SAFEFISH ACTIONABLE RISK REGISTER
RISK IDENTIFICATION

PROGRESS REPORT - MAY 2022

Risk Identification phase developed for SafeFish by:

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ACKNOWLEDGEMENTS

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The scope and approach for the actionable risk register have been agreed and co-developed by a voluntary steering group from SafeFish: Dr. Cristina Lesseur, Program Lead, Natalie Dowsett (SARDI) – SafeFish Executive Officer, Dr. Alison Turnbull (SafeFish/UTAS), Erik Poole (Sydney Fish Market), Mark Boulter (Food and Beverages Importers Association), Dr. Carolyn Stewardson (FRDC), Dr. Andrew Keller (FSANZ) Veronica Papacosta (Seafood Industry Australia, SIA) and a TBC member of the Tasmanian Salmon Growers Association (TSGA).

The research team would like to thank and acknowledge the participants that completed the survey, the people that joined our brainstorming sessions, as well as the expert interviewees who kindly provided their time to help us understand the views and challenges for the Australian seafood industry from their perspective (Crisis management, Food Industry and China).

DISCLAIMER

The current results are based on data obtained from surveys, interactive brainstorming sessions and interviews completed by seafood industry contacts and key stakeholders, plus some experts from relevant areas. The sample size is limited and not fully comprehensive of all aspects of the practices and risk perceptions. It does not have statistical significance and is mostly qualitative in nature. Quantitative data and rankings are indicative and solely based on the responses obtained by study methods. The authors have captured the concerns and opportunities, strictly based on the information provided.

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EXECUTIVE SUMMARY

Recent global events, like the COVID-19 pandemic, economic and political volatility, and climate related disruptions, have highlighted the need for resilience and preparedness. The smart way to navigate an unpredictable future and fast changing environment, is to improve our risk management culture and maturity. SafeFish clearly identified this need for the Australian seafood Industry and has set up the Actionable Risk Register program to support their members to build better knowledge and tools in managing their most relevant risks.

This report focuses on the results from the initial phase of the program, where the objective was to identify the most relevant risks for seafood related to food safety and trade and market access. This was achieved by gathering insights from industry stakeholders and key experts in seafood research and regulations, food safety and material areas of concern such as crisis management, geopolitical (China) and general food industry practices. The final data was analysed, then summarised and included a balanced demographic of participation between sectors and supply chain roles, highlighting the areas that require attention and preparedness.

Figure 1 details the top 32 risks identified through this process, organized by severity, from critical to low. The bullseye shows the top five most critical risks as being: increased presence, virulence and challenges of *Vibrio* species, climate change impacts, geopolitical uncertainties for trade, industry not adapting effectively to traceability and authenticity needs, and increasing harmful algae blooms with low awareness of biotoxins and Ciguatera.

Table 1 follows the bullseye with a filter of the risks into three categories: (a) those that fall strictly within SafeFish's ability to influence and support, (b) those where SafeFish can support partially or indirectly, and (c) the risks that need to be addressed by industry or government.

The report develops in detail every aspect of the risk identification process and clustered results obtained via different methods: surveys, guided brainstorming sessions and in-depth interviews with key experts. It also provides a much broader view of concerns for the current state of the industry as well as a foresight exercise into the future.

This identification phase provided further reflections that should be considered to develop quicker and more effective outcomes for the following phases of this program. Many of the top risks are common for the whole of the seafood industry and should be approached collectively and collaboratively. These risks are complex and contain multilayers that combine food safety and market access elements which require a different strategy to that of traditional, individual risk management tools. It is recommended, that these issues are socialised, and approached in a smart, resilient and innovative way.

The suggested approach is to pilot the emergence of Vibrio species as our top common risk and develop the assessment and risk control plans collectively. In parallel to this, we will also set up sector groups to identify their most relevant risks and develop a smart approach for the complex, existential risks like climate change and geopolitical uncertainties. As we progress these three variable scenarios, we will learn and capture the best practices to use and will in turn develop a resilient risk culture for the seafood industry.

Figure 1.-Safefish Risk Register for the Australian Seafood Industry-Top Risks

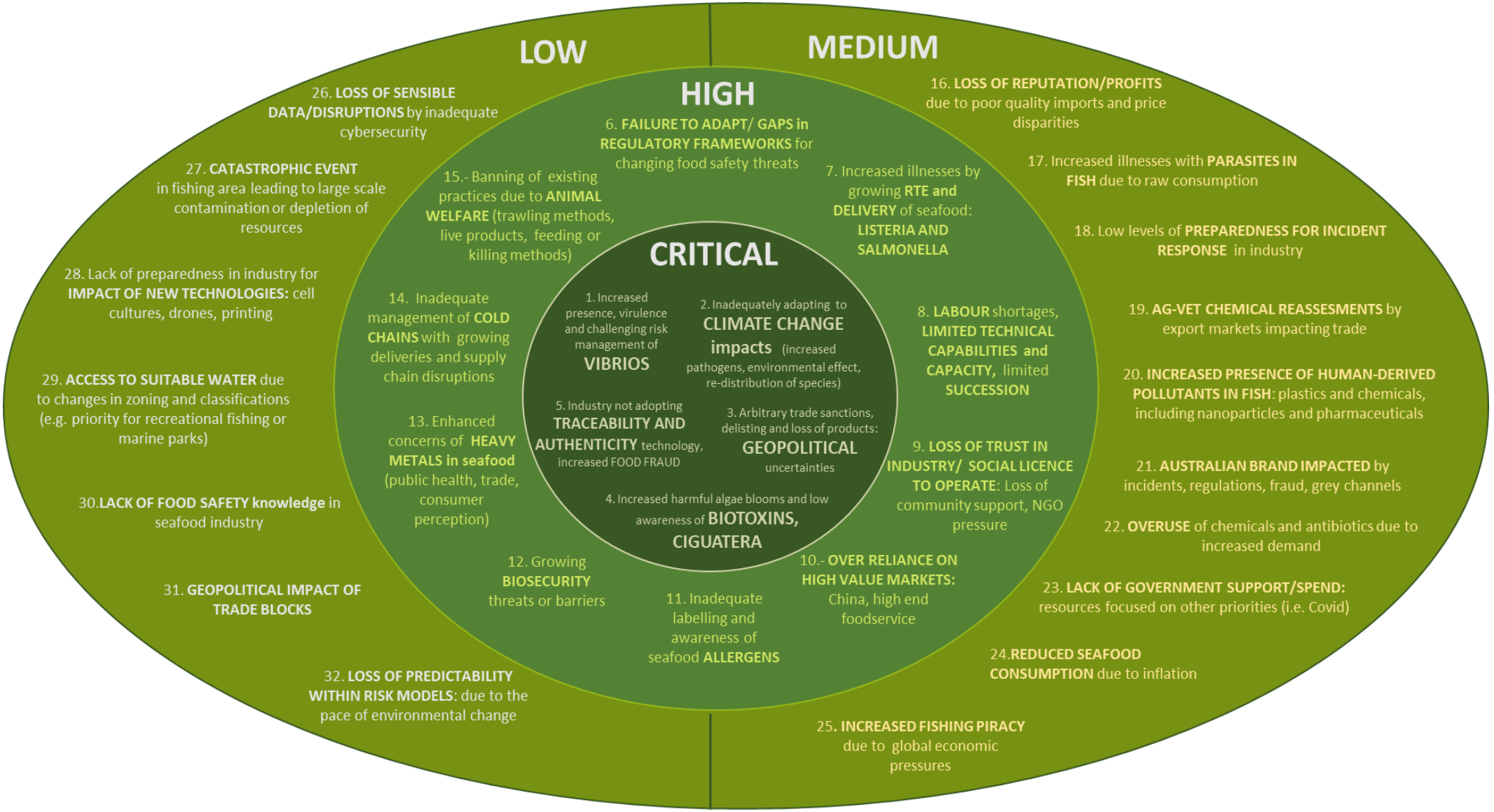


Table 1.- Top Risks identified categorised by SafeFish's ability to support or influence

SAFEFISH CAN SUPPORT DIRECTLY: Within its area of influence and capability

1. Increased presence, virulence and challenging risk management of VIBRIOS
4. Increased harmful algae blooms and low awareness of BIOTOXINS, CIGUATERA
7. Increased illnesses by growing RTE and DELIVERY of seafood: LISTERIA AND SALMONELLA
17. Increased illnesses with PARASITES IN FISH due to raw consumption
19. AG-VET CHEMICAL REASSESMENTS by export markets impacting trade
20. INCREASED PRESENCE OF HUMAN-DERIVED POLLUTANTS IN FISH: plastics and chemicals, including nanoparticles and pharmaceuticals
30. LACK OF FOOD SAFETY knowledge in seafood industry

SAFEFISH SUPPORTS INDIRECTLY/PARTIALLY:

Some aspects of these complex risks may fall within SafeFish's ability to influence or facilitate

