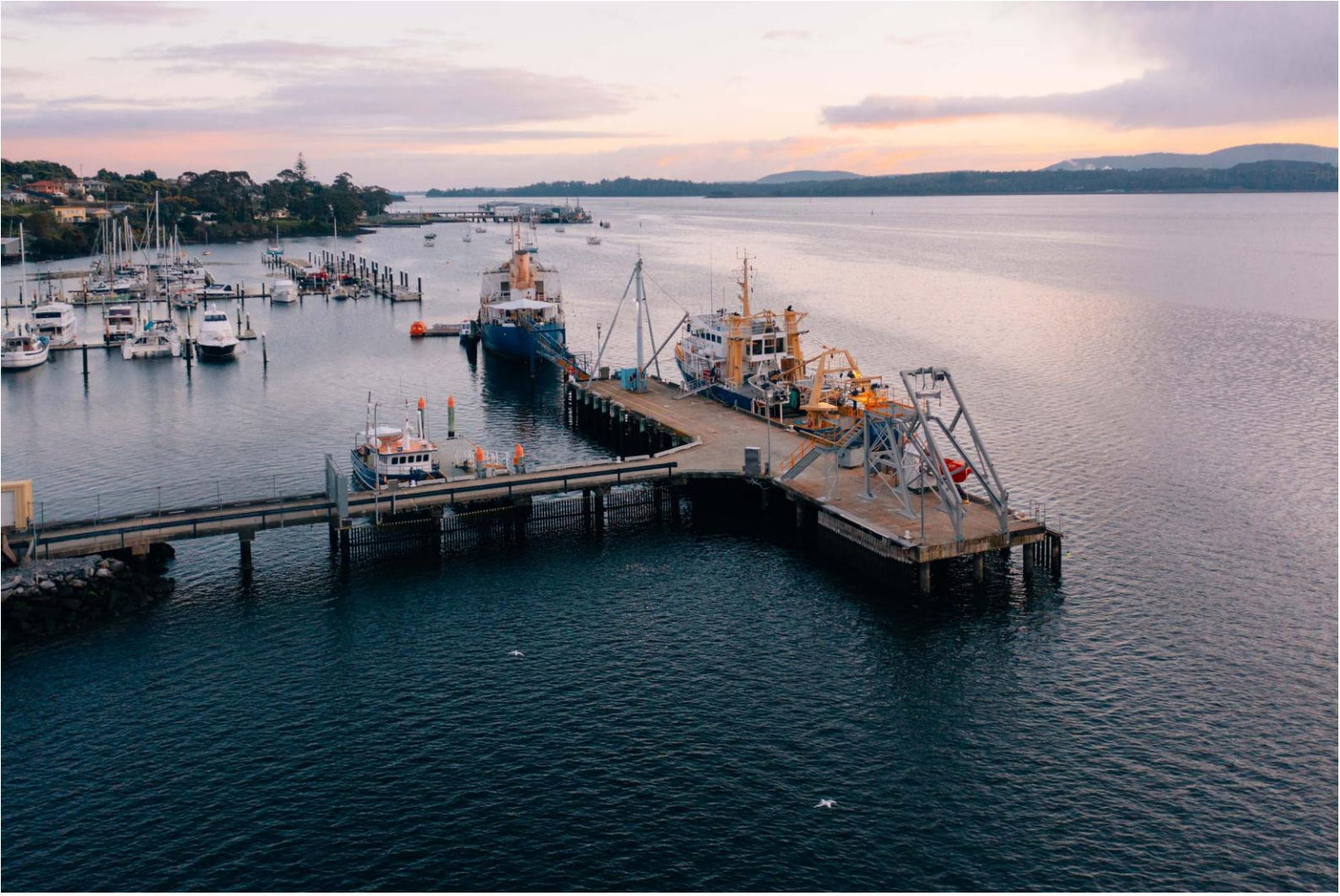

[5873] Cost Recovery and Return to Community - Australian Sardine

Final Report

December 2024 | Prepared by:
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UNIVERSITY of TASMANIA
IMAS
Institute for Marine and Antarctic Studies

Acknowledgment of Country

We acknowledge the Pakana and Palawa people of lutruwita, the traditional owners of the land upon which we live and work.

We pay respects to Elders past and present as the knowledge holders and sharers. We honour their strong culture and knowledges as vital to the self-determination, wellbeing and resilience of their communities.

We stand for a future that profoundly respects and acknowledges Aboriginal perspectives, culture, language and history.

Acknowledgments

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Contents

Executive Summary

This report responds to a request from the Department of Natural Resources and Environment Tasmania (NRE Tas) for the Institute for Marine and Antarctic Studies (IMAS) to explore both cost recovery and return to community from the establishment of a commercial sardine fishery in Tasmanian State waters.

The term 'return to community' has no specific definition in economics. A global review of fisheries conducted for this study found that full resource rent recovery is rare, and that governments often use a mix of partial recovery and community-focused strategies. This might be achieved for example through direct means like royalties or indirect approaches such as supporting local seafood processing.

From the examples presented in this report, only New South Wales and the King Island kelp fishery in Tasmania have explicitly implemented return to community as producer fees. The Tasmanian abalone fishery effectively implements a single charge determined as a percentage of landed value, which may include an implicit return to community in situations where the recovered funds exceed government costs.

Return to Community

The term 'return to community' does not have a specific definition in economics.

In practice, this concept in fisheries may involve government policies designed to either capture economic returns directly for the public sector (e.g., through royalties) or else help ensure the distribution of benefits to specific target communities (such as by supporting local seafood processing).

Full resource rent recovery is rare, and policies often combine partial recovery with other measures.

Cost recovery mechanisms differ across Australian jurisdictions. Most apply a fee structure that is comprised of a 'base fee' or 'licence fee', and a 'unit fee' paid for each quota unit permanently attached to a fishing licence.

The report illustrates how Tasmania might realise economic value from the introduction of a fishery. Economic modelling was conducted using the input-output method to consider four scenarios[1] for the potential economic contribution of a sardine fishery and onshore processing in Tasmania. These scenarios assume value-adding through expanded onshore processing, which differs from the existing example of the South Australian sardine fishery. Under a scenario where the Tasmanian fishery matches the SA fishery in size (38,024 tonnes), the total economic contribution could reach $47.9 million per annum, supporting around 303 full-time equivalent jobs, which would include the direct and flow-on effects from processing as well as fishing. At three-quarters the size (28,518 tonnes), this contribution could be $35.9 million per annum with 227 FTE jobs. At half the size (19,012 tonnes), the contribution drops to $23.9 million per annum and 152 FTE jobs. Lastly, a smaller fishery harvesting 7,500 tonnes

[1] It is unknown what the size and scope of this fishery will be at the time of writing, given that it has yet to develop; and therefore, four scenarios of varying magnitudes for production have been considered to investigate potential return to community.

could contribute $9.4 million per annum and support up to 60 FTE jobs in the local economy.

The project also provides an analysis of the South Australian Sardine Fishery, established in 1991, as a relevant comparison with a potential Tasmanian sardine fishery. The South Australian Sardine Fishery is zonally managed and has an individual transferable quota system with a total allowable commercial catch and input controls on licence numbers and gear.

The nominal economic profit of the South Australian Sardine Fishery was $2,238,000 in 2020-21, and the published cost of management and associated research for the same period was $892,761. Costs have increased to $1,438,587 in 2023-24, and this largely reflects an increase in costs from a Daily Egg Production Method (DEPM) survey and spawning biomass report for the fishery.

A measure referred to as Net Economic Return (NER), which approximates to economic profit (as calculated by this study), has been tracked for 20 years for the South Australian Sardine fishery. NER has been less than zero in approximately five of those years, which indicates that there is no potential for payment to the government under some operating conditions. The NER has been positive for the last 10 years of the fishery, in the range from $1.6 million to $7.4 million per annum. In the case of the Tasmanian sardine fishery, total harvests and profits are expected to be lower during the early stages of development (as analogous to the case of the early growth years for the South Australian fishery).

1. Introduction

During discussions with NRE Tas in July 2023, it was requested that research be undertaken by IMAS to extend consideration of possible models of return to community for a potential Australian Sardine Fishery managed by Tasmania.

This project presents the South Australian Sardine Fishery (SA fishery) as an analogue for a potential Tasmanian sardine fishery. We acknowledge there are multiple ways in which a Tasmanian sardine fleet could differ from the current situation in South Australia at the time of writing. We also note that these differences might have implications for economic contribution, especially if they involve supply chain stages that are located differently either within or outside of Tasmania.

Australian Sardine in Tasmanian State waters represents a proportion of the South-eastern sardine stock, which is shared by three jurisdictions: Tasmania, Victoria, and New South Wales. Research indicates that the spawning biomass of the South-eastern sardine stock in 2019 may have exceeded 200,000 tonnes (Ward et al. 2022) and that there is potential for development of a commercial fishery for Australian Sardine in Tasmanian State waters (Ward and Gardner 2022). Further research published in November 2024 shows the biomass to be in the order of 210,000 tonnes (Ward et al. 2024).

