

A. PROJECT TITLE	Co-developing a risk management model for the NZ Pāua Industry to build resilience and prepare for business related environmentally driven uncertainties, risks, and opportunities.
“SHORT” TITLE	Upholding the value of Pāua Quota
B. THEME / PROGRAMME	Sustainable Seas: Risk and Uncertainty

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E. ABSTRACT

Meeting human seafood security needs is increasingly at risk from environmental variability including climate change. Neither fisheries management, operational sectors (whether commercial, customary, and recreational), nor seafood business investors and lenders, currently systematically account for environmental changes, either as risks or opportunities. The shift to ecosystem-based fisheries management requires improving understanding of environmental change and associated risks and opportunities so that the Fisheries and Quota Management Systems and fishery sectors can factor such variability and change, evolve where required, and collaboratively invest in appropriate response strategies.

Pāua is a taonga species and Māori own 71.9% of the commercial Pāua fishery quota with Moana New Zealand holding 53.9% on behalf of all Iwi. It is an important customary and recreational fishery to Māori, and recreational fishery to non-Māori. While many species may be capable of geographical shifts, Pāua are not and thus their state can indicate climate change impacts on low-tolerance marine species. Whether commercially fished or not, it is imperative that the Pāua fishery is resilient through Pāua fishery management adapting to the changing environment. To uphold both long-term Pāua fishery cultural values, and the value of Pāua quota, appropriate strategic responses to environmental change must be developed and informed by knowing the relative risks, uncertainties, costs, and any opportunities created by environmental variability.

This project is designed to understand real world commercial Pāua sector challenges related to environmental change, to develop methods to systematically assess environmentally driven risks and opportunities to Pāua businesses, and to document potential response strategies that can underpin maintaining Pāua quota values. It is focused on the PAU2 Fishery, (east coast North Island), a region which has seen some significant and consistent heat events which influence growth rates given the size profile (smaller in Northern regions, larger in Southerly latitudes). Moreover, the PAU2 area encompasses various Iwi rohe, and Māori have a strong interest in this project across both commercial and customary rights associated with Pāua. Much of the systematic assessment of environmentally driven risks will apply to all Pāua fishers and interests, not just commercial businesses, thus the project will inform holistic fishery management planning for all sectors.

The findings will be of value to customary and recreational fisheries management, ecosystem-based fisheries management planning, investment guidance and seafood sector transparency, and in developing collaborative strategic responses. Beyond the Pāua sector, the process and risk model developed will be assessed for its transferability to other fisheries.

F. RELEVANCE TO CHALLENGE OBJECTIVE

This project meets the Challenge objective of utilisation of marine resources within environmental constraints by considering how best to prepare seafood businesses for the increasing variability and long-term changes that are arising from climate change, within the context of introducing ecosystem-based management into Aotearoa New Zealand marine management.

It will bring together a range of expertise across the biophysical and social sciences and seafood business and finance analytics to develop guidance for collaborative approaches to assessing risk and developing and investing in forward thinking strategic responses. The assessment of environmentally driven risks to Pāua will be transferred to Pāua businesses and will inform customary and recreational fishers in order to best prepare all interested sectors for any potential decreases, and opportunities for sustainable increases in utilisation, of the Pāua resource related to climate change and land-based activities. Because the project is a case study, the results will be of use to areas other than the PAU2 area and potentially other industries.

G. OUTPUTS	This project will produce the following Outputs:	Linked to which Theory of Change Outputs:	Explain briefly your plan to ensure uptake by iwi and stakeholders:
	Output 1. Short Report detailing the environmental risks facing Pāua and in particular the commercial wild harvest Pāua sector.	F Tools for predicting and managing cumulative and multiple stressors developed, assessed, and demonstrated	The Pāua Industry Council (PIC) will be involved in assessing the relevant environmental risks and characterising the fishery. The PAU2 Fishery has a management committee that was chaired by Tony Craig (project co-leader) and he maintains strong links with the group. PIC and PAU2 advice, as well as current customary and recreational fishing networks and relationships will be sought and used to inform wider customary and recreational pāua fishery interests of the research progress and findings.
	Output 2. Integrated Calculating Economic Model for assessment of environmental risks and uncertainties facing the Pāua fishery	D Decision-making processes that recognise risk and	An advisory group including iwi representatives, Māori fishery interests, PIC, ANZ and possibly also the Aotearoa Circle will provide guidance and dissemination opportunities