2. Inadequately adapting to CLIMATE CHANGE impacts (increased pathogens, environmental effect, re-distribution of species)
5. Industry not adopting TRACEABILITY AND AUTHENTICITY technology, increased FOOD FRAUD
8. LABOUR shortages, LIMITED TECHNICAL CAPABILITIES and CAPACITY, limited SUCCESSION
11. Inadequate labelling and awareness of seafood ALLERGENS
14. Inadequate management of COLD CHAINS with growing deliveries and supply chain disruptions
18. Low levels of PREPAREDNESS FOR INCIDENT RESPONSE in industry
21. AUSTRALIAN BRAND IMPACTED by incidents, regulations, fraud, grey channels
22. OVERUSE of chemicals and antibiotics due to increased demand
27. CATASTROPHIC EVENT in fishing area leading to large scale contamination or depletion of resources
28. Lack of preparedness in industry for IMPACT OF NEW TECHNOLOGIES: cell cultures, drones, printing
32. LOSS OF PREDICTABILITY WITHIN RISK MODELS: due to the pace of environmental change

OUTSIDE OF SAFEFISH'S SCOPE: Industry or Government's focus

9. LOSS OF TRUST IN INDUSTRY/ SOCIAL LICENCE TO OPERATE: Loss of community support, NGO pressure
10.- OVER RELIANCE ON HIGH VALUE MARKETS: China, high end foodservice
12. Growing BIOSECURITY threats or barriers
13. Enhanced concerns of HEAVY METALS in seafood (public health, trade, consumer perception)
15.- Banning of existing practices due to ANIMAL WELFARE (trawling methods, live products, feeding or killing methods)
16. LOSS OF REPUTATION/PROFITS due to poor quality imports and price disparities
23. LACK OF GOVERNMENT SUPPORT/SPEND: resources focused on other priorities (i.e. Covid)
24. REDUCED SEAFOOD CONSUMPTION due to inflation
26. LOSS OF SENSIBLE DATA/DISRUPTIONS by inadequate cybersecurity
25. INCREASED FISHING PIRACY due to global economic pressures
29. ACCESS TO SUITABLE WATER due to changes in zoning and classifications (e.g. priority for recreational fishing or marine parks)
31. GEOPOLITICAL IMPACT OF TRADE BLOCKS

INTRODUCTION

SafeFish identified the need to develop a thorough understanding of the current and future risks for the Australian seafood Industry and build a framework for preparedness and mitigation that will help be more resilient and adapt to these challenges in an effective, actionable and collaborative way.

In the application for funding for the SafeFish project to the FRDC, the Secretariat specified the following: 'SafeFish will create a food safety risk register for the seafood industry that will be compiled through work-shopping risks with key stakeholders, including SafeFish partners and industry groups. Where significant risks are identified we will develop mitigation plans that include short- and long-term actions to address the risk. The register will be reviewed annually, and information from here will feed into the SafeFish prioritisation plan. The national register of food safety/market access risks for the seafood industry will be maintained by SafeFish but will also be incorporated with the seafood Industry Australia broader risk register.'.

To assist with the development of an Australian seafood risk register, SafeFish engaged CL Advisory as an expert consultant to facilitate the process. In addition to this, a steering group of SafeFish partners and funders was also convened to support the development of the register, and to make sure the deliverables were an appropriate representation of the 'whole of seafood' view. The risk framework model that was agreed to by SafeFish and the CL Advisory to develop the register is described in Figure 2.

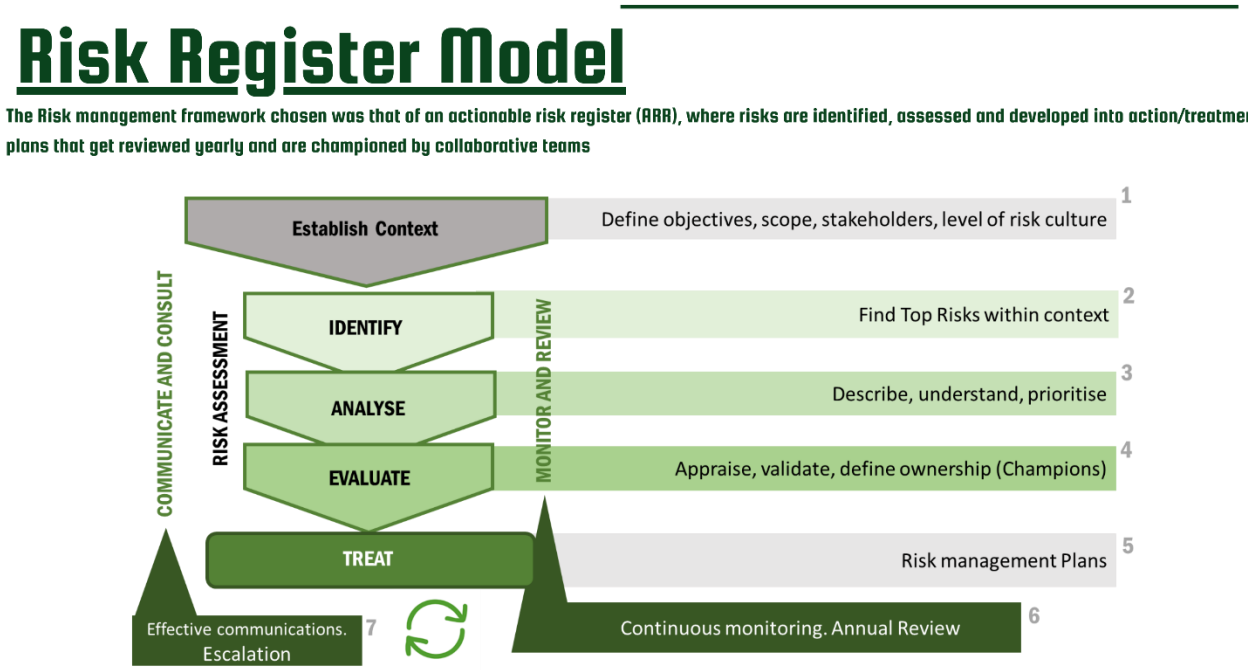


Figure 2.- Actionable risk register (ARR) model agreed for SafeFish.

The first step within the framework was to establish the risk context. This was developed and agreed with the steering group committee (defining objectives, scope, stakeholders and level of risk culture) and is shown below:

OBJECTIVES:

- To develop an Actionable Risk Register (ARR) for the Australian seafood Industry, focused on Food Safety, Trade and Market Access, aligned with SafeFish' goals
- To promote risk culture and ownership amongst key Industry stakeholders

- To develop a collaborative model to monitor and manage common risks for the Australian seafood industry

SCOPE:

- The ARR will identify and cover the top 10-20 most relevant risks in food safety, trade and market access
- Other risks identified outside of these categories will be omitted as they are out of scope for this program
- The chosen risks are dynamic, as every year they will be reviewed and could change to reflect new realities.

STAKEHOLDERS:

- Members and Partners of SafeFish.
- For consulting and communication: additional seafood industry and government stakeholders, local and international experts

LEVEL OF RISK CULTURE:

Quite variable within industry.

The second step of the model is to identify the top risks. Although there are different risk priorities for the various sectors and supply chain areas, the initial approach was set for identifying the top food safety, trade and market access risks for the broader Australian seafood industry. In later stages, there will be a deep dive to determine the most relevant, actionable risks for the individual sectors or high-risk issues that affect multiple industries.

In order to find the top material, and critical risks for the industry, the team agreed to use a mixed methodology approach to allow better engagement and to capture a comprehensive view from various stakeholders. A summary of the different techniques used is described in Figure 3.

METHODOLOGY

Figure 3.- Data capturing methods used to identify the top risks for the seafood industry.

The participants were nominated by SafeFish members or funders and were required to fit within a set criteria. An additional set of participants called wildcards (based on a specific expertise or knowledge) were also added to the mix. All the nominees were given the option to choose between completing an online survey or joining a virtual brainstorming session.

Survey respondents were asked to provide their top five risks within the set scope and describe in detail, causes and consequences (unprompted risks). Then they were asked to rank a pre-set of risks (prompted).

The brainstorming sessions were held virtually and were run in two groups. Participants provided an initial view on top-of-mind risks (current and future) followed by a brainstorming whiteboard activity that allowed collaboration and building on others' thoughts and ideas. They were also asked to vote and rank the most relevant risks based on the data collected.

Three in-depth interviews were also conducted to capture the lens of experts in certain key areas: Crisis management, Food industry and China.

RESULTS:

I.- SURVEYS

A summary of the results obtained via surveys is depicted in Figure 4. A 46% response rate allowed us to capture a total of 185 risks described and categorised by respondents spontaneously from critical to low. We also compared these unprompted responses to the results obtained when they were given a list of prompted risks to rank from most severe to less, and found they were quite similar. This confirmed the top risks from the survey as portrayed in the funnel graph in Figure 5. The most critical risks identified were the emergence of Vibrio species, biotoxins, climate change, geopolitical risks, Ciguatera, *Listeria* and food fraud.

Figure 4.- Summary of survey results.

