instinct and reason

National Aquaculture Industry Biosecurity Survey—

an assessment of enterprise level biosecurity

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Executive summary

The Australian Government Department of Agriculture and Water Resources (the department) commissioned the independent research company Instinct and Reason to conduct a survey aimed at farm owners/managers in the Australian aquaculture industry. The survey aimed to investigate the level of biosecurity knowledge within national aquaculture industries and the current biosecurity practices used in each sector. It also attempted to identify the specific needs of each sector to support the appropriate development and implementation of enterprise level biosecurity plans. The project was funded by the department through the Fisheries Research and Development Corporation.

A Sub-Committee on Aquatic Animal Health (SCAAH) Working Group was established to oversee the overall project. The working group prepared the draft survey questionnaire that was provided to Instinct and Reason for refinement and selected the eight aquaculture sectors to be surveyed.

A total of 122 farm owner/managers from across the Australian abalone, barramundi, edible oyster, pearl oyster, prawn, salmonid, southern blue fin tuna and yellowtail kingfish sectors were surveyed.

The results of the survey[1] indicate that:

- **Awareness of biosecurity has grown, but the concept of 'shared responsibility' for biosecurity is not well known among aquaculture industries**

More than three-quarters (78%) of respondents considered their awareness of biosecurity to be good or very good. Eighteen percent indicated it was neither good nor poor, and 4% considered it poor. Seventy one percent of respondents considered their awareness of surveillance (in general) to be good or very good. Approximately 84% of respondents believed their awareness of biosecurity had increased over the past three years, primarily as a result of disease incursions and training.

The concept of 'shared responsibility' for biosecurity was not well known among aquaculture industries, with only 40% of respondents believing everyone has a role to play when it comes to biosecurity. Many respondents (43%) believed biosecurity was the role of the state governments or the Australian Government (40%), with significantly more in northern Australia (55%) believing the latter. A similar number of respondents (37%) believed farmers have a responsibility for biosecurity.

- **The perceived benefits of biosecurity are based on personal, industry, business or environmental factors**

Seventy nine percent of respondents saw being free from aquatic pests and diseases as the main benefit of biosecurity. Although, those in northern Australia were significantly less likely to say this at 65%. Other perceived benefits of biosecurity were: the protection of livelihood (38%), the protection of marine life (35%) and doing the right thing for the industry (26%).

[1] **Note**: Where percentages do not add up to 100% respondents were given the option to select more than one answer for a given question.

- **Two-thirds of respondents anticipate a major aquatic disease outbreak in Australia within the next 12 months**

Sixty four percent of respondents rated the likelihood of a major aquatic disease outbreak in Australia within the next 12 months as likely or very likely. Sixty two percent of respondents believed Australia was not strict enough with its biosecurity and quarantine when it comes to imports. Respondents believed 'imported stock contamination' (36%) and 'diseases, pathogens, viruses and bacteria' (34%) were the main threats to the Australian aquaculture industry. There was no significant difference between northern and southern Australia.

- **Attitudes towards biosecurity are mixed**

Twenty five percent of respondents felt that Australian was not performing well in terms of biosecurity. Sixty six percent of respondents felt they were properly informed of biosecurity requirements. Although, this percentage was significantly lower in northern Australia (49%). Seventy two percent of respondents indicated they were aware of recent legislative changes regarding biosecurity and 85% believed it was worth investing in biosecurity measures. However, 8% of respondents felt that disease risks were exaggerated.

- **Passive surveillance activities are widely performed**

Passive surveillance measures are performed by most, with more than 8 in 10 respondents (86%) visually checking the health of their stock at least daily. Visual checks were predominantly undertaken during mortality checks (89%) and harvesting (80%). The two largest triggers for concern were unexplained mortality rates (59%) and unusual stock behaviour (31%).

- **Government and laboratories are generally the first port of call**

Most respondents relied on their own experience when deciding how to act (71%). One third of respondents (36%) would contact 'government' if they noticed a change in their stock and a similar number would contact the laboratory (34%).

Most respondents (70%) could cite a notifiable aquatic animal disease relevant to their industry. Of those, 86% indicated they would immediately notify their state or territory government and 21% a veterinarian if they suspected such a disease on their farm.

- **Most would report to government immediately**

Most respondents (81%) indicated nothing would hold them back from immediately reporting to government. However, 5% indicated they would do research first and 4% would 'wait and see' before reporting. When respondents were asked what may encourage them to report more, 75% indicated they would report more if they knew to whom to report. Cost sharing and financial assistance (83%), an easy reference guide to identify diseases (79%) and a no-blame advisory or reporting service (74%) were also identified as tools that may encourage reporting. Thus, while 81% of respondents would report immediately, there are factors that would make reporting easier (for example, knowing to whom to report).

- **Record keeping and management tools are commonly used**

Most respondents indicated they kept comprehensive records: 91% kept animal movement records and 90% water quality records. However, only 72% kept records for sick and dying animals. Almost all (95%) had standard operating procedures (in general), 91% kept a map of all land and water bases, and 93% provided hand and foot washing facilities.

- **Most have a biosecurity plan and review it regularly. Some have them audited**

Most respondents indicated they had a 'biosecurity plan'[2] (77%) and of these 71% reviewed it at least once a year. Thirty eight percent of respondents also indicated their biosecurity plan was audited at least once a year and 41% had their plans audited less often than every other year. However, it is important to note that respondents were not provided a definition of what constitutes a biosecurity plan according to the national biosecurity plan guidelines and templates. The term 'biosecurity plan' was open to the interpretation of the respondent. Consequently, the type(s) of 'biosecurity plan' indicated by respondents varied from very simple documents through to those consistent with the national guidelines and templates. Similarly, the type of auditing undertaken was not able to be explored within the scope of the survey.

Respondents saw cost, in terms of time and resources, as the primary disadvantage to having a biosecurity plan. A number of respondents indicated that they didn't need a biosecuity plan because they had other plans or procedures in place (i.e. already covered in current documentation).

- **Willingness to participate in a support program**

Most respondents (70%) indicated they would participate in a support program to help develop and implement a biosecurity plan for their farm. Respondents were asked to identify which support tools they would find most helpful on a scale of 1 to 5 (where: 1 is extremely helpful; 2 very helpful; 3 quite helpful; 4 not very helpful; 5 not helpful at all).

When categories 1 and 2 are considered in combination respondents indicated their preferred support tools would be: 'disease reference guides for those (diseases) considered high risk' (74%) and 'help writing a biosecurity plan to suit your individual property or business' (74%).

However, when category 1 is considered in isolation respondents preferred support tools are: 'access to sample kits' (48%), 'products or tools to help identify diseases' (47%), 'disease reference guides for those (diseases) considered high risk' (45%) and 'sector-specific biosecurity training workshops' (40%).

- **People are important sources of biosecurity information.**

Sixty five percent of respondents indicated that the relevant state/territory department (officer) was their typical source for information and advice. Followed by aquatic veterinarians (33%) and industry bodies or groups (30%). Respondents wished to have greater access to most kinds of biosecurity information, with 93% indicating they would like to receive 'biosecurity warnings or alerts', 89% 'solutions to mitigate risks', 88% 'disease types, symptoms and what to look for', 88% 'what the risks are and how to identify them, and 85% more information on 'how to implement biosecurity measures'.

- **Be aware of the 8–10% of respondents that are unlikely to engage**

There was a common thread throughout the survey of 8–10% of respondents being sceptical of the value of biosecurity measures. Engaging these respondents will be difficult as they are unlikely to be receptive to messages or education about biosecurity. Apart from increasing compliance

[2] **Note**: Respondents were not provided with a definition of what constitutes a 'biosecurity plan'.

requirements, engagement may be possible through messages describing best practice (for example how their peers are profiting by implementing biosecurity measures).

Recommendations

- **Increase education about shared responsibility for biosecurity**

The concept of 'shared responsibility' for biosecurity between governments and industry is relatively unknown within the Australian aquaculture industry compared with terrestrial industries[3]. Educational activities about Australia's approach to shared responsibility for biosecurity should be increased. Farmers need a better understanding of their role in this area. Messages on the benefits of shared responsibility should focus on protecting the farm, the industry and marine environment.

- **Maintain positive attitudes towards improvement of biosecurity measures at aquaculture farms**

The efforts in improving biosecurity measures at an aquaculture farm level should continue. The majority of respondents are well aware of the benefits of biosecurity measures. Their willingness to improve biosecurity measures is apparent. A large proportion of respondents agreed that it is worth investing money to on-farm biosecurity to avoid disease incursions and protect their business, livelihood and productivity.

- **Continue efforts in communicating biosecurity measures both pre-border and at the border**

Many respondents expressed concern about disease and pest incursion through imported aquatic commodities. In addition to the awareness of shared responsibility in biosecurity; communication of Federal Government import controls and state/territory government interstate trade measures should continue. With two-thirds of respondents anticipating a major aquatic animal disease outbreak in Australia within the next 12 months, the time is ideal to push messages about the importance of biosecurity efforts by everyone.

- **Support and strengthen the first actions of farmers**

The research produced mixed messages around whether farmers knew whom to call to report a notifiable disease. While there was strong evidence that most would contact the state/territory government, there was still a strong call for this contact information to be readily available. Consider producing a simple marketing product (calendar, bookmark, stickers etc.) with relevant government contacts and/or phone numbers.

Farmers' first actions should be supported through the creation of tools such as disease recognition and reporting guidelines. Incentives to report to authorities (for example, cost sharing mechanisms) should also be explored.

[3] Instinct and Reason, Social attitudes and understanding of biosecurity to support market access and plant health surveillance, December 2016

- **Develop support tools or mechanisms to improve on-farm biosecurity plans**

It is clear that all eight sectors surveyed want assistance to develop and implement on-farm biosecurity plans. It depends on the individual farms and sectors as to what kind of assistance and activities are preferred (for example, developing, implementing, reviewing or auditing plans). However, the support program should focus on the following key activities; (1) workshops on writing, reviewing and auditing biosecurity plans specific to their property and business; (2) sector-specific training workshops with the provision of sample kits; and (3) develop sector-specific biosecurity plans for remaining aquaculture industries including smaller/emerging sectors.

- **Information required by farmers**

Consider an easy reference guide for diseases, especially notifiable diseases. Diseases should be listed by aquaculture type describing symptoms and actions to be taken. Focus on the communication and distribution of this reference guide.

Disease guides and their communication and distribution will be developed further in subsequent projects aimed at improving sensitivity of Australia's passive surveillance system for aquatic animal diseases.

- **Inclusiveness strategy needed to address remaining 8-10% of industry members**

Eight percent of respondents think disease risks are exaggerated. This represents a significant proportion of disaffected farmers. A strategy to explain statistical and scientific evidence supported by personal stories may more effectively engage this group and improve biosecurity at the enterprise level.

1. Background and Objectives

AQUAPLAN 2014-2019 is Australia's national strategic plan for aquatic animal health. It was jointly developed by aquatic animal health industry sectors and the Australian, state and territory governments. The development of a program to support farms to develop and implement enterprise level biosecurity plans is included as Activity 1.2 of AQUAPLAN 2014-2019 under Objective 1: *Improving regional and enterprise level biosecurity*.

The implementation of enterprise level biosecurity plans may facilitate safe inter-state and international trade in aquatic animals, by underpinning proof of freedom surveillance; establish a nationally consistent approach to biosecurity planning; and help meet common levels of biosecurity risk management.

It is generally accepted that implementing enterprise level biosecurity plans may be a complex and resource intensive task, even with the benefit of sector level guidance documents (completed under AQUAPLAN 2014-2019 Activity 1.1). Activity 1.2 of AQUAPLAN 2014-2019 aims to support farmers to implement biosecurity plans in a manner that is fit for purpose and balances practicality, cost and regulatory priorities. Any enterprise level biosecurity practices should improve biological, operational and economic performance and be as simple and low-cost as possible to achieve desired outcomes.

The most suitable approach to Activity 1.2 will depend on the nature of the different sectors, the level of understanding of biosecurity and current biosecurity practices. The activity must be developed in a way that is end-user driven, i.e. must provide appropriate support that meets the needs of farmers. These needs are likely to differ among sectors and individual farm managers.

A Sub-Committee on Aquatic Animal Health (SCAAH) Working Group (WG)[4] has been established to oversee the overall project. As a first step the WG recommended that up to eight aquaculture industry sectors be surveyed to address the following four objectives:

1. To better understand the level of biosecurity knowledge farm owner/managers have in each sector.
2. To better understand what biosecurity practices are currently used by farm owner/managers in each sector.
3. To identify whether each sector requires support to develop and implement on-farm biosecurity plans.
4. To identify the most appropriate support approach(es) to address the specific needs of each sector.

The Australian Government Department of Agriculture and Water Resources (the department) commissioned the independent research company, Instinct and Reason, to conduct the social science survey. The project was funded by the department through the Fisheries Research and Development Corporation.

[4] SCAAH Biosecurity Plan working group members: Ingo Ernst (Commonwealth), Yuko Hood (Commonwealth), Tracey Bradley (Vic), Shane Roberts (SA), Karen Dowd (WA), Tim Lucas (Qld), Jeffrey Go (NSW), Aaron Irving (NAC), Helen Jenkins (AHA), Kim Hooper (Industry), Olivia Liu (Commonwealth).

2. Methods

2.1 Aquaculture industry contacts

Instinct and Reason conducted quantitative research with 122 respondents from eight Australian aquaculture industry sectors; namely the abalone (n=12), barramundi (n=20), edible oyster (n=46), pearl oyster (n=9), prawn (n=19), salmonid (n=10), southern bluefin tuna (n=6) and yellowtail kingfish (n=4) sectors. Note some respondents were engaged in more than one sector.

Enterprise contacts were produced through lists provided by the department, state and territory governments, referrals from relevant industry associations and contacts, and by searching through publicly available information. While some sample sizes are small, the total population of enterprises in the target eight industry sectors in Australia is small.

Attempts were made to contact and include all contactable enterprises in the survey. Based on available information, robust response rates were achieved for both the combined total of the eight aquaculture industry sectors at 56% and for each of the individual industry sectors (abalone 80%, barramundi 63%, edible oyster 45%, pearl oyster 60%, prawn 76%, salmonid 48%, southern bluefin tuna 60% and yellowtail kingfish 100%).

2.2 Privacy arrangements

All research at Instinct and Reason is conducted in accordance with the Market and Social Research Privacy Code and the Australian Market and Social Research Society (AMSRS) Code of Professional Behaviour. In addition, all projects are executed according to Instinct and Reason's ISO 20252 standards accreditation. Confidential information and personal research participant details and individual responses are kept secure and access restricted to the purposes of research only. Results are aggregated and individual information is not identifiable, unless explicit permission is granted to do so.

2.3 Quantitative survey

2.3.1 Preparation of the survey questionnaire

An inception meeting was held between Instinct and Reason, the department and the SCAAH WG in early July 2018. The research design, project timing and management, and communication methods were discussed and agreed upon. A draft survey questionnaire was prepared by the SCAAH WG and provided to Instinct and Reason for refinement.

For farm owner/managers in northern Australia, there was an additional research project targeting various farm management levels (other than farm owner/managers) to identify the specific aquatic biosecurity needs of northern Australia. This survey was also being conducted by Instinct and Reason, but commissioned by Animal Health Australia's aquatic industry liaison officer for northern Australia (AHA ILO). That project was funded through the Australian Government Agricultural Competitiveness White Paper. While the overall subject matter and aquatic biosecurity focus was the same across the projects, their specific objectives differed. Thus, to avoid contacting farmers

repeatedly on the similar subject matter, an amalgamated survey questionnaire was developed by Instinct and Reason, in conjunction with SCAAH biosecurity working group and AHA ILO, to collect all of the data specific to each study in one survey.

Keeping in mind that enterprises operated in different locations, and in particular 11 enterprises operated in both in northern Australia and southern Australia, there were 38 enterprises that indicated operating in northern Australia (31% of the total sample of 122 enterprises) and 95 enterprises that indicated operating in southern Australia (78% of the total sample).

2.3.2 Survey cognitive testing and qualitative insight

The refined survey questionnaire was tested internally at Instinct and Reason in late July 2018. Ten live cognitive tests were conducted with survey respondents in early August 2018; with 5 of the cognitive tests overlapping with the AHA ILO project.

The purpose of the cognitive testing phase was threefold. Firstly, cognitive testing helped to gain further insight into the topic of biosecurity as it relates to the aquaculture industry. Secondly, it was used to qualitatively test the survey questionnaire and further refine it in preparation for the quantitative survey. Thirdly, it was used to gain industry referrals for further contacts for the quantitative survey.

The quantitative survey was scripted for computer assisted telephone interviewing (CATI) and for an online option. The final programmed survey was 20 minutes long. Five minutes longer than initially planned.

2.3.3 Quantitative survey fieldwork

The quantitative fieldwork ran for approximately 3 months from the end of August 2018 to late November 2018. A total of 122 respondents were surveyed from across eight Australian aquaculture industry sectors (abalone, barramundi, edible oysters, pearl oysters, prawns, salmonids, southern bluefin tuna and yellowtail kingfish) using a mix of 100 phone interviews and 22 online responses.

2.4 Analysis and data handling

The survey data was checked, cleaned and coded, and statistically analysed. The results were charted, interpreted and provided in this report. The following outlines the data handling approach used.

Weighting

The data is unweighted and therefore reported as captured through the survey.

Statistical significance – 5% at 95 per cent level of confidence

All tests for statistical significance have been undertaken at the 95 per cent confidence level, and unless otherwise noted, any notation of a ‘difference’ between subgroups means that the difference discussed is significant at the 95 per cent level of confidence compared to the result for the total survey sample. Significant differences of sub-groups are indicated in the report by either a positive percentage figure (e.g. +5%) which represents the difference in percentage terms above the result

for the total sample, or a negative percentage figure (e.g. -5%) which represents the difference below the result for the total sample.

A red circle or green square around a value denotes that the result is significantly lower or greater (respectively) than that of the total sample for that question — e.g. ◯ □

Where cell sizes were small, the cell has been highlighted to indicate the highest score.

Treatment of means

Where responses are scale variables, for example, 1 to 5 where 1 is disagree strongly and 5 is agree strongly, the mean is calculated with the removal of 'don't know'.

Rounding of figures – may result in anomalies of +/- 1%

All results have been rounded to the nearest whole percentage figure, and anomalies of about +/- 1% may occur in charts, i.e. total percentages for each bar add to 99%, or 100% or 101% due to rounding error.

