Namibia and South Africa are also likely to be from their respective domestic MSC-certified fisheries for cape hakes (*Merluccius capensis, M. paradoxus*). In the Namibian hake fishery, catch is taken using both trawl and longline gear and all catch within the fishery is MSC-certified (Jones et al, 2020). The most recent assessment report notes that "*there is an established and effective Monitoring, Control and Surveillance (MCS) system and evidence that they are effective at a national level. The fishery has two main ports, with land-based monitoring of all landings, sea-based monitoring using patrol boats (ad hoc), 100 %*

observer coverage on the trawl fleet (partial coverage on longline), VMS on all vessels. Catches, landings and observers report on fishery performance (MCS) and contraventions are prosecuted". The longline sector of the fishery received an unconditional pass against the compliance and enforcement PI, although for the trawl sector Jones et al (2020) report that "*trawlers are required to deploy specified tori lines and to avoid discharging offal while setting and hauling gear. … there is a problem with the compliance and effective implementation of these bird mitigation measures by the trawl fleet, which is systematic (and related to how they have been defined) but reduces drastically their effectiveness*". The most recent surveillance report for the fishery indicated progress was on track to address a condition requiring the fishery to demonstrate no evidence of systematic non-compliance in the use of seabird bycatch mitigation measures (Jones et al, 2023).

In South Africa, Andrews et al (2021) report that "*the hake TAC is split between different fishing sectors according to a predetermined allocation key (DAFF, 2016a). A proportion of the hake TAC is set aside as a by-catch reserve in the horse mackerel-directed midwater trawl fishery, and the remaining direct catch of hake is allocated to the handline fishery (1.8433%), longline fishery (6.5510%), inshore trawl fishery (6.1790%) and the offshore trawl fishery (83.9268%). A further 1.500% is allocated to small scale subsistence fishers*". The MSC certification covers the inshore and offshore trawl sectors. The most recent assessment report for the fishery noted that "*The hake sector is one of the 4 compliance priorities in South Africa. Annual enforcement inspection targets are set for the deep-sea and inshore trawl fisheries. Annual surveillance audits of the fishery have found that these annual targets have consistently met; and this was reconfirmed at the site visit. As well as remote surveillance and monitoring at sea, DFFE inspect landings and audit the catch, landings and processing records for the fishery to ensure compliance with effort (TAC) controls. Mobile scanners are used to inspect the contents of frozen containers. During the recent years, DFFE enforcement activity directed at the hake fishery has detected only minor offences (mainly administrative errors). The vessels were fined for these transgressions*".

Given the overwhelming majority of hake imports are likely to be sourced from MSC-certified stocks with strong compliance systems and straightforward traceability (e.g. Jones et al, 2020), overall IUU risk is likely to be lower.

4.3.9 Mussels

Mussel products accounted for 1.2% of seafood imported into Australia by volume during the 2018-2022 period. The substantial majority (70%) of mussel products were imported from New Zealand (Table 9), with the remaining 30% imported from 17 additional countries. Mussels from New Zealand were primarily imported as frozen or dried/salted/in brine (307320017, 307390038).

Table 9: Average proportion of mussel products imported into Australia between 2018-2022, by exporting country and main tariff codes. (Data source: ABS)

Country of origin/export	Contribution to total sardine import volume 2018-2022	Main tariff codes
New Zealand	70%	307320017 (frozen; 43%), 307390038 (dried/salted/in brine; 30%), 1605530043 (prepared/ preserved; 14%), 307310016 (live/ fresh/chilled; 13%).

Mussels from New Zealand are likely to be green lipped mussels (*Perna canaliculus*) (also called green shell mussels). Mussels are farmed, although most (65%[45]) originate from wild spat harvested from beachcast material sporadically arriving at Ninety Mile Beach in the north of the country (Jeffs et al., 2018).

[45] https://www.mpi.govt.nz/dmsdocument/29702-Review-of-Sustainability-Measures-for-2018-part07-Green-lipped-mussel-GLM-9; https://niwa.co.nz/aquaculture/aquaculture-species/greenshell-mussel

While Fisheries New Zealand (2023a) report that current levels of illegal harvest are not known, given the farmed nature of the product and harvest of wild spat is regulated under NZ's Quota Management System and MCS regime, overall IUU risk appears low.

Mussels imported from other countries are also likely to be farmed, albeit potentially with some wild spat collection.