Analysis of the general economics of Australian Sardine fisheries in this report has been based on the South Australian example (BDO 2023a). However, we note that while a potential Tasmanian fleet might feature similar purse seine operations to those in South Australia, it could also contain a smaller scale bait fish fleet, and a boutique table fish contingent. Product markets would then be comprised of table fish and a mixture of bait and fish for oil/meal or similar (e.g. for use in bioceuticals). While we expect fish for oil/meal might attract a beach price like that seen interstate (in South Australia), the bait fish market could be closer to existing high value markets for Australian Sardine (such as in Western Australia) and table fish could be a higher value market (but also likely to be shallow). These price differentials are not known for certain at the time of writing for this report.

A technical definition of return to community and of cost recovery

For the discussion presented in this report, we mainly consider the concept of 'return to community' paid by a fishing industry to be synonymous with the definition of a Rent Recovery Mechanism (RRM) for a fishery. The application of a 'cost recovery' charge by government for management and research services would be the application of a Cost Recovery Mechanism (CR). This is principally because 'return to community' has no specific meaning in economic theory, whereas RRM and CR are defined and encompass a spectrum of charging-methods observed in fisheries. The decision tree in Figure 1 describes the classification of fisheries charges as either RRM or CR. RRMs are distinct from CRs in that the latter is imposed on extractive industries to recover management costs paid by government (Ben-Hasan et al. 2021).

In developing policy, it is important to interpret 'a fair return to the community' more broadly than this conventional (technical) definition. This should encompass initiatives that enhance significant community or cultural values, as well as those that deliver substantial flow-on economic benefits through increased growth and employment. These contributions should not be overlooked, as they are integral to achieving equitable and sustainable outcomes for the broader community.

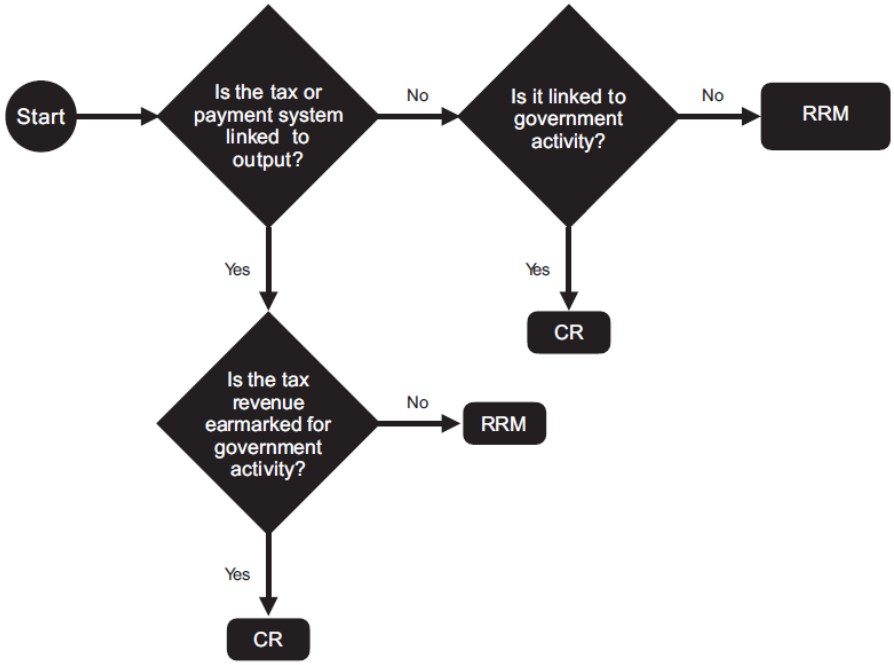


Figure 1. Decision tree for determining whether a mechanism corresponds to an RRM or CR. RRMs that are not tied to production generally reflect auctions (source: Ben-Hasan et al., 2021).

The information needs and 'return to community' pathways explored in this report are as follows:

- Types of government charging frameworks used across Australia (Section 2);
- Types of RRM and associated components of 'return to community' (Section 3);
- Case study of the sardine fishery in South Australia (markets, government cost recovery, economic profit) (Section 4); and
- Economic analysis of a Tasmanian sardine fishery, considering two possible pathways of 'return to community' for Tasmania (increased economic activity assuming onshore processing and a locally based fishing fleet, and the economic implications of a sardine-specific RRM) (Section 5).

Section 5 of the report considers two distinct pathways through which a potential Tasmanian sardine fishery could deliver a return to the Tasmanian community. These include: (1) increased economic activity from localised operations, and (2) fiscal return to the State budget from a sardine-specific RRM. Table 1 provides a summary of these pathways, including scope, type of return, and key assumptions.

Table 1. Pathways of 'return to community' considered in this report

Pathway	Scope	Type of Return Measured	Assumptions
Localised Economic Activity	Onshore processing, Tasmanian-based fishing fleet, supply chain impacts	Employment, regional investment, value-added production	Processing occurs in Tasmania; fleet is locally operated; multiplier effects benefit local economy
Rent Recovery Mechanism (RRM)	Design of a sardine-specific RRM	Fiscal returns to the Tasmanian State budget	Sufficient resource rent occurs from sardine fishing to support an RRM.

2. Survey of government charging frameworks in Australia

Table 2 provides examples of existing government charging frameworks for the renewal of fishing access rights in Australia. The table is organised by jurisdiction and describes the charging framework as it relates to cost recovery and RRM.

Most examples implement a fee structure that is comprised of two main components (i) a 'base fee' / 'licence fee' paid by all licence-holders in the fishery and (ii) a 'unit fee' paid for each quota unit permanently attached to a fishing licence.

In terms of cost recovery, activity-based costing was apparent for fisheries in New South Wales, Victoria, South Australia, and the Commonwealth. Tasmanian fisheries do not currently implement activity-based costing within the meaning of the Australian or Tasmanian Government guidelines (see Australian Government Department of Finance 2014, Tasmanian Government 2006).

An RRM was seemingly implemented as a volumetric or fixed fee in the case of the 'Tasmania – King Is. kelp' and New South Wales through a 'Community contribution' fee component. In the case of 'Tasmania – King Is. kelp' the fee-level of this charge is set as a 'perpetual' royalty based on 6% of the 2015 commodity price per dry-tonne (DPIPWE 2017) and is termed a "State royalty".

Some examples (e.g., 'Tasmania – abalone') implemented a single charge determined as a percentage of landed value. Such arrangement may include an implicit RRM in cases where the recovery of funds exceeds government costs. Alternatively, they may under recover for government costs during periods of low value.

Table 2. Summary notes on cost recovery and cost recovery basis for government charging to wild fisheries in Australia.

Jurisdiction	Notes on cost recovery	Cost basis
Commonwealth	Australian Fisheries Management Authority (AFMA) reviews and updates its Cost Recovery Implementation Statements (CRIS) for each financial year. AFMA's CRIS describes how the agency will charge fishing concession holders for the management of Commonwealth fisheries, and the agency prepares a cost-recovered budget based on each annual statement.	Cost Recovery Implementation Statement (CRIS) *Australian Government Department of Finance – Australia Government Cost Recovery Guidelines: Resource Management Guide No. 304 (2005) and (July 2014 – Third Edition)* *Australian Productivity Commission – Cost Recovery by Government Agencies Inquiry Report (2001)*
New South Wales	Schedule of Commercial Fishing Fees and Charges established under: - *Fisheries Management (General) Regulation 2019* (FMGR 2019) - *Fisheries Management (Abalone Share Management Plan) Regulation 2000* (Abalone SMP) - *Fisheries Management (Lobster Share Management Plan) Regulation 2000* (Lobster SMP) - *Fisheries Management (Supporting Plan) Regulation 2006* (Supporting Plan)	Fees under FMGR 2019, Abalone SMP, Lobster SMP have two parts (a) an endorsement/share fee, and (b) a community contribution. **Endorsement/share fee** No cost basis for endorsement fees under the FMGR 2019 is prescribed and these are generally set to maximum of the contribution cap specified. Unit fees (share fees) under Abalone and Lobster SMP have the following basis: - the cost of developing, reviewing, implementing, and ensuring compliance with strategies, policies, and legislation relating to the fishery (including for the purpose of promoting ecologically sustainable development of the fishery)

Jurisdiction	Notes on cost recovery	Cost basis
		- the cost of providing administrative services in connection with the operation of the fishery - the costs incurred in connection with the establishment and operation of any relevant advisory council or advisory group - the costs incurred in connection with the following research (or such part of those costs as may be determined by the Minister): (i) ongoing research into the management and sustainability of the fishery or of commercial fisheries generally, (ii) specific research projects relating to the management and sustainability of the fishery or of commercial fisheries generally, - such other costs of management of the fishery as may be determined by the Minister after consultation with any relevant advisory council or advisory group. - The costs of management attributed to industry may be reduced in any manner the Minister considers appropriate to recognise any saving, or any public benefit or benefit to any other fishing sector, that is achieved in the management of the fishery. - A maximum of $98 per share for Lobster and $400 per share for Abalone applies. **Community contribution** - Community contribution under the Abalone SMP is a royalty calculation from beach price