	(fishery and infrastructure) including an investment options analytical tool.	uncertainty evaluated, developed, and demonstrated.	As the banker to 60% of the seafood sector, the involvement of ANZ NZ will contribute capability (including modelling). Terra Moana's long-standing relationships with PAU2 Māori fishery interests, PIC and Moana New Zealand will ensure Pāua commercial interests (including Māori) are involved, contribute to, and kept abreast of project developments.
	Output 3. Document factors that might prevent use of the model for other fisheries, locations and industries, together with the modifications that would be needed.		
	Output 4. Final Project Report summarising the environmental risks and uncertainties facing the commercial Pāua Sector, their financial implications, and Guidance for Investing in Response Strategies.	L Remaining knowledge gaps that increase environmental risks of decision making are identified for iwi and stakeholders.	The PAU2 Fishery management committee and the Pāua Industry Council will be involved throughout the research. Terra Moana's long-standing relationships with PAU2 Māori fishery interests, PIC and Moana New Zealand will ensure Māori Pāua commercial interests are involved, contribute to, and kept abreast of project developments.
	Output 5. Public Summary of Output 4	K Pathways for knowledge, understanding and skills developed by the Challenge to be understood by iwi and stakeholders are developed.	An advisory group, communications guidance, social media, and a public summary will translate the research for wider audiences.

H. OUTCOMES	This project will contribute to the following Theory of Change Outcomes:
	1. The value of blue economy business models is recognised and adopted by Aotearoa New Zealand businesses (FO1)
	2. Decision-making practices that are more inclusive, multi-sectorial and account for the effects from cumulative and multiple activities are adopted (FO2, FO4)
	3. Knowledge from the Challenge (science and mātauranga) is used in decision making to improve ecological health and influences Aotearoa New Zealand's marine management practice and policy (FO3)
	5. Decision-making processes explicitly identify and address both risk and knowledge uncertainty in a way that reduces risks to ecological, social, cultural and economic wellbeing (FO1, FO2 and FO3)

I. INTRODUCTION
<p>That the only certainty is uncertainty is especially the case in highly dynamic marine environments where stressors readily accumulate. The marine environment is facing increasing non-linear environmental change including heat waves, microplastics, pollution and sedimentation, ecosystem shifts, ocean acidification, sea level rise, and other climate change caused perturbations. These pose risks to businesses, and uncertainty arises in the when, where, and severity of impacts, and in any interaction outcomes. In recent years leading seafood companies in New Zealand have begun running thorough sustainability journeys to respond to these changes and have found opportunities to improve their businesses in doing so. However, challenges remain in understanding the exact types and levels of risk, their factoring in business analysis and management, and therefore how to prioritise and invest in types and levels of response. Furthermore, addressing some risks may have both public and private good outcomes and therefore require consideration in fisheries management, as well as blended financing.</p> <p>This project is a pilot exercise to calculate environmental risks to seafood industries and investors, and to assess response strategies. Pāua has been selected as it is an important taonga species for Iwi, Whanau and Hapū and a valuable export product worth on average \$50-60 million annually. It is prized culturally and an important customary fishery. Being a relatively sedentary coastal, rocky shore species Pāua is subject to issues associated with poor land-use practices including sedimentation which smothers its kelp habitat and food, and clogs Pāua respiratory and feeding systems. Climate change related ocean acidification also affects larval development and there is heightened risk to Pāua and its habitats from the cumulative effects of both warmer water and sedimentation.</p> <p>Under the New Zealand Quota Management System, Total Allowable Catch (by Quota Management Area) includes the Total Allowable Commercial Catch (TACC) which also allows for estimated recreational and customary take. With an absence of detailed recreational and customary catch levels TACs are often influenced by the commercial fishery catch per unit effort (CPUE) although in most cases a time lag exists of ~ two years between catch information entering the management system and TAC setting. For such a sedentary species this is further complicated when factoring in environmental variability and long-term change. TACs are blunt instruments and experience has shown that they are fast to be lowered but slow to be raised. The commercial Pāua sector has been using 'Shelving' for several years to circumvent this and to enable more flexible and responsive management within the TACC. However, at present there is no defined fishery management framework that factors environmental risk and uncertainty</p>