4.3.10 Other (non-edible)

Seafood imported under the 'other' HTISC category listed in Figure 2 have not been considered here in detail, but >99.9% were imported from various locations under a two 'non-edible' HTISCs:

- 2301200031 - Flours, meals and pellets, of fish or of crustaceans, molluscs or other aquatic invertebrates, unfit for human consumption (56%); and
- 511910020 - Products of fish, crustaceans, molluscs or other aquatic invertebrates, not elsewhere specified, unfit for human consumption (44%) (Table 10).

Table 10: Average proportion of 'other' products imported into Australia between 2018-2022, by exporting country and main tariff codes. (Data source: ABS)

Country of origin/export	Contribution to total 'other (non-edible)' import volume 2018-2022	Main tariff codes
China	19%	511910020 (Products of fish, crustaceans, molluscs or other aquatic invertebrates, not elsewhere specified, unfit for human consumption; >99%).
Peru	16%	2301200031 (Flours, meals and pellets, of fish or of crustaceans, molluscs or other aquatic invertebrates, unfit for human consumption; 100%).
American Samoa	10%	
United States of America	10%	511910020 (Products of fish, crustaceans, molluscs or other aquatic invertebrates, not elsewhere specified, unfit for human consumption; 99%).
New Zealand	7%	511910020 (Products of fish, crustaceans, molluscs or other aquatic invertebrates, not elsewhere specified, unfit for human consumption; 94%), 2301200031 (Flours, meals and pellets, of fish or of crustaceans, molluscs or other aquatic invertebrates, unfit for human consumption; 6%).

China

Around 19% of volume during the 2018-2022 period was imported from China, with 92% of all product destined for South Australia. Advice from industry confirmed that the product was chub mackerel sourced from domestic fisheries in China and used for southern bluefin tuna feed (SBT; ASBTIA, pers comm.). We understand the use of Chinese mackerel in SBT farm feed has been largely discontinued since 2020/21.

Peru

Around 16% of volume during the 2018-2022 period was imported from Peru. The overwhelming majority of this product was imported into Tasmania (~88%), with small quantities also going to Queensland and Victoria. Given the import destinations, it is highly likely this product is fishmeal, squid meal and krill meal destined for aquaculture/agriculture feed and similar purposes. BAC data indicated that most imports under this category were declared to have originated in Peru. The most likely source of the raw material for fishmeal is from anchoveta (*Engraulis ringens*) fisheries in Peru (Peron et al., 2010). For example, Tasmanian-based aquafeed producer Skretting Australia indicated 71% of their fishmeal raw material used in 2022 was anchoveta sourced from Peru[46]. Raw materials for squid meal are likely supplied by Peru's domestic fleet, which fish primarily within Peru's EEZ (high seas squid vessels typically tranship catch to other ports).

BAC data showed that krill meal imported from Peru was declared by importers to originate in Norway and Uruguay. One source may be the MSC certified Aker Biomarine Antarctic Krill fishery. This fishery begins with Norwegian flagged vessels catching krill in CCAMLR Area 48, transhipping 100% of that catch to carrier vessels which land in Montevideo, Uruguay, before distributing to processors (Spain, USA) or end markets (Hønneland et al., 2020). Nevertheless, while Skretting Australia indicated that 4.7% of the fish meal used in their products in 2022 was sourced from Antarctic krill, none of it was MSC certified[47], so it seems likely different sources were used, at least in 2022.

USITC (2021) report that the Peruvian industrial anchoveta fleet is highly regulated and monitored. However, IUU issues have been identified in the less regulated artisanal fleet. By law, industrial anchoveta landings must go to the fishmeal processing industry, whereas the artisanal landings are to be exclusively used for processing for direct human consumption. Nevertheless, the US Department of Agriculture report that despite the government's efforts, much of this catch is channelled to the more profitable fishmeal processing industry[48]. Similar conclusions were reported in a study for the NGO Oceana (Grillo et al, 2018). The Oceana study also references a Peruvian Government study which estimated 90,000 mt of fishmeal was produced from illegally diverted inputs during 2014–16 representing around 3.7 percent of total Peruvian fishmeal production during that period. Following the release of the Oceana report, IFFO supported efforts by the National Fisheries Organisation in Peru, the Sociedad Nacional de Pesqueria (SNP) and the Peru Government to combat the manufacture of fishmeal from illegal raw material[49]. The extent to which these issues remain is unclear. Importantly, the fish themselves are harvested by legally authorised vessels; it is the channelling of the fish into unauthorised supply chains that is unlawful.

