Report to Seafood Industry South Australia (SISA)

Benchmarking Review of PIRSA's Aquaculture Science and Compliance Cost Recovery Programs

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Ian, John and Bess

Executive Summary

Overview

This benchmarking review was commissioned by Seafood Industry South Australia (SISA) to independently benchmark the effectiveness and efficiency of the Department of Primary Industries and Regions (PIRSA) aquaculture science and compliance cost recovery programs. The review was conducted with oversight from the Cost Recovery Implementation Committee (CRIC), and via extensive engagement with government, industry, and research stakeholders.

The review focused on marine aquaculture sectors—oysters, mussels, finfish, southern bluefin tuna, and marine abalone—excluding inland aquaculture, seaweed farming, and food safety programs. The review aimed to benchmark South Australia's cost recovery mechanisms against national and international best practices, identify opportunities for digital transformation, and recommend improvements for stakeholder engagement and regulatory effectiveness.

Methodology

The review followed a multi-stage process accessing a wide range of data sources:

- **Literature Review:** Analysis of South Australia's extensive cost recovery policies, historical review exercises, and global/national aquaculture cost recovery frameworks.
- **Stakeholder Engagement:** Surveys and in-person interviews with over 40 aquaculture businesses, industry advisors, and sectoral peak bodies supplemented by field visits and online meetings.
- **Extensive Government Engagement:** Calls and meetings with PIRSA/SARDI staff to gather data and discuss operational practices and access available reports and data.
- **External Benchmarking:** Surveys and consultations with other Australian jurisdictions and international experts in aquaculture regulation, research and cost recovery.

The project timeline spanned from July to December 2025, with iterative data collection, analysis, and stakeholder feedback, particularly from the CRIC and independent advisors to the CRIC, informing the final recommendations addressing the Terms of Reference. We have also made a number of observations which might be considered by PIRSA and the aquaculture industry in due course if they choose to do so.

Key Findings

1. Aquaculture Cost Recovery in SA Overall

The review concluded that South Australia has the most mature, transparent, and comprehensive aquaculture cost recovery system in Australia, and is also a global leader in aquaculture cost recovery. The state's activity-based cost recovery model is unique in its scope, transparency and regular review cycle, but is now due for a reset to address changing national and global seafood markets, environmental conditions, farming technologies and risk profiles as sectors evolve and new opportunities emerge.

2. Effectiveness and Efficiency

Science Program: The science programs led by SARDI that underpin the tuna, finfish, and mussel sectors are generally robust, and well supported by advanced modelling and environmental monitoring to address key ESD risks. However, the oyster sector lacks adequate scientific assessment of carrying capacity and environmental impacts, with regulatory settings based on historical practices rather than current data. There is also a need for innovation in other areas of aquaculture science, including emerging sectors such as integrated multi trophic aquaculture (IMTA) and greater collaboration with interstate and global peers to develop projects that would use the limited industry funds, leveraged with Fisheries Research and Development Corporation (FRDC) and state contributions to address common research questions.

Compliance Program: Compliance activities are limited, with generally high industry adherence to regulations. Resource allocation is not based on systematic risk assessment, especially for the oyster sector, and compliance staff lack adequate training in aquaculture generally. There is a need for more emphasis on staff capacity building and improved grower engagement, as well as more targeted risk-based and sector-specific compliance planning and improved digital tools for monitoring and reporting.

3. Equity and Stakeholder Engagement

Stakeholder feedback to the review team highlighted concerns about the equity of cost recovery fees, particularly for smaller operators, and the need for greater transparency in government contributions versus industry payments. There is broad industry support for the principle of cost recovery, but scepticism remains within some areas of industry about the responsiveness of PIRSA to industry needs and the current effectiveness of a range of cost-recovered activities, particularly in mature sectors such as tuna.

4. National and International Benchmarking

Most Australian jurisdictions rely primarily on various lease and licence fees, with limited direct cost recovery for science and compliance. Tasmania's recent shift to full cost recovery in the salmon sector offers valuable lessons. Internationally, cost recovery models vary widely, with some countries implementing resource rent taxes or partial cost recovery linked to industry maturity and the diverse public benefit objectives of each jurisdiction.

Conclusion

South Australia's aquaculture cost recovery framework is generally fit-for purpose, but like other national and global aquaculture jurisdictions, faces challenges in adapting to sectoral issues, technological advances, environmental changes and evolving stakeholder expectations.

The review's recommendations aim to enhance the effectiveness, efficiency, and equity of science and compliance programs, underpinning sustainable industry growth and public trust. Implementation of these priorities will require close collaboration between PIRSA, industry, and research partners via the CRIC. They will also require a review of current appropriations for aquaculture management relative to industry contributions as part of the PIRSA response to this review, and as part of the overall approach of government and industry to harmful algal bloom (HAB) recovery.

Summary of Recommendations

The recommendations outlined in this review target specific opportunities for improvement of current practices and are collectively designed to both improve the cost recovery settings and mitigate specific ESD risks for future marine aquaculture development and operations in South Australia.

To guide efficient allocation of effort by PIRSA and industry, all recommendations from the report are compiled here and divided into Science, Compliance, and General Initiatives and Opportunities.

Science

1. *PIRSA to consider further the case for specifying the maximum biomass limit for tuna and finfish within a sea cage on the basis of kg/m^3 to reflect the scale of impacts on water quality.*
2. *Research on the effects of subtidal growing technologies and methodologies being used in intertidal leases on the availability of food for other filter feeding organisms, spread of pests and spawn broadcasting should be initiated.*
3. *A science program is carried out to measure primary productivity in all oyster farming areas within South Australia with the data used to develop a peer-reviewed and publicly available carrying capacity model for all growing areas. Carrying capacity is to be determined and limits set using oyster biomass.*
4. *PIRSA and SARDI to investigate use of HAB recovery funds and other funding options to maintain and further develop oceanographic models with different aquaculture sectors only contributing to specified industry-related activities through the cost-recovery process.*
5. *Aquaculture managers, scientists and industry sectors to work more collaboratively with their interstate and global peers to develop projects that would use the limited industry funds, leveraged with FRDC and state contributions to address common key aquaculture research questions.*

Compliance

6. *PIRSA expedite review of the Fisheries & Aquaculture Prosecution and Enforcement Policy (F&A P 005) to reflect both findings from recent reviews and advances in fisheries and aquaculture enforcement nationally.*
7. *When determining whether to reassign aquaculture staff (particularly front-line staff) to other duties, PIRSA assess the potential impacts on the aquaculture industry and implement mitigation measures, including communication of any changes industry should be aware of.*
8. *PIRSA adopt a more systematic and transparent approach to compliance prioritisation by developing an annual Aquaculture Risk Assessment and Prioritisation Plan (ARAPP) that considers multiple types of risks and guides the annual allocation of cost recovered compliance resources under the CRIS. The annual ARAPP should also inform and complement annual PIRSA compliance appropriations allocations.*
9. *PIRSA communications staff undertake an assessment of public use of the aquaculture register website and assess options (using cost recovered funds) to expand reporting on that register (or elsewhere) on aquaculture compliance activities.*
10. *PIRSA work with industry and certification bodies to further assess voluntary compliance and certification mechanisms and assess how to incorporate those into compliance risk assessment as a mechanism to reduce costs and promote better stewardship by aquaculture businesses. This*

should include assessment of the option to incentivise voluntary compliance via cost recovery fee reductions/offsets for businesses who meet prescribed standards.

11. *Licence holders that exceed a limit for biomass on a lease or in a zone should submit a forecast monthly operational plan (e.g. biomass, feed input, stock movement, harvesting etc) for all of their lease areas to PIRSA in each of the following two years so that potential non-compliance situations can be identified and mitigated.*
12. *PIRSA develop a SOP for Fisheries Officers to estimate oyster biomass (weight) in baskets and count the number of baskets on a lease to ensure a lease or zone is not overstocked.*

General Initiatives and Observations

13. *PIRSA should strengthen the 'Likely Management Response' statements for Moderate, High and Extreme risk ratings in the ESD risk assessment process. For example, the response "increased management activity… is strongly recommended" for risks that are ranked as Extreme is inadequate.*
14. *PIRSA (a) identify emerging aquaculture industries that may not currently be commercially ready to contribute in full to management cost recovery and (b) develop criteria for partial/full exemption or subsidy of those businesses/sectors, including the reasons and level of relief, mechanisms/conditions and time frame for subsidy/public co-investment.*
15. *PIRSA to add further details of government funding of aquaculture programs relative to industry contributions in the CRIS, on PIRSA website, etc.*
16. *PIRSA develop a succinct summary/metadata of management responses (including any no change responses) to each recommendation made in past (pre ICRRP) cost recovery reviews and post that on the relevant PIRSA webpage.*
17. *CRIC work with PIRSA and peak bodies on a communications plan to licence holders about the results of the current review, with particular attention to making clear what changes are to occur and when.*
18. *CRIC establish an aquaculture sub-committee that meets separately to the overall committee to enable aquaculture-specific issues to be addressed directly during current life of CRIC (and assess options for a subsequent aquaculture industry - government forum in future).*
19. *PIRSA and industry put forward a proposal to FRDC for a new project to better understand the expectations of South Australian residents related to cost recovery from aquaculture and how they influence the social licence.*
20. *PIRSA staff and the CRIC arrange an online meeting with their Tasmanian Salmon Management counterparts to learn more about the Tasmanian cost recovery approach, how it is being implemented and what lessons are being learned.*
21. *PIRSA conduct an annual one-day learning exchange bringing together Fisheries Officers (FOs) with Aquaculture and SARDI staff to share compliance experience and better inform FOs about key science and management approaches. An industry representative should also be invited to present their perspective(s).*
22. *PIRSA (a) engage Australian universities and/or other training providers to develop an online training program for Fisheries Officers and new staff and (b) propose a short (2 week) Fisheries Officer professional development exchange with other aquaculture jurisdictions.*
23. *PIRSA develop a policy that defines industry and government responsibilities and actions for lease rehabilitation in the event of aquaculture business failure or natural disaster. The policy would also deal with how the costs of those actions would be covered.*

24. *PIRSA employ three new Aquaculture Engagement Officers (AEOs) to deliver aquaculture education and awareness activities.*
25. *PIRSA IT staff undertake an assessment of options for improved CRM software to enable interactions with aquaculture licence holders to be better coordinated, curated and accessible across government.*
26. *PIRSA work with industry and MarineSafety SA, EPA and other key agencies to develop a more unified and user-friendly approach to marine farming debris reporting in SA and assess whether there are any off-the-shelf apps (such as Deckee) to use.*
27. *PIRSA work with Oysters SA and SISA to develop a program modelled on the NSW Responsible Oyster Training Program to enable aquaculture workers to better engage in responsible stewardship practices.*
28. *PIRSA develop a new base budget for cost recovered compliance and science activities for the next CRIS (beyond FY2025-26) taking into account recommendations arising from this review.*
29. *PIRSA work with industry and other stakeholders to progress the development and gazetting of the two draft Zone Policies (Franklin Harbour and Ceduna) that were initiated in 2015.*
30. *PIRSA should develop a short document that clearly describes the regulations that apply to new subtidal oyster technologies as used in (a) intertidal areas and (b) water more than 2m deep.*
31. *Lease fees for new sectors should be reduced if the area actually developed and being used for aquaculture is less than 25% of the lease area.*
32. *PIRSA, SARDI and representatives of all aquaculture sectors meet annually to discuss potential strategic cross- or multi-sector priorities and specific research projects that address current gaps and set future directions for South Australian aquaculture.*

Abbreviations

AC	Aquaculture Committee
AEO	Aquaculture Engagement Officer
AFMA	Australian Fisheries Management Authority
AFMF	Australian Fisheries Management Forum
ARAPP	Aquaculture Risk Assessment and Prioritisation Plan
ASC	Aquaculture Stewardship Council
CPI	consumer price index
CRC	Cooperative Research Centre
CRIC	Cost Recovery Implementation Committee
CRIS	Cost Recovery Implementation Statement
CRM	customer relationship management
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DAF	Department of Agriculture and Fisheries (NT)
DAFF	Department of Agriculture, Fisheries and Forestry (federal)
DCEEW	Department of Climate Change, Energy, the Environment and Water (federal)
DPIRD	Department of Primary Industries and Regional Development (NSW)
EM	electronic monitoring
EPA	Environment Protection Authority (SA)
ESD	ecologically sustainable development
FAO	Food and Agriculture Organization of the United Nations
FRDC	Fisheries Research and Development Corporation
FOB	flow of benefit
FTE	full time equivalent
GSA	Guidelines for Sustainable Aquaculture
GSP	gross state product
GVP	gross value of production
HAB	harmful algal bloom
ICRRP	Independent Cost Recovery Review Panel
IMAS	Institute for Marine and Antarctic Studies
IMTA	integrated multitrophic aquaculture
IPA	industry partnership agreement
LEP	Lower Eyre Peninsula
NAS	National Aquaculture Strategy
NFP	National Fisheries Plan
NRE Tas	Tasmanian Department of Natural Resources and Environment
PIRSA	Primary Industries and Regions South Australia
RAC	research advisory committee
RD&E	research, development and extension
SAOGA	South Australian Oyster Growers Association
SARDI	South Australian Research and Development Institute
SASQAP	South Australia Shellfish Quality Assurance Program
SIA	Seafood Industry Australia
SISA	Seafood Industry South Australia
SLA	service level agreement
TACC	total allowable commercial catch

TEPS	threatened, endangered and protected species
WQGV	water quality guidelines values
ZBB	zero-base budget

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1.0 Introduction

1.1 Project Context and Purpose

South Australia is one of Australia's leading aquaculture-producing states, with an estimated total value of production from all sectors of $264.4 million (M) in 2022-23. South Australian aquaculture has a reputation for producing safe, sustainable, high quality and high-value seafood products within a mature and comprehensive regulatory framework. That framework is overseen by the Department of Primary Industries and Regions (PIRSA) who work closely with other South Australian and national agencies to coordinate fisheries and aquaculture management and deliver the vision of the Seafood Growth Strategy for South Australia (2021-31).

PIRSA Fisheries is charged with the ecologically sustainable development (ESD) of the South Australian seafood industry, through the administration of *Fisheries Management Act 2007* and the *Aquaculture Act 2001*. Key activities include the development, implementation and review of legislative and policy frameworks for the South Australian fisheries and aquaculture sectors. They require conservation and management measures are implemented to protect aquatic resources from overexploitation and ensure aquatic resources are not endangered. The legislation also requires aquatic resources to be managed in an efficient and cost-effective manner and that targets are set for the recovery of management costs.

South Australia has the longest running (~20 years), most comprehensive, mature and transparent processes for aquaculture cost recovery amongst all Australian jurisdictions. South Australia was a pioneer in aquaculture cost recovery at the State level. It is one of the few jurisdictions globally that transparently and systematically reports on the scope, level and outcomes from industry contributions to the overall costs of management of aquaculture operations in publicly owned and managed marine areas. Despite the rapid growth of aquaculture in other Australian jurisdictions over the past decade, it was only recently that a second state (Tasmania) introduced a comprehensive form of activity-based cost recovery. Most other states have some level of cost recovery through aquaculture permits, licence and/or lease fees, levies and, in some cases, performance bonds.

One of the hallmarks of the South Australian cost recovery policy is a commitment to regular review. Past reviews were undertaken in 2009, 2015, 2018 and 2023. The latter review triggered a commitment to further benchmarking including this review of aquaculture compliance and science programs. This review was undertaken in parallel with two similar benchmarking reviews of fisheries science and compliance. These reviews were all under the oversight of a newly established Cost Recovery Implementation Committee (CRIC) which brings together senior government and industry stakeholders.

The review outputs will inform future cost aquaculture compliance and science recovery settings. The current Cost Recovery Implementation Statement (CRIS) (FY2025-26) is operating under transitional arrangements pending the outcomes of this review (and related fisheries reviews).

1.2 Scope of Review

Building on the Report of the Independent Cost Recovery Review Panel (ICRRP; McCallum et al 2023) a CRIC was formed to oversee implementation of the next stages of cost recovery benchmarking. Four benchmarking projects were commissioned to independently review cost recovery mechanisms for science and compliance across both the fisheries and aquaculture sectors. The benchmarking exercises sought to ensure the appropriateness and cost-effectiveness of compliance and science services across aquaculture as a whole, and at the individual sector level.

The Terms of Reference for the two aquaculture projects considered in this report are outlined in Annex A. Their key foci were:

A. Aquaculture Compliance

(a) Sector Review: The initial benchmarking phase will focus on the marine (in-sea) aquaculture sector broadly and then identify individual sector needs for the oyster, mussel, finfish, southern bluefin tuna, and marine abalone sectors.

(b) Review of Current Compliance Program: Assess the effectiveness, efficiency, and cost structure of existing compliance measures within aquaculture, including routine monitoring, audits, rehabilitation and enforcement. Determine if the current compliance activities are appropriate, risk-based, and effective across the aquaculture sectors. Recommend a sustainable and risk-based compliance model that balances regulatory effectiveness with financial viability for industry stakeholders

(c) Digital Transformation Opportunities: Assess the potential of transitioning to or enhancing digital tools, and their impact on compliance costs and processes

(d) Stakeholder Engagement: Where required, consult with key stakeholders, including aquaculture lease and licence holders, commercial industry bodies, and PIRSA, to gather input on current compliance challenges and potential improvements

(e) Benchmarking with External Jurisdictions and Peers: Compare South Australia's compliance framework with other jurisdictions to ensure adoption of best practices

B. Aquaculture Science

(a) Sector Review: The initial benchmarking phase will focus on the marine (in-sea) aquaculture sector broadly and then identify individual sector needs for the oyster, mussel, finfish, southern bluefin tuna, and marine abalone sectors.

(b) Review of Current Science Program: Assess the effectiveness, efficiency, and cost structure of existing aquaculture science programs delivered by South Australian Research and Development Institute (SARDI), including environmental monitoring, and supporting science. Determine if the current science activities are appropriate, risk-based, and effective across the aquaculture sectors

(c) Technology Integration: Identify opportunities to integrate modern technologies into science activities to improve outcomes.

(d) Stakeholder Engagement: Where required, consult with key stakeholders, including aquaculture lease and licence holders, commercial industry bodies, science organisations, and the Department of Primary Industries and Regions South Australia (PIRSA), to identify science priorities, and improvements without compromising scientific integrity or sustainability goals.

(e) Benchmarking with External Jurisdictions and Peers: Compare science frameworks with other jurisdictions and international standards to ensure competitiveness, adoption of best practices, and cost-efficiency.

The Terms of Reference also outlined specific activities that were excluded from the cost recovery reviews for both science and compliance. Specific exclusions included:

- Food safety (i.e., South Australia's Shellfish Quality Assurance Program)
- Inland aquaculture activities (including land-based abalone aquaculture)
- Seaweed farming
- Aquaculture Zone Policies

These exclusions were the subject of some commentary by stakeholders consulted during this project. They also posed some challenges for the team in terms of being able to understand the full picture of cost recovery and compare the relative efficacy of "in scope" cost recovery activities relative to "out of scope" costs that are also subject to cost recovery.

This was especially notable in the context of the South Australia Shellfish Quality Assurance Program (SASQAP) and nascent seaweed farming activities - stakeholders consulted during this consistently sought to comment on these even when it was pointed out that they were out of scope for this review. It is also notable that some of the focal sectors for this review (e.g., abalone) also have a land-based component that the review did not consider.

In addition to the formal Terms of Reference, benchmarking project teams were provided with additional guidance on project scope and approach in a letter from PIRSA on 16th June 2025 which identified the following "*key focus areas for the benchmarking*":[1]

- Cost recovery boundaries: maintain focus on appropriateness, efficiency and cost effectiveness—not on recalibrating cost-sharing or new recovery streams; flag public-good costs (e.g., climate change, biosecurity) and their implications
- Technology adoption: review new technology (e.g., electronic monitoring), distinguish initial set-up costs (often government-led) from ongoing running costs (industry)
- Barriers to change: identify regulatory, management-plan or process barriers (e.g., assessment methods, transferability rules) that might impede science and compliance innovation

[1] *Note*: some of these focus areas (e.g., Harvest Strategies) are more relevant to commercial fisheries benchmarking than aquaculture and so the approach applied has been adjusted accordingly (in consultation with the CRIC).

- Flexible management arrangements: evaluate multi-year total allowable commercial catch (TACC), carry-over/carry under provisions—note both benefits and associated risks under the risk–catch–cost principle[2]
- Harvest strategy and TACC levels: apply the risk–catch–cost principle to flag fisheries where TACs may drive disproportionate costs
- Long-term price expectations: include in final report a discussion on industry's capacity to pay under future scenarios of falling prices and rising costs (note that after further consultation with the CRIC in October, this item was subsequently deleted from the requirements)

1.3 Review Methods and Limitations

Table 1.1 below summarises the principal activities undertaken by the project team to address the formal Terms of Reference and additional requirements from the CRIC.

Table 1.1: Aquaculture Cost Recovery Project Activity Timeline.

Month	Key Activity
May/June	- Contracting and initial liaison with PIRSA and Seafood Industry South Australia (SISA) - Initial work planning and project inception meeting in Adelaide
July	- Review of SA Cost Recovery policies, past benchmarking exercises, etc. - Assessment of available global and national cost recovery information - Design industry survey in consultation with industry and PIRSA - Design national benchmarking survey in consultation w/ PIRSA
August	- Online meeting(s) with industry, PIRSA and CRIC - Conduct national benchmark survey - Conduct SA aquaculture industry survey - Undertake global aquaculture case studies
September	- Industry meetings online and in Adelaide, Port Lincoln, Coffin Bay and Cowell and debrief w/ CRIC/PIRSA - In person and online meetings with PIRSA and SARDI staff and follow up industry engagement - Synthesis of survey results with other data, published information, etc. - Engagement with lead project synthesis consultants (IC & KS) - Ongoing briefing meetings with CRIC, SISA members and with PIRSA staff
October	- Data analysis and fact checking with government and industry - Report drafting - Draft report to lead project synthesis consultants (IC & KS) for review
November	- Presentation of Draft report and headline findings to CRIC - Further engagement with industry and government on feedback - Review of draft report by lead project synthesis consultants (IC & KS)

[2] The risk-catch-cost principle is well established in fisheries management but has limited historical application in aquaculture management; for this project the review team used the national ESD risk assessment framework that PIRSA applies in assessing and permitting aquaculture projects in various localities – see Section 2.4.

December	- Engagement with lead project synthesis consultants (IC & KS) - Presentation of final recommendations and discussion with CRIC - Editing and submission of Final report

As indicated in the Table, over the course of the project, the project team pursued four main lines of data gathering:

1) Review of available literature related to aquaculture cost recovery in South Australia
   As indicated throughout this report, South Australia has by far the most comprehensive suite of policies, processes, data and performance reports of all Australian jurisdictions involved in aquaculture cost recovery. The record of aquaculture cost recovery data and activities generated by government is extensive and is supplemented by numerous review processes, including a series of independent reviews of cost recovery that provide a helpful paper trail of issues and policy evolution over the past 20 years. This extensive literature required a significant level of analysis and cross checking so that the team could better understand how issues have evolved, gaps in understanding and what options for reform may be workable.

2) Direct engagement with key industry stakeholders
   Consistent with the Terms of Reference, and to better understand the contemporary dynamics of industry views on cost recovery, the team met on multiple occasions with sector leaders and growers/members and with industry representatives (frequently as part of the CRIC process) on numerous occasions. A survey was undertaken of licence holders (see Annex C) and was supplemented by interviews with peak body representatives and with individual growers in the Port Lincoln, Cowell, and Coffin Bay areas during an extended field trip to Adelaide and the Eyre Peninsula in September 2025. Meetings were also held with industry representatives in Adelaide and online and as part of the CRIC process throughout the project. That engagement was a critical part of this review as it helped the review team better understand contemporary perspectives on cost recovery.

3) Ongoing engagement with PIRSA
   This included weekly calls and emails with PIRSA/SARDI aquaculture staff (management, research, operations, and compliance) to obtain and discuss data as well as conduct several in person and online meetings with senior staff in Port Lincoln and Adelaide to better understand available data (and gaps), approaches to current cost recovered activities and discuss options for reform.

4) Engagement with peer organisations in other Australian and international jurisdictions
   These engagement activities included a survey of all State aquaculture agencies and discussion of specific issues and options with national experts in biosecurity, compliance, cost recovery, research and global aquaculture. The review team also reached out through a range of professional networks to aquaculture researchers, regulators and certification agencies in

Scotland, Norway, the USA and New Zealand to obtain insights into contemporary cost recovery practices.

It should be noted that despite the concerted efforts of the team to obtain up-to-date information from local, national and global sources, this information was not always readily available at short notice. For example, although there are published fee schedules for permits and licences and occasionally collated estimates of the level(s) for some types of cost recovery in each Australian state, these data are generally not as well described as South Australian data. The benchmark data are also not as well supported by sufficient metadata to properly understand their context, limitations and confidentiality. These data limits reduced the extent to which the review team could provide the desired level of benchmarking insights in the time available.

In a similar manner, as noted above, the exclusion of land-based abalone, seaweed aquaculture and food safety related aquaculture activities in the Terms of Reference, while understandable in terms of review focus, limited the reviewers' ability to fully assess cost recovery considerations within an aquaculture supply chain or "whole of production" context. This included various issues related to aspects of cost recovery in the oyster and abalone sectors that were raised by some industry members during consultations.

The review team's stakeholder engagement activities also revealed additional issues related to cost recovery that extend well beyond the scope of science and compliance. It was evident that in many cases, industry stakeholders do not see aquaculture cost recovery as a series of discrete cost activities, but, often as an inter-related and indivisible body of charges. In such discussions, it was occasionally difficult to tease apart views on compliance or science relative to other recovered costs including the two largest categories of aquaculture cost recovered income – (a) Licensing, Business and Data and (b) Management and Legislation which together represent 57% of all cost recovered income in FY2025-26 (see Section 3.0).

Not surprisingly, the review team also addressed the inevitable overlap between compliance and science activities. While these programs are separated for operational and budget purposes in the annual CRIS, in Sections 5 and 6 the reviewers note that there is often a need for closer integration of these activities in program design and delivery. A final, and notable limitation of this review process was that it coincided with the intensive efforts of government, industry and community to address the unprecedented harmful algal bloom (HAB) event occurring in South Australian waters.[3] The review team is appreciative of the efforts made by all affected stakeholders to engage in this process given the operational demands and challenges posed by HAB response activities.

[3] PIRSA HAB Algal bloom situation update - PIRSA

2.0 Aquaculture in South Australia

2.1 Aquaculture in Australia

Aquaculture has become a cornerstone of Australia's seafood industry, generating an estimated $2.31 billion in gross value from 2024 to 2025—accounting for 58% of the total value of the national fisheries and aquaculture sector. The industry is driven by high-value species such as salmonids, southern bluefin tuna, oysters, prawns, and barramundi, with over 40 species farmed commercially across diverse environments.[4]

As indicated in Figures 2.1 and 2.2 (both from the Department of Agriculture, Fisheries and Forestry (DAFF) 2025[5]) there has been significant growth in aquaculture production and ongoing diversification of the "species mix" of aquaculture production in Australia. Tasmania leads the nation in aquaculture production value, primarily due to its large salmon farming industry. South Australia (tuna, finfish and oysters) and Queensland (dominated by recent rapid growth in prawn production) follow. The next "production tier" of states includes Western Australia, Queensland, and New South Wales, while Victoria and the Northern Territory have much smaller but growing aquaculture sectors.

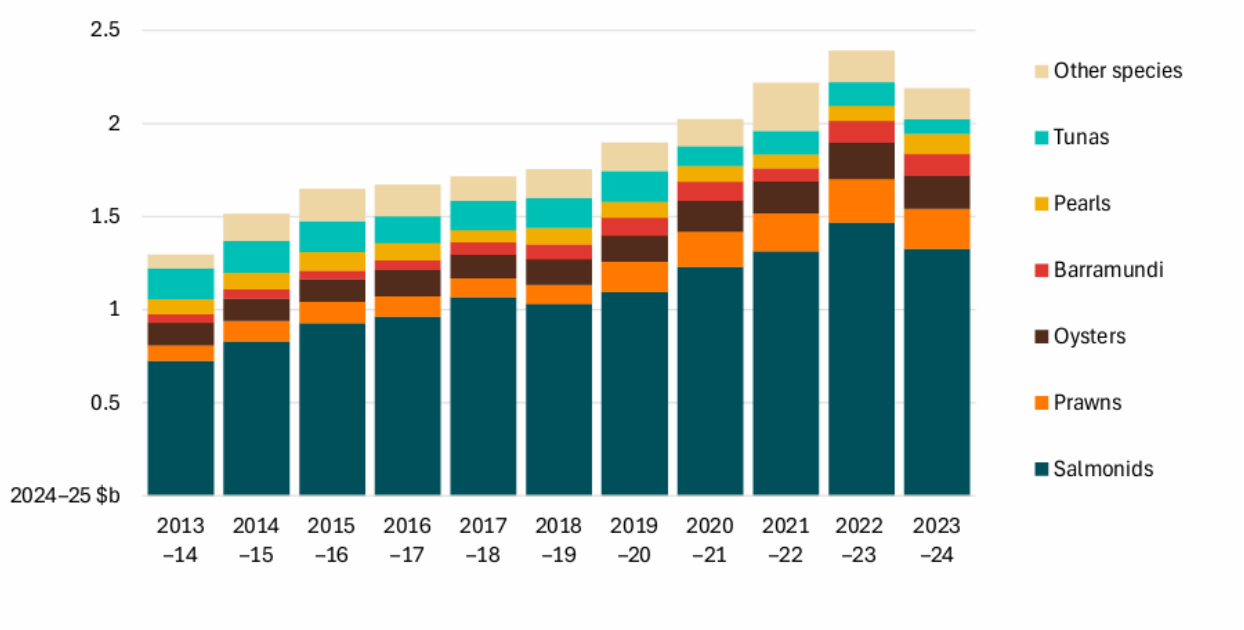

Figure 2.1 Changes in Gross Value of Australian Aquaculture by Species 2014-2024.

[4] DAFF 2025 Australia's Aquaculture industry - DAFF
[5] ABARES 2025 Fisheries and aquaculture statistics 2024 - DAFF

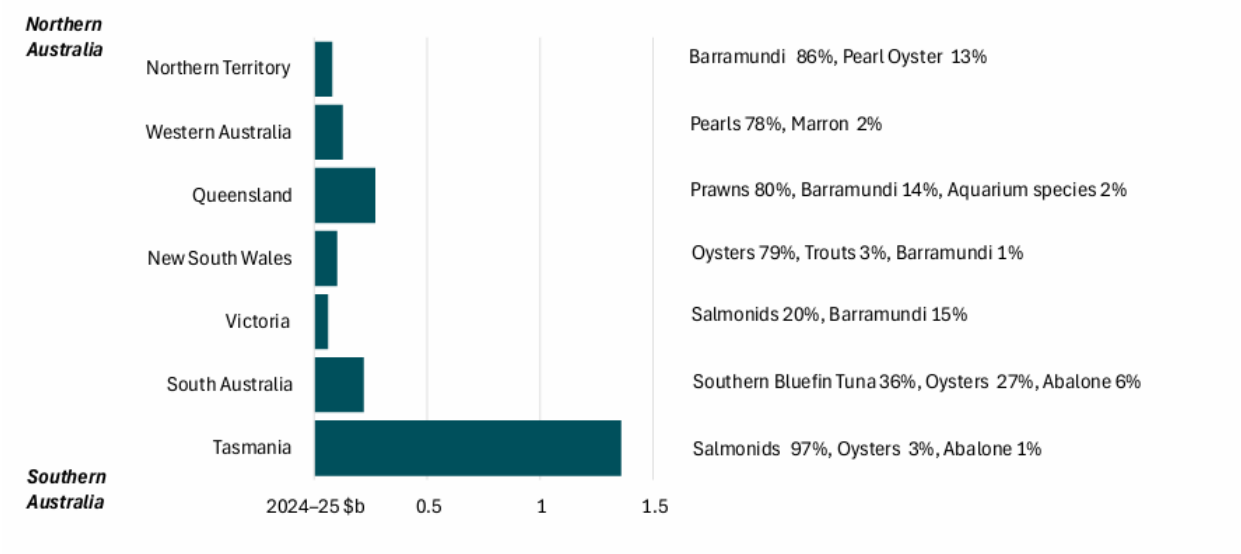

Figure 2.2: Real GVP of Aquaculture Production by State 2023/24.

Australia aquaculture is governed by a complex and growing set of regulations at all three levels of government. A National Aquaculture Strategy (NAS) was launched in 2017.[6] The NAS was Australia's first comprehensive plan to guide the development of aquaculture at a national scale. The NAS outlined 35 actions grouped under eight priorities that were collectively designed to achieve an annual aquaculture production target of $2 billion a year by 2027-28.

Over the past eight years of NAS implementation significant developments have occurred in Australian aquaculture, including a scaling up of aquaculture production in all jurisdictions and diversification of species grown. Significant private and public investments (often under specific co-investment arrangements[7]) in sustainable practices, biosecurity, and technological innovation have underpinned much of the industry's growth. As a consequence of this accelerated growth and investment, the annual production target for the NAS was achieved in 2021-22 ($2.07 billion gross value of production). The sector is projected to grow to nearly $3 billion by 2030, with continued expansion in land-based and offshore systems and increasing consumer preference for sustainable Australian produced seafood.[8]

The NAS forms part of a much larger body of aquaculture plans, policies, and regulatory instruments that have now been developed by Australian Government agencies, industry bodies and state and territory jurisdictions. A recent review[9] identified 37 aquaculture-related plans and key policy or institutional initiatives that existed just before the NAS was introduced, that

[6] DAFF National Aquaculture Strategy - DAFF
[7] This is especially important via the Fisheries Research and Development Corporation and various Cooperative Research Centres such as the Blue Economy and Marine Bioproducts CRCs which all operate under various co-investment models.
[8] IBIS 2025 Aquaculture in Australia Industry Analysis, 2025
[9] Dutton Ian *in press* 2025 Review of the National Aquaculture Strategy, Report for Department Agriculture, Forestry and Fisheries (DAFF).

overlapped with design and implementation of the NAS or have been developed subsequent to the launch of the NAS. These are supplemented by an even broader range of research and development, industry, and sectoral plans and processes (from global conventions to industry certification). These cover global to local scales and overlap with various aspects of the NAS. This expansion of aquaculture governance frameworks is relevant to South Australia as there are now more agencies and levels of government actively involved in aquaculture regulation which adds to the complexity of permitting and operational management and costs.

Various technical, socio-economic, and environmental challenges to aquaculture also persist. These include global market competition, climate change and variability, disease outbreaks, and labour shortages. Export values have declined slightly for some sectors due to global competition, but domestic demand remains strong, especially for premium, sustainably farmed seafood. There is also increased competition for ocean space, especially in nearshore waters, increased industry concern about regulatory costs and burdens and growing public concern about the environmental and animal welfare impacts of aquaculture production. The latter is often referenced as "social licence", and there have been various recent initiatives to understand how this relates to aquaculture governance and industry development options in Australia (Alexander and Abernethy, 2019; Breakey, 2022; Cooper et al., 2023). These, and related issues, are a key focus of the Seafood Industry Australia Aquaculture Action Plan.[10]

There is a national debate about the future of seafood production in Australia and the sustainable use of Australia's oceans. There are two Australian processes addressing these issues currently: (a) the Futures of Seafood[11] which is co-led by Seafood Industry Australia and the Blue Economy Cooperative Research Centre (Blue Economy CRC), and (b) the National Sustainable Ocean Planning process led by the Australian Government Department of Climate Change, Energy, the Environment and Water (DCCEEW).[12] There are also, as noted later in this report, a wide range of international processes and schemes designed to address more sustainable seafood production from aquaculture.