Jurisdiction	Notes on cost recovery	Cost basis
		- Community contribution under the Rock Lobster SMP is specified as a fixed amount per shareholder ($115) - Community contribution under Supporting Plan 11(4) is a fixed amount of $100 per fishing business that which holds shares in an NSW fishery (excluding either RL or Abalone, which are dealt with separately in the SMPs for those species).
Queensland		~ 74 Fishery access fees administered by DAF, include base and unit fees for many fisheries (https://www.daf.qld.gov.au/our-organisation/fees#, 21/02/2024). There is also a recreational user fee. *Principles for Fees and Charges* (Queensland Treasury, 2017) overarching principles include: - Full cost recovery principle - Beneficiary pays - *(potentially also benchmarking against comparable fees/services charged interstate)*
South Australia		Cost Recovery Implementation Statement (CRIS) PIRSA's Cost Recovery Policy adopts principles outlined in the *Australian Government Department of*

Jurisdiction	Notes on cost recovery	Cost basis
		Finance – Australia Government Cost Recovery Guidelines: Resource Management Guide No. 304 (2005) and (July 2014 – Third Edition), and *Australian Productivity Commission – Cost Recovery by Government Agencies Inquiry Report (2001)*. Fees established under *Fisheries Management Act 2007* (FMA 2007). The SA Government Gazettes a notice under FMA 2007, e.g. *Fisheries Management (General Fees) Notice 2020* containing the fees (base + unit rate) pursuant to the cost recovery agreement with each industry.
Western Australia		Established under the *Fisheries Resources Management Act 1994*. Fee amounts set out in Part 3 of Schedule 1 of *Fish Resources Management Regulations 1995*. Both base fees and unit fees are implemented for renewals, however both fee types are not necessarily applied in the case of each fishery.
Northern Territory	*Fisheries Regulations 1992*, fees prescribed (from time to time) by Gazette Notice.	
Victoria	Levies are recovered in line with the Victorian Government's response to the National	Activity based costing principles apply.

Jurisdiction	Notes on cost recovery	Cost basis
	Competition Policy 2001 review of the *Fisheries Act 1995*, and its Cost Recovery Guidelines.	
Tasmania	Fees are prescribed by amendment to the *Fisheries (General and Fees) Regulations 2016* (the General and Fees Regulations). The General and Fees Regulations are established under the *Living Marine Resources Management Act 1995*. The *Fee Units Act 1997* prescribes and applies annual indexation to fees.	Various

3. Review of RRM mechanisms globally in fisheries

Note: in relation to the contents of section 3, these represent a survey of international fisheries examples; however, some levers available in these jurisdictions are not available to Tasmania due to constitutional arrangements between States and the Australian Federal Government. For example, Tasmania is not able to impose a tax and cannot be protectionist in trade between the States, additionally local legislative investment incentives may not be possible.

Key points from a global review of rent recovery mechanisms in fisheries[2] were as follows:

- The purpose of rent recovery aims to reduce inefficiency, prevent economic leakage, and redistribute economic rent from fisheries to benefit local communities and jurisdictions.
- Types of policies include direct rent recovery (charges or taxes), indirect methods (limits on foreign ownership, local investment incentives), and rent sharing (distribution to industry or community programs).
- Mechanisms can vary widely in terms of charging basis (production or profit) and who is levied. Common practices involve progressive rates starting low and increasing over time as an industry/sector develops.
- Full resource rent recovery is rare; policies often combine partial recovery with other measures, and industry acceptance ultimately varies with the strength of use rights granted (see Gunnlaugsson et al. 2018 and 2019)
- Active policies typically involve a mix of direct and indirect recovery methods (i.e., less than full resource rent recovery), and clear mechanisms for redistributing rent (as well as public reporting on recovered revenues).

These findings are consistent with the analysis in this report, which has been to consider both RRM through a dedicated payment (see Section 5 on *Economic implications of a sardine RRM,* below) and also through economic impact of locally based sardine fishery and processing stage to the Tasmanian economy (see Section 5 on *Return to community through the economic impact of a locally based sardine fishery and processing stage in Tasmania,* below).

4. Case analysis: The South Australian Sardine Fishery

The SA fishery was a component of the South Australian Marine Scalefish Fishery (MSF), until 2021, when the Sardine Fishery was formally constituted under the Sardine regulations, separating it from the MSF.

The fishery is zonally managed by the Department of Primary Industries and Regions South Australia (PIRSA) and comprises the Gulf Zone and the Outside Zone, as well as the temporary (as at 2023-24) Gulf of St. Vincent Zone. Input controls include limited entry and gear restrictions. 14 vessels are licenced to operate in the fishery using the

[2] A systematic literature review method was applied and identified studies of rent recovery policies and mechanisms (proposed and/or in force) in fisheries. The cases included Rent Recovery Mechanisms for commercial fisheries in Iceland, Norway, Namibia, Faroe Islands, New Zealand, Alaska, Peru. See *References* for the list of studies.

purse seine method of harvesting. Purse seine nets must be no more than 1000m in length, no more than 200m in depth and have a minimum mesh size of 14mm. Catch is frozen on-board.

Currently (at the time of writing), most of the harvest is used as feed for southern bluefin tuna in ranching operations located off Port Lincoln, South Australia, while the remainder supplies markets for human sardine consumption, recreational fishing bait and pet food. The five-year average catch from the fishery is 41,664 tonnes, with a five-year average value of $26,540,920. The average price over the same period is $0.64 per kg. As almost all Australian sardine production occurs in South Australia, the national price closely mirrors the South Australian price.

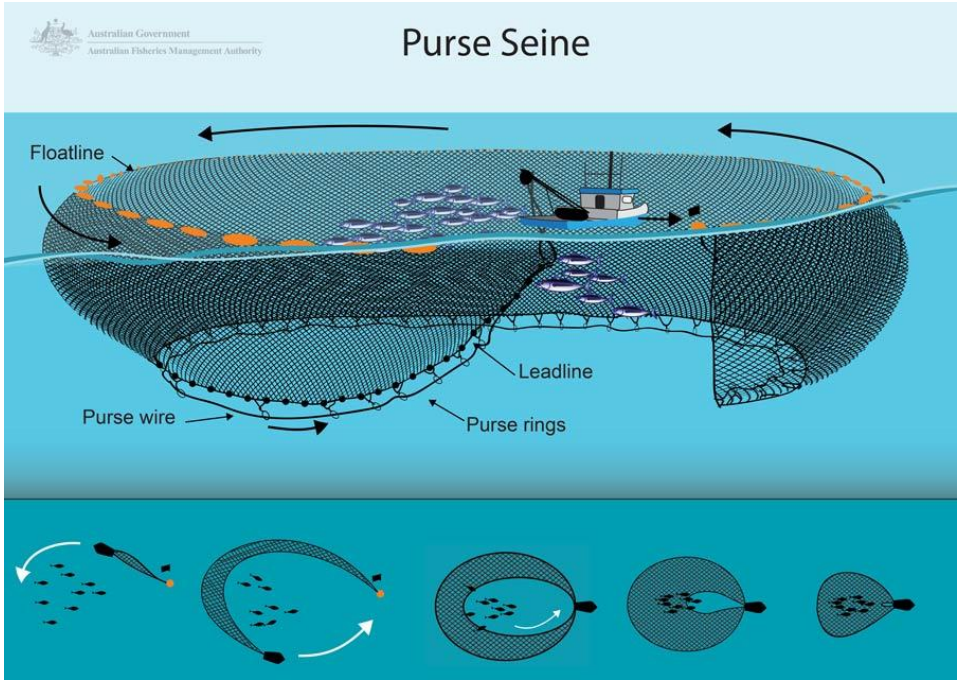


Figure 2. Purse seine fishing method (Source: https://www.afma.gov.au/species/australian-sardine, accessed on 26/02/2024)

In addition to Australian Sardine fisheries in South Australia and Victoria, Australian Fisheries and Aquaculture Statistics (ABARES 2023) report a low level of slightly higher value production in Western Australia. Smaller fisheries also exist, including in the Northern Territory, that are not reported separately in ABARES (2023). The data on Australian Sardine production from ABARES (2023) is summarised in Figure 3 (a timeseries of total quantity produced per jurisdiction per year) and Figure 4 (a timeseries of average price per kg for South Australia, and nationally).