Net figures are also rounded – which may also result in anomalies

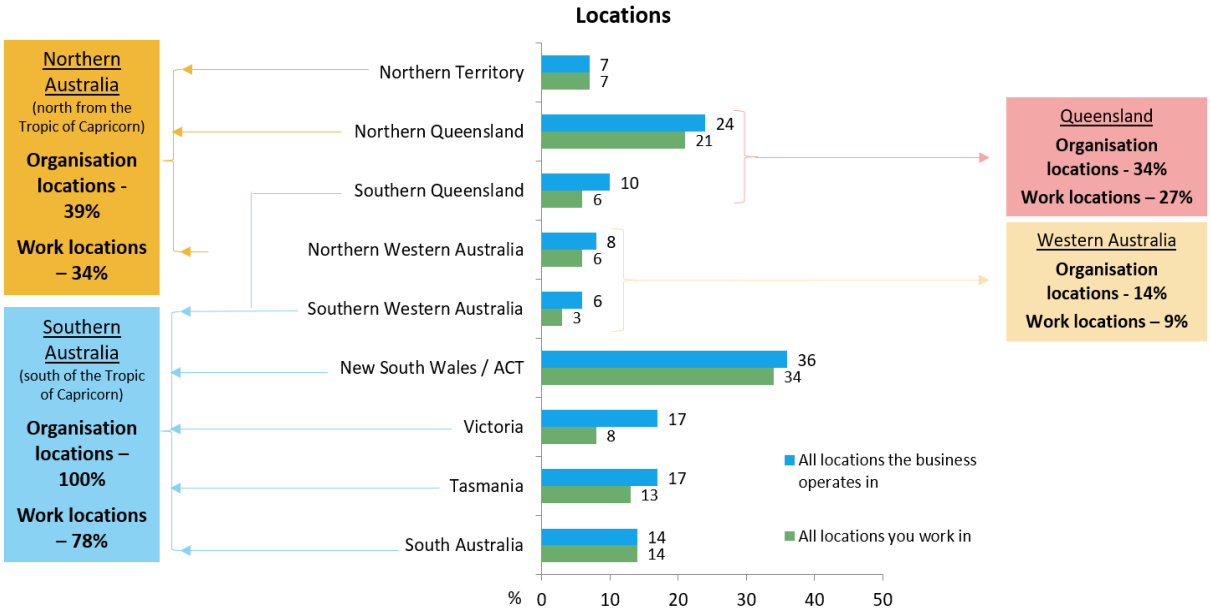
Net results are also rounded after summing the separate proportions rather than simply summing two rounded figures (e.g. '% total agree'). For this reason, anomalies of about 1% sometimes occur between net results and rounded results shown in charts. For example, a proportion of 33.3% 'agree' rounds to 33%, and a proportion of 12.4% 'strongly agree' rounds to 12%. However, when combined to derive the total agree (i.e. agree plus strongly agree), 33.3% plus 12.4% equals 45.7%, which would be rounded to 46%. In this case, the results would be shown in a chart as 33% agree and 12% strongly agree, but the proportion reported as 'total agree' would be 46%.

3. Survey Results

3.1 Sample profile

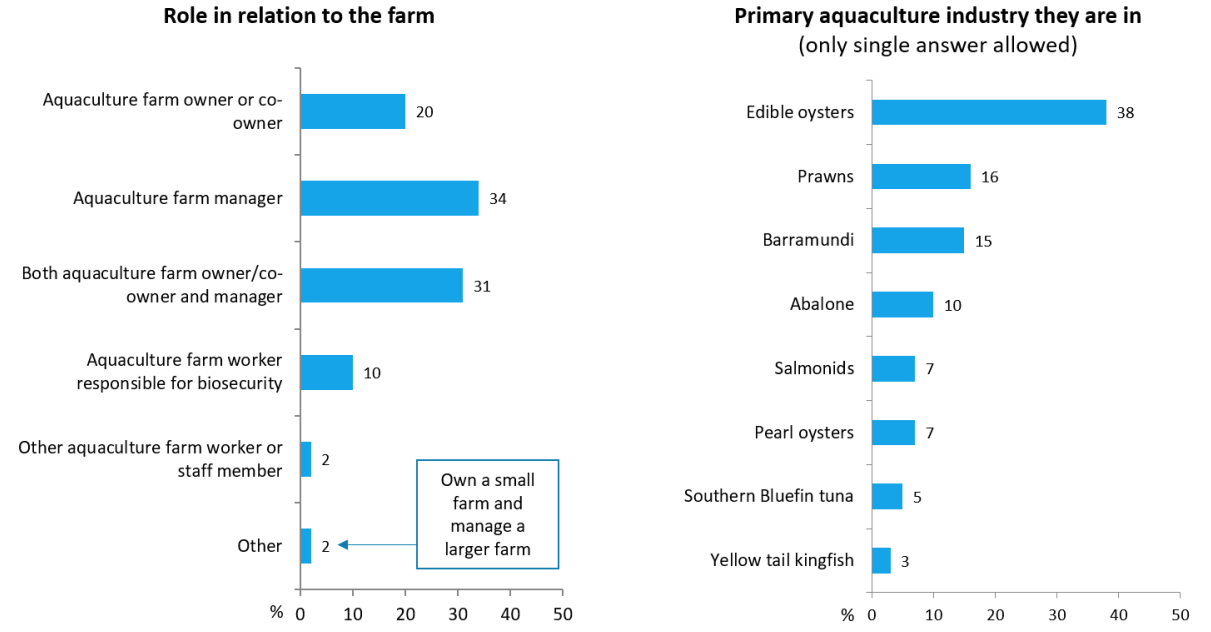
The following four charts provide information on the sample profile. The specific survey question relating to each graph is shown in the box at the base of each figure.

Figure 1. Location of sample and role(s) held in the enterprise.



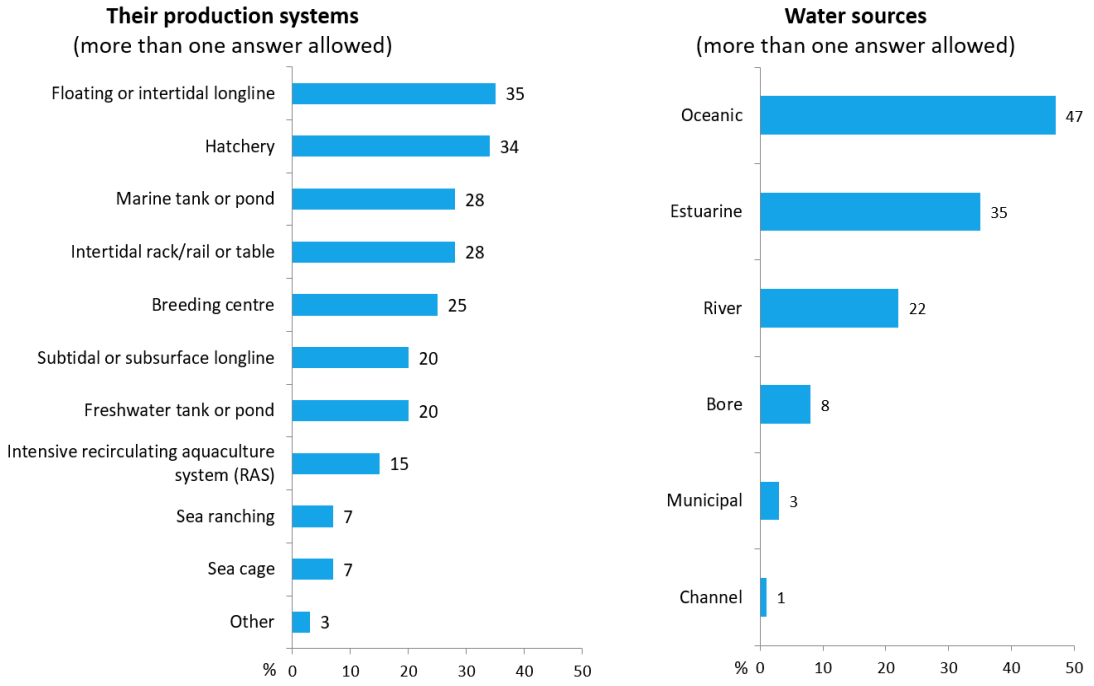
QS2. Can you please confirm all state or territory locations that (a) you work in; (b) the business or organisation you own or work for operates
***Base**: Total sample n=122*

Figure 2. Role(s) held in the enterprise and industry.



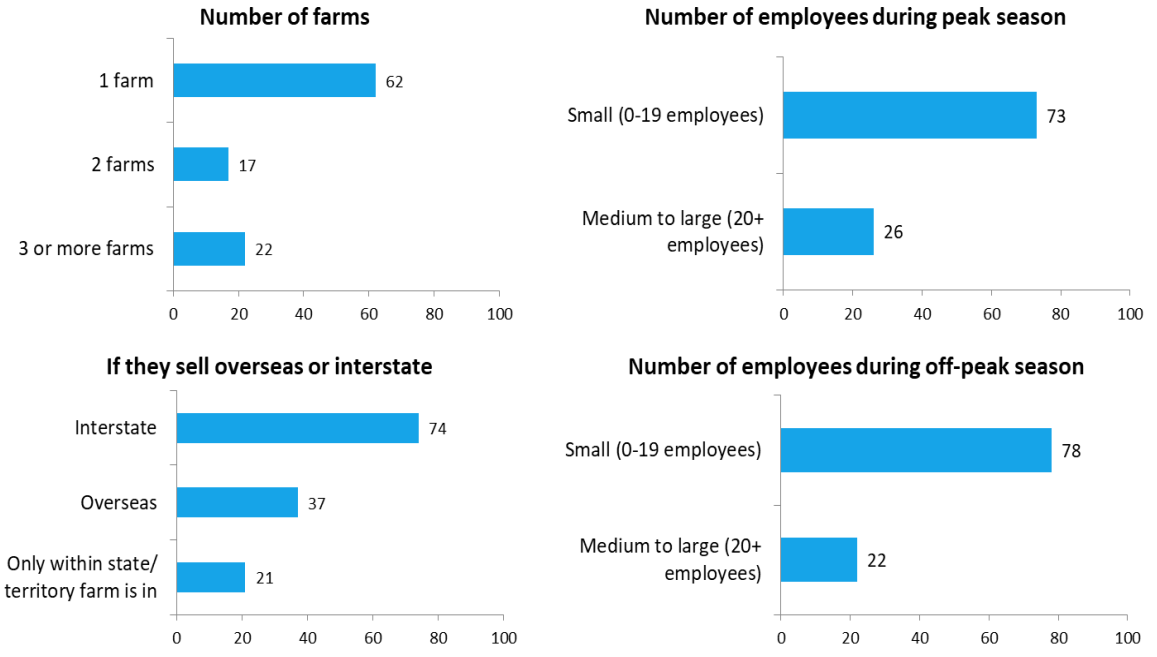
QS3b. What best describes your role in relation to the farm? ***Base**: Total sample n=122*
QS4a. Which aquaculture industry do you work in? Is it… Prawns, Barramundi, etc.? ***Base:** Total sample n=122*

Figure 3. Production system(s) and water sources.



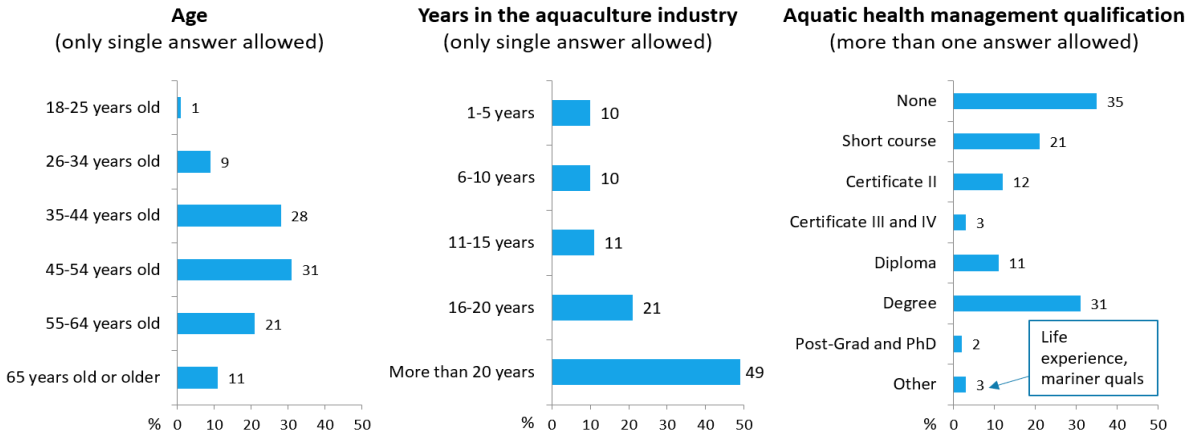
QA1a.	Which of the following describes your aquaculture production system/s?	***Base:*** *Total sample n=122*
QA3.	What type of water supply do you have for the farm/s**?**	***Base:*** *Total sample n=116*

Figure 4. Number of farms owned/managed or serviced by the respondent; number of employees; and where produce is sold.



QA2a.	How many farms do you own or manage, or provide biosecurity services to?	***Base:*** *Total sample n=116*
QA4.	How many full-time equivalent staff members does your farm currently employ during (A) Peak seasons, (b) Off-peak seasons?	
Base:	*Total sample n=116*	
QB7.	To the best of your knowledge, is any of the produce from your farm/s sold…?	***Base****: Total sample n=122*

Figure 5. Age of respondents; years in the aquaculture industry; and level of relevant aquatic health management qualifications.



QS1.	Firstly, can you confirm your age…?	***Base:*** *Total sample n=122*
A5.	How many years have you been working in or with the aquaculture/fisheries industry?	***Base:*** *Total sample n=122*
QA6.	Which of the following formal training in aquatic health management have you had?	***Base:*** *Total sample n=119*

3.2 Awareness, understanding and attitudes towards biosecurity

3.2.1 Awareness of biosecurity and related aspects

Self-rated knowledge of biosecurity was quite high, with more than three-quarters (78%) of respondents rating their knowledge of biosecurity as good or very good (Figure 6). This finding was consistent across northern and southern Australia. Respondents who indicated they had a good/very good knowledge of biosecurity were significantly more likely to indicate they had a good/very good knowledge of shared responsibilities.

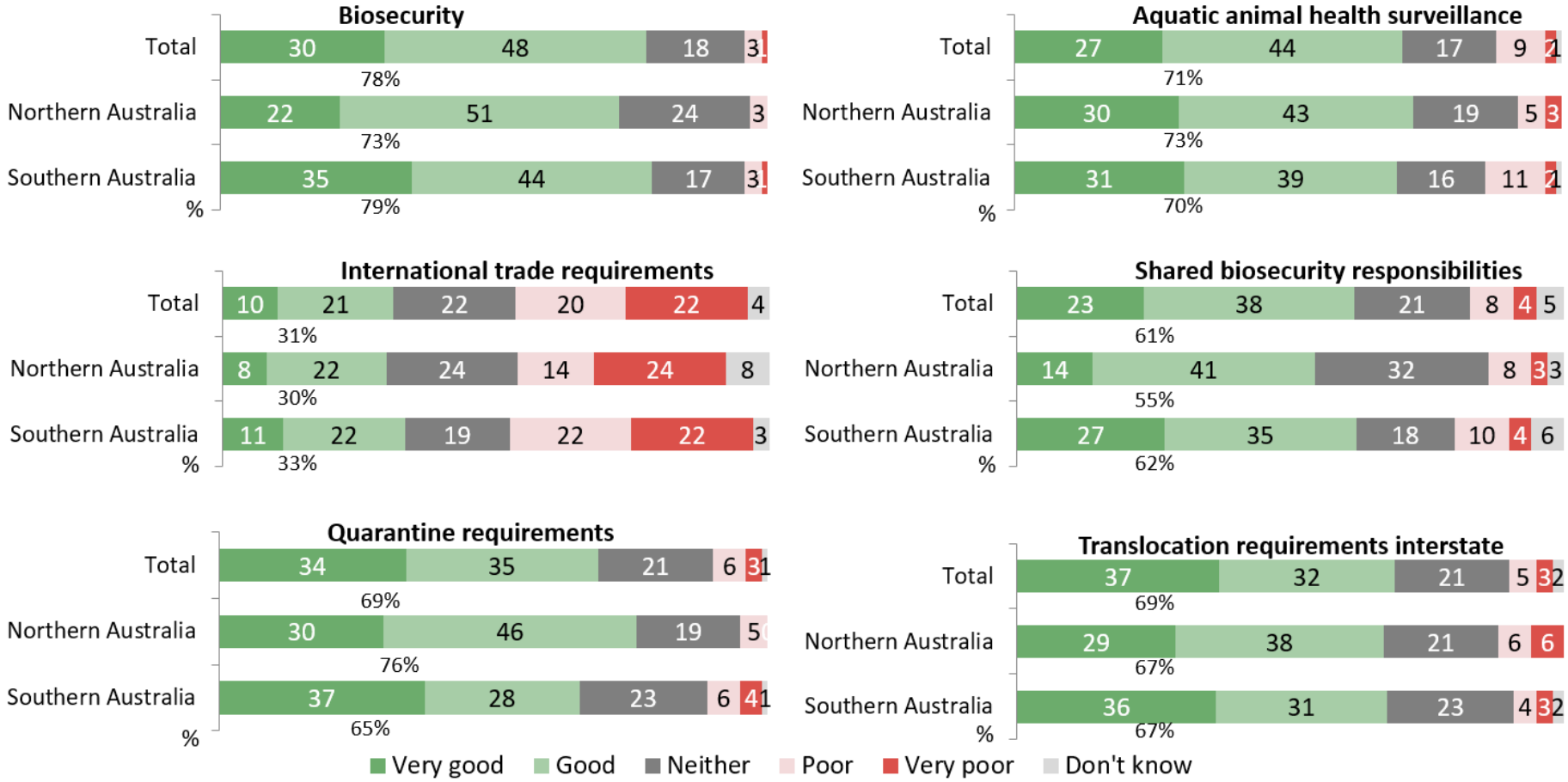
Respondents' knowledge of aquatic animal health surveillance was similar, with 71% of respondents indicating their knowledge was good or very good (Figure 6). Eleven percent indicated their knowledge was poor or very poor (Figure 6); these respondents were significantly more likely to have been industry for five or less years.