In the MSC certified Aker Biomarine Antarctic krill fishery, there is no evidence of systematic non-compliance. A comprehensive MCS system is in place including VMS/electronic logbook reporting to enforcement bodies after every haul and 100% observer coverage (Hønneland et al., 2020). There is also very little risk of mixing certified and non-certified catch, with catches 100% traceable throughout the chain of custody, which is operated by a single, vertically integrated company (Hønneland et al., 2020).

American Samoa

Imports from American Samoa (USA) accounted for 10% of the volume imported under 'Other' HTISCs during the 2018-2022 period and occurred under a single code: 2301200031 - Flours, meals and pellets, of fish or of crustaceans, molluscs or other aquatic invertebrates, unfit for human consumption.

It is likely that a substantial proportion is fishmeal made from tuna processing trimmings from the sole tuna plant (StarKist) operating in Pago Pago. As part of the processing operation, fish oils are often extracted from the processing waste (frames, guts), with the remainder dried into a powder that is used in agriculture and aquaculture feeds and fertilisers (e.g. Gamarro et al, 2013). Skretting Australia indicate that 17.4% of their total fishmeal volume in 2022 comprised skipjack, albacore and yellowfin tuna sourced from American Samoa[50].

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[46] https://www.skretting.com/en-au/sustainability/sustainability-reporting/footprint-report-salmon-feed-2022/use-of-marine-raw-materials/

[47] https://www.skretting.com/en-au/sustainability/sustainability-reporting/footprint-report-salmon-feed-2022/use-of-marine-raw-materials/

[48] https://apps.fas.usda.gov/newgainapi/api/Report/DownloadReportByFileName?fileName=Oilseeds%20and%20Products%20Annual_Lima_Peru_PE2022-0002.pdf

[49] https://www.iffo.com/position-paper/oceana-report-dark-fishmeal-peru-february-2019

[50] https://www.skretting.com/en-au/sustainability/sustainability-reporting/footprint-report-salmon-feed-2022/use-of-marine-raw-materials/

Much of the raw material for the StarKist plant will be sourced from purse seine fisheries in the WCPO and the IATTC area. Fish are also supplied by the MSC-certified American Samoa EEZ tuna longline fishery (Sieben et al, 2023). Fish sourced from WCPO purse seine fisheries will have the same IUU risk profile as that discussed in 4.3.2. The most recent MSC assessment report for the American Samoa longline tuna fishery awarded an unconditional pass against the relevant compliance and enforcement PI, noting that the "*level of compliance is high over the last few years with no major transgressions or fines*" and "*no evidence of systematic non-compliance*".

United States of America

Around 10% of the product was imported from the USA. Of the imported volume in 2018-2022, approx. 57% was imported to South Australia and 35% imported into Queensland, with the remaining volume shared among WA (~4%), VIC (~3%) and NSW (<1%). Discussions with ASBTIA indicate that imports destined for South Australia comprise anchovies imported for SBT aquaculture feed. Volumes imported into Queensland and other States may be small pelagic species used as fishing bait.

New Zealand

Around 7% was imported from New Zealand. The majority during 2018-2022 was imported into Western Australia (66%), with smaller amounts to South Australia (9%) and Victoria (8%). New South Wales, Tasmania and Queensland also imported small volumes, constituting 6%, 6% and 4% of total import volume, respectively. The available information indicates this product is imported for use as bait (e.g. in rock lobster fisheries), with most consignments declared to BAC as containing heads or tails only, imported directly for bait use. The use of New Zealand fish offcuts as bait is reported for the WA rock lobster fishery (e.g. Morison and Brand-Gardner, 2022), WA Deep Sea Crab Fishery (Daume et al., 2021) and Victorian, South Australian and Tasmanian Rock lobster fisheries (Rizzari and Gardner, 2019), among others.

