



Draft Report Submission cover sheet—Intergovernmental Agreement on Biosecurity Review

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24 February 2017

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Fisheries Research and Development Corporation Submission to the Intergovernmental Agreement on Biosecurity Review

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Intergovernmental Agreement on Biosecurity Review Draft Report

Executive summary

FRDC welcomes the opportunity to comment on this biosecurity review and to outline how FRDC and its partners have been investing in this space for many years.

As this submission will show the Government, through FRDC, industry and its research partners has invested considerable funds over the years on RD&E in the aquatic biosecurity area, much of this investment has been aimed at protecting the aquaculture sector. What this body of RD&E has demonstrated is that the aquatic environment is an extremely difficult environment to manage with respect to biosecurity. As once undesirable organisms get a hold they are almost impossible to eradicate or contain, making the key biosecurity roles in the aquatic space one of either Prevention or Asset Based Protection.

FRDC acknowledges that there is an argument that the investment is skewed too much towards the Asset Based Protection rather than the Prevention end of the spectrum. It has been claimed that doing more of the same, i.e. continuing to constantly invest heavily at the Asset Based Protection end of the spectrum and expecting a different result each time is an unwise way of going forward.

This submission demonstrate that FRDC believes that within the aquatics area, it has process in place effective research, development and extension (RD&E) as well planning, consultative, investment, evaluation processes, that could work well; and may be an approach worth looking at for other sectors. This is through the Aquatic Animal Health and Biosecurity Subprogram (AAHBS) which involves all relevant stakeholders and feeds into the Australian Government Sub-Committee on Aquatic Animal Health (SCAAH). However, currently there is no direct relationship between FRDC and the “national biosecurity system (NBC)” as described in the review, except for the new Carp Control Program. There is an implied relationship between the Animal Biosecurity RD&E Strategy and the membership of DAWR on the steering body for that strategy and DAWR’s membership on the “national biosecurity system”.

FRDC can see the logic, outlined in the review, of RIRDC playing a role in managing the relevant cross-sectoral RD&E investment in biosecurity and supports this option that has been put forward.

FRDC does not support a new national biosecurity RD&E plan. This will duplicate the existing Animal Biosecurity RD&E Strategy and the Plant Biosecurity RD&E Strategy. Given that these strategies have been agreed by all participants to the RD&E Statement of Intent (Commonwealth, state and territory governments, Universities and RDCs) it would make sense not to have a duplicative set of priorities that do not link to funding source or implementation process.

1 – Introduction

In December 2016 the Review Panel released the Intergovernmental Agreement on Biosecurity Review Draft Report for comment.

Intergovernmental Agreement on Biosecurity Review

Terms of reference - Scope of the review

The IGAB review will consider and provide recommendations on the following terms of reference:

- 1. The implementation and effectiveness of each section of the current agreement, progress against the priority reform areas outlined in schedules 2–8 and any requirements for revision of the schedules.*
- 2. The suitability of the agreement to underpin the national biosecurity system into the future.*
- 3. Current and likely future biosecurity risks and priorities, including the optimal allocation of resources and availability of required capability and capacity to address those risks and priorities, with particular consideration of risks that may impact Australia's market access arrangements for agricultural products, and the use of innovation in the system.*
- 4. The development of a national statement of intent for the biosecurity system, encompassing the entire biosecurity continuum, including economic and market access, environmental and social considerations for governments, industry and the community.*
- 5. Defining roles and responsibilities of all parties in the national biosecurity system. This should include advice on how the concept of a shared biosecurity responsibility can be better understood and implemented across government, industry, environmental and community groups and individuals.*
- 6. The review of existing cost-sharing arrangements and the potential for implementation of new funding arrangements for all biosecurity activities. Consideration should be given to relevant National Biosecurity Committee projects including:
 - a. the National Framework for Cost Sharing Biosecurity Activities*
 - b. the national portfolio investment optimisation model, and*
 - c. the national stocktake of biosecurity investment.**
- 7. The development of measurable indicators to assess whether the national system is achieving its objectives, and to identify where adjustments are needed. Consideration should be given to the availability of appropriate and consistent data.*

As previously stated, FRDC welcomes the opportunity to comment on this biosecurity review and to outline how FRDC and its partners have been investing in this space for many years. In this introductory section FRDC will outline the biosecurity landscape as it relates to the aquatic environment.

The biosecurity issues in the Australian aquatic environment

It has long been understood that introduced aquatic species have the potential to dominate marine and freshwater communities, significantly impacting on recreational and commercial activities.

It is estimated that around 250 introduced marine species have been discovered in Australian waters and there is every reason to believe that more will be discovered in coming years. These pests include plants and animals, and range from microscopic algae through to large species of seaweed, jellyfish, shellfish, crabs and starfish. Exotic marine species invade Australian waters in a number of ways, but the majority of introductions appear to be related to ballast water – used to give un-laden commercial ships stability and pumped out when they are loaded – and hull fouling.

See: <http://www.marinepests.gov.au/Pages/default.aspx>

It is known that some of these exotic species that establish in Australian waters can bring with them their own array of infectious agents, including viruses, bacteria, parasites and fungi. That is why back in 2005, the Australian Government and most states and territories signed an intergovernmental agreement to develop a national system for preventing and managing marine pest incursions. Given the growth in marine shipping in recent years, which is predicted to grow even more rapidly over the next 2 decades, the biosecurity risk from ballast water is expected to be on the increase not decrease.

Next to ballast water there is also Australia's ornamental aquarium trade. More than 2000 exotic species of marine and freshwater finfish, crustaceans, molluscs and plants are traded in this industry. It is quoted that about 200 licensed fish breeders, catchers and importers supply a network of wholesalers that service almost 900 pet shops and specialist aquarium outlets. Previous studies have suggested that about 34 exotic freshwater species have established populations in Australia and very little is known of the most effective management and control options for these species or their long-term impact on aquatic ecosystems and habitats. Ornamental fish also have the potential to harbour a range of infectious organisms, again, some of which have a broad host range (http://frdc.com.au/knowledge/publications/fish/Pages/21-4_articles/26-darker-side-of-exotic-ornamental-fish.aspx).