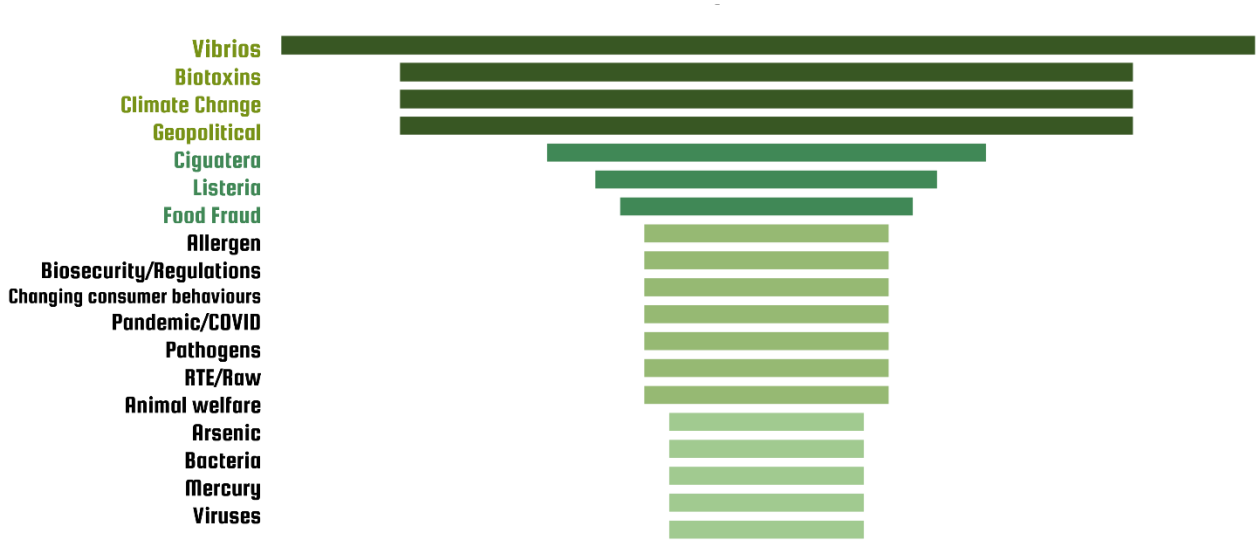


Figure 5.- Top risks identified by survey responses. The picture shows the results from the unprompted data, but there are strong similarities with the ranking of prompted risk scores.

Table 1 below, compares the ranking results of the unprompted versus prompted and ranked risks for food safety and trade and market access issues, showcasing a strong coincidence in the top 6 risks identified. It also found a very close alignment of the issues in the subsequent layers. The top food safety risks are closely related to climate change impacts or consequences. When looking at the trade risks, there is a clear reflection of the concern raised by recent geopolitical events experienced first-hand by the seafood industry.

These results also illustrate the interconnected nature of the food safety and trade and market access concerns, as some become causes or consequences of one another. Most of the critical risks identified are existential risks, which are very complex, multi-factor risks that require a different approach to control and mitigate them due to their cross-functional nature (a good example of this is COVID, which was a huge health-related risk, but affected livelihoods, financial and social elements of our lives in a very significant ways and therefore required a versatile and cohesive approach from many professionals).

Overall Risks- unprompted	Market- prompted	Food Safety-prompted
1. Vibrios	1. Geopolitical	1. Vibrios
2. Biotoxins	2. Climate change	2. Biotoxins
3. Climate Change	3. Traceability/Transparency	3. Ciguatera
4. Geopolitical	4. Biosecurity Threats	4. Listeria
5. Ciguatera	5. Change in Regulations/	5. Salmonella
6. Listeria	6. Food Fraud	6. Viruses
7. Food Fraud	7. Overfishing	7. Allergens
8. Allergen	8. Pandemics	8. Histamine
9. Biosecurity/ Regulations	9. Biosecurity /Regulatory hurdles	9. Parasites
10. Changing consumer behaviours	10. E-commerce / Supply chain disruptions	10. Mercury
11. Pandemic/COVID	11. Changing consumer behaviours (Raw, on the go, deliveries)	11. Arsenic
12. Pathogens		12. Cadmilum
13. RTE/Raw		13. Lead
14. Animal welfare		
15. Arsenic		
16. Bacteria		
17. Mercury		
18. Viruses		

Table 2- Comparison of final risk rankings between prompted and unprompted sections of the survey.

In terms of the representation of the seafood industry and knowledge of the survey respondents, we found that the sample was very well distributed, meaning the split of participants from various sectors, fields of activity, areas of the supply chain and geography were quite balanced. This allowed the results to capture a comprehensive and diverse set of concerns from all areas. A demographic snapshot of the survey is summarised in Figure 6.

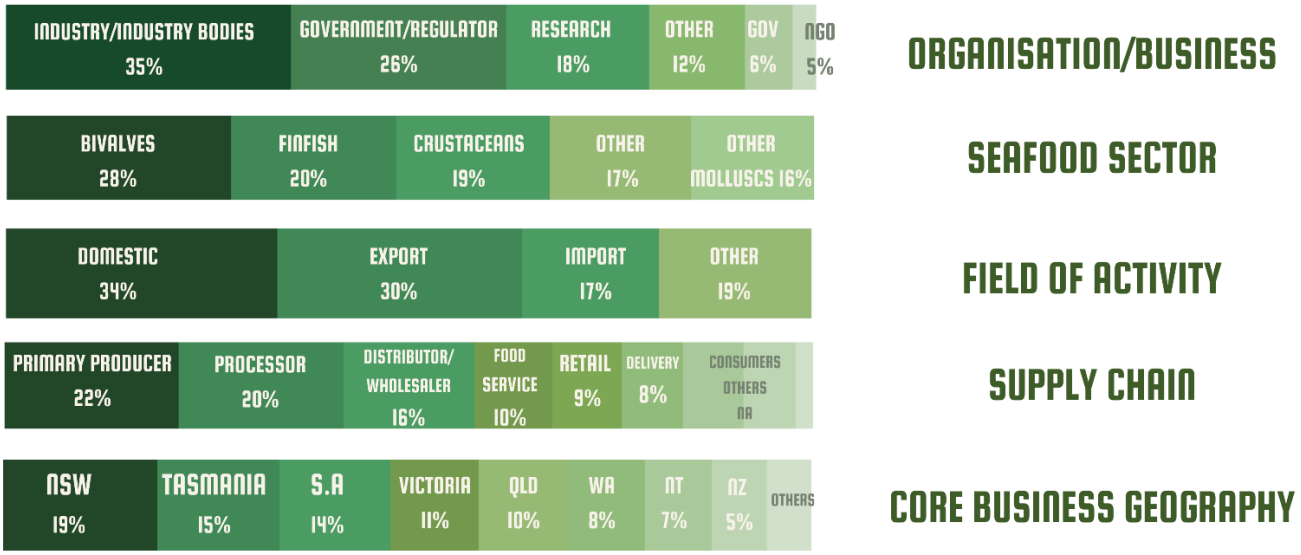


Figure 6.- Survey respondents' demographic details.

II.- BRAINSTORMING SESSIONS:

Two sessions were run with a total of 9 participants, which included stakeholders from industry, regulators, and researchers in areas of social and scientific sciences related to seafood. 45 themes were captured and 145 individual issues or concerning topics were raised. Participants voted and ranked their issues and we collated and mixed the data from the two groups into a bullseye of the most relevant risks as well as the top issues. They are described in Figures 7 and 8.

In addition to the top risks captured by the survey, it can be seen that there are a few additional themes, including the concerns around labour shortages and weak technical capabilities with limited succession planning in the industry. Traceability moves to a higher level of concern, and it is described mainly as industry not keeping up with the technological advances in this area, as well as the increased challenges of food fraud and authenticity. Another two issues that reached the centre are cold chain management difficulties and the consumer preferences around raw or ready to eat food preparations.

Because the sessions allowed the ability to discuss and collaborate as a group, a whole set of specific debates came to life, showcasing other risks for the industry that were not detected or considered less relevant in the survey. These include the case for increased pollution and pollutants in the waters, the strong reliance of industry on premium export markets or high-end foodservice margins, the challenges of maintaining reputation against low quality imports or the potential to lose the social licence to operate with the rising pressures from Non-Government Organisations (NGOs) and media stories.