2.2 Aquaculture Regulation, Strategy and Management in SA

PIRSA has responsibility for managing South Australia's fisheries and aquaculture resources in accordance with the *Fisheries Management Act 2007* and the *Aquaculture Act 2001*. Both Acts were established to protect, manage, and develop the aquatic resources of the state so it:

- Is ecologically sustainable
- Maximises returns to the South Australian community

[10] Seafood Industry Australia (SIA) 2024 Aquaculture Advisory Committee – Seafood Industry Australia
[11] SIA 2025 Futures of Seafood – Blue Economy CRC
[12] DCCEEW Sustainable Ocean Plan – DCCEEW

Those Acts establish the legal basis for the various regulations, policies, and processes which collectively govern fisheries and aquaculture management in South Australia.[13]

The *Aquaculture Act 2001* establishes the broad framework for the regulation of aquaculture in South Australia by:

- Defining aquaculture as the farming of aquatic organisms for the purposes of trade, business or research
- Authorising aquaculture by setting the parameters within which it can occur
- Enshrining the principle of ecologically sustainable development (ESD)
- Providing for marine spatial planning for the future of the aquaculture industry through the development/review of aquaculture zone policies
- Maintaining requirements for aquaculture leases and licences.

Importantly in the context of cost recovery, the objects of the *Aquaculture Act 2001* are to:

- Promote ecologically sustainable development of marine and inland aquaculture
- Maximise the benefits to the community from the state's aquaculture resources
- Ensure the efficient and effective regulation of the aquaculture industry.

Under the *Aquaculture Act 2001*, aquaculture development is ecologically sustainable if it is managed to ensure that communities provide for their economic, social and physical well-being while— (a) natural and physical resources are maintained to meet the reasonably foreseeable needs of future generations; (b) biological diversity and ecological processes and systems are protected; and (c) adverse effects on the environment are avoided, remedied or mitigated.

The Act requires that in making decisions as to whether development is ecologically sustainable or to ensure that development is ecologically sustainable long-term and short-term economic, environmental, social and equity considerations should be effectively integrated. If there are threats of serious or irreversible environmental harm, lack of full scientific certainty should not be taken to justify the postponement of decisions or measures to prevent the environmental harm.

The *Aquaculture Act 2001* is complemented by a range of regulations, policies and strategies. Notable amongst these is the SA Seafood Growth Strategy 2021-31[14] which outlines goals and initiatives under seven pillars that will guide future aquaculture growth and development (both as a sector and within an overall integrated approach). Key elements of this strategy for aquaculture are outlined in Table 2.1 below.

[13] See Policy and legislation for aquaculture - Department of Primary Industries and Regions South Australia - PIRSA
[14] PIRSA Seafood Growth Strategy for South Australia 2021 to 2031

Table 2.1: Aquaculture Goals Related to Cost Recovery Under SA Seafood Growth Strategy 2021-31[15].

Pillar	Goal	Key Initiatives
1. Support Unity and resources	Increased co-management	Review co-management approaches to fisheries and aquaculture management – e.g., Work with the State Government to develop new management and governance structures for fisheries and aquaculture
	Creation of an investment environment	Review and work to reduce regulatory framework to attract new investment and strengthen investment certainty.
2. Seafood Products and Innovation	Increase volume and value of SA Seafood	Review new opportunities for land-based aquaculture and integrated multi-trophic aquaculture to build supply of new and existing species.
	Grow Aquaculture	Drive growth and development • Identify new market opportunities. • Identify new species and supporting RD&E priorities. • Identify new formats—packaging and presentation • Reduce regulatory framework to attract new investment. • Understand the value proposition for global markets and investment. • De-risk by increasing the knowledge and development of target species.
3. Security of Access and Investment	A well-managed marine environment. Efficient regulatory framework that is flexible and transparent	Review the current Fisheries Management Act 2007 (the Act) to ensure a more flexible management environment, to reduce red tape, and increase industry and PIRSA efficiency and reduce costs. Work towards a transparent cost recovery, regulatory management and review system.
4. Industry Promotion and Communication	Seafood industry is trusted and engages well with the public, including recreational fishers, and social licence is maintained	• Foster community support through messaging based on sustainable production and good management, health benefits, disease free product and environment, and socio-economic benefits for regional coastal communities and the state generally. • Ensure the industry understands social licence/community trust.
6. Research Development and Extension	The seafood industry has a South Australian based industry levy, which supports seafood growth RD&E initiatives	Review a range of primary industry levy fund programs and instigate a program to support the South Australian seafood sector. Review the national models and models proposed through the Australian Seafood Cooperative Research Centre (CRC), Australian Wild Abalone and Love Australian Prawns. Ensure they complement national levy collection schemes and are cross-sector where possible.
7. Technology Adoption and Innovation	Technology and innovation used for efficiency and productivity gains	Review and implement new technologies to drive efficiencies in seafood businesses e.g., Scope national/international food technology initiatives, such as the use of robotics or innovations to gain efficiencies in product development, delivery and efficiency.

[15] Note that especially relevant initiatives to this review are underlined for emphasis.

Delivery of legislation, strategy and policies relevant to aquaculture is undertaken primarily by business units under the Fisheries and Aquaculture Division of PIRSA and in conjunction with other Divisions, particularly SARDI, Biosecurity and Corporate services. Aquaculture staff also work closely with other key aquaculture regulatory agencies such as the South Australian Environment Protection Authority (EPA) on both an ongoing and as needed basis. The importance of this ability to engage with the seafood industry (and the broader community) across the whole of government on matters that affect aquaculture, and the health of marine environment more generally, was well demonstrated during the course of this review as the South Australian government dealt with an unprecedented HAB event.[16] Further details on regulation and management that are relevant to aquaculture cost recovery are presented in Section 3.0.

2.3 Development of Aquaculture in South Australia

South Australia is well-suited to various forms of aquaculture in both marine and freshwater environments by virtue of both its diverse environmental conditions and favourable climate for temperate to subtropical species, strong research and development capabilities, well-established fisheries businesses (and related infrastructure and supply chains), and a clear and consistent State government commitment to the sustainable development of primary industries.

There has been a long history of marine and freshwater aquaculture activities in South Australia, including diverse First Nations engagement in aquaculture and related practices such as fish farming throughout southern Australia.[17] As Nell (2001) notes, flat oyster (*Ostrea angasi)* harvesting and farming commenced in South Australia in the late 1800s and was the forerunner of modern oyster farming, which has been a leading primary commercial aquaculture business in South Australia since the 1970s. Annex F provides a brief overview of how aquaculture has developed in South Australia over the past 30 years to provide context for how cost recovery has also evolved.

2.3.1 Production and Value

Figure 2.3 provides an overview of trends in South Australia's aquaculture production and value over the past 25 years. These data are generated annually by BDO EconSearch[18] using PIRSA Fisheries and Aquaculture production returns as reported by South Australian aquaculture licence holders. They form a key part of a comprehensive and long-term reporting system that draws from both grower and government data sets to provide a snapshot of industry activities and trends which in turn informs regulatory settings and initiatives such as the current review.

[16] See Algal Bloom Update
[17] Shamsi et al. 2020 An Introduction to Aboriginal Fishing Cultures and Legacies in Seafood Sustainability
[18] BDO EconSearch 2024 SA_Aquaculture_Economic_Report_2023_24.pdf

As per the Terms of Reference, the review focus is on the following sub-sectors of South Australia's marine aquaculture industry:[19]

Southern Bluefin Tuna

In 2023/24, the tuna sector produced over 7.2 million kilograms of fish valued at just under $77 million (Table 2.2). While production volume declined by 9% from 2022/23 to 2023/24, the production value dropped disproportionately by 36%.

Finfish (currently exclusively Yellowtail Kingfish)

The finfish sector produced just over 3 million kilograms of Yellowtail Kingfish in 2023/24 valued at ~$52 million. Similar to, but not as starkly, as the tuna sector, the finfish sector experienced a disproportionate decline in production value (-13%) compared to the decline in production volume (-6%) from 2022/23 to 2023/24.

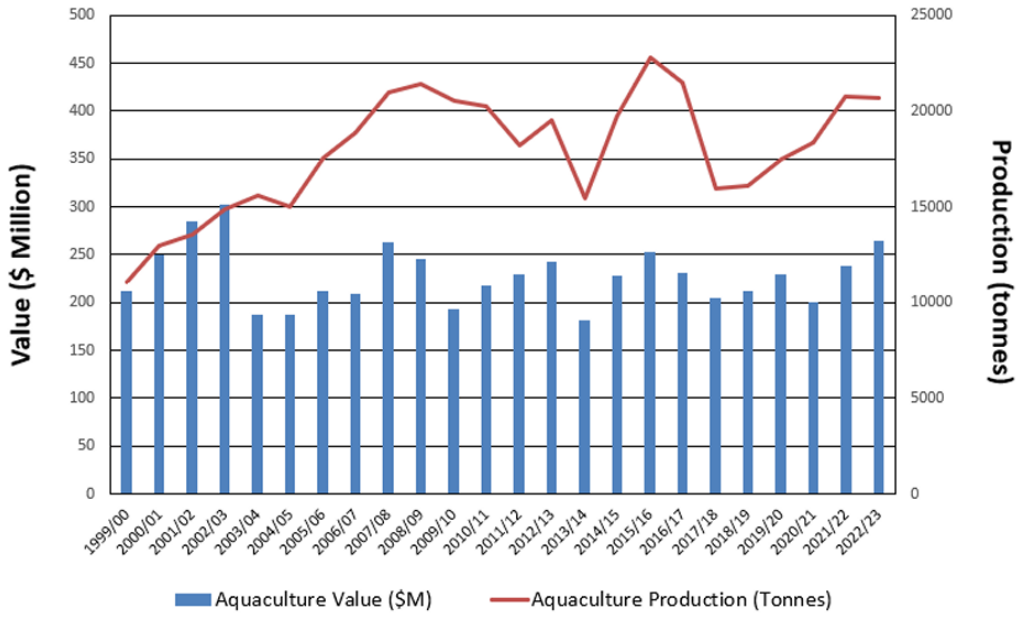

Figure 2.3: South Australia aquaculture production (t) and value ($M) from 1999/00 to 2022/23.[20]

[19] Per the Terms of Reference for this project, we exclude the land-based production components of species such as abalone and marine algae.

[20] PIRSA 2024 Zoning in - South Australian aquaculture report 2024

Oysters

The oyster sector produced 5.2 million kilograms of adult harvest valued at just under $55 million in 2023/24. Production volume declined by 9% and production value declined by 7% from 2022/23 to 2023/24.

Mussel

The mussel sector produced ~2 million kilograms valued at $4.6 million in 2024/2024. Production volume and value were down 13% and 9%, respectively, from 2022/23.

Marine Abalone

Land-based and marine abalone production are combined in South Australia's aquaculture statistics. In 2023/24, the two sectors produced ~2 million kilograms of abalone valued at over $12 million. Despite a 10% drop in production volume, the sector saw a 10% increase in production value from 2022/23 to 2023/24.

Table 2.2: Aquaculture production and value of production by species, South Australia, 2022/23 and 2023/24.[21]

	Weight ('000kg)			Value ($m)		
	2022/23	2023/24	Change	2022/23	2023/24	Change
Southern Bluefin Tuna	8,000	7,261	-9%	120.00	76.97	-36%
Yellowtail Kingfish	3,354	3,141	-6%	59.90	52.08	-13%
Oysters						
adult[a]	5,748	5,207	-9%	58.84	54.82	-7%
on-grown[b]	724	761	5%	2.62	2.87	10%
spat[c]	-	-	-	6.43	7.84	22%
Mussels	2,318	2,007	-13%	5.10	4.62	-9%
Abalone[d]	382	345	-10%	11.18	12.28	10%
Freshwater Finfish	292	297	2%	4.93	4.72	-4%
Marron and Yabbies	3.0	2.4	-20%	0.15	0.14	-11%
Macroalgae[e]	-	0.2	-	-	0.01	-
Other[f]	577	541	-6%	4.33	4.05	-6%
Total[g]	20,673	18,801	-9%	264.44	209.68	-21%

[a] The weight for adult Oysters is an approximation on the basis that a dozen Oysters weighs one kilogram.

[b] The volume of production for on-grown Oysters is shown in '000s of dozens. The volume and value of juvenile Oysters sold for on-growing are excluded from the total volume and value of aquaculture as it is considered an input to production for the final sales of adult Oysters.

[c] The value of spat is also excluded from the total. All spat grown in SA was sold in SA (i.e. no spat grown in SA was exported to other states) and is considered an input to production for the final sales of adult Oysters.

[d] Abalone produced from marine and land-based aquaculture sites, i.e. the data represent species not class of licence.

[e] Includes both land-based and marine production.

[f] Other aquaculture production in 2022/23 and 2023/24 was mostly comprised of land-based Microalgae and Goldfish production.

[g] Totals may not sum due to rounding.

[21] BDO SA_Aquaculture_Economic_Report_2023_24.pdf

Full details of current production methods for these species, changes over time and issues experienced is provided in the PIRSA *Zoning In* Report series[22] with supporting and more granular information on aquaculture economics at the sector, statewide and regional levels available in the annual BDO EconSearch reports. In sections 5 and 6 we address the more specific context for compliance and science activities in each of the aquaculture sectors.

Integrated Multitrophic Aquaculture (IMTA)

There is growing interest in Integrated Multitrophic Aquaculture (IMTA) as a new production system that directly or indirectly complements other farmed species. For example, in 2022, SARDI—in partnership with Dinko Tuna Farmers—secured funding from Agrifutures Australia under an Emerging Industries Grant for the project "Sustainably sourced natural colour pigments from cultivated native marine macroalgae for the plant-based meat industry". This project was completed in June 2023 and is being scoped into a project for the establishment of a pilot plant.[23] While the marine algae sector is beyond the scope of this review, it is notable that there some 48 farmers who have added algae to their licences.

PIRSA also recently approved a Tuna licence holder to collect naturally occurring seaweed (biofouling) on floating longlines (similar farming structures to the Mussel sector) located adjacent to Tuna cages for on growing and harvesting. Cultivating seaweed next to Tuna or Finfish farms may provide significant environmental benefit through the assimilation of nitrogen, carbon, and phosphorus that is produced from these farms. Furthermore, the recently updated Lower Eyre Peninsula (LEP) aquaculture zone now considers nutrients offsets within an IMTA framework to support regenerative and nature positive aquaculture in the region.

2.3.2 Employment and Regional Economic Impacts

In 2022-23, aquaculture's total contribution to Gross State Product (GSP) of $386.3M represented 0.27% of the total GSP for South Australia. Around 77% of the contribution to GSP was generated in regional South Australia. Direct employment was estimated to be 1,285 Full Time Equivalent (FTE) jobs (855 on-farm and 430 in downstream activities) through direct employment and 1,196 flow-on jobs, giving total employment of 2,481 FTE (BDO EconSearch, 2024).

Approximately 73% of these jobs were generated in regional South Australia, particularly the Eyre Peninsula region, reflecting the importance of Tuna, Marine Finfish, Mussel, on-land Abalone, and the majority of the states oyster farming that occurs in this region. These data reaffirm the importance of aquaculture in key regions of South Australia. Such data are sometimes used by industry and government in other jurisdictions when assessing the broader public benefits of

[22] PIRSA Zoning in - South Australian aquaculture report 2024
[23] PIRSA Zoning in - South Australian aquaculture report 2024

aquaculture and appropriate levels of service charges and resource rent, but these are not part of the South Australian cost recovery approach.

2.3.3 Marine Aquaculture Licences

The total number of active aquaculture licences in South Australia during 2022-23 reporting period was 476 of which 418 were marine sites. Included in these numbers are 6 marine maintenance sites operated by the Tuna sector for the purpose of holding and maintaining empty sea-cages. Figure 2.5 provides an overview of licence distribution by species in 2022-23. Note that the number of licence holders varies annually; as of May 2025, there were 421 marine licences (PIRSA Compliance *pers comm*.).

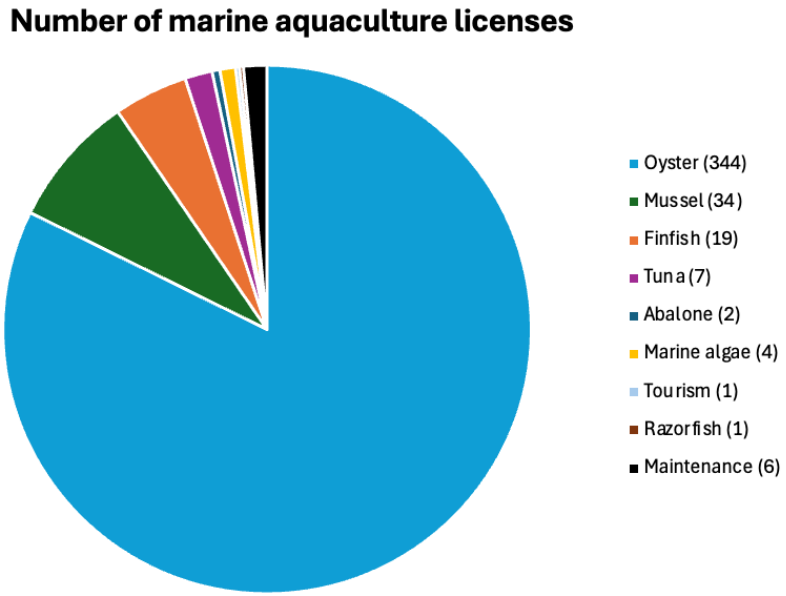

Figure 2.5: Marine aquaculture licences by species 2022/23.[24]

2.4 Aquaculture ESD and Risks

Given the emphasis of the *Aquaculture Act* 2001 on ecologically sustainable development (ESD), it is not surprising that ESD is a core and recurring element of the South Australian approach to aquaculture regulation, including risk assessment and mitigation. PIRSA requires that all applications for new licences are considered in light of a comprehensive Ecological Sustainable Development (ESD) science-based risk assessment, legislated public consultation and referrals to government agencies.

PIRSA's ESD risk assessment of applications is based on a National ESD Framework (Fletcher et al., 2004) underpinned by the Australian and New Zealand standard for risk management (AS/NZS ISO

[24] PIRSA 2024 Zoning in - South Australian aquaculture report 2024

31000:2018). During each assessment, up to 36 risk events (depending on the type of activity being proposed) are identified as relevant covering site and regional scales and are assessed using likelihood and consequence risk matrices. Results identify any required mitigation measures (e.g., additional licence conditions).[25]

As an example, the risk assessment methodology described below was used by PIRSA Aquaculture in a publicly available report for a marine aquaculture application for a new finfish licence and variation (movement of 6 existing finfish lease sites) within the Fitzgerald Bay Aquaculture Zone.[26] Each identified risk was assigned a risk ranking.

Table 2.3 Standard likelihood levels for PIRSA ESD analysis of finfish aquaculture.[27]

Likelihood	Level	Descriptor
Remote	1	Never heard of, but not impossible
Rare	2	May occur in exceptional circumstances
Unlikely	3	Uncommon
Possible	4	Some evidence to suggest this is possible
Occasional	5	May occur
Likely	6	Is likely to occur

To determine a risk ranking for each risk event assessed, two factors were determined – the likelihood that a particular event will occur (Table 2.3) and the potential consequence of that event (Table 2.4). The likelihood and the consequence of a particular event occurring were considered independently.

Table 2.4 Standard consequence levels for PIRSA ESD analysis of finfish aquaculture.[28]

Consequence	Level	Descriptor
Negligible	0	Insignificant impacts, unlikely to be measurable at the scale of the ecosystem or community level against background variability
Minor	1	Possibly detectable but minimal impact on structure, function or dynamics
Moderate	2	Maximum acceptable level of impact (e.g., full assimilation rate for nutrients)
Severe	3	Wider, longer-term impacts detectable at the ecosystem or community level
Major	4	Serious impacts with relatively long time frame likely to restore to an acceptable level
Catastrophic	5	Widespread and permanent/irreversible damage or loss - possibility that problem cannot be fixed

[25] PIRSA Application Assessment Process – Finfish farming in Fitzgerald Bay
[26] PIRSA Marine License Assessment for AQO0397
[27] PIRSA Marine License Assessment for AQO0397
[28] PIRSA Marine License Assessment for AQO0397

The combination of likelihood and consequence (actually calculated by likelihood * consequence) produce a risk value (Table 2.5), which in turn was used to determine the risk ranking and the appropriate response action required (Table 2.6).

Table 2.5 Risk matrix assigning risk values for PIRSA ESD analysis of finfish aquaculture. The risk values are colour coded according to the risk rankings.[29]

Risk Value		**Consequence**					
		Negligible	Minor	Moderate	Severe	Major	Catastrophic
Likelihood		0	1	2	3	4	5
Remote	1	0	1	2	3	4	5
Rare	2	0	2	4	6	8	10
Unlikely	3	0	3	6	9	12	15
Possible	4	0	4	8	12	16	20
Occasional	5	0	5	10	15	20	25
Likely	6	0	6	12	18	24	30

Table 2.6 Risk rankings and associated required levels of management for PIRSA ESD analysis of finfish aquaculture.[30]

Risk Ranking	**Risk Values**	**Likely Management Response**
Negligible	0	Nil
Low	1-6	No specific additional management is needed but low level monitoring of the risk may be required. Any current management should continue.
Moderate	7-12	Additional information may be needed or the issue may require monitoring. Immediate management is required but the issue should be the subject of continuous improvement.
High	13-18	Possible increase to management activities in addition to those already being applied. Needs to be monitored and any information deficiencies should be addressed
Extreme	>19	Increases in management activities in addition to those already being applied are strongly recommended

Recommendation 1: ***PIRSA should strengthen the 'Likely Management Response' statements for Moderate, High and Extreme risk ratings in the ESD risk assessment process. For example, the response "increased management activity... is strongly recommended" for risks that are ranked as Extreme is inadequate.***

[29] PIRSA Marine License Assessment for AQOO397
[30] PIRSA Marine License Assessment for AQOO397

Table 2.7. Risk ranking values for South Australian marine aquaculture sectors (averaged from independently assessed scores from the review team members).

			Sector					
Risk Domain	**Risk event**	**Risk is on**	**Tuna**	**Finfish**	**Oysters**	**Mussels**	**Algae**	**Abalone**
Individual facilities	Effects of structures	habitat effects	4	8	8	8	5	5
		Alienation	0	1	1	1	1	0
		Erosion						
		Seepage						
		water flow	4	4	2	7	5	0
		Shading	4	8	7	6	1	0
		Rehabilitation	7	7	9	6	6	7
		Navigation	10	10	12	10	10	2
		Visual	4	6	8	3	3	0
Operational	Use of resource	Noise	8	8	4	3	3	1
		Escape	6	6	7	3	0	3
		chemicals and therapeutants	5	5	0	1	0	0
		entanglement or confinement	7	7	2	5	2	1
		habitat effects	11	11	16	4	6	1
		disease management	7	7	15	2	1	5
		sedimentation of wastes	7	10	0	0	0	1
		culture organism disposal	3	3	4	10	1	1
		general refuse	5	5	6	6	4	4
		Biofouling	4	9	4	7	6	1
		water quality						
		Processing	4	2	2	6	4	1
Regional effects	Water use	Nutrients						
		Sedimentation						
		chemicals and therapeutants						
		Flow						
	Ecology and biodiversity	TEPS	7	7	2	3	3	1
		sensitive habitats						
		behaviour changes						
		translocation between regions	1	4	12	1	3	11
		Phytoplankton						
		benthic communities						
	Tenure	loss of access						
		human cultural heritage areas						
		Navigation						
	Production	disease management	1	8	12	2	2	16
		disposal of waste						

Assessed as N/A by PIRSA

The review team used the methodology above to consider all the information available to them from this project to individually and independently follow the ESD assessment framework to assign

likelihood and consequence levels to the 20 risks that PIRSA Aquaculture assesses for each marine aquaculture sector. This exercise considered the whole of each sector, not individual operations, leases, zones or farming approaches, so the values obtained reflect the typical operation or lease.

The average values for likelihood and consequence levels for each risk areas were calculated, and the average scores were multiplied together and reported to the nearest integer to give the overall risk rating. The resulting colour coded average risk ranking for each risk issue for each sector is shown in Table 2.7. Note: the detailed individual sector assessment data (likelihood, consequence and risk rating) are presented later in the report (Section 6.2). The current section just has the summarised view to show how the risk areas and values differ between the different sectors.

Most of the risks were assessed as Low and Moderate. All of the applicable risk issues for Tuna, Finfish, Mussels and Algae sectors were ranked as Nil, Low or Moderate. Only three risks were assessed as High. Two of these were for the Oyster sector (habitat effects and disease management – affecting operational matters), and one was for the abalone sector (disease management – affecting regional productivity). A detailed discussion of each of these ESD analyses for each sector is given in Section 6.2.

The main purpose of the summary Table 2.7 is to identify the areas of activity for each sector that are at higher relative risk and which should be the subject of further science and/or compliance focus. At the same time, it also shows which sector(s) that could potentially receive less attention (and require less investment) because their 'business as usual' operations have lower risk rankings.

It would be interesting to see the results of a similar ESD risk analysis assessment as made by staff from PIRSA Aquaculture, PIRSA Fisheries Officers and each marine aquaculture sector, and how they compare to that shown here as well as to each other. Whilst somewhat academic, it could give some insights as to similarities and differences in perceived risk between the stakeholders that might help improve the two-way communication between them. That assessment forms part of the proposed annual risk assessment prioritisation planning process discussed in Section 5.

To their credit PIRSA already notes that the "*ESD risk assessment process currently does not consider the positive impacts of an aquaculture activity, including ecosystem services, which are more recently being documented in the literature* (Zhu et al., 2020; Naylor et al., 2021; Alleway et al., 2022; Jones et al., 2022). These positive aspects of aquaculture are increasingly being considered by regulators and the community, which better support social licence to operate."[31] Further development of the ESD analysis framework for aquaculture could include such aspects by modifying Consequences (Table 4) to have some new beneficial, as well as the existing deleterious, impacts on the environment. Such a change would be useful development to the ESD analysis methodology as it would capture more of a holistic representation of the operation or sector, but any positives are unlikely to offset the concerns of any risks that are ranked as High or Extreme.

[31] PIRSA Zoning in - South Australian aquaculture report 2024

3.0 Cost Recovery in SA Aquaculture

3.1 PIRSA Cost Recovery Policy

As outlined in the South Government submission to 2016 Productivity Commission Inquiry into Regulation of Australian Marine Fisheries and Aquaculture Sectors,[32] cost recovery is designed to ensure specific industry sectors fund the government products and services which are directly supplied to them as a result of their commercial activities derived from access to the State's community-owned aquatic resources. PIRSA has undertaken activity-based cost recovery in the commercial fishing sector since 1995 and the aquaculture sector since 2008.

One of the key elements of the overall policy framework for aquaculture management in South Australia is cost recovery. Importantly, for consistency across government, (fisheries and) aquaculture cost recovery also sits within a broader PIRSA cost recovery policy.[33] That policy has a core focus on three objectives for cost recovery:

- Improve the consistency, transparency and accountability of existing and future cost recovery arrangements, assist in establishing the appropriate levels of service delivery, and promote the efficient and equitable allocation of resources;
- Used appropriately, to improve the efficiency with which government products and services are produced and consumed by transmitting an important message to users or their customers about the cost of resources involved; and
- Improves equity by ensuring that those who use and benefit from government products and services, or who create the need for regulation, bear the costs.

The cost recovery policy adopts key principles adapted from the Australian Government Cost Recovery Guidelines,[34] and Australian Productivity Commission Reports on Cost Recovery,[35] Of note, Principle 2 of the PIRSA Policy states:

> "*Cost recovery should not be applied where it is not cost effective, where it is inconsistent with government policy objectives, or where it would unduly stifle competition or industry innovation*"

Principle 2 is worth considering in the context of the aspirations of the SA Seafood Growth Strategy and emerging developing aquaculture sectors (such as IMTA) to avoid stifling industry investment, innovation and the development of new sectors. There are relevant examples from other jurisdictions and globally where the recovery of costs for developing and emerging sectors are

[32] SA Govt. 2016 Submission 63 - Government of South Australia - Marine Fisheries and Aquaculture - Public inquiry
[33] See Corporate policies - Department of Primary Industries and Regions South Australia - PIRSA
[34] AGCF What is the Australian Government Charging Framework? | Department of Finance
[35] Productivity Commission 2001 https://dx.doi.org/10.2139/ssrn.304307

reduced or not applied to support innovation and growth and so accelerate startups,[36] This review noted there is a lack of adequate guidance currently in the PIRSA cost recovery framework in relation to the application of cost recovery to emerging aquaculture sectors.

Recommendation 2: PIRSA (a) identify emerging aquaculture industries that may not currently be commercially ready to contribute in full to management cost recovery and (b) develop criteria for partial/full exemption or subsidy of those businesses/sectors, including the reasons and level of relief, mechanisms/conditions and time frame for subsidy/public co-investment.

3.2 Application of Aquaculture Cost Recovery Policy

South Australia has the longest running (~20 years), most comprehensive, mature and transparent process for aquaculture cost recovery amongst all Australian jurisdictions. The ICRRP Report (McCallum et al 2023) provides an insightful summary of the early design of the cost recovery program - from an early internal paper by Hall (1995)[37] that initiated cost recovery through 2009 when PIRSA developed the first iteration of the current Cost Recovery Policy containing a range of general, costing and pricing principles (PIRSA, 2020), and applying across its entire portfolio.

3.2.1 Cost Recovery Framework and Process

PIRSA Fisheries and Aquaculture manages the administrative and regulatory requirements of the *Aquaculture Act 2001* through dedicated programs. As indicated in Figure 3.1, these programs are determined in close consultation with industry representatives and lease and licence holders and aim to support the development of sustainably managed aquatic resources for aquaculture consistent with legislative objectives and other guiding policy.

Each year PIRSA meets with representatives of each of the commercial seafood industry sectors (11 for fisheries and 6 for aquaculture[38]) to consult on the programs of services required to effectively manage the States aquatic resources and ensure legislative requirements under the *Aquaculture Act 2001* are met.

Figure 3.1 below summarises the key components of the PIRSA fisheries and aquaculture cost recovery framework and implementation process. As the Figure indicates, the process comprises a multi-level and integrated approach from legislation to stakeholder engagement through implementation and review. Full details of the process are communicated transparently on the

[36] See for example the Ocean Cluster model developed in Iceland that has now expanded internationally - Home | NE Ocean Cluster

[37] Hall (1995) Cost Recovery in South Australia Commercial Fisheries – Fisheries Management Paper No.7

[38] With the exception of land-based aquaculture business which do not have peak body representation; those businesses are consulted through letters/email seeking feedback.

PIRSA website and in detail in the annual CRIS reports that determine cost recovery settings and in subsequent annual reports on service delivery on each Cost Recovery Agreement.

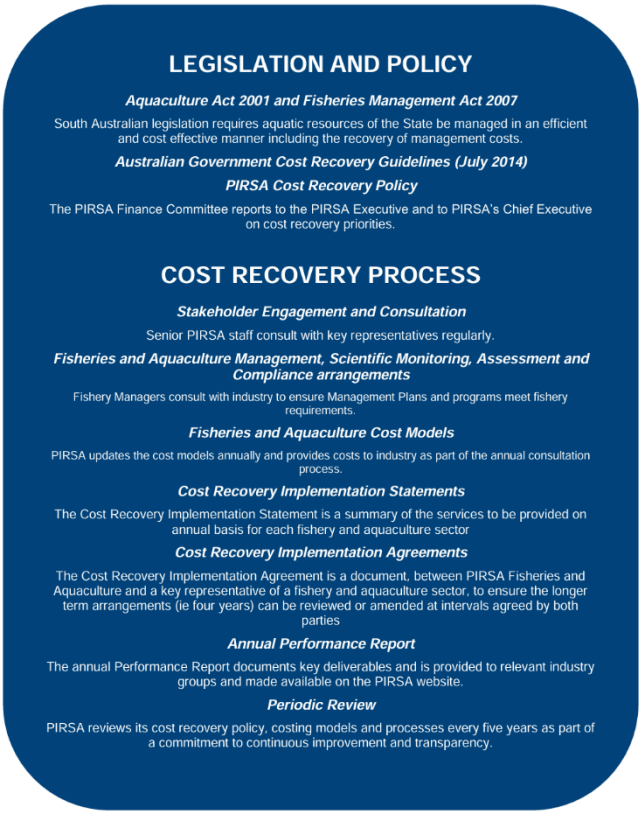

Figure 3.1: PIRSA Cost Recovery Framework and Process

Costs are recovered from the various aquaculture sectors for the delivery of the following five programs.[39] These closely align with PIRSA organisational units and budget centres.

Science Projects - SARDI conducts research and monitoring related to innovative science, monitoring and stock assessment. SARDI core skills and expertise include fisheries monitoring, stock assessment, modelling and harvest strategies, threatened, endangered and protected species (TEPS) assessment, oceanography, aquatic biosecurity and health, fisheries biology, marine and freshwater ecological and ecosystem processes research, environmental assessment, and aquaculture nutrition, genetics, propagation, and algal production.

Management and Legislation - key activities include the development, implementation and review of legislative and policy frameworks for the South Australian fisheries and aquaculture sectors. Controls are in place for sustainable fishing and farming activities, with arrangements to match the characteristics of individual sectors and areas. Legal and legislative services include strategic

[39] Note: these programs have evolved over time and were adjusted between the FY 2024-25 and FY 2025-26 CRIS.

advice on management arrangements, review of draft documentation and correspondence, statutory interpretation and the provision of general advice, in consultation with the Crown Solicitor's Office where necessary.

Licensing, Business Support, Data Management and Systems - the Leasing and Licensing Unit is responsible for the management of leasing, licensing and support services including the timely processing and management of information leading to the issue and variation of licences. The Business Services Unit coordinates the cost recovery process, establishing agreements with service providers, coordinating program provider reports and providing audit, financial and human resource functions. The Information Services Unit is responsible for the management of fisheries quota, catch, effort, value of production, and Survey and Wildlife Interaction data.

Compliance Activities - PIRSA Fisheries and Aquaculture coordinate compliance activities to build awareness and behavioural outcomes that have a long-term beneficial impact in the fisheries and aquaculture sectors. The objective of the compliance activities is to minimise the risks to aquatic resource sustainability, resource allocation and access rights, and ultimately commercial economic viability.

Other Costs - PIRSA Fisheries and Aquaculture recover other costs that provide additional services to help manage and support the sectors, such as the Fisheries Research and Development Corporation (FRDC) funding and co-management services.[40]

The programs, activities under the programs, and costs for PIRSA's provision of these programs, are detailed for each individual sector in annual sector based and overall CRIS. These documents also form the basis for the compendium annual report on service delivery that summarises what was undertaken by PIRSA in relation to each sector. Both documents (for recent years) are publicly available on the PIRSA website.

The process is also informed by an effort recording system used by departmental staff (Timewise). Although this has reportedly resulted in an increased administrative burden for PIRSA, it has increased transparency and accountability to the seafood industry.

PIRSA has also recently moved to enter into longer-term (initially up to four-year) cost recovery programs agreements with fisheries and aquaculture sectors, which fixes PIRSA-related programs and the associated costs over that period and applies the Department of Treasury and Finance's indexation rate between years. The current (FY 25-26) CRIS cycle is framed as a transitional year pending the results of this review process.