Now there are even suggestions (as yet unproven) that imported human food, namely Prawns, could be a vector for aquatic disease transmission across borders.

Known pests that have hitched a ride into Australia include Carp, Tilapia, the Striped Mussel, toxic algae's such as those that cause biotoxin producing bloom events and exotic crabs such as the European Shore Crab. Diseases that have impacted the commercial aquatic sector over the last decade include the Pacific Oyster Mortality Syndrome (POMS) and the Abalone Viral Ganglioneuritis (AVG). The farmed prawn sector has had to deal with exotic acute hepatopancreatic necrosis disease (AHPND) and more recently White Spot Syndrome Virus (WSSV), which is currently impacting Queensland's Gold Coast region. There have also been issues where it has been difficult to determine the causal factor, such as unexplained mortalities in both wild Groupers and in farmed Pearl Oysters.

The Aquatic Animal Health & Biosecurity Subprogram

Under the FRDC's RD&E Plan, there are three subprograms. One of these is the Aquatic Animal Health & Biosecurity Subprogram (AAHBS) that manages projects in this biosecurity space.

The AAHBS was established in 2001 to provide a cohesive and national approach to aquatic animal health research and development in Australia. The development of the subprogram was an initiative of AQUAPLAN (Australia's National Strategic Plan for Aquatic Animal Health). Through an agreement between Department of Agriculture and the FRDC it was assured that the subprogram continued through to 2016. The subprogram expanded its scope to specifically include biosecurity in 2016 and has secured funding through to 2020.

Scope and objectives

The Subprogram is responsible for coordinating FRDC funded RD&E aimed at addressing priorities within the field of aquatic animal health and biosecurity. The Subprogram adopts a special responsibility for national aquatic animal health and biosecurity related research, and research to address issues of new and emerging aquaculture species. R&D that is aimed primarily at specific industry or regional needs, would require an appropriate level of co-funding from industry or other source to be supported with subprogram funds.

Subprogram management

The AAHBS is managed by an expertise - based steering and scientific committee, appointed by the FRDC, which includes industry, government and research provider members. In addition to its leadership and strategic roles, the committee advises the FRDC on allocation of subprogram funds to projects consistent with stakeholder priorities and relevant R&D plans; actively oversees progress of projects under its direct management; and provides technical advice to the FRDC on issues, applications and projects beyond those under its management.

This cross sectoral AAHBS committee feeds up into the Sub-Committee on Aquatic Animal Health (SCAAH), which sits under the Animal Health Committee (AHC). Many committee members sit on both the AAHBS and SCAAH groups. The AAHBS also has links to Animal Health Australia and the related Animal Biosecurity RD&E Strategy.

Strong Communication and Engagement

FRDC believes that it is through the AAHBS and the strength of the inter-committee relationship with SCAAH that ensures that relevant issues are appropriately addressed with the necessary prioritisation in this Aquatic Animal Health and Biosecurity space. It is FRDC's view that whilst other sectors might be having issues with communication and engagement, as outlined in section 2.4 of the review report, the presence of these two aquatic forums has successfully addressed this issue in this sector.

Review Feedback

Through the various sections of this submission FRDC has provided its feedback on the specific requests and recommendations from the review committee, outlined the expenditure that FRDC and its partners have made in biosecurity related projects over the last 5 – 7 years and highlighted some key industry and environmental sectors that are the focus of biosecurity research led by FRDC. In section 6 a list of all biosecurity related projects from 2010 – to date can be found and in section 7 an example of how research that has been funded through FRDC is communicated to stakeholders is demonstrated.

2 – Responses to the specific Feedback Requests and Recommendations

a) Knowing and owning our roles and responsibilities

Feedback request 1 The Review Panel seeks feedback on the draft roles and responsibilities of national biosecurity system participants.

FRDC: Currently there is no relationship between FRDC and the “national biosecurity system” as described in the review, except for the new National Carp Control Program. There is an implied relationship between the Animal Biosecurity RD&E Strategy and the membership of DAWR on the steering body for that strategy and DAWR’s membership on the “national biosecurity system”. It is assumed that DAWR’s role is to inform the Animal Biosecurity RD&E Strategy of priority areas for RD&E investment that are determined by the national biosecurity system.

Recommendation 1 The NBC and the proposed Industry and Community Advisory Committee, through an open, transparent and collaborative process, should lead the development of a draft National Statement of Intent for public consultation that outlines:

- a vision, goal and objectives for the national biosecurity system
- principles for managing biosecurity
- the meaning and application of ‘shared responsibility’
- the roles, responsibilities and commitments of participants, including accountability measures
- governance arrangements for the national biosecurity system.

The process should involve government (including local government), industry and the community.

FRDC: it would be good to include either the RDCs through the Council of Rural RDCs or through the AgSOC Research and Innovation Committee as part of this consultation. For the fishing and aquaculture sectors it will be important to pick bodies that include commercial wild catch, aquaculture, recreational fishing and Indigenous.

b) Market Access is key

Feedback request 2 The Review Panel seeks feedback on the total effort and costs associated with demonstrating area freedom by jurisdictions, and the value of that trade.

FRDC: The majority of aquatic biosecurity outbreaks so far in Australia have not involved eradication. There have been exceptions to this, but they were for pests and not diseases. The current White Spot Disease outbreak is the one of the few that has involved a possible plan to reinstate Australia's disease free status.

Recommendation 2 The Primary Industries Technical Market Access and Trade Development Task Group, should seek to enhance engagement with industry to ensure that Australia's market access strategies are aligned appropriately through an agreed priority setting process, and that the degree of transparency and communication is carefully weighed against its level of risk to trade activities.

FRDC: To date biosecurity has not been a significant factor in access to overseas markets for seafood. It may be in the future. Recreational fishers travelling overseas are required to ensure their equipment is disease and pest free prior to departure. However, biosecurity issues have stopped the trade in oyster spat to overseas markets.

Recommendation 3 IGAB2 should strengthen consideration of market access requirements within the next NBC work program.

Recommendation 4 Jurisdictions' biosecurity surveillance activities should include pests and diseases that pose the greatest threat to our export markets.