Knowledge of quarantine and translocation requirements were both rated as good or very good by 69% of respondents (Figure 6). Those with poor or very poor knowledge of quarantine requirements (9%) were significantly less likely to have a biosecurity plan and to say they had good or very good knowledge of shared responsibilities.

Sixty-one percent of respondents indicated that their knowledge of shared responsibility was good or very good and 12% indicated it was poor or very poor (Figure 6). Cognitive testing suggested that the term 'shared responsibility' was sometimes misunderstood. This was reinforced in a later question on responsibility (section 3.2.2), which suggested that the concept of 'shared responsibility' was not well understood.

Only 31% of respondents indicated their knowledge of international trade requirements was good or very good (Figure 6). Most likely reflecting the 37% of respondents that indicated their enterprise exported. These respondents were significantly more likely to be large employers (20 staff or more) and to have university degrees.

Figure 6. Self-rated knowledge of issues related to biosecurity

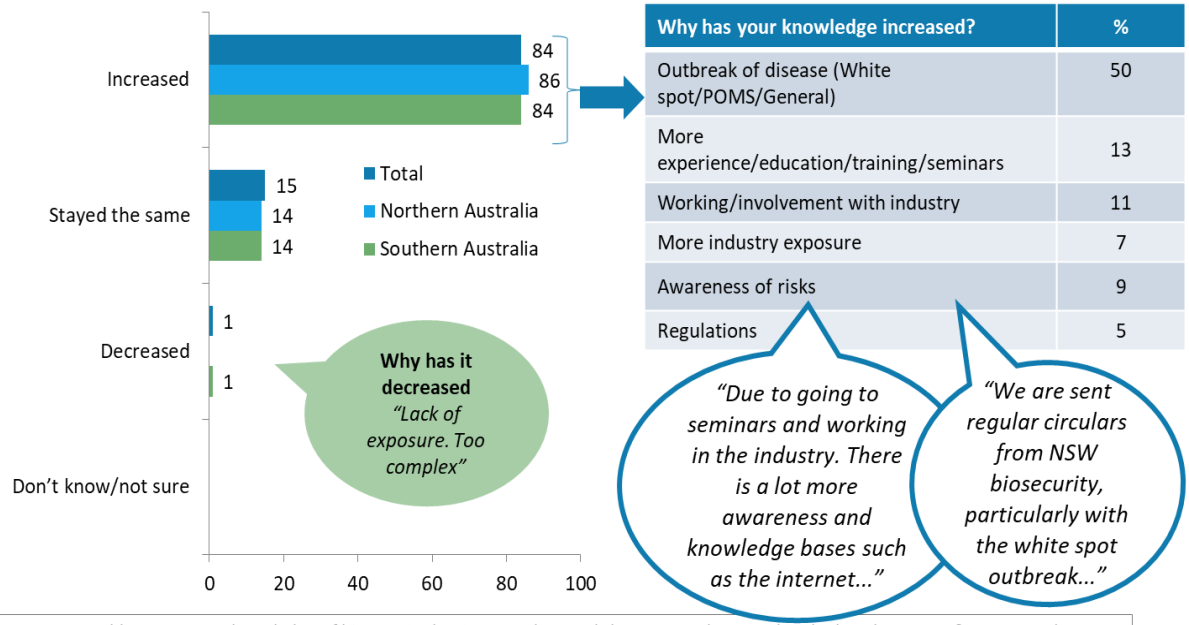


QB1. On a scale from 1 to 5 where 1 is very poor and 5 is very good, how would you rate your knowledge of…? ***Base**: Total sample n=122*

The vast majority of respondents (84%) considered that their knowledge of biosecurity had increased in the last three years (Figure 7). Reasons given for their increased knowledge included: incursions such as white spot (25%), Pacific Oyster Mortality Syndrome (POMS) (14%) and other aquatic animal disease outbreaks (11%); more experience, education and training in biosecurity (15%); and their involvement with the industry (11%).

There were no significant differences between northern and southern Australia. However, those who indicated that their knowledge had increased due to industry involvement were more likely to have sea ranching farms or to be biosecurity officers. Those who cited an industry newsletter were more likely to have no formal training in aquaculture. Those who said it was because of the POMS outbreak were more likely to own or manage three or more farms. Respondents who indicated their knowledge had increased due to exporting were more likely to have a poor or very poor knowledge of shared responsibility.

Figure 7. Indication whether respondents' knowledge of biosecurity has increased, decreased or stayed the same in the last 3 years.



Why has your knowledge increased?	%
Outbreak of disease (White spot/POMS/General)	50
More experience/education/training/seminars	13
Working/involvement with industry	11
More industry exposure	7
Awareness of risks	9
Regulations	5

QB2a. Would you say your knowledge of biosecurity has increased, stayed the same or decreased in the last three years? ***Base:*** *Total n=117*
QB2b. Why is that? ***Base:*** *Those who said their knowledge of biosecurity has increased in the last three years n=99*
QB2c. Why is that? ***Base:*** *Those who said their knowledge of biosecurity has decreased in the last three years n=1*

3.2.2 Who is responsible for biosecurity?

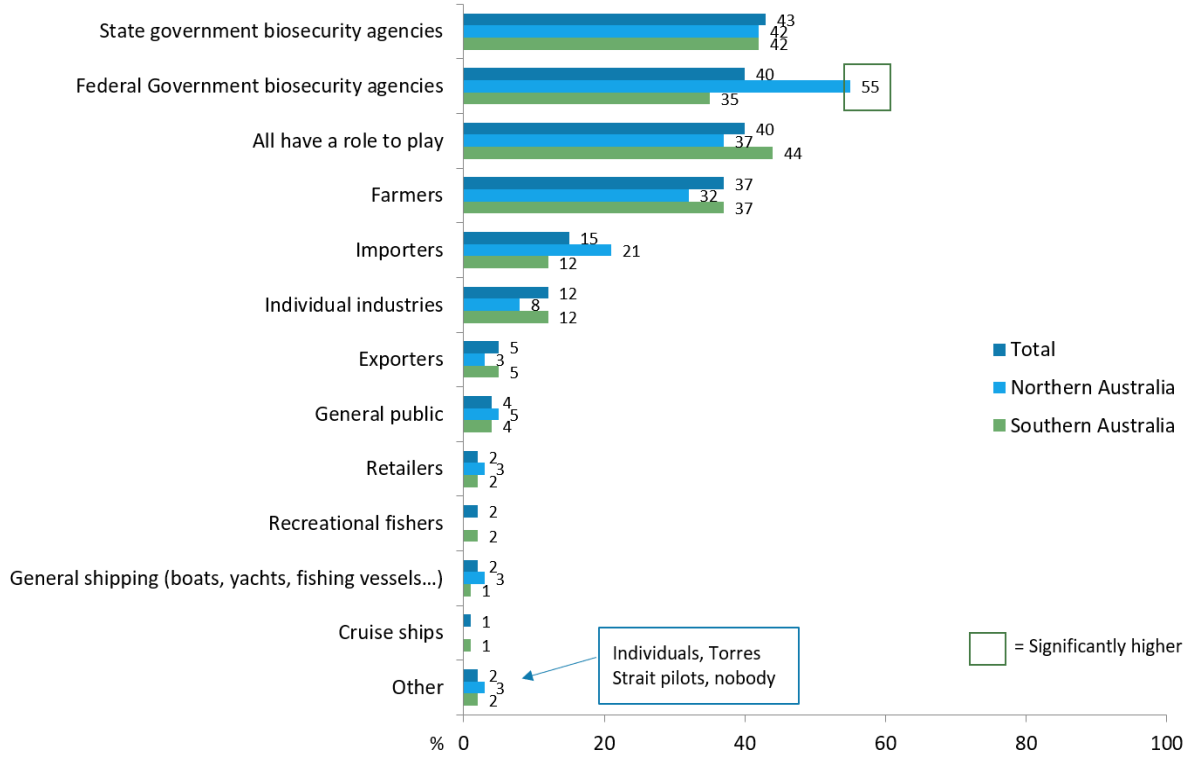
Respondents were asked who they believe is responsible for biosecurity. Respondents had the option of providing multiple responses for this question (Figure 8). Perceptions of responsibility for biosecurity were reasonably evenly spread, with 43% of respondents believing state and territory governments were responsible for biosecurity, 40% the Federal Government and 37% farmers. Forty percent of respondents believed everyone has a role to play in biosecurity.

Respondents from northern Australia were significantly more likely to say that the Federal Government was responsible for biosecurity.

Respondents who owned or managed one or two farms were significantly more likely to say farmers are responsible for biosecurity.

Respondents in the abalone industry were significantly more likely to include importers, individual industries and cruise ships as having a responsibility for biosecurity.

Figure 8. Who respondents believe is responsible for biosecurity.



QB3. Who do you think is responsible for biosecurity? (more than one answer allowed) ***Base:*** *Total sample n=122*

3.2.3 What are the perceived benefits of biosecurity?

Eight in ten respondents (79%) saw being free from pests and diseases as the main benefit of biosecurity (Figure 9). Although, this was significantly lower in northern Australia at 65%. Protection of livelihood (38%), protection of marine life (35%) and doing the right thing (26%) were the next most common responses (Figure 9).

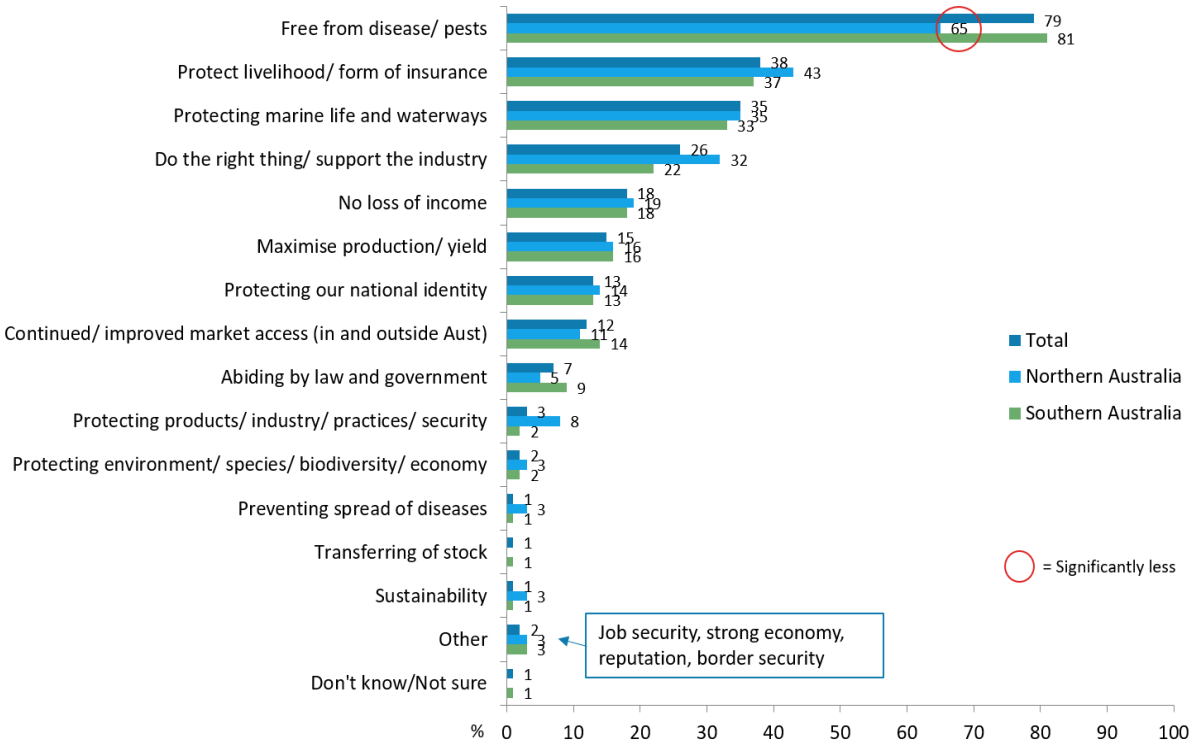
Respondents who indicated being 'free from pests and diseases' as the main benefit of biosecurity were significantly more likely to be small farms (1-2 farms), while those who indicated no loss of income as the main benefit were more likely to be large employers (20 or more staff).

Those who indicated maximising production/yield as the main benefit were more likely to be abalone farmers or large employers (20 or more staff).

Respondents who indicated 'abide by the law/government' as the main benefit were significantly more likely to be yellowtail kingfish farmers or to agree with the statement 'disease risks are exaggerated'.

Respondents who indicated the environment or preventing the spread of disease as the main benefit were more likely to be edible oyster farmers. Respondents who could not name a benefit were significantly more likely to believe that disease risks are exaggerated.

Figure 9. Perceived benefits of biosecurity.



QB4. What do you believe are the main benefits of biosecurity in general? (more than one answer allowed) ***Base:*** *Total sample n=122*

3.2.4 Likelihood of a major outbreak and top three threats

Sixty four percent of respondents rated the likelihood of a major aquatic disease outbreak in Australia in the next 12 months as likely or very likely. This was consistent across northern and southern Australia. Only 15% of respondents considered it unlikely or very unlikely (Figure 10).

Respondents were asked to describe what they saw as the three main threats facing the aquatic industry (Figure 10 and Table 1). Respondents believed 'imported stock contamination' (36%) and 'diseases, pathogens, viruses and bacteria' (34%) were the main threats facing the aquatic industry. Seventeen percent of respondents also believed agricultural/industrial practices and run-off was a key threat. There was no significant difference between northern and southern Australia.

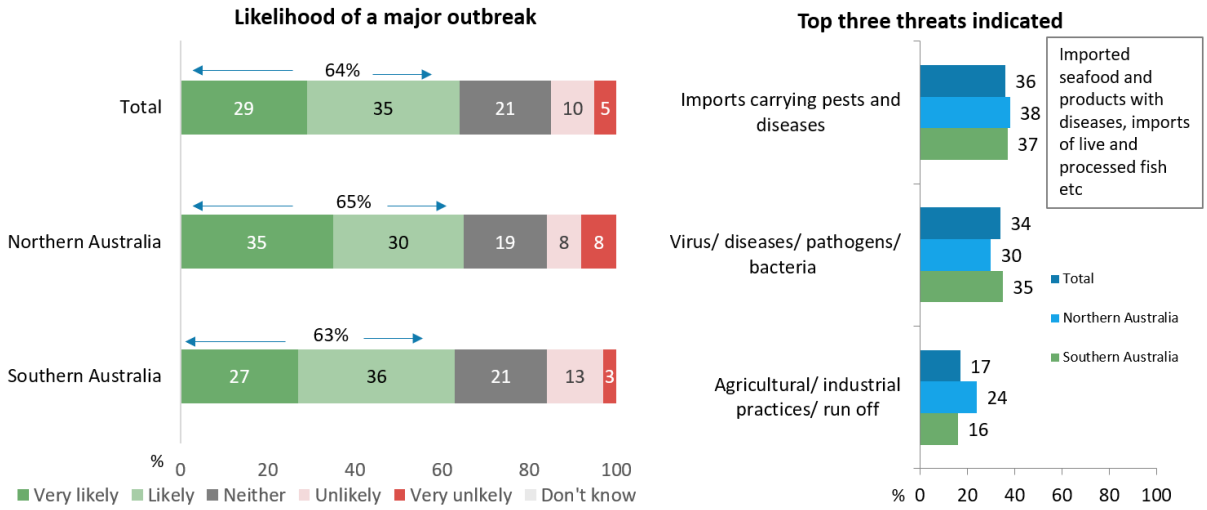
Respondents who rated the likelihood of a major aquatic disease outbreak as unlikely were more likely to say that they had a poor or very poor knowledge of biosecurity.

Those respondents who felt that it was unlikely there would be a major aquatic disease outbreak or had cited agricultural/ industrial practices and run-off as a major threat were more likely to say they had poor or very poor knowledge of biosecurity.

Respondents in the pearl oyster industry were more likely to say 'excessive use of resources/ overfishing' was a main threat, while those in the edible oyster industry were more likely to indicate the threats relating to the health of produce (Table 1).

Those in the prawn industry were more likely to indicate 'white spot' as a main threat; and abalone farmers were more likely to cite 'illegal fishing and off-shore activities' as a main threat to the aquatic industry (Table 1).

Figure 10. Likelihood of major aquatic disease outbreak in Australia in the next 12 months and top three threats.



QB5. On a scale from 1 to 5 where 1 is very unlikely and 5 is very likely, how would you rate the likelihood of a major aquatic disease outbreak in Australia in the next 12 months ? ***Base:*** *Total sample n=122*

QB6. Please describe what you see as the top three threats facing the aquatic industry? ***Base:*** *Total sample n=122*

Mentioned in the top three threats	Total	Nth	Sth
Imported stock contamination*	36%	38%	37%
Virus/ diseases/ pathogens/ bacteria	34%	30%	35%
White spot (specifically mentioned)	*5%*	*5%*	*4%*
Agricultural/ industrial practices/ run off	17%	24%	16%
Climate change/ loss of habitat	17%	8%	19%
Shipping/import conditions/compliance	15%	14%	13%
Lack of knowledge/education/training	10%	14%	9%
Council/govt restrictions/laws, red tape	11%	11%	10%
Pollution	10%	8%	11%
Natural/ environmental disasters	8%	3%	9%
Pests/ invasive species	7%	3%	9%
Ballast	7%	8%	8%
Poor biosecurity	6%	5%	8%
Excessive use of resource/ overfishing	5%	8%	7%
Translocation	5%	11%	3%

Mentioned in the top three threats	Total	Nth	Sth
Rising costs	5%	8%	4%
Loss of business/ workforce/ financial support	5%	0%	5%
Water access/ threats to supply/ quality	5%	8%	4%
Lack of leadership/ monitoring/ planning	5%	3%	4%
Seasonal change	4%	3%	4%
Lack of resource/ licensing	4%	8%	2%
Drought/lack of rain	3%	3%	3%
Cost	3%	0%	3%
Threats to water supply/environ	3%	3%	2%
Lack of security	3%	3%	2%
Unregulated/ unlawful practices	3%	3%	2%
Illegal fishing/ trades	1%	0%	2%
Increased market demand/access	1%	3%	0%
Other	5%	8%	4%
None – no threats/ none identified	5%	3%	4%
Don't know/ not applicable	6%	5%	7%

* Note: Imported stock contamination refers to imports of both live and processed fish (see Figure 9). Respondents did not differentiate between the two, however it is important to note that the import of contaminated frozen prawns (White spot) was in the media at the time the survey was in the field.