4.4 Data and methodological challenges

As described above, the main impediment to more accurately assessing IUU risk from Australia's seafood imports is the lack of detailed publicly available information allowing the identification of imported species and respective source fisheries (and farms), and supply chains. In order to assess IUU risk, good information is required on the details of the source fishery (e.g. species, gear type, catching area/management system) as well as each link in the supply chain between the harvester and the first point of landing in Australia (e.g. details of transhipment at sea, container transport, cold storage, processing, re-exporting etc.). Information on the source fisheries is required to assess the effectiveness of the MCS system and likelihood that the fish was harvested in an authorised way, while information on supply chains is required to assess the risk of mixing or substitution of legal and IUU fish.

When seafood is imported to Australia, the importer (or usually their customs broker) must classify all goods according to ten-digit HTISCs, each of which has an associated description. When lodging an import declaration (in the Australian Border Force's Integrated Cargo System), importers/brokers must declare the country of origin of the goods, the country of loading, and provide a description of the goods in a free text field. However, this data is not publicly available or easily searchable, and the specificity of goods descriptions varies widely. While we have obtained and carefully used a subset of this non-public data in our analysis, the data currently captured at the Australian border in digital form remains insufficient to identify the species and source fisheries and supply chains of seafood imports for several reasons:

1. HTISCs are often generic and contain a diverse array of species under a single commodity code, thus obscuring the species imported;
2. There is no formal requirement for importers to use the most specific HTISC available for the product being imported, as opposed to generic codes such as 'Frozen fillets of fish'. Discussions with customs brokers indicated that there may be practical advantages in grouping items under generic codes (e.g. to reduce the chances of being randomly selected for audit). Given most seafood imports are tariff

free, brokers also noted there was no financial incentive to allocate products to some codes over others;

3. Importers may have little oversight of global supply chains and, from the data reviewed 2018-2022, often declare the country of origin as the country of processing/exporting (e.g., high volumes of Alaskan pollock from 'China' rather than the key fisheries in USA or Russia);
4. While imported goods undergo audit checks to ensure that import declarations accurately reflect the commercial documents and physical cargo, from the data reviewed 2018-2022, it is evident that imports were often misclassified by HTISC[51]. For example, hake and pollock from numerous countries were often imported under processed seafood codes which specifically excluded these species. Similarly, squid from 'China' was imported under mollusc codes which specifically excluded squid. While identification of these mis-declared species was possible through careful analysis of free-text fields supplied by the BAC, these data are not publicly available nor are they stored in a searchable format, there is no mandatory information requirement, and the extent of their accuracy is untested; and
5. For most seafood imports, there is no requirement to declare the species, production method (aquaculture/ wild-caught), the fishing/ harvest event (e.g., location, gears, management system, dates and points of landing, transhipment declarations etc.), previous links in the supply chain, or the fish producing entity (e.g., name and flag state of vessel/company, certification status, evidence of authorisation to fish/ farm etc.).

Additional data is available in import documentation but this is typically in scanned documents intended for assessment on a transactional basis and is not suitable for analysis.

The lack of information identifying seafood imports not only hinders the identification of species and source fisheries, but also traceability beyond the country immediately prior to import. While this may not be an issue for short, simple supply chains from counties without a large re-exporting sector (e.g., imports of fish from New Zealand) it becomes problematic for identifying source fisheries and IUU risk in countries that import, process and re-export significant quantities of seafood (e.g., China; Asche et al., 2022) and/or source from numerous fisheries with different IUU risks, in unknown amounts.

For many commodities, the issues above also make it impossible to determine the species and source fishery composition of Australia's import volume based on existing public information, as opposed to the composition of exports from the exporting country more generally. For example, China fishes for squid within their EEZ and across multiple ocean basins (NW Pacific, SE Pacific, SW Atlantic and NW Indian Ocean), but it is unclear from public information whether Australia's squid imports from China are derived from a particular oceanic region, all regions, or from re-exports that were landed in a different country but processed/ packed in China. While we found that ground truthing with importers was very useful in elucidating key species and source fisheries for commodities with simple supply chains, the source fisheries/species used as raw materials of highly processed products (e.g. surimi, fish balls) and seafood commodities with complex supply chains (e.g., squid) were less well known. Moreover, commodity and importer composition are likely to be variable through time, making it difficult to compare 'apples with apples' without regular ground truthing of species and catch area information with importers. Some countries (e.g. New Zealand, the United States of America) publicly release official export statistics at the species level, which can partly resolve these issues (notwithstanding that these may be originally based on self-declarations and therefore subject to error). Nevertheless, exports are rarely broken down by fishing gear or catch area, which still results in some uncertainty as to source fishery identification.