Recommendation 5 States and territories should utilise (or adapt) the dispute resolution process agreed by ministers in 2012 and include the key elements of that in IGAB2.

Recommendation 6 IGAB2 should clarify the roles and responsibilities of the parties with regard to international and domestic market access, including proof of area freedom.

c) Stronger environmental biosecurity

Recommendation 7 IGAB2 should include an explicit commitment by jurisdictions to support financially, decisions agreed to under NEBRA, but look to put in place systems that ensure decisions are evidence-based and transparent, in keeping with best risk management principles, and that give confidence to governments and the community that funds are being committed wisely and appropriately.

Recommendation 8 Jurisdictions should institute formal arrangements between agriculture and environment agencies to define the objectives of cooperation, leading and support roles, information flows, resources and deliverables. The Australian Government agriculture and environment departments should enter into a Memorandum of Understanding, modelled on those with health and immigration agencies.

Recommendation 9 The IGAB should make clearer commitments to environmental biosecurity and include:

- the principle of ecologically sustainable development
- acknowledgement of Australia's international responsibilities under the Convention on Biological Diversity
- a program of work to determine, plan and prepare for national priority pests and diseases impacting the environment and native species
- a focus on environment and community as well as industry partnerships
- invertebrate transmitted diseases as well as animal diseases.

FRDC: To date FRDC has not been engaged except on adhoc basis by environmental agencies on RD&E investment for pests and diseases that affect biodiversity and ecosystem health. The new National Carp Control Plan will establish formal linkages with these structures.

Recommendation 10 The Australian Government should establish the senior, expert position of Chief Environmental Biosecurity Officer within the environment department. A less preferred option is to house the position in the agriculture department. The position should report on the effectiveness of Australia's environmental biosecurity arrangements and achievements. Reports should be made publicly available.

FRDC: The preference would be to have that position in the DAWR, all in one area of biosecurity management as DAWR is also responsible for NRM. It would make it easier to ensure collaborative priority setting for RD&E investment.

Recommendation 11 The NBC should establish and resource a new Environmental Biosecurity Committee (EBC), comprising government and external environment biosecurity experts and representatives from both the animal and plant sectoral committees of the NBC, to support the role of the Chief Environmental Biosecurity Officer. The role of the EBC should be reviewed following its work to prioritise national biosecurity risks impacting the environment.

Recommendation 12 Greater and explicit roles should be developed for AHA and PHA in environmental biosecurity, instituted through amended constitutions and expanded board expertise.

FRDC: FRDC supports a more inclusive role for AHA to ensure that the Animal Biosecurity RD&E Strategy is informed of changing biosecurity needs that require changes to RD&E investment.

Recommendation 13 Jurisdictions should adopt a systematic approach to determine and plan for national priority animal, plant and environmental pests and diseases.

Recommendation 14 The NBC should lead five-yearly national-level risk prioritisation for emerging animal, plant and environmental risks and pathways, in partnership with system participants, reporting to AGSOC and AGMIN.

d) Research and Innovation

Recommendation 15 The sectoral committees of the NBC, with the endorsement of the NBC, should develop an agreed set of National Biosecurity R&I Priorities, in consultation with system participants and in line with the agreed national priority pests and diseases. Priorities at a sectoral and cross-sectoral level need to be considered. The priorities should be developed within two years of the final IGAB review report, and should be reviewed every five years.

FRDC: This will duplicate the existing Animal Biosecurity RD&E Strategy and the Plant Biosecurity RD&E Strategy. Given that these strategies have been agreed by all participants to the RD&E Statement of Intent (Commonwealth, state and territory governments, Universities and RDCs) it would make sense not to have a duplicative set of priorities that do not link to funding source or implementation process.

Feedback request 3 The Review Panel seeks feedback on the following options for a new entity for cross-sectoral biosecurity R&I:

Option 1: Establishing a new stand-alone entity for cross-sectoral biosecurity R&I.

FRDC: does not support this option

Option 2: Addressing cross-sectoral biosecurity R&I within an existing RDC (for example, the Rural Industries RDC).

FRDC: FRDC supports the roles of AHA and PHA in managing the two RD&E Strategies. There is also a role for RIRDC to ensure all RDCs work together on cross-sector funding.

The Panel also seeks feedback on the funding options and would welcome alternative suggestions.

FRDC: Currently FRDC is funding a large quantum of biosecurity related RD&E. Unfortunately the majority of this investment is in responding to failures in the biosecurity at Australia's international border. Balancing this investment so more funds were invested in prevention and surveillance RD&E would be a priority. However, there is no clear adoption and impact pathway for RD&E invested in fishing and aquaculture biosecurity prevention. Having a clear understanding of the priorities and who would be responsible for implementing the RD&E outputs would address this. A commitment to adopt recommendations arising from aquatic biosecurity RD&E by government quarantine agencies would improve the RD&E investment in this area.

e) Strengthening governance

Recommendation 16 A future IGAB should remain an agreement between the First Ministers of the Australian, state and territory governments.

Recommendation 17 First Ministers should, within IGAB2, identify lead ministers and agencies for biosecurity (assumed to be agriculture or primary industries) and require supporting whole-of-government arrangements to be in place, including through memoranda of understanding.

Recommendation 18 First Ministers should formally establish the NBC and articulate its Terms of Reference in the IGAB.

Recommendation 19 The NBC should include the CEO of the Australian Local Government Association, and the New Zealand Government be invited to include a representative.

FRDC: FRDC would support NZ involvement and ask that somehow a linkage is created to the RDCs on the NBC

Feedback request 4 The Review Panel seeks feedback on the proposed Terms of Reference for the NBC.

Recommendation 20 The NBC should adopt a sub-committee structure that aligns with the revised national biosecurity system objectives and national reform priorities in the IGAB. All NBC working groups and expert groups should be task-specific and, wherever possible, time-limited.

FRDC: The existing system has the appropriate structure for fishing and aquaculture. The Aquatic SCAAH committee has effective two way consultation and communication linkages with FRDC's Aquatic Animal Health and Biosecurity Subprogram (AAHBS) that is led by CSIRO out of AAHL and has both technical, government and industry membership. CSIRO has provided excellent leadership and support for the partnership involving the AAHBS – it is critical that CSIRO's capability and capacity is supported.

