Submission to the Department of Agriculture, Fisheries and Forestry:

Sustainable funding and investment to strengthen biosecurity discussion paper

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Contents

Executive Summary....3

Introduction....3

Sector Values....3

- Commercial Fisheries (Aquaculture and Wild Harvest)....4
- Recreational Fisheries....4
- Charter Fisheries....4
- Indigenous Fisheries....4

Biosecurity Context: Disease and Pests....4

- Incursions of exotic aquatic diseases....5
- Imported Seafood Products....6
- Imported Aquarium Fish....6

Learnings from WSSV....6

- WSSV Quarantine Breakdown....7
- WSSV Outbreak....7
- Future Proofing Prawns....7

Questions and Sector Views....8

Concluding Comments....11

Recommendations....13

References....13

Executive Summary

The Fisheries Research and Development Corporation (FRDC) welcomes the opportunity to contribute to developing a sustainably funded biosecurity system. This submission provides key considerations for sustainable funding of the Australian biosecurity system. This submission melds sector feedback with research regarding disease and pest incursions.

The FRDC believes that the aquatic environments provide a nuanced issue with biosecurity. On the introduction of an exotic pest or disease there is very little ability to control an 'outbreak', and while the repercussions impact private interests there may be larger impacts on the environment and public interests.

This submission highlights key biosecurity issues of concern to the Australian fishing and aquaculture sectors. Australia's aquatic biosecurity measures protect complimentary and competing commercial, recreational, and Indigenous fishing values. FRDC has previously highlighted that pest and disease incursions continue to be an ongoing concern. In summary, the following model has support across sectors groups:

- A government funded model that is supported by a biosecurity levy;
- The levy is sourced from risk creators that are beneficiaries of access to Australian markets (risk creators can include but are not limited to importers of seafood and exotic aquatic pets, air and sea freight, conveyance, or container shipping; and
- A risk/science-based approach is the desired outcome for aquatic biosecurity.

Introduction

The Department of Agriculture, Fisheries and Forestry (DAFF) discussion paper states that the Australian community shares in the benefits of the biosecurity system, in addition to sharing in the responsibility for the system. DAFF posed a series of questions for consideration, including:

- What elements do you think a sustainable biosecurity funding model should include? Are there elements that should not be included; if so, why?
- How would your proposed model operate at a practical level and who would it apply to?
- How would your proposed model impact you and others? What would be the benefits or disadvantages to you and/or other stakeholders?
- Is the proportionality between those who contribute to the funding system and those who benefit the most, right?
- Are there other technologies, current or emerging, that could be employed to increase the efficiency of the biosecurity system, and perhaps reduce operational cost?
- How could the Commonwealth Government improve efficiency in the biosecurity system (consistent with meeting our Appropriate Level of Protection)?
- What other investments or actions could the Commonwealth Government make or take to sustainably support the delivery of biosecurity activities?

Sector Values

Australian fishing and aquaculture was worth $3.48 billion in 2021-22 to the national economy (ABARES, 2022). This figure does not include the value of recreational fish, environmental benefits and tourism related to the aquatic environment. The long-term goal of a biosecurity funding model is that it allows the system to protect our primary industries and natural environments from disease and pest incursions. The system should protect the socio-economic and socio-cultural values of our aquatic environments for not just fishing and aquaculture sectors and industry but for the broader Australian public.

The need for a properly funded biosecurity system has been addressed in research conducted by Centre of Excellence for Biosecurity Risk Analysis (CEBRA) in which it was stated that the, *'total flow of benefits arising from assets vulnerable to biosecurity hazards was calculated to be A$251.52 billion per annum, or*

A$5.696 trillion over 50 years' (Dodd et al., 2020, p.13). Protecting aquatic biosecurity has significant additional benefits of helping to protect native ecosystems and biodiversity (Rawluk, Beilin and Lavau, 2021).