From a practical point of view, detailed information on supply chains may be commercially sensitive and collection may prove difficult (as discussed above, those in the middle of supply chains may be reticent to disclose suppliers for commercial reasons). The MSC addresses this problem by requiring that each link in the supply chain is certified (such that any product bearing the logo or trademarks should be able to be traced

[51] In some cases, misclassification may occur because HTISC descriptions use the common names of fishes, despite common names differing geographically and among importers/ actors in the supply chain.

back through a continuously certified chain of custody), but that each link need only know the details of those immediately upstream and downstream in the supply chain. Requiring an importer to hold the details of the full supply chain may prove more challenging in some cases, although we note that agreement to collect and hold such information is increasingly being facilitated through initiatives such as the Global Dialogue for Seafood Traceability[52] and similar information requirements already exist under other schemes (e.g. EU IUU Regulation; US SIMP).

In addition to the difficulties in identifying source fisheries, differences in fishery objectives, management systems, MCS systems and the nature and quality of information available make designing an effective one-size-fits-all IUU risk assessment framework at the fishery level challenging. While we have applied a qualitative judgement of relative risk based on a weight of evidence for this initial review, consideration should be given to the merits of developing a more structured process once better information on source fisheries/supply chains is known. Such a framework may be useful in helping prioritise Australia's engagement in RFMO processes and bilateral/multi-lateral capacity building efforts, as well as targeting audits etc under any future import monitoring scheme.

[52] https://traceability-dialogue.org/

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Annex 1: Harmonised Tariff Item Statistical Codes

Since 1 January 1988, all goods requiring a full customs declaration for import into Australia are classified according to the ten-digit Harmonized Tariff Item Statistical Code (HTISC) of the Combined Australian Customs Tariff Nomenclature and Statistical Classification (Customs Tariff) under the Customs Tariff Act 1995[53]. The first six digits of the code are taken from the Harmonized Commodity Description and Coding System (commonly referred to as the Harmonized System, or 'HS') - a six digit system developed by the World Customs Organization (WCO) for describing internationally traded goods. The seventh and eighth digits are added by the Department of Home Affairs to allow for different rates of duty applied to particular goods. The ninth and tenth digits (statistical codes) are added by the Australian Bureau of Statistics (ABS) to satisfy Australian statistical requirements[54]. Importers need to self-assess the correct classification of goods they import[55].

The HS is organised into 21 sections, which are subdivided into 99 chapters. Section and chapter titles describe broad categories of goods. Chapters of particular relevance in the context of seafood include:

- Chapter 3 - Fish and crustaceans, molluscs and other aquatic invertebrates;
- Chapter 5 - Products of animal origin, not elsewhere specified or included;
- Chapter 15 - Animal, vegetable or microbial fats and oils and their cleavage products; prepared edible fats; animal or vegetable waxes;
- Chapter 16 - Preparations of meat, of fish, of crustaceans, molluscs or other aquatic invertebrates, or of insects; and
- Chapter 23 - Residues and waste from the food industries; prepared animal fodder.

For our analysis, we used the existing ABS system which assigns seafood imports into commodity categories based on HTISC. HTISCs assigned to each commodity category are set out below.

Commodity	HTISC
Abalone	3078100, 3078300, 3078700, 3078900, 3079110, 3079912, 3079913, 3079914, 3079915, 3079916, 16055700, 16059012, 16059020, 16059025, 307810031, 307830033, 307870035, 307890032, 307990031, 1605570047
Anchovy	3024200, 3024201, 302420002, 302420003, 16041600, 1604160054, 3056300, 3056303, 305630029, 305630083
Aquatic invertebrate	3089000, 3089090, 308900090, 308900091, 16056900, 1605690090, 1605900016, 1605900064
Carp	3019302, 3019303, 3019304, 3027301, 3032500, 3032501, 3043900, 3043901, 3046900, 3046901, 301930007, 302730033, 303250052, 303250053, 304390068, 304390069, 304690018, 304690019
Catfish	3027200, 3032400, 3032401, 3043200, 3046200, 302720032, 302720033, 303240051, 303240052, 304320061, 304620012
Caviar	16043000, 16043100, 16043200, 1604300001, 1604310075, 1604320078
Clam	3077100, 3077200, 3077900, 3077901, 16055600, 307710028, 307720029, 307790029, 307790030, 1605560046
Coalfish	3026300, 3036501, 3037300, 3047300, 302530021, 303650062, 303650063, 303730017, 304550084, 304730022
Cobia	3024600, 3024601, 302460006, 303560059
Cod	3025000, 3025100, 3025101, 3035208, 3036000, 3036300, 3036301, 3047100, 3055100, 3055110, 3056200, 3056202, 302500019, 302510018, 302510019, 303520052, 303600014, 303630060, 303630061, 304710020, 305510024, 305510071, 305620028, 305620082
Conch	307880037, 307840034, 3078400
Coral	5080020, 5080091, 508000015
Crab	3061400, 3061419, 3062400, 3062402, 3063300, 3069300, 16051000, 16051020, 306140004, 306140026, 306240004, 306240011, 306330003, 306930013, 1605100010, 1605100016, 1605100017