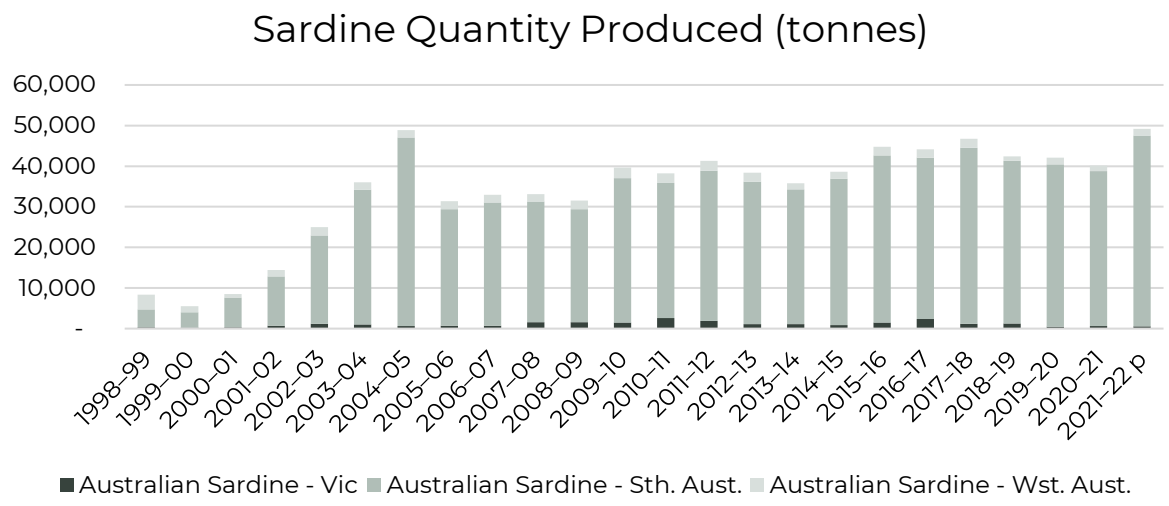


Figure 3. Australian production of *Sardinops sagax* (Australian sardine) (data source: ABARES 2023).

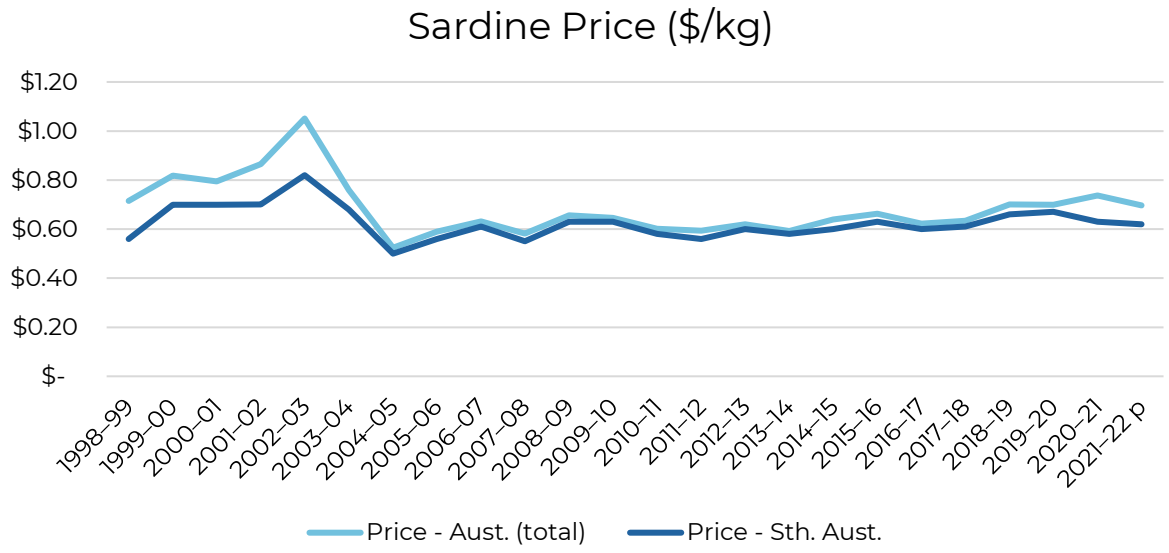


Figure 4. Commodity price for *Sardinops sagax* (Australian sardine) (data source: ABARES 2023).

South Australian Sardine Fishery: Cost of Government Management

Table 3 shows the published cost of management for the SA fishery from the cost recovery implementation statements for 2018-19 to 2023-24 published by Department of Primary Industries and Regions South Australia[3]. Data shown in columns two to seven are the published costs from each cost recovery implementation statement, in nominal terms and itemised for each financial year for which this data is currently available. The final column shows the inflation-adjusted average for the period (in 2020-21 dollars).

[3] https://www.pir.sa.gov.au/primary_industry/aquaculture/leasing_and_licensing/pirsa_services_aquaculture, accessed 19/03/2024.

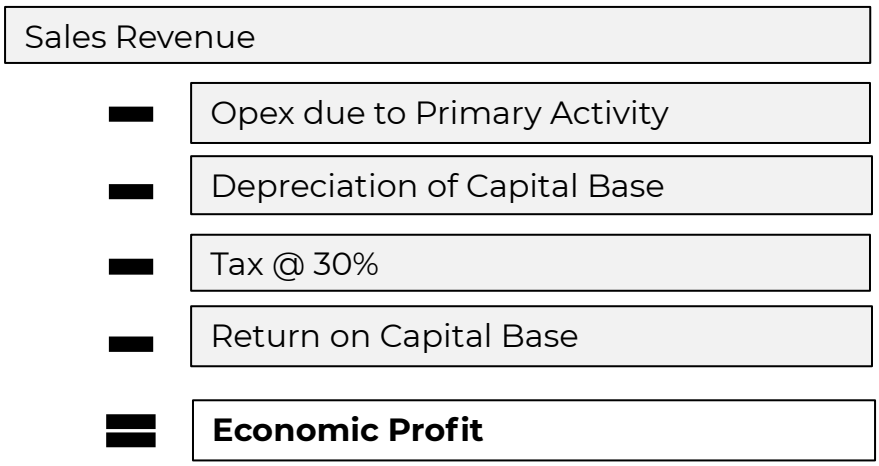
Table 3. Summary of cost recovery information published for the South Australian *Sardinops sagax* (Australian sardine) fishery (https://www.pir.sa.gov.au/primary_industry/aquaculture/leasing_and_licensing/pirsa_services_aquaculture, accessed 19/03/2024.) and calculation of inflation adjusted average for the period shown, as indicated in the 'Average' column of the table.

	FY2018-19	FY2019-20	FY2020-21	FY2021-22	FY2022-23	FY2023-24	Average
Research costs							
Stock assessment and monitoring	$ 763,130	$ 516,419	$ 351,919	$ 556,987	$ 298,928	$ 762,741	$ 518,892
Sardine-Dolphin Interactions	$ -	$ -	$ -	$ -	$ 54,919	$ 54,102	$ 15,815
Economic assessment	$ 14,128	$ 14,551	$ 14,987	$ 15,438	$ 15,901	$ 16,378	$ 14,543
Observer coverage	$ 73,673	$ 73,673	$ 135,159	$ 65,000	$ 20,000	$ 109,675	$ 76,565
PIRSA related costs							
Policy and Management	$ 75,988	$ 76,800	$ 77,760	$ 68,640	$ 70,000	$ 73,360	$ 70,789
Legislation	$ 15,554	$ 15,450	$ 15,765	$ 13,860	$ 14,130	$ 14,805	$ 14,329
Licensing	$ 15,597	$ 15,876	$ 16,359	$ 19,530	$ 19,908	$ 20,874	$ 17,139
Directorate	$ 6,591	$ 6,587	$ 6,825	$ 5,971	$ 6,090	$ 6,377	$ 6,148
Compliance	$ 115,444	$ 115,110	$ 117,450	$ 112,590	$ 114,840	$ 200,550	$ 122,387
Vessel	$ 53,248	$ 53,648	$ 55,132	$ 47,075	$ 48,020	$ 50,323	$ 49,212
VMS	$ 12,600	$ 12,600	$ 12,600	$ 12,600	$ 12,852	$ 13,468	$ 12,232
Quota Monitoring	$ 14,004	$ 14,520	$ 14,916	$ 18,656	$ 19,030	$ 19,932	$ 15,992
Information Services	$ -	$ -	$ -	$ -	$ -	$ 29,444	$ 4,170
Other Costs							
FRDC	$ 55,634	$ 63,465	$ 63,908	$ 66,301	$ 64,291	$ 66,558	$ 60,551
Co-Management Services	$ 7,498	$ 9,981	$ 9,981	$ -	$ -	$ -	$ 4,631
TOTAL	**$ 1,223,089**	**$ 988,680**	**$ 892,761**	**$ 1,002,648**	**$ 758,909**	**$ 1,438,587**	**$1,003,396**

South Australian Sardine Fishery: Economic Profit

In this report, economic profit is estimated in accordance with the standard 'building block model' (see for example Australian Energy Regulator, 2017). In the building block model, the level of economic profit is calculated as the difference between reported Earnings Before Interest, Tax and Depreciation (EBITDA) from the harvest and sale of fish, less the imputed cost of Australian government income taxation, the depreciation of capital engaged in production, and the rate of return on capital which would apply to an *economically efficient* entity.