This new longer cycle approach aims to improve the cost recovery process through reducing red-tape and improving service delivery and government-industry stakeholder relationships. This will be achieved by:

[40] FRDC levies paid by industry are an important component of the overall funding for aquaculture science and are discussed throughout later sections of this report, especially section 4.2.2.

- Reducing process administration and improving resource allocation for both PIRSA and industry in focusing on priority industry development and sustainability issues; and
- Increasing industry business stability through improving the predictability of regulated fees, allowing for improved budget forecasting and development activities.

3.2.2 Cost Recovered Revenue

Through the cost recovery process, PIRSA collects approximately $18.2 million annually from fisheries and aquaculture licence and permit holders and lessees. In FY 2025-26 this represents around 53% of the total cost of management of South Australian based fisheries and aquaculture.[41] That $18.2M is made up of costs recovered from fisheries ($15,953,086 representing 87.7% of cost recovered income) and costs recovered from aquaculture ($2,244,051 or 12.3% of total cost recovered income). Cost recovered income equates to 7.5% of the total value of FY2022-23 fisheries production, 0.8% of the value of 2022-23 aquaculture production and 3.8% of the combined fisheries and aquaculture production.

Further details of what is included in cost recovery and how the costs are apportioned, exemptions and transfers, including broad details of State appropriations, "public good" costs, treatment of recreational and Aboriginal Traditional fisheries activities and FRDC levies are outlined in the FY 2025-26 CRIS.[42] Additional details of the budget context for these funds is also available in the PIRSA Annual Financial Statements.[43] Those include details of all related funds administered such as the income under the Aquaculture Fund and the transfers of industry contributions via the Fisheries Research and Development Fund. The latter are especially important to science funding, as noted later in the review.

The reviewers noted that stakeholders are generally pleased with the transparency and level of detail of reporting of cost recovered funding. However, some are concerned that it is difficult to understand the full picture of aquaculture program funding, especially the co-investment of government funds.

- *"I have tried to follow the money – what we contribute, what government contributes and how they line up, but I can't understand the government side of it… budget documents aren't easy to read if you don't have a public finance background. I have the same problem with FRDC and how they explain their funding".*

The limited industry understanding of government contributions to aquaculture management across all sectors was evident in the industry survey (Annex C Q8). This was also mirrored in discussions with several industry organisations who would like to see more details on how industry

[41] Note that this excludes cost recovery from Commonwealth fisheries operating out of South Australia which are subject to a separate Commonwealth cost recovery framework which does not apply to aquaculture

[42] PIRSA 2025 2025-26 PIRSA Fisheries and Aquaculture Cost Recovery Implementation Statement

[43] PIRSA 2024 Department of Primary Industries and Regions 2022–23 Annual Report – Independent Auditor's Report: Department of Primary Industries and Regions

contributions align with service delivery at a programmatic level. Addressing this issue would help improve industry understanding of the larger budget picture.

Recommendation 3: PIRSA to add details of government funding of aquaculture programs relative to industry contributions in the CRIS, on the PIRSA website etc.

Figure 3.2 outlines the distribution of fisheries and aquaculture income derived from cost recovery by expenditure program.

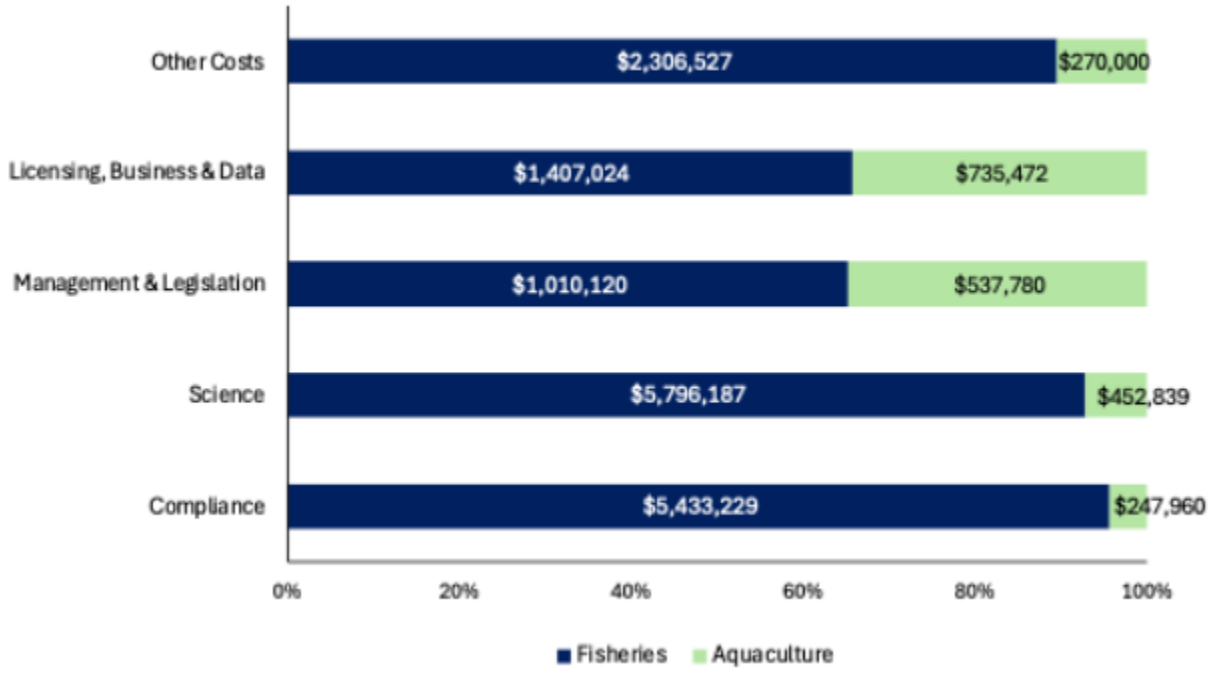

Figure 3.2: Allocation of Fisheries and Aquaculture Income from Industry by Program FY25-26.[44]

Figure 3.3 (also derived from the FY2-25-26 CRIS data) outlines the relative allocation of cost recovered aquaculture income by program category. Notably, Compliance and Science, which are the focal categories of this review, represent only around one third (11% for Compliance and 20% for Science) of the total aquaculture program budget. By contrast, those same two program categories represent 70% of the total cost recovery budget for commercial fisheries (36% for Compliance and 34% on Science).

[44] PIRSA 2025 2025-26 PIRSA Fisheries and Aquaculture Cost Recovery Implementation Statement

As indicated in the Figure, the major program budget categories for aquaculture cost recovery are (a) Licensing, Business and Data and (b) Management and Legislation which comprise 57% of the budget.

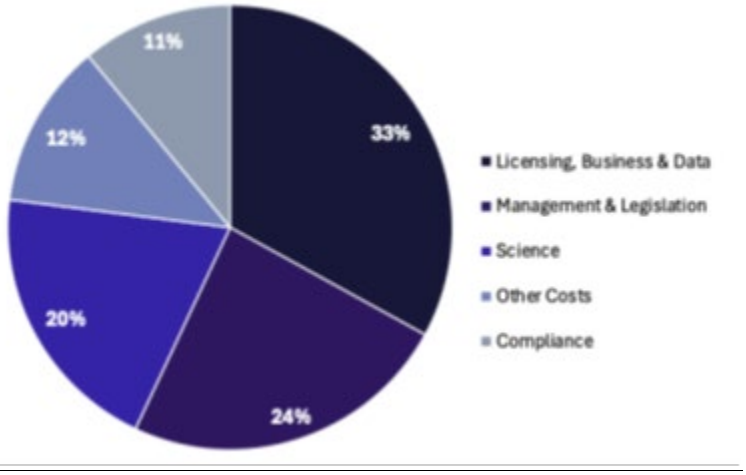

Figure 3.3: Proportional Allocation of Cost Recovered Aquaculture Income by Program FY25-26.

Figure 3.4 outlines trends in cost recovery levels in each aquaculture sector since 2015.

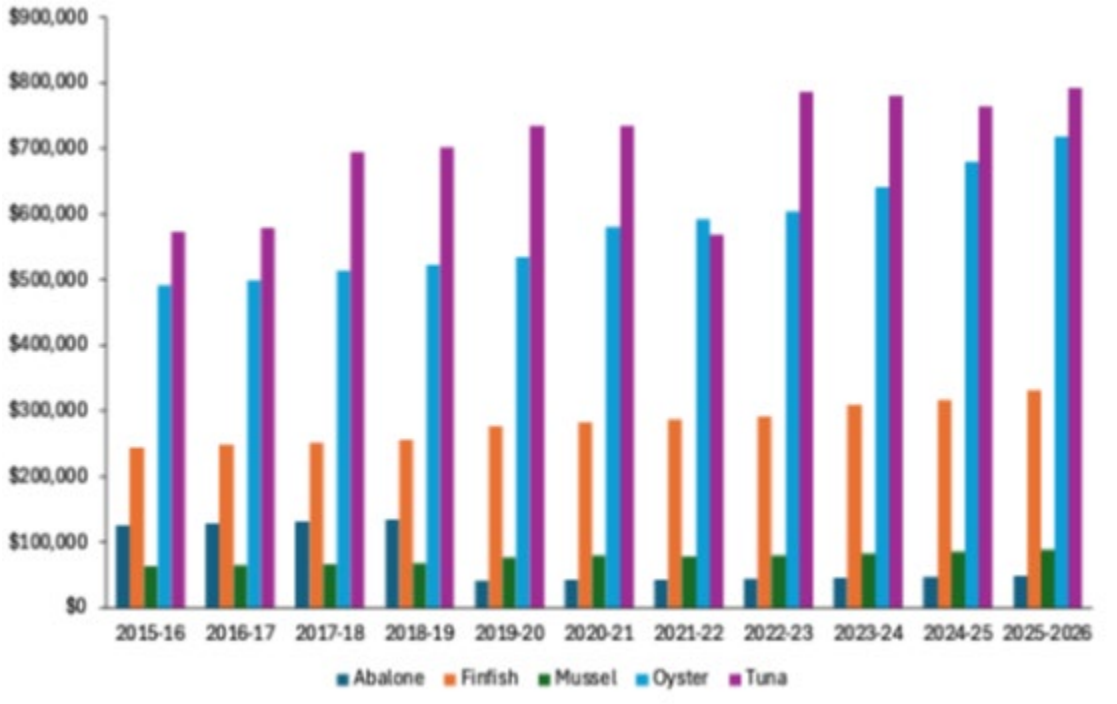

Figure 3.4: Total cost-recovered management costs for each aquaculture sector from 2015 to 2026. Management costs are inclusive of aquatic animal health, environmental monitoring, science and compliance.[45]

It is notable in Figure 3.4 that the proportional contributions from each aquaculture sector have remained relatively constant, with the exception of Tuna in FY2021-22 which reduced production significantly due to global market challenges. As noted later in the review, this trend underpins stakeholder concern that not enough attention is given to cost recovery settings as a sector matures over time, or as market conditions evolve.

3.3 Past Cost Recovery Reviews

Over the past twenty years there has been a significant body of internal review work on cost recovery policy complemented by regular independent reviews. Together, these reviews have shaped the evolution of cost recovery practices in South Australia's (fisheries and) aquaculture industries.

The key findings, recommendations, and outcomes of past external cost recovery reviews are summarized in Table 3.1 below. To PIRSAs credit, these reviews have been undertaken with extensive stakeholder engagement, and most relevant reports are readily accessible online.[46] There is also a detailed response to the recommendations of the most recent review.[47]

Despite the stated commitment of PIRSA to engage stakeholders in these regular review processes, there is a perception by some industry members interviewed of a lack of adequate transparency with respect to how review findings have been addressed by PIRSA.

While some recommendations stemming from the McCallum et al review are generally well understood and obvious to most stakeholders, there is a lingering scepticism about the extent to which past reviews have made a difference to cost recovery practices, including comments such as:

- *"It doesn't matter what I put forward, nothing is going to happen anyway based on what I have seen before"; and*
- *"Tell me what has changed except that every year what I have to pay increases and I get less for it"' and*
- *"So what will be different this time round – I met with the last lot of consultants and saw their report but never heard what happened until you showed up".*

[45] Note: the oyster industry figures from 2016/17 through to 2019/20 do not consider fee waivers provided by PIRSA due to the impacts from POMS.

[46] PIRSA PIRSA Fisheries and Aquaculture independent cost recovery review - PIRSA

[47] PIRSA Government response to Independent Cost Recovery Review reports for the South Australian seafood fishery and aquaculture sectors

Addressing this issue is key to building of trust by stakeholders and ultimately improving cost recovery processes.

Table 3.1: Summary of previous cost recovery reviews.[48]

Review	Findings	Recommendations	Outcomes
Deloitte (2015)	• PIRSA's approach to cost recovery in the aquaculture industry is consistent with its cost recovery policy • Unlike in fisheries, PIRSA does not recover the full cost of regulatory activities	1) Improve transparency and accountability through publicly-available documentation, including the cost of administrative services, the process of calculating and collecting fees, and the percentage of costs recovered 2) Report performance measures for services provided to industry that are supported through cost recovery fees 3) Report policy decisions made by the South Australian Government and their consistency with cost recovery policy	• Cost recovery policy amended to include 11 principles, including a specific principle on transparency and accountability (*Recommendations 2 & 3*) • Key cost recovery documentation made available online (*Recommendation 1*)
KPMG (2018)	• Longer term cost recovery arrangements with all aquaculture sectors reduced the administrative burden, increased industry certainty, and supported businesses' stability • Lack of details related to the costing, timing, and negotiation processes that occurs between industry and PIRSA	1) Provide a publicly accessible costing framework to clearly define the costing process 2) Establish more robust independent verification process for the 5-year cycle review, including regular cost model reviews and sensitivity analyses 3) Cost recovery policy should provide greater detail when aligning expenses to revenue, as outlined in the Commonwealth Cost Recovery Guidelines 4) Cost recovery policy should contain documentation around risk assessment	• Updated several sections of the South Australian Cost Recovery Policy in line with recommendations • Agreed to establish a more robust, independent verification process (*Recommendation 2*) • Longer term (up to 4-year) agreements put in place

[48] Sources include past review documents, especially McCallum et al (2023)

		and the Cost Recovery Implementation Statement to align with the Commonwealth Cost Recovery Guidelines	

SG Heilbron Economic & Policy Consulting (2021, 2023)	• Shifting to a Gross Value of Production cost recovery model would place aquaculture on more even footing relative to fisheries with respect to percentage of costs recovered
	• Under a Gross Value of Production approach, some sectors (tuna, finfish, abalone, and oysters) would pay more than their current contributions while mussels would pay less:
	  ○ Tuna: +$700k
	  ○ Finfish: +$100k
	  ○ Abalone: +$200k
	  ○ Oysters: +$8k
	  ○ Mussels: -$40k
		1) The current limitations of South Australia's current cost recovery model should be evaluated against alternative approaches (such as a percentage of the Gross Value of Production)
		2) A new model should be sensitive to industry's economic conditions, capacity to pay, and service utilization
		3) Phasing in a Gross Value of Production approach can ameliorate the impacts to individual sectors
			• Levying income through a Gross Value of Production approach was deemed inappropriate as a cost recovery mechanism under the objectives of the Commonwealth and South Australian cost recovery policies

ICRRP (McCallum et al 2023)	• Strong overall support from PIRSA and industry for the conceptual basis of cost recovery and for the broad objectives and principles that underpin the use of cost recovery in South Australian fisheries • Implementation of cost recovery in South Australian commercial fisheries has, over time, eroded the confidence of the majority of industry in PIRSA's ability to actively manage the cost recovery process; parts of the cost recovery process are 'broken'. • Needs to be a 'revise and reset process' entered into by industry and government; involves reconsideration of the	17 recommendations that address findings. Key recommendations: 1) Retain the existing PIRSA Cost Recovery Policy, and hence the activity-based attributable cost model, but revise and reset. 2) Establish an over-seeing 'cost recovery advisory body' charged with responsibility to consider and advise on broader sector-wide cost recovery policy, principles and implementation issues. 3) Review and benchmarking of science and compliance	• Establishment of CRIC (*Recommendation 1*) • More active engagement with industry (SISA) in review process • This review of Aquaculture Science and Compliance (in parallel with similar initiatives for fisheries)

	principles and implementation guidance (revise) and, based on this revision, to recalibrate cost recovery settings and charges.		

Industry representatives also expressed a desire for improved communication about the current process and its outcomes – some indicated that they have felt adequately informed through their industry association, but others indicated that they'd like to receive additional communications directly from PIRSA. There would also be some value to PIRSA in addressing this issue as the review team learned that, over the course of time, some institutional memory within PIRSA about these past reviews has apparently been lost (due to staff changes).

Recommendation 4: PIRSA develop a succinct summary/metadata of management responses (including any no change responses) to each recommendation made in past (pre ICRRP) reviews and post that on the relevant PIRSA webpage.

Given the reported experience of mixed understanding of the outcomes of past reviews the review team propose that a specific effort be made to coordinate communications about this review with peak bodies and deliver timely messages to all licence holders.

Recommendation 5: CRIC work with PIRSA and peak bodies on a communications plan to licence holders about the results of the current review, with particular attention to making clear what changes are to occur and when.

3.4 Stakeholder Attitudes Towards Cost Recovery

The MacCallum et al (ICRRP) review identified a divergence of industry views regarding cost recovery by PIRSA. On the one hand, they noted that "*the (review) Panel was advised by participants in some specific fisheries that they were comfortable with the existing cost recovery model. In the main these were fisheries where the overall cost was low in comparison to the annual GVP of the fishery".*

However, they also noted that … "*implementation of cost recovery by PIRSA has, over time, eroded the confidence of the majority of industry in PIRSA's ability to actively manage the cost recovery process in a manner consistent with these key elements and to ensure that the right service activity is applied, the level at which that service activities delivered is right and that the cost of that activity is attributed and recovered in the most appropriate way*". The ICRRP went on to note that… "*parts of the cost recovery process are 'broken' and that some relationships are fractured. Even in those fisheries comfortable with the existing cost recovery model there were concerns raised that some attributed costs were questionable, different compliance activities could be considered and greater clarification of application and costs of science implemented*".

Unfortunately, those findings did not break out views across sectors in sufficient detail to determine their applicability to the aquaculture sector. However, importantly for this review, they suggest that there are two main narratives related to industry views on cost recovery:

a. General acceptance of the concept as a means of ensuring industry contributes to management in return for the benefit of accessing/using public resources; and
b. Industry experience with implementation of cost recovery by PIRSA is the primary source of industry concern/tension.

These narratives underpinned the design of the current review. The review team felt that it was important to obtain a contemporary and more detailed perspective on stakeholder attitudes towards cost recovery particularly on industry experience/issues with management and implementation of cost-recovered science and compliance activities.

An industry survey was undertaken, with design inputs solicited from industry and government. The survey was distributed via email by PIRSA and via industry oyster and tuna industry associations to all marine licence and lease holders informing them about this review and asking them to respond to a confidential online survey with their thoughts about the licencing and lease system. The survey had a particular focus on current compliance and science budgets and programs and whether they were 'fit for purpose'.

The survey was made available online In August and closed at the end of September. The survey was widely promoted in all meetings with stakeholders and industry associations as an opportunity to provide more personal feedback. The assurance of confidentiality was important as some growers shared a sense of concern about how past interactions with these processes had left them feeling vulnerable.

There were 33 responses (which is less than 10% of all licence holders). While this was a lower than the anticipated response rate, it was not unexpected given the issues that some growers were experiencing with the HAB and the expectation of many growers that their industry association would provide input on their behalf. This expectation was addressed by the deliberate efforts of the review team to meet with growers during field visits to Port Lincoln, Coffin Bay and Franklin Harbour/Cowell in September and in the course of online and in person meetings with industry associations and specific businesses between July and October.

A copy of the survey and a graphical summary of results is presented in Annex C. The headline findings from the online industry survey were:

1. Most respondents believe that aquaculture businesses who utilise public resources for private benefit should be charged a licence fee.
2. There is majority support for the current licence and lease system to manage industry development and to set expectations for industry. However, around one third of respondents do not know if the current system is the best or if there were better alternatives.
3. Most respondents would like to know more about the annual negotiation with PIRSA for cost recovery activities, with around one third leaving that up to their industry association.

4. A slight majority of respondents do not know how fees are spent (and do not want to know about the details) or know enough to be satisfied.
5. The majority of respondents thought that aquaculture license/lease fees are expensive, with the balance considering them 'about right'.
6. The majority of respondents don't know how much state government contributes to aquaculture management with others divided between those either believe the industry is fully cost-recovered or who believe that less than half is cost recovered; they are similarly unclear when it comes to knowledge about FRDC support for the industry.
7. A majority believe that PIRSA provides a regulatory and management framework that supports aquacultures public image as a well-managed and regulated industry but also indicate that indicating that PIRSA could do more.
8. A majority of respondents believe that reporting requirements are about right, with around one third describing them as burdensome.
9. A majority of respondents describe the relationship between PIRSA and their sector as about the same or better than other aquaculture sectors; with around one third indicating they do not have enough knowledge of other sectors to comment.
10. A strong majority of respondents believe that the State government should contribute more funding for environmental science directly and in conjunction with industry funding. Priority areas for research include:
    a. Aquatic biosecurity (pests and diseases)
    b. Oceanographic modelling (nutrient dispersal, pathogen movement and HABs)
    c. Water quality monitoring around aquaculture infrastructure
    d. Water quality monitoring of marine and coastal inputs

These observations were supplemented by consultations with industry stakeholders. The consultants met or had phone conversations with both representatives from the peak bodies and with some 17 additional individual growers who expressed an interest in sharing their business level perspectives on aspects of cost recovery. The following were notable feedback points in conversations with licence holders across all sectors (except abalone who were unable to be engaged in this process despite several efforts by the review team).

To protect confidentiality, no individually identifiable observations are shared. Feedback is broadly grouped into three categories that are related to three core cost recovery principles (see Section 4.2); efficiency, effectiveness and equity.

Efficiency

- Businesses have become used to the cost recovery process and generally understand how the process works but are concerned that cost recovery does not drive service in the way that businesses are accustomed to – while they appreciate seeing the annual reports on what activities were undertaken, they also feel as if those services were not always aligned with what they see as priorities. That 'disconnect' between what industry expects and sees

and what government describes as planned and done was a recurring theme, suggesting gaps in understanding and communication of cost recovered plans and activities.

- Growers see opportunities for more efficient interaction with PIRSA through better online accounts and better electronic form submission – several noted that commercial fisheries is more advanced in their reporting systems. *"We live in an area where internet coverage is slow – some of those web page links with PIRSA should be more accessible offline"*.
- Growers who support the current approach to cost recovery suggest that it could be even more efficiently implemented if specific program budget priorities were set annually but that ongoing programs were carried forward beyond annual cycles (some were aware that this was in the works after this FY).
- Growers are concerned about the challenges they face interacting with PIRSA. They expressed concern about PIRSA responsiveness to telephone calls, lengthy delays in correspondence and in being able to discuss issues of concern with staff directly. *"It's really hard to get hold of someone in the Department when you need them"*.
- Ineffective and inadequate compliance approaches was a consistent theme from many growers. There was a strong concern expressed that (a) aquaculture is not a sufficiently high a priority for Fisheries Officers and (b) that Fisheries Officers are not as knowledgeable about aquaculture or as motivated to engage as they are with commercial fisheries.

Effectiveness

- While there was praise by many sectors for the strong support that cost recovery resources provided for the early stages of SA aquaculture development (esp. for tuna, oysters and finfish), there were consistent concerns expressed about the adequacy and effectiveness of more recent science investments, including questions about whether SARDI still offers value for money, whether staff have the relevant expertise, whether the science has kept up with industry stewardship and whether there is a vision for, and genuine commitment to, growth and diversification of aquaculture.
- Value for money was a key theme for several business, especially those whose work engages with SARDI. There were frequent concerns expressed about the intellectual investment of SARDI scientists ("*they only seem to want to do research that is publishable and not routine work that informs our operational needs*"), the value for money that SARDI provides and whether (as per other industries), there may be options to bid out routine work or even invite other research providers to participate.
- The impacts of new technology was a major issue for smaller sized oyster growing operations – they felt that they were not engaged adequately in the introduction of flip farming technology and that since the introduction and expansion of flip farming operations oyster farmers in some regions have reported declines in production. "*I can definitely say that in this bay we have seen a loss in productivity; that was not factored into management of these waters by PIRSA*".

- Industry raised some concerns about the charges for redundant services – for example, companies who employ or engage external veterinarians question the value of animal health services from PIRSA.
- PIRSA leadership on aquaculture and feedback to industry was raised by several growers as inadequate; some made the point that "*industry makes the running*" and that PIRSA and SARDI are not as active in advocating for the sector nor as responsive to industry as they believe it should be given its economic importance and potential for growth relative to other seafood production. "*PIRSA seems to have lost interest in aquaculture development in recent years… I know it's difficult, but so were those early years and at that time we had champions in all areas of PIRSA*".
- Concern was raised by oyster growers about the lack of an adequate framework and cost recovered contingency fund to address site clean-up and rehabilitation – growers feel that there is potential risk in not having a readily accessible clean-up fund or other mechanism (e.g., performance bond) ready to support those situations.

Equity

- There is a perception across some industry members in multiple aquaculture sectors that PIRSA "*picks favourites*" in its application of cost recovery settings and that not all sectors are treated equally given the relative levels of environmental risks they present and the steps they take to mitigate those risks.
- There is a perception, particularly amongst oyster growers, that growers lack credibility with PIRSA compliance and other regulatory staff. "*I know we are not scientists, but we live and work here year-round and so we know what is changing in our backyards – that knowledge isn't being used and when we offer it, they dismiss us*".
- Growers appreciated the objectivity of Fisheries Officers who undertake compliance activities – "*they are professional and objective in doing their job even when it's clear that they are not all that familiar with our business operations*".
- Some growers expressed concern about the equity of cost recovery fees – smaller growers felt that they were paying a disproportionate level of costs given their generally lower risk profile and management requirements relative to larger companies within their sector.
- As noted in the survey results, the cost of access to public resources is an expected cost of doing business, especially for larger companies who are generating a profit from access to and use of those resources, but many growers believe that charges are potentially unsustainable given market conditions, competition from imports and the challenges posed by HABs and other environmental changes. There was strong interest in a reset of the costs under each category (and not just science and compliance programs). "*I get what our science and compliance charges cover and agree with them, but I don't understand why we have to pay for legislation services when surely that is a normal cost of government?*"
- Transparency is key to building business trust but can be quickly eroded – growers noted that when they see other growers not being treated the same as they are (e.g., when late in

submitting a production report), that undermines their view that they are being treated equitably. "*Why do growers who don't put their reports in time get no penalty*".

- A final point about equity relates to how aquaculture is represented in the current CRIC process. The newly established CRIC provides an important opportunity to improve engagement and coordination/collaboration with industry. However, during the course of this review process, it was noted that it is challenging for the CRIC to efficiently cover all business in the fisheries and aquaculture sectors concurrently. Despite CRIC Chair and PIRSA efforts to address aquaculture and fisheries cost recovery in a consistent manner, some interviewees during this process expressed concern about the extent to which aquaculture receives an adequate level of consideration in cost recovery policy and operational planning. While there is some overlap of interests (e.g., sardines and tuna), many aquaculture sectors/businesses have distinctive needs that require dedicated attention.

Recommendation 6: CRIC establish an aquaculture sub-committee that meets separately to the overall committee to enable aquaculture-specific issues to be addressed directly during current life of CRIC (and assess options for a subsequent aquaculture industry-government forum in future).

4.0 Global and National Approaches to Aquaculture Cost Recovery

4.1 International Cost Recovery

4.1.1 Global Overview

The most recent State of World Fisheries and Aquaculture report (FAO 2024) highlights aquaculture as critical in addressing global food security with its increasing growth driven by rising demand for aquatic foods, technological advances and investment. This "Blue Transformation" integrates aquatic-food systems into global food security, nutrition, livelihoods, climate resilience and environmental sustainability agendas. However, the Food and Agriculture Organization of the United Nations (FAO) reports points out that this blue transformation must be accompanied by appropriate and efficient governance and regulatory frameworks to support sustainable outcomes.

The recent FAO Guidelines for Sustainable Aquaculture[49] (GSA) provide a global framework to guide policy, investment and regulation in aquaculture. The GSA articulates shared principles around sustainability, equitable livelihoods, food-security contributions, climate-resilience and ecosystem protection. It also highlights that aquaculture regulation and management should be supported by enabling investment, transparent governance, and financial viability. There is emphasis on regulatory frameworks must be adaptive, enforceable and cost-effective.

Cost recovery frameworks, though globally prevalent when it comes to fisheries, are much more limited with respect to aquaculture—potentially due to the more recent rise of the industry as an increasing commercial use of public waters in many jurisdictions. The review team noted that there are three principal global policy approaches to cost recovery in the aquaculture sector. These mirror cost recovery and resource rent mechanisms that are also more broadly applied in other sectors such as forestry, irrigation, mining and tourism:

1) No or Minimal Cost Recovery
   These approaches do not pursue any form of cost recovery or limit their scope to cost recovery mechanisms that introduce or align with existing permit systems that only capture basic administrative costs such as permit or licence fees. There are many reasons for doing this, but, most frequently, it is applied in the early stages of aquaculture industry development to avoid investment barriers and/or simplify regulatory processes. For example, in the United States, the state of North Carolina does not pursue cost recovery and has intentionally kept license and operational fees low to encourage industry development (North Carolina Department of Natural and Cultural Resources; *personal communications*).

2) Partial Cost Recovery
   These approaches undertake varying levels of cost recovery based on the government policy guidelines under which the regulator operates and are usually further shaped by the

[49] FAO 2025 Guidelines for Sustainable Aquaculture

specific objectives and practices of the regulatory agency. For example, Canadian aquaculture licence fees only cover ~10% of the costs associated with licensing and management activities.[50] The state of Florida similarly uses licence fees to offset some administrative and management costs, but the fee rate is not set to achieve full cost recovery (Florida Department of Agriculture & Consumer Services; *personal communications*). Other jurisdictions have separate mechanisms for accruing revenue depending on the specific management objective. For example, the Scotland Environmental Protection Agency collects an 'activity charge' from marine finfish farms specifically to cover the costs of environmental modelling and monitoring of discharge waste from these sites.[51]

3) Full Cost Recovery (which may also be linked with Resource Rent)
These systems involve combinations of taxes, royalties, levies or similar resource access payments, sometimes linked with, or complementary to, other cost recovery mechanisms.[52] Examples of resource rents are almost exclusively found in high-value aquaculture sectors (i.e., salmonids), and the tax revenue is not necessarily or wholly invested back into the aquaculture industry. For example, after a series of consultative processes where resource rent settings were widely debated,[53] Norway's Directorate of Fisheries has implemented a 25% tax on salmonid (salmon, trout, and rainbow trout) farming profits, which are based on the market price at the stage of the production process where the fish leaves the pen (in accordance with the arm's length principle).[54] Both the state and the municipalities in which the farms are located share these proceeds. Chile also charges a resource rent to its salmon aquaculture industry.

In global jurisdictions that do pursue some form of cost recovery, the objectives of cost recovery and the mechanisms by which they generate revenue reflect diverse objectives, including industry development (sometimes linked with more specific regional or sectoral economic development objectives), cost-sharing/revenue generation, risk prevention/mitigation and environmental protection. Cost recovery is also complicated by the diversity of production species and systems in many jurisdictions. These variables make it difficult to accurately benchmark and assess global aquaculture management, science and compliance costs in a manner commensurate with the South Australian approach. Benchmarking across sectors has been a persistent challenge to the aquaculture industry across various management and performance contexts (Anderson et al., 2025).

[50] Government of Canada: https://gazette.gc.ca/rp-pr/p2/2015/2015-05-20/html/sor-dors96-eng.html
[51] SEPA 2022 aquaculture-charges-analysis-of-response-for-publication-june-2022.pdf
[52] These options are well reviewed in the McCallum et al 2024 report
[53] See The Norwegian Government's proposed resource rent tax on aquaculture - regjeringen.no
[54] See Resource Rent Tax on Aquaculture - English

The section below provides an overview of aquaculture cost recovery frameworks for two particularly insightful and mature aquaculture nations -- Iceland and New Zealand.

4.1.2 Global Case Studies

4.1.2.1 Iceland

Industry overview

Iceland's aquaculture industry has grown rapidly in the past decade, with a compound annual growth rate of 30% from 2015-2022, and produced 51.4 million kilograms in 2022.[55] The industry almost exclusively produces salmonids, driven largely by the farming of Atlantic salmon (~87% of 2022 production volume) in open sea net pens in the West- and Eastfjords regions of the country.

Regulatory overview

Both land-based and marine aquaculture falls under the purview of Iceland's Fish Farming Act (2008). While the Ministry of Fisheries and Agriculture is the principal authority for the aquaculture industry, the Icelandic Food and Veterinary Authority is in charge of implementing any regulations and/or provisions issued under the Act.[56] Icelandic policy emphasizes environmental sustainability within the industry, with a focus on limiting escapees and reducing the farming impacts on the marine environment. However, Iceland's regulatory frameworks and enforcement have struggled to keep up with the industry's rapid growth, with a 2023 industry review citing inefficiencies in the licensing processes and understaffed compliance authorities.[57]

Cost recovery

Cost recovery in Iceland's aquaculture industry is achieved through a special levy that has been in effect since January 1, 2020.[58] The levy (referred to as a production/resource fee) is a combination of a payment for the use of the sea area in Iceland's fjords and a cost recovery fee to recoup administrative expenses.[59]

As salmonids (inclusive of Atlantic salmon and Arctic Char) make up almost 100% of Iceland's current aquaculture sector, the fee is determined by the total weight of salmon harvested (head-on gutted/gutted weight equivalent) multiplied by a variable fee rate. The variable fee rate is dependent upon the average international market price, with a higher price resulting in a higher fee rate and vice versa. Originally calculated based on average prices from August to October, the fee has been updated to utilize full-year average prices.

The implementation of this production/cost recovery framework is incremental over a 7-year period. Upon its inception in January 2020, farmers paid 1/7 of the calculated base fee. Subsequent years have seen an annual 1/7 increase in the proportion of the fee to be paid, and the full fee will

[55] Ministry of Food, Agriculture and Fisheries
[56] Act No. 71/2008 on fish farming
[57] Ministry of Food, Agriculture and Fisheries
[58] Act No. 89/2019 on the collection of fees for aquaculture in the sea and the aquaculture fund
[59] Ministry of Food, Agriculture and Fisheries

be charged beginning in 2026. Farmers are charged the production fee twice a year based on self-reported harvest volume. Two-thirds of the fee revenue is allocated to the government, though the services this revenue covers are not clearly defined. The remaining third accrues to the Aquaculture Fund (Fiskeldissjóður), which is leveraged by local municipalities to invest in 'relevant infrastructure'.[60] In 2022, the Aquaculture Fund distributed a total of 185m ISK (~$2.3m AUD) in subsidies.