Recommendation 21 The NBC should take steps to increase its public profile and openness, including establishing a stand-alone website. The website could be maintained by, but be separate from, the Australian Government Department of Agriculture and Water Resources, and could accommodate and centralise all information on the NBC, its committees, and their activities. Key policy frameworks, agreements and reports of the NBC should be made publicly available on the site.

Recommendation 22 AGSOC should establish and provide oversight to an independent IGAB Evaluation Program to assess and report on implementation of each jurisdictions' commitments under the IGAB. The evaluations, or a summary of them, should be made publicly available following ministerial consideration.

Recommendation 23 The NBC should clarify core commitments of jurisdictions for use in the independent IGAB Evaluation Program to be documented in a future IGAB.

Recommendation 24 The NBC should report annually to AGMIN on its progress of priority reform areas. The NBC's work program and annual report should be made publicly available upon ministerial consideration.

Recommendation 25 AGSOC should establish, as a priority, an Industry and Community Advisory Committee to provide advice to the NBC on key policies and reforms.

Recommendation 26 The NBC should convene a dedicated annual national Biosecurity Roundtable for AHA and PHA members to provide direct input to the NBC.

f) Funding our national system

Recommendation 27 The NBC and the Industry and Community Advisory Committee, in consultation with other key stakeholders, should revise the National Framework for Cost Sharing Biosecurity Activities to enable its practical application.

Recommendation 28 The NBC, with key industry and non-government partners, should agree uniform and fully inclusive categories of funding activity for the national biosecurity system.

Recommendation 29 The IGAB should include an ongoing commitment to the funding stocktake, with governments publicly reporting their expenditure and the high-level stocktake results under uniform and fully inclusive categories.

FRDC: FRDC Supports this recommendation. FRDC, through its Annual Report, outlines it's expenditure in many different categories. It is clear how much funding is going into the Animal Health and Biosecurity Subprogram (Ref: FRDC Annual Report 2016 pg 169). http://www.frdc.com.au/about/frdc/Documents/Annual_Report/

Recommendation 30 All governments should review their current biosecurity expenditure, with a view to redirecting funding into areas that return the highest yields to farmers, industry and the community. This approach will require a planned and coordinated strategy of engagement and communication.

FRDC: Currently FRDC is funding a large quantum of biosecurity related RD&E. Unfortunately the majority of this investment is in responding to failures in the biosecurity at Australia's international border and hence falls into the area described in the report as Asset Based Protection. Balancing this investment so more funds were invested in Prevention and surveillance RD&E would be a priority. However, there is no clear adoption and impact pathway for RD&E invested in fishing and aquaculture biosecurity prevention. Having a clear understanding of the priorities and who would be responsible for implementing the RD&E outputs would address this.

Recommendation 31 The Risk Return Resource Allocation model should be extended to include all jurisdictions and their investments, with the Australian Government providing assistance to jurisdictions to build national capacity.

Recommendation 32 AHA and PHA should coordinate an industry stocktake of national biosecurity system investments, making the results publicly available.

Feedback request 5 The Review Panel seeks feedback on the following options to ensure a more rapid-response to an exotic pest or disease incursion:

Option 1: Cost-sharing arrangements should provide for four weeks of monitoring, assessment and preliminary control strategies, while an overall assessment is conducted on the possibility of successful eradication.

Option 2: Cost-sharing arrangements should include a default funding arrangement for when decisions cannot be quickly reached about the success or otherwise of an eradication program.

Recommendation 33 The emergency response deeds for aquatic animals and exotic production weeds should be finalised within 12 months.

Recommendation 34 State and territory governments should review their biosecurity cost-recovery arrangements to ensure they are consistent, appropriate and transparent.

Recommendation 35 All levels of government could help meet their budgetary challenges by reviewing biosecurity levies and rates/charges currently or potentially applying to system participants. These should be commensurate with agreed national cost sharing principles, which the Review Panel considers should be reviewed.

g) Measuring System Performance

Recommendation 36 The NBC should establish a time-limited task group to progress development of a performance framework and performance measures for the national biosecurity system.

Recommendation 37 The Australian Government should facilitate development of an integrated, national biosecurity information system to provide a common platform for all jurisdictions to share and access biosecurity data and information in the national interest.

Recommendation 38 Data and knowledge sharing should be a core commitment of jurisdictions under the IGAB. Minimum standards and specifications should be agreed for data sets.

Recommendation 39 The Australian Government should establish, within the Department of Agriculture and Water Resources, a dedicated National Biosecurity Intelligence Unit, to coordinate and provide advice to the NBC, AGSOC and AGMIN on biosecurity intelligence covering emerging risks and pathways, and international and domestic pest and disease detection.

h) A future system, a future IGAB

Recommendation 40 Jurisdictions should adopt the proposed new priority reform areas and associated work program for IGAB2, and amend the IGAB in line with proposed revisions.

3 – Continuing to support biosecurity Research and Investment

Market Access

To date biosecurity has not been a significant factor in access to overseas markets for seafood. It may be in the future. The Government through FRDC and its Industry and research organisation partners have spent considerable RD&E investment on biosecurity in recent years and plans to continue to do so into the future.

Over the previous 8 years the data shown on the table below outlines that FRDC has contributed \$13 million to biosecurity projects and its industry / research partners have contributed \$22 million dollars. A total investment in biosecurity of over \$35m. With the 2017/2019 contribution predicted to grow beyond that already budgeted for.

Financial years	FRDC Investment	Industry and Researcher Investment	Total biosecurity investment \$
2011/2012	874,119	988,154	1,862,272
2012/2013	960,211	3,081,929	4,042,140
2013/2014	1,905,649	3,425,808	5,331,457
2014/2015	1,327,278	3,719,302	5,046,580
2015/2016	3,072,316	3,659,205	6,731,521
2016/2017	2,948,976	3,483,284	6,432,260
2017/2018	1,255,786	2,605,857	3,861,643
2018/2019	807,019	1,243,996	2,051,015
Total	13,151,353	22,207,535	35,358,887

Table 1. FRDC and Partner investment in biosecurity projects

As the figure below indicates FRDC and its government, industry and research partner’s investment in biosecurity over recent years has been considerable, with an annual expenditure of between \$2m - \$6m per annum.