The following diagram shows the elements and calculation of economic profit in the building block model.



In the above diagram, the EBITDA for the efficient entity is equivalent to the sales revenue less the operating expenditure ('Opex due to Primary Activity') for the production activity of the fishery, where these expenditures include the value of unpaid labour invested by proprietors (and associates) in their business (which would not be considered in accounting profit). The economic profit also deducts the consumption of fixed capital engaged in production ('Depreciation of the Capital Base'). The value of capital engaged in production is termed the *Capital Base* for an entity and represents the value of fishing gear and equipment as reported in the most recent economic and social indicators reported for the fishery (BDO 2023a). It excludes the value of intangibles such as fishing licences and goodwill. The consumption of fixed capital ('Depreciation of the Capital Base') is a portion of the total *depreciation and amortisation* charge that would be reported in each entity's financial statements which relates to the Capital Base. The analysis deducts an imputed company tax (Tax @ 30%), to avoid any issues related to tax effect accounting, and deducts an 'efficient' return on the Capital Base ('Return on Capital Base') calculated as the fishery's Weighted Average Cost of Capital (WACC) multiplied by its Capital Base.

A normal profit is defined as an economic profit of zero, and an economic rent is an economic profit that is above zero. In general, given the heterogeneity of fixed, natural, and human capitals; the asymmetric nature of information, and imperfect institutional

arrangements, it would be surprising to not see some levels of economic rent persisting in an economy through time.

Weighted Average Cost of Capital

In this study the Officer formula for the calculation of WACC is applied (Officer, 1994). This formula is reproduced at Eq. (1) below.

$$WACC = \frac{1}{1 + D/E}.R^E.\left(\frac{1-T}{1-T.(1-\gamma)}\right) + \frac{D/E}{1 + D/E}.R^D.(1-T) \quad (1)$$

Where:

D/E is the debt-to-equity ratio of the fishery (*assumed=33%*)[4]
R^E is the required rate of return on equity
R^D is the average interest rate on debt
T is the corporate tax rate (*assumed=30%*)[5]
γ is the value of imputation tax credits (*assumed=0.25)*

The debt-to-equity ratio for the fishery was obtained from published financial analysis for the South Australian fleet (BDO 2019). The average interest rate on debt R^D is determined from RBA (2024a) for small business lending (variable rate). The required rate of return on equity R^E is computed from the *Sharpe Lintner Capital Asset Pricing Model* (SL-CAPM), as is the common practice (see for example Australian Energy Regulator 2018, Frontier Economics 2016, IPART 2018, Office of the Tasmanian Economic Regulator 2018, Queensland Treasury 2020).

Gamma estimates the effect of imputation credits applied in the Australian tax system on the required rate of return on company equity (i.e., the required rate of return excluding the value of the imputation credits). There are conflicting views on the magnitude of γ (Queensland Treasury 2020), and in this study a rate of γ*=0.25* is applied (Frontier Economics 2016; IPART 2019).

Sharpe-Lintner Capital Asset Pricing Model (SL-CAPM)

The required rate of return on equity R^E is a market assessed opportunity cost (i.e., the minimum return investors currently require from investing in a similarly risky asset). In this study the SL-CAPM is applied to published data for the South Australian fishery (BDO 2019) to estimate this opportunity cost.

The SL-CAPM model (e.g., Bishop et al., 2018) is shown in Eq. (2).

$$R^E = R^f + \beta.MRP + \alpha \quad (2)$$

[4] (BDO, 2019)
[5] (Hunter Water 2019, IPART 2019, Office of the Tasmanian Economic Regulator 2018)

Where:

R^f – 10-year government bond rate (*source: RBA 2024b*)
β – 5-year average equity beta (s*ource: BDO 2019*)
MRP – Market Risk Premium (*assumed=6.1% nominal*)[6]
α – super-normal return applied for SA fishery (s*ource: BDO 2019*)[7]

Market Risk Premium is based on historical returns on the All-Ordinaries index for the Australian Share Market.

Treatment of 'quasi rent'

Occasionally above normal economic profits (greater than zero) may occur because of new markets, product innovation, or changes in the natural environment. These rents typically dissipate over time as the economy adjusts to the new conditions, and as such are referred to as 'quasi-rents'. In this study, using a medium-term average (5-year average) is proposed to limit the impact of transient factors on the measured economic profit.

Sensitivity of economic profit to interest rates

There is not a strong relationship between economic profit and changes in long-term interest rates *in theory* (given the effect of such changes on asset valuations) or historically (when measured for the SA fishery over the sample period for this study). While this observation may apply in general for the relationship between economic profit (as defined by economists) and long-term interest rates, it remains the case that the impact on individual firms from an increase in the interest rate will vary from negligible (or positive) to severely negative, and this would largely depend on their capital structure (debt-to-equity ratio) and the timing of their decision to purchase a fishing vessel, or fishing licences.

[6] (Bishop et al. 2018, Australian Energy Regulator 2018)
[7] In the application of a WACC to wild-catch fishing, the capacity for the total allowable catch to be adjusted periodically without compensation (without requiring the government to buy-back available quota units to affect a TAC change) introduces an additional 'risk premium' that would apply in an efficient market.

Table 4. Economic profit of the South Australian *Sardinops sagax* (Australian sardine) fishery consistent with the 'building block model' (as outlined in this section).

SA Australian sardine ($'000)	**FY2020-21**	**FY2018-19**	**FY2017-18**	**FY2016-17**	**FY2015-16**	**FY2014-15**	**Average[1]**
Sales Revenue[2]	$ 24,170	$ 30,062	$ 30,041	$ 22,773	$ 24,729	$ 20,639	$ 26,756
less Cost of Goods Sold	$ 5,364	$ 7,746	$ 7,473	$ 5,793	$ 6,070	$ 5,684	$ 6,703
less Employee Expenses	$ 6,440	$ 8,317	$ 8,298	$ 6,895	$ 6,758	$ 6,567	$ 7,607
less Other Expenses	$ 6	$ 58	$ 58	$ 178	$ 175	$ 173	$ 116
less Depreciation Expense	$ 4,594	$ 4,078	$ 4,100	$ 2,632	$ 2,696	$ 2,798	$ 3,652
Earnings Before Interest and Tax	*$ 7,766*	*$ 9,863*	*$ 10,111*	*$ 7,275*	*$ 9,030*	*$ 5,417*	*$ 8,678*
less Income Tax @ 30%	$ 2,330	$ 2,959	$ 3,033	$ 2,182	$ 2,709	$ 1,625	$ 2,604
	$ 5,437	$ 6,904	$ 7,078	$ 5,092	$ 6,321	$ 3,792	$ 6,075
less Post Tax Nominal Return on Capital Base	$ 3,199	$ 3,606	$ 3,797	$ 1,633	$ 1,705	$ 1,834	$ 2,751
Nominal Economic Profit ($'000)	**$ 2,238**	**$ 3,298**	**$ 3,281**	**$ 3,459**	**$ 4,616**	**$ 1,957**	**$ 3,324**

Table notes:

[1] Average reported in $2020-21.

[2] Revenue differs slightly from the Gross Value of Production (GVP) estimates published for the fishery.

Table key data sources:

BDO (2019). *Licences in the MSF: Valuations Report*, BDO Advisory Pty Ltd, Adelaide, South Australia

BDO (2023a). *Economic and social indicators for the South Australian Sardine Fishery 20021/22: A report for the Department of Primary Industries and Regions*, BDO Advisory, Adelaide, South Australia

RBA (2024a). 'Business Lending Rates – F7: FLRBFNSBV', available at: https://www.rba.gov.au/statistics/tables/xls/f07hist.xlsx?v=2024-03-19-13-36-13. Accessed: 19/03/2024

RBA (2024b). 'Capital Market Yields – Government Bonds – Daily – F2: FCMYGBAG10', available at: https://www.rba.gov.au/statistics/tables/xls/f02d.xlsx?v=2024-03-19-13-36-13. Accessed: 19/03/2024

5. Return to community (RRM) analysis

In this section we consider two distinct pathways through which a potential Tasmanian sardine fishery could deliver a return to the Tasmanian community. These are: (i) Return to community through the economic impact of a locally based sardine fishery and processing stage in Tasmania (Pathway 1), and (ii) Economic implications of a sardine RRM for the Tasmanian economy (Pathway 2). There is little evidence for a large economic profit occurring from sardine fishing (see Section 4 above) and returns sufficient to resource an RRM seem less likely during the early stages of development (assuming similarity with the early experience of the SA fishery, which initially had lower harvests and profits than in later years).