QB6. Please describe what you see as the top three threats facing the aquatic industry? ***Base:*** *Total sample n=122*

Table 1. Full list of threats facing the aquatic industry according to Australian aquaculture farmers.

3.3 Attitudes to biosecurity

To gain a better understanding of aquaculture farmers' attitudes towards biosecurity, respondents were presented with a number of statements people have made about biosecurity. For each statement they were asked to indicate the degree to which they agreed or disagreed (Figures 11 and 12).

Most respondents (85%) believed that disease risks are not exaggerated. However, 8% of respondents agreed that 'disease risks are exaggerated' and 5% were unsure (Figure 11). This poses a problem for communicating biosecurity issues to the aquaculture industry, particularly the concept of 'shared responsibility' for biosecurity.

Respondents in the edible oyster industry and from larger enterprises (three or more farms) were more likely to agree that 'disease risks are exaggerated', while smaller enterprises (one or two farms) were more likely to disagree.

Most respondents (85%) believed it was worth investing in biosecurity measures, with only 5% of respondents disagreeing with this statement (Figure 11). Respondents who had been in the aquaculture industry for more than 20 years were significantly more likely to disagree with this statement (i.e. believe biosecurity measures are not worth investing in).

Seventy seven percent of respondents disagreed with the statement "because we have not had a serious outbreak I assume the system must be working" (Figure 11). The ten percent of respondents that agreed with this statement were significantly more likely to be enterprises without a biosecurity plan in place.

Seventy two percent of respondents agreed they were aware of recent changes to biosecurity legislation (Figure 11). Although, respondents from northern Australia were significantly less likely to say this (62%) and also recorded a high 'neither agree nor disagree' score (22%). Respondents who were unaware of recent legislative changes to biosecurity were also more likely to have a poor or very poor awareness of 'shared responsibility' for biosecurity.

One-quarter of respondents (25%) agreed with the statement 'Australia is performing well with its biosecurity' (Figure 11). However, almost double that number disagreed (43%), believing Australia is not performing well. This number was significantly higher in northern Australia and among those who had been in the aquaculture industry for 5 years or less.

Sixty two percent of respondents believed Australia was not strict enough with its biosecurity and quarantine when it comes to imports (Figure 11).

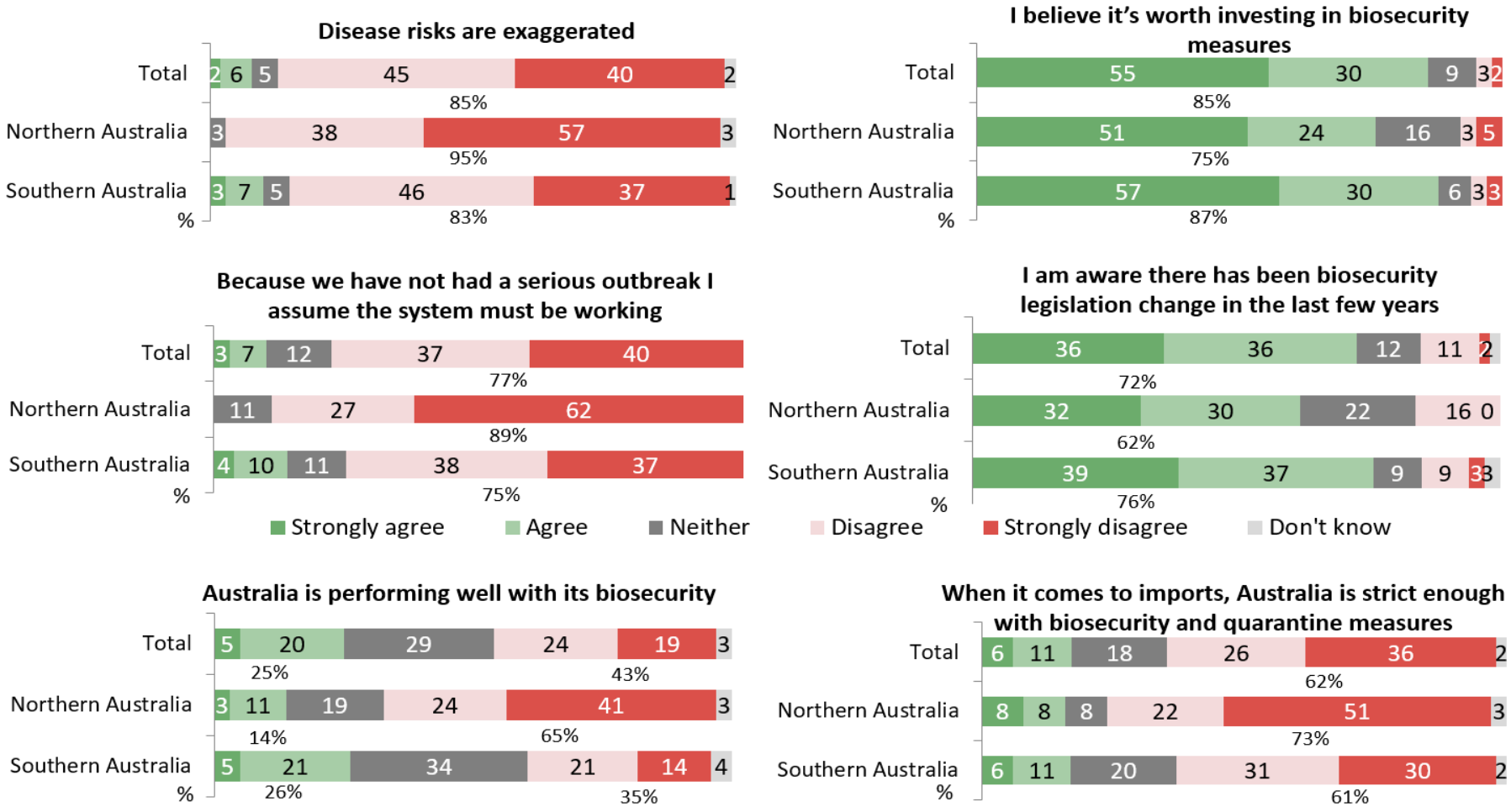
Around one third of respondents from northern Australia (35%) believed that they had not been properly informed of biosecurity requirements (significantly more than the total at 16%); and more than half (57%) believed that decisions were made by government bodies without real consultation with producers and industry (with 20% indicating they neither agreed nor disagreed) (Figure 12).

Forty seven percent of respondents disagreed with the statement 'there are no practical or operational limitations to complying with biosecurity requirements' and 25% agreed with the statement (Figure 12).

Approximately half (51%) agreed that the rules and their application keep changing, and 21% disagreed (Figure 12). Sixty three percent of respondents felt that Australia was 'strict enough' with moving stock between states, and 15% disagreed (Figure 12).

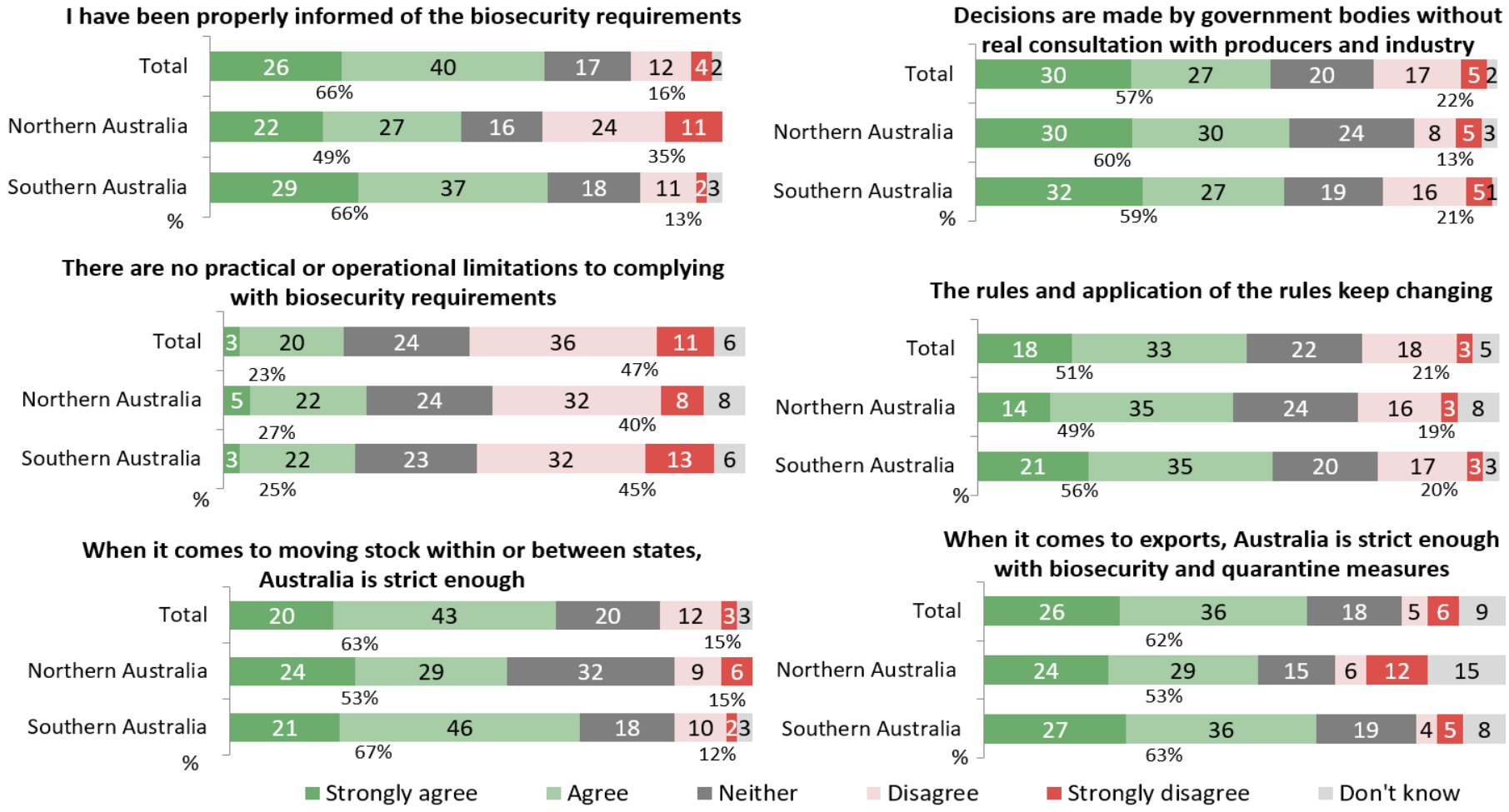
A similar number (61%) agreed that Australia's biosecurity and quarantine measures for exports were strict enough; while 11% disagreed (Figure 12).

Figure 11. Attitudes towards biosecurity.



B8. The following are statements some people have made about biosecurity. For each statement please indicate on a scale from 1 to 5 where 1 is strongly disagree and 5 is strongly agree, the extent to which you agree or disagree. ***Base:*** *Total sample n=122*

Figure 12. Attitudes towards biosecurity (continued).



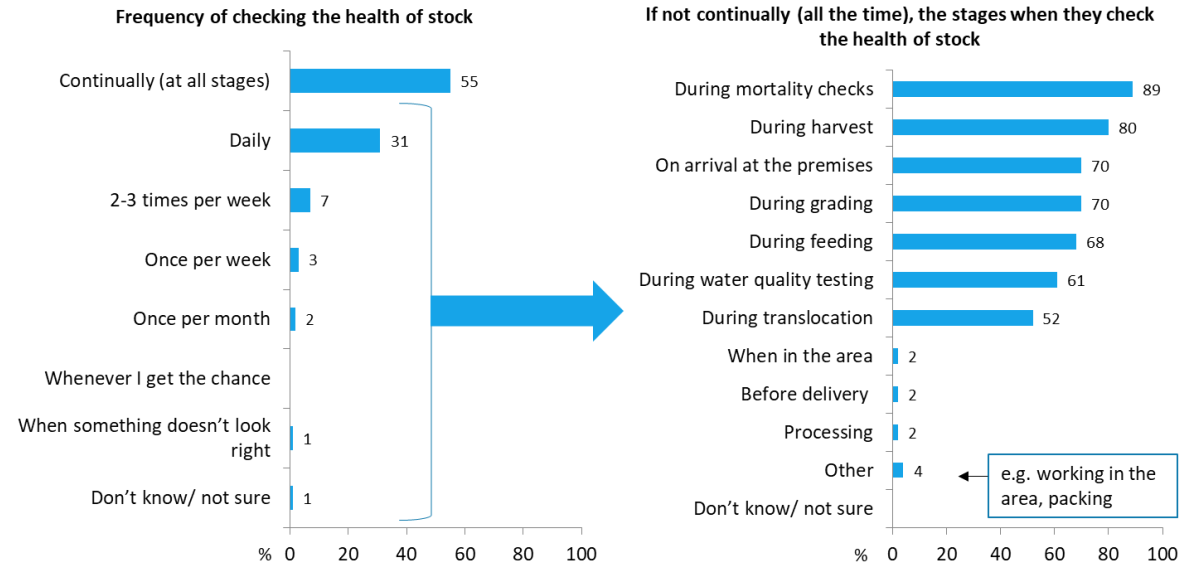
B8. The following are statements some people have made about biosecurity. For each statement please indicate on a scale from 1 to 5 where 1 is strongly disagree and 5 is strongly agree, the extent to which you agree or disagree. ***Base:*** *Total sample n=122*

3.4 Monitoring and reporting of incidents

3.4.1 Monitoring stock

Fifty five percent of respondents indicated that they visually check the health of their stock continually (at all stages of production), while almost one-third (31%) indicated they check daily (Figure 13). Respondents who didn't continually check their stock indicated that they predominantly perform visual checks during mortality checks (89%) and harvesting (80%). There were no significant differences between northern and southern Australia. However, respondents who indicated they continually visually check their stock were also more likely to say that nothing would hold them back from reporting a suspected notifiable disease.

Figure 13. Frequency and timing of visual checks for the health of stock.

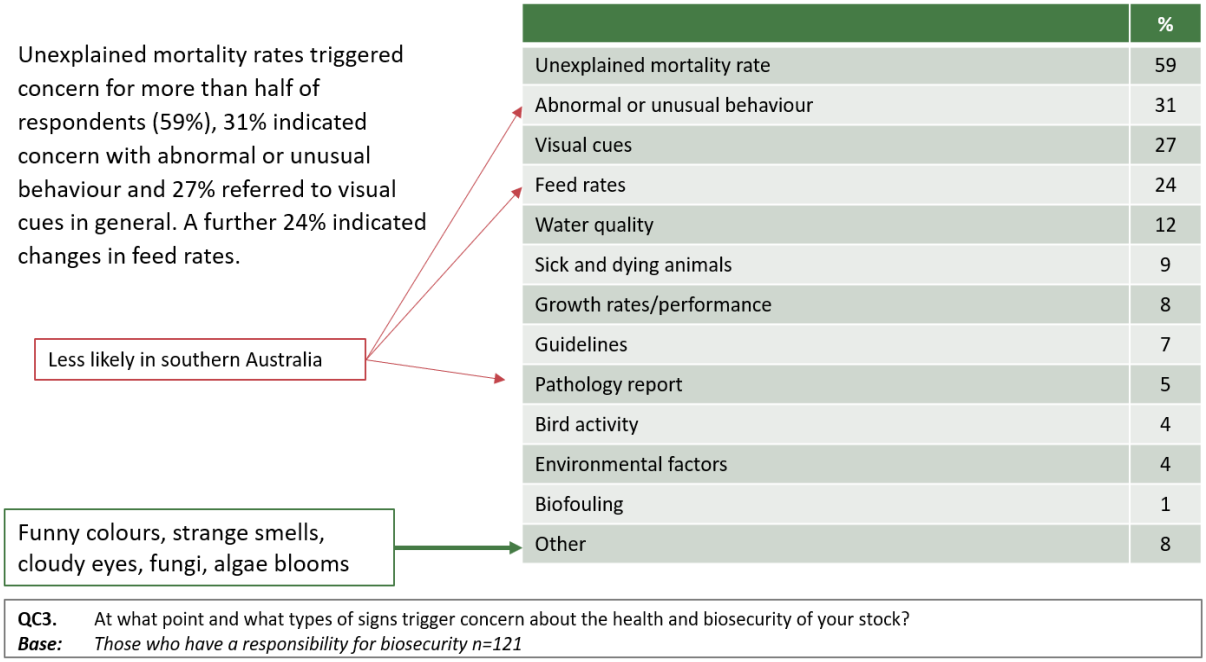


QC1. How often do you do a visual check of the health of your stock? ***Base**: n=122*
QC2. When do you visually check the health of your stock? Is it during…? ***Base:** Those who do not check continuously n=56*

3.4.2 The visible signs that trigger concern

Fifty nine percent of respondents indicated 'unexplained mortality rate' as a trigger for concern regarding the health and biosecurity of their stock (Table 2). Thirty one percent of respondents indicated abnormal or unusual behaviour as a trigger for concern, and 24% indicated a change in feeding rates. Twenty seven percent of respondents referred to visual cues in general (Table 2).

Respondents from southern Australia were less likely to indicate abnormal and unusual behaviour, feed rates or pathology reports. However, respondents who indicated abnormal or unusual behaviour as a trigger for concern were more likely to have a biosecurity plan in place and to employ 20 or more staff. Respondents who referred to guidelines were more likely to be yellowtail kingfish farmers or to have worked in the aquaculture industry for 5 or fewer years. Respondents who referred to sick or dying animals were more likely to be in the prawn industry or to employ 20 or more staff.



	%
Unexplained mortality rate	59
Abnormal or unusual behaviour	31
Visual cues	27
Feed rates	24
Water quality	12
Sick and dying animals	9
Growth rates/performance	8
Guidelines	7
Pathology report	5
Bird activity	4
Environmental factors	4
Biofouling	1
Other	8

Table 2. Signs that trigger concern about the health and biosecurity of stock (note: more than one response was permitted).