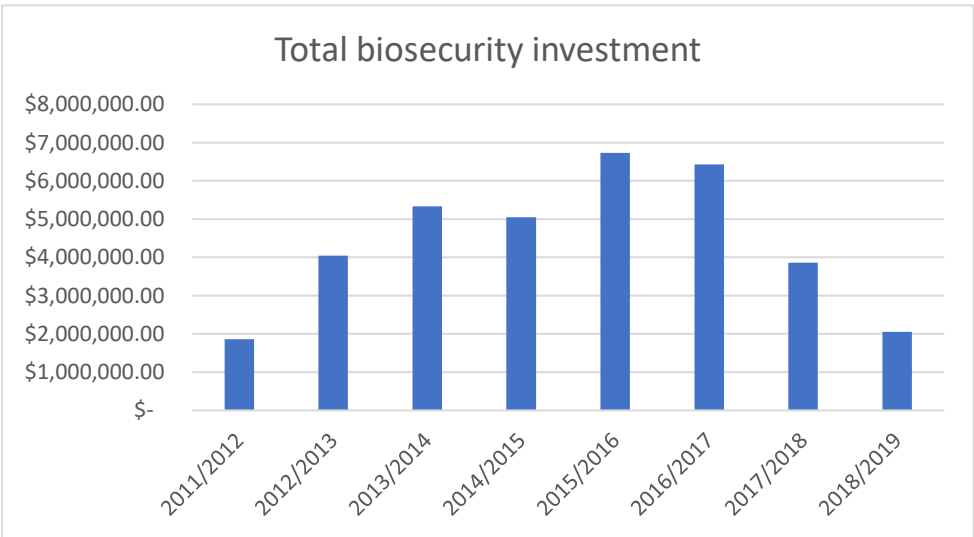


Figure 1. FRDC and Partner investment in Biosecurity R&I in recent years

The annualised spend for projects initiated between 2010/11 and 2016/17 has been \$5.3million per annum on biosecurity related projects.

The key industries that have required RD&E investment have been in the aquaculture sector. Between 2010/11 and 2016/17 the aquaculture sector investment on biosecurity projects has totalled

\$28,084,304. The bulk of these funds have been to address issues in 3 key aquaculture sectors; Pacific Oysters, Prawns and Atlantic Salmon. These three sectors have invested over \$21m into biosecurity projects during this period. This is evident from how frequently they appear in the list of projects conducted since 2010 that are shown in section 5 below.

The Pacific Oyster sector has been addressing issues regarding Pacific Oyster Mortality Syndrome or POMS since 2011 with a number of projects looking to help the industry deal with the effects of this incoming disease. This work has been ongoing from 2011 – to date. Initially in NSW where it first appeared in Australia and more recently in Tasmania when it emerged in their environment.

The Black Tiger Prawn farming sector has had projects looking at generic biosecurity risks over the review period as well as having to deal with specific issues arising from; Infectious myonecrosis, harmful algal blooms, yellow head virus (YHV), exotic acute hepatopancreatic necrosis disease (AHPND) and more recently White Spot Syndrome Virus (WSSV).

The Atlantic Salmon sector has from 2010 – 2014 been investing in projects related to Amoebic Gill Disease (AGD) and Salmon Orthomyxo-like virus (SOMV).

The other sector most affected has been the wild Abalone sector that has been addressing the issue of Abalone Viral Ganglioneuritis (AVG) since 2011. This wild sector has invested \$1.6 million into biosecurity projects since 2010.

For these 3 key aquaculture sectors and for the wild Abalone sector it has been possible to assess the considerable investment in RD&E on biosecurity against product volumes using the ABARE 2010 – 2014 production data available, as outlined on table 2 below.

Species	Annualised biosecurity investment (2010-2014)	Annualised Production Volumes (2010 – 2014) Tonnes	Biosecurity expenditure per tonne
Pacific Oysters	\$1,595,412	13,084	\$121.93
Farmed Prawns	\$337,134	4,157	\$81.08
Wild Abalone	\$234,210	4,936	\$47.44
Atlantic Salmon	\$1,111,798	42,678	\$26.05

Table 2. RD&E Expenditure and production data for key biosecurity risk sectors of the aquatic industry.

As can be seen from the data in the above table these four sectors (and their R&D partners including FRDC) are having to invest considerable amounts into their biosecurity research and development programs.

On the market access front, due to a biosecurity incident, namely the occurrence of POMS in Tasmania, businesses that had overseas customers for their spat oysters have had to cease this trade. But as previously stated market access is not the main driver for biosecurity in the Aquatic sector.

Environmental Biosecurity

In the environmental biosecurity area, other groups have traditionally taken the lead such as OceanWatch, as the National Marine NRM body and State Government agencies. However, the Federal Government has recently announced a very large project looking to control Carp. The FRDC is leading the National Carp Control Plan on behalf of DAWR.

As recently announced;

The FRDC will lead the newly announced \$15 million National Carp Control Plan, which will evaluate the benefit of biological control of carp through the use of a carp virus (Cyprinid herpesvirus). The Minister for Agriculture and Water Resources Barnaby Joyce has appointed Matt Barwick to lead development of the plan, dubbing him 'the Carpinator'.

Matt Barwick also leads the FRDC's Recfishing Research subprogram. In developing the carp control plan, he will work with state and federal government departments and non-government stakeholders, including researchers, industry and environmental organisations, recreational fishers, Indigenous and community groups, tourism operators and landholders. The plan is expected to be complete by the end of 2018.

The National Carp Control Plan is funded by the Department of Agriculture and Water Resources, the Department of Environment and Energy and the Department of Industry, Innovation and Science.