Pathway 1: Return to community through the economic impact of a locally based sardine fishery and processing stage in Tasmania

The Tasmanian community achieves a multiplier on direct spending by its local industries, including its fishery sector. Direct spending creates flow-on benefits to the Tasmanian economy through business and household re-spending, including from the flow of new credit for housing development that is sustained by regular employment in the State. The 'return to community' concept may in general encompass some, or all, of the increased economic activity that derives from new industry in Tasmania.

The estimates reported in this section include a potential economic contribution of commercial sardine fishing and processing activity physically based in Tasmania. The economic activity of sectors that supply goods and services to the commercial sardine fishing industry is included in the analysis as flow-on effects from the expenditures by the commercial sardine industry. This includes fishing support services. Fishery sector management activity (other than where these costs would be recovered through licence fees) is excluded. The analysis relates to primary production units (the harvesting activities) and to processing of raw product. The estimates are for the economic impact of this activity in Tasmania to the Tasmanian economy. The contribution of a Tasmanian sardine fishery to the rest of Australia is outside the scope of this report.

Please note that limited data was available to estimate the contribution of this sector to the Tasmanian economy. The estimates for the processing component have been based on an extensive desk review of existing studies (both nationally and internationally), whereas estimates for the production (fishing) component are based on available data for the South Australian fishery. A significant locally based processing stage for sardine in Tasmania would differ from the existing example of the SA fishery, where catch is largely frozen and stored for use in downstream production.

Definition of terms

Employment is a measure of the number of working proprietors, managers, directors, and other employees, in terms of the number of jobs (employment – total) and the

number of full-time equivalent (FTE) jobs (employment – FTE). For this study we consider 1 FTE as being equivalent to 37.5 hours of work per week.

Gross product represents the total dollar value of all 'final' goods and services consumed during a specific period and is considered a measure of the total size of the economy. At the national level, gross product is referred to as Gross Domestic Product (GDP); at the state level it is referred to as Gross State Product (GSP); and at a regional level it is called Gross Regional Product (GRP). Contribution to gross product is measured as the value of output less the cost of goods and services (including imports) used in producing that output. Gross product can be measured as household income plus gross operating surplus (business profit) and the total of all taxes, less subsidies paid to the government.

Gross Value Added (GVA): GVA represents the value of all goods and services produced in an industry, minus the cost of all inputs and raw materials used to produce those goods or services. It also represents the total household income (defined below) and gross operating surplus generated by the industry over a time-period. In this report GVA provides a basis for measuring the net contribution of the Tasmanian sardine fishery to the Tasmanian economy.

GVA is easier to estimate than gross product (defined above) at the industry level because it *excludes* the value of net taxes (taxes minus subsidies) on products. Net taxes are hard to estimate at this level because money that is levied on buying or selling specific products (e.g., fuel excise, stamp duties, luxury car tax, etc.) is difficult to allocate between the buyers and sellers of those products. For example, when a tax is levied on the seller of a product, that firm may increase the price of their production outputs and thereby 'pass through' a part of the tax to buyers. These proportions are difficult to estimate at small scales. The National Accounts report GVA, but do not report GDP, at the industry level (in part due to this difficulty).

Output measures the gross revenue from goods and services produced by commercial organisations (e.g., landed value of sardine). Output must be used with care as it includes elements of double counting.

Sardine production stage

Figure 5 shows a breakdown of costs for the South Australian sardine production (fishing) sector. The information is derived from BDO (2023a). The chart illustrates the distribution of seven expense categories: Paid labour (48%), Repairs and maintenance (14%), Fuel (12%), Interest (10%), Licence fees (8%), Insurance (4%), and Other Costs (4%). The interest component of the calculation assumes the same capital structure (debt-to-equity ratio) as is seen in South Australia. Licence fees are also based on the South Australian example, where industry agreements are in place, and full cost recovery occurs through a combination of base fees and unit fees paid by licence-holders. All vessels in this case are owner-operated and there are no quota rental payments.

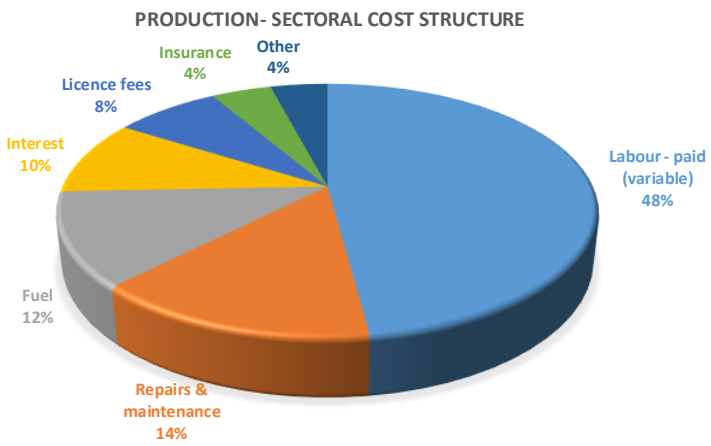


Figure 5. A breakdown of costs for the sardine production sector (Source: BDO 2023a).

Sardine processing stage

Figure 6 shows a breakdown of costs for the sardine processing sector. The cost structure is based on a desk review of existing data, derived from various national and international sources (BDO 2023b, Gudmundsson et al. 2006, KPMG 2020, National Marine Fisheries Service 2024, SeaFish 2024).

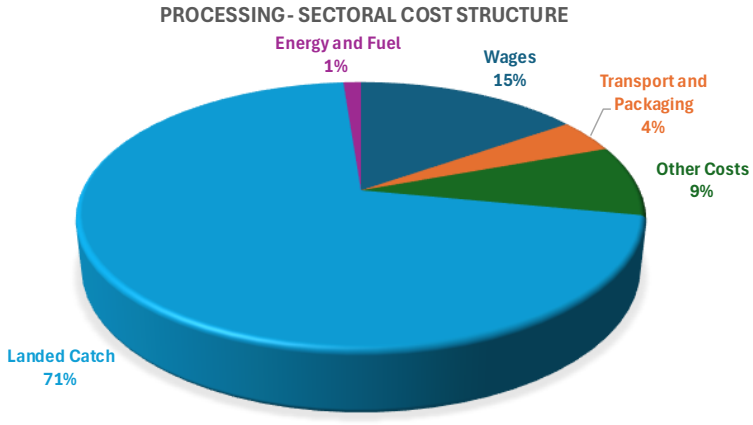


Figure 6. A breakdown of costs for the sardine processing sector. The cost structure is based on a desk review of existing data, derived from various national and international sources (BDO 2023b, Gudmundsson et al. 2006, KPMG 2020, National Marine Fisheries Service 2024, SeaFish 2024).

The chart in Figure 6 illustrates how a dollar spent by processors is distributed across five categories: Landed Catch (purchase of raw product from fishers), Energy and Fuel (electricity, diesel, and ULP for plant and equipment), Wages (employee salaries), Transport and Packaging (transportation costs), and Other Costs (all remaining expenses). Fisheries investment activities, such as quota renting and brokering, are not included. On average, 71% of costs in the processing sector are attributed to Landed Catch. Of the remaining expenses, Wages account for 15%, Transport and Packaging for 4%, and Energy and Fuel for 1%. Other Costs collectively make up 9% of the total

expenses. Firms in this sector typically achieve thin profit margins due to the high costs involved. Profit is generated by applying a markup to the landed price of the fish (in our profile this markup is around 59.4%). *This information has been derived in a general way for seafood processing*.

Commodity price

The commodity price (landed price) for wild-harvest Australian Sardine per kilogram from 1998-99 to 2021-22 is shown earlier in this report (Figure 4). The chart shows that the landed price for sardine peaked in 2002-03, dipped in 2004-05, and has since remained stable at around $0.63 per kg.

Modelled economic contribution results

The pie charts in Figure 7 show estimates of economic contribution for a potential fishing and onshore processing sector for sardines in Tasmania for four possible cases for the size of a Tasmanian sardine fishery (same size as the existing SA fishery; three quarters the size; one half the size; and 7 500 tonnes). The results are shown for a fishery that includes a substantial onshore processing stage based in Tasmania, and this differs from the SA fishery (where there is little onshore processing). Estimates are presented for GVA and employment (see *Definition of terms*), and are shown for:

- The direct contribution of sardine fishing, and sardine processing (where applicable), to the Tasmanian economy;
- The flow-on (indirect and induced) contribution of the potential sardine industry (both sardine fishing and sardine processing together) to the Tasmanian economy; and
- The total contribution of the potential sardine industry to the Tasmanian economy.

The direct contribution of fishing and processing measures the initial effects (GVA, employment) that are generated by a potential industry in Tasmania. This includes spending on wages (to employees, and business owners) and the purchase of fishing and processing inputs. These effects are identified as ‘sardine fishing’ and ‘sardine processing’ in the pie charts in Figure 7. The total direct effect on the Tasmanian economy is the sum of both the fishing and the processing direct effects shown in each pie chart.