Nevertheless, the critical risks captured did have a clear alignment with survey results in many areas, but added the human capital dimension, as well as a few elements of the supply chain and consumer behaviours such as cold chain, traceability technology and raw fish consumption (Figure 8)

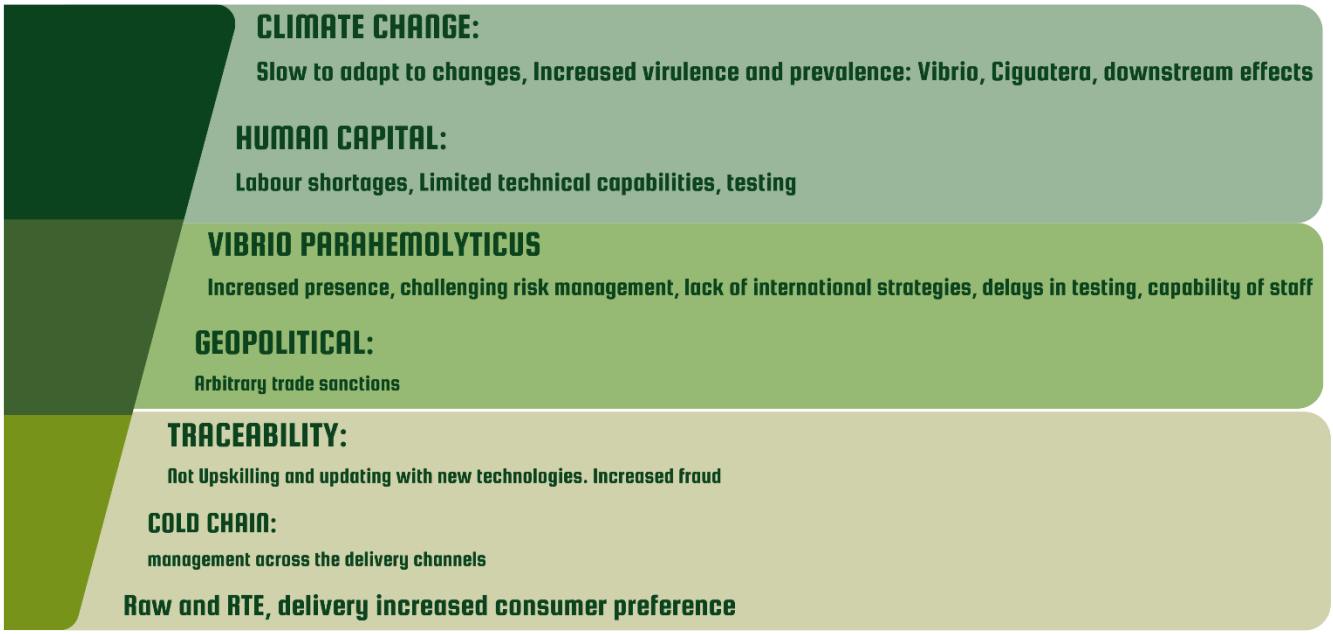


Figure 7.- Critical risks summary of the brainstorming sessions.

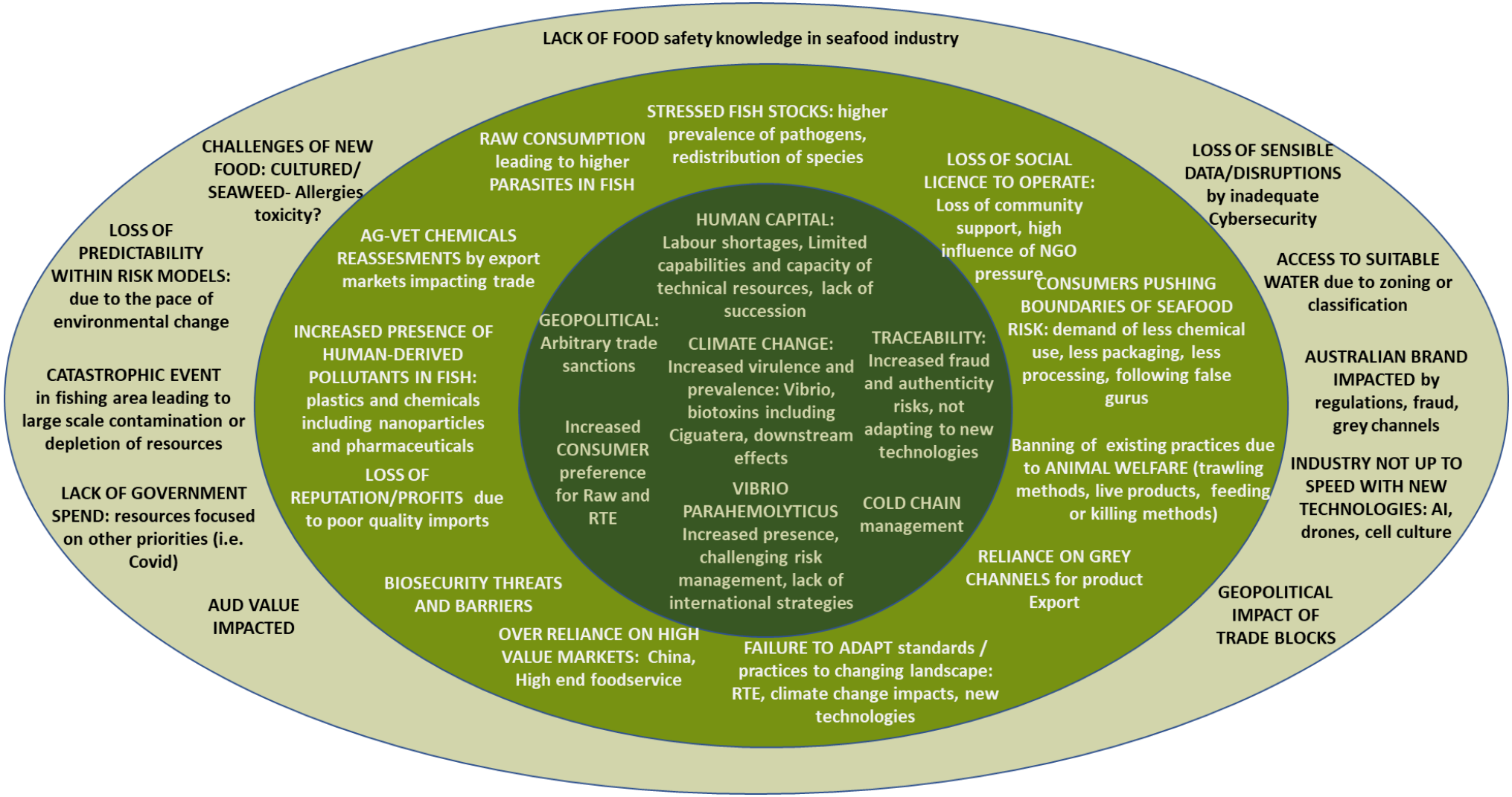


Figure 8.- Compounded Bullseye of high and critical risks captured in the brainstorming sessions. The centre of the bullseye has the most voted for risks and the subsequent layers had lower votes or single mentions.

III.- IN-DEPTH INTERVIEWS WITH KEY EXPERTS:

Experts were identified and validated by the steering group from three areas: Crisis management, the Food Industry perspective and geopolitical challenges, specifically with China.

Interviews were held via zoom and explored what the experts see in the current landscape, what they see as concerns for the future, and what they recommend the industry should do in the future. The in-depth interviews were conducted to provide a broader insight into certain areas that could be considered beyond the food safety and market access scope, but that have relevant considerations in risk management for the seafood industry.

CRISIS MANAGEMENT. Expert: Allan Briggs. Crisis Shield

Allan Briggs is a Melbourne-based crisis communication expert. He is the Chief Executive Officer of Crisis Shield and a sessional lecturer at RMIT University. Prior to starting his own communications company, Allan headed the Media and Public Relations Unit at State Emergency Services in Victoria Police. Allan has managed the media for a number of high-profile crises and emergencies such as the Melbourne gangland killings, the Black Saturday bushfires and the Kerrang train collision. He currently supports clients for preparedness and Incident management plans.

FOOD INDUSTRY. Expert: Dr. Geoffrey Annison. Australian Food and Grocery Council

Experienced Deputy Chief Executive Officer (AFGC) with a demonstrated history of working in the food production industry. Skilled in Fast-Moving Consumer Goods (FMCG), Strategic Planning, Business Strategy, Stakeholder Engagement, and Food Industry. Strong business development professional with a Doctor of Philosophy (Ph.D.) focused on Applied Microbiology from UNSW Australia.

CHINA. Expert: LEONIE MCKEON. Author and Negotiation expert.

Leonie McKeon is a Negotiation Expert, International Author, Expert in the 36 Strategies (derived from Sun Tzu, 'The Art of War'), China-Educated Strategist, Business Consultant, Keynote Speaker, and Workshop Presenter. In addition to her tertiary qualifications in Anthropology and Business, Leonie is well travelled and extremely street wise.

Figure 9 below captures each of the experts' views on the current and growing threats facing the Australian seafood industry.