Climate Change related biosecurity RD&E

It has been recognised that there will be changes in marine pest and diseases associated with climate change. It has been demonstrated that elevated water temperatures can act as a stressor impacting the immune responses of all cool water aquatic animals such as Abalone, Atlantic Salmon and Pacific Oysters, potentially increasing their susceptibility to bacterial, viral, fungal and parasitic infections.

Stressors can lead to major impacts on wild harvest fisheries and aquaculture – e.g. major floodplain wetland drainage and the accompanying increase of acidic runoff led to the contraction in the range of Sydney Rock Oyster (*Saccostrea glomerata*) aquaculture in south-east Queensland and NSW estuaries, with debilitating diseases such as QX accompanying these acidic runoff events.

Disentangling causal relationships for disease outbreaks is challenging and will always require ongoing work.

Harmful algal bloom (HAB) outbreaks such as those resulting from the dinoflagellate *Alexandrium tamarense* on the East Coast of Tasmania are becoming more commonplace. These blooms increase the risk of Paralytic Shellfish Poisoning (PST) and have resulted in lengthy fisheries closures with devastating consequences to shellfish and other sectors. There are increasing questions world-wide on the interactions between HABs and changing climate.

Examples of recent investments include:

Sens T – a project to detect changing temperatures specifically for the oyster industry.

Pacific Oyster Mortality Syndrome (POMS) – especially research to enhance industry practices. POMS only causes problems in summer. Tasmanian oyster farms are trialling 'window farming' – farming oysters in infected areas over the cooler months and harvesting before warmer water temperatures raise the risk of significant losses. Extended periods of warm water will reduce the viability of this practice.

Abalone farms – these are highly susceptible to elevated temperatures, losing stock to heat stress during periods of high temperatures. The only method to alleviate this problem is to increase water flow through rearing systems, increasing operational costs.

4 – Concluding comments

As has been outlined in this submission biosecurity is very important to the aquatic sector, both the commercial and the environmental sectors, across all habitats; freshwater, estuarine and marine. The pressures show no sign of letting up, in fact the predictions are with increasing globalisation and world trade they will only get greater. The FRDC is supporting the aquatic sector to ensure it has relevant RD&E programs in place to attempt to address these biosecurity challenges. In this submission the FRDC has demonstrated that some industry sectors are having to invest considerable funds to address biosecurity concerns.

Through the current AAHBS and SCAAH consultative processes it is felt that the industry, researchers and relevant Government aquatic agencies have appropriate mechanisms in place, with respect to plugging into the Animal Health Committee (AHC). However, linkage up to “National Biosecurity System” is acknowledged as weak.

FRDC accepts that current RD&E investment is skewed towards the Asset Based Protection end of the spectrum and would like to see a mechanism whereby more funds could be allocated at the Prevention end of the spectrum.

FRDC can see the logic in RIRDC playing a role in managing the relevant cross-sectoral RD&E investment in biosecurity and supports this option that has been put forward.

FRDC welcomes this review and hopes that this submission adds some useful perspective to the topic from the Aquatic RD&E perspective.

5 – A summary of recent FRDC investment into biosecurity

Below is a list of projects funded by FRDC on this topic between 2010 - 2016.

2010

- TSGA IPA: Tasmanian Aquabirnavirus vaccine development: Towards achieving pan-specific protection of cultured salmonids in Australia using multivalent vaccines

2011

- Aquatic Animal Health Subprogram: Investigations into the genetic basis of resistance to infection of abalone by the abalone herpes-like virus
- Aquatic Animal Health Subprogram: development of improved molecular diagnostic tests for *Perkinsus olsenii* in Australian molluscs
- Aquatic Animal Health Subprogram: Investigation of inclusions in Australian prawns
- Aquatic Animal Health Subprogram: understanding and planning for the potential impacts of OsHV1 u Var on the Australian Pacific oyster industry
- Tactical Research Fund - Aquatic Animal Health Subprogram: determining the susceptibility of Australian species of prawns to infectious myonecrosis
- Aquatic Animal Health Subprogram: Pacific oyster mortality syndrome (POMS) - understanding biotic and abiotic environmental and husbandry effects to reduce economic losses
- Atlantic Salmon Aquaculture Subprogram: The effects of AGD on gill function - use of a perfused gill model
- TSGA IPA: Comparative susceptibility and host responses of endemic fishes and salmonids affected by amoebic gill disease in Tasmania
- Tactical Research Fund: trial of an industry implemented, spatially discrete eradication/control program for *Centrostephanus rodgersii* in Tasmania
- TSGA IPA: development of an RLO vaccine: Proof-of-Concept to commercial application
- TSGA IPA: Aquareovirus (TSRV) vaccine development for the Tasmanian salmonid aquaculture industry
- Pearl Consortium IPA: Improving reliability and efficiency of spat nursery and growout for the silver-lip pearl oyster (*Pinctada maxima*)
- Feasibility study for establishing an APFA model prawn farm in Qld
- Tactical Research Fund: Development of a commercial control treatment for sepiolid tube worm fouling at Port Phillip Bay mussel farms
- Tactical Research Fund: Research methods to manage pathogenic microbiological and biological organisms within a redclaw (*Cherax quadricarinatus*) egg incubator hatchery to improve survival and reliability
- Pearl Consortium IPA: Control of Reproduction of the silver-lip pearl oyster, *Pinctada maxima*
- Seafood CRC: genetic selection for Amoebic Gill Disease (AGD) resilience in the Tasmanian Atlantic salmon (*Salmo salar*) breeding program

2012

- Aquatic animal health subprogram: Strategic planning, project management and adoption
- Aquatic Animal Health Technical Forum
- Prawn Superpowers Summit - enhancing awareness of emergency aquatic animal disease response arrangements for the Australian prawn farming industry
- Australian abalone industry emergency disease response awareness workshop
- Aquatic Animal Health Subprogram: Pacific oyster mortality syndrome (POMS) - risk mitigation, epidemiology and OsHV-1 biology
- Aquatic Animal Health Subprogram: Exercise Sea Fox: testing aquatic animal disease emergency response capabilities within aquaculture
- Atlantic Salmon Aquaculture Subprogram: Culture and cryopreservation of *Neoparamoeba perurans* (AGD)
- Aquatic Animal Health Subprogram: *Edwardsiella ictaluri* survey in wild catfish populations