Environmental monitoring

Any holder of a sea cage farming licence is required to pay an annual fee to the Environmental Fund for Sea Farming in the amount of 20 SDR for each ton of aquaculture licenced to be produced.[61] The Environmental Fund is a state-owned enterprise and covers the costs of carrying capacity assessments, monitoring, and other projects aimed at minimizing the environmental impact of the aquaculture industry. Fishing rights holders can apply for grants from the Environmental Fund to offset costs or loss of income due to damage that cannot be attributed to a specific fish farm.[62]

4.1.2.2 New Zealand

Industry overview

New Zealand's aquaculture industry primarily farms Greenshell mussels, King (also known as Chinook) salmon, and Pacific oysters. In 2023, the industry harvested 109 million kilograms of farmed product, generating ~$686 million (AUD) in revenue, and supporting over 3000 jobs in local communities.[63]

Regulatory overview

Aquaculture in New Zealand primarily falls under the purview of the *Resource Management Act* (1991) and the Ministry of Primary Industries but is also subject to the *Fisheries Act* (1996) and the *Food Act* (2014). Under the *Resources Management Act*, regional councils are responsible for the licencing, planning, and regulation of the aquaculture industry in the territorial seas (0-12 nautical miles). Aquaculture consents granted by the regional councils cannot unduly affect fishing, per the *Fisheries Act*, and shellfish production is subject to strict sanitary requirements under the *Food Act*.

In addition to these industry Acts, the *Māori Commercial Aquaculture Claims Settlement Act* (2004) requires the Crown to set aside aquaculture space for distribution to Iwi Aquaculture Organisations.[64] Under the settlement, iwi must be allocated 20% (or provided assets equivalent to 20% of the value) of all new farming space.

[60] Ministry of Food, Agriculture and Fisheries
[61] Ministry of Food, Agriculture and Fisheries; Act No. 71/2008 on fish farming
[62] Act No. 71/2008 on fish farming
[63] Ministry of Primary Industries
[64] Ministry of Primary Industries

Cost recovery

Per the *Resources Management Act*, regional councils can recover costs from aquaculture farmers for the following services:

- Application processing (including coastal permits and discharge consents)
- Monitoring and enforcement of consent conditions
- Adaptive management

Under the *Fisheries Act*, the Ministry of Primary Industries can recover costs associated with:

- Testing for undue effects on fishing
- Registration of aquaculture farmers
- Compliance
- Research (this function has not yet been utilized)

The *Food Act* requires shellfish farmers to contribute to sanitation surveys for human consumption.

Cost recovery has also been considered in the form of a coastal occupation charge for the private use of public space, similar to a resource rent. Only the Southland District Council has implemented these charges, though the Marlborough District Council is planning to propose them. There is substantive community opposition to these charges as they would apply to all uses of the coastal area, including recreational infrastructure. However, some aquaculture farmers have offered to pay some form of occupation charge for social licence purposes.[65]

4.2 Aquaculture Cost Recovery in Australia

4.2.1 National Overview

Aquaculture Governance Arrangements

As noted in section 2, aquaculture is an increasingly important part of Australia's overall seafood production and food security more generally. Regulation of aquaculture operations and related environmental regulation is primarily undertaken by State and Northern Territory governments as most aquaculture activities occur between low water mark and 3 nautical miles (nm) offshore. The Australian Government is responsible for:

- regulation in Commonwealth waters (from 3 nm to the extent of Australia's exclusive economic zone), and

[65] *Personal communications; New Zealand Ministry for Primary Industries*

- for, related national functions, regardless of the location of the aquaculture operation, such as animal health, the export and import of aquatic products and, biodiversity protection (through the *Environmental Protection and Biodiversity Conservation Act* 1999)

It is also notable that local governments may also play an important role in planning and permitting of some aquaculture activities, especially land-based operations and landside infrastructure, access to local waters and permitting of some forms of development.

Aquaculture industries are represented at the national level by Seafood Industry Australia (SIA) which has its own Aquaculture Advisory Committee with broad cross sectoral representation.[66] Specific aquaculture sectors also have their own state and national peak bodies who are able to directly represent industry viewpoints to State and Commonwealth government agencies. These peak bodies often also have a close working relationship with research funders such as FRDC.

There are limited and evolving aquaculture governance arrangements nationally. The primary vehicle for coordination of activities between state and federal agencies and industry is the National Aquaculture Strategy, which is overseen by DAFF, but coordinated by the Aquaculture Committee (AC) of the Australian Fisheries Management Forum (AFMF).[67] State and federal agencies, including PIRSA, are represented on the AFMF AC and there are also several guest members, including FRDC, the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and SIA.

Responsibility for most regulatory oversight of aquaculture, including management processes such as cost recovery sits with State governments. Governance approaches understandably vary considerably depending on factors such as the nature and diversity of aquaculture practices, industry maturity, regulatory settings and structures, government and institutional priorities and capabilities and, increasingly, public attitudes and expectations.

There has been an upsurge in public engagement and non-governmental organisation activism related to aquaculture development and regulation in various Australian (and global[68]) jurisdictions over the past decade[69]. There has been increased Australian research focus on developing an improved understanding of the costs and benefits of various regulatory approaches (e.g., Cullen-Knox et al., 2017, Alexander and Abernethy 2017, Buckwell et al., 2025, and Olsen et al., 2024) and related work on social (and cultural) licence and ethics in the Blue Economy that has been supported by the Blue Economy Cooperative Research Centre.[70]

Despite these recent advances, there remains a lack of research on cost recovery in Australian aquaculture that directly informs evolving public expectations of benefit sharing arrangements in

[66] Seafood Industry Australia Aquaculture Advisory Committee – Seafood Industry Australia
[67] see Australian Fisheries Management Forum
[68] Relevant global initiatives and certification schemes are outlined elsewhere in this report
[69] See, for example Anti-salmon protest held at Verona Sands, site of first dead fish wash up from Tasmanian mass mortality event - ABC News, Coastal residents opposed to abalone farm near Portland vow to fight on as project gets planning approval - ABC News and Aquaculture - AJPWA22
[70] See Blue Economy CRC BECRC_Prac-Summary_Report-IV_A4_e120824.pdf

industries such as aquaculture (and fisheries). Such understanding is important in making the case for allocation/protection of access rights, in addressing changing social expectations for use and management of oceans and in determining appropriate access fees.

Recommendation 7: PIRSA and industry put forward a proposal to FRDC for a new project to better understand public expectations related to cost recovery from aquaculture and how they influence the social licence of aquaculture.

Cost Recovery Approaches and Arrangements

Cost recovery is a foundational mechanism for funding regulatory, compliance, and service delivery functions in Australia's primary industries. It operates on the principle that those who benefit from, or create demand for government activities—such as licensing, monitoring, enforcement, and research—should bear the associated costs.

The Australian Government Cost Recovery Policy[71] outlines two primary charging mechanisms: cost recovery fees (for services to individuals) and levies (for services to industry groups). These are embedded within a broader charging framework that includes commercial charges and other costs for service.

Consistent with these mechanisms, cost recovery in the aquaculture sector in Australia is applied through several categories of charges:

- Licensing and access fees for resource use and market participation.
- Compliance and enforcement charges tied to regulatory oversight.
- Research and development levies that often support industry innovation.
- Monitoring and biosecurity fees to manage environmental and health risks.
- General management and administrative fees related to administration of aquaculture activities – these may include data and technology systems, legal and regulatory costs and even transfers to other service providers within and outside government.

Consistent with the cost recovery policy guidance referenced in Section 3, the review team notes three key criteria for implementation of robust cost recovery programs are effectiveness, efficiency and equity, as outlined below.

[71] Australian Government Cost Recovery Policy | Department of Finance

Effectiveness in cost recovery is about ensuring that the mechanism reliably funds the relevant activities in a manner consistent with public and stakeholder expectations. An effective cost recovery regime is marked by:[72]

- Adequate funding: Agencies must accurately estimate the true cost of the regulated activity and set charges accordingly, avoiding both under- and over-recovery.
- Alignment with policy goals: Charges must support broader government objectives, such as quality regulation, market access, or improved service delivery in key sectors (e.g., ESD, biosecurity, food safety).
- Responsiveness to change: Effective cost recovery adapts to shifts in demand, regulatory requirements, or risk environments, thus sustaining operational quality and timely interventions.[73]

Recent performance audits (e.g., by the Australian National Audit Office) have highlighted the need for consistency and timely revision of charges to maintain effectiveness, especially where cost bases or workloads fluctuate substantially (e.g., in export certification or biosecurity).

Efficiency in cost recovery focuses on ensuring the optimal use of resources—recovering the minimum amount necessary without excessive administrative burden or inefficient fee structures. The key dimensions include:

- Cost reflectivity: Fees and levies should represent the actual cost of the service or regulatory activity, incentivising both government and users to seek efficiencies.
- Administrative simplicity: The cost of implementation and compliance must not outweigh the value of cost recovery, necessitating streamlined systems for fee assessment, billing, and collection.
- Demand management: By charging for costly or resource-intensive activities, government can moderate excessive demand and direct resource allocation to areas of highest need or public benefit.[74]

For example, in the aquaculture sector, the choice between flat access fees versus variable, risk-based charges has been widely debated for their respective impacts on both agency costs and industry incentives.[75]

The **Equity** principle in cost recovery is perhaps the most debated, reflecting the need to:

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[72] *Australian Government Cost Recovery Policy - Department of Finance*. https://www.finance.gov.au/government/managing-commonwealth-resources/implementing-charging-framework-rmg-302/australian-government-cost-recovery-policy

[73] https://www.anao.gov.au/sites/default/files/Auditor-General_Report_2018-2019_38.pdf

[74] *Cost Recovery Implementation Statement - Budget 2025-26*. https://www.amsa.gov.au/sites/default/files/cost-recovery-implementation-statement-for-2025-26-budget-30-june-2025_0.pdf

[75] See, for example discussion on setting fees based on GVP of production in the McCallum et al review- https://pir.sa.gov.au/__data/assets/pdf_file/0020/464042/cost-recovery-aquaculture-sector-final-report-2023.pdf

- Ensure fairness: Those who are direct beneficiaries, or who create risks necessitating government intervention, should bear associated costs, not the wider taxpaying population.
- Minimise unintended consequences: Charging should not unjustly disadvantage particular groups, regions, or enterprises, especially where public interest or essential supply chains are in play.
- Policy exceptions and subsidies: In some instances, government policy may intentionally subsidise or exempt certain services for equity or strategic reasons (e.g., new industries, small producers, biosecurity emergencies, or essential goods provision).[76]

Several reviews have identified the challenge of achieving vertical and horizontal equity—ensuring large players do not inordinately benefit at the expense of small ones, or that sectors with disproportionate costs or risks do not cross-subsidise others unfairly. In the grains sector, for example, persistent surpluses and concerns of over-recovery have prompted industry pushback, while deficits in other export categories have been met with supplementary government appropriations.[77]

There is also often reference to **transparency** as a key element of cost recovery, however, in practice it is more a component of how cost recovery is undertaken than a key criterion for shaping cost recovery settings.

Importantly for this review, unlike the commercial fisheries sector where a national agency (the Australian Fisheries Management Authority [AFMA]) serves as a key benchmarking reference point for commercial fisheries cost recovery assessments throughout Australia, there is no equivalent flagship reference resource for aquaculture.

With the sole exception of South Australia, and the more recent case of salmon aquaculture in Tasmania, there is relatively little publicly available data on the status of cost recovery (a CRIS) for aquaculture in each Australian jurisdiction.

Most cost recovered data is buried in agency budgets and is not generally accessible to stakeholders without a specific information request. This is understandable, given (a) the heterogeneity of aquaculture industries around Australia, (b) the variable approaches to aquaculture regulation, including cost recovery processes in each jurisdiction and (c) the opaque nature of most published public accounts.

While there are no overarching national guidelines or standards for cost recovery that are specific to aquaculture, there are two high level national plans that have several elements relevant to cost

[76] *Cost recovery implementation statement 2024-25 | ASIC*. https://asic.gov.au/about-asic/what-we-do/how-we-operate/asic-industry-funding/cost-recovery-implementation-statement/cost-recovery-implementation-statement-2024-25/

[77] *Grains unfairly carrying load of DAFF costs: GTA - Grain Central*. https://www.graincentral.com/news/grains-unfairly-carrying-load-of-daff-costs-gta/

recovery - The National Aquaculture Strategy (NAS)[78] and the National Fisheries Plan (NFP). Both have an emphasis on:

- Efficient and transparent regulation with appropriate resources to support research, compliance and service delivery.
- Industry-government collaboration: a key enabler of co-designed and co-investment funding models, including user-pays systems.
- Sustainable resource management.

Both plans note the challenges of ensuring regulation meets industry needs and community expectations. for example, the NAS notes that… *to continue to develop, the Australian aquaculture industry needs an efficient, effective and supportive regulatory environment that reflects best practice. According to the Productivity Commission investigation of marine fisheries and aquaculture,[79] regulation has not significantly impeded growth of the aquaculture industry in Australia except in the case of land-based prawn farming in North Queensland. However, the commission noted the benefits of spatial planning and the tensions for governments in regulating and promoting industry growth. Further, the aquaculture industry has raised concerns about the complexity of different regulatory requirements when operating in more than one jurisdiction*".

Reflecting the concerns referenced by Productivity Commission, recent inquiries have highlighted both the benefits and challenges of reforms related to governance efficiency and effectiveness. A 2022 Federal Government Inquiry into Aquaculture[80] noted the importance of continued innovation and regulatory reform to support aquaculture growth.

No mention was made of cost recovery specifically, but the inquiry did address streamlining of aspects of regulatory processes - that has a range of implications for costs to industry and government. For example, unifying government permitting processes can greatly reduce the administrative burden on industry which may accelerate investment in new forms of aquaculture development.

More targeted attention has been given to cost recovery in state level inquiries. For example, the 2019-22 Tasmanian Legislative Council Review of Finfish Farming[81] recommended that:

- *Recommendation 40 - To ensure appropriate returns to the Tasmanian community, commission an independent review of fee and levy structures for fin fish farming, including: lease value and its reassessment over time; setting of lease fees; rates of levies required to fully fund regulatory monitoring, compliance and enforcement activities; and local government rates, as relevant to the industry.*

[78] National Aquaculture Strategy - DAFF
[79] Productivity Commission 2016 Inquiry report - Marine Fisheries and Aquaculture - Productivity Commission
[80] House of Representatives Standing Committee on Agriculture and Water Resources 2022 Supporting a strong future for Australian aquaculture
[81] Parliament of Tasmania 2022 inq.finfish.rep.20220519.finalreport.jm.001.pdf

- *Recommendation 41 - Ensure any review of fee and levy structures for fin fish farming includes public consultation and examination of other jurisdictions.*
- *Recommendation 42 - Apply environmental bonds to the fin fish farming industry to ensure sufficient funds for any remedial work required due to the operations of the industry.*

As detailed further below, the 2023 Tasmanian Salmon Plan[82] subsequently implemented (from July 1, 2023) a very significant scaling up of cost recovery for finfish farming[83] and also proposed a process to further consider returns to the Tasmanian community more broadly. That response reflected both the significant and the escalating costs to government of increasing finfish farming regulation and increasing community concern about the social licence, impacts and benefit sharing of finfish farming.

4.2.2 Key Role of FRDC Levies to Support SA Aquaculture Science

The Fisheries Research and Development Corporation (FRDC) plays a key role in supporting Australian aquaculture research, development and extension (RD&E). All Australian jurisdictions collect levies from industry which are then passed through the lead state agency to the FRDC (in SA this is PIRSA). These contributions are eligible for Australian government matching funds and additional unmatched Australian Government support including public good funding support.[84]

Table 4.1: Overall Industry Contributions to FRDC, Match and Return by Jurisdiction FY 24-25.[85]

Jurisdiction	Maximum matchable (A)	Contributions (B)	Percent of matchable (C)	Distributions of FRDC spend (D)	Return on contribution (D/B)		Additional project contributions (G)	Percentage of total contributions (A/(B+G))	Return on contribution (D/(B+G))	
	$	$		$	2024-2025	5 years	$		2024-2025	5 years
Commonwealth	1,515,568	1,164,042	77%	3,286,634.35	5.61	3.83	30,100	127%	5.26	3.86
New South Wales	488,038	470,295	96%	4,974,977.40	10.92	8.55	773,084	39%	4	8.73
Northern Territory	339,450	325,811	96%	1,979,658.58	6	6.51	0	104%	6.08	6.67
Queensland	715,290	150,000	21%	7,563,870.07	52.17	11.45	1,321,983	49%	5.14	11.66
South Australia	1,066,993	764,027	72%	6,395,255.39	7.16	5.67	1,711,297	43%	2.58	6.02
Tasmania	3,802,080	3,430,211	90%	6,696,488.29	1.96	2.65	410,684	99%	1.74	2.69
Victoria	272,882	161,762	59%	2,630,013.11	16.48	12.05	355,245	53%	5.09	12.31
Western Australia	1,271,172	1,120,177	88%	6,482,364.31	5.92	3.78	270,666	91%	4.66	3.87
Total	9,471,473	7,586,325	80%	43,009,261.51	5.67	4.54	4,873,059	76%	3.45	4.65
Australian Farmed Prawns	524,365	310,233	59%	1,422,248.76	4.58	2.66	-	-	4.58	2.66

Table 4.1 provides a snapshot of the level of overall industry levy contributions, project contributions, match by government (note that this table summarises levy contributions from both aquaculture and fisheries). It is notable that South Australia, by virtue of its advanced aquaculture

[82] See Tasmanian Salmon Industry Plan 2023 | Department of Natural Resources and Environment Tasmania
[83] Full details of finfish cost recovery are provided on a dedicated website - Cost Recovery | Department of Natural Resources and Environment Tasmania
[84] FRDC Revenue About FRDC | FRDC
[85] FRDC FRDC006-Annual-Report-25-S3V4-Digital low-res 20250926 (1).pdf

(and fisheries) industries attracts a significant level of funding and a consistently high level of matching funding contributions (expressed as returns on contributions below).

Table 4.2. provides a detailed breakdown of FRDC support for aquaculture related research and development activities over the past decade. These data were provided by FRDC staff and give an indication of the relative return on industry contributions over that period. The contributions are estimated based on the total "voluntary levy" contribution to the FRDC against the aquaculture GVP based on ABARES fisheries statistics for aquaculture in SA.

The FRDC investment in SA aquaculture is based on projects where a flow of benefit (FOB) was attributed to SA aquaculture and the budget attributed based on the FOB (i.e., 50% benefit then 50% of the budget attributed for that financial year). As is outlined in Section 6, this investment is both a very significant complement to government and industry investment in aquaculture science via cost recovery and a very important source of diversified funding.

Table 4.2: Industry Contributions and FRDC Investment in SA Aquaculture 2014/15-2023/24.

Financial year	**SA Aquaculture contribution**	**FRDC investment in SA Aquaculture**	**Return on contribution**
2014/2015	$344,948	$635,230	1.84
2015/2016	$323,383	$1,936,950	5.99
2016/2017	$367,105	$2,342,196	6.38
2017/2018	$345,000	$1,523,855	4.42
2018/2019	$340,684	$1,660,649	4.87
2019/2020	$395,457	$1,765,608	4.46
2020/2021	$425,489	$1,724,626	4.05
2021/2022	$418,003	$1,944,802	4.65
2022/2023	$474,206	$1,939,886	4.09
2023/2024	$411,599	$2,733,526	6.64

FRDC research priorities are advised by a series of research advisory committees (RACs) and via industry partnership agreements (IPAs). The IPAs are a key part of FRDC's operations as they provide individual sectors with greater certainty for long-term investment against their sector specific R&D plans and priorities. Like the RACs, the IPAs play an important role in setting priorities

aligned to their R&D plans and monitoring progress of investments, with the view to adoption. Each IPA develops an R&D plan outlining its specific priorities. The R&D plans and priorities continued to form the basis of investment during the year. FRDC had IPAs with the following organisations whose operations cover South Australia:

- Australian Abalone Growers Association
- Australian Southern Bluefin Tuna Industry Association
- Oysters Australia
- Australian Barramundi Farmers' Association[86]
- Australian Prawn Farmers Association[87]

The critical role played by FRDC as a contributing partner to aquaculture research and development in South Australia over the past 25 years is acknowledged throughout the 2024 *Zoning In* Report.[88]

Despite the significant historical and ongoing FRDC co-investment in South Australian aquaculture and the very effective ongoing working relationship between PIRSA/SARDI, Industry peak bodies and FRDC, numerous questions arose during consultations with industry about (i) how well FRDC funding is aligned with PIRSA and industry priorities, (ii) how effective FRDC funding is in catalysing new innovations and capacity development in South Australian aquaculture and (iii) how well industry is informed about research outputs.

Some of the industry participants in interviews questioned whether SARDI has been effectively engaged with FRDC on improving our understanding of the local and cumulative impacts of aquaculture in a manner comparable to FRDC support for aquaculture in Tasmania where FRDC has (a) provided high profile major investments in modelling studies to support regional aquaculture development[89] and (b) endangered species recovery in an aquaculture production region.[90]

4.3 Aquaculture Cost Recovery by Other Australian Jurisdictions

4.3.1 Overview

As indicated above, aquaculture cost recovery policies and processes in all Australian jurisdictions are underpinned by broad principles and typically reflect the broader Australian Government cost recovery policy principles. However, in practice, as will be detailed below, each jurisdiction has a bespoke approach to the application of cost recovery.

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[86] Note: that these IPAs represent land-based operations in SA and so are outside the scope of this review.

[87] Note: that these IPAs represent land-based operations in SA and so are outside the scope of this review; SA members of the Australian Prawn Farmers Association are supply chain businesses and not farms.

[88] PIRSA Zoning in - South Australian aquaculture report 2024

[89] FRDC Storm Bay Research Program | FRDC

[90] FRDC Macquarie Harbour oxygenation trial | FRDC

This reflects many influences, from overarching State government policy particularly in relation to cost recovery in the primary industries sector, to the role and scale of aquaculture in a State/regional economy, to the stage of development and investment profile of specific aquaculture industries in each jurisdiction.

Each of these affects not only the governance aspirations of each jurisdiction but also acknowledges the practicality and burden of cost recovery to an often-immature industry.

In order to better understand the application of cost recovery approaches in each jurisdiction, a national survey was undertaken. This comprised three processes:

1) A review of available literature, including, research papers, consultant reports and departmental publications and websites;
2) A survey of each jurisdiction seeking information that direct addresses the ToR for this review – the survey and a summary of responses are provided as Annex C; and
3) Follow up interviews and discussions with various state government and relevant industry peak body representatives on an *ad hoc* basis to try and access additional information or address specific queries. Ultimately, because of the bespoke arrangements that apply in each jurisdiction, there remain some key gaps in detail - these are largely beyond the scope of this review but reaffirm the challenges of aquaculture benchmarking across jurisdictions.

Table 4.3 summarises some of the key elements of the approach used by each jurisdiction to recover costs of aquaculture management. Note that the mechanisms listed are not comprehensive; full details are available at each of the agency websites referenced in the Table and some further details are outlined in Annex C.

Table 4.3: Aquaculture Cost Recovery (ACR) by State

State+	Agency	ACR $ per year#	Key Mechanisms and Exclusions
South Australia[91]	PIRSA	$2.24million	Activity-based cost recovery based on costs of service provision. Lease and licence fees. Science funding includes collection of FRDC levies and co-investment and direct investment by State in priority research such as aquatic animal health, environmental monitoring, etc. (mostly via SARDI).
Tasmania[92]	NRE Tas	$9.6 million+	Finfish levies based on costs of service provision. Lease and licence fees addition to levies.

[91] PIRSA Aquaculture Cost Recovery Final Report 2023
[92] Tasmanian Salmon Industry Levy – NRE Tas

			Lease and licence fees for all aquaculture businesses. Licence exemptions due to disease, hardship, etc. State collects FRDC levy and leverages industry investment (FRDC and direct) in aquaculture via additional sustainable marine research collaboration agreement (Institute of Marine and Antarctic Studies) and Blue Economy CRC collaborations and investments by government in specific projects. Some compliance costs fully cost recovered; others covered by State Govt and via SLAs between the Department of Natural Resources and Environment and Tasmania Police and Director of Public Prosecutions. A wide range of environmental planning, monitoring, animal health and related science and compliance costs are directly recovered under the Salmon levy. There are also additional cost recovery arrangements in place for other fee-for-service work beyond the scope of the levy and specific exemptions for services that are provided by government.
Victoria[93]	VFA	n.a.	Leases and Licences Compliance activities are not subject to cost recovery (beyond costs incorporated in licence fees). Science funding includes collection of FRDC levies and co-investment by State in priority research; no direct activity level cost recovery from industry.
Western Australia[94]	DPIRD	n.a.	Access fees (5.75% of GVP), lease and licence fees, environmental assessment fees (WA EPA), compliance, site inspections and performance bonds Compliance activities are not directly subject to cost recovery but are supported from access fee and other revenue. Science funding includes collection of FRDC levies and co-investment by State in priority research and infrastructure; access fees also support aquaculture related science. Fees reduced to $1 during COVID-19.

[93] Victoria - see VFA Aquaculture Licensing and Biosecurity Framework 2024 and Aquaculture Management - VFA
[94] DPIRD Aquaculture Licensing and Compliance Schedule 2024

Queensland[95]	DAF	n.a.	Resource allocation assessment fees (scalable), Permits, performance bonds Fees for development approvals and environmental assessment set by other agencies Fees waived during key disease outbreaks Compliance activities are not subject to cost recovery. Science funding includes collection of FRDC levies and co-investment by State in priority research; limited direct science activity cost recovery (such as environmental assessment as part of fees).
New South Wales[96]	NSW DPI	n.a.	Annual aquaculture permit fees, annual research contributions, and all application fees as prescribed in Schedule 3 of the *Fisheries Management (Aquaculture) Regulation* 2024. Annual lease rent for the lease area. Compliance activities are not subject to cost recovery (beyond costs incorporated in licence fees). All science-based activities (including research, baseline studies, monitoring) and use of DPIRD research facilities and assets, are subject to full cost recovery. Science funding may include collection of FRDC levies and co-investment by State in priority research.
Northern Territory[97]	DAF (ex DITT)	n.a.	No formal cost recovery fees; Some small scale fees for licences. Management costs funded primarily via general appropriations and federal R&D support. Compliance activities are not subject to cost recovery (beyond costs incorporated in licence fees). Science funding includes collection of FRDC levies and co-investment by State in priority research; no direct cost recovery for science activities from industry.

Notes:

ACR Aquaculture Cost Recovery amount generated/year - note that it was not possible in the time frame of this review to estimate this accurately due to the considerable variation in funding mechanisms and a lack of public reporting of income and expenditures from non-government sources.

[95] DAF Aquaculture Cost Recovery Statement 2024
[96] NSW DPI Aquaculture Licensing and Compliance Schedule 2024
[97] NT Aquaculture RDE Workshop 2024 – DITT

+ See also Annex C and the website resources cited in footnotes for each jurisdiction.

n.a. = not available

4.3.2 Key Takeaways

In the context of this review, there are five especially notable findings from the review of FRDC support and the national jurisdictional survey:

Finding 1 - Limited revenue raised via cost recovery beyond lease and licence charges

South Australia has one of the few activity-based cost aquaculture cost recovery systems in Australia. Most jurisdictions (with the recent exception of Tasmania) rely primarily on lease and licence fees and other forms of payments for access and the associated administrative processing services. These rarely extend to specific payments for all the types of government services that the South Australian cost recovery process covers such as legislative development, specific science and animal welfare professional services, compliance, etc.

Finding 2 – Aquaculture science costs are generally shared between government, industry, FRDC and research providers under bespoke arrangements; direct cost recovery for specific aquaculture science activities is limited to SA and Tasmania, although some States also collect funds for baseline studies and monitoring costs.

Aquaculture science costs in most jurisdictions are borne primarily by industry and government agencies directly. There are a range of co-investment vehicles, most notably FRDC (per 4.1.3) and various CRCs (such as the Blue Economy and Marine Bioproducts CRCs currently) which incentivise collaboration and enable aquaculture research and development activities from local to global scales. State government investment in those CRCs has been limited, with only Tasmania and South Australia formally contributing funding to those two CRCs; various states are, however, active in projects led by those CRCs.

There are also a diverse range of service providers (from Universities to Government-based entities such as CSIRO[98] to fully private research and research service providers) that operate in each jurisdiction (and across jurisdictions) that provide a range of services. In some jurisdictions, research service capacity is maintained within government (such as the role of SARDI within PIRSA or the NSW Fisheries Institute within the NSW DPI or the Darwin Aquaculture Centre[99]) while other jurisdictions have various external science partnerships. Most notable amongst these is the 20 year-long Tasmanian Government partnership with the Institute for Marine and Antarctic Studies (IMAS) at the University of Tasmania[100] which has a core focus on aquaculture science, and which

[98] CSIRO Aquaculture - CSIRO
[99] Darwin Aquaculture Centre Aquaculture research and development | Department of Agriculture and Fisheries
[100] IMAS Sustainable Marine Research Collaboration Agreement (SMRCA) | Institute for Marine and Antarctic Studies

has been critical to the success of their salmon industry.[101] That arrangement is underpinned by a core annual State government budget allocation which is then leveraged by IMAS.[102]

Finding 3 – FRDC Levy funding is key to aquaculture science support in all jurisdictions and provides a consistent and flexible framework for co-investment

The FRDC levy funds the majority of aquaculture science undertaken at the jurisdiction level and nationally (see section 4.1.3). As outlined above, the FRDC levy funds are undertaken on a co-investment basis with a range of industry (often under an Industry Partnership Agreement or IPA with peak bodies), government, research and community organisations.[103] Industry participants in these projects noted the importance of FRDC investment to their aquaculture programs; for example, "*without FRDC we would never have gotten as far as we have come in the past 20 years on tuna aquaculture in SA - they have been there every step of the way*".

Finding 4: Aquaculture compliance costs are generally not recovered fully or directly by most State management agencies; SA, Tas and NSW are exceptions

As indicated in the Table and Annex C, with the clear exception of SA and Tas and partial exception of NSW, core aquaculture compliance service costs are not specifically targeted under the most types of aquaculture cost recovery in most States; those jurisdictions cover compliance/enforcement costs as part of annual budget appropriations to agencies. There are various reasons for this – some conceptual (based on whether compliance is seen as a public good service or whether other service activities such as research merit higher allocations) and others more pragmatic or jurisdiction-specific such as limited mechanisms for recovering these types of costs (and related costs such as prosecution).

Even in Tasmania, only the direct costs of aquaculture compliance by relevant agencies are included in cost recovery levies; related costs such as Police and Prosecution services are covered from government appropriations funding. It is notable in this context also that there have been a number of significant reforms related to aquaculture and fisheries compliance structures and staffing in recent years across Australia.[104]

Finding 5: Tasmania has a new activity-based approach to aquaculture cost recovery that merits further examination

Tasmania has a new and distinctive cost recovery model that has some novel elements. Following development of the 2023 Salmon Industry Plan[105] a priority implementation action was to quickly implement full cost recovery in the salmon sector; the costs of managing Tasmania's salmon industry have been fully cost recovered since 1 July 2023.

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[101] Salmon Aquaculture Research in Tasmania – Salmon Science

[102] The match target is $3 for every $1 of state funding, but this is usually exceeded – see Annual Report | Department of Natural Resources and Environment Tasmania

[103] FRDC About FRDC | FRDC

[104] See, for example VFA reforms 2025: 2025 workforce changes - VFA

[105] See Tasmanian Salmon Industry Plan 2023 | Department of Natural Resources and Environment Tasmania

The costs of management of the Tasmanian salmon farming industry are cost recovered where the service:

1. Provides a benefit to the industry, where the benefit is solely for the salmon industry or the benefit received by the salmon industry is significantly disproportionate; or
2. Is solely, or principally, in service of the salmon industry within Tasmania; or
3. Results in a cost or burden to the Government which arises because of, or principally because of, the salmon industry within Tasmania.

Costs are recovered through a levy on salmonid marine farming licences. A licence holder becomes liable to pay the levy when they apply for the grant or renewal of a licence. Services within scope are provided across business units of NRE Tas, the Environment Protection Authority and the Inland Fisheries Service. For 2024-25, 54.75 FTE are required to undertake activities or services within scope for cost recovery. This FTE total is attributed across 120 positions.[106] There are also services provided by Government that are outside the scope of the cost recovery program as they are more general services or apply across a broad range of stakeholders; these are excluded from cost recovery.

Some of these operate under their own cost recovery model, such as testing undertaken by Analytical Services Tasmania. This is not incorporated in the Tasmanian salmon industry cost recovery program but is an additional mode of cost recovery funded by industry (with government co-contributions). Annual lease fees for marine farming leases are also additional to cost recovery charges. These fees represent a payment to the Crown for the rights conferred by the marine farming lease.

The total cost of services within scope of the Tasmanian salmon industry cost recovery program is $10.4 million. A range of fees and charges apply for some services, for example, licence fees and fish pathology fees. The net cost of management, over and above the revenue from these fees and charges, to be recovered in 2024-25 is $9.6 million. NRE Tas expects there will be 2905 hectares of marine farming lease areas subject to a marine farming licence in 2024-25. With a levy of $3310 per hectare applied to 2905 hectares, full cost recovery of $9.6 million is apportioned amongst four businesses using a standardised methodology[107] which is independently audited, and which also engages each company in review of the model and implementation arrangements.

The Tasmanian model is based on a specific set of policy commitments and so is not directly applicable to South Australia. However, it does share some key underpinnings with the South Australian approach and also provides insights into common issues in cost recovery such as secure information sharing between government and industry, public reporting and trust and independent verification.

[106] NRE Tas Program Details - Salmon Cost Recovery Program.pdf
[107] Salmon Costing Model - Agreed Upon Procedures Report.pdf

Recommendation 8: PIRSA staff and the CRIC arrange an online meeting with their Tasmanian Salmon Management counterparts to learn more about the Tasmanian cost recovery approach, how it is being implemented and what lessons are being learned.

5.0 SA Aquaculture Compliance Cost Recovery

This section also overlaps with aspects of the science program that are funded through cost recovery. Details of that overlap are addressed in the following section.

5.1 Aquaculture Compliance Program Overview

5.1.1 Aquaculture Compliance Program Investments

As was noted earlier, compliance ($9.1M) represents around 26% of the total costs of management ($34.2M) of South Australia's overall fisheries and aquaculture sectors in FY2025-26. Industry is the major funder of the total compliance budget, providing 63% of the total budget. Within the total fisheries and aquaculture compliance funding provided by industry (~$5.7M), the aquaculture compliance program ($248k) represents only 4.4% of total costs recovered.