Commercial Fisheries (Aquaculture and Wild Harvest)

The major industry sectors include Atlantic Salmon farming, rock lobster fisheries, prawn fisheries and farming, abalone fisheries and farming and tuna fisheries and farming. There has been substantial growth in some aquaculture (i.e., farming) sectors over the past five years, specifically Atlantic Salmon (+181%), prawn farming (+ 269%) and Barramundi farming (+ 162%). Voyer et al (2016, p.16) provide an analysis of the value of NSW fisheries beyond the beach price of seafood noting that, *'89% of NSW residents expect to eat local seafood when they visit the coast, 76% feel that eating local seafood is an important part of their coastal holiday experience and 64% indicated they would be interested in watching professional fishers at work while on holidays'*. The reliance by post-harvest businesses (retailers and wholesalers) and tourism businesses are typically not captured in published industry values.

Recreational Fisheries

The estimated value of recreational fishing in 2019 was $2.87 billion and was based on an assessment of recreational fisher expenditure on fishing-related activities as a direct value estimate. The 2019 figure was based on the *2000 National Recreational Fishing Survey,* and in the year of the survey, an estimate of the national value of recreational fishing was $1.86 billion (Henry and Lyle, 2003).

Charter Fisheries

There is no current national estimate stating the value of Charter fishing however there is some guidance on a state-by-state basis. An estimate of the value of Charter fishing based as noted in Table 1 is over $230 million.

Table 1. Charter Fishing Value

Jurisdiction	GVP for Charter fishing including flow on effects
Queensland	$66.6 million (BDO EconSearch, 2022)
New South Wales	$33.16 million (McIlgorm and. Pepperell, 2014)
South Australia	$21.2 million (BDO EconSearch, 2021)
Western Australia	$110.9 million (Recfishwest, 2022)

Indigenous Fisheries

Smyth, Egan and Kennett (2018) identified multiple cultural, social and economic values to Indigenous fishing across three case study regions. The authors identified multiple value sets including (1) shared cultural values, (2) shared social values, (3) shared economic values, (4) shared physical health values and, (5) shared mental health values. Protecting these values is critical with Smythe, Egan and Kennett (2018, iii) noting: '*The results show that for many Aboriginal peoples, customary fishing practices are of immense value and multi-faceted importance; being able or unable to access customary fisheries can have profound repercussions for the cultural, social, economic, physical and mental health of individuals, families and communities'.*

Biosecurity Context: Disease and Pests

According to the Council of Rural Research and Development Corporations (CRRDC), biosecurity has attracted a significant investment focus among Rural Development Corporations (RDCs) and in 2021/22,

RDCs invested $104 million in biosecurity preparedness and response and over the last five years have invested $463 million (CRRDC, 2022). The CRRDC (2022, p.2) also noted that: '*RDC investments cover the spectrum of biosecurity including management of the risks and impact of established pests, weeds and diseases and preparedness and response in the event of incursion of exotic (not yet established) biosecurity threats. While much of RDC investment has a strong focus on on-farm biosecurity management, they also partner and co-invest at state and federal level'.*

The successful detection of introduced marine pests (IMP) relies on effective surveillance (McDonald et al., 2019). It should be noted that the expedience of responses following an IMP detection depends on the relationship between regulatory authorities and stakeholders (McDonald et al., 2019). A State-Wide Array Surveillance Program (SWASP) was developed with the Department of Primary Industries and Regional Development, Western Australian Port Authorities, and port industry stakeholders (McDonald et al., 2019).

The learning outcomes identified by McDonald et al (2019) detailed in Table 2 suggest that a biosecurity system must incorporate: (1) functional working relationships between government and stakeholders, (2) a 'one size fits all' approach may not meet the needs of industry or the community, and (3) avoiding regulation in favour of cooperation among stakeholders.