[53] https://www.abf.gov.au/importing-exporting-and-manufacturing/tariff-classification/current-tariff; https://www.abf.gov.au/importing-exporting-and-manufacturing/tariff-classification/overview; https://www.abf.gov.au/importing-exporting-and-manufacturing/tariff-classification/2022-harmonized-system-changes

[54] https://www.abs.gov.au/statistics/detailed-methodology-information/concepts-sources-methods/international-merchandise-trade-australia-concepts-sources-and-methods/2018/classifications

[55] https://www.abf.gov.au/importing-exporting-and-manufacturing/tariff-classification/overview

Crayfish	306190050, 306190051, 306290070, 306290071
Crustacean	3061901, 3061960, 3061961, 3062901, 3062950, 3063900, 3063990, 3069900, 16054000, 16054030, 306190026, 306190046, 306190047, 306190052, 306290009, 306290027, 306290072, 306390007, 306990020, 306990021, 1605400021, 1605400023
Squid (Cuttlefish)[56]	3074100, 3074200, 3074300, 3074900, 3074950, 3074951, 16055400, 16055401, 307410018, 307420018, 307430019, 307490019, 307490039, 307490040, 1605540044, 1605540049, 307490020
Eel	3019202, 3026600, 3027400, 3032600, 3032601, 3037600, 16041700, 301920004, 302660025, 302740034, 302740035, 303260053, 303260054, 303760020, 1604170065
Fish (Generic)	3019903, 3019909, 3019950, 3024900, 3025900, 3025901, 3026900, 3026909, 3027000, 3028900, 3028901, 3029000, 3029100, 3029900, 3035900, 3036900, 3036901, 3037912, 3037919, 3037990, 3038000, 3038950, 3038951, 3039000, 3039101, 3039910, 3041000, 3041909, 3042000, 3042002, 3042909, 3044400, 3044900, 3044901, 3045300, 3045950, 3045951, 3047900, 3048900, 3048901, 3049091, 3049500, 3049900, 3049901, 3049919, 3051001, 3052000, 3053000, 3053200, 3053900, 3053901, 3054901, 3054950, 3054951, 3055300, 3055400, 3055990, 3055991, 3055992, 3056900, 3056950, 3056951, 3057200, 3057950, 16041900, 16041920, 16041921, 16042000, 16055900, 23012000, 301990010, 301990029, 301990035, 302490001, 302590029, 302590030, 302690026, 302690042, 302700027, 302890049, 302890050, 302900027, 302910001, 302990003, 303590090, 303690069, 303690070, 303790002, 303790023, 303790055, 303800024, 303890079, 303890080, 303900077, 303910090, 303990092, 304100042, 304190058, 304200021, 304200022, 304200044, 304200045, 304290091, 304290092, 304440073, 304490079, 304490080, 304530082, 304590089, 304590090, 304790029, 304890039, 304890040, 304900042, 304950073, 304990072, 304990079, 304990080, 305100031, 305200032, 305300033, 305320042, 305390049, 305390050, 305490022, 305490023, 305490061, 305490062, 305490063, 305490064, 305530073, 305540074, 305590026, 305590079, 305590080, 305690030, 305690089, 305690090, 305720092, 305790099, 1604190030, 1604190033, 1604190034, 1604190035, 1604200039, 1604200059, 1604200060, 1604200066, 1604200070