Within the total aquaculture cost recovered budget ($2.24M), the proportion allocated to compliance is around 11% ($248k). The oyster sector is the largest contributor representing ~60% of the total aquaculture compliance budget (in FY25-26). The next highest sectors are tuna (17%), land-based (11.5%), finfish (7%) and mussels and marine algae (~2.3% each). Abalone makes no budget contribution in the current FY. Figure 5.1 outlines trends in cost recovered aquaculture compliance budgets by sector relative to overall production by each sector over the past decade

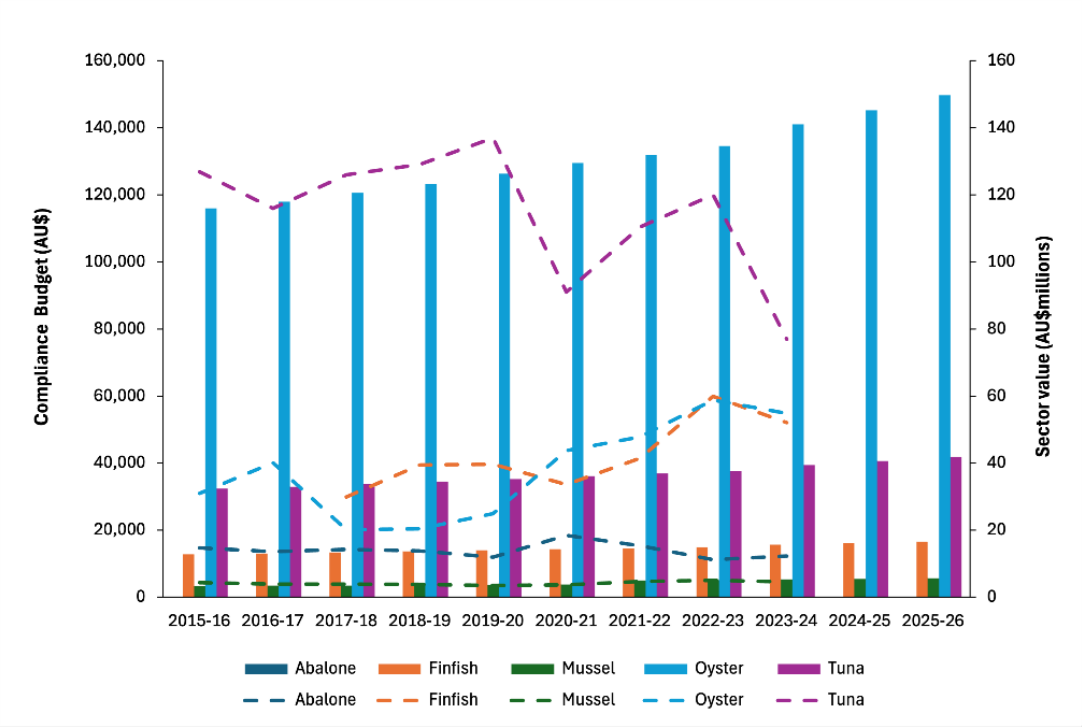

Figure 5.1: Aquaculture Compliance Budget (left axis, bars) relative to Aquaculture Sector Production Value (right axis, dashed lines) by sector 2015-2024.

The high portion of total compliance budget costs recovered from oysters is understandable given the large number of licences and dispersed nature of the industry footprint; compliance costs are higher in that sector given the higher servicing costs for activities such as field inspections and industry engagement. For the next largest sector (tuna), compliance costs have not varied greatly (beyond consumer price index [CPI] increases) despite the fluctuating value of the industry – this is not uncommon given that the 'base costs' of compliance staffing and support resources tend to stay relatively constant, unless there is a very significant change in a sector (such as a major expansion or contraction of the footprint).

5.1.2 Aquaculture Compliance Policy and Operations

PIRSA have developed a Fisheries & Aquaculture Prosecution and Enforcement Policy (F&A P 005) to provide a consistent state-wide approach to the enforcement of Acts administered by PIRSA Fisheries and Aquaculture. Core elements of the policy are outlined in Figure 5.2. PIRSA Fisheries and Aquaculture staff use education and awareness approaches as the foundational and most common compliance tool to encourage voluntary compliance. Other, more legally-based compliance and enforcement processes and tools may be used as cases develop and may led to significant changes in licence conditions, including revocation.

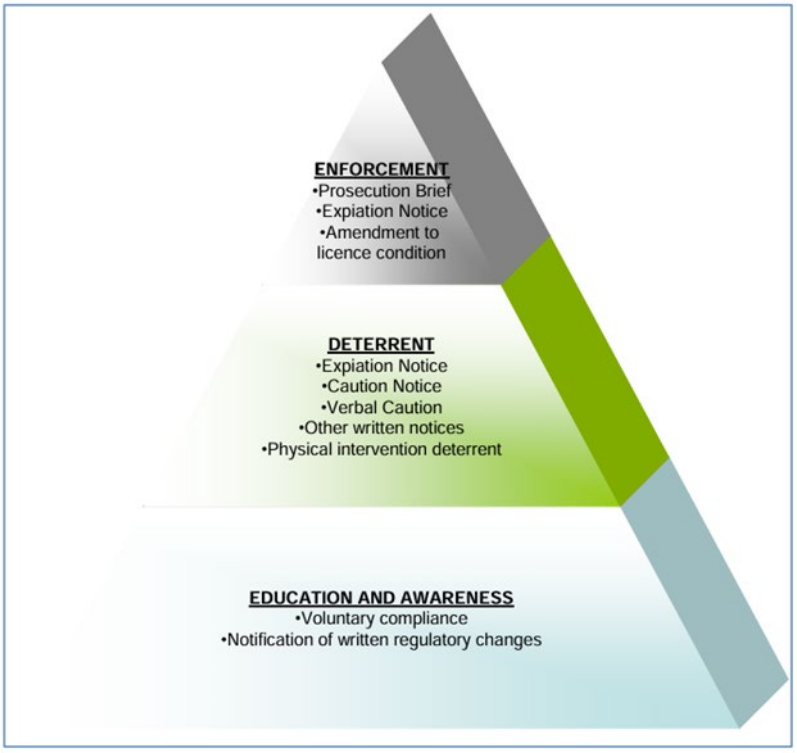

Figure 5.2: PIRSA Fisheries and Aquaculture Compliance Model.[108]

[108] PIRSA 2016 Fisheries And Aquaculture Enforcement and Prosecution Policy

The PIRSA Compliance model is generally consistent with international compliance best practices and national frameworks for fisheries compliance such as the recently refreshed AFMA National Compliance and Enforcement Program.[109]

The compliance policy was approved in 2016 and was due for review in August 2021. The review team were advised that this review is in process but is not yet complete. Updating of the policy would be timely given national advances in compliance policies that apply in the fisheries and aquaculture sectors and the strong growth of aquaculture in other jurisdictions in recent years that introduce more bespoke and innovative approaches to aquaculture compliance activities.

Recommendation 9: PIRSA Expedite review of the Fisheries & Aquaculture Prosecution and Enforcement Policy (F&A P 005) to reflect both findings from recent reviews and advances of fisheries and aquaculture enforcement nationally.

Implementation of aquaculture compliance policy and operations within PIRSA is undertaken under the oversight of the Director of Operations who reports directly to the Executive Director and who oversees compliance and operations staff in three regions (West, Central and South) and an operational support unit that provides cross cutting services, including vessel operations.

Within the Operations unit, Fisheries Officers undertake all compliance operations; a role that they balance with their other duties undertaking fisheries compliance activities. It is notable, given the level of specialised knowledge involved in the various aquaculture sectors, that there are no compliance staff whose sole responsibility or skill base is aquaculture compliance.

Fisheries Officers have a close working relationship with aquaculture, licensing and science staff across PIRSA and SARDI and with external agencies such as the EPA as needed. The level of professionalism and commitment to best practice compliance protocols by the Fisheries Officers that the review team met with was exemplary.

They are motivated to continually improve their knowledge, systems and effectiveness. It was notable during interviews with the Fisheries Officers that they are less comfortable in the aquaculture space than in commercial (and recreational) fisheries.

Recommendation 10: PIRSA conduct an annual one-day learning exchange bringing together Fisheries Officers (FOs) with Aquaculture and SARDI staff to share compliance experience and better inform FOs about key science and management approaches. An industry representative should also be invited to present their perspective(s).

Recommendation 11: PIRSA (a) engage Australian universities and/or other training providers to develop an online training program for Fisheries Officers and new staff and (b) propose a short (2 week) Fisheries Officer professional development exchange with other aquaculture jurisdictions.

[109] AFMA 2025-27 Domestic Compliance | Australian Fisheries Management Authority

This largely reflects the more limited training and knowledge they have related to aquaculture science and production practices. It also reflects the challenges of providing minimum service levels to each aquaculture sector with very limited resourcing relative to the scale (footprint and number of licensees) of the industry.

Table 5.1: Aquaculture Compliance Effort Allocation by Sector 2024/25.[110]

Aquaculture Sector	Licenses (May 2025)	Funded Compliance Days
SBT	7	30
Mussel	34	4
Land Based	56	20
Finfish	19	12
Abalone	2	0
Algae	4	10
Oysters	323	105
Other (non-cost recovered)	32	0
Total	477	180

Compliance resources are allocated annually depending on the scope of work outlined in the annual operations plan associated with the annual program budget and adjusted throughout the year based on emerging priorities and compliance risks. Table 5.1 above details the anticipated allocation of compliance effort by aquaculture sector in 2024-25.

As indicated in the Table, and generally consistent with the overall program funding allocations described above, the oyster sector dominates compliance effort allocation, with 58% of compliance days, followed by tuna with 17%, land-based (11%), finfish (7%), marine algae (5%), mussels (2%). Abalone licences receive no allocation as they are currently inactive. Notably, there are also 32 non-cost recovered licences (7%) that receive no compliance effort allocation.

Funded compliance days cover the full spectrum of the compliance model – from education and awareness to prosecution actions. They do not represent just field/site inspection or grower engagement days nor do they reflect the costs associated with different field-based and more complex/specialized compliance activities, including legal engagement (in higher level activities such as expiations or prosecution actions). The licence data is provided for context only but is indicative of the challenges faced in providing compliance services across all aquaculture sectors and risks.

[110] Data provided by PIRSA

Compliance activities are tracked by Fisheries Officers and reported within PIRSA and then back to industry in annual reports on services delivered to each sector under the cost recovery agreement.[111] These reports tend to cover a range of operational activities, generally without reference to specific business operations or details of any cases elevated for expiation or prosecution, maintaining privacy and protecting the confidentiality of any ongoing investigations.

Table 5.2 below outlines key compliance activities over the past five years. While the seriousness of offences varies from year-to-year, these data confirm that overall, there is a high level of industry compliance with license and lease conditions.

Table 5.2 Aquaculture Compliance Records 2020-2025.[112]

Year	***Aquaculture Regulations***			***Aquaculture Act***		
	Caution	**Expiation**	**Prosecution**	**Caution**	**Expiation**	**Prosecution**
2020	25	1	1 (withdrawn)			1 (withdrawn)
2021	7	3	0	4	0	0
2022	2	0	0	1	0	0
2023	13	2	0	0	2	1
2024	4	0	0	1	3	0
2025	7	2	0	0	2	0

5.2 Compliance Cost Recovery Assessment

5.2.1 Effectiveness and Efficiency

One of the key findings of the ICRRP (McCallum et al., 2023) report was that:

Compliance, which generally comprises the second largest PIRSA-related cost component in all fisheries, stood out to the Panel as the most contentious area of service delivery in PIRSA's fisheries program and is the area in need of repair most urgently. The Panel found PIRSA and industry have views that differ markedly on the best compliance approach to managing fisheries. PIRSA appears to apply a very precautionary and risk averse approach, with many in industry of the view this is based on a somewhat outdated attitude to compliance. There was a view that PIRSA applies a 'rinse and repeat' compliance program in some cases.

This observation is supported by review of PIRSA Cost Recovery Implementation Statements over the past five years (2020-2025) which reveals no fundamental changes in the objectives, activities, and deliverables of aquaculture compliance operations specific to each sector. Education and awareness as well as effective monitoring and enforcing programs are the central goals across all compliance operations and are supported through three PIRSA activities (Table 5.3).

While the deliverables for each of these activities reflects consistent alignment of activities, it also raises a concern for the review team that aquaculture compliance activities are not sufficiently tailored to the specific ESD risks (per section 2.4) and evolving compliance issues associated with

[111] For example, Annual Report on PIRSA's Service Delivery on the Cost Recovery Agreement for the Tuna Sector 2022–23
[112] Data provided by PIRSA Prosecution Coordinator

each sector. It also raises a question as to whether the compliance staff have the necessary level of education and awareness activity that the PIRSA compliance model envisages.

Table 5.3: Summary of PIRSA compliance activities and deliverables applicable across all aquaculture sectors.[113]

Activity	Deliverable(s)
Operational planning and implementation	Communicating compliance related issues of key importance and relevance to the Sector in a timely manner, including advance notice of site inspections
Site surveillance	• Undertaking site inspections and ensuring lease and licence holders are compliant with lease and licence conditions and requirements • Timely communication of inspection outcomes to relevant lease and licence holders • Undertaking re-inspections of non-compliant sites • Undertaking inspections of sites due to be or that have been rehabilitated • Responding to information provided by members of the public or SA Government Agencies in relation to compliance issues relevant to the Sector
Aquaculture compliance liaison	Seeking assistance from Fisheries & Aquaculture Policy and Environment staff in relation to compliance activities. Includes, but not limited to scheduling of sector specific site inspections, confirmation of licence and lease conditions, positioning of sites, confirmation of sites requiring or subject to rehabilitation and provision of assistance in field-based compliance initiatives.

The compliance resources allocated to aquaculture are clearly insufficient to undertake the level of compliance activities consistent with the level of compliance effort applied to the commercial fisheries sector. This is partially evidenced by the lower level of resources available to undertake even the most basic levels of aquaculture engagement and enforcement activities outlined above. For example, Fisheries Officers interviewed during this review suggested that in order to undertake compliance activities in the oyster sector to the standards they aspire to would likely require an annual allocation of ~500 days (c.f. the 105 currently allocated).[114]

Determining the level of resources needed for each aquaculture sector is not an easy task, as each sector has both (a) different ESD risks at different stages of development and (b) specific needs over the course of a growing and harvest cycle. In some cases (such as oysters as discussed further in Section 6), those risks and needs are changing as new technology comes online. In others, risks

[113] Source - synthesis of PIRSA annual aquaculture sector reports.
[114] Noting that for WHS reasons each site inspection requires the presence of two officers.

and needs change as industry practices mature and market conditions evolve – for example as production increases or decreases or there are emergencies (e.g., Covid-19, HAB, disease, etc).

These changes dictate a need for flexibility and discipline in compliance resource allocation. PIRSA has demonstrated that ability in past and current crises and generally works closely with aquaculture management staff and industry to ensure responses are well tailored. That said, staff did note that because of the limited internal resources capacity, aquaculture-related staff across PIRSA have experienced notable capacity constraints when seconded to agency-wide emergencies (e.g., fruit fly, bushfires, drought).

Recommendation 12: When determining whether to reassign aquaculture staff (particularly front-line staff) to other duties, PIRSA assess the potential impacts on the aquaculture industry and implement mitigation measures, including communication of any changes industry should be aware of.

In determining the level of resources needed for aquaculture compliance, it is not just a question of allocating staff effort based on simple metrics such as sector value, the number of licence holders or footprint of production. There are few benchmarks or standards that provide guidance, but PIRSA compliance staff do make a concerted effort to target operations which are deemed (using various risk and operational criteria) more at risk of noncompliance or which should be part of the compliance rotation given lack of recent inspection.

The approach reflects the best professional judgement of compliance staff, but is challenged by unexpected events such as weather, operational needs in fisheries and even internal reassignment to cover emergencies. There was also concern raised by Fisheries Officers about the level of effort required to pursue more serious offences such as expiations, complex investigations of suspected criminal activities under Fisheries and Aquaculture Acts and prosecutions as these inevitably reduce time for field inspections and grower engagement.

To assist Fisheries Officers with annual effort/resource allocation planning, the review team found that a more systematic approach to resource prioritisation based on risk, capacity, sectoral needs and other operational considerations is needed to underpin future compliance cost recovery settings. A new approach based on both ESD risks and operational considerations was developed by the review team and discussed with PIRSA Operations staff and Fisheries Officers.

That approach is outlined in Annex D, and can be summarised as follows:

a. Fisheries Officers and other key PIRSA operations and aquaculture staff annually develop/update the aquaculture risk assessment and prioritisation plan (ARAPP) for each sector (using the ESD Risk Assessment outline in Section 2.4 as a starting input);
b. The ARAPP is shared with industry for input/feedback and then with the CRIC for final review;
c. The ARAPP frames the principal scope of work for annual cost recovered compliance activities. Per below, compliance activities which have a greater public good focus would be implemented concurrently with cost recovered compliance activities but would be funded

from government appropriations. Some of those, such as random lease inspections or covert surveillance of potentially illegal activities may extend beyond the scope of the ARAPP.

Because of the importance of engaging compliance and aquaculture staff with local knowledge and expertise in the final design of the ARAPP, the review team did not propose a final approach to ARAPP development. Rather, the approach outlined in Annex D provides a starting point for further development in concert with industry and is subject to further refinement by PIRSA and industry. As noted in Section 2.4, this also provides the opportunity to refine and update current ESD ratings for various aquaculture operations in all locations to ensure that up-to-date knowledge is being used.

Recommendation 13: PIRSA adopt a more systematic and transparent approach to compliance prioritisation by developing an annual Aquaculture Risk Assessment and Prioritisation Plan (ARAPP) that considers multiple types of risks and guides the annual allocation of cost recovered compliance resources under the CRIS. The annual ARAPP should also inform and complement annual PIRSA appropriations allocations.

A further consideration in assessing compliance needs is social licence which is an increasingly important issue facing aquaculture in Australia. Although it is currently not as prominent in South Australia as it is in other jurisdictions, Australian and global experience has shown that it is important to build and maintain public trust to ensure that aquaculture businesses are valued and supported by the community.

Transparency is key to building and maintaining public trust. A key part of that trust also requires assurance/public reporting of compliance activities. While PIRSA has commendable record of making key information about cost recovery and aquaculture publicly available on its website, more needs to be done to ensure that information is both accessible and meets public needs. In this regard, the current compliance related elements of the website can be challenging to navigate and have limited information. A key example is the public register (Aquaculture public register - PIRSA) that has only limited information about the current status and history of lease production. As was noted earlier, other jurisdictions have a more cohesive public facing approach that has a specific emphasis on compliance reporting.[115]

Recommendation 14: PIRSA communications staff undertake an assessment of public use of the aquaculture register website and assess options (using cost recovered funds) to expand reporting on that register (or elsewhere) on aquaculture compliance activities.

The review team felt that assessment could also link with an improved understanding of what the South Australian public believes to be important in maintaining the social licence of SA Aquaculture and could build on:

(a) Work already undertaken by Condie et al. (2025) on understanding what types of communication reduces conflict over aquaculture; and

[115] See, for example the compliance reporting data here Home | Salmon Farming Data Portal

(b) Work underway by Condie and Condie (in progress) to better understand the social licence requirements for new types of aquaculture.[116]

5.2.2 Cost Structure

As noted above, cost recovered funding for aquaculture compliance represents only a little over four percent of the total amount of funds cost recovered for compliance activities across fisheries and aquaculture in FY2025-26 and only around 11 percent of the total funds that industry contributes specifically to aquaculture management. As Figure 5.1 outlined, those relatively low levels of cost recovery have been a long-established norm for the aquaculture sector. They reflect an institutional view that aquaculture compliance is a lower risk and a generally lower priority than commercial fisheries.

That view is supported by the relatively low levels of non-compliance by aquaculture licensees (Table 5.2) in recent years. It is always challenging to determine the appropriate levels of compliance resources in any industry. Much depends on factors such as the (a) the "base resources" needed to maintain a viable compliance capacity (which is generally higher for marine based operations given the need for specialised equipment, additional safety protocols, etc.), (b) the detectability of offences (licences generally have advance notice of planned inspections) and (c) the diversity of behaviours of potential offenders.

The limited resources available for aquaculture compliance activities have constrained the ability of Fisheries Officers and other staff to undertake the full range of activities envisaged in the PIRSA Compliance Policy and to meet the diverse aspirations of all sectors, particularly oysters. While the level and allocation of government appropriations to aquaculture management is beyond the scope of this review, it is obviously a key complement to the cost recovery budget and an opportunity for government to support compliance activities that have a specific 'public good' focus, whether those be educational or enforcement in approach.

One specific area of ESD risk that is insufficiently covered by current cost recovery arrangements relates to emergency lease clean up. While there is an appropriate framework for lease clean up in the event of routine business closure or lease termination, arrangements for emergency response for a lease clean up in the event of natural disasters or abrupt business failure need further policy development. There are various arrangements in other jurisdictions that have a mix of public and industry funded support. The important element of these is that there is a clear protocol to follow and a readily accessible source of funding (or fund recovery mechanism) in the event that an aquaculture lease needs to be cleaned up or rehabilitated at short notice.

[116] See FRDC Project 2023-01 Pathways to social license for the emerging Tasmanian seaweed industry | FRDC

Recommendation 15: PIRSA develop a policy that defines industry and government responsibilities and actions for lease rehabilitation in the event of business failure or natural disaster. The policy would also deal with how the costs of those actions would be covered.

5.2.3 Equity and Stakeholder Engagement

As indicated in the earlier summary of stakeholder consultations, industry stakeholders are supportive of the need for a strong compliance program but sometimes have divergent views about the approach taken by PIRSA Fisheries officers. There is a consistent recognition of the importance of compliance with permit conditions.

Businesses look to PIRSA to "act as the umpire" in enforcing the rules and in so doing "level the playing field". The reasons for support vary from pecuniary (e.g., not wanting a business competitor to gain an unfair business advantage by cutting corners, etc.) to more ethical and strategic (e.g., not wanting the industry to come under further scrutiny or even generate negative publicity).

Comments made during stakeholder interviews reflect these views:

- *"We can't afford to not comply with the rules as eventually that'll come back to bite us"*
- *"I don't want to be the bad guy and tell others what to do – if other companies don't do the right thing – it's up to the Fisheries officers to intervene"*
- *"We need to be careful that we don't end up with protestors like they have had in Victoria and Tasmania on fish farm proposals; if we want to be allowed to grow our businesses we have to be seen to be doing things right".*

However, despite this support, there is both a surprising variability in licence holder understanding of aquaculture regulations, including compliance efforts and concern about the limited profile of aquaculture compliance activities as reflected in interviews, especially with the oyster sector. A small number of growers questioned what they get for their compliance fee payments and how effective Fisheries Officers are in providing advice and services to businesses.

- *"We don't see them very often and when we do they focus on things that really are not that important in the bigger scheme of things – who cares when a length of line is a foot too long? They should be more focused on the effects of flip farms who use up more of the available feed in this bay"*
- *"They can't answer questions about why I can't do things a bit differently even though what I would like to do is not that different to what we are allowed to do and would probably be less risky for seagrass"*
- *"Fisheries Officers are nice enough, but they don't know much about why the rules are set the way they are – I have tried discussing this with the aquaculture team in Adelaide, but they never answer their phone"*

- *"Why don't they train their inspectors more to be able to make common sense decisions about how we manage our leases – they know how much we are growing in our lease and we could be even more productive in the same area if we could just have a bit more flexibility".*

Interestingly, these overlap with points made by PIRSA Fisheries Officers who are concerned that they are not adequately trained and supported to undertake the broad range of education and engagement skills envisaged in the PIRSA Compliance Policy and operating procedures when working in the aquaculture sector. In discussions with Fisheries Officers, they acknowledged that even with training/briefings and ongoing support from other PIRSA aquaculture research and management staff, they often feel 'mismatched' in responding to requests for advice to growers or in explaining the nuances of regulations that they are enforcing during site visits.

This is not uncommon, nor unexpected, especially given the breadth of their other duties, the complex technical and legal settings that apply in each aquaculture sector and the inherent challenges of balancing enforcement approaches with educational approaches. The review team believe that this shortfall could be addressed by bringing onboard additional staffing to complement existing compliance efforts via industry engagement activities.

Recommendation 16: PIRSA employ three new Aquaculture Engagement Officers (AEOs) to deliver aquaculture education and awareness activities.

It is proposed that, given the focus of industry, the three AEOs would be based in Port Lincoln (2x FTE) and in Adelaide (1xFTE) and report in a matrix fashion to the General Manager of Aquaculture and to the Director of Operations. The staff would rotate as needed for seasonal and sector specific lease inspection operations and share key PIRSA resources such as small boats with Fisheries Officers.

The AEOs would be funded from both appropriations and from cost recovered funds and would work with PIRSA aquaculture and compliance teams to:

- improve two-way communication between PIRSA and growers (acting as first points of contact for general grower inquiries, sharing key knowledge and updates, being more visible and accessible to growers, etc.),
- complement the work of Fisheries Officers by dealing with routine queries, inspecting leases and referring potential infringements to Fisheries Officers for follow up (but ideally operate at arm's length from any enforcement activities), and
- work with peak bodies such as SAOGA to support grower outreach activities, direct feedback on emerging issues to PIRSA.

A further element of this proposal is the timeliness of additional grower support given the current HAB and its impacts on aquaculture businesses and the need for a range of support as recovery begins. In this context, these new AEO roles may qualify for additional budget support from future HAB recovery funding. AEO numbers may also be temporarily expanded to include provision of research extension services similar to the work of FRDC Extension Officers.

5.2.4 Digital Transformation Opportunities

Many of the compliance approaches utilised by Fisheries Officers are based on well-established methods that meet evidentiary standards for prosecution of offences. Some of these (such as counting baskets and measuring line lengths on oyster and mussel leases) are cumbersome and time consuming. While the review team could not identify a specific technology that would assist in making this work more efficient, there is significant opportunity for Fisheries officers to use a variety of digital measurement technologies and combine those with improved field data entry technology to enable faster and more meaningful assessments of lease compliance (see recommendation in Section 6).

As part of our review of global and national compliance operations, the review team scanned a range of digital innovation opportunities related to compliance. There are various new data gathering and recording technologies including remote sensing and artificial intelligence platforms that could support and potentially increase the efficiency of field-based and online compliance operations.

There are ongoing rapid advances in remote sensing and computer vision[117] that offer potential for more accurate and cost-effective measurement and monitoring of aquaculture operations in the field that could assist with compliance operations. These are also increasingly coupled with software and related AI technologies that offer potential for faster data integration and prediction[118] which could then be used to better integrate available data to prioritise monitoring and support field compliance activities at local scales. These technologies offer a significant cost advantage because they can be undertaken using remote sensing platforms and real-time data integration. SARDI, Operations and Aquaculture staff maintain general awareness of these technologies through peer networks, professional development and engagement with research and development organisations.

However, with a few possible exceptions (such as the increased use of emerging AUV and drone technologies to reduce on water time and enable more accurate capture of lease condition data), relatively few of these are new to PIRSA staff or are ready for immediate application to aquaculture compliance. Much electronic monitoring (EM) software available in Australia[119] is oriented towards wild fisheries and not aquaculture operations. Aquaculture companies already maintain a range of EM systems that support their operational needs. Few of these are suited to compliance information needs, although some operators did raise the question of whether there may be value in developing surveillance capabilities (using video or sound recorders) for some locations to better understand wildlife interactions and human uses of areas near aquaculture operations.

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[117] See, for example, Quaade et al. (2024) Remote sensing and computer vision for marine aquaculture | Science Advances

[118] See Yang et al 2025 AI-driven aquaculture: A review of technological innovations and their sustainable impacts - ScienceDirect

[119] Such as the CSIRO AIML technology https://research.csiro.au/mvt/home/fisheries-management/

The review team identified a need for better technology related to two-way information sharing with licence holders and with the general public. Examples include reporting systems such as the Deckee app for marine debris reporting and the Tasmanian Salmon Portal which are both described further in other sections of the review; these systems would enable PIRSA to benefit from publicly submitted reports on debris and even threatened/endangered species interactions and provide channels for reporting information to key stakeholders (e.g., recreational boaters/fishers).

For improved communication between units of government and with licence holders, there appears to be value in developing better customer relationship management (CRM) systems. The review team is reluctant to recommend any specific case management or CRM software given the perennial challenges of introducing new software within a larger government technology framework. However, the one area where we believe that there would be immediate value in further investment is integrated CRM software such as Salesforce that would enable all PIRSA aquaculture staff (and potentially other key agencies such as the EPA) to better track interactions with licence holders (and other stakeholders such as peak bodies) in a more systematic manner than current systems. Industry members we consulted expressed frustration with inadequate record keeping, lack of internal coordination between PIRSA business units and the loss of institutional memory due to PIRSA staff turnover… "*I have to tell them who I just talked with in that part of PIRSA; they should already know that*".

Recommendation 17: PIRSA IT staff undertake an assessment of options for improved CRM software to enable interactions with aquaculture licence holders to be better coordinated, curated and accessible across government.

That software should also have the ability to integrate with case management software used by Fisheries Officers and prosectors and be accessible in the field.

5.2.5 Innovations from Other Jurisdictions

As outlined in section 4 of the report, there are a variety of bespoke arrangements for aquaculture management in each Australian jurisdiction. Most jurisdictions, partly because of the limited scale of aquaculture activities and partly because of their established agency structure, budget and compliance/enforcement staffing arrangements, undertake aquaculture compliance alongside commercial (and recreational) fisheries management in a similar manner to South Australia.

One jurisdiction that has a more tailored approach to aquaculture compliance activities is Tasmania. The Aquaculture Branch of NRE Tas recognised that the types of activities and skills required for effective aquaculture compliance management were different to those that were required in the commercial and recreational fisheries sectors. No specifically authorised Fisheries Officers are employed in the management of Tasmanian aquaculture.

Instead, there is a dedicated aquaculture enforcement team (three FTE who are also interoperable with members of the ShellMAP team) that undertakes all field-based inspections and industry

engagement activities. The group coordinates activities (and is interoperable) with other enforcement units of NRE Tas and government more generally (e.g., Marine and Safety Tas, EPA, Inland Fisheries Service, Biosecurity, etc). The enforcement team has the authority to issue infringement notices for matters such as boundary marking, marine debris, etc. More serious matters are escalated to Tasmania Police or dealt with directly via referral to the Director of Public Prosecutions, but such cases are rare.

One major advantage of this approach is that it enables two-way learning and information exchange between industry and governance and knowledge building within government. The aquaculture compliance team works closely with other Branch staff (many of whom participate in field-based surveillance/inspection activities)[120] and routinely conduct grower education activities as part of the compliance program. This emphasis on education and awareness is also increasingly common in other jurisdictions. Victoria has recently undergone a major reform of Fisheries officers roles and structure to place greater emphasis on education/outreach activities.[121]

Two other innovations from Tasmania that are relevant to compliance (and science to some extent) are:

- Tasmanian Salmon Farming Data Portal[122] – created in 2019-20 with the intent of improving transparency in management of the salmon industry, the portal provides regularly updated data on a range of aspects of salmon farming, using a standard series of metrics including operational compliance; and
- Marine Debris reporting – there are a range of stakeholders in marine debris reporting and multiple sources of marine debris including marine farming. To better address marine debris reporting NRE Tas together with Marine and Safety Tasmania and the EPA have partnered with software company DECKEE to develop incident reporting functionality on the DECKEE app.[123]

Recommendation 18: PIRSA work with industry and MarineSafety SA, EPA and other key agencies to develop a more unified and user-friendly approach to marine farming debris reporting in SA and assess whether there are any off-the-shelf apps (such as Deckee) to use.

Across Australia there is increasing engagement of aquaculture businesses in various kinds of marine stewardship activities. There are many examples where, like the Adopt a Beach program[124] in South Australia where aquaculture businesses and employees engage in marine search and

[120] That involvement offers industry an opportunity to meet with staff in the field and also has a range of professional development benefits for staff, especially staff who are new to aquaculture operations.
[121] VFA 2025 workforce changes - VFA
[122] See Home | Salmon Farming Data Portal
[123] Marine Farming Debris | Department of Natural Resources and Environment Tasmania
[124] PIRSA 'Adopt a Beach' program - PIRSA

rescue activities (including wildlife recovery) and sponsor marine debris clean ups, habitat restoration and diverse research and community education initiatives. These contribute to a positive image for the industry and have also provided industry staff with opportunities for professional development, building their commitment to responsible aquaculture practices.

An example of stewardship innovation that is of relevance to aquaculture compliance in SA at the present time is the Responsible Oyster Farmer Training program in NSW.[125] To provide new farmers with a baseline level of knowledge across a broad range of topics, a training program has recently been custom-built for the NSW oyster industry. These materials were created by OceanWatch Australia, in close partnership with NSW Farmers, NSW Food Authority, NSW Aquaculture Administration & Management, and NSW DPI Biosecurity.

NSW Farmers secured funding to convert these materials for delivery via an online Learning Management System. This platform went live in early 2023, and is available to all NSW aquaculture permit holders, their staff, and those looking to enter the industry. To encourage completion of the training, and to support industry recovery following the fires, the course was paired with a rebate program administered by NSW Farmers. Every Class-A aquaculture permit holder was eligible to apply for a $3,000 rebate on eligible items and activities, with almost $800,000 provided through this process.

Recommendation 19: PIRSA work with Oysters SA and SISA to develop a program modelled on the NSW Responsible Oyster Training Program to enable aquaculture workers to better engage in responsible stewardship practices.

This type of program would offer significant opportunities to both advance industry engagement in stewardship activities and to build a closer working relationship between PIRSA compliance and aquaculture staff and industry.

5.2.6 Other Matters

1. Barriers to Change

There are, as has been noted throughout this section, various barriers to changing current aquaculture compliance settings. These include:

- Environmental - the decentralised scale of South Australia aquaculture operations means that compliance operations have to be agile and able to cover large/diverse areas and often repeatedly which increases cost;
- Social - e.g., what does the SA public expect when it comes to protection of marine resources from the operational impacts of aquaculture? and
- Economic - e.g., what is an appropriate level of cost contribution by industry?

[125] Responsible Oyster Farmer Training & Rebates Package

The South Australian government has been a national pioneer in addressing those kinds of questions over the past two decades, but it is evident that there remain both philosophical (e.g., is cost recovery appropriate to all aquaculture businesses and at what risk levels and cost?) and pragmatic (e.g., how many hours/days of compliance resources is appropriate to allocate to various types of aquaculture operations?) challenges to resolve.

The review team have no further recommendation on addressing these barriers other than to propose that the CRIC supports efforts by industry and PIRSA to continue to test, learn and adapt as per past cycles of reform. The recommendations above address some of the potential barriers to change, including a reshaping of the compliance resource profile through the introduction of AEO roles.

The review team believes that the CRIC shows promise in better enabling industry and government to identify and discuss barriers and opportunities for reform. It will be critical, as was noted earlier for the aquaculture sector within the CRIC to ensure that their needs are being addressed and that their time and fiscal contributions are used effectively.

2. Voluntary Management Arrangements

An unresolved issue related to encouraging industry compliance is the limited ability of the current compliance framework to recognise or incentivise voluntary compliance by industry. Voluntary compliance and adoption of best practices by industry is well advanced in some aquaculture sectors, particularly those, like the mussel sector-based aquaculture strategy (that was co-developed with PIRSA[126]) and/or who have been engaged (e.g., tuna, finfish) or are still engaged with third party certification schemes.

The leading industry standard is the Aquaculture Stewardship Council (ASC). ASC currently certifies two aquaculture operators in SA[127] – Yumbah (Abalone) and Clean Seas (Yellowtail Kingfish). These provide PIRSA, consumers and the community at large with some assurance that global best practice standards are being followed.

There are also increasing options to access best aquaculture practices via the Global Seafood Alliance which also offers the additional opportunity for engagement of aquaculture supply chain partners[128] – that system creates further market-based incentives for voluntary compliance by producers. Unfortunately for smaller aquaculture operators for whom ASC or alternate certification may not be feasible or cost effective, there are relatively few widely accepted standards for aquaculture businesses seeking to implement voluntary compliance practices.[129] An emerging opportunity in this respect is the Global Sustainable Seafood Initiative.[130]

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[126] A "how to guide to ensure potential adverse effects on the environment resulting from day-to-day farming practices and other conduct by the mussel sector are avoided, remedied, or mitigated wherever possible".

[127] ASC Find Certified Fish Farm Locations - ASC International

[128] Global Seafood Alliance BAP Best Aquaculture Practices

[129] There was, for example, an Australian aquaculture voluntary code of conduct in the early 2000s led by the now defunct Australian Aquaculture Forum – see Australian Aquaculture Code of Conduct

[130] Benchmarking - GSSI

A specific concern is that PIRSA does not yet have a formal mechanism to incentivise or recognise voluntary compliance in its compliance approach; while PIRSA staff are aware of those standards and there is some alignment with licence conditions, that is often incidental. As industry noted, there is little incentive for industry to undertake of rigorous and extensive third-party certification.