Table 2. Biosecurity System Essentials

Lesson No	Issues and Learnings
1	Work with bodies that are willing to work with you. Do not spend initial efforts in ongoing dialogue with those who do not wish to participate. Our experience has shown the value of the initial participants, even though they may not be located within highest risk areas.
2	Do not aim for perfection in the initial surveillance programme, rather the understanding should be that 'something is better than nothing'. It is important to develop a collaborative approach to surveillance that parties can agree upon. The sampling regime and fine-tuning of the surveillance protocol can be built upon and evolve as time progresses.
3	Understand that a single system will not fit every environment: threats, habitats and stakeholders vary. An effective surveillance system has to be adaptable to risk and size.
4	Be open to learning from your stakeholders. Stakeholders have a wealth of knowledge and consequently are better situated to advise on their environment and specific considerations for implementation. Regulators need to listen and learn from stakeholders, and in this way, a constructive and effective surveillance pathway can be created.
5	Do not try and impose a rigid regulatory approach. A truly collaborative programme will achieve greater participation. Biosecurity should always be a shared responsibility.

Source: McDonald et al (2019, p.83).

Incursions of exotic aquatic pests and diseases

Australian fisheries have been significantly impacted by disease incursions affecting finfish and shellfish, and there are over 250 introduced marine species in Australia, some of which have and may in the future have significant impacts on fishing and aquaculture, if not the environment (biodiversity and ecology). Some recent examples include:

1995: *Mass mortalities of pilchards devastated the fishery in Southern Australia that was subsequently identified to be caused by the Pilchard Orthomyxovirus that now causes substantial problems for farmed Atlantic Salmon in Tasmania.*

1999: *Incursion of black striped mussel in the Northern Territory (NT), Darwin Harbour. Although successfully eradicated, the cost to the NT government more than $2.2 million.*

2005: *Mass mortality of abalone caused by Haliotis Herpes Virus devastated the fishery and abalone farms in western Victoria and has reoccurred in in the fishery in 2021.*

2010: *The Pacific Oyster Mortality Syndrome (POMS) was discovered in the Georges River, Sydney.*

2016: *POMS spread to Tasmania, where it devastated the oyster farming industry and indirectly caused major loss of production in the South Australian oyster farming industry. White spot syndrome virus (WSSV) was identified on prawn farms in Moreton Bay.*

2022: *WSSV has been reported in Northern New South Wales.*

The FRDC submission to the Adequacy of Australia's biosecurity measures and response preparedness, with respect to foot-and-mouth disease identified the following observations:

- Each disease incursion episode has been devastating and has demonstrated the challenge for eradication of aquatic biosecurity threats;
- The absence of effective barriers for disease containment in connected freshwater and marine environments is an ongoing concern;
- The inter-connectedness of aquatic systems requires the need to prevent the introduction of diseases and parasites; and
- Pre-border and border biosecurity is the most cost-effective approach to minimise risks and impacts of aquatic diseases and parasites (FRDC, 2022).

The National Priority List of Exotic Environmental Pests, Weeds and Diseases (EEPL) identifies 168 exotic species of significant environmental risk with a third of the list relates to aquatic environments (DAFF, 2022). Investing in the sustainability of the biosecurity system is crucial to all sectors of Australian fishing and aquaculture.

Imported Seafood Products

Australia currently allows the importation of a range of uncooked seafood products for human consumption. Imported products pose a risk for direct exposure of farmed and wild aquatic species (this has been hypothesised as the likely pathway of the 2016 WSSV incursion (DAWE, 2021; Diggles, 2022b; Hernandez-Jover et al., 2017)).

Seafood intended for human consumption cannot be imported for use as bait (AQIS, 1999). However, these products, or waste from them (e.g., whole prawns and shellfish, heads, frames, viscera etc) are known to be used for bait for hook and line fishers and crab/lobster pots, a practice which is not illegal throughout Australia.

Imported Aquarium Fish

Infectious spleen kidney necrosis virus (ISKNV) that threatens Australian fish species has been detected in numerous domestic populations of ornamental fish at wholesalers and retailers, and at one aquaculture facility (Rimmer et al., 2016).