3.4.3 First response and knowledge of changes in stock health

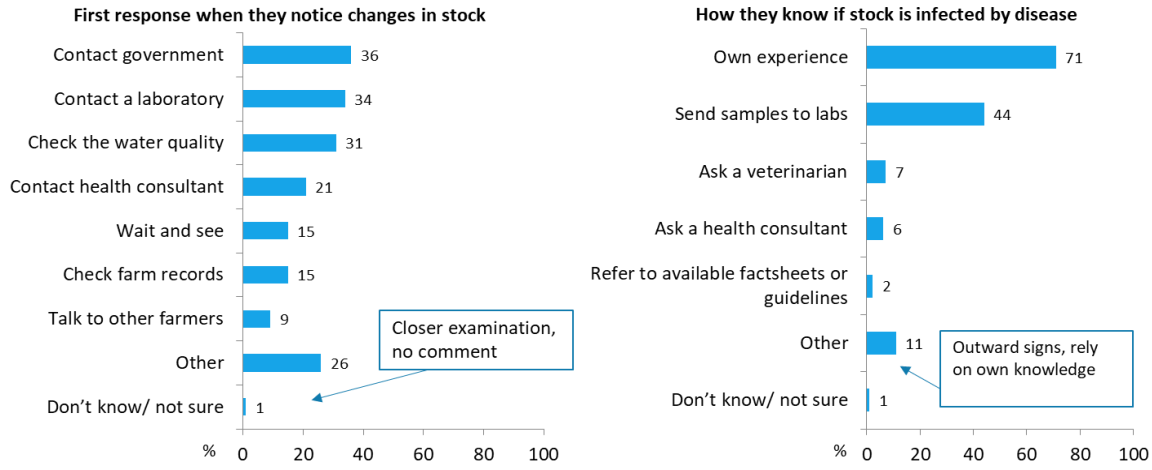
More than one third of respondents indicated that their first response would be to contact government (36%) or a laboratory (34%) if they noticed changes in the health of their stock (Figure 14). Thirty one percent indicated that they would check the water quality and 21% would contact a health consultant. Fifteen percent of respondents indicated their first response would be to 'wait and see' (Figure 14).

Those respondents who indicated they would contact a laboratory were more likely to have degree, be biosecurity officers or employ 20 or more staff. Those who indicated they would check the water quality were more likely to be from the prawn industry and those who indicated that they would contact 'government' were more likely to be edible oyster farmers. Respondents who indicated they would contact a health consultant were more likely to use an intensive recirculation aquaculture system or to farm southern bluefin tuna. Respondents in the salmonid industry were more likely to indicate that they would 'wait and see'.

Seventy one percent of respondents indicated they would rely on their own experience to know if stock was infected by disease and 44% would rely on laboratory tests (Figure 14). Seven percent of respondents would ask a vet to know if stock was infected by disease and 6% would ask a health consultant (Figure 14).

Respondents who relied on their own experience to know if stock were infected by disease were more likely to indicate that nothing would hold them back from reporting a suspected notifiable disease. Respondents who indicated they would 'send samples to labs' were more likely to have a biosecurity plan and those who indicated they would 'ask a health consultant' were more likely to be yellowtail kingfish farmers.

Figure 14. Respondents' first response(s) when they notice changes in stock and how they know stock is infected by disease.



QC4. What is your first response when you see changes in the health of your stock? (more than one answer allowed)
Base: *Those who work on a farm n=122*
QC5. And how do you know if your stock is infected by disease(s)? (more than one answer allowed) ***Base:*** *Total sample n=122*

3.4.4 Knowledge of aquatic notifiable diseases

Pacific oyster mortality syndrome (POMS), QX disease and white spot disease (WSD) were cited as notifiable diseases by around one-quarter of respondents (20-28%) (Figure 15). Thirteen percent of respondents cited winter mortality, 11% abalone viral ganglioneuritis (AVG) and 10% yellow head virus. Perkinsus (7%), scale drop syndrome (5%), early mortality syndrome (4%) and Nodavirus (3%) were also cited by a number of respondents (Figure 15). Respondents in northern Australia were more likely to cite WSD as a notifiable disease.

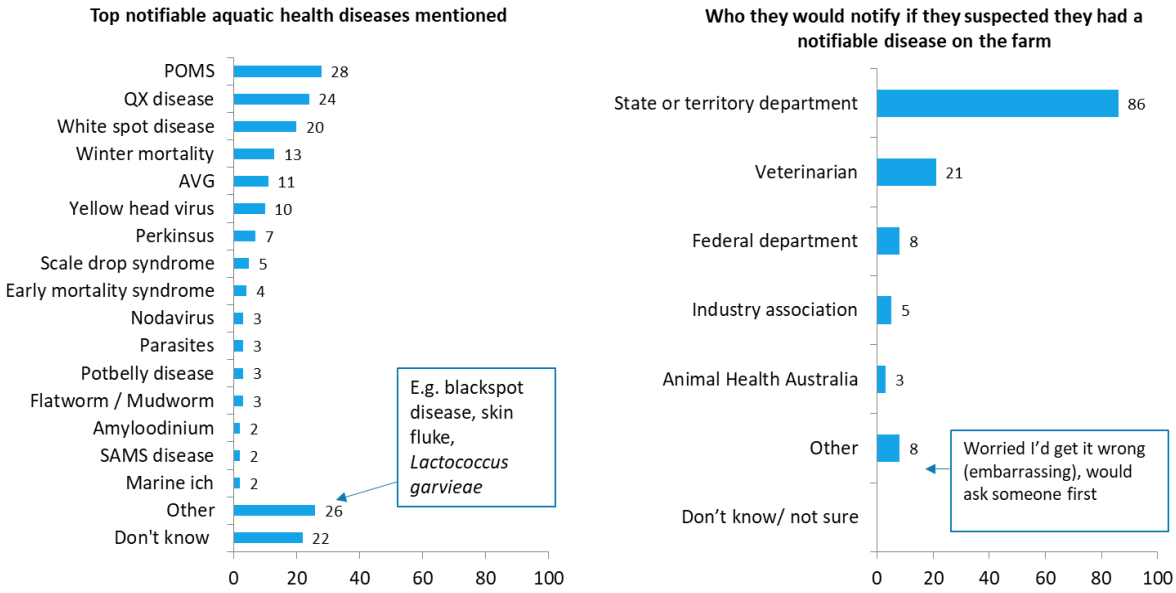
As expected, respondents were more likely to nominate diseases which affected their own stock:

- Abalone farmers were more likely to cite AVG and *Perkinsus*.
- Barramundi farmers were more likely to cite scale drop syndrome, pot belly disease, Nodavirus, Amyloodinium and marine ich (*Cryptocaryon irritans*).
- Edible oyster farmers were more likely to cite POMS, QX disease and winter mortality syndrome.
- Prawn farmers were more likely to cite yellow head virus.
- Southern bluefin tuna farmers were more likely to cite flatworm and mud worm.

Eighty six percent of respondents indicated they would notify the state/territory department if they suspected a notifiable disease on their farm and 21% indicated they would notify a vet (Figure 15). Eight percent of respondents indicated they would be hesitant to notify, citing 'embarrassment if they were wrong' and 'wanting to ask around and get other opinions first' as reasons for this answer (Figure 15)

Respondents who indicated they would notify a vet were more likely to be in the barramundi industry, while those who indicated they would 'notify the manager' or 'knew what to do because they had seen it before' were more likely to be in the yellowtail kingfish industry.

Figure 15. Notifiable aquatic animal diseases as mentioned by respondents and who they would report to if a notifiable disease was suspected on their farm.



QC6.	Please name two notifiable aquatic health diseases most relevant to your industry.	***Base:*** *n=120*
QC7.	If you suspected that you had a notifiable disease on your farm(s), who would you notify?	***Base:*** *n=119*

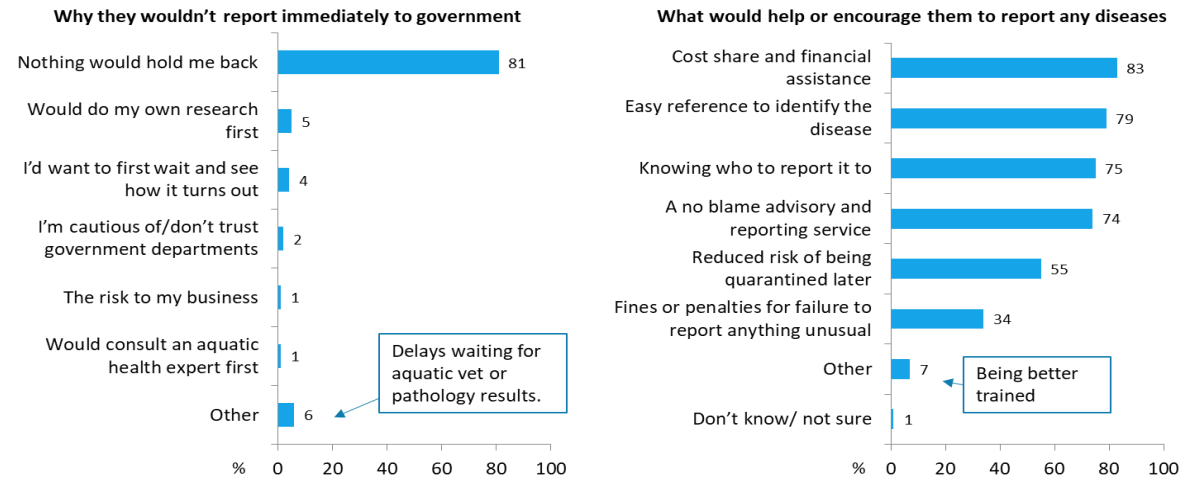
3.4.5 Why respondents wouldn't report immediately and what could encourage them

Eighty-one percent of respondents indicated 'nothing would hold me back' from reporting something to government immediately. Five percent would 'do my own research first' and 4% would 'wait and see how it turns out' (Figure 16).

Respondents who indicated they would 'wait and see' were more likely to believe that disease risks are exaggerated and also more likely to say that they've seen the symptoms before and know what to do. Respondents that indicated they were 'cautious of/don't trust government departments' were also more likely to say they'd seen the symptoms before and knew what to do. Those who indicated they would 'do my own research first' were more likely to say they reviewed their biosecurity plan less often than every two years. Respondents who indicated that they were concerned about 'the risk to my business' or 'would consult an aquatic health expert first' were more likely to have been in the aquaculture industry for 11-25 years. Respondents from the abalone industry were more likely to indicate 'other', which included waiting for pathology results or notifying the farm owner.

The majority of respondents (83%) indicated that 'cost share and financial assistance' would help or encourage them to report any diseases (Figure 16). Seventy nine percent indicated and 'easy reference to identify the disease and 75% said 'knowing who to report it to' (Figure 16). Seventy four percent of respondents indicated 'a no blame advisory and reporting service' would help or encourage them to report any disease. 'Fines or penalties' was the least favoured option (34%) (Figure 16). Those who indicated 'don't know / not sure' were most likely to be pearl oyster farmers (1%) (Figure 16).

Figure 16. Why respondents wouldn't report immediately to government and what would help or encourage them to report any diseases.



QC8.	What, if anything, would hold you back from reporting something to government immediately?	***Base:** n=113*
QC9.	Which of the following options would help or encourage you to report any diseases found?	***Base:** n=122*

3.5 Specific aquaculture tools and farm practices

3.5.1 Record keeping tools

Most respondents indicated that they kept records of all animal movements onto, around and off the farm (91%) and water quality records (90%) (Figure 17). Around three quarters of respondents (77%) kept disease testing records and 72% animal health monitoring records for sick and dead animals (Figure 17).

Respondents who indicated they had water quality, disease testing and animal health monitoring records were more likely to indicate they had a biosecurity plan in place. Those who indicated they had disease testing and animal health monitoring records were also more likely to have a degree. Respondents who indicated 'don't know / not sure' were more likely to have been in the aquaculture industry for 11-15 years.

3.5.2 Staff management practices

Almost all respondents (95%) indicated that they had standard operating procedures in place on their farm and 83% indicated they had a list of emergency contacts and procedures available to all staff (Figure 17). Sixty four percent of respondents indicated 'staff are required to wear fresh, clean clothes each day' and that 'all staff receive training in biosecurity' (Figure 17). Fifty six percent of respondents indicated they had staff assigned to specific production units; 50% employed a veterinarian or health consultant; and 34% had a designated biosecurity officer employed on their farm.

Respondents who indicated they had a biosecurity plan in place on their farm were more likely to say they had a list of emergency contacts and procedures, employed a veterinarian or health consultant, employed a designated biosecurity officer, or had staff assigned to specific production units.

Large employers (20 or more staff) were also more likely to indicate that they had staff assigned to specific production units or have a veterinarian/health consultant or biosecurity officer employed on farm. Respondents with a degree were more likely to have a veterinarian/health consultant employed on farm. Respondents who indicated 'don't know/not sure' (1%) were more likely to be pearl farmers than from another industry, although the number of pearl farmers is too small to be definitive (Figure 17).

Figure 17. Record keeping tools and staff management practices used on farm.

QD1.	Which of the following *record keeping tools* do you currently have in place on your farm?	***Base:** n=116*
QD2.	Which of the following *staff* management practices do you currently have in place on your farm?	***Base** n= 116*

3.5.3 Property management tools

Most respondents indicated that they have property management tools in place on their farm (Figure 18). In particular, 91% indicated they keep a map of all land and water bases on farm, 77% indicated their farm has a secure perimeter fence or well defined boundary and 73% indicated production units have appropriate features to prevent the entry of wild animals and the escape of farmed stock.

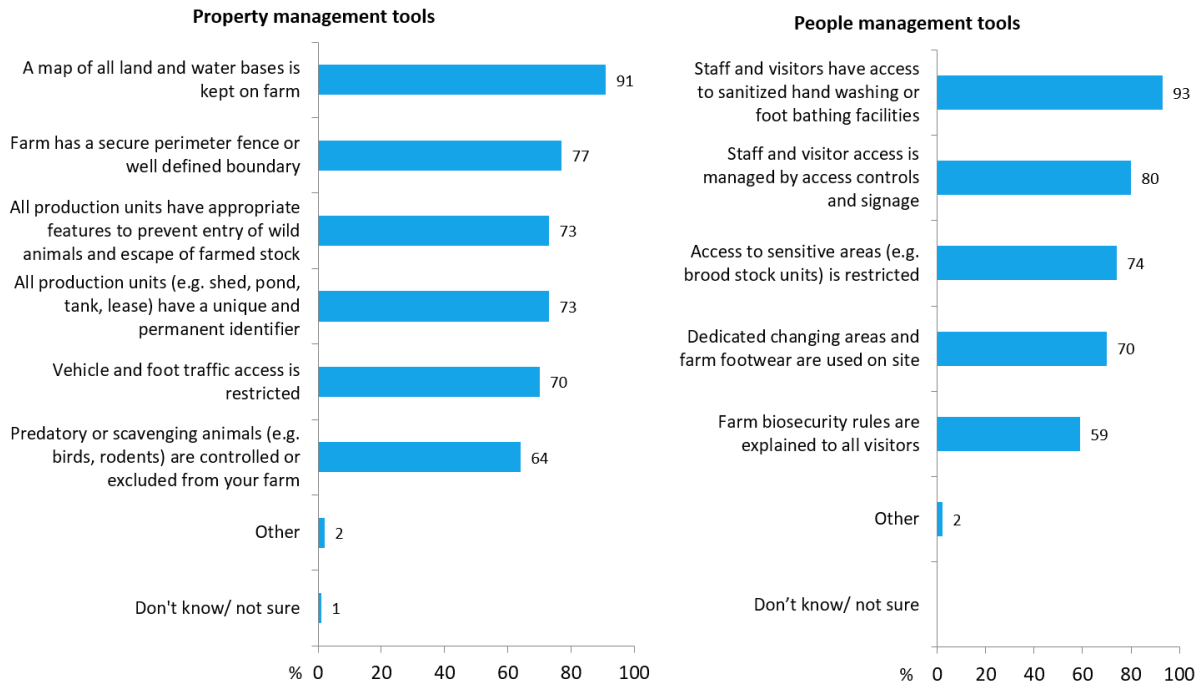
Respondents who indicated they had a secure perimeter fence/well defined boundary, prevented the entry of wild animals and the escape of farmed stock, and restricted access to vehicle and foot traffic were more likely to have a biosecurity plan in place on their farm. Large employers (20 or more staff) were more likely to indicate 'all production units (e.g. shed, pond, tank, lease) have a unique and permanent identifier'. Respondents in the pearl oyster industry were more likely to indicate 'don't know/not sure' (1%) than any other industry although the number of pearl farmers were too small to be definitive. (Figure 18).

3.5.4 People management tools

Ninety three percent of respondents indicated staff and visitors have access to sanitized hand washing or foot bathing facilities and 80% managed staff and visitor access by access controls and signage (Figure 18).

Respondents who indicated they have a biosecurity plan in place were more likely to have sanitized hand washing or foot bathing facilities available to staff and visitors and to have 'dedicated changing areas and farm footwear used on site'. Large employers (20 or more staff) and those with a degree were more likely to indicate 'farm biosecurity rules are explained to all visitors'. Respondents with a degree were also more likely to restrict access to sensitive areas of the farm.

Figure 18. Property and people management tools used on farm.



QD3.	Which of the following *property* management tools do you currently have in place on your farm?	***Base:*** *n=116*
QD4.	Which of the following *people* management practices do you currently have in place on your farm?	***Base:*** *n=116*

3.5.5 Animal management

Almost all respondents (94%) indicated that sick and dead animals are removed from production units and disposed of properly and 85% considered disease risks prior to moving animals on, around or off the farm (Figure 19).

Large employers (20 staff or more) were more likely to indicate that 'quarantine of broodstock is lifelong'. Respondents who indicated 'other' (1%) or 'don't know / not sure' (1%) were more likely to be in the abalone or pearl oyster industries, respectively (Figure 19), although the figures are small and cannot be definitive.