An Experts' lens: Crisis Management

TOP CURRENT RISKS:

- Foreign country invasion/takeover/big dependency on China/geopolitical tensions
- Super trawlers and fishing piracy – this has been an issue for a number of years on a small scale but due to food instability and sustainability of fishing resources this could increase dramatically
- Shift to alternative protein sources/ loss of appetite for seafood
- International borders restrictions: Covid or other
- Social licence to operate (Seaspiracy)/Animal welfare/ seafood no longer on the menu

GROWING THREATS/FUTURE RISKS:

- Cybersecurity
- Environmental disasters
- Insurance costs will rise
- Workforce issues in some industries
- Water is a valuable resource and may become finite
- Wealth disparity rising – there is a move away from middle class, majority upper and the remaining live in poverty
- Environmental threats impacting on climate change
- Contamination of seafood
- Inflation/ Increasing fuel prices
- Piracy
- Executive integrity, funding, donations (people impacting the ethical baseline, checks and balances)

An Expert's lens: Food Industry

TOP CURRENT RISKS:

•Sustainability of seafood (fish stocks depleted in many parts of the world, growing challenge of industry to demonstrate its credentials)
•Disparity between imported and exported products
•Fishing is an international commodity (there are grey areas on who owns what– oceans governance/increase in fishing piracy etc)
•Aquaculture production of seafood in Australia will likely increase due to demand which may lead to an increase/overuse of chemicals and antibiotics that are used to produce the food)
•Lab cultured fish is increasing and could pose food safety concerns (would need to go through a novel food assessment/ registration process at FSANZ)
•Social licence issues arising more
•Relying on global supply chains is tricky in the COVID climate (this has been shown explicitly in Australia in a number of import/export sectors). Australia has listed the Modern Manufacturing Initiative as a priority.
•Online purchasing is increasing dramatically : may introduce freshness/quality/food safety issues
•Currently there is a retail sector dominance (Coles/Woolworths) which is a concern
•Carbon Dioxide use as a processing aid is increasing
•Branding associated with Fresh food
•Harder share of store, business growth by acquisitions: WW – PFD
•Reliance on premium markets such as China

An Experts' lens: China

Figure 9- Current and future risks for the seafood industry and observations from the experts.

In terms of recommendations, all of the experts provided their views on areas that require additional work beyond risk management and mitigation, and all had a common theme around preparedness. The key areas of development were around having proper processes and plans for managing incidents, for reacting to potential triggers in the political and geopolitical fronts, implementing business continuity plans, working with communities to have them tell your story, unifying and working as collectives in industry, or as a cohesive body that has bigger strengths, and learning and developing knowledge around Chinese culture.

The most relevant current risks were very similar to the ones identified via the other methods of data gathering, having the following aspects in common:

- Seafood sustainability: impacts by climate change (depletion of stocks, social licence to operate, animal welfare)
- Big dependency on China and premium markets geopolitical tensions
- Growth of piracy, fraud, grey areas (ocean's governance)
- Gaps in our regulatory framework (lab cultured fish, deliveries)
- Disparities between imports and exports
- Rise of online and delivery models- impacts on food safety/freshness (consumer behaviours, new ways to purchase)

DEEP DIVE INTO TOP 5 RISKS

The next section of the report is captured in 5 graphs, one for each of the top 5 material/critical risks identified. They are described with further elements that make-up the risk profile for each of them, as well as a brief comment on their causes and consequences. Most of them fall into the existential type of risk category, so they have many factors to consider before moving into our action and control plans (Figures 10-14).

Top Risk #1- Vibrio Species

The increased presence and virulence of Vibrio species in most of the seafood sectors has become a critical risk. It is also further influenced by the testing capabilities and knowledge around this bacterium, as well as the challenges of managing the risks and levels properly. The consequences have already been clear for some businesses and therefore, it calls for a cohesive and impactful move to action. SafeFish has agreed that this is a risk that requires further work immediately.

Top Risk #2- Climate change

Climate change is very broad and has many elements of systemic impact in multiple areas. It can affect food safety through a chain of events but will also restrict or impair trade and the ability to source certain species from certain places. This risk is classified under the banner of existential risks for its complexity and multiple touch points that has the ability to result in severe consequences. A different approach will be developed to address this risk that differentiates from our classic focused risk mitigation, as it requires a more holistic strategy, and a clear understanding of what actions matter most in the scale of what we can do. This will build our resilience and risk culture as an industry.

Top Risk #3- Geopolitical uncertainty

This issue is very similar in nature to Climate change, in the sense of its complexity and limited ability to influence direct changes. But we have the advantage of recent events for the industry that have taught us lessons around diversification of markets/product types, technical awareness of certain regulations and parameters, and how to work together to achieve more. The industry needs to stay informed and be proactive to be prepared to face any potential situations that arise in this space. This will also be a part of the differentiated risk approach, and we will continue to evolve and learn how to do improve as the response to this issue is developed.

Top Risk #4- Increased harmful algae blooms

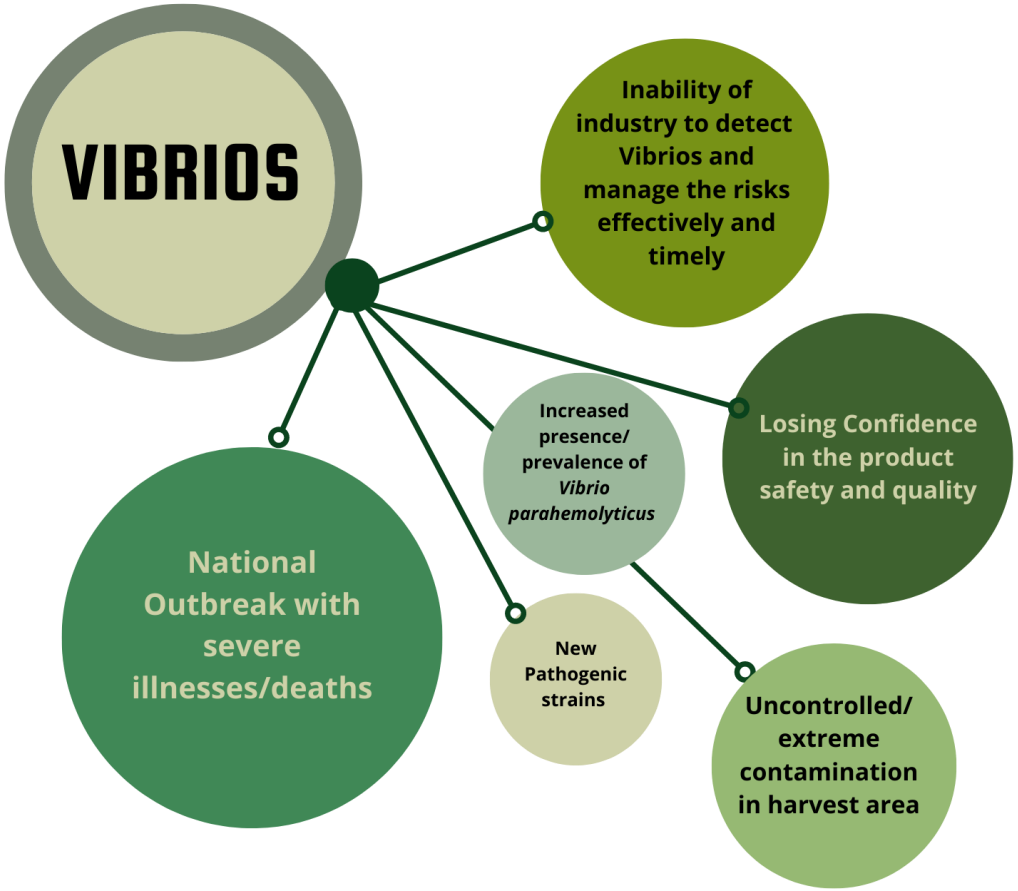
Potentially derived as a result of climate change or through other environmental conditions and fluctuations, blooms have a direct impact on the health of the harvesting areas and species, as well as a consequence to human health via toxins. It presents many management challenges, including monitoring, controlling, and the potential of closures to affected growing areas. It also affects both fish and shellfish sectors, which makes it an area for multi-sector collaboration.

Top Risk #5- Industry not adopting traceability and authenticity technology

Food fraud has grown significantly especially following the impacts from COVID 19 to global supply chains. Sustainability and origin have become even higher in consumers' agendas. These realities showcase the need for urgent action to protect and enhance the quality of the products we harvest and transform or sell. Employing technology that is available to manage traceability and authenticity faster and more effectively for seafood products has become a priority and, should be a focus in the coming years.