Millington et al (2022) have argued that invasive species represent one of the greatest biological threats to Australian ecosystems. Underpinned in part by the distribution of non-native ornamental species and their establishments in Australian waterways. García-Díaz et al (2018) attributed this to deliberate or accidental release of non-native species by ornamental fish keepers. There are examples of fish and other aquatic species being introduced to the Australian environment likely from aquarium sources.

Learnings from WSSV

White Spot Disease (WSD) is caused by WSSV, which emerged from China in the early 1990's. WSSV can infect decapod crustaceans, planktonic copepods, polychaetes, insect larvae from marine, brackish and

freshwaters. Diggles (2022b) provides a comprehensive analysis of the impacts of WSSV and the lessons that will impact the need to spend funds in response to disease incursion – learnings are italicised.

WSSV Quarantine Breakdown

- Project Cattai found seafood importers purposefully avoided at border WSSV testing (quarantine) protocols throughout 2016 allowing entry of large volumes of infected prawn products;
- Retail testing of imported prawn products available from supermarkets in Southeast Queensland in Dec 2016 showed that 50-80% of samples tested positive for WSSV;
- Subsequent surveys found 20-27% of recreational fishers in Southeast Queensland were using supermarket bought prawns as bait representing the most likely pathway for WSSV to be introduced to waterways adjacent to prawn farms (an update to this has shown that prawns are the most popular bait nationally and that 20% of respondents indicated they had purchased prawns from a seafood retailer); and
- The biosecurity risk of uncooked seafood entering waterways via recreational fishers using seafood as bait or burley had been recognised for over two decades.

WSSV Outbreak

- Once introduced, disease spread rapidly to adjacent ponds on that farm within 7 days, while diagnostics were being undertaken;
- Within two weeks a second nearby farm detects diseased prawns, and WSSV positive wild prawns were sampled from Logan River on the same day; and
- State Government authorities attempted eradication.

Future Proofing Prawns

- Diggles (2022b) argued that biosecurity is foremost about prevention, and control. While risk analysis is an important pre-border risk management tool for applying a country's appropriate level of protection (ALOP).

In addition to the work of Diggles (2022b), the Australian Council of Prawn Fisheries (ACPF, 2020, p.5) provided a response to the DAFF 'Review of the biosecurity risks of prawns imported from all countries for human consumption' Draft Report' noting a range of recommendations regarding ongoing risk:

Altered risks in disease introduction pathways *a. That the review report clearly outlines the process for assessing new and emerging risks outside of a formal and properly resourced import risk assessment (IRA) review process.* *b. That the review report explicitly acknowledge that the bait pathway risk cannot be properly assessed – neither should import protocols be varied from the current interim provisions or to those proposed – until this risk is properly understood with the completion and release of the results of the recreational fishing survey.*
Implementation of the bio-security framework to reduce risk *c. That resourcing required to assess imports on entry to meet the ALOP should largely be cost-recovered as was advised by Inspector-General of Biosecurity (IGB), 2017.* *d. That additional or alternative means of inactivating pathogens in uncooked prawns be considered (as occurs for imported pork products) if Australia wishes to continue retailing uncooked imported prawns for human consumption, noting that the review report acknowledges that head, shell and vein removal is not sufficient to remove all pathogens eg WSSV.* *e. That the review report clearly outlines the testing regime for each of the prawn categories, the justification for it and trigger mechanisms for increased surveillance for each of those categories.* *f. That the review report details the post-border measures that are proposed as per the IGB, 2017 recommendations.*
Importation protocols

g. That additional pre-border processing requirements be added for uncooked prawns from countries with known disease to ensure that ALOP is met in light of previous demonstrated failure in pre-border, entry and post-border measures.
h. That testing regimes be made clear in the proposed protocols including the regime for products categorised as low risk.
i. That altering legibility of labelling be rejected as a satisfactory post-border risk mitigation for managing risks posed by uncooked prawns processed as per the proposed protocols.
j. That the review propose more effective post-border measures than product labelling and education campaigns.