nor to assess, capitalise on or manage any associated opportunities (e.g., new tropical species). Pāua quota asset values also do not reflect the changing environment. These and the potential response strategy possibilities, and investment needs, to underpin the value of quota *into the future* are currently not factored in fisheries management nor seafood sector business strategies.

This project explores integrating fishery, finance and environmental knowledge in an initial model building and context documentation pilot exercise focused on Pāua which if successful could apply to other fisheries, and potentially to other primary industries. It recognises the need for new approaches to support building resilience in the commercial seafood sector through enabling fisheries management and operational planning and commercial business strategies informed by improved understandings of environmental state into the future and the implications for the physical operating environment. As evidenced by the Aotearoa Circle Seafood Climate Adaptation Taskforce, the seafood sector is increasingly seeking to understand the potential response strategies it can invest in, (in partnership and collaboration with Government), to address risks and reduce uncertainties facing fisheries.

Critically this project will determine the extent to which the science about the environmental risk and uncertainty of sedimentation and climate change in the marine environment can be translated into quantitative, proportionate economic impact factors that can be used in models calculating seafood business value (e.g. Pāua Quota values) and which will inform response strategy opportunities and co-investment requirements.

J. AIMS

1. To develop a shared understanding of environmentally driven risks, uncertainties and opportunities facing wild Pāua as well as the commercial NZ Pāua fishery and associated shore-based infrastructure economics, amongst Māori Pāua Quota Owners, Science, the Government, and the Banking Sector.
2. To use these understandings to develop a model of business risks and uncertainties facing the commercial Pāua wild harvest sector (fishery and infrastructure), including investment options, that can be used by customary and commercial fishers and Pāua businesses and investors.
3. To use this model to guide commercial Pāua sector and public sector investment in resilience building strategies and highlight other seafood industries that could use/adapt the model.

K. PROPOSED RESEARCH

This is an applied research and analysis pilot project anchored in the structure and reality of the commercial Pāua fishery aiming to build resilience in the sector. It is envisaged that this will inform the shift to ecosystem-based fisheries management in Aotearoa New Zealand and that what is learnt of environmental risks to commercially fished pāua will apply to customary and recreational pāua fisheries, as well as to other fisheries.

The project brings together a capable team from commercial fisheries and fisheries management, and economics, social science, banking, and applied seafood sector business research, analysis, and innovation. In particular, project leads from Terra Moana have a long and successful partnership advising Moana New Zealand and with the PAU2 management group, and past conversations with these organisations lead to the underlying ideas behind much of the project. **The project will research how to translate environmental science about environmental variability, risk and uncertainty, specifically related to climate change and sedimentation, into factors that can be used to inform the building of a calculating model that will improve understanding of the impacts of environmentally driven risks and uncertainties in the commercial wild harvest Pāua fishery and therefore enable sector resilience building and informed ecosystem-based fisheries management planning.** This will be specifically in relation to at least the value of annual revenue streams and in perpetuity value of Pāua Quota and the guidance for medium term (5-10 year) business strategies for the commercial Pāua sector for harvest and infrastructure planning. The research and outputs are designed to inform real world commercial Pāua sector challenges. Of critical importance is the need to identify priority response strategies and generate related investment guidance that, if co-designed and effectively and collaboratively implemented, may better support socio-ecological system resilience, Pāua fishery resilience and therefore uphold Pāua quota values.