Summary– Top Risks

The Risk of:



Caused by:

- Bacteria proliferation in warm conditions (Climate change impacts)
- Evolution on new pathogenic strains
- Dificulties in Risk management
- Lack of International standards/ local guidance
- Unharmonised standards
- Increased production
- Changing consumer profiles and preferences
- Insufficient/inaproppiate detection methods and surveillance practices

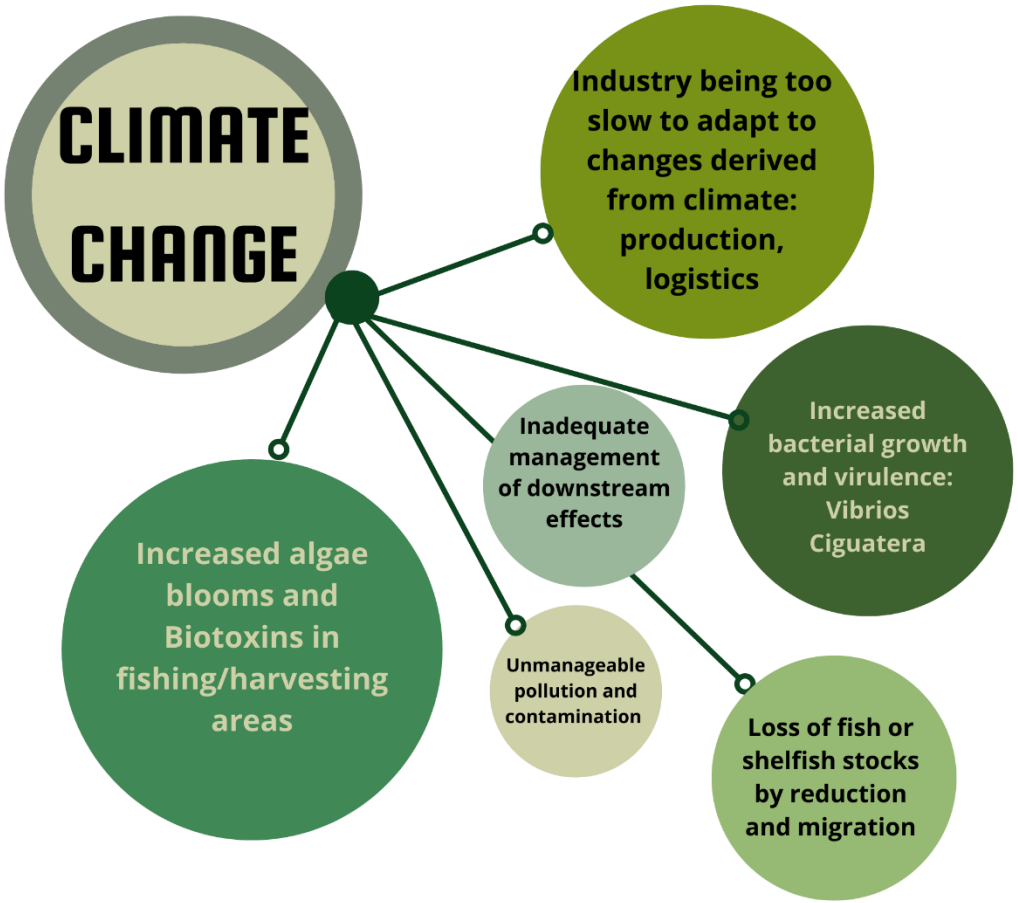
Consequences:

- Outbreaks and increased human illnesses
- Closing/shutting down harvest areas and businesses
- Reputational damage to some/all Australian shellfish/fish
- Loss of products
- Loss of profit, income
- Loss of licence to operate
- Loss of licence to export
- Exit from industry

Figure 10- A risk overview of Vibrio

TOP RISK #2: CLIMATE CHANGE

The Risk of:



Caused by:

- Increased pollution and industrial contaminants reaching waters during rainfall events
- Warming waters
- Acidification
- Adapting of species via evolution or migration (higher virulence or more resistant to controls)
- Industry and government unpreparedness/lack of investing in mitigation and amendment actions
- Unrealistic testing requirements/parameters to be met by exporters

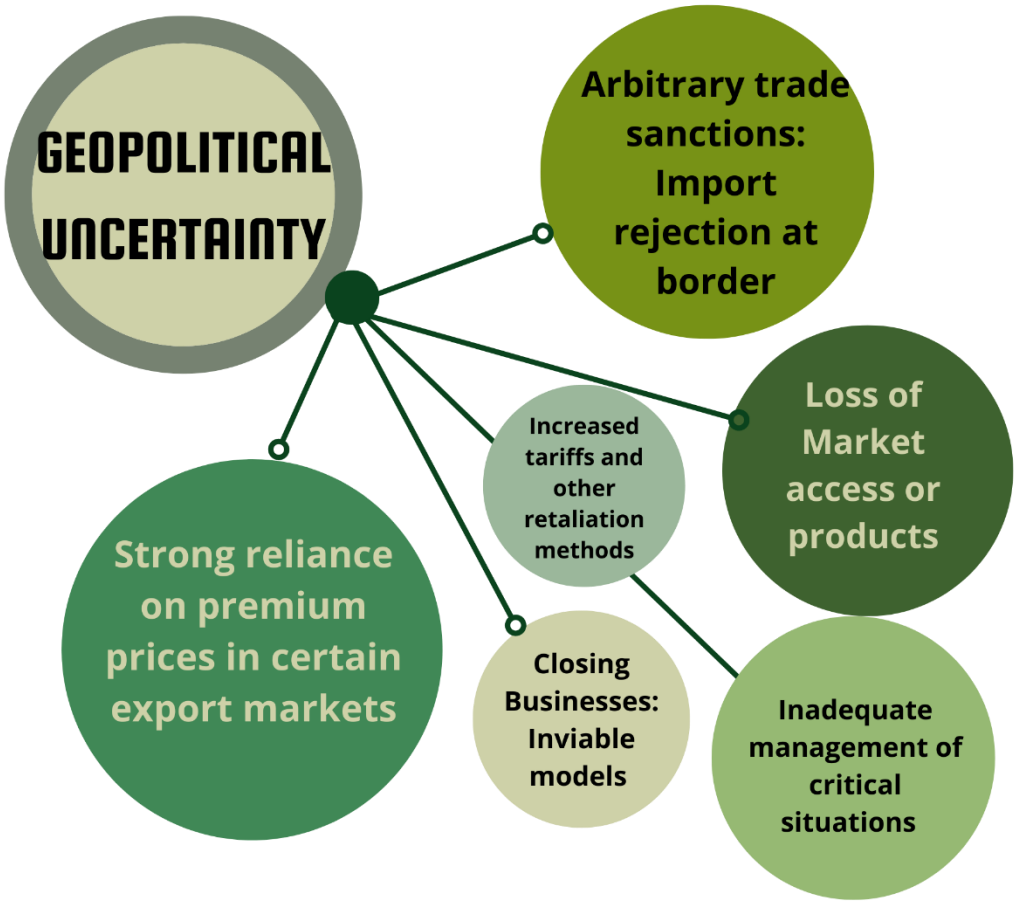
Consequences:

- Closing/shutting down businesses
- Reputational damage to some/all Australian shellfish/fish
- Loss of products
- Delisting of products in certain countries or markets
- Loss of profit/income: profitability at the mercy of geopolitics
- Loss of licence to operate
- Loss of market share

Figure 11- A risk overview of climate change

TOP RISK #3: GEOPOLITICAL UNCERTAINTY

The Risk of:



Caused by:

- Cultural imbalances, difficulty in communications
- Changes in regulations or testing standards without prior notice
- Lack of clarity around specifications and expectations: questionable trade barriers
- Political noise between Australia and China that impacts trade
- "all eggs in one basket" business model/ lack of diversified markets

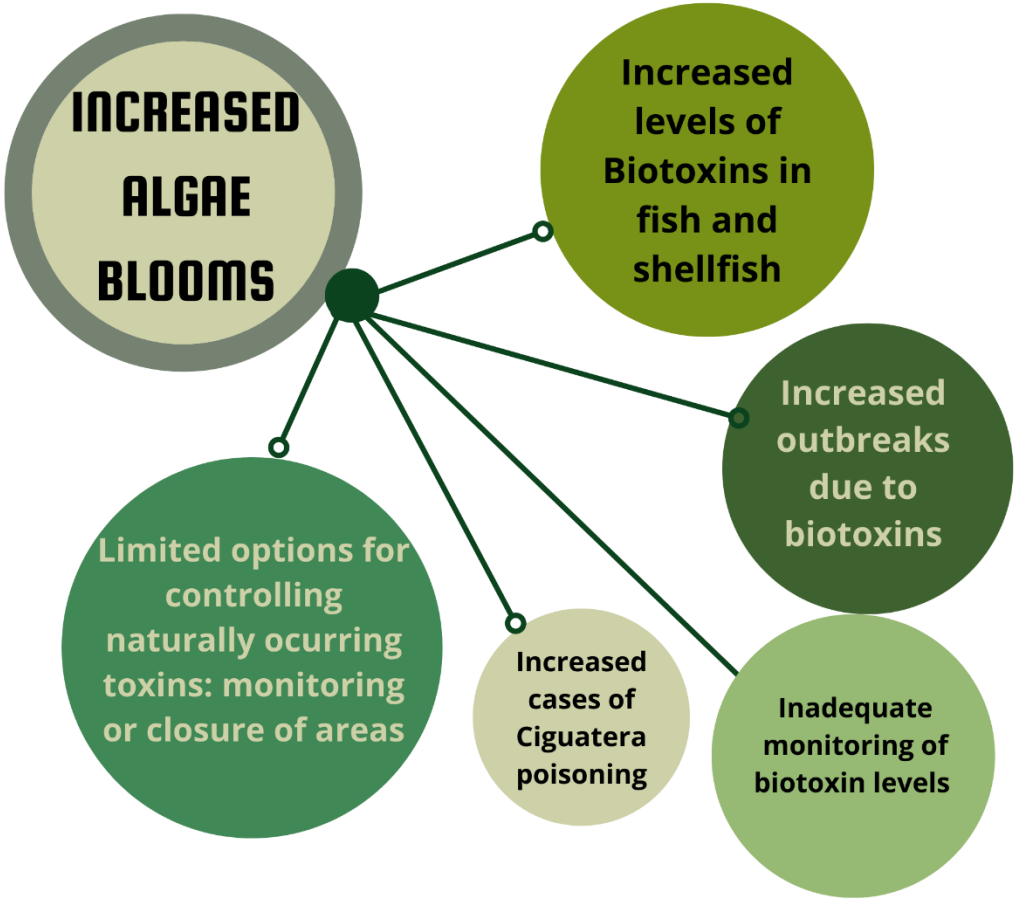
Consequences:

- Closing/shutting down businesses
- Reputational damage to some/all Australian shellfish/fish
- Loss of products
- Delisting of products in certain countries or markets
- Loss of profit/income: profitability at the mercy of geopolitics
- Loss of licence to operate
- Loss of market share

Figure 12.- A risk overview of geopolitical uncertainty

TOP RISK #4: INCREASED HARMFUL ALGAE BLOOMS

The Risk of:



Caused by:

- Climate change impacts such as higher water temperatures, salinity, carbon dioxide, rainfall.
- Lack of knowledge of biotoxins or Ciguatera in the industry, insufficient monitoring
- Increasde pollution
- Droughts

Consequences:

- Closing/shutting down production areas
- Increased outbreaks and illnesses, potential deaths
- Increased costs for testing, monitoring and controlling algae blooms

Figure 13.- A risk overview of harmful algal blooms

TOP RISK #5: Industry not adopting traceability and authenticy technology

Caused by:

- High cost, low awareness of certain technologies and testing
- Not prioritising traceability and authenticity in the business
- "Head in the sand" practice: if you cant see it, it's not there
- Inadequate maturity or capabilities of technical teams: lack of knowledge
- Low investment in food safety and quality, supplier assurance

Consequences:

- Reputational impacts
- Product recalls or outbreaks
- Financial loss related to fraudulent products and invetsments
- Loss of licence to operate, loss of trust from customers and consumers

Figure 14.- A risk overview of traceability and authenticity technology

CONCLUSION

1. This process has been successful in identifying the most critical and material risks for the Australian seafood industry, from a food safety, trade and market access perspective. These are validated and confirmed through different methods and gather the perceptions of many experts and industry stakeholders. The undisputed top risks identified, validated by various methods are:
    - The emergence of Vibrio species
    - Biotoxins
    - Climate change
    - Geopolitical
    - Ciguatera
    - Listeria
    - Food fraud
    - Human capital challenges
    - Traceability
    - Regulatory changes
    - Consumer behaviour/Raw/RTE
    - Cold Chain/Supply chain disruptions

2. We have gathered the insights of **current and future risks and opportunities** from seafood stakeholders with a good **balance in the representation of respondents** in terms of their business type, sector, field of activity, supply chain role and geography of core activity.
3. Many of these risks are **significant to the seafood industry as a whole and are extremely complex and compounded.** They require a very pragmatic and collective approach to be actioned in a meaningful and impactful way.
4. Based on the reflections from industry and on the process shown below, we suggest a **mixed set of next steps so that the benefits and value can be capitalised on sooner**. Pathways for these are under development.

REFLECTIONS

FROM AN INDUSTRY PERSPECTIVE:

Regardless of the seafood industry Sector that you operate in, there are definitely clear, big and common risks that require a collective effort to mitigate and action. No single group can influence certain risks individually (i.e., climate change, geopolitical).

The high level of uncertainty and complexity is making us experience risk in a very different way: Some call them existential risks, or combined risks. They require a significantly different approach and a more cohesive, collaborative way of working. COVID is a clear example of a critical health crisis that translates into a social, financial, political, global crisis at the same time. We need to look at the sum of risks and its compounding effects altogether.

Food Safety Risks are closely linked/intertwined to trade and market access risks, becoming strategic and material in consequences.

A key factor to consider is our level of risk culture and preparedness for critical situations. Although not mentioned separately as a risk in itself, it was clear that more resources and time need to be dedicated to building resilience into the industry as a whole.

FROM A PROCESS PERSPECTIVE:

We were able to cross check and validate the risks that were most relevant and top of mind for various groups of the seafood industry stakeholders through our mixed methods data gathering approaches. This also enabled a balanced representation of input.

Looking at the 'Bigger Picture'/whole of industry first allowed us to bring efforts together for the most common/larger issues affecting the seafood industry and has given us many lessons on how to better approach the understanding of the more granular, sectorised or individual risks.

Although we had great results from all methods, we believe the sessions and interviews were more engaging and effective at gathering data and sharing knowledge and thoughts, as it encouraged building from others' ideas and suggestions.

OUR NEXT STEPS

APPENDICES

Appendix 1- Additional graphs from survey data.

TOP RISKS–Categorised by severity UNPROMPTED

	Critical	High	Medium	Sum
Vibrios	5	10	5	20
Climate change	5	10		15
Geopolitical	5	7	3	15
Biotoxins	3	8	4	15
Allergens	2			3
Pandemic	2			2
Listeria		6		6
Ciguatera		5	3	9
Biosecurity		4		4
RTE/Raw		4		4
Heavy metals		3		3
Food Fraud			5	5

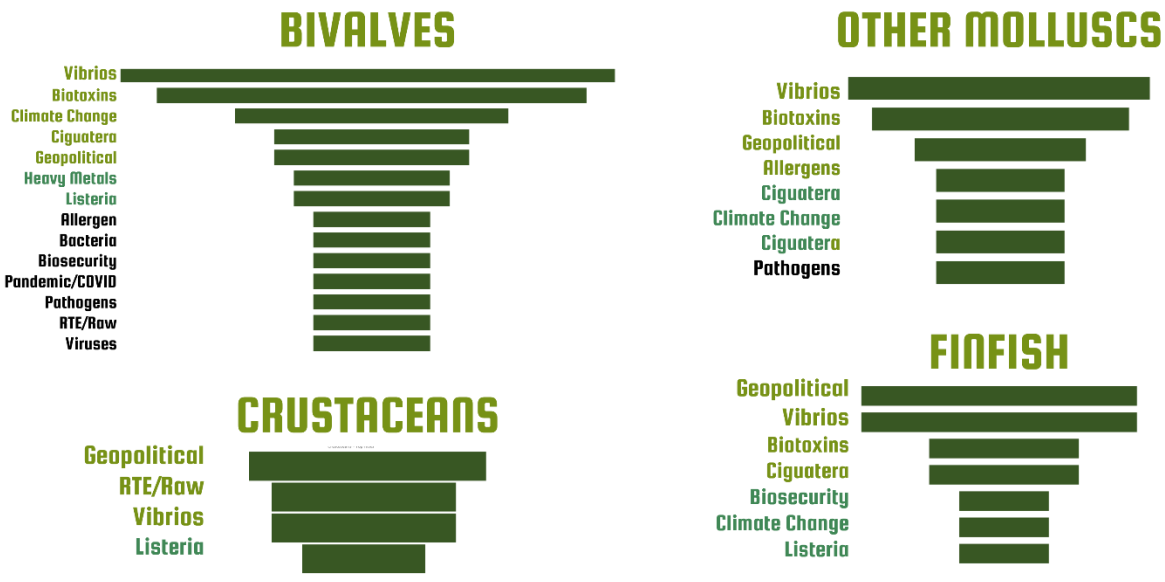
When asked to categorize the severity of their concerns from Critical to Low, the data indicates that the most relevant issues from a material and high impact perspective are:
1.Vibrio
2.Climate change
3.Geopolitical
4.Biotoxins.