Questions and Sector Views

In 2020, CEBRA evaluated the health of the Australian biosecurity system as the final phase of a three-year project commissioned by DAFF. Schneider and Arndt (2020) note that the biosecurity system consists of a set of interconnected activities, see Figure 1.

Figure 1. Elements of the Australian Biosecurity System (Schneider and Arndt, 2020).

Seafood Industry Australia (SIA), the national seafood industry peak body outline that biosecurity within the fishing and aquaculture space is complex. Disease and pest incursions within shared waterways are extremely difficult to control, isolate and eradicate (SIA, 2022). The economic, environmental and social consequences as a result of disease and pest incursions will have far reaching implications (SIA, 2022). Moreover, with the notable exception of Salmonid aquaculture, most species harvested in Australia are native species. The cost of disease and pest incursions will: (1) lead to economic loss, (2) the loss of recreational amenity, (3) impacts to Indigenous cultural values, (4) food security, and (5) impact on natural ecosystems.

The questions posed by DAFF must be understood in a multi-stakeholder fishing and aquaculture context that includes Aquaculture and Commercial, Recreational, Charter and Indigenous fisheries with complimentary and competing socio-economic and socio-cultural values (Colquhoun, 2015; Delisle et al., 2018; Voyer et al., 2016). A range of stakeholders' views provide some guidance for considerations of a sustainable funding model. The following responses represent feedback from representatives of the Australian seafood industry.

1) What elements do you think a sustainable biosecurity funding model should include? Are there elements that should not be included; if so, why?

A key element in the management of biosecurity and a relevant funding model is the difficulty in understanding and controlling for biosecurity threats when they escape containment and may have far reaching impacts on the environment, not just for commercially, recreationally, or culturally important species. An effective funding model needs to have capacity to account for these instances.

The wild harvest fishery feedback argues for a model that: (1) is fully funded by government, or (2) is funded by risk creators with public good funding being shared across State and Federal government. Wild harvest fisheries have no control of the aquatic environments in which they operate and as the White Spot Disease (WSD) demonstrated, industry must play a role in responding to a disease incursion which does not necessarily mean financial contributions to fund the system. Industry has a role to play in employing good biosecurity practice.

The Aquaculture sector and wild harvest fisheries pay licence fees to either Commonwealth or State Governments for the right to harvest or operate in a publicly owned resource, these fees are used for the management, research, compliance, and biosecurity. There are strong concerns to additional levies or cost recovery models. These sectors suggest that risk creators must contribute to the response cost to eradicate or contain a disease or pest incursion that is shown to originate through an import pathway. A possible mechanism is a biosecurity levy on imports that may be an appropriate mechanism to fund some elements of response.

The recreational fishing view of a model is one that is fully funded by government.

The risk creator has more financial responsibility in the system than is currently the case. The community should not be fully funding the cost of responses and those that created the risk need to be accountable for the damage they do or potentially, the damage they might do to Sea Country. We have spoken about the obvious risks from imported seafood products but another important pathway (and one which has been shown to have been a vector for introductions) is the act of shipping.

2) How would your proposed model operate at a practical level and who would it apply to?

From a fishing and aquaculture perspective, mechanisms should be in place to communicate quickly and effectively with industry despite AQUAVETPLAN already in place. From an aquatic biosecurity perspective, identifying who are risk creators is critical with risk assessments needing to be undertaken to keep stakeholders as informed as possible while also reviewing risks as they change.

Multiple models could be adopted including:

- A polluter pays model states the party responsible for producing pollution (a biosecurity issue), where the responsible party pays for the damage done to the environment; and
- Levies on risk creators such as international shipping (a high biosecurity risk to the marine environment).

The commercial fishing and aquaculture sectors increasingly conduct surveillance of disease, meeting its 'public good' obligations.