Those who do engage in certification schemes such as ASC, are often motivated primarily by the market access opportunities those offer. All "gold standard" certification schemes have an independent auditing element that is at least equivalent to (if not more rigorous than) PIRSA compliance standards.

Recommendation 20: PIRSA work with industry and certification bodies to further assess voluntary compliance and certification mechanisms and assess how to incorporate those into compliance risk assessment as a mechanism to reduce costs and promote better stewardship by aquaculture businesses. This should include assessment of the option to incentivise voluntary compliance via cost recovery fee reductions/offsets for businesses who meet prescribed standards.

3. Industry Ability to Pay

Many industry members raised the issue of cost escalation. They note that the way that cost recovery currently operates was established a long time ago and that a reset is needed given how the industry has evolved and the relatively low rates of non-compliance that have been observed. An alternative view put forward by government is that aquaculture compliance settings are as efficient and cost-effective as possible (if not below where they need to be) and that there is a need to maintain key services which become more expensive over time due to inflation.

Industry ability to pay was raised by several industry bodies in three contexts:

- Emergency Relief – noting the responsiveness of government during Covid-19 pandemic to various fee relief requests, and in the context of the current HAB response, some industry members would like a clearer picture of what elements of cost recovery may be eligible for relief in the current HAB response process and in any future emergencies;
- Market Trends – as per the experience of the Abalone and Tuna sectors, global markets for those species are very challenging at the present time, but operators pointed out that the current cost recovery framework provides no specific mechanism for fee reduction tied to market conditions; and
- Industry Maturity – businesses in several sectors made the point that they have been operating in a similar manner in the same locations for 10-20 years and had not breached any licence conditions. They noted that the burden of compliance cost recovery was greatest when they were first established and that a case should be made for discounting compliance costs over time if a business maintains a clean record.

The review team noted that because of the "installed cost" of most government services especially staffing, it is challenging for government to provide any relief or concessions without either (a) a reduction/variation in service levels (which may be factored in using the ARAPP approach cited earlier) or (b) an accompanying increase in government funding either via (a) emergency funds (such as the current HAB relief package) or (b) annual appropriations.

To address industry concerns (noted in Section 3.2.2) about cost escalation and address opportunities for greater service efficiency arising from this review, the review team proposes that a zero-base budget (ZBB) approach be used for the next phase of the upcoming cost recovery cycle.

Under ZBB principles, the budget for the next CRIS period would begin with a compilation of all key compliance activities needed to meet PIRSA cost recovery and ESD risk mitigation objectives for each sector (outputs from the ARAPP process). These would then be allocated as eligible (or not) for cost recovery and then calculated by a sector-based approach and overall relative to other budget sources (mainly appropriations).

Recommendation 21: PIRSA develop a new base budget for cost recovered compliance (and science[131]) activities for the next CRIS (beyond FY2025-26) taking into account the ARAPP and other recommendations arising from this review.

[131] Science is included here for comprehensiveness, with further justification outlined in the next section.

6.0 Science Cost Recovery

This section also addresses the science underpinning aspects of compliance policy and operations outlined in the previous section.

6.1 Key Elements of Aquaculture Science Program

6.1.1 Aquaculture Science Cost Recovery

As was noted earlier, science ($13.5M) represents around 39.5% of the total costs of management ($34.2M) of South Australia's overall fisheries and aquaculture sectors in FY2025-26. Industry funds nearly half of that budget, providing 47% of the total budget and also makes a further contribution of $2.5M to FRDC research activities. Within the overall science funding provided by industry from cost recovery (~$6.2M), costs recovered from the aquaculture science program ($453k) represents only 7.2% of the total science budget.

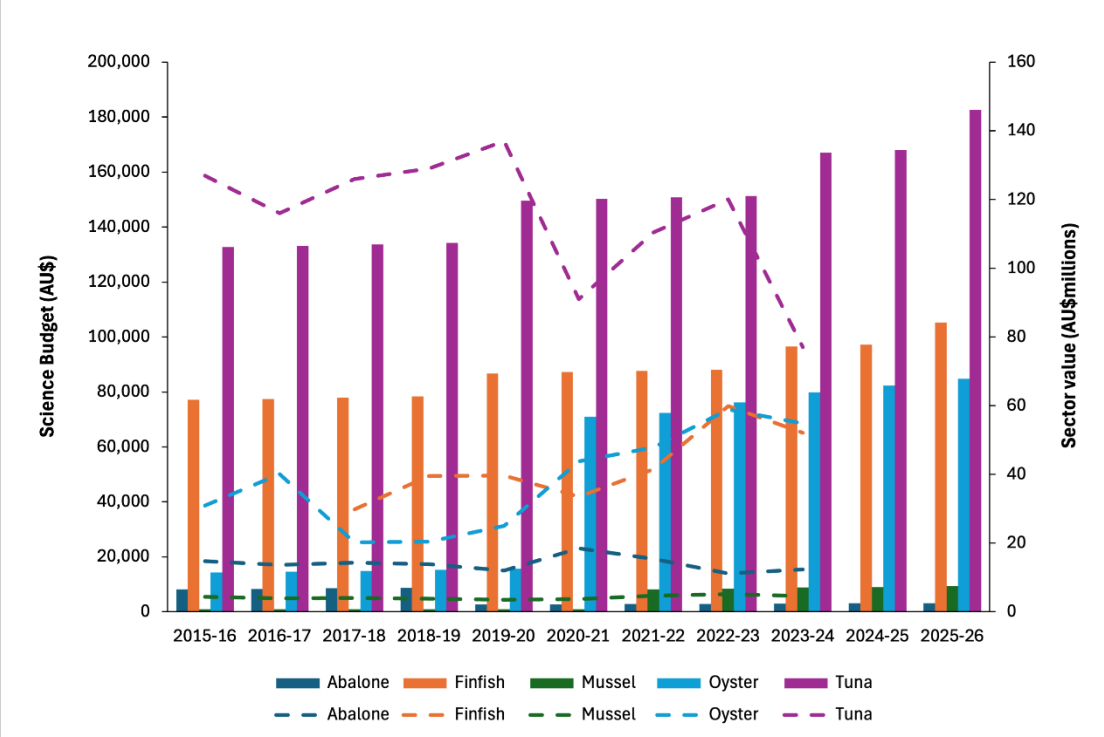

Figure 6.1: Aquaculture Science Budget (left axis, bars) relative to Aquaculture Sector Production Value (right axis, dashed lines) by sector 2015-2024.

Within the total aquaculture cost recovered budget ($2.24M), the proportion allocated to science is around 20%. The tuna sector is the largest contributor to the aquaculture science budget representing ~44% of the total aquaculture science budget (in FY25-26). The next highest sectors are finfish (24%), oysters (22%), land based (4%) and Mussels (2%). Marine algae and abalone make only minor budget contributions in the current FY. Figure 6.1 outlines trends in cost recovered

aquaculture science budgets by sector relative to overall production by each sector over the past decade.

6.1.2 Aquaculture Science Program

Marine aquaculture in South Australia is large in scope, economic value and diverse in species. At the moment (2025), all of the finfish and tuna farming operations are based in the Lower Eyre Aquaculture Zone, and they share that Zone with mussels, algae and oysters. Oysters are the most geographically dispersed aquaculture species with 7 main growing areas from Kangaroo Island to Ceduna.

Whilst the economic and social importance of the industry cannot be overstated it is important to remember that the amount of water zoned to aquaculture is a small percentage (7%) of the total water available in the state. Even within the declared Aquaculture Zones, more than half of the area is *excluded* from any aquaculture activity, and only between 5 and 15% of the Zone is actually allocated to aquaculture leases.

All of this means that ~$260m of economic value is produced from aquaculture occurring in about 1% of state marine waters. Importantly, other water users (recreational and marine fishers, recreational vessels) are still permitted to use the aquaculture zones and, in some circumstances, even allowed within the aquaculture lease areas, so the impact on other marine sectors is very small. In this regard PIRSA have shown commendable foresight and wisdom to make sure that aquaculture activities have a strong science foundation, can occur with minimal disruption to other stakeholders, maintaining a strong social licence for the industry while allowing sustainable exploitation of the resource.

Over the past 20 years PIRSA Aquaculture has progressed a forward-thinking, logical and comprehensive approach to the development and management of state waters for aquaculture. Evidence of this are the many publicly available detailed documents that clearly demonstrate the principles that the agency follows when it comes to what aquaculture activities are, and are not, allowed in different areas of water.

Under the *Aquaculture Act 2001* there are 14 formally gazetted and adopted Aquaculture Zone Policies and 2 draft Zone Policies that address the key issues for all stakeholders: where, what type and what size of aquaculture development(s) are possible within that Zone. That level of clarity gives great confidence to current and potential future industry parties.

Recommendation 22: PIRSA work with industry and other stakeholders to progress the development and gazetting of the two draft Zone Policies (Franklin Harbour and Ceduna) that were initiated in 2015.

6.1.3 ESD Risk Assessment

It is clear from numerous reports that an ESD risk assessment approach has been core to all of PIRSA Aquaculture's policy, licencing and lease management activity. Whilst some of the earlier documents did not specifically use the term ESD, the most recent documents have, and the process and principles are described and explained in detail. These documents include:

> *ZONING IN: South Australian Aquaculture Report 2024*
>
> *Aquaculture (Zones – Lower Eyre Peninsula) Policy 2023*
>
> *Aquaculture (Zones – Lower Eyre Peninsula) Policy 2023 Summary of Public Consultation Submissions and Responses*
>
> *Report Supporting the Draft Aquaculture (Zones – Lower Eyre Peninsula) Policy 2023*
>
> *Aquaculture (Zones – Fitzgerald Bay) Policy 2008 Marine Licence Assessment (New licence and Variation) 2019*

Examples from these documents will be used to demonstrate a number of points as part of this review. Even though the *Aquaculture Ac*t (2001) and the *Aquaculture Zone Policies* are excluded from the scope of this review, those instruments set the framework by which the industry is managed and illustrate the ways in which ESD principles are set and applied. It is not possible to describe and discuss how important and effective scientific activities have been as the foundations of ESD without pointing out how science has been incorporated into those instruments.

Aquaculture Zone Policies consider all types of suitable aquaculture activities that could occur within an area, and sub-sections of that area, based on water depth, water movement, proximity to ecologically sensitive habitats or protected areas, and the presence of other aquaculture species. As part of the zoning process, PIRSA has applied a set of general guidelines to Aquaculture Zones that minimise the likelihood of environmental harm to sensitive and valuable areas of seagrass and reef.

Zone Policies have been informed by a number of scientific studies carried out by SARDI and other research providers in the 2000s. The most detailed studies were carried out in the Lower Spencer Gulf area, but additional work – mainly benthic surveys – were carried out in other areas that led to Aquaculture Zone Policies being developed or drafted.

Tuna and finfish aquaculture development have been supported through several projects such as Collings et al. (2007), Fernandes et al. (2007a, b), Tanner and Bryars (2007), Tanner et al. (2007), Fernandes and Tanner (2008), Tanner and Volkman (2009), Middleton et al. (2013), Middleton and Doubell (2014), Doubell et al. (2015), and Tanner et al. (2019). These high-quality, publicly available studies, a mixture of SARDI, FRDC and CRC reports, and externally peer-reviewed journal papers give substantial confidence to the quality of the data and the validity of the interpretation.

A direct output of these studies has been the development of a sophisticated computer model of the large and medium scale hydrodynamic processes occurring in the Lower Spencer Gulf area.

The model includes functionality to examine the dispersal, dilution and assimilation of particulates and dissolved nutrients from Tuna and Finfish (Yellowtail Kingfish) sea cages and lease areas on a temporal and spatial basis.

Estimations of the carrying capacity of Tuna and Finfish aquaculture within the Lower Spencer Gulf Zone, the Arno Bay Zone and the Fitzgerald Bay Zone have all been informed by this model. This model continues to be modified, refined and updated until the present day. Not only is it a robust predictive modelling platform that underpins ESD for Tuna and Finfish aquaculture in this region but is also assisting in understanding and predicting the movement of the current HAB event. It has also been useful in discussions about potential deep water ports in Spencer Gulf and the north shore of Kangaroo Island, as well as possible sites for the planned desalination plant to supply drinking water to the Lower Eyre Peninsula.

In stark contrast, the scientific data that underpins estimates for carrying capacity in the intertidal and nearshore subtidal areas for filter feeding bivalves (particularly Oysters), is extremely limited and not publicly available. The reference that is often cited for this purpose is Parsons Brinckerhoff and SARDI (2003). The carrying capacity for filter feeding bivalves is largely determined by the levels of primary productivity (mostly phytoplankton, though particulate organic matter and bacteria can also be ingested) that occur in the water column.

This primary productivity may be carried into an area by water movement or it could be generated within the local environment, the rapid changes in levels of primary production that can happen due to changes in environmental conditions (temperature, nutrient inputs, upwellings, rain events or strong winds flushing or blowing terrestrial nutrients into the water) especially in nearshore and intertidal areas are all factors which make it difficult to develop a good understanding of local and even regional food availability for filter feeders.

On the other hand, subtidal Mussels are not as exposed as oysters to the variability of primary production. Mussels are grown in water that is at least 10m deep and much of the sector is currently focused in areas that are captured by the Lower Spencer Gulf hydrodynamic model, so primary production is largely derived from regional drivers and delivered to the mussels via water movement.

The scientific basis for carrying capacities of marine algae and abalone is largely ignored since the sectors are small and the impacts are either positive (algae) or negligible (abalone).

Even when an Aquaculture Zone has been prescribed, all applications for a new licence or lease within that area needs to be evaluated on the specific coordinates and intended use of the lease area, as fine scale circumstances in that location may be different from the broader scale conditions established under the Zone Policy. Thus, an ESD risk assessment is carried out on every licence and lease application to determine the conditions under which a specific aquaculture activity can occur.

Furthermore, aquaculture licence and lease holders need to provide a monthly (Tuna and Finfish) and/or annual (Oysters and Mussels) environmental monitoring report (EMP) to PIRSA as part of

their compliance obligations. Some of the data in the EMP will relate to production (tonnage of product) but other data such as stock biomass and supplemental feed inputs are directly relevant to ESD licence and lease conditions.

Aquaculture Zone Policies are well written, logically structured and deliver generally very clear information regarding aquaculture developments. However, there are exceptions:

From *Aquaculture (Zone - Lower Eyre Peninsula) Policy 2023*

> *Part 7 – Louth Bay aquaculture zone*
>
> *20.1 (b) the biomass of the aquatic animals being farmed in the zone in a manner that involves supplementary feeding must not exceed –*
>
> *(i) an amount that would, in the opinion of the Minister, have an environmental impact on the zone equivalent to the environmental impact that 7,953 tonnes of finfish would have on the zone*

The supporting report (section 7.2.2) explains the rationale for the proposed biomass limits for supplementary fed aquatic animals as being related "*to the net nutrient (i.e., NH_4^+) emissions based on flushing rates, connectivity and different WQGVs (water quality guideline values) appropriate to the three areas" (different levels of water movement/flushing rates).... The intention of the lower WQGV values is that the dispersion, dilution and assimilation of the dissolved nutrient will lead to background levels at the boundary of the aquaculture sector or zone based on the oceanographic model of the region*".

The issues with this are:

1. "Environmental impact" is broader than just the level of dissolved nutrients which, as the supporting report describes, is the intent of the Policy.
2. The focus on NH_4^+ as the sole indicator of impact is perhaps a little simplistic. At high biomass levels, in low flushing situations the metabolic demands of the fish in a sea cage might reduce dissolved oxygen levels to a level where there is localised depletion.
3. Lease areas within the aquaculture zone/sector will not be a consistent distance from the boundary of the zone/sector and the distance to the lease area and zone/sector boundary will change based on prevailing water movement, so this complicates the claimed intent of reducing nutrient levels to background at that point.

Some minor clarification or rewording of these documents may be useful at some point in the future.

6.2 Sector management settings, performance and risk analysis

The key management settings, the performance and compliance track record of each of the marine aquaculture sectors is described below. Based on this information the review team members did independent ESD risk analysis assessments for each of the marine aquaculture sectors.

6.2.1 Tuna sector

Tuna aquaculture has a 25-year history of being a well-managed and largely compliant sector. It now operates as a very efficient (much better management of feed), low mortality (improved blood fluke management at the beginning of farming), a more time-restricted (5-6 month) growout phase in high water flush areas, with maximum biomass/stocking density at ~75% of the permitted limit being achieved immediately before the harvest begins and then biomass drops to zero in 5 weeks. Any future increases in farmed tuna biomass are likely to be relatively small and slow as the intake of fish is determined by internationally negotiated wild fisheries catch limits.

The permitted biomass limit for tuna leases of 6 t/ha is below the 9.5 t/ha estimated carrying capacity of the zone based on the oceanographic and nutrient dispersion and assimilation model. This would indicate that the sector is being regulated in way that supports an ESD approach.

In practice, the actual average monthly stocking density for the tuna farms was 3.5 tonnes per hectare, with a peak of 4.6 tonnes per hectare (so about 50% of the estimated carrying capacity), in 2022-23.[132]

It is commendable that:

- Tuna leases have **never** exceeded the permitted 6 t/ha stocking density limit.
- Tuna lease areas are allowed to fallow for 6 months before being re-stocked.
- There are **no** detectable impacts of tuna farming on the benthos.

During the 2022-23 tuna farming season a total of 61,000 tonnes of mostly locally caught baitfish was used as feed. Given that wet baitfish are 75% water, that would suggest the dry weight of nutrients fed to the tuna was ~15,250 tonnes.

[132] PIRSA Zoning in - South Australian aquaculture report 2024

*Table 6.1: ESD risk analysis for Tuna. Likelihood and Consequence values are the average of the reviewers' independent assessments. The Risk matrix value is the product of average Likelihood * average Consequence each rounded to the nearest integer (hence the occasional apparent discrepancy).*

Risk Domain	Risk event	Risk is on	Likelihood	Consequence	Risk Value
Individual facilities	effects of structures	habitat effects	4	1	4
		alienation	1	0	0
		water flow	4	1	4
		shading	4	1	4
		rehabilitation	4	2	7
		navigation	5	2	10
		Visual	3	2	4
Operational	use of resource	Noise	5	2	8
		escape	6	1	6
		chemicals and therapeutants	5	1	5
		entanglement or confinement	4	2	7
		habitat effects	5	2	11
		disease management	5	1	7
		sedimentation of wastes	5	1	7
		culture organism disposal	3	1	3
		general refuse	4	1	5
		biofouling	3	1	4
		processing	2	2	4
Regional effects	water use ecology and biodiversity	N/A			
		TEPS	3	2	7
		translocation between regions	1	1	1
	tenure production	N/A			
		disease management	2	1	1

N/A as assessed PIRSA

For Tuna the following 8 risk areas were assessed by review team as of Moderate risk, but the Consequences of each of them were assessed as 2 (Moderate - maximum acceptable level of impact) or 1 (Minor - possibly detectable but minimal impact on structure, function or dynamics).

- Habitat effects due to operations (11). Mainly the localised input of dissolved nutrients and the potential for the increased growth of micro- and/or macroalgae in the areas adjacent to Tuna farming operations during the 5-6 months of the farming season. The current Tuna and Finfish environmental monitoring program measures dissolved nutrients around operations but there is no measurement of whether micro- or macroalgal growth is affected. The development of IMTA (Tuna and macroalgal aquaculture) on the same lease will provide some data on how much productivity has been changed. However, the seasonal nature of Tuna nutrient input would probably restrict increases in algal growth to that same window of

time. The 2025 algal bloom event in South Australian waters will increase the research happening to try to understand and predict future algal bloom events. It is clear that broader regional weather and oceanographic conditions play a large role in such events, but the impact of localised features and activities need to be included.

- Navigation due to structure (10). Tuna farming infrastructure is fairly obvious during daytime conditions due to the width (30m in diameter, 3m high netting) of the pontoons and the fact that they tend to be anchored in close proximity within a lease. At nighttime and in poor visibility the farms are marked by flashing lights. Damage to the nets and infrastructure has usually been due to vessels performing tuna farming operations. Despite this the Lower Spencer Gulf ha very busy sea traffic with some large grain bulk carriers transiting the corridors adjacent to the tuna farming lease areas.
- Noise due to operations (8). This is related to marina-based operations where feed is loaded onto feed boats, harvested tuna are unloaded, nets and anchor systems are loaded and unloaded, and diesel motors are operating. The crews involved in these processes are aware of the proximity of residential homes and marina visitors and minimise noise and other disturbances whenever possible.
- Rehabilitation of unused lease areas (7). Tuna lease areas have not yet been abandoned but some sites are used as staging areas for spare pontoon rings. As the tuna industry consolidates into a few larger operating companies there may be some infrastructure left in the water by non-operating companies rather than removing it to land storage.
- Entanglement of TEPS due to structure and operations (7). The tuna industry has infrequent issues with seals and sharks around pontoons, but these have decreased in number since the survival of tuna was substantially improved. For the rare event when sharks become trapped inside a Tuna/Finfish pontoon, a set of industry guidelines have been for their safe removal and release.
- Sedimentation of wastes due to operations (7). Feeding of tuna will result in about 25% of the dry weight of feed being lost as a fine faecal cloud and all the evidence shows it is quickly dispersed in the water currents and consumed by small pelagic fish around the structure. There in negligible accumulation of sedimented waste under or around the tuna farming structure.
- Disease management due to operations (7). Tuna farming is now much better at preventative health of the stock with newly captured being fed on frozen baitfish injected with a measured dose of a prescribed antiparasitic compound (Praziquantel, approved by the Australian Pesticides and Veterinary Medicines Authority) to reduce levels of blood flukes. This initial short-duration treatment allows fish to be farmed for 5-6 months and harvested before any further treatments are required. Any species in open water aquaculture is at risk of new diseases appearing. All tuna farming companies engage their own aquatic veterinarians and have fish health monitoring programs to identify any problems before they become larger issues.

Twelve of the risk areas were assessed by the review team as being of Low risk all, by definition, have minimal impact on the environment and do not need any increase in monitoring.

6.2.2. Finfish

Finfish aquaculture can operate at up to 15 tonnes per hectare even for those leases that are in the low and medium flush areas although the larger fish (and thus the majority of the biomass), are held in the medium and high flush areas.

However, it seems odd that finfish leases are permitted a relatively higher stocking density than tuna when the same oceanographic and nutrient dispersal model is used to inform the regulations and conditions for both sectors. There is no explanation of why this difference is permitted. It could be argued that the tuna lease areas are larger than the finfish lease areas and that is why their stocking density is lower than finfish. So perhaps the better way to look at stocking density is to consider the biomass of fish inside the sea cage on a kg/m^3 basis, the rates are more similar. Given this, could it be better to specify what the maximum biomass inside the sea cage should be in areas that have different flushing rates?

Recommendation 23: PIRSA to consider further the case for specifying the maximum biomass limit for tuna and finfish within a sea cage on the basis of kg/m^3 to reflect the scale of impacts on water quality.

Of concern is that the *ZONING IN: South Australian Aquaculture Report 2024* indicates there were several months during 2022-23 when biomass limits were adjusted at certain finfish lease sites to 20, 40 and 41 tonnes per hectare (including in low flush areas). Furthermore, two zone biomass limits were temporarily exceeded by up to 10% due to operational issues delaying the towing of sea cages to other lease sites and the transit of harvesting vessels. There was no action other than a reminder to the licensee to be cognisant of their biomass limits.

Increasing the biomass limits on particular lease sites by a factor of 2 or more on more than a temporary basis risks the ESD credibility of the management program. Allowing these exceptions implies that the regulatory settings are too conservative and/or that there are no alternative plans or options available to mitigate these events. On the available information it would seem that the overstocking issue was due to a lack of available infrastructure (nets, sea cages, anchors, vessels) within the business rather than a lack of available and suitable lease sites to move the fish to suggesting that the cause was inadequate operational planning. If so, perhaps the licence holder should be required to submit an operational plan with PIRSA each year so that such contingency arrangements can be anticipated and prevented in the future.

The total harvest of 3,354 tonnes of finfish in 2022-23 was accompanied by use of 10,147 tonnes of manufactured feed. The apparent 3:1 feed conversion ratio stands out as being much higher than expected and may suggest suboptimal and inefficient feeding practices.

Recommendation 24: Licence holders that exceed a limit for biomass on a lease or in a zone should submit a forecast monthly operational plan (e.g. biomass, feed input, stock movement,

harvesting etc) for all of their lease areas to PIRSA in each of the following two years so that potential non-compliance situations can be identified and mitigated.

*Table 6.2: ESD risk analysis for Finfish. Likelihood and Consequence values are the average of the reviewers' independent assessments. The Risk matrix value is the product of average Likelihood * average Consequence each rounded to the nearest integer (hence the occasional apparent discrepancy).*

Risk Domain	Risk event	Risk is on	Likelihood	Consequence	Risk Value
Individual facilities	effects of structures	habitat effects	5	2	8
		alienation	2	0	1
		water flow	4	1	4
		shading	5	2	8
		rehabilitation	4	2	7
		navigation	5	2	10
		visual	3	2	6
Operational	use of resource	noise	5	2	8
		escape	6	1	6
		chemicals and therapeutants	5	1	5
		entanglement or confinement	4	2	7
		habitat effects	5	2	11
		disease management	5	1	7
		sedimentation of wastes	5	2	10
		culture organism disposal	3	1	3
		general refuse	4	1	5
		biofouling	5	2	9
		Processing	2	1	2
Regional effects	water use ecology and biodiversity	N/A			
		TEPS	3	2	7
		translocation between regions	4	1	4
	tenure production	N/A			
		disease management	5	2	8

N/A as assessed by PIRSA

For finfish the following 12 risk areas were assessed by the review team as of Moderate risk, but the Consequences were assessed as 2 (Moderate - maximum acceptable level of impact) or 1 (Minor - possibly detectable but minimal impact on structure, function or dynamics).

- Habitat effects due to operations (Risk value 11). Similar to the situation with tuna, this is mainly considered the localised input of nutrients in the water and areas adjacent to finfish farming operations. The issues with finfish are somewhat different as there are fish in the water throughout the year and some of the lease areas are in shallower water with less water movement than the tuna operations, but the overall tonnage of feed (on a dry weight

basis) is less than it is for tuna – somewhat offsetting the relative risk. The overstocking of particular finfish lease sites such that biomass limits have been exceeded is of some concern but because those biomass limits have been conservative based on the predicted carrying capacity of the zone, the effect is probably not large. However, it suggests better forward planning is required for finfish farm operators. The current tuna and finfish environmental monitoring program measures dissolved nutrients around operations but there is no measurement of whether micro- or macroalgal growth is affected. As with tuna, the development of IMTA (finfish and macroalgal aquaculture) on the same lease will provide some data on how much productivity has been changed. The 2025 algal bloom event in South Australian waters will increase the research happening to try to understand and predict future algal bloom events. It is clear that broader regional weather and oceanographic conditions play a large role in such events, but the impact of localised features and activities (such as finfish farming) need to be included.

- Navigation due to structure (10). Finfish farming infrastructure can be fairly obvious during daytime conditions due to the width (20m in diameter, 2m high netting) of the pontoons and the fact that they tend to be anchored in close proximity within a lease. At nighttime and in poor visibility the farms are marked by flashing lights. Wind and sea conditions as well as vessel interactions can damage in-water markers, and they need to be regularly checked and maintained. Damage to the nets and infrastructure has usually been due to vessels performing farming operations although in the past some instances of net damage have been suspected to be deliberate. The busy sea traffic to and from Port Lincoln uses corridors that are adjacent to some of the finfish farming lease areas.
- Sedimentation of wastes due to operations (10). Feeding of finfish will result in about 25% of the dry weight of feed being lost as a fine faecal cloud that is quickly dispersed in the water currents, consumed by small pelagic fish and some makes it to the substrate under the structure particularly in the shallower areas. Good feeding practices should mean there is negligible accumulation of sedimented waste but with fish feeding less vigorously in wintertime and the need to allow fish to put on as much growth and condition before water temperatures drop there can be overfeeding. The apparent high feed conversion ratio (3:1) reported for the 2023-34 season might suggest that feeding practices are suboptimal.
- Biofouling (9). The year-round farming of finfish in shallower water with less current promotes the growth of seaweed and various marine invertebrates on the submerged structures. The effect of this is two-fold, it weighs down the structure, so it sits lower in the water, but it mostly reduces the flow of water through the net. The efficient and effective flow of water through the net is what provides the fish with the necessary water quality (sufficient dissolved oxygen for respiration and removes and disperses metabolic wastes) to survive and grow. Replacing netting on pontoons that hold 20-50,000 finfish is a skilled and somewhat risky procedure, so finfish farms tend to reduce their reliance on net changes by using automatic net cleaning machines that scrub fouling growth off the net in situ. This reduces the risk of catastrophic loss, but it produces a localised plume of dirty water downstream of the pontoon.

- Habitat effects of structure and Shading (8). These are somewhat similar effects, particularly with finfish lease areas in shallower water. Although finfish lease areas are not over seagrass, they can be over occasional rocks and attached macroalgae. The effects are very localised and limited.
- Noise due to operations (8). This is related to marina-based operations where feed is loaded onto feed boats, harvested fish are unloaded, nets and anchor systems are loaded and unloaded, and diesel motors are operating often in the hours around dawn. The crews involved in these processes are aware of the proximity of residential homes and marina visitors and minimise noise and other disturbances whenever possible.
- Disease management due to operations (8). Finfish farming has struggled with emergent health and disease issues for 25 years to now put it in the position where it is much better at preventative health of the stock. Having fish in an open water pontoon for twelve months of the year leaves them to exposure to disease from wild fish, and with all their food being provided as a formulated pellet it means they are at risk of nutritional disease due to inappropriate rations being provided and when the fish are under environmental stress. The finfish farming company engages an aquatic veterinarian, a nutritionist and has a fish health monitoring program to identify any problems before they become larger issues.
- Rehabilitation of unused lease areas (7). Finfish lease areas have tended to be operational/non-operational more than tuna leases as the sector has dealt with disease, hatchery and market matters over the course of the journey. This has led to some zones no longer being used for finfish aquaculture. Some of the initial businesses folded with some infrastructure still in the water but this was addressed in the following years by PIRSA and the rest of the industry. The current finfish operator is active across several aquaculture sectors and is unlikely to abandon any of the operations and risk its relationship with the community and PIRSA.
- Entanglement of TEPS due to structure and operations (7). The finfish industry has infrequent issues with seals and even fewer with sharks around cages. Seals inside cages have been successfully released. Numbers of seabirds (silver gulls and pelicans) around pontoons that have not had bird netting fitted in a timely way can be an issue for the finfish, not so much the birds.

Nine of the risk areas were assessed by the review team as being of Low risk all, by definition, have minimal impact on the environment and do not need any increase in monitoring.

6.2.3 Oysters

There is no science component in the SLA between PIRSA and SARDI arising from the annual cost-recovery process for the oyster sector – this is an important omission.

The oyster sector does pay for R&D/science through the national industry body leveraging the funds through FRDC though that work has largely been focused on disease, genetics and feed preferences, with little if any work on carrying capacity.

The oyster farming sector operates under a diverse set of conditions that can differ between the different growing areas. The conditions try to manage oyster biomass using the length, utilization and spacing of baskets on racks or lines permitted in and within a lease.

Given that mussels and oysters are filter feeding bivalves and both rely on the delivery of primary production/particulate organic matter in the water column as food it seems illogical that the biomass of mussels can be given in t/ha but no such biomass limitation can be provided for oysters. As was noted in section 5, the compliance metrics are metres of line, metres of line utilized, spacing of baskets and alignment of baskets (to minimise effects of shading on seagrass). No baskets are opened, nor oysters counted, during compliance visits. Biomass of oysters can only be assumed from the annual EMP reports that licence holders send to PIRSA. There is no independent corroboration of actual and reported oyster biomass.

The Report Supporting the Aquaculture (Zones – Coffin Bay) Policy 2008 (page 33) says that (text in bold – emphasis added):

*"It should be noted that **central to the sustainable management** of Pacific oyster production within Coffin Bay is the **availability of accurate information** relating to the **number, size, stocking density** and length of time to harvest for all cultured stock. **Without this information, managing the economic and environmental sustainability of the industry will be compromised**. In the **absence of information** required to predict carrying capacity, marine **resources must be allocated conservatively** for aquaculture in Coffin Bay and **no increase in** allocation of **farming** area for **bivalve molluscs** is recommended in the Policy."*

In the 17 years since that Report was written no progress has been made to better understand the carrying capacity of any oyster growing area. Whilst there may not have been any increase in the area allocated to farming oysters in Coffin Bay, the number and biomass of oysters stocked into the zone has increased by a factor of 2 or 3. Similar increases in numbers and biomass of oysters have been reported for Franklin Harbour.

This would suggest that the settings used to manage the sector (area, line length, basket spacing) are either inappropriate or incapable of avoiding biomass 'creep' by licence and lease holders seeking to maximise their income and profitability. This has to be a significant concern for PIRSA Aquaculture and the oyster industry.

It would seem very timely for a specific project to focus on assessing primary production in key oyster growing areas to better understand population dynamics, limiting factors, ecosystem value of that primary production (oyster growing areas may be nursery grounds for commercially and recreationally important species), and what proportion of primary production can be allocated to aquaculture.

New technologies that could make oyster farming more labour efficient have recently been allowed into areas that have traditionally used intertidal farming practices. The fact that the new technologies allow the oysters to be kept subtidal for almost all of the time could have implications for feed availability. There are no data to address this question.

Recommendation 25: Research on the effects of subtidal growing technologies and methodologies being used in intertidal leases on the availability of food for other filter feeding organisms should be initiated.

PIRSA could have managed the introduction of these new technologies to the oyster sector better. Separate conditions for subtidal and intertidal farming systems would help. Allowing subtidal technologies to be used only in subtidal lease areas would help the industry adjust and transition. If subtidal technologies are to be used in intertidal areas, then the number of baskets/biomass should be reduced in proportion to the total submersion time for intertidal baskets.

Recommendation 26: PIRSA should develop a short document that clearly describes the regulations that apply to new subtidal oyster technologies as used in (a) intertidal areas and (b) water more than 2m deep.

*Table 6.3: ESD risk analysis for Oysters. Likelihood and Consequence values are the average of the reviewers' independent assessments. The Risk matrix value is the product of average Likelihood * average Consequence each rounded to the nearest integer (hence the occasional apparent discrepancy).*

Risk Domain	Risk event	Risk is on	Likelihood	Consequence	Risk Value
Individual facilities	effects of structures	habitat effects	5	2	8
		alienation	2	1	1
		water flow	2	1	2
		shading	4	2	7
		rehabilitation	4	2	9
		navigation	5	2	12
		visual	5	2	8
Operational	use of resource	noise	3	1	4
		escape	4	2	7
		chemicals and therapeutants	1	0	0
		entanglement or confinement	2	1	2
		habitat effects	4	4	16
		disease management	4	4	15
		sedimentation of wastes	1	0	0
		culture organism disposal	3	1	4
		general refuse	3	2	6
		biofouling	3	1	4
		processing	2	1	2
Regional effects	water use ecology and biodiversity	N/A			
		TEPS	2	1	2
		translocation between regions	5	3	12
	tenure	N/A			

	production	disease management	4	3	12

N/A as assessed by PIRSA

For oysters two areas were assessed as being of High risk. Nine risk areas were assessed by the three reviewers as of Moderate risk. The range in the Consequences was from one assessed as 4 (Major - serious impacts with relatively long-time frame likely to restore to an acceptable level), two as 3 (Severe - Wider, longer-term impacts detectable at the ecosystem or community level), and six assessed 2 (Moderate - maximum acceptable level of impact).