Flat fish	3022900, 3022901, 3022902, 3033900, 3033910, 3033911, 3044300, 3048300, 302290019, 302290020, 302290026, 302390040, 303390008, 303390009, 303390010, 304430072, 304830033
Haddock	3025200, 3025201, 3026200, 3037200, 302520019, 303720016, 304720021
Hake	3025401, 3036600, 3036601, 3037800, 3047400, 302540021, 302540022, 303660063, 303660064, 303780022, 304200033, 304200043, 304290062, 304290063, 304740023, 304900034, 304990071
Halibut	3022100, 3022101, 3033100, 302210025, 302210026, 303310005, 303310006
Herring	3024000, 3024101, 3035000, 3035105, 3048600, 3054200, 3054220, 3056100, 3056101, 16041200, 302400018, 302410001, 303500013, 303510051, 303510052, 304860036, 305420035, 305420052, 305610027, 305610081, 1604120051
Jellyfish	308300056, 1605630067, 16056300
Live fish	3019910, 301990009
Lobster	3061121, 3061122, 3061123, 3061124, 3061131, 3061132, 3061133, 3061150, 3061200, 3061218, 3061520, 3062112, 3062119, 3062120, 3062122, 3062200, 3062201, 3063100, 3063200, 3069100, 3069200, 3069400, 16053000, 16053020, 306110001, 306110024, 306120002, 306120025, 306150027, 306210001, 306210006, 306220002, 306220033, 306310001, 306320002, 306910011, 1605300020, 1605300022
Mackerel	3024400, 3024401, 3026400, 3035400, 3035401, 3035500, 3037400, 16041500, 302440004, 302440005, 302450005, 302640023, 303540054, 303540057, 303550056, 303550058, 303740018, 1604150053
Molluscs	3079100, 3079101, 3079111, 3079200, 3079201, 3079900, 3079901, 3079992, 5080099, 16055901, 302530020, 307910034, 307910039, 307910040, 307920050, 307920060, 307990036, 307990061, 307990062, 1605590090, 1605590091, 1605900013, 1605900014, 1605900015, 1605900061, 1605900062, 1605900063, 3079190, 3079991, 16059019, 16059090, 16059092, 307910035, 307990032, 1605900012
Mussel	3073100, 3073200, 3073900, 3073950, 3073951, 16055300, 307310016, 307320017, 307390017, 307390037, 307390038, 1605530043
Nile perch	3043300, 3046300, 304330062, 304630013, 3027901, 3032910, 3032911, 302790039, 302790040, 303290059, 303290060
Octopus	3075100, 3075200, 3075900, 3075950, 3075951, 16055500, 307510021, 307520022, 307590022, 307590023, 307590024, 1605550045
Ornamental fish	3011010, 3011059, 3011090, 3011100, 3011902, 3011909, 301100032, 301110037, 301190039
Other	3099090, 5080010, 5119100, 5119110, 15041000, 15042000, 15043000, 15043010, 15043099, 309100010, 309900090, 507900014, 511910019, 511910020, 511999029, 1504100034, 1504100050, 1504200006, 1504300035, 1516100013, 1516101036, 1516109037, 2301200031
Oyster	3071000, 3071100, 3071200, 3071900, 3071901, 16055100, 307100013, 307110010, 307120011, 307190011, 307190012, 1605510041
Pearl	71011001, 71012101, 71012201, 7101100031, 7101210032, 7101220033, 7116100039

[56] Note this category is referred to as 'cuttlefish' in ABS/FRDC summaries, although the overwhelming majority of volume and value will be squid