A levy on risk creators should be considered to build funds to address disease incursions. The levy should be reasonable and we have existing cost recovery models for this – toll roads. Levies should be based on risk (again identifying risk creators) and do not have to be prohibitively expensive. Risk creators that can demonstrate better practice could reduce levies.

3) How would your proposed model impact you and others? What would be the benefits or disadvantages to you and/or other stakeholders?

The fishing and aquaculture sectors need education and information resources and guidelines to: (1) help build an understanding of their biosecurity obligations and (2) in the event of a disease incursion, education and information materials are developed with industry input to tailor the response, this could

also be applied to recreational fishers. Compliance from risk creators needs to be assessed as currently, there is no incentive for them to contribute to funding the biosecurity system.

Given the experienced gained across commercial fisheries, implementing appropriate sanitary measures for high risk imported goods focussing on prevention before and at the border is critical. Education needs to be targeted at English and non-English speakers who may have a preference for imported seafood as bait.

Indigenous people have been caring for country for countless generations. Benefits can mean financial return or access to markets for non-Indigenous people, but caring for country is the primary concern for Indigenous people. The health of the natural environment is critical and the cost of managing disease or pest incursions erode the connection between Indigenous people and Country. Ensuring adequate investment in the Indigenous Sea Country Ranger program, that also includes biosecurity outcomes, can ensure Indigenous expertise is utilised.

4) Is the proportionality between those who contribute to the funding system and those who benefit the most, right?

Further regulatory costs would create more financial pressure to medium and small-scale fishing and aquaculture entities. The concept of the 'public good' must be included in the discussion of how biosecurity is funded. The basic principle that risk creators must proportionally pay for biosecurity measures should apply and seems to be supported by all fishing and aquaculture sectors.

Indigenous peoples' focus is broader than the financial impacts, but also includes the risk to native species and aquatic environments. Those with the most significant risk profile need to be identified, monitored, and levied based on their risk profile.

5) Are there other technologies, current or emerging, that could be employed to increase the efficiency of the biosecurity system, and perhaps reduce operational cost?

From a fishing and aquaculture perspective, the issue is less about technology and more about education, a better understanding of the biosecurity system and how biosecurity obligations are realised. Testing is expensive and rapid testing technology would help in surveillance of threats to industry or the community from disease and pest species. Technologies like environmental DNA (eDNA) are an opportunity is a relatively new method of capturing the presence of organisms that might otherwise be missed.

Industry understands that advances have been made in biosecurity testing at border control points. However, concerns remaining regarding: (1) proven technologies in aquatic systems, (2) testing of containers and (3) incursions based on the release of ornamental fish (a behavioural issue).

Improved traceability technology (e.g. Vibrio detection in Oysters) is needed. Relatively new methods of capturing the presence of organisms that might otherwise be missed.

Testing methods that determine country of origin through genomic sequencing would identify not only on farmed versus wild, but also risk factors identified in relation to area (country) of origin and likelihood of diseases existing in the place of origin (Bernatchez et al., 2017).

A greater focus on education materials and engaging recreational fishers. An issue for the sector is having materials in other languages in recognition of the non-English speaking segment of the recreational fishers. Expenditure on research that helps to identity risks at the border with a focus on real-time identification of risks.

6) How could the Commonwealth Government improve efficiency in the biosecurity system (consistent with meeting our Appropriate Level of Protection)?

Fishing and aquaculture sectors that experienced the impacts of WSSV did not believe there is an appropriate level of protection (ALOP) . Better pre-border and border controls including increased monitoring and fines are required. Moreover, funding for appropriate systems and protocols needs to be built into the biosecurity infrastructure.

Ongoing investment in research to help protect the environment at the border. Risk management and the implications of acceptable risk are contingent on effective mitigation. Part of the issue around managing biosecurity risks is a lack of understanding of various emerging diseases or pests as there are limited ways to conduct research on these in Australia. It would help if in the biosecurity system there was more formal collaborations with overseas research agencies and countries to enable research on emerging pests and diseases to inform biosecurity management.