The project is focused on the PAU2 commercial fishery which reaches from Raglan south around the bottom of the North Island and up to East Cape, however only the Wairarapa / Hawkes Bay coast (Black Head to Turakirae Point) is commercially fished and this will be the major area of interest. Much of the rest of the coastal area is open to important and valued recreational and customary Pāua fisheries, which also occur in the commercially fished areas.

A major asset to this research will be the project advisory group, intended to include representatives from the major iwi interests, Moana New Zealand, PAU2 stakeholders, PIC, ANZ and potentially also the Aotearoa Circle Seafood Adaptation Taskforce, which will guide the research and provide capability to assess risks and incorporate financial planning. An initial workshop (or online meeting if required by Covid conditions) with team members, associated scientists, researchers, key stakeholders, and advisory group members will be held in the first months (targeting December) of the project to introduce the project, refine the methodology and roles, and begin to identify information (data, literature etc) needs.

The research is structured into 4 Research Areas:

RA 1: Collate data and knowledge about environmental risks facing the New Zealand commercial wild harvest Pāua fishery.

Of the changing environmental factors mentioned above, temperature, marine heatwaves and sedimentation have all been observed for the East Coast North Island and specifically in the PAU2 fishery Wairarapa coastal area. Pāua and their kelp habitat are known to be at risk from temperature change and sediment with some information available about the associated impacts on spawning, growth, recruitment, preferred depth, and wider population dynamics. Storms are also known to cause Pāua damage and mortality through rocks rolling and which may become a greater risk through climate change increasing their frequency and severity. In the last 15 years PAU2 has observed changing weather patterns and increased South-Easterly storms which directly hit the PAU2 area coast resulting in reduced dive days and affected fishery operations. For example, in 2020 in the Turakirae area, after a major southerly storm, Pāua divers observed movements of rocks as big as small cars, and that the seaweed and kelp underneath were dying and Pāua were sparse. The divers and PAU2 fishery members were very worried initially and yet six months later the fishery appeared to have recovered. This sub-area is very productive and is thought to be more resilient possibly because there is protected native vegetation down to the shoreline in the area.

To produce a calculating economic model of environmentally driven risks and uncertainties facing the commercial wild harvest Wairarapa PAU2 Pāua fishery the project will focus on climate change and sedimentation variables. RA1 will collate data and where possible characterise risk levels and any associated uncertainties of these for PAU2. Data is available from multiple sources including:

- the CARIM project;
- MPI project ZBD2014-09 on climate change and fisheries;
- the sedimentation and kelp work of Professor Schiel, including the recent Kaikoura earthquake recovery research with PIC;
- from the MetService MBIE funded Moana Project (Marine Heat Waves) as Terra Moana is building analytical methods to interrogate the implications of marine heat waves for Māori Commercial Fisheries and Aquaculture in Te Moana-A-Toi, the Bay of Plenty (project METO1801);
- modelling from Our Land and Water as part of a combined programme of work with Sustainable Seas and MfE;
- predicted sea level rise from NZ Searise MBIE project;
- the review of land-based effects on coastal fisheries and kaimoana and their habitats (ZBD2020-11);
- improved understandings from the Sustainable Seas cumulative stressors project 1.1;
- and knowledge from pāua divers, and local hapū and whanau living and working on the coast and observing environmental change.

Post data collation, a workshop will be held to summarise the data and strategic responses, explore the risk characterisation, and agree the estimated risk factors to be used in the calculating model. This workshop will be attended by the research partners and members of the advisory group, and key researchers including Prof D. Schiel and Dr V. Cummings. The workshop will include identifying potential response strategies for building resilience to climate change and sedimentation in the Pāua fishery. The workshop will be summarised in a draft Output 1 Report. Much of this information will also be of interest to customary and recreational fishers and results will be disseminated to these through personal contacts of Terra Moana, and via PIC, PAU2 and other key networks such as holding open webinars.