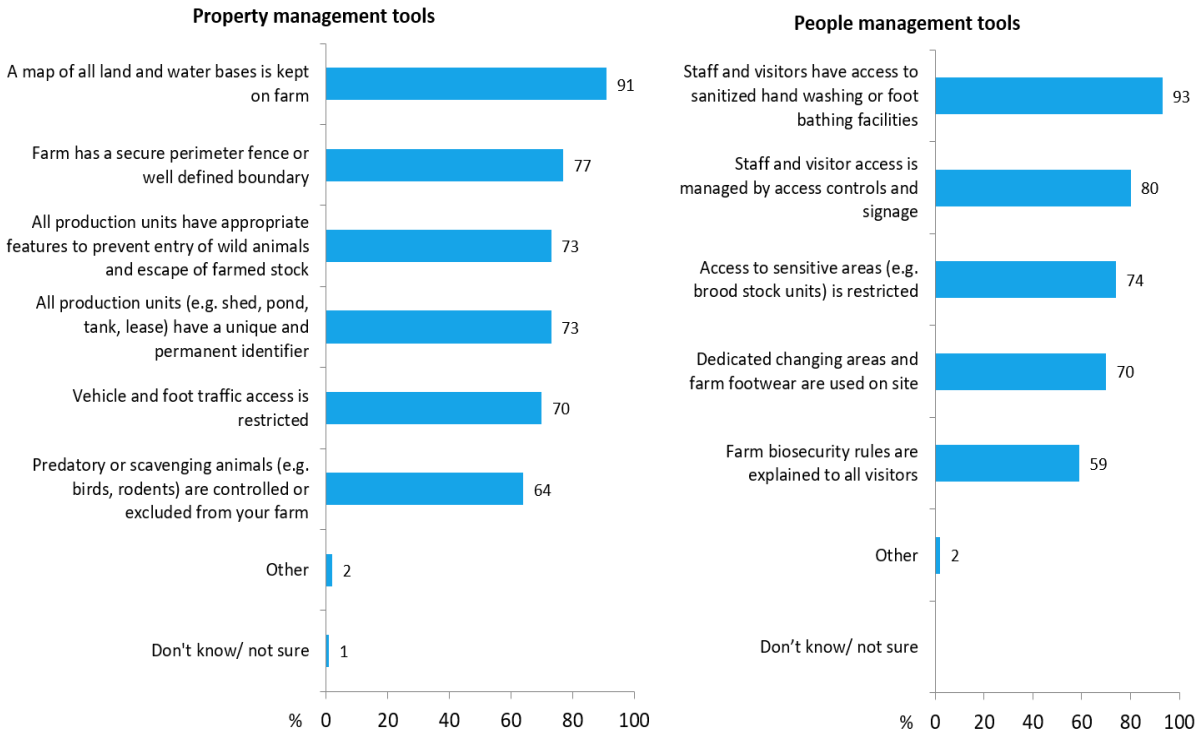
3.5.6 Feed management

Fifty three percent of respondents indicated commercially manufactured feed is used on farm (Figure 19). Twenty seven percent indicated 'oysters feed naturally' and 25% indicated feed or ingredients are irradiated or heat treated prior to use, live or unprocessed feed is sourced from disease free areas, or that feed or ingredients are tested for disease (Figure 19).

Respondents from northern Australia, the barramundi industry or who indicated that have biosecurity plan in place on their farm were more likely to use commercially manufactured feed on

farm. However, respondents from northern Australia were also more likely to indicate that feed or ingredients are irradiated or heat treated prior to use or that live or unprocessed feed is sourced from disease free areas. Respondents with a degree were more likely to use feed or ingredients irradiated or heat treated prior to use and southern Bluefin tuna farmers were more likely indicate that thawed-frozen feeds are used on farm.

Figure 19. Animal and feed management tools used on farm.



QD3.	Which of the following *property* management tools do you currently have in place on your farm?	***Base:*** *n=116*
QD4.	Which of the following *people* management practices do you currently have in place on your farm?	***Base:*** *n=116*

3.5.7 Vehicle and equipment management

Seventy nine percent of respondents indicated their farm had a designated delivery and loading area and 73% had procedures and infrastructure in place to clean and disinfect equipment and vehicles (Figure 20). Sixty eight percent of respondents used separate equipment for different production sites, units or tanks, but only 54% assessed equipment and vehicles brought onto the farm for biosecurity risks (Figure 20).

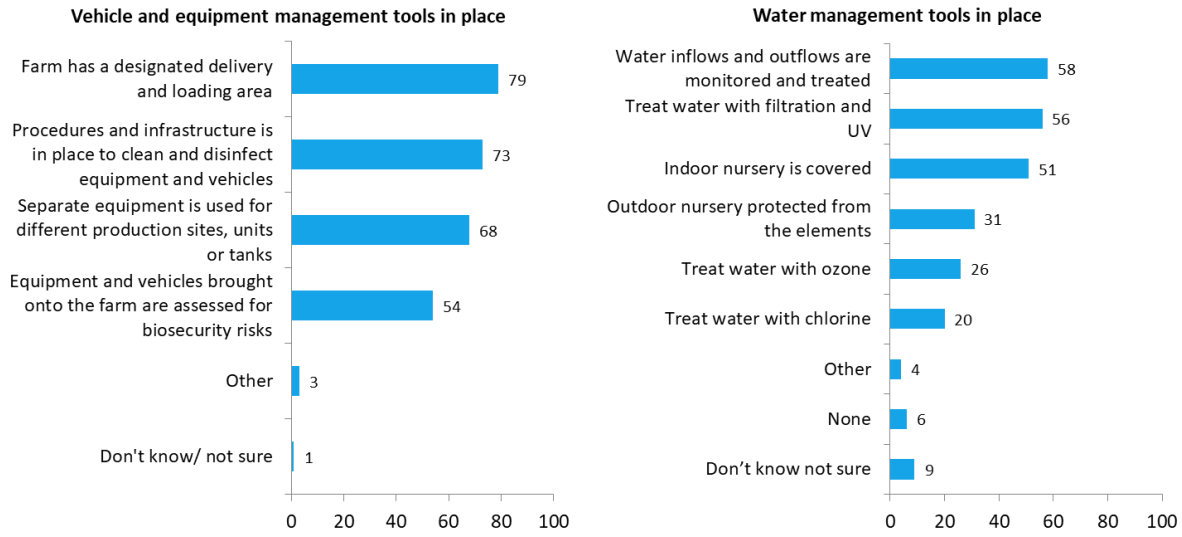
Respondents who indicated they have a biosecurity plan in place were more likely to have procedures and infrastructure in place to clean and disinfect equipment and vehicles, to assess incoming equipment and vehicles for biosecurity risks and to separate equipment and vehicles from different sites, tanks or units. Large employers (20 or more staff) and respondents with a degree were also more likely to indicate they used separate equipment for different production sites, units or tanks. Respondents from the prawn industry in northern Australia were more likely to indicate 'don't know/not sure' (1%) (Figure 20).

3.5.8 Water management

Fifty eight percent of respondents indicated that water inflows are monitored and treated and 56% indicated that water is treated with filtration and UV (Figure 20). Fifty one percent indicated that indoor nurseries are covered and 31% that the outdoor nursery is protected from the elements (Figure 20).

Respondents who indicated they have a biosecurity plan in place were more likely to monitor and treat inflows and outflows, while respondents in the yellowtail kingfish and southern bluefin tuna industries were more likely to indicate 'don't know / not sure' and 'none', respectively.

Figure 20 Vehicle, equipment and water management tools used on farm.



QD7.	Which of the following *vehicle and equipment* management practices do you currently have in place on your farm?	***Base:*** *n=116*
QD8.	Which of the following *water* management practices do you currently have in place on your farm?	***Base:*** *n=114*

3.6 Biosecurity plans

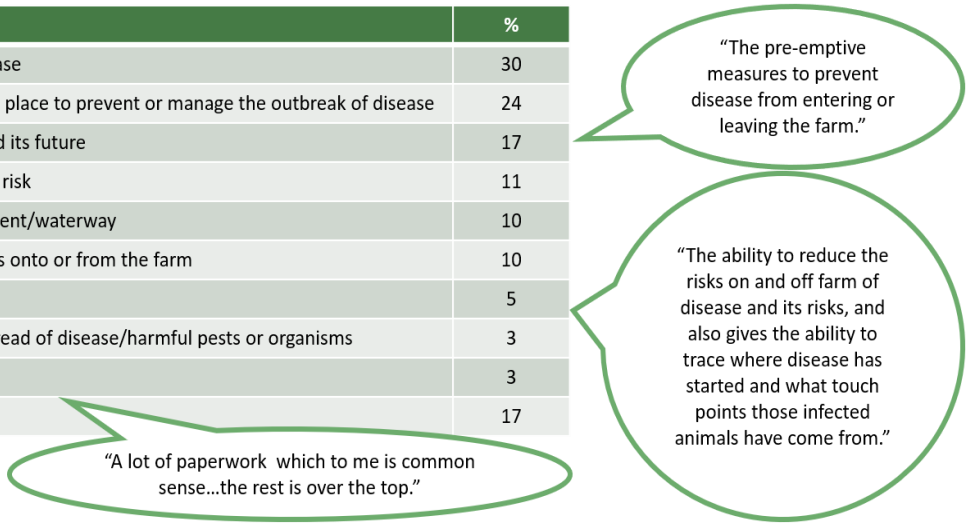
3.6.1 Meaning of the terms 'biosecurity' and 'biosecurity plan'

The words and phrases used by respondents when describing biosecurity in general or biosecurity plans in particular are summarised in Table 3. Thirty percent of respondents associated the terms 'biosecurity' and 'biosecurity plan' with preventing the spread of disease; 24% associated it with 'having a process/system in place to prevent or manage the outbreak of disease'; and 17% associated the terms with protecting the business and its future (Table 3). While most responses centred on either risk management for stock, industry or business, 10% of respondents associated the terms with protecting the health of the environment/waterway (Table 3).

Respondents with a degree were more likely to associate the terms 'biosecurity' and 'biosecurity plan' with insurance and biosecurity officers were more likely to associate the terms with having a process/system in place to prevent or manage disease outbreaks. Respondents who do not have a biosecurity plan in place on their farm were more likely to associate them with 'not bringing diseases/pests onto or from the farm'.

Respondents in the barramundi, edible oyster and prawn industries associated 'biosecurity' and 'biosecurity plans' predominantly with 'prevent the spread of disease', while respondents in the abalone and yellowtail kingfish industries predominantly associated it with 'having a process/system in place to prevent or manage the outbreak of disease' (Table 4). Respondents in the pearl oyster industry predominantly said 'protecting the business and its future', while salmonid farmers focused on 'not bringing pest/disease onto or from the farm' (Table 4).

	%
Prevent the spread of disease	30
Having a process/system in place to prevent or manage the outbreak of disease	24
Protecting the business and its future	17
Minimise disease, mitigate risk	11
Protect health of environment/waterway	10
Not bringing diseases/pests onto or from the farm	10
Keep stock healthy	5
Prevent introduction or spread of disease/harmful pests or organisms	3
Insurance	3
Other	17



QE1. What do the terms 'biosecurity' and 'biosecurity plan' mean to you?
Base: *Those who own, manage, or are responsible for biosecurity on a farm n=115*

Table 3. Meaning of the terms 'biosecurity' and 'biosecurity plan' according to Australian aquaculture farmers.

= highest number of responses for sector

Aquaculture sector n=	Abalone	Yellow tail kingfish	Barramundi	Edible Oysters	Pearl Oysters	Prawns	Salmonids	Bluefin tuna
Prevent the spread of disease (30%)	1	2	7	14	1	7	2	1
Having a process/system in place to prevent or manage the outbreak of disease (24%)	5	3	5	10	1	3	1	1
Protecting the business and its future (17%)	2		1	8	4	3	1	
Minimise disease, mitigate risk (11%)	1	1	4	6	1			
Protect health of environment/waterway (10%)	4			5		1		1
Not bringing diseases/pests onto or from the farm (10%)	1		1	4		2	3	
Keep stock healthy (5%)	1			3			1	1
Prevent introduction/spread of disease/pests or organisms (3%)			1	3				
Insurance (3%)	1		1	1				
Other (17%)	3		2	9		4	1	

QE1. What do the terms 'biosecurity' and 'biosecurity plan' mean to you?
Base: *Those who own, manage, or responsible for biosecurity on a farm n=106*

Table 4. Meaning of the terms 'biosecurity' or 'biosecurity plan' according to each aquaculture sector. While cell sizes were too small to determine statistically significant differences, the highest number of responses provided in each sector is highlighted.

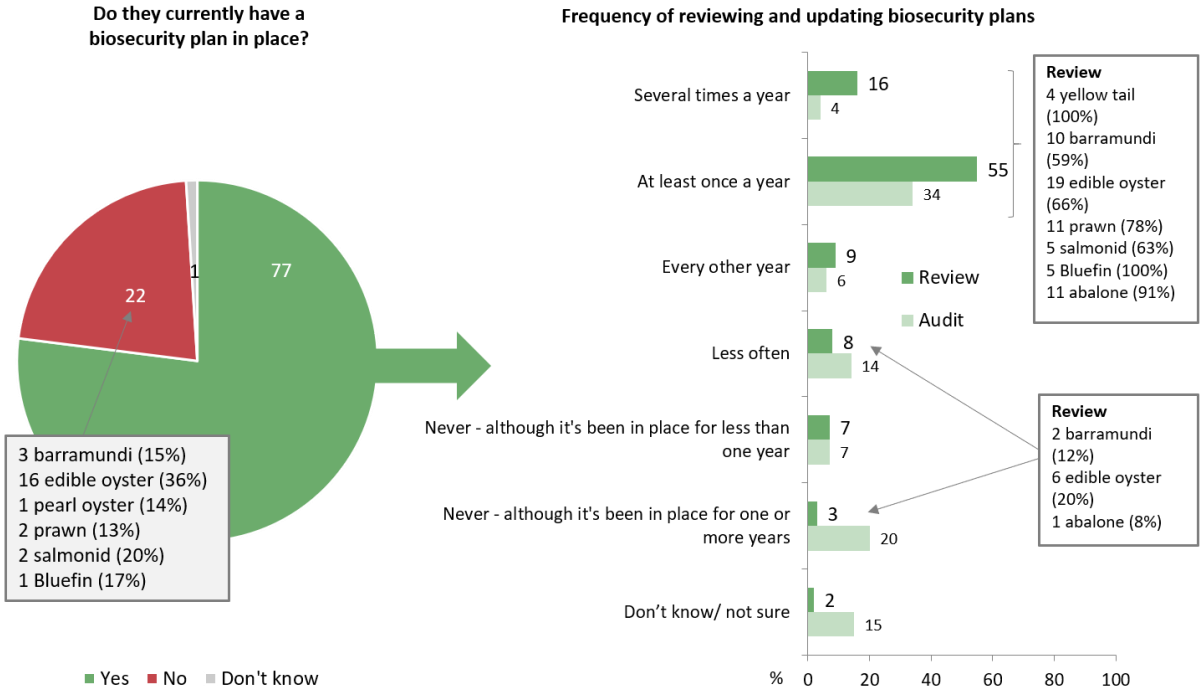
3.6.2 Do you currently have a biosecurity plan in place on your farm?

Seventy seven percent of respondents indicated that they have a 'biosecurity plan' in place on their farm, and of these nearly three quarters (71%) reviewed and updated their 'biosecurity plan' at least once per year (Figure 21). Twenty seven percent of respondents indicated they reviewed and updated their 'biosecurity plan' every other year or less often, or have never done so. Almost one in four (38%) indicated they audited their plan at least once per year and 20% had never had their plan audited despite it being place for one or more years (Figure 21).

It is important to note that respondents were not provided a definition of what constitutes a biosecurity plan according to the national biosecurity plan guidelines and templates. The term 'biosecurity plan' was open to the interpretation of the respondent. Consequently, the type(s) of 'biosecurity plan' indicated by respondents varied from very simple documents through to those consistent with the national guidelines and templates. Similarly, the type of auditing undertaken was not able to be explored within the scope of the survey.

Larger employers (20 or more staff) were less likely to indicate that they reviewed their plan several times a year, while respondents in the salmonid industry were more likely to say they reviewed their plan every other year. Southern bluefin tuna farmers were more likely to say they audited their plan several times a year, while prawn farmers were more likely to indicate they audited their plans less often than every second year, particularly those in southern Australia.

Figure 21. Percentage of respondents that do and do not have a biosecurity plan in place on their farm and the frequency of plan review and/or auditing.



QE2.	Do you currently have a biosecurity plan in place for your farm/s?	***Base**: n=116*
QE3.	With your biosecurity plan, how often do you (a) Review and update; (b) *Have it audited*?	***Base:** Those who have a plan n=90*

3.6.3 Advantages and disadvantages of having a biosecurity plan

Approximately one third of respondents (36%) identified procedure (i.e. ensuring everything that needs to be done is documented) as the main advantage of having a biosecurity plan (Table 5). Twenty nine percent identified 'security against disease for self and industry' as a main advantage. Disadvantages to having a biosecurity plan centred predominantly on management (14%), time (19%) and cost (17%) (Table 5). For respondents who don't currently have a biosecurity plan in place, reasons for not having one focused on the feeling that it was unnecessary (Table 5).

Respondents who have been in the aquaculture industry for 11-15 years, or are from the barramundi industry were more likely to indicate 'protect the environment' as a main advantage.

Those who indicated they 'don't know / not sure' were more likely to have felt that disease risks are exaggerated under section 3.3. Respondents who had indicated that nothing would hold them back from immediately reporting a notifiable disease to government were more likely to say there were no disadvantages to having a biosecurity plan.

Respondents in the abalone, barramundi, edible oyster, pearl oyster and bluefin tuna industries were more likely to say that the main advantage of having a biosecurity plan was that it provided procedures to follow, respondents from the prawn, salmonid and bluefin tuna industries were more likely to indicate the main advantage was security against disease for self and industry, the yellowtail kingfish industry indicated to stop diseases spreading, and edible oysters were also most likely to say that having a plan keeps you aware and vigilant (Table 6).

Respondents in the edible oyster, salmonid and southern bluefin tuna industries were more likely to indicate that there were no disadvantages to having a biosecurity plan (Table 7). Abalone farmers identified the 'costs involved' as the main disadvantage to having a biosecurity plan, while respondents in the barramundi and yellowtail kingfish industries identified the main disadvantage as 'time consuming' (Table 7). Respondents in the prawn industry indicated the 'ongoing management of the plan' as the main disadvantage, while pearl farmers pointed to ensuring others understand and implement the plan as the main disadvantage (Table 7).

Main advantages of having a biosecurity plan	%
Procedural	36
Security against disease for self and industry	29
Training	15
Stops diseases spreading	14
Action plan if something goes wrong	13
Keeps you aware and vigilant	13
Identify and manage risks	11
Protect the environment	5
Market access	3

Main disadvantages of having a biosecurity plan	%
No disadvantages	37
Costs involved	17
Time consuming	19
Ongoing management of the plan	14
Ensuring others understand and implement plans	12
Other	16

"It adds cost to the business and we are only as strong as the weakest link if others don't manage biosecurity well."

"We are in water, we can't stop it. If we get it , we get it. We can only minimise risk of land based contamination. So we don't have a plan for the farm but we do have one for the processing facility."