There is no testing method to determine country of origin or differentiate between farmed and wild-caught seafood commodities. Australia is still importing non-salmonid finfish commodities that have not met Biosecurity Import Conditions (BICON). The 23-year-old Import Risk Assessment undermines Australia's ALOP and fails to acknowledge the socio-economic/socio-cultural consequences of the incursion of newly emergent exotic diseases, which are materially different (ABFA, 2022).

7) What other investments or actions could the Commonwealth Government make or take to sustainably support the delivery of biosecurity activities?

Continued government investment in education – with materials developed in conjunction with wild harvest fishers through the industry / sector representative bodies. Continued improvements in surveillance technologies of both seafood and ornamental imports.

Once a disease or pest has moved into aquatic environments the issue of sharing the cost of a biosecurity response is complicated and was highlighted in the WSSV incursion in Moreton Bay (APFA, 2017; Diggles, 2022a; QSIA, 2017). A lack of surveillance pre-border and at the border may have failed through a lack of surveillance (Diggles, 2022b).

Understand the changing needs of a multi-cultural country. The goods (foods) and exotic pets that may be brought into the country may also create risks. It was noted that the risk generated from imports of salmon and trout is underestimated. The risk of invasive species from international equipment used in the oil and gas sectors may create additional disease and pest risks.

As mentioned under the previous question investment in research and development to better understand new and emerging biosecurity risks from overseas is required to inform responses when a pest or disease incursion occurs.

Concluding Comments

Sectoral feedback suggests that governments remain the core funder of the Australian biosecurity system. The Biosecurity Collective support this view recommending a doubling of funding for the national biosecurity system from government and non-government sources (Biosecurity Collective, 2022). Once a disease or pest has moved into aquatic environments the issue of sharing the cost of a biosecurity response is complicated and was highlighted in the WSSV incursion in Moreton Bay (APFA, 2017; Diggles, 2022a; QSIA, 2017).

The Australian Barramundi Farmers' Association (ABFA) submission regarding foot-and-mouth disease provides guidance on the deficiencies of the existing biosecurity system (ABFA, 2022). Landos et al (2021) assessed the biosecurity risk of imported uncooked, whole, and head-on eviscerated, barramundi and non-salmonid finfish in relation to exotic viruses. The project highlighted multiple areas of biosecurity risk mitigation inadequacy and non-compliance to BICON of imported non-salmonid commodities. Infectious spleen kidney necrosis virus (ISKNV) like and Singapore grouper iridovirus (SGIV) viral DNA were detected in uncooked whole and head-on eviscerated non-salmonid finfish commodities imported into Australia, at a prevalence greater than 5%. It should be noted that 100% of head-on eviscerated barramundi commodities sampled (n=57) were non-compliant to BICON import conditions.

The FRDC supports increasing pre-border and at border protection from current and emerging aquatic biosecurity threats. This will greatly reduce risks to the growing Australian seafood industry. A sustainably funded biosecurity system should assure the community that pre-border and border controls prevent the introduction of diseases and pests once seafood products clear quarantine, and are sold across the retail

counter, all control of the end use is lost (Senate Rural and Regional Affairs and Transport Committee, 2017).

The responsibility of individuals and businesses are made clear under State biosecurity legislation. For example, the Biosecurity Act 2014 (Qld) identifies a 'general biosecurity obligation' while the Biosecurity Act 2015 (NSW) identifies a 'general biosecurity duty'. Neither define risk creators that contribute to the spread of an aquatic disease or pest incursion.

The Aquaculture sector has some control and responsibility for the costs of developing and maintaining biosecurity on farm through ongoing planning. The risks for farms can to a degree be managed and differs from other sectors who access aquatic environments. Movement of wild harvest and recreational vessels may transport aquatics diseases and pests.