Blank spaces indicate that no survey respondents classified that risk at that level

Detailed Top risks ranked by sector(s):

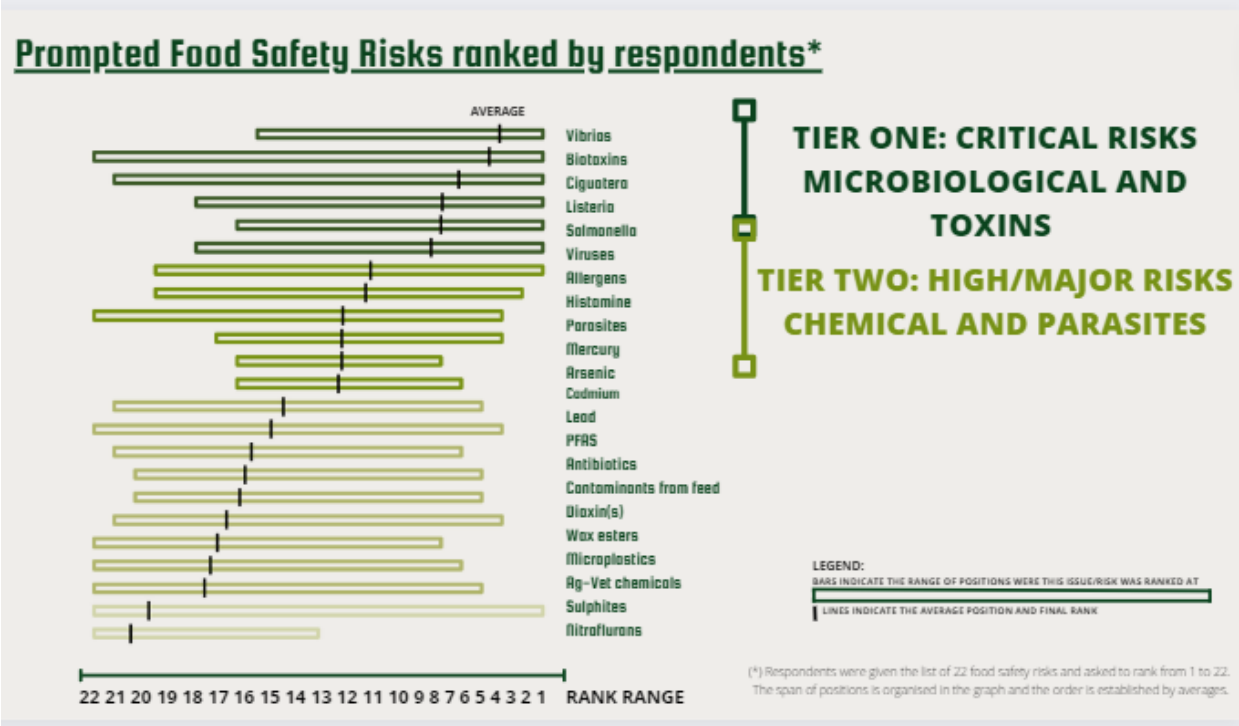
Top Risks by Sector

Based on the answers obtained from respondents of each sector to the unprompted top risks

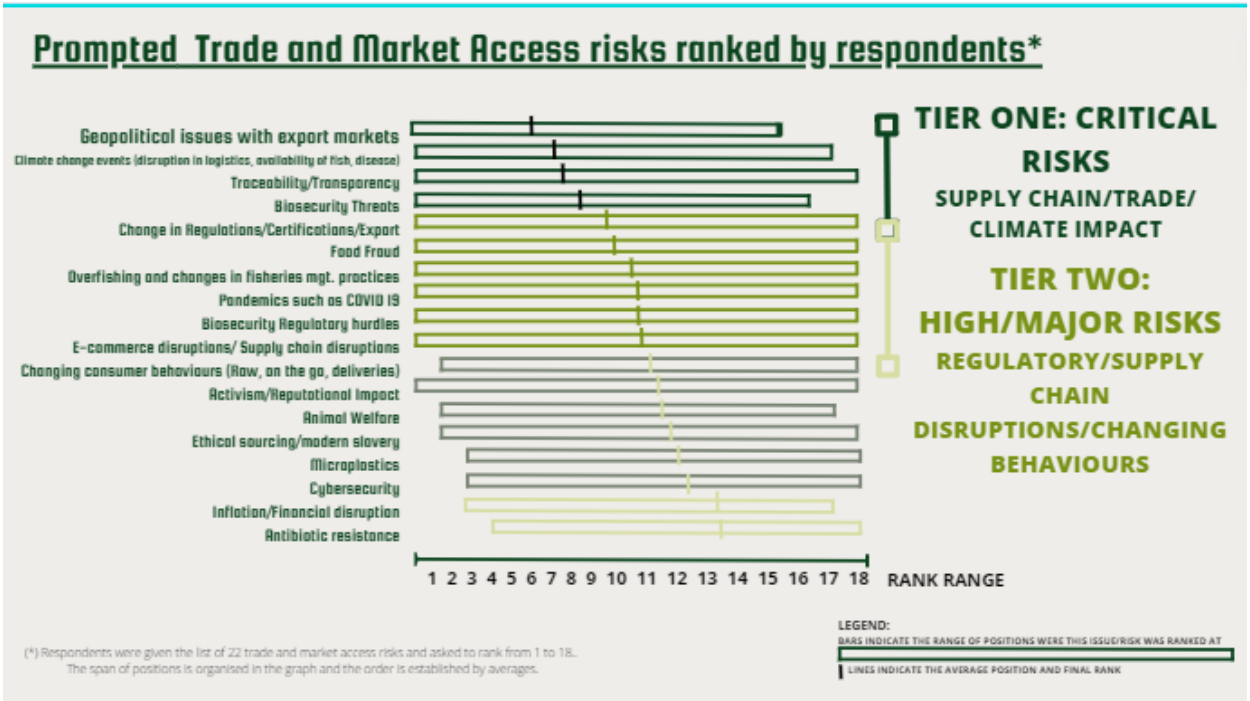


Appendix 2- Detailed ranking of prompted risks by respondents, positioned by average:

A) Food Safety



B) Trade and market access



Appendix 3- Heat Map from total unprompted responses:

A) Food Safety

RANK	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Vibrios	12	8	6	2		1	1	1		1					1							
oxins - paralytic, diarrhetic, amnesic or emerging shellfish toxins	11	4	8	6		1	1							1								
Ciguatera	1	9	8	3	3	1	2	2	1	1										1		1
Listeria monocytogenes	3	4		4	5	6	5		2	1		2						1				
Salmonella	2	1	1	5	8	7	1	3	1	2	1					1						
Viruses	2	3	2	7	3	6	2		1	1	1	1	1	1			1	1				
Allergens	1	2	4	1	1	2	2	2	3	3		1	3	1	2	1	1	1	1	1		
Histamine		2		1	4	2	3	1	5	3	3	2	2		1	1			1	2		
Parasites			1			2	5	6	1	3	3	3	1	3	1		1		2			
Mercury			1		1	2	4	2	2	1	3	4	7	3		1	2					
Arsenic						1	1	6	4	3	8	2	1	2	4	1						
Cadmium					3		2	1	4	4	3	7	2	2	2	3						
Lead				1			1	1		3	1	3	5	7	3	1	3	2			1	1
PFAS (per and poly-fluoroalkyl substances such as PFOS)			1		1		1		4		1	2		2	6	6	1	3	3	1		
Antibiotics (e.g Chloramphenicol)					2			2	2	2	2	2		1	1	2	1	1	8	4	2	1
Contaminants from feed				1			2	2		1		1	1	2	3	1	2	7	7	1	2	
Dioxin and Dioxin like substances e.g. PCBs				1				1		2		1	1	1	4	6	9		2	2	3	
Dioxins and dioxin like substances			1						1		3	1	1	1		3	6	9		3	2	2
Wax esters						1		1			1		1	3	5	4	3	2	4	2	1	1
Microplastics - human health					2	1		2		1	2		4	1				2	1	2		1
Ag Vet Chemicals (other than antibiotics)				1					2	1	1		2	2			1	3	2	11	3	3
Sulphites	1												1			1		1	1	2	14	9	
Nitrofurans												1				1	2		1	1	5	14

B) Trade and market access

RANK	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Geopolitical issues with export markets	14	2	1	1	3	1	1	1			1	1	3		4			
e change events (disruption in logistics, availability of fish, disease)	3	5	3	3	4	1	4	1		3	1			4			1	
Traceability/Transparency	4	3	3	6		2	3		3	2	1		2	1	2			1
Biosecurity threats	1	2	2	1	3	6	4	3	3	3	2				2	1		
Change in Regulations/ certifications/ export	3	5	3	2	2	1		2	2		1	2	1	2			4	3
Food fraud	1		3	3	3	1	2	4	4	2	2		3	1		2	1	1
Overfishing and changes in fisheries management practices	1	2	3	1		8	1	1	2	2		1			5	3	2	1
Pandemics such as COVID 19	2	4	2	2			1	2	2	4	1	1	3	1	1	2	3	2
Biosecurity regulatory hurdles	1	2	2	3	2	2		2	4	1	2	1	3	1			4	3
E-commerce disruptions/ supply chain disruptions	2	2	1	1	3	3	1	1	2	3	1	2		2	3		2	4
Changing consumer behaviour (i.e. raw, on the go, deliveries)		2	2	1	2	2	3	1		1	4	5	1	2	3	2	1	1
Activism/ reputational impact	1			1	2		4	5	2	4	1	2	4	1	1	2		3
Animal welfare		1		1	1	1	2	6	2	3	3	3	2	3	1	2	2	
Ethical sourcing/ modern slavery		3	3	1	1	2	1		1	1	2	1	2	4	2	5	1	3
Microplastics - animal health/ changing gear requirements			1	2	3	2	2		2	1	1	6	1	3	2	1	2	4
Cybersecurity			3	1	2		3	1		3	1	3	2	4	2	1	4	3
Inflation/ Financial disruption			1	1		1		1	3		4	4	4	3	2	5	4	
Antibiotic resistance				2	2		1	2	1		5	1	2	1	3	7	2	4