Reasons for not having a biosecurity plan
Having other plans/ procedures in place
Don't need it/ Not necessary
In the process of getting one done
I know what I'm doing

QE4a. What are the main advantages of having a biosecurity plan? ***Base:*** *Have a biosecurity plan n=88*
QE4b. And what are the main disadvantages, challenges or issues of having a biosecurity plan? ***Base:*** *Have a biosecurity plan n=90*
QE5. And why is it that you don't have a biosecurity plan? What has stopped you from having one? ***Base:*** *Do not have a plan n=25*

Table 5. Main advantages and disadvantages of having a biosecurity plan and reasons for not having a biosecurity plan according to Australian aquaculture farmers.

= highest number of responses for sector

Main advantages of having a biosecurity plan	Abalone	Yellow tail kingfish	Barramundi	Edible Oysters	Pearl Oysters	Prawns	Salmonids	Bluefin tuna
Procedural (36%)	7	1	7	7	5	5	2	2
Security against disease for self and industry (29%)	5		3	6		6	3	2
Training (15%)	4		2	2	1	3		
Stop diseases spreading (14%)	1	5	5		1		1	
Action plan if things go wrong (13%)	2		1	5		1	1	1
Keeps you aware and vigilant (13%)	2		2	7				
Identify and manage risks (11%)		2	2	1		3	1	
Protect the environment (5%)	1		2	1				
Market access (3%)	1			1				

QE1. What do the terms 'biosecurity' and 'biosecurity plan' mean to you?
Base: *Those who own, manage, or responsible for biosecurity on a farm n=106*

Table 6. Main advantages of having a biosecurity plan according to each aquaculture sector. While cell sizes were too small to determine statistically significant differences, the highest number of responses provided in each sector is shown by the highlighted cell.

= highest number of responses for sector

Main disadvantages of having a biosecurity plan	Abalone	Yellow tail kingfish	Barramundi	Edible oysters	Pearl oysters	Prawns	Salmonids	Bluefin
No disadvantages (37%)	1	1	4	15	1	3	5	2
Costs involved (17%)	4		4	3		4		
Time consuming (19%)	2	2	6	3		3	1	
Ongoing management of the plan (14%)	1		3	2	1	6		1
Ensuring others understand and implement plans (12%)			5	1	2	4		
Legislation keeps changing (7%)	2		2	2				
Other (16%)	4	2	1	3	2	1	1	

Reasons for not having a biosecurity plan	
Having other plans/ procedures in place	3 barramundi, 6 edible oysters,
Don't need it/ Not necessary	6 edible oysters, 1 salmonid
In the process of getting one done	1 barramundi, 1 edible oysters, 2 prawns
I know what I'm doing	2 edible oysters, 1 pearl oysters

QE4b. And what are the main disadvantages, challenges or issues of having a biosecurity plan? ***Base: Have a biosecurity plan n=82***
QE5. And why is it that you don't have a biosecurity plan? What has stopped you from having one? ***Base:*** *Do not have a plan n=24*

Table 7. Main disadvantages of having a biosecurity plan and reasons for not having a biosecurity plan according to each aquaculture sector. While cell sizes were too small to determine statistically significant differences, the highest number of responses provided in each sector is shown in the highlighted cell.

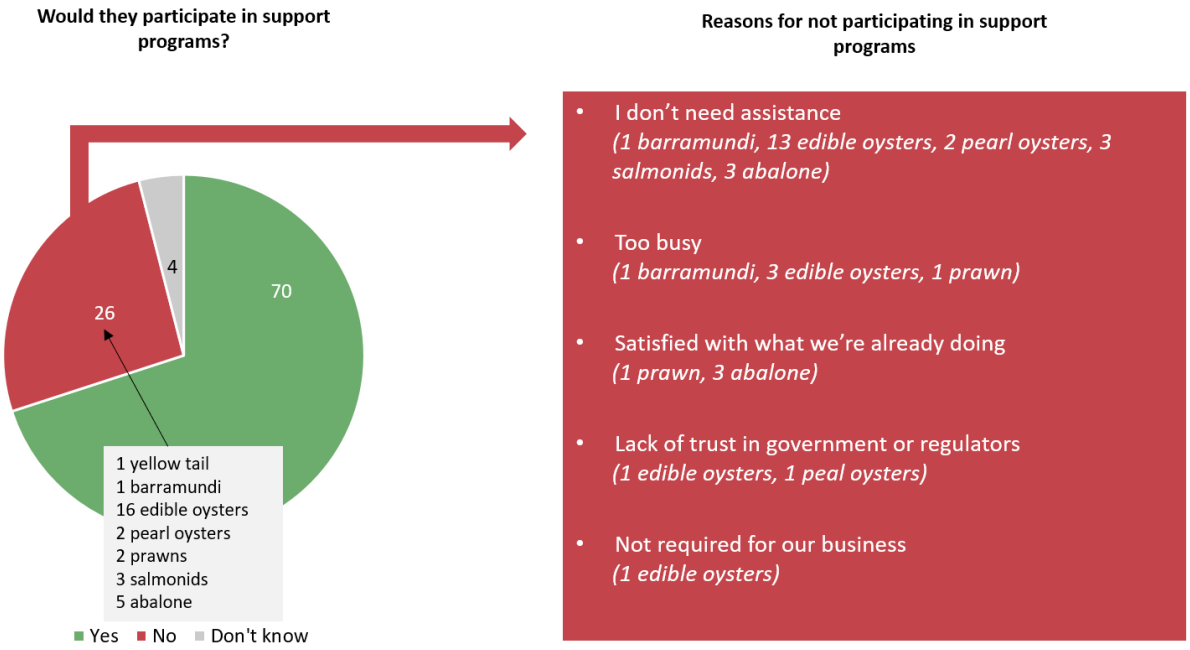
3.7 Support program and tools

3.7.1 Willingness to participate in a support program

Respondents were asked whether they would participate in a support program to help them develop and implement a biosecurity plan for their farm (Figure 22). Seventy percent of respondents indicated that they would participate in such a program; 26% indicated that they would not; and 4% indicated they 'don't know' if they would participate (Figure 22).

Respondents who indicated they would not participate in such a support program cited not needing assistance, being too busy, being satisfied with what they're currently doing, lack of trust in government or regulators, and 'not required' as the main reasons for their response (Figure 22). Respondents in the pearl oyster industry also identified 'it will lead to high costs' as a reason for not participating.

Figure 22. Willingness to participate in a support program to help farmers develop and implement on farm biosecurity plans.



QE6. Would you participate in a support program to help you develop and implement a biosecurity plan for your farm/s?
Base: *Those who own, manage, or responsible for biosecurity on a farm n=116*
QE7. Why not? ***Base:*** *Those who said they wouldn't participate in the support program = 30*

3.7.2 Preferred support tools

To gain a better understanding of which support tools aquaculture farmers in each industry would find most useful, respondents were asked to indicate the degree to which a list of proposed support tools was helpful or not helpful (Figure 23). Respondents identified 'disease reference guides for those considered high risk' (74%) and 'help writing a biosecurity plan to suit your individual property or business' (74%) as the most useful support tools, when the very helpful and extremely helpful categories are considered in combination (Figure 23).

However, it is important to note the variation in the extremely helpful scores against the other options. When looking at the extremely helpful category only, respondents identified 'access to sample kits' (48%), 'products or tools to help identify diseases' (47%), 'disease reference guides for those considered high risk' (45%) and 'sector-specific biosecurity training workshops' as the most useful support tools (Figure 23). 'Voluntary biosecurity plan audits' was the least favoured option regardless of whether the very helpful and extremely helpful categories were considered in combination or not (Figure 23).

Respondents who indicated they had a poor or very poor understanding of biosecurity were more likely to identify 'on-farm biosecurity training for owner/managers' and having an 'aquatic animal biosecurity officer visit your farm and help implement your plan' as very helpful or extremely helpful support tools.

Respondents in northern Australia were more likely to indicate 'general biosecurity training workshops' as a useful support tool.

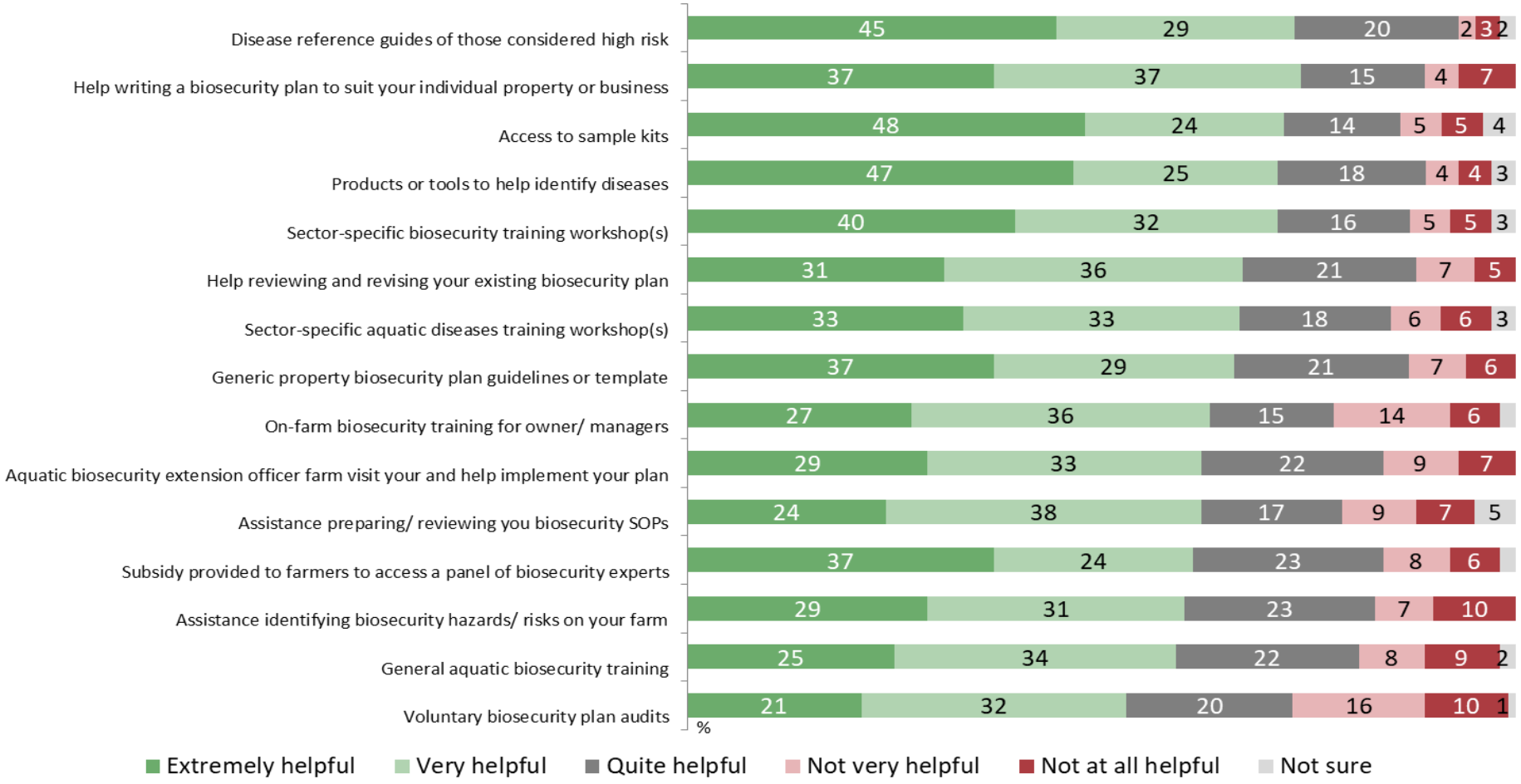
Respondents who felt that biosecurity risks were exaggerated in section 3.3 were more likely to indicate 'not sure' for voluntary audits, sector-specific biosecurity training and aquatic disease training workshops and products or tools to help identify diseases.

Large employers (20 or more staff) were more likely to say that volunteer biosecurity plan audits would be helpful, while small employers were more likely to indicate they are not helpful. Large employers were also more interested in general aquatic biosecurity training. Respondents who had been in the aquaculture industry for 20 or more years did not consider sector-specific biosecurity training workshops to be helpful.

The following support tools were identified by each aquaculture sector as their preferred options (Table 8):

- Abalone: help reviewing and revising your existing biosecurity plan and having an aquatic biosecurity extension officer visit your farm and help implement your plan.
- Barramundi: sector-specific biosecurity training workshops and general aquatic biosecurity training workshops.
- Edible oysters: disease reference guides for those diseases considered high risk.
- Pearl oysters: disease reference guides for those diseases considered high risk.
- Prawns: access to sampling kits and sector-specific biosecurity training workshops.
- Salmonids: disease reference guides for those diseases considered high risk and products or tools to help identify diseases.
- Southern bluefin tuna: access to sampling kits, sector-specific biosecurity training workshops, sector-specific aquatic diseases training workshops, generic property biosecurity plan guidelines or template, on-farm biosecurity training for farm owner/managers and general aquatic biosecurity training workshops.
- Yellowtail kingfish: access to sampling kits, sector-specific biosecurity training workshops and sector-specific aquatic diseases training workshops.

Figure 23. Preferred support tools to develop and implement on farm biosecurity plans according to Australian aquaculture farmers.



QE8. On a scale of 1 to 5, where 1 is not at all helpful and 5 is extremely helpful, how helpful would each of the following support tools be in helping you develop or review a biosecurity plan for your farm/s, should you wish to do so?

Base: *Those who own, manage, or responsible for biosecurity on a farm n=113*

= highest number of responses for sector

Aquaculture sector n=	Abalone	Yellow tail kingfish	Barramundi	Edible Oysters	Pearl Oysters	Prawns	Salmonids	Bluefin tuna
Help writing a biosecurity plan to suit your individual property or business (74%)			2	11	1	3	2	1
Disease reference guides of those considered high risk (74%)	7	3	15	32	5	11	9	4
Products or tools to help identify diseases (72%)	8	3	16	29	4	11	9	4
Access to sampling kits (72%)	8	4	14	30	3	13	8	5
Sector-specific biosecurity training workshop(s) (71%)	8	4	17	28	4	13	5	5
Help reviewing and revising your existing biosecurity plan (68%)	10	2	14	18	2	8	5	4
Sector-specific aquatic diseases training workshop(s) (67%)	7	4	16	26	4	11	6	5
Generic property biosecurity plan guidelines or template (66%)	7	3	15	30	3	10	6	5
On-farm biosecurity training for owners/managers (63%)	7	2	14	28	2	10	7	5
Assistance preparing/reviewing your biosecurity SOPS (63%)	7	1	13	30	1	10	7	4
Subsidy provided to farmers to access a panel of biosecurity experts (62%)	8	2	13	25	2	12	7	4
Help from an aquatic biosecurity extension officer who'll visit your farm and help implement your plan (62%)	10	1	15	25	1	10	7	4
Assistance identifying biosecurity hazards/risks on your farm (60%)	7	1	13	27	4	7	7	4
General aquatic biosecurity training workshop(s) (60%)	5	2	17	22	4	12	4	5
Voluntary biosecurity audits to assess how well your plan is working (54%)	9	1	15	18	3	7	7	4

QE8. On a scale of 1 to 5, where 1 is not at all helpful and 5 is extremely helpful, how helpful would each of the following support tools be in helping you develop or review a biosecurity plan for your farm/s, should you wish to do so?
Base: *Those who own, manage, or responsible for biosecurity on a farm n=112*

Table 8. Preferred support tools to develop and implement on farm biosecurity plans according to each aquaculture sector. While cell sizes were too small to determine statistically significant differences, the highest number of responses provided in each sector is shown in the highlighted cell.

3.8 Information sources and requirements

3.8.1 Obtaining information and advice

Respondents were asked where they typically obtain information and advice regarding aquatic health, aquatic animal protection, disease and other biosecurity matters (Figure 24). Sixty five percent of respondents indicated the relevant state/territory department was their typical source for information and advice. Aquatic veterinarians (33%) an industry bodies or groups (30%) were rated as the second and third most common information sources.

Respondents with a diploma were more likely to indicate biosecurity plans, manuals or fact sheets as their typical information sources, as well as 'accreditation system/QA/industry guidelines'. Respondents who indicated they had a biosecurity plan in place on their farm were most likely to indicate 'industry bodies or groups' as their typical information or advice source.

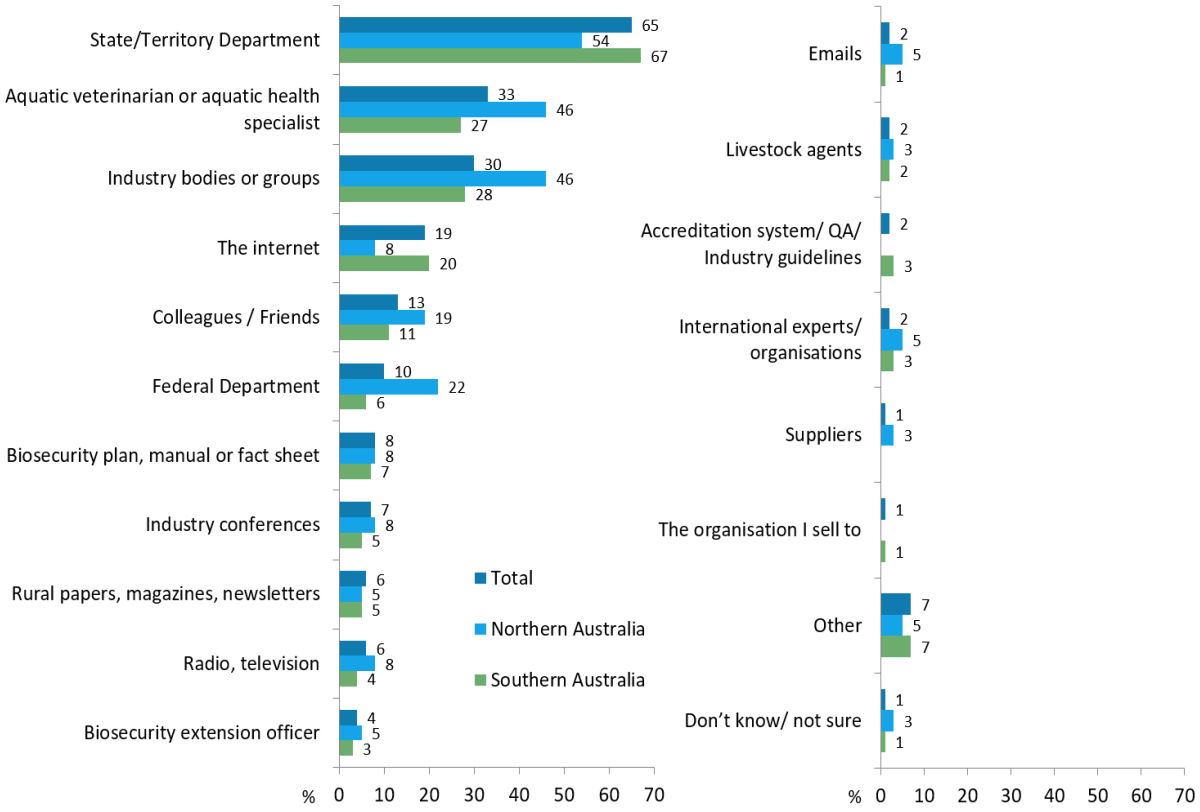
Specific 'industry bodies or groups' as mentioned by respondents included: Animal Health Australia, the Australian Prawn Farmers Association, Oysters Australia, the Pearl Producers Association, the International Pearling Industry, Fish Health, Sunfish and the CSIRO.