Flow-on contribution occurs through the re-spending by households, business, and governments following receipt of the direct spending of the industry. Production-induced effects are additional GVA and employment resulting from re-spending by firms (e.g., boat maintenance contractors) that receive payments from goods or services provided to a fishing industry. In the analysis undertaken for this report, business re-spending also includes a level of re-spending or re-investment of industry profit in Tasmania. Consumption-induced effects are additional GVA and employment that results from re-spending by households that receive some income from employment in activities that are either directly or indirectly associated with an industry. The total flow-on effect is shown in each pie chart as ‘Indirect & induced Tasmania’.

The total contribution is the sum of direct and flow-on contribution of sardine in Tasmania. This applies for both GVA and employment and is identified beneath each pie chart in Figure 7.

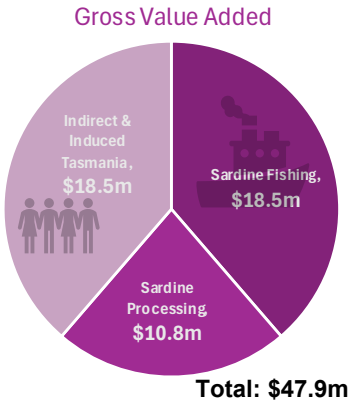
As mentioned above, the estimates in this subsection are provided for four possible cases for the size of the Tasmanian sardine industry (specified in terms of the total tonnage landed for the most part relative to the existing SA fishery):

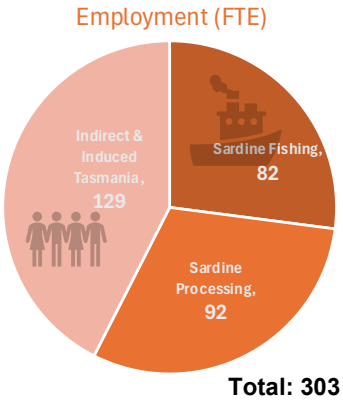
- Tasmanian sardine fishery of the same size as SA fishery (GVP $23.96m; harvest 38,024 tonnes);
- Tasmanian sardine fishery of three quarters the size of SA fishery (GVP $17.97m; harvest 28,518 tonnes);
- Tasmanian sardine fishery of one half the size of SA fishery (GVP $11.98m; harvest 19,012 tonnes); and
- Tasmanian sardine fishery of 7 500 tonnes (GVP $4.73m; harvest 7,500 tonnes).

These estimates assume a Tasmanian-based fishing fleet and that additional processing capacity is implemented onshore in Tasmania to handle the landed sardines.

Tasmanian sardine fishery: same size as SA fishery

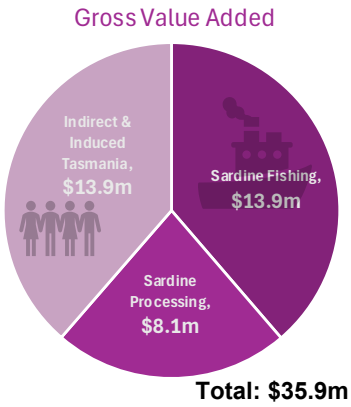
GVP: $23.96m
Harvest: 38,024t

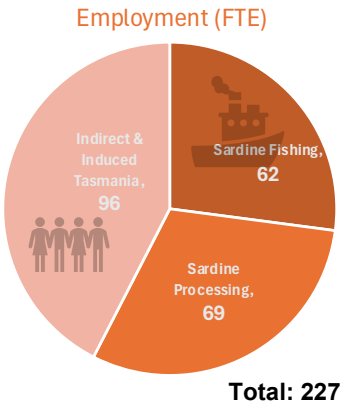




Tasmanian sardine fishery: three quarters of SA fishery

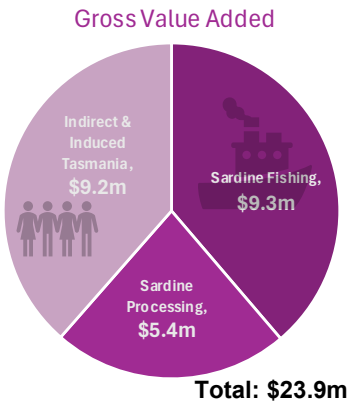
GVP: $17.97m
Harvest: 28,518t

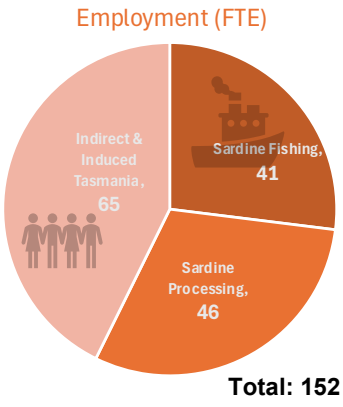




Tasmanian sardine fishery: one half of SA fishery

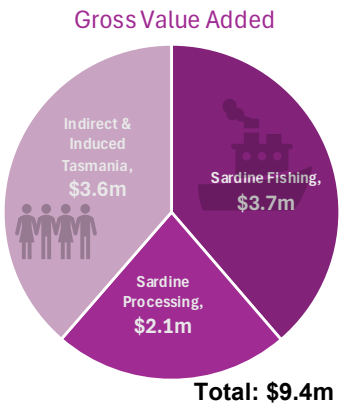
GVP: $11.98m
Harvest: 19,012t





Tasmanian sardine fishery: 7,500 tonnes

GVP: $4.73m
Harvest: 7,500t



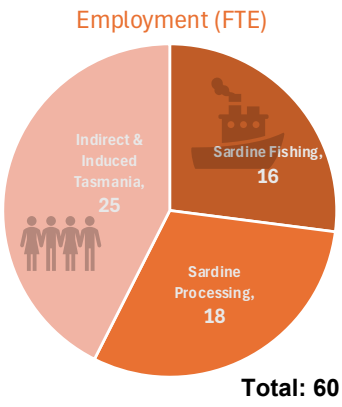


Figure 7. Estimates of economic contribution for a potential fishing and onshore processing sector for sardines in Tasmania for four possible cases for the size of a Tasmanian sardine fishery (same size as the existing SA fishery; three quarters the size; one half the size; and 7 500 tonnes).

Pathway 2: Economic implications of a sardine RRM

Figure 8 below shows a conceptual model for two expenditure pathways, one (on the left-hand-side) for a single year of funds received as a private rental return on harvesting, and the other (on the right-hand-side) for funds received by government for a single year of receipts under an RRM. The expenditure pathways illustrated in Figure 8 relate in each case to just one year of receipts from the fishery. In the figure we consider the pathway of these funds *prior to the investment* of any savings/retained earnings back into the economy. The South Australian fishery is quota managed, and hence we have used a system of quota management to illustrate these flows.

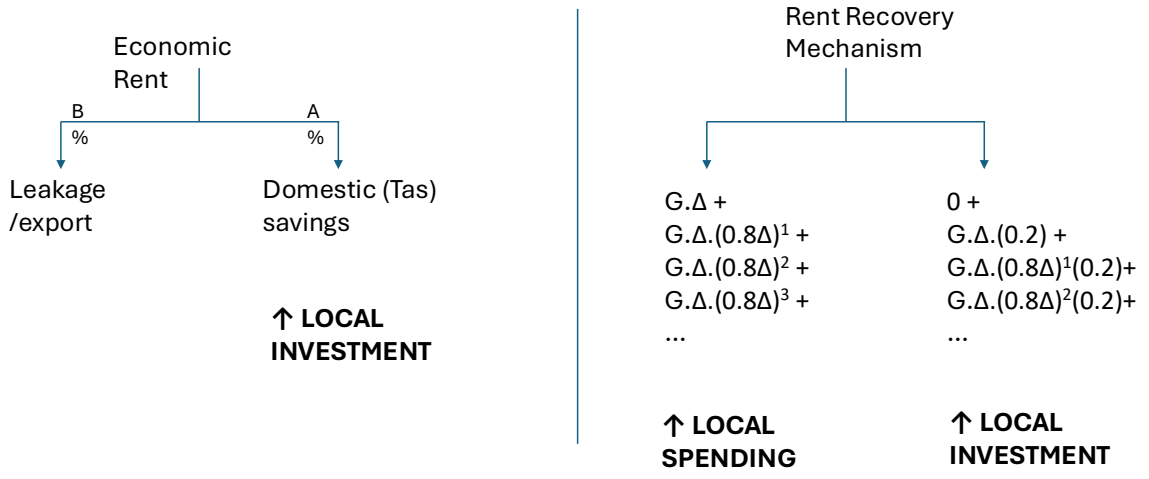


Figure 8. Return to community conceptual model for this report. On the left-hand side, a portion of incoming rent is paid out-of-State (B%) and a portion is retained as savings by domestic quota holders (A%). On the right-hand side there is a diminishing stream of activity, and increasing balance of savings, as the RRM revenues are spent and re-spent into the local economy (with some leakage 1-Δ occurring at each stage from imports).