Whilst the project emphasis is on climate change related risks (temperature, ocean acidification, storms, sea-level rise) and sedimentation, the project will also scope other Pāua industry business risks, through investigating the potential future legislative change that may impact businesses. One example is redress of the Te Tiriti o Waitangi WAI262 claim, whereby the responsibilities to Pāua may alter current habitat and harvest practices.

- A desktop scoping exercise will initially be undertaken with the aim to stretch into wānanga activities with project collaborators, as well as through linkages with Sustainable Seas projects 4.1, 4.3 and T.1. This emerging context potentially provides opportunities to explore the content and design of collaborative response strategies to address the risks and seize any opportunities from a changing environment.
- In partnership with ANZ NZ the project will explore the requirements, opportunities, and implications for Pāua quota owners related to their meeting requirements under the new Financial Sector Climate Related Disclosure legislation and

External Reporting Board¹ in relation to the Taskforce on Climate Related Financial Disclosure (TCFD). The Financial Sector (Climate-related Disclosures and Other Matters) Amendment Bill, which passed its third reading on 21 Oct 2021², will amend the Financial Markets Conduct (FMC) Act 2013, the Financial Reporting Act 2013, and the Public Audit Act 2001, implementing a single policy to broaden non-financial reporting by requiring and supporting the making of climate-related disclosures by certain FMC reporting entities and supporting related matters. It is possible that some Māori investment interests will fall into one or more of these categories AND have Pāua fishery interests as the new New Zealand climate reporting requirements will apply to the following:

- All registered banks, credit unions, and building societies with total assets of more than \$1 billion³.
- All managers of registered investment schemes with greater than \$1 billion in total assets under management.
- All licensed insurers with greater than \$1 billion in total assets under management or annual premium income greater than \$250 million.
- All equity and debt issuers listed on the NZX.
- Crown financial institutions with greater than \$1 billion in total assets under management, such as ACC and the NZ Super Fund⁴.

As the banker to ~60% of the New Zealand seafood sector, ANZ plays an important role. Being required to report, and for many of them, seeking to reduce climate change risk and impact, banks per se are working through their exposure to climate change, and other environmental (natural capital) risk. With the (2018) combined Māori Authority assets over \$20.7 billion⁵, there will be significant reporting requirements in the Māori economy too. Methodological and quantitative improvements are needed to inform the increasing use of sustainability linked loans⁶ to de-risk banks in this respect, and to better document material natural capital risks in annual corporate reports which also improve transparency for corporate governance and beyond, for wider civil society audiences.

RA 2: Analysis of the commercial Pāua wild harvest sectoral operational infrastructure subject to environmental risk and uncertainty.

This RA will document the risks facing Pāua sector coastal infrastructure i.e. boat ramps, wharves, seafood holding and processing facilities, relevant at-risk coastal transportation infrastructure e.g. remote roads including from sea-level rise and increasingly severe and frequent storms.

This RA will draw on the research about coastal hazards and storms from the NIWA coastal climate change and sea level rise⁷ and the Coastal Adaptation to Climate Change research programmes, as well as from the Ministry for the Environment Climate Change Adaptation work programme and other resources such as the DOC Risk Exposure Assessment (2019)⁹, from Greater Wellington Regional Council, the FRDC Handbook Adaptation of Fisheries Management to Climate Change, and any available research and analysis from key partners and stakeholders in the project including ANZ NZ Bank, the Aotearoa Circle, and those they may know in the insurance sector (e.g., IAG).

The risks will be documented and assessed as risks to the physical infrastructure, as well as for example supply continuity, access to insurance and relevant public infrastructure planning for roading, using sector surveys and discussions with the advisory group. RA2 will also summarise much of RA1's work in a report (**Output 1**) documenting the environmental risks facing the commercial wild harvest pāua sector.

¹ <https://www.xrb.govt.nz/extended-external-reporting/climate-related-disclosures/> KPMGs Stefan Gray, who was facilitating the Aotearoa Circle is currently on secondment to the XRB.