- Workshop to facilitate epidemiological analysis of unexplained mortality of South Australian Pacific Oyster
- Aquatic Animal Health Subprogram: development of a laboratory model for infectious challenge of Pacific oysters (*Crassostrea gigas*) with ostreid herpesvirus type-1
- Seafood CRC: Review of the 2012 paralytic shellfish toxin non-compliance incident in Tasmania
- ACA IPA: Wild Harvest Abalone National RD&E Planning, Management and Oversight
- Seafood CRC: genetic selection for resistance to Pacific oyster mortality syndrome

2013

- Aquatic Animal Health Subprogram: Determination of susceptibility of various abalone species and populations to the various known AbHV genotypes
- Aquatic Animal Health Subprogram: Identifying the cause of Oyster Oedema Disease (OOD) in pearl oysters (*Pinctada maxima*), and developing diagnostic tests for OOD
- Aquatic Animal Health Subprogram: the Neptune Project- a comprehensive database of Australian aquatic animal pathogens and diseases
- ASBTIA: Optimising the use of praziquantel to manage blood fluke infections in commercially ranched SBT
- The Comparative Performance of Management of the Individual Threats to Marine Environments and Fisheries Resources
- TSGA IPA: Establishing viral diagnostics for salmonid aquaculture in Tasmania: characterisation and identification of Salmon Orthomyxo-like virus and associated pathology in Atlantic Salmon
- Tactical Research Fund: Aquatic Animal Health Subprogram: Viral presence, prevalence and disease management in wild populations of the Australian Black Tiger prawn (*Penaeus monodon*)
- TSGA IPA: Amoeba Lifecycle Biology: Development and application of molecular tools for detection of parasite in host and environment
- TSGA IPA: The Australian Aquatic Animal Health and Vaccine Centre: First Phase to Establish Atlantic Salmon Biosecure Fish Facility Capabilities and Develop Strategy for an Australian Centre of Excellence
- Reducing the impact of paralytic shellfish toxins on Australian shellfish industries
- Development of management recommendations to assist in advisories around seafood safety during toxic bloom events in Gippsland Lakes
- IPA APFA: Characterising and managing harmful algal blooms that cause production loss on Australian prawn farms

2014

- Aquatic Animal Health Subprogram: Development of stable positive control material and development of internal controls for molecular tests for detection of important endemic and exotic pathogens
- Improved understanding of Tasmanian harmful algal blooms and biotoxin events to support seafood risk management
- Oysters Australia IPA: Pacific Oyster Mortality Syndrome (POMS) – closing knowledge gaps to continue farming *C. gigas* in Australia
- TSGA IPA: Amoeba biology diagnostics and farm management strategies for Amoebic Gill Disease (AGD)
- TSGA IPA: Design and testing of well-boat bathing systems including the development of full freshwater re-circulation capability, and, the safe and reliable use of hydrogen peroxide treatment in both seawater and reusable freshwater baths for Atlantic Salmon
- Aquatic Animal Health Subprogram: Development of a national aquatic animal health curriculum for delivery by tertiary institutions
- Oysters Australia IPA: Australian edible oyster RD&E investment via Oysters Australia strategic plan 2014-2019
- ABFA IPA: RD&E project investment and management via ABFA strategic plan 2014-2020

- Seafood CRC: disease challenge testing at the Centre of Excellence - Scope for estimating the genetics of resistance

2015

- Aquatic Animal Health Subprogram: Development of standard methods for the production of marine molluscan cell cultures
- Aquatic Animal Health Subprogram: Determining the susceptibility of Australian *Penaeus monodon* and *P. merguensis* to newly identified enzootic (YHV7) and exotic (YHV8 and YHV10) Yellow head virus (YHV) genotypes
- ABFA IPA: an assessment of the risk of exotic disease introduction and spread among Australian Barramundi farms from the importation of Barramundi products
- Assessing occurrence of pathogenic species of the marine bacteria *Vibrio* in Tasmanian oysters from St Helens
- APFA IPA: towards understanding the relationship of the distribution of the PirAB toxin DNA and *Penaeus monodon* mortality syndrome (PMMS) pathology in farmed prawns in Australia
- The development of a mobile application for the 'Aquatic animal diseases significant to Australia: Identification field guide'
- Oysters Australia IPA: Australian Seafood Industries Pacific Oyster Mortality Syndrome (POMS) investigation into the 2016 disease outbreak in Tasmania
- APFA IPA: RNAi treatment of broodstock to reduce disease impacts in farmed prawns
- Oysters Australia IPA: funding for Oysters Tasmania to respond to POMS Event 2016
- Oysters Australia IPA: development of a national Pacific Oyster Mortality Syndrome (POMS) response plan

2016

- Aquatic Animal Health and Biosecurity Subprogram: *Perkinsus olseni* in abalone - development of fit-for-purpose tools to support its management
- Aquatic Animal Health and Biosecurity Subprogram: Disinfection measures to support biosecurity for infectious spleen and kidney necrosis virus (ISKNV) at aquaculture facilities
- Aquatic Animal Health and Biosecurity Subprogram: Comparative pathogenicity of exotic acute hepatopancreatic necrosis disease (AHPND) and the presumptive bacterial hepatopancreatitis detected in farmed *Penaeus monodon* in Queensland
- IPA APFA: detection of pesticide impacts on larval prawns in hatcheries and presence in estuarine intake water
- TSGA-IPA: Pilchard orthomyxovirus fast-track proof-of-concept vaccine
- Assessment of the containment and eradication of white spot syndrome virus (WSSV) undertaken by Biosecurity Queensland in response to the white spot contamination that occurred on the Logan River on the 22 November 2016 for prawn farms farming *Penaeus monodon* - Black Tiger Prawn
- Assessing compliance and efficacy of import conditions for green (raw) prawn in relation to White Spot Syndrome Virus (WSSV)
- Development of sector-specific biosecurity plan templates and guidance documents for the abalone and oyster aquaculture industries
- Pearl Consortium IPA: Scaling up spat production of *Pinctada maxima*
- Aquatic Animal Health and Biosecurity Subprogram: Strategic planning, project management and adoption
- Future oysters CRC-P: Advanced understanding of POMS to guide farm management decisions in Tasmania
- Future Oysters CRC-P: Advanced aquatic disease surveillance for known and undefined oyster pathogens