On the left-hand-side of Figure 8, a portion of the incoming rent is paid out-of-State to quota holders that reside interstate/internationally (B%), and the remaining rental return (A%) is held as local wealth in household savings and business retained earnings that is available for funding real investment in Tasmania ('↑ Local Investment'). In making this statement, we assume that businesses and households are most likely to invest in areas that they are familiar with, or that are complementary to their existing knowledge, since these prospects represent less risk from poorly defined factors (such as strategic behaviour from sellers' agents, suppliers, or incumbent firms; or otherwise lacking the judgement that develops from direct experience with a market or production process). We therefore model the wealth retained locally as a correlate of potential real investment into the State economy from this year of fishing.

Please also note that, financial investment translates to real investment (economic activity) when it is used to create new capital (e.g., buildings, machinery or equipment required for production or residential investment activities). Where the funds are used for asset purchases in secondary markets (e.g. additional fishing quota, shares, existing

housing) then there is a net transfer of liquidity from the purchaser to the vendor however the wealth remains 'within' Tasmania in the sense that it is crystalised as financial assets that are owned by the local purchaser. Likewise, when fishing assets are sold and the vendor remains resident in Tasmania, the wealth remains locally.

There is thus some level of *efficiency* in the conversion of wealth into real economic activity over time that reflects the prevalence of 'better opportunities elsewhere' from the perspective of these local financial investors. The level of investment into Tasmania will ultimately also depend on the conditions being created for this to occur locally by governments (in terms of its regulatory settings, such as planning provisions, and in generating population growth, and productivity); and it may also depend on inflation and the level of debt already maintained by quota holders[8].

On the right-hand-side of Figure 8, an RRM collects some portion of the economic rent to government revenue *(NB: this does not affect production activity in the fishery, since the RRM is paid from an above normal economic profit)*. This supports government expenditure (G) which might typically be ~60% local wages and ~40% for goods[9]. In second-round effects, this goes partly to household savings and retained earnings by businesses, partly to business expenditures and wages, partly to household consumption by Tasmanians and partly to imports (out-of-state), in the main (i.e., ignoring taxes). On the basis that 20% of the incoming expenditures to each round are saved by Tasmanian households or businesses, and a fraction *(1-Δ)* is 'leaked' from the local economy due to imports (out-of-state), then the model in Figure 8 illustrates the diminishing stream of activity that occurs locally over time due to the RRM in this single year ('↑ Local Spending'). The increasing balance of local savings because of this activity is also shown ('↑ Local Investment').

The existence of the expenditure pathway shown on the right-hand-side of Figure 8 depends largely on the nature of the government spending that is supported by the RRM. If the collected funds are used to repay debt or held as sinking fund assets against future liabilities, this would have little immediate benefit to the economic activity in Tasmania. Similarly, unnecessary increases in regulatory burden, such as those required to keep funds in a particular work area, agency, or department, are detrimental to the business environment generally. Government spending that stimulates economic growth (e.g., affordable housing and infrastructure investments, regional development, and research activities that enhance productivity or result in new production processes) is more reflective of the pathway shown on the right-hand side of Figure 8. Environmental compliance activities are assumed to be a component of CR and are not related to the discussions in this section.

The relative merits of each of these pathways depend largely on the level of investment that can be attracted back into the Tasmanian economy. This, in turn, requires regulatory settings that are both stable and conducive to those outcomes. If there is little prospect for sustaining such an environment in Tasmania, a government

[8] This level of debt could potentially be higher in cases where an auction process is used for the initial and/or repeated allocation of quota units.
[9] For some agencies those goods purchases will be from local manufacturing sectors, but for others (e.g., possibly Department of Health) they will be for specialist equipment that can only be sourced international or interstate locations.

consumption pathway may be more beneficial for the economy. However, the capacity of this pathway to enhance long-term growth is limited[10]. Ultimately, growing an economy over time also requires a mix of private sector investment that can sustain the funding required for an expansion in the business cycle, e.g. through borrowing or capital raising for investment projects (supported by interstate or overseas markets or domestic population growth).

Australian Government income taxation

Income tax collected by the Australian Government may, in part, function as a form of RRM paid to the broader Australian community. However, there is no mechanism in place to ensure that this return would be received with certainty by the Tasmanian community, where the resource is located.

Summary

This report has explored both cost recovery and return to community from the establishment of a commercial sardine fishery in Tasmanian State waters. It has explored cost recovery by examining publicly available information on government charging frameworks for commercial fisheries across Australia and collating historical management costs available for the sardine fishery in South Australian. The report has considered return to community through an economic lens, by exploring the potential economic contribution of a Tasmanian sardine fishery and by also examining possible expenditure pathways for its resource rents[11].

A comparison of cost recovery mechanisms currently in use elsewhere in Australia was presented. Most examples implemented a fee structure that is comprised of two components, being a 'base fee' / 'licence fee' paid by all licence-holders and a 'unit fee' paid for each quota unit attached to a licence. In terms of cost recovery, Tasmanian fisheries do not currently implement activity-based costing, however activity-based costing was apparent for fisheries in New South Wales, Victoria, South Australia, and the Commonwealth. An identified 'return to community' charge was implemented as either a fixed or volumetric fee in the case of the Tasmania King Island kelp fishery and in New South Wales. For the South Australian fishery, average cost recovery over a recent six-year period, after accounting for inflation, was approximately $1,000,000 in 2020-21 dollars. For the same base year (2020-21), an average of 6.3% of GVP was charged to fisheries across South Australia (through activity-based costing).

[10] The exception to this, from an economic standpoint, would be research investments which are productivity enhancing for the local economy (e.g., result in the development of new products or services, new resources, or the improvement in output per unit of 'effort' input to existing production processes). A well-functioning research and development program that focuses on productivity enhancement is an important feature of long-term growth. Similarly, targeted investments in public infrastructure can also enhance productivity and enable more efficient service delivery.

[11] There is little evidence for large resource rents occurring from sardine fishing in Australia. The average economic profit from sardine fishing in South Australia was estimated for a six-year period (to 2020-21), and after accounting for inflation was $3.3 million per annum over the entire fleet. An estimate of this size provides limited confidence that a Tasmanian fishery could generate economic profits across different seasonal and market conditions, particularly during its early development.

The report outlines four scenarios for the potential economic contribution of a sardine fishery and processing sector in Tasmania. These scenarios assume value-adding through expanded onshore processing, which differs from the existing example of the sardine fishery in South Australia. Economic modelling was carried out using the input-output method, which has limitations in this context. Under a scenario where the Tasmanian fishery matches the SA fishery in size (38,024 tonnes), the total economic contribution was modelled to be $47.9 million per annum, supporting around 303 full-time equivalent jobs, which includes the direct and flow-on effects from processing as well as fishing. At three-quarters the size (28,518 tonnes), this contribution would be $35.9 million per annum with 227 FTE jobs. At half the size (19,012 tonnes), the contribution drops to $23.9 million per annum and 152 FTE jobs. Lastly, a smaller fishery harvesting 7,500 tonnes could contribute $9.4 million per annum and support up to 60 FTE jobs in the local economy.

In addition to the direct and flow-on benefits to the Tasmanian economy from the establishment of a sardine fishery, this study also explored possible expenditure pathways for resource rents. A conceptual model for two expenditure pathways was discussed. In the first pathway, part of the economic profit from fisheries is paid to fishing interests outside of Tasmania, while the remaining portion stays within the local economy[12]. This locally retained component may be held as household savings or business retained earnings, supporting further investment in Tasmania. In the second pathway, a portion of economic rent is collected to government revenue through an RRM. In cases where economic rent exists, this could support government finances and potentially contribute to household savings and retained earnings by businesses, flow-on business expenditures and wages, and household consumption (i.e., aggregate demand).

The accumulated savings, prior to any reinvestment, in the second expenditure pathway is likely to be spread across more households than in the first pathway and thereby convert more efficiently into residential real estate investment. Flows along the first pathway concentrate savings within the local economy, increasing the potential for larger individual investments. This, in turn, can significantly enhance Tasmania's long-term production capacity and real economic growth—though the viability of such investments often depends on aligning factors.

A global review of fisheries found that full resource rent recovery is rare, and that governments often use a mix of partial recovery and community-focused strategies. This might be achieved for example through direct means like royalties or indirect approaches such as supporting local seafood processing. In the case of the Tasmanian sardine fishery, total harvests and profits are expected to be lower during the early stages of development (as was the case for the early growth of the South Australian fishery), limiting the applicability of royalties and other such RRMs initially.

[12] Please note that the component paid to the out-of-State interests in many cases may have been previously paid *into* Tasmania as a large lump sum amount when those interests were initially purchased from Tasmanian residents, and thereby already exist in Tasmanian total savings or have been redeployed in the economy. However, when ownership and wealth shift residentially out of Tasmania, there is a risk of economic 'leakage,' reducing the potential for local reinvestment and growth.

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