Combined, there are thousands of Aquaculture and Commercial, Charter and Indigenous fishers and millions of Recreational fishers interacting with fresh and saltwater aquatics environments. With general biosecurity obligation/duty, Australian seafood industry participants require tailored educational materials to better understand: (1) sectoral obligations, and (2) how can sectors contribute to a functional biosecurity system? The Australian Academy of Technological Sciences and Engineering (ATSE) submission relating to foot-and-mouth disease recommended education in the form of research to prepare for future outbreaks and to better prepare Australia's biosecurity workforce (ATSE, 2022).

Technologies like eDNA can provide another tool to help the Federal government detect potential disease and pest incursions. Increased investment to improve traceability may help address disease impacts. Development of a testing method to determine country of origin to differentiate between farmed and wild-caught finfish commodities.

The ALOP provided to the Australian seafood industry by Australia's biosecurity system is largely determined from import risk assessments but has not met industry expectations (APFA, 2017; QSIA, 2017). These assessments need to reflect current and emerging trade and travel realities.

With respect to WSD, improved testing protocols at the border remains a concern. Education material need to be targeted at consumers at point of sale in addition to any educational campaigns that engage recreational fishers. In terms of better use of biosecurity funding, a greater focus on cost reduction and simplifying compliance.

This cumulative burden of new and existing incursions of invasive species is likely to continue to escalate in future years. A recent study predicted that the number of established non-native species in Australia is likely to increase by 36% between 2005 and 2050 (Seebens et al., 2021).

Based on sector feedback and previous FRDC work regarding biosecurity the following research and development opportunities were identified.

Table 3. Research and Development Opportunities

Details	Opportunity (Research, Education, Other)
Help develop a definition of 'risk creator'.	Other
Continue to assist the Federal Government on pre-border and border controls.	Other
Help develop education materials with government and industry sector stakeholders.	Education
Development of technologies to detect aquatic diseases and pests.	Research
Continued improvement of risk assessments.	Research

Build on learnings from WSSV as it impacted the Aquaculture, Commercial and Recreational fishing sectors.	Education

Recommendations

Aquatic biosecurity breaches are not only impacting farm production, but also jeopardising commercial wild harvest, recreational fishing, Indigenous people's access to the resource for their cultural needs, the food service sector, and consumers' ability to source Australian seafood, along with devastating effects on the marine environment, ecology, and biodiversity.

1. *Biosecurity Funding – the model is funded to meet its public good obligations and apply levies from risk creators.*
2. *Pre-Border and Border – increase pre-border and at border protection from current and emerging aquatic biosecurity threats. A sustainably funded biosecurity system should assure the community that pre-border and border controls prevent the introduction of diseases and pests:*
    - *2.1. Post-border surveillance is insufficiently funded and appears ineffective to protect against disease and pest incursions – review of post-border controls, users and beneficiaries is critical.*
3. *The biosecurity architecture in Australia is a risk-based system that clearly identifies risk through risk assessments and generates data that helps facilitate science-based ALOP that recognise the unique value of the Australian seafood industry:*
    - *3.1. Risk Creators – whether an individual or business entity, State and Federal legislation need to define risk creators.*
4. *Education – with a general biosecurity obligation, the Australian seafood industry requires tailored educational materials to better understand: (a) their obligations and (b) the most efficient ways to contribute to a functional biosecurity system:*
    - *4.1. A consistent national approach to elimination of the use of imported seafood for human consumption as bait.*
5. *Strategic reviews of international trends and science to proactively identify and prepare for potential disease and pest incursions:*
    - *5.1. A full and thorough review of the out-of-date Import IRA be completed, the barramundi IRA is more than 20 years old, and circumstances have significantly changed in that time.*
6. *Technology and research:*
    - *6.1. Increased investment to improve traceability can help disease and pest impact; and.*
    - *6.2. Development of a testing method to determine country of origin to differentiate between farmed and wild-caught finfish commodities.*
7. *Protection of the aquatic environment – the ALOP provided to the Australian seafood industry by Australia's biosecurity system is largely determined from import risk assessments. These assessments need to reflect current and emerging trade and travel realities.*

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