- Habitat effects (16 – operational; Consequence 4 Major)

  The risk of overstocking of oysters on the amount and type of primary production available for non-cultured filter feeders and the organisms that rely on them for food is assessed as High. The values used in the model that was used to underpin the potential biomass of bivalves that could be grown in aquaculture areas were not collected from within an area that is used for such activity and therefore they may not be representative of the reality. The temptation of some operators to increase oyster stocking density (more oysters per basket since only basket numbers/spacing are counted) to try to maximise their output and therefor income has been raised. The variation in oyster growth and fattening rates seen from bay to bay and season to season may be due to seasonal productivity, environmental or stocking density variation. Many oyster farming zones are in productive embayments that serve as nursery grounds for important commercial, recreational and ecosystem regulating species. Overstocking of oyster leases could have much broader consequences than just on oyster aquaculture.

Recommendation 27: A science program is carried out to measure primary productivity in all oyster farming areas within South Australia with the data used to develop a peer-reviewed and publicly available carrying capacity model for those important growing areas. Carrying capacity is to be determined and limits set using oyster biomass.

Recommendation 28: PIRSA develop a SOP for Fisheries Officers to estimate oyster biomass (weight) in baskets and count the number of baskets on a lease to ensure a lease or zone is not overstocked.

- Disease management (15 – operational: Consequence 4 Major) and
- Disease management (12 – regional effects: Consequence 3 Severe).
  These (and the following risk areas of Translocation) are clearly related issues. We have already seen the significant economic effect that outbreaks of different oyster diseases have had on oyster farming in NSW, Tasmania and SA. The oyster sector has been quick to respond to most of these diseases and considerable investment in research on genetic resistance to disease has allowed some sectors to avoid the worst or recover quickly from such events. The highly mobile nature of oyster farming from interstate supplies of spat to movement of oysters between bays, together with the fact that healthy oysters may be able to carry a virus without showing any symptoms becomes a problem if that oyster becomes stressed. Under such circumstances the disease can quickly spread through the mass

movement of water[133]. Disease events are a constant worry for all in the oyster industry. Health monitoring of all oyster operations and honest and timely reporting of unexplained mortalities is key, but it can only do so much. Any potential preventative actions are likely to be time-consuming and expensive to implement.

- Translocation between regions (12 – regional effects: Consequence 3 Severe)
  Aside from disease risk, translocation of oysters could have potential to introduce other problems. These include phytoplankton and potentially some of the organisms that are responsible for biotoxins that are of human health and therefore food quality concern. PIRSA Aquaculture recently assessed the risks of such translocation of oysters from one bay that was closed to harvesting due to the detection of brevetoxin to an unaffected bay and deemed that it was a "low risk" and "minimal risk", but the public response was so strong against the move that the attempt was abandoned. The details of the risk assessment carried out by PIRSA are not available. The reviewers for this report deemed it to be a Moderate risk but it has to be acknowledged we are not oyster or phytoplankton experts. What is does demonstrate is that risk assessment needs to properly explained to all stakeholders to avoid problems like this occurring again. The effect that such events have on the perception of social licence and PIRSAs ability to uphold it are not viewed positively.
- Navigation (12). Most oyster farms are intertidal and close to where boats can be launched. These areas are also popular with other water users, particularly recreational boats who may be being driven by inexperienced operators or people affected by alcohol. Poorly marked or maintained lease areas can be difficult to see at high tide and/or in poor visibility. The small size of these vessels and the shallow water mean that were an accident to happen the people are likely to make it to shore.
- Rehabilitation (9). With 350 oyster farming licences it is almost inevitable that some growers will, for health or economic reasons, not be able to attend to their leases. Such periods may be short-term; others will be long-term. Some licence and leaseholders have 'walked away' from their farms leaving infrastructure, usually posts and lines, in the water despite correspondence from PIRSA about the requirement to remove it. It can take several years for such situations to be resolved, and it usually cleaned up by other oyster farmers at their expense who are concerned about the perceptions of the industry and the social licence to operate.
- Visual impacts (both 8) and Shading (7) of structures. These related issues are highly variable depending on location of the oyster lease. Many oyster leases are only visible from the water or the air, and, even then, only when the tide is low. Others are located in areas where they are visible from land, and in many cases the people who come to the area come because the oysters are there. Some leases are situated over sand with no seagrass and shading is not a problem. Others are over seagrass and coverage of seagrass is affected by

[133] It was noted that to address this risk FRDC funding was secured to assess virus risk and identify oyster disease management areas – see Improving early detection surveillance and emergency disease response to Pacific Oyster Mortality Syndrome (POMS) using a hydrodynamic model for dispersion of OsHV-1 | FRDC

many factors not just shading, so it can be hard to ascribe any changes in coverage to a single cause. Monitoring of seagrass coverage is carried out periodically by PIRSA with control areas (no oyster farming) showing similar changes in coverage over time.

- Escape (7). Pacific oysters are an introduced species to Australia and whilst an oyster can't really 'escape' very far from a rack or basket, it can spawn from there and the fertilized eggs can develop into larvae and disperse with the water currents to metamorphose into a spat on a suitable hard surface and grow there. The survival and settlement of larvae and spat is more difficult in fully marine systems than in estuaries, which is generally the case in South Australian oyster growing areas, but it can and does happen. The main problem with feral Pacific oysters is that they can act as reservoirs and propagation areas for oyster diseases and allow spread of disease to areas that would otherwise not be exposed.

Ten of the risk areas were assessed by the three reviewers as being of Low risk all, by definition, have minimal impact on the environment and do not need any increase in monitoring. Two risk areas were assessed as Nil risk.

6.2.4 Mussels

There is no science component in the SLA between PIRSA and SARDI arising from the annual cost-recovery process for the mussel sector.

The Lower Eyre Zone Policy allows mussel farming at 20 t/ha – a figure derived on the basis of estimated carrying capacity from the publicly unavailable Parsons Brinckerhoff and SARDI (2003) report and data. As previously indicated, the fact that these data are not publicly available is of concern.

Strangely, the Standard Lease and Licence Conditions do not mention tonnages, instead it prescribes the maximum length of backbone (560m/ha) and the maximum length of submerged longline that can be used (15m per m of backbone) for mussel farming. The apparent interchangeability of biomass and growing structure parameters is concerning since they are not equivalent nor interchangeable.

The mussel industry operator indicated that stocking densities are kept below 12.5 t/ha as experience shows that at higher stocking densities on these lengths of ropes there are deleterious effects on mussel growth and increased likelihood of mussels slumping off the suspended lines. Given this, mussel farmers will only reach 62.5% of the permitted carrying capacity of their licence and lease conditions.

The mussel sector operates under a sector-based aquaculture strategy that describes and defines the operating parameters that comply with regulations and conditions.

*Table 6.4: ESD risk analysis for Mussels. Likelihood and Consequence values are the average of the reviewers' independent assessments. The Risk matrix value is the product of average Likelihood * average Consequence each rounded to the nearest integer (hence the occasional apparent discrepancy).*

Risk Domain	Risk event	Risk is on	Likelihood	Consequence	Risk Value
Individual facilities	effects of structures	habitat effects	5	2	8
		alienation	1	1	1
		water flow	5	1	7
		shading	5	1	6
		rehabilitation	3	2	6
		navigation	5	2	10
		visual	3	1	3
Operational	use of resource	noise	3	1	3
		escape	4	1	3
		chemicals and therapeutants	2	0	1
		entanglement or confinement	4	1	5
		habitat effects	3	1	4
		disease management	1	1	2
		sedimentation of wastes	1	0	0
		culture organism disposal	5	2	10
		general refuse	3	2	6
		biofouling	5	1	7
		processing	5	1	6
Regional effects	water use ecology and biodiversity	N/A			
		TEPS	2	1	3
		translocation between regions	1	1	1
	tenure production	N/A			
		disease management	1	1	2

N/A as assessed by PIRSA

For mussels the following 5 risk areas were assessed by the three reviewers as of Moderate risk. The range in the Consequences was 2 (Moderate - maximum acceptable level of impact) and 1 (Minor - possibly detectable but minimal impact on structure, function or dynamics).

Navigation (10). Mussels, unlike the other sectors discussed so far, have very little above water visibility for small vessels. The mussel farming areas are in less exposed open water areas where smaller recreational vessels are likely to share the water. Although the lease areas are marked with posts and crosses at each corner, the buoys that support the lines are semi-submerged and may not always be visible in choppy conditions or poor visibility.

Culture organism disposal (10). Mussel farmers try very hard to avoid mussels slumping off their lines by controlling seeding density. However, there will be times just before a harvest when rough

sea conditions can dislodge mussels from the ropes and they fall to the substrate below. Similarly, during harvest operations, the movement of the boat and the lifting of the ropes with the hydraulic gear can cause some loss of product. The main effect of this is an economic loss to the business as the mussels will be eaten by snapper, rays, crabs and starfish.

Habitat effect of structures (8). Mussel aquaculture is relatively simple, there are anchors, ropes and floats. All are submerged and are therefore new substrates for sessile organisms to colonise. The biofouling growth weighs down the infrastructure but provides habitat for many species of plants and invertebrates and act as a fish aggregation device in what is otherwise a fairly unremarkable area of open water. So, whilst these structures are undoubtedly having an effect on the habitat, it is a positive effect rather than a negative effect. Current risk assessment tools do not factor in the potential for such 'nature positive' effects.

Water flow effect of structures (7). Mussel ropes, when the mussels are large and ready to be harvested and the biofouling (see below) it at its most dense will have a very localised effect to reduce water flow through the depth of the water column. That provides protected niche habitats for juvenile fish to feed and hide from predators in a lower current environment than would otherwise be the case. Again, this could be viewed as a nature positive effect of mussel farming.

Biofouling (7). During mussel farming operations, particularly harvesting spat off ropes and harvesting market sized product, a lot of biofouling material can be released into the water column. This produces a plume of discoloured water downstream of the vessel, but it provides a magnificent berley trail for fish that feed on the material that is released.

Fifteen of the risk areas were assessed by the three reviewers as being of Low risk all, by definition, have minimal impact on the environment and do not need any increase in monitoring. One risk area was assessed as Nil risk.

6.2.5 Marine Algae and Marine Abalone

Marine algae and marine abalone sectors are, despite previous ventures, currently undeveloped. Aquaculture lease fees for these sectors are based on large areas that would not be utilized until farming technologies and markets are proven. It is suggested that this substantial upfront cost is deterring sector development.

As a means to derisk investments and bring recovered costs into line with business growth, new sectors licence holders could have a lower lease cost (say 20%) as a baseline and then increasing in increments of 10% based in the proportion of the lease/carrying capacity that is actually developed/utilized until they reach 100% of the lease fee.

The licence fee for these licence holders would not be reduced.

Recommendation 29: Lease fees for new sectors should be reduced if the area actually developed and being used for aquaculture is less than 25% of the lease area.

*Table 6.5: ESD risk analysis for Marine Algae. Likelihood and Consequence values are the average of the reviewers' independent assessments. The Risk matrix value is the product of average Likelihood * average Consequence each rounded to the nearest integer (hence the occasional apparent discrepancy).*

Risk Domain	Risk event	Risk is on	Likelihood	Consequence	Risk Value
Individual facilities	effects of structures	habitat effects	5	1	5
		Alienation	1	1	1
		water flow	4	1	5
		Shading	2	1	1
		Rehabilitation	4	2	6
		Navigation	5	2	10
		Visual	3	1	3
Operational	use of resource	Noise	3	1	3
		Escape	3	0	0
		chemicals and therapeutants	1	0	0
		entanglement or confinement	3	1	2
		habitat effects	3	1	6
		disease management	1	1	1
		sedimentation of wastes	1	0	0
		culture organism disposal	2	1	1
		general refuse	3	1	4
		Biofouling	5	1	6
		Processing	4	1	4
Regional effects	water use ecology and biodiversity	N/A			
		TEPS	2	1	3
		translocation between regions	2	1	3
	tenure production	N/A			
		disease management	1	1	1

N/A as assessed by PIRSA

For marine algae (whether alone or in IMTA) only one risk area was assessed by the review team as of Moderate risk. The Consequences was 2 (Moderate - maximum acceptable level of impact).

- Navigation (10). Marine algae, like mussels, will have very little above water visibility for small vessels. The marine algae farming areas are in more exposed open water areas than mussels. Although the lease areas are marked with posts and crosses at each corner, the buoys that support the lines are semi-submerged and may not always be visible in choppy conditions or poor visibility. The reviewers only considered the scenario in the initial stages whilst marine algal farming becomes properly developed and may change at larger scale.

Seventeen of the risk areas were assessed by the review team as being of Low risk all, by definition, have minimal impact on the environment and do not need any increase in monitoring. Three risk

areas were assessed as Nil risk. The reviewers believe that marine algal culture could provide several 'nature positive' benefits rather than risks, with the potential to reduce levels of dissolved nutrients such as nitrogen and phosphorus and provide habitat and niche environments for larval and juvenile fish in what would otherwise be unremarkable open water situations.

*Table 6.6: ESD risk analysis for Marine Abalone. Likelihood and Consequence values are the average of the reviewers' independent assessments. The Risk matrix value is the product of average Likelihood * average Consequence each rounded to the nearest integer (hence the occasional apparent discrepancy).*

Risk Domain	Risk event	Risk is on	Likelihood	Consequence	Risk Value
Individual facilities	effects of structures	habitat effects	5	1	5
		alienation	1	0	0
		water flow	1	0	0
		shading	1	0	0
		rehabilitation	4	2	7
		navigation	3	1	2
		visual	1	0	0
Operational	use of resource	noise	2	0	1
		escape	2	1	3
		chemicals and therapeutants	1	0	0
		entanglement or confinement	1	1	1
		habitat effects	2	0	1
		disease management	4	1	5
		sedimentation of wastes	2	0	1
		culture organism disposal	2	0	1
		general refuse	3	1	4
		biofouling	2	1	1
		processing	1	1	1
Regional effects	water use ecology and biodiversity	N/A			
		TEPS	1	1	1
		translocation between regions	3	3	11
	tenure production	N/A			
		disease management	4	4	16

N/A assessed by PIRSA

For marine abalone one risk areas were assessed by the three reviewers as of High risk, and two as Moderate risk. Thirteen were assessed as Low risk, and five as Nil risk.

- Disease management (risk value 16). Abalone are susceptible to a number of diseases that have extremely serious effects in terms of incidence and severity. Abalone viral ganglioneuritis (AVG) and *Perkinsus olseni* (a protozoan) have affected wild and cultured abalone in Australia. There are other health problems that affect farmed abalone

particularly in warmer months that may be diet related. The consequence of introducing these or other communicable diseases into areas of open water which are connected to known abalone habitat where these diseases have not been reported (i.e., the western side of Eyre Peninsula) is assessed as 4 - Serious impacts with relatively long-time frame likely to restore to an acceptable level. The impact on wild abalone populations and commercial abalone fishing could be devastating. At this point there is no active commercial marine abalone aquaculture, and it is not likely to happen anytime soon given the current low price of abalone in the market and the difficulties in obtaining disease-free stock.

- Translocation between regions (11). This is clearly related the previous point. Moving juvenile abalone from one region to another (even if it from an area where disease has not previously been identified) would be seen as endangering the commercial abalone fishery.

- Rehabilitation of infrastructure (7). Past attempts to farm abalone in the open ocean have not gone well. The approach taken by one operation was not sufficiently robust to withstand the west coast conditions and was destroyed and washed up on the beach. The loss of stock and infrastructure was partly to blame for the financial failure of the business. Recovering habitats from exposed coastal areas some distance from boat ramps is something to attempt on calm days only.

6.3 Science Cost Recovery Assessment

6.3.1 Effectiveness, Efficiency, and Cost Structure

The Terms of Reference (Annex A) for this review indicate that the science component relates specifically to the environmental assessment and monitoring work that has, and continues to be, carried out that underpins the PIRSA aquaculture management process for the marine aquaculture sector. It ensures that aquaculture is managed and operates under the principles of ESD using a risk based management approach informed by relevant data and knowledge.

Effectiveness

Tuna, finfish and mussel sectors are well serviced by scientific understanding of the environments they occupy, that they impact and that impact them. The quantity and quality of that data would be comparable with the best anywhere. While these industries occupy these same regions there is plenty of capacity for them to extend and expand production as markets and circumstances allow. The data that feeds into the model needs updating each year to better measure and manage changes in climate that affect the movement of water and its chemical, physical and biological composition.

The effectiveness of the current science underpinning oyster aquaculture is extremely poor. The settings are largely based on historical practices, but recent technological and economic priorities or imperatives have put more oyster biomass into some growing areas. The parameters used to try

to keep growers within those historical biomass boundaries are being ignored and so there is little risk of detection of excess biomass.

Efficiency

The work done in the period 2007-2015 in particular was important and impressive. There is no doubt that this was a highly efficient program of work and was closely tied to the risk assessments that underpinned sectoral development (as noted in Annex E). Since that time, however, the science conducted has been largely business as usual. Data collection without too much new science. It isn't because there is a lack of important or interesting work to be done, so what could explain the extended lull in activity? It is true that for much of that time the oyster sector was doing what it had always done, with incremental increases in production being interrupted by concerns and consequences of POMS and localised HABs and Vibrio closures. But the advent of new subtidal oyster growing systems has the potential for a generational step-change in oyster farming. Like most disruptive technologies the development happens, the products are introduced to the market and then the rules and regulations play catch up. Subtidal oyster technologies appear to offer significant efficiencies and opportunities to grow product in lease areas that have been zoned but not leased. This should be an attractive field of research for scientists, but it is not clear who is stepping forward. If PIRSA sees inadequate interest from SARDI for that work, then the opportunity is there for non-traditional service providers to step into that gap.

Cost structure

As highlighted elsewhere, the majority of science that has underpinned the PIRSA Aquaculture management program has been derived from research activities that have not been paid for through the cost recovery pathway. This is in stark contrast to the situation with the PIRSA Fisheries management program where most of the funding that has supported the underpinning science has come from licence holders through cost recovery.

Tuna and finfish licence and lease holders do contribute to a science program that adds data to the hydrodynamic model. It could be argued that, after 20 years of operations without detectable impact, their need for that work has decreased. However, the value of that work is of huge value to many stakeholders, as evidenced by the current HAB event, with wild fishers, recreational fishers, holiday accommodation, coastal tourism operations and fishing tackle shops all being affected. The recently announced State and Federal HAB response investment into more science should be able to offset and supplement some of the funds currently raised by the aquaculture cost recovery mechanism for tuna and finfish sectors.

Recommendation 30: PIRSA and SARDI to investigate use of HAB recovery funds and other funding options to maintain and further develop oceanographic models with different aquaculture sectors only contributing to specified industry-related activities through the cost-recovery process.

One of the most common inputs from industry during consultation was concern about the expense and limitations of SARDI as the principal science provider under cost recovery. The following comments were made by key stakeholders:

- *"They don't have the capacity that they had back when the tuna industry was starting up – they don't seem to give us the priority we had back then";*
- *"Their cost structure is expensive by any standard, but we don't see the quality in what to do for that price"; and*
- *"Their overheads are far more than we are used to paying for R&D partners".*

At the same time, industry does understand the importance of being able to access strong science expertise and facilities locally/in State. Those same views were supported by PIRSA staff across different units who noted that being able to access SARDI staff was key to being able to address emerging issues quicky and to building their own understanding of aquaculture science. It was noted during the review that there are limited options for alternative science providers in SA, with some university programs now shedding expert staff.

Recommendation 31: PIRSA, SARDI and representatives of all aquaculture sectors meet annually to discuss potential strategic cross- or multi-sector priorities and specific research projects that address current gaps and set future directions for South Australian aquaculture.

6.3.2 Stakeholder Engagement and Equity

This part of the review has been informed by the interactions of the review team with industry stakeholders, industry representatives, SARDI scientists and PIRSA aquaculture managers. The review team noted the tensions between government and industry observed by the ICRRP Review (McCallum et al 2023). As noted earlier, in the context of this review, these tensions relate primarily to the manner in which cost recovery programs are implemented.

The review team noted that the newly established CRIC has significant potential to improve the working relationship between managers and key industry bodies. However, the team also observed that there are various steps that government and industry could take to improve communications with growers and industry engagement in science activities more broadly and regularly. Earlier recommendations related to the role of aquaculture engagement officers should assist, but there are additional opportunities for PIRSA to nurture knowledge sharing and capacity development and work with other leading aquaculture research providers in Australia, New Zealand and globally.

Recommendation 32: Aquaculture managers, scientists and industry sectors should work more collaboratively with their interstate and global peers to develop projects that would use the limited industry funds, leveraged with FRDC and state contributions, to address common key aquaculture research questions.

That approach has worked well for tuna and finfish sectors, and for oyster growers in areas of disease and genetics but now needs to be extended to consider more regional scale and cumulative impacts such as estimating carrying capacity for oysters in specific growing areas.

6.3.3 Digital Transformation Opportunities

The recently announced HAB response research program will bring many new and improved water quality monitoring buoys and robots to the fore to augment the existing datasets and models that underpin aquaculture management in South Australia. The new activities should have near-shore and embayment components, not just broad-scale aspects, to better support the oyster sector.

6.3.4 Other Matters

1. Barriers to Change

There would appear to be three barriers to change in the realm of aquaculture science (1) the lack of research projects being either proposed or poorly justified by researchers to industry, and the high costs of doing that research because the projects are (2) priced using the SARDI cost model, or (3) not developed in a way that would be suitable or eligible for FRDC co-investment. Expertise at research institutions is not as broad as it used to be, and not all institutes can cover all the areas it used to.

2. Flexible Management Arrangements

The example of the mussel grower who worked with PIRSA Aquaculture to develop the sector-based aquaculture strategy is an excellent working approach for operational activities. The fact that there is only one mussel grower made this task relatively straightforward. The strategy does not change the management arrangements for the sector—it just makes it easier for all stakeholders to see how the sector is managed and regulated. That transparency will be beneficial in terms of public perception and the social licence.

Similarly, other sector strategies could be developed for the tuna and finfish growers, given their activities are established and largely predictable, and there are few businesses involved. In time, algae and abalone sector strategies could be developed too. It is probably unlikely for the oyster sector to develop a similar strategy given the current situation, though separate intertidal and subtidal documents might help.

3. Industry Ability to Pay

Tuna and oyster sectors are not as profitable as they once were. Input costs have increased at a faster rate than the price they get for their product. The tuna sector in particular has had to accept reduced prices for fish on a $/kg basis. This means that cost recovery fees that increase with CPI are an increasing impost to economic viability. Efforts have been made to diversify tuna products and markets in order to increase prices, but those innovations are more expensive than business as usual, at least in the short term.

The consolidation of the sector into even fewer companies may be the only way to become more efficient, but there is only so far that can go before the costs of production are still greater than the value of the product. That would have major social and economic impact on the Port Lincoln region and hence the importance of processes such as this review to ensure that cost recovery is

undertaken as efficiently as possible. Recommendations made in this review are cognisant of industry limitations and hence earlier sections have also addressed issues such as more efficient use and leverage of FRDC funding.

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Annex A: Project Terms of Reference

1: Compliance Benchmarking: Aquaculture

Governing authority: Cost Recovery Implementation Committee (CRIC)

Agency: Department of Primary Industries and Regions (PIRSA)

Agency responsibility: Executive Director Fisheries and Aquaculture (PIRSA)

Background

The **Cost Recovery Implementation Committee (CRIC)** was formed to implement the recommendations of the Independent Cost Recovery Review Panel. Compliance benchmarking was a recommendation of this review to ensure that compliance activities and costs are transparent, risk-based and aligned with best practice.

Appropriate enforcement, aimed at maximising voluntary compliance and creating an effective deterrence, is delivered through intelligence driven, risk based and outcome focused compliance plans developed for the aquaculture sector utilising the three core strategies of education and awareness, effective deterrence and appropriate enforcement.

Section 8(1)(c) of the *Aquaculture Act 2001* prescribes the efficient and effective regulation of the aquaculture industry. The Terms of Reference sets out the objectives, scope, and deliverables of the compliance benchmarking process for aquaculture within South Australia.

Objectives

This benchmarking exercise seeks to ensure the appropriateness and cost-effectiveness of compliance services across aquaculture as a whole, and at the individual sector level.

The primary objectives of the Aquaculture Compliance Benchmarking process are to:

1. **Evaluate current compliance frameworks** and cost structures within the aquaculture sectors to determine if these are appropriate risk-based and effective.
2. Ensure compliance costs are **transparent** and aligned with best practice.

3. **Identify efficiencies** in current activities and future opportunities for modernisation, particularly through digital transformation.

4. **Ensure Compliance with Legislation.** Confirm that compliance service provision aligns with the requirements of the *Aquaculture Act 2001*, where the aquatic resources of the State are to be managed in an efficient and cost-effective manner.

Scope and Process

The Aquaculture Compliance Benchmarking will include:

- **Sector Review:** The initial benchmarking phase will focus on the aquaculture sector as a whole, and then identifying individual sector needs for the oyster, mussel, yellowtail kingfish, southern bluefin tuna and abalone aquaculture sectors.

- **Review of Current Compliance Program:** Assessing the effectiveness, efficiency, and cost structure of existing compliance measures within aquaculture, including routine monitoring, audits, rehabilitation and enforcement. Determine if the current compliance activities are appropriate, risk-based and effective across the aquaculture sectors. Also, recommend a sustainable and risk-based compliance model that balances **regulatory effectiveness** with financial viability for industry stakeholders.

- **Digital Transformation Opportunities:** Assessing the potential of transitioning to or enhancing digital tools, and their impact on compliance costs and processes.

- **Stakeholder Engagement:** Where required, consulting with key stakeholders, including aquaculture lease and licence holders, commercial industry bodies, and PIRSA, to gather input on current compliance challenges and potential improvements.

- **Benchmarking with External Jurisdictions and Peers:** Comparing South Australia's compliance framework with other jurisdictions to ensure adoption of best practices.

Exclusions:

- Food safety: SASQAP (PIRSA South Australia Shellfish Quality Assurance Program).
- Inland aquaculture activities and seaweed.
- Aquaculture Zone Policies.

In achieving this task, the Contractor will be required to:

- Engage with PIRSA to identify the data, information, reports and policies necessary to undertake the review and analysis.

- If deemed necessary by the Contractor, undertake consultation with technical experts familiar with compliance cost recovery models used for aquaculture.

- Provide options that align with the principles of risk-catch-cost that promote best practice and identify opportunities for improvement to both industry and PIRSA within the current regulatory framework.

- Consult (online or face-to-face) with the aquaculture sector and relevant government agencies, as required.

- Maintain full records of all activities undertaken by the Contractor.

- Regular updates will be required by the Contractor to the CRIC.

PIRSA will provide relevant background information, any additional relevant information requested by the Contractor where such information exists, and access to PIRSA's files regarding relevant matters. A draft report to be presented to the CRIC by DATE, subject to all necessary data and information being provided to the Contractor in a timely manner.

Following CRIC feedback on the draft report, a final report to be provided by DATE.

Confidentiality

All documents and other materials used and produced by the Contractor in the course of its activities remain the property of PIRSA.

2. Science Benchmarking: Aquaculture

Governing authority: Cost Recovery Implementation Committee (CRIC)

Agency: Department of Primary Industries and Regions (PIRSA)

Agency responsibility: Executive Director Fisheries and Aquaculture (PIRSA)

Background

The **Cost Recovery Implementation Committee (CRIC)** was formed to implement the recommendations of the Independent Cost Recovery Review Panel. Science benchmarking was a recommendation of this review to ensure that science activities (i.e., environmental assessment and monitoring) and costs are transparent, risk-based and aligned with best practice.

The **South Australian Research and Development Institute (SARDI)** serves as the government's science provider for the aquaculture sector.

Science is critical in ensuring aquaculture sectors are managed based on the best available scientific data. The costs associated with this must be fair, risk-based and transparent.

Section 8(1)(c) of the *Aquaculture Act 2001* prescribes the efficient and effective regulation of the aquaculture industry.

The Terms of Reference sets out the objectives, scope, and deliverables of the science benchmarking process for aquaculture within South Australia.

The goal is to ensure SARDI delivers efficient and cost-effective services without compromising science quality.

Objectives

This benchmarking exercise seeks to ensure the appropriateness and cost-effectiveness of science services across aquaculture as a whole, and at the individual sector level.

The primary objectives of the Aquaculture Science Benchmarking process are to:

1. **Evaluate current science frameworks** and cost structures within the aquaculture sectors to determine if these are appropriate, risk-based and effective.
2. Ensure science costs are **transparent** and aligned with best practice.
3. **Identify efficiencies** in current activities and future opportunities for modernisation, particularly through innovation and new approaches to aquaculture and monitoring.
3. **Ensure Compliance with Legislation.** Confirm that SARDI service provision aligns with the requirements of the *Aquaculture Act 2001*, where the aquatic resources of the State are to be managed in an efficient and cost effective manner.

Scope and Process

The Aquaculture Science Benchmarking will include:

- **Sector Review:** The initial benchmarking phase will focus on the aquaculture sector as a whole, and then identifying individual sector needs for the oyster, mussel, yellowtail kingfish, southern bluefin tuna and abalone aquaculture sectors.
- **Review of Current Science Program:** Assessing the effectiveness, efficiency, and cost structure of existing aquaculture science programs delivered by SARDI, including environmental monitoring, and supporting science. Determine if the current science activities are appropriate, risk-based and effective across the aquaculture sectors.
- **Technology Integration:** Identifying opportunities to integrate modern technologies into science activities to improve outcomes.

- **Stakeholder Engagement:** Where required, consulting with key stakeholders, including aquaculture lease and licence holders, commercial industry bodies, science organisations, and PIRSA, to identify science priorities, and improvements without compromising scientific integrity or sustainability goals.

- **Benchmarking with External Jurisdictions and Peers:** Comparing science frameworks with other jurisdictions and international standards to ensure competitiveness, adoption of best practices, and cost-efficiency.

Exclusions:

- Food safety: SASQAP (PIRSA South Australia Shellfish Quality Assurance Program).
- Inland aquaculture activities and seaweed.
- Aquaculture Zone Policies.

In achieving this task, the Contractor will be required to:

- Engage with PIRSA, including SARDI, to identify the data, information, reports and policies necessary to undertake the review and analysis.

- If deemed necessary by the Contractor, undertake consultation with technical experts familiar with science cost recovery models used for aquaculture.

- Provide options that align with the principles of risk-catch-cost that promote best practice and identify opportunities for improvement to both industry and PIRSA within the current regulatory framework.

- Consult (online or face-to-face) with the aquaculture sector and relevant government agencies, as required.

- Maintain full records of all activities undertaken by the Contractor.

- Regular updates will be required by the Contractor to the CRIC.

PIRSA will provide relevant background information, any additional relevant information requested by the Contractor where such information exists, and access to PIRSA's files regarding relevant matters. A draft report to be presented to the CRIC by DATE, subject to all necessary data and information being provided to the Contractor in a timely manner.
Following CRIC feedback on the draft report, a final report to be provided by DATE.

Confidentiality

All documents and other materials used and produced by the Contractor in the course of its activities remain the property of PIRSA.

Annex B: National Cost Recovery Survey Summary

SA Aquaculture Cost Recovery Benchmarking Project:

Jurisdictional Survey 2025

Context

This survey is being undertaken as part of a larger project to update and inform South Australia's Fisheries and Aquaculture cost recovery framework. The South Australian Government has implemented a Cost Recovery Policy for fisheries and aquaculture for approximately 20 years. This policy is based on the understanding that the State owns South Australia's aquatic resources, with PIRSA managing them on behalf of the community.

Costs incurred by PIRSA services due to commercial access or farming of these resources in State waters are recovered from commercial licence/farm lease holders. Services covered include management, policy formulation, scientific monitoring, stock assessment, compliance and licensing as per the Fisheries Management Act 2007 and the Aquaculture Act 2001.

As outlined in the Cost Recovery Implementation Statement (2025-26)[134] PIRSA must undertake periodic reviews of all existing and potential cost recovered activities within its portfolio. Reviews have been undertaken in 2220, 2025, 2016, 2018, 2021 and 2022. This current review is being implemented via a Steering Committee (CRIC) comprising government and industry representatives. The CRIC oversees work being undertaken by consultants and is a key audience for survey results.

The survey seeks information on aquaculture science and compliance cost recovery from all Australian jurisdictions. ***Collated results from the survey will be shared in confidence with participating jurisdictions. The resulting report (which will be written to ensure no commercial or sensitive/confidential materials are disclosed) may be made public via the PIRSA website (as per past reviews).***

Survey Data Request and Response Protocol

The survey outlines a series of questions that are designed to gather up-to-date information on aquaculture cost recovery from each jurisdiction. The survey can be completed in writing or via an interview with the consultant. Jurisdictions can determine how best to answer any question, to reframe a question or decline to answer any question. Results will be reviewed with respondents

[134] 2025-26 PIRSA Fisheries and Aquaculture Cost Recovery Implementation Statement

before being included in the survey report. If you have any questions on any aspect of this survey or would like to discuss responses before submitting, please contact PI Ian Dutton on 0401..... (*number provided but removed from report*) or by email ian@reenvision.au.

Aquaculture Cost Recovery - Jurisdictional Survey Questions

1. Does your jurisdiction have:

   a. An overarching legislative or policy framework for cost recovery or resource access/rent?

   (*if yes, please attach details/web page links*)

   b. A specific legislative or policy framework for aquaculture cost recovery or resource access/rent?

   (*if yes, please attach details/web page links*)

2. How is industry and/or the broader community and/or other government agencies involved in aquaculture cost recovery policy and implementation in your jurisdiction? Are there any specific cost recovery coordination, review or reporting mechanisms at the whole of agency or jurisdiction levels?

3. Does your jurisdiction publicly report on cost recovery:
   a. Principles and Processes

   b. Income and Expenses

   c. Results of Reviews

   (*if yes to any of these, please attach details/web page links*)

4. What Sectors or species does aquaculture cost recovery apply to in your jurisdiction and on what basis is cost recovery applied?

Aquaculture Sector/species	Basis for Cost Recovery (GVP, Cost of Management, etc.)	Comments/further information

5. What is the total amount (or percentage) of regulatory costs recovered by aquaculture sector and/or species?

Aquaculture Sector/Species	Costs Recovered ($ or %)	Comments/further information

6. In relation to aquaculture compliance activities:

(a) What are the main types of compliance activities that are subject to cost recovery in your jurisdiction (e.g., surveillance/inspection, prosecution, etc)?

(b) Are there any project or species or sector specific arrangements for compliance cost sharing with industry or other stakeholders/regulators (e.g., Police)?

(b) Are the results of compliance activities that are subject to cost recovery reported publicly, and if so, how is this done?

7. In relation to science-based activities that are subject to cost recovery:

(a) What are the main types of science activities that are subject to cost recovery (e.g., research, baseline studies, site monitoring costs, etc.)?

(b) Are there any ongoing or project-specific arrangements for cost sharing with industry or other stakeholders/regulators/funders (e.g., FRDC)?

(c) Are the results of science activities that are subject to cost recovery reported publicly and, if so, how is this done?

8. Are there any specific regulation, compliance, scientific research/monitoring or other categories of management costs that are specifically excluded from collection?

9. Are there any situations where your jurisdictional cost recovery policies or approaches have been varied due to emerging or actual economic, environmental or social risks and emergencies (e.g. COVID-19 emergency, HAB/aquatic disease outbreaks, bushfire or drought impacts, etc.)? Please describe these and add links to any available resources.