Plaice	3022200, 3022201, 3033200, 303320006
Pollock	3025501, 3036700, 3036701, 3047500, 302550023, 303670064, 303670065, 304750024, 304940072
Prawn	3061310, 3061320, 3061390, 3061621, 3061750, 3062310, 3062320, 3062390, 3062600, 3062700, 3063500, 3063600, 3069500, 16052000, 16052100, 16052900, 306130003, 306130040, 306130041, 306130042, 306160028, 306170029, 306170033, 306170034, 306230009, 306230010, 306230060, 306230061, 306230062, 306260006, 306270007, 306360006, 306950015, 1605200018, 1605200019, 1605210081, 1605290090
Salmon	3021201, 3021300, 3021301, 3021400, 3021401, 3021901, 3021902, 3031001, 3031100, 3031101, 3031200, 3031201, 3031300, 3031301, 3031900, 3031910, 3031911, 3032200, 3032901, 3044100, 3045200, 3048100, 3054101, 3054110, 16041100, 302120008, 302130010, 302130011, 302140020, 302140021, 302190031, 302190032, 303100001, 303110040, 303110041, 303120041, 303120042, 303130042, 303130043, 303190045, 303190049, 303190050, 303220003, 303290026, 304410070, 304520081, 304810030, 305410018, 305410019, 305410051, 1604110050, 1604200057
Sardine	3024301, 3024300, 3026100, 3035300, 3035301, 3037100, 16041300, 302430003, 302430004, 302610020, 303530053, 303530055, 303710015, 1604130052, 1604200058
Scallop	3072100, 3072101, 3072200, 3072900, 3072901, 3072910, 3072990, 16055200, 307210014, 307220015, 307290015, 307290035, 307290036, 1605520042, 3072201, 3072991, 307220016, 307290037
Sea crawfish	3061190, 3061191, 3062190, 3062192
Sea cucumber	3081100, 3081200, 3081900, 3081901, 16056100, 308110041, 308120042, 308190042, 308190043, 1605610065
Sea urchin	3082100, 3082200, 3082900, 3082901, 16056200, 308210051, 308220052, 308290052, 308290053, 1605620066
Sea bass	3028400, 3028401, 3037700, 3038400, 302840043, 303770021, 303840073, 303840074
Seabream	3028501, 302850044, 302850045
Seafood extracts	16030000, 16030012, 16030020, 16030091, 1603000018
Seahorse	3011020, 3011901, 3055910
Seaweed/algae	12122100, 12122900
Shark and ray	3026500, 3028201, 3029200, 3037500, 3038100, 3038101, 3045600, 3048800, 3049600, 3049700, 3057100, 16041800, 302650024, 302810040, 302820042, 302920002, 303750019, 303810070, 303810071, 303820071, 303820072, 303920091, 304470076, 304560085, 304880038, 304960075, 304970076, 305590025, 305710091, 1604180067
Snail	3076000, 3076060, 16055800, 307600023, 307600025, 1605580048
Sole	3022300, 3033300, 302230012, 302230013, 303330007, 303330008
Sponges	5090000, 5119930, 509000016, 511999022
Swordfish	3024700, 3024701, 3026705, 3035700, 3035701, 3036105, 3041101, 3042103, 3044500, 3045400, 3048400, 3049105, 302470007, 302470008, 302670040, 303570058, 303570060, 303610053, 304110056, 304210060, 304450074, 304540083, 304840034, 304910069
Tilapia	3027100, 3032300, 3032301, 3043100, 3045100, 3045101, 3046100, 3049301, 3053101, 3054441, 3055200, 302710031, 302710032, 303230050, 303230051, 304310060, 304510079, 304510080, 304610011, 304930071, 304930074, 305310040, 305310041, 305440054, 305440055, 305520072, 305640084, 305640085
Toothfish	3026807, 3037911, 3038300, 3038301, 3041202, 3042001, 3044600, 3048500, 3049206, 302680041, 303620054, 303790001, 303830072, 303830073, 304200020, 304220061, 304850035, 304920070
Trout	3019102, 3021101, 3021102, 3031400, 3031401, 3032101, 3044200, 3048200, 3054330, 302110030, 302110031, 303140043, 303140044, 303210025, 304420071, 304820032, 305430053
Tuna	3019404, 3019507, 3023100, 3023101, 3023200, 3023201, 3023300, 3023301, 3023400, 3023401, 3023500, 3023510, 3023511, 3023600, 3023601, 3023900, 3023902, 3023905, 3023906, 3034100, 3034101, 3034200, 3034201, 3034300, 3034301, 3034400, 3034401, 3034500, 3034510, 3034511, 3034600, 3034601, 3034900, 3034905, 3034920, 3034921, 3048700, 3049010, 3049911, 16041400, 301940003, 302310014, 302310015, 302320015, 302320016, 302330016, 302340033, 302340034, 302350034, 302350035, 302350036, 302360037, 302360038, 302390017, 302390038, 302390039, 303410009, 303420010, 303420011, 303430011, 303430012, 303440050, 303440051, 303450052, 303450053, 303450054, 303460055, 303460056, 303490012, 303490026, 303490027, 303490059, 304870037, 1604140025, 1604140026, 1604200038
Turbot	302240014, 302240015
Whiting	3025600, 3025601, 3036800, 3036801, 3037910, 303680065, 303680066