Specific 'newsletters' as mentioned by respondents included: the Department of Primary Industries biosecurity newsletter, the Fisheries Research and Development Corporation's FISH magazine, Queensland Fisheries, Global Aquaculture Advocate, and Intrafish Aquaculture.

Specific 'internet sources' as mentioned by respondents included: Google, science and environment websites and laboratories websites; while those who mentioned 'email' as a source cited: scientists, researchers, and laboratories.

Respondents in the abalone, edible oyster, pearl oyster, salmonid and southern bluefin tuna industries cited state/territory departments as their main source of information and advice for aquatic animal health, aquatic animal protection, disease and other biosecurity matters (Table 9). The abalone, barramundi and yellowtail kingfish industries also cited aquatic veterinarians and health consultants as their main source. The prawn industry cited industry bodies or groups as their main source of information (Table 9).

Figure 24. Typical information and advice sources according to Australian aquaculture farmers.



E9. Where do you typically obtain information and advice for animal health, aquatic animal protection, diseases, and other biosecurity matters?
Base: *Total sample n=122*

= highest number of responses for sector

Aquaculture sector n=	Abalone	Yellow tail kingfish	Barramundi	Edible Oysters	Pearl Oysters	Prawns	Salmonids	Bluefin tuna
State/territory department (65%)	8	3	11	35	4	11	7	3
Aquatic veterinarian or health specialist (34%)	8	4	14	3	2	6	5	3
Industry bodies or groups (30%)	6	2	4	6	2	13	2	1
The internet (19%)	3	3	4	10		2	2	2
Colleagues / friends (13%)	3		5	3	2		3	
Federal department (10%)	1	1	4		2	2		2
Biosecurity plan / manual or fact sheet (8%)	4	2	2			1	1	
Industry conferences (7%)	4		3				1	
Rural papers, magazines, newsletters (6%)	2		2	3				
Media, radio, TV (6%)	3		3	1				
Biosecurity officer / extension officer (4%)	2			1		2		
Emails (2%)	1		2					
Livestock agents (2%)	1					1	1	
Accreditation system / QA / industry guidelines (2%)	2						1	
International experts (2%)	1					2		
Suppliers (1%)			1					
The organisation I sell to (1%)				1				
Notes from past training (1%)			1					
Other (4%)				2	1	1	1	
Don't know						1		

E9. Where do you typically obtain information and advice for animal health, aquatic animal protection, diseases, and other biosecurity matters?
Base: *Total sample n=121*

Table 9. Typical information and advice sources according to each aquaculture sector. While cell sizes were too small to determine statistically significant differences, the highest number of responses provided in each sector is highlighted.

3.8.2 Information requirements

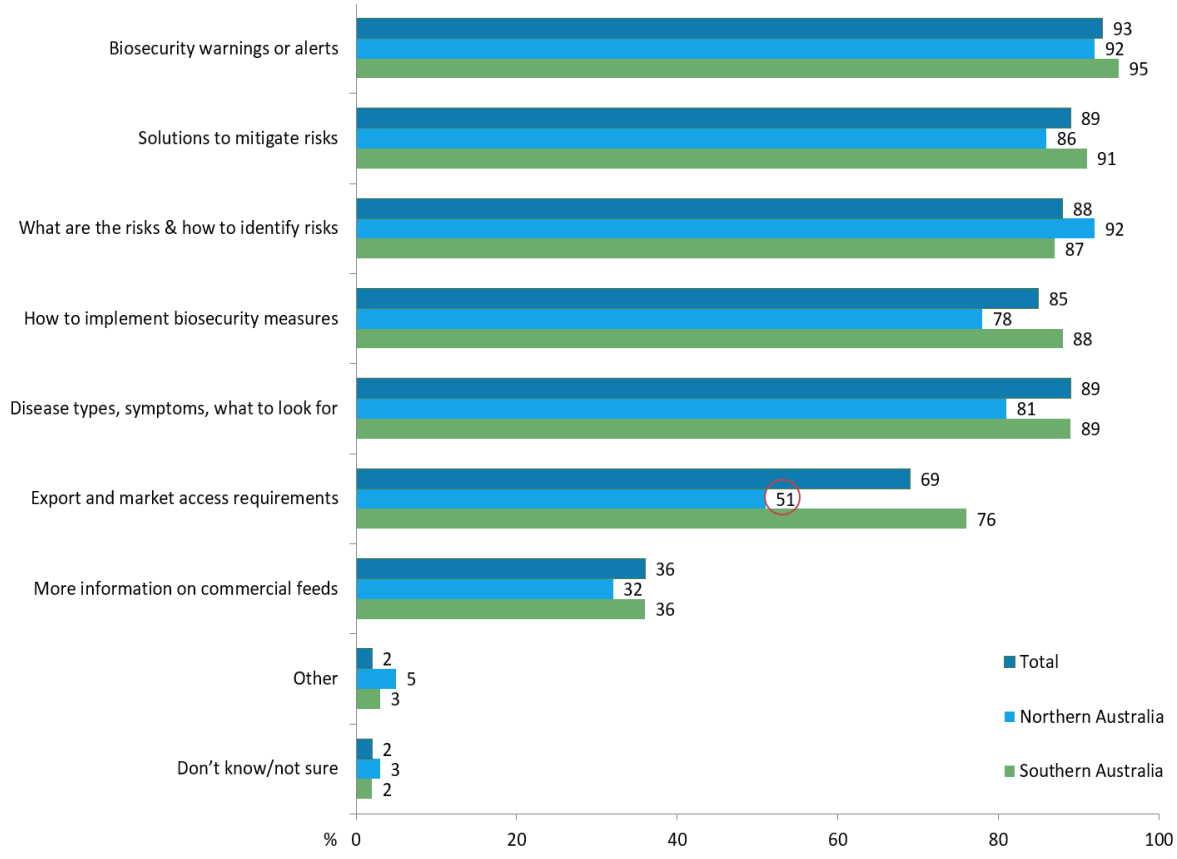
Respondents were asked what type(s) of biosecurity information they felt they needed access to (Figure 25). Respondents indicated that they would like greater access to most kinds of biosecurity information, with 93% indicating they would like to access to 'biosecurity warnings or alerts'; 89% indicating 'solutions to mitigate risks' and 'disease types, symptoms and what to look for'; 88% 'what are the risks and how to identify them'; and 85% more information on 'how to implement biosecurity measures' (Figure 25).

There was significantly less interest in the subject of commercial feeds (36%); and respondents from northern Australia were also less likely to want information on export and market access requirements (51%) compared to those in southern Australia (69%) (Figure 25).

Respondents who indicated they needed more access to information on 'biosecurity warnings and alerts' and 'risks and how to identify them' were more likely to disagree with the statement 'disease risks are exaggerated' under section 3.3. Respondents who indicated they had a good knowledge of biosecurity were more likely to indicate that they wanted more information on 'solutions to mitigate risks' and 'risks and how to identify them'.

Respondents in the prawn and salmonid industries indicated they would most like access to information on 'biosecurity warnings or alerts', 'solutions to mitigate risks' and 'risks and how to identify them' (Table 10). Respondents in the edible oyster industry indicated they would most like access to information on 'disease types, symptoms and what to look for', while pearl farmers indicated 'biosecurity warnings and alerts'; barramundi farmers 'risks and how to identify them'; and abalone farmers 'export and market access requirements' (Table 10). Respondents in the yellowtail kingfish industry indicated they would most like access to 'biosecurity warnings or alerts', 'disease types, symptoms and what to look for', 'solutions to mitigate risks' and 'risks and how to identify them' (Table 10). Southern bluefin tuna farmers indicated they would like more access to all of the suggested options (Table 10).

Figure 25. Biosecurity information that Australian aquaculture farmers feel they need greater access to.



E10. Which of the following specific information or topics about biosecurity do you feel you need to be able to access?
Base: *Total sample n=122*

= highest number of responses for sector

Aquaculture sector n=	Abalone	Yellow tail kingfish	Barramundi	Edible Oysters	Pearl Oysters	Prawns	Salmonids	Bluefin tuna
Biosecurity warnings or alerts (93%)	11	4	18	43	7	19	10	6
Disease types, symptoms, what to look for (89%)	9	4	18	45	6	16	9	6
Solutions to mitigate risks (89%)	10	4	17	41	6	19	10	6
What are the risks and how to identify risks (89%)	9	4	19	39	6	19	10	6
How to implement biosecurity measures (85%)	11	2	15	42	5	18	9	6
Export and market access requirements (68%)	12	2	10	35	3	12	7	6
More information on commercial feeds (36%)	5	2	8	10	3	9	5	6
Other						3		
Don't know / not sure					2			

E10. Which of the following specific information or topics about biosecurity do you feel you need to be able to access?
Base: *Total sample n=121*

Table 10. Biosecurity information needs according to each aquaculture sector. While cell sizes were too small to determine statistically significant differences, the highest number of responses provided in each sector is highlighted.

4. Industry sector profiles

The following information summarises all of the statistically significant differences between the aquaculture sectors and the total sample. Where sample sizes were too small for significance testing, differences are marked in blue to assist profiling.

4.1 Abalone Industry				
Awareness, understanding and attitudes towards biosecurity	**Monitoring and reporting of incidents**	**Specific aquaculture tools and practices**	**Biosecurity plans**	**Support programs, tools and information requirements**
More likely to indicate maximising production/ yield as a main benefit of biosecurity. More likely to identify illegal fishing and offshore activities as a key threat to the aquaculture industry.	Identified abalone viral ganglioneuritis (AVG) and *Perkinsus* spp. as notifiable diseases of importance to their industry.	No significant differences from the total.	Associated the terms 'biosecurity' and 'biosecurity plan' with 'having a process/system in place to prevent or manage the outbreak of disease'. More likely to indicate the 'costs involved' as the main disadvantage to having a biosecurity plan.	Cited 'help reviewing and revising your existing biosecurity plan' and 'having an aquatic biosecurity extension officer visit your farm and help implement your plan' as preferred support tools. Cited 'state/territory departments' and 'aquatic veterinarians and health consultants' as their main sources of information regarding biosecurity. Indicated they would most like access to information on 'export and market access requirements'.

4.2 Barramundi Industry				
Awareness, understanding and attitudes towards biosecurity	**Monitoring and reporting of incidents**	**Specific aquaculture tools and practices**	**Biosecurity plans**	**Support programs, tools and information requirements**
No significant differences from the total.	Identified scale drop syndrome, pot belly disease, Nodavirus, Amyloodinium and marine ich (*Cryptocaryon irritans*) as notifiable diseases of importance to their industry. More likely to 'notify a veterinarian' if they suspected a notifiable disease on their farm.	More likely to use commercial feeds on their farm.	Associated the terms 'biosecurity' and 'biosecurity plan' with 'prevent the spread of disease.' More likely to indicate 'protect the environment' as a main advantage of having a biosecurity plan. More likely to indicate 'time consuming' as the main disadvantage to having a biosecurity plan.	Cited 'sector-specific biosecurity training workshops' and 'general aquatic biosecurity training workshops' as preferred support tools. Cited 'aquatic veterinarians and health consultants' as their main source of information regarding biosecurity. Indicated they would most like access to information on 'risks and how to identify them'.

4.3 Edible Oyster Industry				
Awareness, understanding and attitudes towards biosecurity	**Monitoring and reporting of incidents**	**Specific aquaculture tools and practices**	**Biosecurity plans**	**Support programs, tools and information requirements**
More likely to indicate the environment or preventing the spread of disease as a main benefit(s) of biosecurity. More likely to indicate threats relating to the health of produce as key threats to aquaculture industry. More likely to agree with the statement: 'disease risks are exaggerated'.	More likely to 'contact government' as a first response if they noticed a change in the health of their stock. Identified Pacific Oyster Mortality Syndrome, QX disease and winter mortality syndrome as notifiable diseases of importance to their industry.	No significant differences from the total.	Associated the terms 'biosecurity' and 'biosecurity plan' with 'prevent the spread of disease.' More likely to indicate that there were no disadvantages to having a biosecurity plan.	Cited 'disease reference guides for those diseases considered high risk' as the preferred support tool. Cited 'state/territory departments' as their main source of information regarding biosecurity. Indicated they would most like access to information on 'disease types, symptoms and what to look for'.

4.4 Pearl Oyster Industry				
Awareness, understanding and attitudes towards biosecurity	**Monitoring and reporting of incidents**	**Specific aquaculture tools and practices**	**Biosecurity plans**	**Support programs, tools and information requirements**
More likely to indicate 'excessive use of resources/overfishing' as a main threat to the aquaculture industry.	No significant differences from the total.	No significant differences from the total.	Associated the terms 'biosecurity' and 'biosecurity plan' with 'protecting the business and its future'. More likely to indicate 'ensuring others understand and implement the plan' as the main disadvantage to having a biosecurity plan.	More likely to indicate 'high costs' as a reason for not participating in a support program. Cited 'disease reference guides for those diseases considered high risk' as the preferred support tool. Cited 'state/territory departments' as their main source of information regarding biosecurity. Indicated they would most like access to information on 'biosecurity warnings and alerts'.

4.5 Prawn Industry				
Awareness, understanding and attitudes towards biosecurity	**Monitoring and reporting of incidents**	**Specific aquaculture tools and practices**	**Biosecurity plans**	**Support programs, tools and information requirements**
More likely to indicate 'white spot' as a main threat to the aquaculture industry.	More likely to use 'sick or dying animals' a trigger for concern for the health of their stock. More likely to 'check the water quality' as a first response if they noticed a change in the health of their stock. Identified yellow head virus as a notifiable disease of importance to their industry.	No significant differences from the total.	Associated the terms 'biosecurity' and 'biosecurity plan' with 'prevent the spread of disease.' More likely to indicate they audited their biosecurity plan less often than every second year, particularly those in southern Australia. More likely to indicate the 'ongoing management of the plan' as the main disadvantage to having a biosecurity plan.	Cited 'access to sampling kits' and 'sector-specific biosecurity training workshops' as the preferred support tools. Cited 'industry bodies and groups' as their main source of information regarding biosecurity. Indicated they would most like access to information on 'biosecurity warnings or alerts', 'solutions to mitigate risks' and 'risks and how to identify them'.

4.6 Salmonid Industry				
Awareness, understanding and attitudes towards biosecurity	**Monitoring and reporting of incidents**	**Specific aquaculture tools and practices**	**Biosecurity plans**	**Support programs, tools and information requirements**
No significant differences from the total.	More likely to indicate 'wait and see' as a first response if they noticed a change in the health of their stock.	No significant differences from the total.	Associated the terms 'biosecurity' and 'biosecurity plan' with 'not bringing pest/disease onto or from the farm'. More likely to indicate they reviewed their biosecurity plan every other year. More likely to indicate that there were no disadvantages to having a biosecurity plan.	Cited 'disease reference guides for those diseases considered high risk' and 'products or tools to help identify diseases' as the preferred support tools. Cited 'state/territory departments' as their main source of information regarding biosecurity. Indicated they would most like access to information on 'biosecurity warnings or alerts', 'solutions to mitigate risks' and 'risks and how to identify them'.

4.7 Southern Bluefin Tuna Industry				
Awareness, understanding and attitudes towards biosecurity	**Monitoring and reporting of incidents**	**Specific aquaculture tools and practices**	**Biosecurity plans**	**Support programs, tools and information requirements**
No significant differences from the total.	More likely to 'contact a health consultant' as first response if they noticed a change in the health of their stock. Identified flatworm and mud worm as notifiable diseases of importance to their industry.	More likely to use thawed-frozen feeds on their farm.	More likely to indicate that they audit their biosecurity plan several times a year. More likely to indicate that there were no disadvantages to having a biosecurity plan.	Cited 'access to sampling kits', 'sector-specific biosecurity training workshops', 'sector-specific aquatic diseases training workshops', 'generic property biosecurity plan guidelines or template', 'on-farm biosecurity training for farm owner/managers' and 'general aquatic biosecurity training workshops' as the preferred support tools. Cited 'state/territory departments' as their main source of information regarding biosecurity. Indicated they would like more access to all of the information options suggested in Table 9.

4.8 Yellowtail Kingfish Industry				
Awareness, understanding and attitudes towards biosecurity	**Monitoring and reporting of incidents**	**Specific aquaculture tools and practices**	**Biosecurity plans**	**Support programs, tools and information requirements**
More likely to indicate 'abide by the law/government' as a main benefit of biosecurity.	More likely to use 'guidelines' as a trigger for concern for the health of their stock. More likely to 'ask a health consultant' to know if their stock is infected by disease. More likely to 'notify the owner/manager' AND to 'know what to do because they have seen it before' if they suspected a notifiable disease on their farm.	No significant differences from the total.	Associated the terms 'biosecurity' and 'biosecurity plan' with 'having a process/system in place to prevent or manage the outbreak of disease'. More likely to indicate 'time consuming' as the main disadvantage to having a biosecurity plan.	Cited 'access to sampling kits', 'sector-specific biosecurity training workshops' and 'sector-specific aquatic diseases training workshops' as the preferred support tools. Cited 'aquatic veterinarians and health consultants' as their main source of information regarding biosecurity. Indicated they would most like access to information on 'biosecurity warnings or alerts', 'disease types, symptoms and what to look for', 'solutions to mitigate risks' and 'risks and how to identify them'.

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