10. Has your Agency/government undertaken any review(s) of cost recovery policy and performance? Please indicate their status and whether these are publicly available.

11. Are there any notable operational, logistical or governance issues associated with your current approach to cost recovery?

12. Are there any impending changes to your approach to cost recovery?

13. Are there any other comments you would like to make or information you would like to share on aquaculture cost recovery in your jurisdiction?

Thank you for your assistance.

National Benchmark Survey Results Summary

Queensland

1a. Overarching Framework

Queensland does not have a cost recovery policy for fisheries and aquaculture management. A fee review was undertaken in 2006 and fees for access rights to commercial fisheries and quota fees established which are specified in fisheries regulations. Fees have increased in line with CPI each year.

1b. Specific Legislative of Policy Framework

No. Fees relating to assessment of aquaculture approvals for resource allocation authorities, transfers or amendments, and broodstock permits are included in fisheries regulations. There are fee levels based on level of assessment for a resource allocation authority. Refer to schedules 5 and 6 of the Fisheries (General) Regulation 2019. Details about the fee levels can be found at Resource Allocation Authorities | Business Queensland.

3. Public Reporting

NA

4. Sectors or Species for CR

NA. Only assessment fees for broodstock permit applications and resource allocation authority applications for aquaculture. Fees for resource allocation authorities are based on a level of assessment – more complex have a higher fee.

The fees charged for aquaculture under the Fisheries Act 1994 include:

- Resource allocation authority assessment fees for where aquaculture is occurring in Queensland waters or unallocated tidal lands
- Renew or extend the period of a resource allocation authority
- General fisheries permit for broodstock or culture stock collection
- Other application fees such as to replace, amend or transfer an authority

5. Total Recovered

Difficult to calculate as managed across multiple agencies. There are no annual approval fees to cover costs associated with compliance/management/research.

6. Compliance CR

a. Subject to CR

   Compliance activities are not subject to cost recovery in Qld. There are no annual fees for authority holders that would contribute to compliance costs.

b. Sector specific arrangements

   Not specific for aquaculture. There is cost sharing with GBRMPA for general compliance activities within the marine park but would not include aquaculture activities.

c. Public Reporting of Compliance Activities

   No

7. Science CR

No CR reported.

8. Science and Compliance Activities Excluded from CR

Fees are only related to assessment costs. No annual fees/resource rent to cover the cost of management/compliance/research.

9. Fee waivers Due to Emergencies etc

Waiving of annual fees in the commercial sector for a number of issues – Covid 19 response, export issues for tropical rock lobsters, waiver of annual fees for worm and yabby fishers in response to white spot outbreak, Spanish mackerel fishery due to changes to management arrangements.

10. Fee Review

Last fee review was in 2006.

11. Notable issues for CR

As there is no policy for cost recovery for fisheries and aquaculture management this impacts on the current resourcing strategy and service delivery.

12. Impending Changes to CR

None at this time.

NSW

1a. Overarching Framework

Yes. Fisheries Management Act 1994 and Fisheries Management (Aquaculture) Regulation 2024

156 Annual contribution to cost of administration or research or to other industry costs

(1) A permit holder must, if the regulations so require, pay to the Minister an annual contribution towards any of the following costs—

(a) the cost of administration of this Part, being a cost that is identified in the regulations as a cost directly attributable to industry,

(b) the cost of monitoring the quality of the environment in which aquaculture is undertaken and of testing the quality of the fish or marine vegetation cultivated or kept,

(c) the cost of carrying out research into aquaculture,

(d) any other costs relating to the aquaculture industry.

(2) The amount of the contribution is to be specified in or determined by the regulations. The regulations may provide for the contribution to be based on the size of the area available for aquaculture or on any other basis and for the payment of the contribution by instalments or otherwise.

(3) The payment required by this section is taken to be a condition of every aquaculture permit.

(4) A contribution payable under this section is in addition to any rental payable by the permit holder for an aquaculture lease.

(5) A contribution is payable under this section even if the aquaculture permit is suspended.

(6) The Minister is to appoint a committee of persons to advise the Minister about the level of services provided to the aquaculture industry for the purposes referred to in subsection (1)(a) and

about the amount of contributions for the costs of administration directly attributable to the aquaculture industry. The Minister is to ensure that a majority of the members of such a committee are relevant representatives of the aquaculture industry.

165 Lease rentals

(1) The Minister is required to determine the rental of an aquaculture lease granted or renewed under this Division on the basis of the area of the lease.

(2) The Minister may redetermine the rental of an aquaculture lease at such periods, being not less than 1 year, as the Minister thinks fit.

(3) The amount paid in connection with an auction or a public tender for an aquaculture lease does not constitute the rental payable for the lease.

(4) The regulations may make provisions for or with respect to the rental for aquaculture leases.

(5) In particular, the regulations may prescribe a minimum rental for an aquaculture lease, either in respect of leases generally or leases of a particular class.

1b. Specific Legislative of Policy Framework

As above.

2. Coordination on CR Between Agencies involved in Aquaculture

Industry – via the NSW Aquaculture Research Advisory Committee and NSW Shellfish Committee

Broader Community – Nil

Government Agencies – agency specific legislation e.g., EPA Pollution Control Licenses, Crown Lands land-based oyster depot lease/licence fees, Food Authority State and Local NSW Shellfish Program levies.

DPHI Government Shared Services, Revenue and Debt Management

External Debt Recovery Agency

3. Public Reporting

No. The NSW Aquaculture Research Advisory Committee do publish annual reports for the web which includes expenditure. NSW Shellfish Committee reports on Fisheries and Shellfish Program expenditure, but this is not made public.

4. Sectors or Species for CR

Aquaculture Sector/species	Basis for Cost Recovery (GVP, Cost of Management, etc.)	Comments/further information

All sectors – lease, marine and land-based.	*Lease rent for use of public resource, cost of administration of permits and leases, mandatory research contributions, mandatory lease security/bond for clean-up*	

5. Total Recovered

NSW DPIRD has annual aquaculture permit fees, annual research contributions and aquaculture lease security bond contributions for public water land leases. These fees are paid by NSW aquaculture permit holders and are based on the total area authorised by the permit. Aquaculture leaseholders are also required to pay annual lease rent for the lease area they hold. In NSW activities are described as intensive or extensive and broken down into aquaculture permit and lease classes. Some fees are a minimum fee, and some are based on production area. Where an aquaculture business holds more than one aquaculture permit class they pay only one set of fees not a cumulative fee. Fees can be seen at: https://www.dpi.nsw.gov.au/dpi/fishing/aquaculture/resources/fees.

Fees are subject to CPI increases annually.

6. Compliance CR

a. Subject to CR

   Nil, triennial lease and land-based fees are covered by annual permit fee. Nil fee for Hatchery Quality Assurance Scheme audits (triennial)

b. Sector specific arrangements

   No

c. Public Reporting of Compliance Activities

   Reported to statutory Committees not publicly.

7. Science CR

a. Main types

   All science-based activities (including research, baseline studies, monitoring) and use of DPI research facilities and assets, are subject to full cost recovery.

b. Ongoing arrangements

   Cost sharing may occur through project-specific or ongoing co-investment arrangements with industry or funders, but DPI must apply cost recovery pricing

NSW Aquaculture Research Advisory Committee expenditure of 0.25% GVP/3 years to FRDC

c. Public reporting of science

Results from R&D projects are reported publicly through required deliverables, publications, and other agreed dissemination channels.

8. Science and Compliance Activities Excluded from CR

None listed

9. Fee waivers Due to Emergencies etc

Yes, for natural disasters DPIRD has a fee and debt waiver policy.
https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0012/1579386/Aquaculture-account-billing-and-debt-recovery-policy.pdf

10. Fee Review

No

11. Notable issues for CR

No

12. Impending Changes to CR

No

Victoria

1a. Overarching Framework

See Department of Treasury and Finance 2013 - https://www.dtf.vic.gov.au/sites/default/files/2024-10/Cost-Recovery-Guidelines-Jan2013_0.pdf

1b. Specific Legislative of Policy Framework

Yes – See Fisheries Cost Recovery - VFA

The Victorian Fisheries Authority (VFA) delivers fisheries administration, management, compliance and research services for the ongoing sustainable operation of Victoria's commercial fisheries (comprising wild-catch, aquaculture and fish receiver licences and individual quota holders), in accordance with the *Fisheries Act 1995* and the *Fisheries (Fees, Royalties and Levies) Regulations 2008*. Levies for cost-recoverable services are recovered in line with the Victorian Government's response to the National Competition Policy 2001 review of the Fisheries Act and its more recent Cost Recovery Guidelines.

In April 2004, a dedicated Fisheries Activity Costing System (FACS) was put in place to track specific activities carried out by Victorian Fisheries Authority staff, and retrospective cost recovery was introduced.

The Fisheries Cost Recovery Standing Committee (FCRSC) was established by the Minister responsible for fisheries to provide advice on the implementation and ongoing operation of the cost recovery program.

No further details available.

Tasmania

1a. Overarching Framework

Yes - Refer to Department of Treasury Fees and Charges Guidelines 2006: COSTING FEES AND CHARGES

1b. Specific Legislative of Policy Framework

Relating to Salmon: details are provided here: Cost Recovery | Department of Natural Resources and Environment Tasmania

2. Coordination on CR Between Agencies involved in Aquaculture

Through the Government-Industry Salmon Industry Working Group (SIWG) and direct engagement with Salmon Tas. There are only a few concentrated processors and growers. Additionally reporting and information on salmon cost recovery activities are provided on the Cost Recovery website.

Salmon Costing Model - Agreed Upon Procedures Report.pdf

3. Public Reporting

No formal reviews done to date as Program only commenced 1 July 2023. Reviews are expected to be undertaken this Financial Year. See also Salmon Cost Revovery Program Guidance

4. Sectors or Species for CR

Aquaculture Sector/species	Basis for Cost Recovery (GVP, Cost of Management, etc.)	Comments/further information
Shellfish	Cost of sample collection and testing required by Shellfish Market Access Program und Australian Shellfish Quality Assurance Program. It does not cover staff time or general program expenses	Covers sample collection All required testing including; Biotoxins E. Coli in flesh E. coli & TC in water Heavy metals and pesticides

Finfish (Salmonids)	The costs of managing Tasmania's salmon industry are fully cost recovered from 1 July 2023. Costs of management of the Tasmanian salmon farming industry will be cost recovered where the service: provides a benefit to the industry, where the benefit is solely for the salmon industry or the benefit received by the salmon industry is significantly disproportionate; or is solely, or principally, in service of the salmon industry within Tasmania; or results in a cost or burden to the Government which arises because of, or principally because of, the salmon industry within Tasmania. Services within scope are provided across NRE Tas, the Environment Protection Authority and the Inland Fisheries Service	

5. Total Recovered

Aquaculture Sector/Species	Costs Recovered ($ or %)	Comments/further information
Finfish Salmonids	$9.6 Million	Full cost recovery
Shellfish Oysters Mussels	100% of sample collection and testing costs	The Tas shellfish program operate on roughly a 50/50 split between industry and Government. Industry pays all testing costs and Government pays for operating the program, staff, vehicle, vessel costs etc

6. Compliance CR

Suggest reading 'Salmon Cost recovery Program: Scope of Services' and 'Financial Costings For The Tasmanian Salmonid Industry Approved Services Cost Recovery Model 2023-24' documents for further scope of costs recovered from salmon industry

a. Subject to CR

All costs relating to compliance activities undertaken by Fisheries Officers of NRE Tas for the salmon industry are to be fully cost recovered. Examples of this include:

- Routine compliance inspections of leases and farm operations
- Investigations and responses to marine farming debris reports
- Running costs of field operations related to compliance (i.e., vessel maintenance, monitoring gear, safety equipment, surveillance drones)
- Costs relating to data record management (e.g., Salmon Farming Data Portal)
- Management & administration of leases and licences

Additional costs relating to compliance with conservation and wildlife management include:

- Develop, review and maintain Environmental Standards relating to salmon (e.g., for marine and freshwater finfish farming) and Wildlife Interaction Standards
- Regulation and compliance associated with protected species interactions with the salmon industry, including:
    - Assessing development proposals
    - Developing advice for proponents and other stakeholders
    - Updating, permitting, and auditing activities associated with the Seal Management Framework 2018 and Minimum Requirements
    - Compliance activities
    - Research and analysis
- Administration of seal management supplies
- Conservation assessment and advice relating to salmon industry development and operational issues.

For other Tasmanian aquaculture species, comprehensive compliance related cost recovery is not undertaken to the same scope as salmon. For these industries, some costs are managed and recovered through licencing fees, without explicit compliance-cost related levies.

b. Sector specific arrangements

The primary sector-specific arrangement relates to salmon related compliance, and the scope of services is provided across:

- NRE Tas

- Marine Resources
- Biosecurity Tasmania
- Environment Strategic Business Unit

- Environment Protection Authority (EPA Tasmania)
- Inland Fisheries Service (IFS)

c. Public Reporting of Compliance Activities

Data related to finfish compliance activities is publicly available through the Tasmanian Salmon Farming Data (Salmon Portal). Data is published on a quarterly basis and includes inspection status (Yes/No) and number of infringements issued to each finfish company across Marine Farm Development Plan areas.

Annual reports are also compiled and distributed internally to assess industry and regulatory compliance performance, but these are not published due to confidentiality.

7. Science CR

a. Main types

- Biogeochemical, hydrodynamic and oxygen tracer modelling - Tasmanian Coastal Modelling and Information System
- Science outputs and advice required to inform decision-making;
- Expertise and advice to support the development of the Technical Standards for Marine Finfish Farming in Tasmania;
- Development of technical report series on the ecological effects of aquaculture.
- Review of state-wide monitoring data and sampling designs.
- Spatial science support including the ongoing maintenance of the Marine Atlas Platform as relevant to finfish;
- Maintenance of relevant databases and interface;
- Technical modelling support

Other projects leveraged through the Sustainable Marine Research Collaboration Agreement.

b. Ongoing arrangements

Research projects are leveraged with FRDC, or through other mechanisms where possible.

c. Public reporting of science

A determination is made on a case-by-case basis as to whether cost-recovered science is made publicly available.

8. Science and Compliance Activities Excluded from CR

The below information is taken from the Cost Recovery website. Further details on the scope of services can be found here: Scope of Services - Salmon Cost Recovery Program.pdf:

There are also services provided by Government that are outside the scope of the cost recovery program as they are more general services or apply across a broad range of stakeholders. Some of these operate under their own cost recovery model, such as testing undertaken by Analytical Services Tasmania. This is not included in the Tasmanian salmon industry cost recovery program.

Annual lease fees for marine farming leases are additional to cost recovery charges. These fees represent a payment to the Crown for the rights conferred by the marine farming lease.

9. Fee waivers Due to Emergencies etc

As prescribed in Section 275 of the Living Marine Resources Act 1995, the Minister may vary fees and charges where a written request is made. This capacity is usually exercised in response to applications for consideration of financial hardship

Seaweed – Permit charges are minimal to encourage emerging industry.

Shellfish – levy exemptions due to:

- POMS
- Covid
- Prolonged unexplained mortalities
- Financial hardship

Regarding salmon, the Cost Recovery Levy is set at the beginning of the FY and not changed throughout.

10. Fee Review

Nothing to date has been done due to the relatively young nature of the Program. However, reviews are scheduled to be undertaken this FY.

11. Notable issues for CR

Not at this stage. Proposed changes may arise out of the reviews.

12. Impending Changes to CR

No

Western Australia

1a. Overarching Framework

There is no overarching framework for resource access/rent. At a Fisheries portfolio level, Ministerial Policy Guideline 21 - Matters Related to the 2010 Funding Reform Decisions of Government, sets out that access fees for the State's commercial fishing industry will be set at 5.75% of the GVP for respective fisheries. It also establishes that will be charged for access to marine waters for pearling and aquaculture purposes.

This framework is not explicitly based on cost recovery, but provides revenue to the Fisheries Research and Development Account (established under the Fish Resources Management Act, 1994), which covers commercial fishing and aquaculture management, enforcement, education, research and monitoring of fishing activity.

1b. Specific Legislative of Policy Framework

Department of Primary Industries and Regional Development

Aquaculture lease fees are charged per hectare for permission to occupy the site. These are outlined on page 5 of Administrative Guideline No.2: Principles for Grant and Management of Aquaculture Leases in Coastal Waters of Western Australia.

Additional fees are charged for applications for the grant, variation or transfer of an aquaculture licence and the grant of an aquaculture lease. These fees are defined in Schedule 1 of the Fish Resources Management Regulations 1995.

2. Coordination on CR Between Agencies involved in Aquaculture

Environmental Protection Authority - The Environmental Protection (Cost Recovery) Regulations 2021 (Cost Recovery Regulations) were gazetted on 17 December 2021 and came into effect on 1 January 2022. In February 2024, Department of Water and Environmental Regulation (DWER) contracted Marsden Jacob Associates to conduct An Independent Review to Address the Extent Fees under Division 1 Recover Incurred Costs Arising from Proposals under Environmental Protection Act Part IV.

https://www.wa.gov.au/service/environment/environment-information-services/cost-recovery-part-iv-environmental-protection-act

EPA assessment of aquaculture proposals is limited to significant proposals. The threshold for this is usually a large scale proposal that include the use of supplemental feed (for example., a large scale marine finfish proposal).

3. Public Reporting

No

4. Sectors or Species for CR

NA

5. Total Recovered

NA

6. Compliance CR

a. Subject to CR

   No compliance activities are subject to specific cost recovery arrangements.

b. Sector specific arrangements

   No

c. Public Reporting of Compliance Activities

   No

7. Science CR

NA

8. Science and Compliance Activities Excluded from CR

NA

9. Fee waivers Due to Emergencies etc

As a COVID response, aquaculture licence and lease application fees, grant fees, and renewal fees were reduced to $1 for a one-year period (2020-2021). An option was provided for deferred payment of Aquaculture lease fees.

10. Fee Review

On 20 September 2021, DWER released a discussion paper “Implementing cost recovery for Part IV of the Environmental Protection Act 1986” and a consultation draft of the Environmental Protection (Cost Recovery) Regulations 2021.

11. Notable issues for CR

No

12. Impending Changes to CR

No

13. Other Comments

Aquaculture is growing from a low GVP base in WA, consequently, it is not considered appropriate to pursue cost recovery at this time.

Northern Territory

Department of Agriculture and Fisheries (DAF). Does not apply cost recovery for aquaculture but does apply a range of fees for different types of aquaculture licence ranging from an ornamental aquaculture licence ($110) to a commercial aquaculture licence which applies to facilities with a total water volume of >10,000 litres ($1,535 which is based on $645 plus the NT Levy). Further details of the NT Aquaculture Management approach are detailed at Aquaculture | NT.GOV.AU and Aquaculture | Department of Agriculture and Fisheries.

Annex C: South Australia Aquaculture Industry Survey

FINAL Questions for Aquaculture Industry Benchmarking Survey

Aquaculture sectors that are part of this review are: abalone, finfish, mussels, oysters, tuna

Are you an aquaculture licence holder? Yes/No

Are you an aquaculture lease holder? Yes/No

Are you directly involved in the annual negotiations regarding the PIRSA aquaculture licence and lease fees cost-recovery process? Yes/No

****

1. Do you know how your annual aquaculture licence and per hectare lease fee (if applicable) are negotiated and set?
    a. No
    b. Yes – I know a little
    c. Yes – I know enough
    d. I didn't know there was an annual negotiation process

2. Would you want to know more about this?
    a. No - I'll leave this up to my oyster/tuna industry association representative
    b. Yes - I'd like to know a little more
    c. Yes - I'd like to know a lot more

3. Should aquaculture businesses who utilise public resources (e.g., seawater and the aquatic environment) for private economic benefit be charged a licence fee?
    a. No
    b. Yes
    c. I don't know

4. Do you think the current licence and lease system is the best way to manage industry development and set expectations for all industry operators?
    a. No
        i. If no, what is your suggested alternative system?
    b. Yes
    c. I don't know

5. Do you know what government services your annual aquaculture licence and per hectare lease fee (if applicable) are spent on?
    a. No - and I'm not particularly interested in the details
    b. No - but I'd like to know more
    c. Yes - I know enough to be happy
    d. I don't know

6. Do you think the cost of your annual aquaculture licence/lease fees are:
    a. A lot underpriced
    b. A little underpriced
    c. About right
    d. A little expensive
    e. Very expensive
    f. I don't have a view

7. Explain your response to Question 6 here

8. How much do you think the **state** government contributes to the total costs of managing and providing services to support the aquaculture industry in SA?
    a. Nothing – it's fully cost-recovered from industry
    b. More than half
    c. Less than half
    d. I don't know

9. How much do you think the **federal** government (through FRDC) contributes to the total costs of managing and providing services to support the aquaculture industry in SA?
    a. Nothing – it's fully cost recovered from industry
    b. Nothing – it's not a federal government responsibility
    c. More than half
    d. Less than half
    e. I don't know

10. Do you think PIRSA provides a regulatory and management framework that supports your aquaculture's public image as a well-managed and regulated industry?
    a. No
    b. Somewhat - but it could do more
    c. Yes
    d. I don't know
11. How would you describe the relationship between PIRSA and your sector compared to other aquaculture sectors with regards to compliance?
    a. Poorer than other sectors
    b. About the same
    c. Better than other sectors
    d. I have no knowledge of what treatment other sectors get

12. Explain your response here

****

13. Are the reporting requirements associated with holding your aquaculture licence and lease (if applicable):
    a. Extremely insufficient
    b. Insufficient

c. About right
d. Burdensome
e. Extremely burdensome

14. Explain your response here

15. Do the reporting conditions on the licence/lease for your sector focus on the right areas or are there aspects that could be improved?

    Comment:

16. Give a rating of importance (H = high; M = moderate; L = low) of the issues below in terms of ensuring your sector maintains a broadly positive image in the eyes of the local community, the South Australian population and your customers:
    a. On-land site appearance/upkeep (includes sheds, equipment yards, used baskets, spare nets and by-product / mortality pits, for oyster, tuna, finfish, mussel operations)
    b. In-water site appearance/upkeep
    c. Navigation marker compliance
    d. Adhering to biomass/stocking limits
    e. Measuring the impact of your activities on water quality
    f. Adhering to livestock translocation requirements where applicable (e.g., sourcing stock from interstate hatcheries)
    g. Rehabilitation of expired or cancelled lease sites
    h. Preventing escaped stock and recapturing escaped stock
    i. Minimising interactions with protected species
    j. Impact of your activities on substrate flora/fauna (including seagrass)
    k. Monitoring of the health of stock, and reporting high mortalities or disease
    l. Ensuring veterinary medicines are used appropriately
    m. Maintaining stock welfare (including how product is harvested)
    n. Implementing a farm biosecurity plan to protect your business from the impacts of disease

17. Give a rating of importance to these areas of environmental science (H = high; M = moderate; L = low) as they affect your sector:
    a. Aquatic biosecurity (pests and disease)
    b. Oceanographic modelling (including nutrient dispersal and predicting movement of pathogens and harmful algae blooms) of the broader areas you farm
    c. Understanding more about marine heatwaves and harmful algal blooms
    d. Environmental monitoring of the substrate under aquaculture infrastructure
    e. Environmental monitoring of the substrate adjacent to your lease sites and zones
    f. Monitoring of water quality around aquaculture infrastructure
    g. Monitoring of water quality around other marine and coastal inputs (freshwater inputs, stormwater inputs, sewage treatment systems, desal)
    h. Trialling new aquaculture systems
    i. Measuring the nature positive impacts of aquaculture

18. Should the state government contribute more funds to support the areas of environmental science (above) that you rated as H = high?
    a. No
    b. Yes
    c. Yes - in conjunction with industry funds
    d. I don't know

19. Should the aquaculture industry contribute more funds to support the areas of environmental science (above) that you rated as H = high?
    a. No
    b. Yes
    c. Yes – in conjunction with government funds

20. What do you think are the key government **barriers** to your aquaculture sector's viability and growth?

    Comments:

21. What do you think are the key **opportunities** to your aquaculture sector's viability and growth?

    Comments:

22. Is there anything the state government can do to realise those opportunities?

    Comments:

23. Any other comments/suggestions?

Results for close-ended survey questions

Annex D: Aquaculture Risk Assessment and Prioritisation Plan (ARAPP)

Purpose:

To provide PIRSA compliance staff and aquaculture managers with a clear and consistent process to inform, prioritise and communicate annual aquaculture compliance activities.

The ARAPP process may also facilitate engagement of aquaculture licence holders in understanding and improve their compliance risks and facilitate planning and reporting of compliance risk assessment to key external audiences.

This system aligns with many current elements of compliance planning and is intended to improve the efficiency, effectiveness and industry/community understanding of, and support for, aquaculture compliance activities.

Alignment:

Designed to be consistent with both current PIRSA compliance policy[135] and practices and elements of the National Aquaculture ESD Reporting Framework[136] (which already underpins PIRSA aquaculture management).

Primary Prioritisation Criteria (applied at site level**):**

1. Environmental Risk Assessment – review of the environmental risk assessment profile for leases in each zone to take into account known and emerging risks and uncertainties, changes in rating, etc.
2. Farming Method by – rating of farming practices such as established or new technologies noting also any proposed changes in activities on the lease.
3. Species Farmed – addresses whether species is well understood and has established husbandry procedures or whether these are a new species that are not yet well understood or for which there are unresolved husbandry/farming risks such as disease.
4. Governance – assesses whether there are appropriate/established management and processes in place and the capacity of the lease or licence holder to implement and adjust them in accordance with their conditions.

[135] See Fisheries and Aquaculture Enforcement and Prosecution Policy (2016)
[136] Aquaculture - Fisheries Ecologically Sustainable Development

5. Compliance – assesses whether there have been any violations of lease or licence conditions in the past three years of operations.
6. Any public complaints received by PIRSA about operations on the site.

Secondary Criteria (to be applied as appropriate at licence/business level):

a. Any licence specific risks that have emerged which merit further consideration on an annual basis (e.g., AVG, changes in species in near vicinity, marine heatwave prediction, etc.)

b. Existence of independent and audited accreditation (as a positive risk offset)

c. Issuance of any shareholder warnings (for ASX listed companies)

d. Compliance – whether there have been any violations of licence conditions (cautions, expiations or prosecutions) in the past three years of operations (see, for example Recommendation 25).

e. Reporting – all required annual reporting has been received by due deadline(s).

f. New licence holder through a lease transfer process.

Scoring:

Primary and secondary criteria scores can be weighted/rated and integrated by the ARAPP Committee (comprised of Operations and Aquaculture branch staff with inputs from SARDI staff as needed).

Scoring Summation and Presentation

Ratings for each lease and licence holder can be summed to an overall risk rating score. Scores can then be analysed to determine "risk bands" that inform compliance planning for lease and licence inspections and any related engagement activities (e.g., conducting a zone workshop to provide lessees with an update on emerging risks, etc.).

Scores could also be summed up graphically (e.g., radar graphs) to communicate compliance risk ratings to stakeholders. Following completion of this ARAPP process, it is suggested that results be reviewed with relevant peak bodies and the CRIC for both transparency purposes and to enable them to contribute data and propose any refinements in method(s).

Annex E: Phases of Aquaculture Industry Development in South Australia 1990-Present

To better understand the context on how aquaculture science and compliance cost recovery settings have evolved in parallel with the growth of the various sectors, the review team found it useful to briefly summarize the last 30 years of aquaculture development in South Australia.

Over the past 30 years, South Australian aquaculture has developed in three phases:

Phase 1: Early Development (1990s–2000s)

Commercial aquaculture production in South Australia began to develop and diversify rapidly in the early 1990s, with experimental sea cage farming of Southern Bluefin Tuna in Spencer Gulf. This marked the start of a transformation from a smaller scale and largely nearshore aquaculture to more subtidal and/or offshore marine aquaculture systems.

Key developments in this period included:

- Southern Bluefin Tuna ranching became the flagship industry, with wild-caught juveniles fattened in sea cages with significant research investment from industry, FRDC and the Aquaculture and the Aquafin CRCs.
- Oyster farming expanded rapidly, especially on the east and west coasts of the Eyre Peninsula.
- The Farmed Seafood Initiative (FSI) launched by the SA Government provided foundational support for industry growth.
- Spencer Gulf Aquaculture Management Plan prepared under the (then) Fisheries Act 1982, an early regional framework pre-dating the statewide aquaculture legislation

By the early 2000s, aquaculture was contributing significantly to regional economies, with employment in aquaculture and related sectors growing steadily.

Phase 2: Expansion and Diversification (2000s–2010s)

During the 2000s, South Australia's aquaculture industry diversified beyond tuna ranching and oysters and was supported by innovative regulatory developments to specifically support sustainable aquaculture expansion and growth. Key milestones include:

- Introduction of the *Aquaculture Act 2001*, creating the modern licensing, leasing and (later) zoning architecture for SA aquaculture, which paved the way for more streamlined aquaculture development[137]

[137] Learning from the systematic approach to aquaculture zoning in South Australia: A case study of aquaculture (Zones – Lower Eyre Peninsula) Policy 2013 - ScienceDirect

- Introduction of Aquaculture cost recovery frameworks and mechanisms
- In the early 2000s, PIRSA and FRDC initiated a funding partnership to support the development of the aquaculture industry in South Australia. Termed 'innovative solutions for aquaculture planning and management', this pool of funding supported critical research needs to underpin strategic policy, legislation and sustainable aquaculture developments. This was considered an important milestone for aquaculture development in South Australia (FRDC 2004-203). The aims of the innovative solutions fund were:
    - To establish a strategic policy and legislative framework based on the principles of ecologically sustainable development to build, manage and protect South Australia's aquaculture resources
    - To improve aquaculture allocation decisions and management responses by developing risk-based spatial impact and carrying capacity models to increase understanding of the broad scale impacts associated with aquaculture.

  Key projects included, but were not limited to:
    - Environmental audit of marine aquaculture developments (FRDC 2003-223)
    - Planning and management - addressing seal interactions in the finfish aquaculture industry (FRDC 2004-201)
    - Development of rapid environmental assessment and monitoring techniques for application to finfish aquaculture in South Australia (FRDC 2006-078)
    - Investigations to address key policy gaps associated with the development of clam farming in South Australia: genetic and health issues aligned to translocation and stock identification (FRDC 2010-233)
    - Development of a sustainable South Australian macroalgal aquaculture industry (FRDC 2011-253)
    - Review of the aquaculture environmental monitoring program (EMP) in South Australia to inform a review of EMP regulations (FRDC 2011-263)
- At least two companies started commercially farming Yellowtail Kingfish near Port Lincoln, Fitzgerald Bay and Arno Bay. Two hatcheries were operating in Northern Spencer Gulf with broodstock regularly collected from the wild fishery. One of those companies, Clean Seas Seafood, achieved world-class health and survival rates with research from the Australian Seafood CRC.
- Snapper (*Chrysophrys auratus*) and mulloway (*Argyrosomus hololepidotus*) were also trialed in sea-cages, although difficulties with product quality and growth rates meant commercial success was limited.
- Clean Seas Tuna closed the lifecycle of Southern Bluefin Tuna at their Arno Bay hatchery. This was an ambitious commercial project that started in the mid 2000's involving broodstock tuna being transferred (by helicopter) to a large land-based hatchery in Arno Bay for spawning. By the early 2010's the Arno Bay hatchery achieved a major technical first by successfully closing the lifecycle of Southern Bluefin Tuna (SBT) with a number of batches of hatchery raised juvenile fish transferred to a sea-based aquaculture facility for grow-out

trials. However, the full commercial lifecycle closure and large-scale fingerling production was not realized, primarily due to biological (larval & juvenile survival) and economic (costs, scale-up) constraints.

- Growth in Abalone and Mussel production in marine systems and barramundi and other fish species in land-based systems.
- Collaborative research between government and the oyster farming industry in the late 2000's looked into the opportunities to support the commercial development of a clam aquaculture industry (2 key species were investigated: *Donax deltoides* and *Katelysia rhytiphora* on intertidal and subtidal leases). These proved to not be commercially viable.
- Microalgae and seaweed cultivation began to emerge as niche sectors.
- The industry also saw the rise of recirculating aquaculture systems (RAS) and multi-species hatcheries, laying the groundwork for land-based aquaculture initiatives such as the Waikerie Project[138] which is a research trial to grow marine finfish in saline borewater, 150 kms from the coast.

Phase 3: Innovation and Sustainability (2010s–mid 2020s)

South Australia positioned itself as a global leader in sustainable aquaculture through:

- Robust legislative frameworks, additional aquaculture regulations (including zone policy) and marine spatial planning (Lauer et al, 2015)
- Investment in research and development via SARDI (South Australian Research and Development Institute), interstate R&D agencies and funded by FRDC and Australian Seafood CRC
- Adoption of smart farming technologies, including new production systems such as flip farming of oysters, satellite-based monitoring of resources and an expanded range of seafood processing and marketing approaches to add value and access new markets (e.g., ultracold frozen tuna portions, premium pet food)
- Effective emergency disease responses to reduce impact and leveraging adversity to create opportunity: the Pacific Oyster Mortality Syndrome (POMS) outbreak in Tasmania in 2016 led to SA banning live oyster imports, boosting local hatchery developments.

Breakthroughs included:

- Expanded aquaculture regulations including zone policies introduced
- Precision aquaculture using data analytics and remote sensing
- Development of new biosecurity protocols and environmental monitoring programs.
- New initiative on Integrated Multitrophic Aquaculture (IMTA) underway[139]

[138] THE WAIKERIE PROJECT - A-Culture

[139] PIRSA and SARDI in affiliation with Flinders University secured funding for FRDC funded project (2023 051) "Ecologically sustainable aquaculture growth through Integrated Multitrophic Aquaculture (IMTA) – Incorporating IMTA

In all of these phases, in common with other Australian jurisdictions, the SA aquaculture industry has encountered a range of threats and challenges, including:

- Climate variability affecting water temperatures, hazardous algal blooms and a range of species (Roberts et al, 2019[140]).
- Biosecurity threats like Pacific Oyster Mortality Syndrome (POMS), Abalone Viral Ganglioneuritis (AVG), fluke parasites and other aquatic diseases which add to business costs and risks.
- Disruptions caused by the COVID-19 pandemic which impacted business operations and global markets.
- Workforce challenges, including skills shortages and regional employment gaps.
- Market volatility and competition domestically and overseas from international producers.
- Impact (actual and potential) of seismic testing and renewable energy development.
- Conflicts with coastal infrastructure development such as desalination plants[141].
- Increased concern about the social licence of fisheries and aquaculture in select locations (sometimes related to conflicts with other uses including conservation[142])

As noted above, the SA Seafood Growth Strategy 2021–2031 addresses these and related issues through investment, education, and innovation. There are also complementary processes underway currently to develop:

- IMTA nutrient modelling for determining carrying capacity in aquaculture zones which is aimed at improving regulatory frameworks (using SA as a test case) (FRDC 2023-051)[143]
- A targeted South Australian Aquaculture Industry Blueprint (2025–2030) that will guide aquaculture growth.

nutrient modelling into regulatory frameworks". The $1.5 million three-year project will include development of a national IMTA policy guideline to inform regulatory frameworks.

[140] Frontiers | Marine Heatwave, Harmful Algae Blooms and an Extensive Fish Kill Event During 2013 in South Australia

[141] Desalination plant aimed at helping Port Lincoln's drinking water shortage feared to put mussel business at risk - ABC News

[142] Save the Australian Sea Lion - Conservation Council SA

[143] FRDC Ecologically sustainable aquaculture growth through Integrated Multitrophic Aquaculture (IMTA) – Incorporating IMTA nutrient modelling into regulatory frameworks. | FRDC