6 – Examples of FRDC RD&E outcomes in biosecurity

Details regarding the outcomes of completed projects are published in The Aquatic Animal Health Subprogram's regular 'Health Highlights' Newsletter. These are available from;

http://www.frdc.com.au/research/aquatic_animal_health/Pages/default.aspx

The following is an example of a project summary extracted from the Newsletter:

Project No. 2011/048: Tactical Research Fund Aquatic Animal Health Subprogram:

Determining the susceptibility of Australian species of prawns to infectious myonecrosis

PI: Nicholas Gudkovs and Mark Crane

Executive Summary

What the report is about

Scientists at the CSIRO Australian Animal Health Laboratory (AAHL) in Geelong Victoria, with assistance from Indonesian scientists at the Centre for Brackishwater Aquaculture Development (CBAD), Jepara, Indonesia have demonstrated that two prawn species of commercial importance to Australia are susceptible to the exotic virus, infectious myonecrosis virus (IMNV). IMNV causes infectious myonecrosis, a disease of penaeid prawns which has been reported to occur in north-eastern Brazil, in the East Java Island, west Java, Sumatra, Bangka, west Borneo, south Sulawesi, Bali, Lombok and Sumbawa in South-East Asia and possibly in other South-East Asian countries (OIE, 2014). IMNV is known to cause significant disease outbreaks, associated with mortalities, in farmed Pacific white shrimp (*Litopenaeus vannamei*) i.e. by natural infection.

In addition, the Pacific blue shrimp (*Penaeus stylirostris*) and the black tiger shrimp (*P. monodon*) are susceptible to experimental infection with IMNV (OIE, 2014). Apart from these data there is no information on susceptibility of other prawn species. In 2011-12, Australian commercial prawn production was valued at \$265 million (ABARES, 2013) and, together, commercial and non-commercial prawns are a significant resource of which the farmed banana prawn (*Fenneropenaeus merguensis*) and the wild brown tiger prawn (*Penaeus esculentus*) are important species. It is important to know whether prawn species such as these are susceptible to infection by IMNV to assist in determining the risk this exotic virus may pose should there be an incursion. Thus, in collaboration with MCBAD Indonesia, infectivity trials were undertaken (1) at AAHL to determine the susceptibility of IMNV to the banana prawn and the brown tiger prawn, and (2) at MCBAD, using the natural host the Pacific white shrimp as positive control.

Background

The prawn fishery, including prawn aquaculture, is an important natural resource for Australia that is also the basis for a valuable export industry.

Fortunately, the Australian prawn industry is free from many of the diseases that have devastated prawn aquaculture overseas at one time or another, e.g., the estimated impact of white spot disease (WSD), caused by white spot syndrome virus (WSV) in Asia alone after its emergence in 1992 until 2001, was US\$4-6 billion (Lightner, 2003). In the Americas, the emergence of WSD in 1999 resulted in immediate losses estimated at US\$1 billion to 2001. Infectious myonecrosis (IMN) is a viral disease that has caused significant disease outbreaks and mortalities in farmed *Litopenaeus vannamei* (Pacific white shrimp) overseas (OIE, 2014). The economic loss in Brazil alone was estimated to be US\$20 million in 2003 (Tang et al., 2005).

While *L. vannamei* is considered the principal (natural) host, experimental infection of *Penaeus stylirostris* (Pacific blue shrimp) and *P. monodon* (black tiger shrimp) has been reported (Tang et al., 2005). The susceptibility of other shrimp/prawn species is unknown. Information on the susceptibility of prawn species important to Australia is lacking. Using the bio-secure containment facility provided by the CSIRO Australian Animal Health Laboratory, this study provides significant new information on the susceptibility of two commercially important species of Australian prawns, *F. merguensis* (banana prawn) and *P. esculentus* (brown tiger prawn), following exposure to exotic IMNV. Such information is important to policy-makers, regulators and primary producers with respect to relevant biosecurity issues at all levels of government.

Aims/objectives

1. Import infectious myonecrosis virus (IMNV) of known pathogenicity
2. Determine the susceptibility of banana prawns to IMNV
3. Determine the susceptibility of brown tiger prawns to IMNV

Methodology

An infectious inoculum of IMNV was prepared at MCBAD, Jepara, Indonesia and transferred to CSIRO AAHL, Geelong. At Geelong, the inoculum was inoculated (i.m.) into banana prawns and brown tiger prawns which were subsequently monitored for signs of infection and disease. The prawns were sampled on a daily basis post-inoculation and tissues were processed for determining the presence of IMNV infection and disease using OIE methods. Following this first trial a second series of experiments were conducted to simulate natural modes of viral transmission and confirm susceptibility according to criteria developed by the OIE (OIE, 2014a).

Results/key findings

This investigation has demonstrated that the two commercial species of prawns of Australian origin, *Fenneropenaeus merguensis* and *Penaeus esculentus*, are susceptible to infection with the exotic virus IMNV. Such information is important to policy-makers, regulators and primary producers with respect to relevant biosecurity issues at all levels of government.

Implications for relevant stakeholders

While this project was limited to investigating the susceptibility of two important prawn species, the results suggest that the host range for IMNV is broader than previous data had indicated.

Recommendations

It is recommended that industry, regulators at all levels of government and the prawn health community in general note the results of this project and their implications with respect to biosecurity.

Keywords

Infectious myonecrosis (IMN); infectious myonecrosis virus (IMNV); banana prawn (*Fenneropenaeus merguensis*); brown tiger prawn (*Penaeus esculentus*); in vivo infectivity trials; susceptibility; prawn virus

7 – Acknowledgements

This submission was prepared for FRDC by Mark Boulter (safesustainableseafood@gmail.com) in consultation with FRDC, and in discussion with AAHBS, RIRDC, industry and researchers from across Australia.