² <https://www.beehive.govt.nz/release/nz-passes-world-first-climate-reporting-legislation>

³ About 200 entities. <https://environment.govt.nz/what-government-is-doing/areas-of-work/climate-change/mandatory-climate-related-financial-disclosures/>

⁴ <https://www.beehive.govt.nz/release/new-zealand-first-world-require-climate-risk-reporting>

⁵ <https://www.stats.govt.nz/information-releases/tatauranga-umanga-maori-statistics-on-maori-businesses-2019-english>

⁶ <https://www.rnz.co.nz/national/programmes/ninetoonoon/audio/2018818000/westpac-moves-to-loans-with-sustainability-strings-attached>

⁷ <https://environment.govt.nz/what-government-is-doing/areas-of-work/climate-change/adapting-to-climate-change/adapting-to-sea-level-rise/>

⁸ Category A – Coastal subdivision, greenfield developments and major new infrastructure

The New Zealand Coastal Policy Statement 2010 emphasises locating such development away from areas prone to coastal hazard risks (including climate change) and avoiding increasing the risk. Therefore, councils considering coastal subdivision, greenfield developments and major new infrastructure should avoid the hazard risk by considering sea-level rise over more than 100 years and using the highest sea-level rise scenario (H+).

Category B – Changes in land use and redevelopment (intensification)

When considering changes in land use and redevelopment (intensification), councils should conduct a risk assessment using all four sea-level rise scenarios and the adaptive pathways planning approach.

Category C – Existing coastal development and asset planning

For planning and decision timeframes out to 2120, councils should use a minimum transitional value for sea level rise of 1 metre relative to the 1986-2005 baseline.

⁹ <https://www.doc.govt.nz/globalassets/documents/science-and-technical/sfc332entire.pdf>

RA 3: Develop a methodology for the commercial Pāua wild harvest sector to factor environmental risk and uncertainty into investment decisions.

This RA will see the development of a weighted average cost of capital (WACC) rate by a specialist team that is able to factor in “risk” beyond previously normalised risk factors associated with return-on-investment modelling. This will take the use of a WACC rate beyond those factors considered important related to rights attributes (flexibility, quality of title, exclusivity, transferability, divisibility & duration) into the realms of fishery management, infrastructure, response approach and ability, market requirements and demands, and shared fishery implications (recreational, customary). Information considered from RA1 will include the environmentally driven risks and, also the potential response strategies that may offset or reduce risks.

Methodologically, in developing the model:

- We will firstly explore assessment of the risk implications from climate change to quota values and annual revenue streams which drive quota values. Based on this we will then assess the likely investment decisions and considerations required to protect those values into the future.
- In the absence of reliable observed market prices, value must be estimated. It is generally accepted that the value of any asset is a function of future cash flow discounted back to a present value by an appropriate discount rate or cost of capital which allows for risk and the time value of money.
- A discounted cash flow (DCF) valuation model will be developed to determine a value for quota. This approach requires an estimation of the net cash flows available from ownership of the quota and the estimation of and application of an appropriate discount rate.
- Conventional approaches to risk assessment (discount rates) in quota valuation have not considered climate change in significant detail and certainly it is unlikely that industry (or quota buyers) currently consider factoring such risk in purchase decisions beyond the short-term TAC and TACC setting possibilities driven by harvest impact rather than environmental impact. The project will explore expanding “discount rate” considerations to include wider climate change and environmental impacts and how such considerations may impact the sector.

Characterisation of the business and financial structures of the industry (from Quota ownership to Pāua divers) will be necessary to identify the impact of environmental risk and uncertainty, and any related opportunities, on respective business models, preparedness, capability and financial capacity that will be needed to develop meaningful response strategies. This work will include review of comparable Pāua (abalone) fisheries in New Zealand and internationally to understand how environmental risk and uncertainty are addressed. The FRDC Handbook Adaptation of Fisheries Management to Climate Change is a good starting point¹⁰. For New Zealand, this will document and analyse historical ROI trends and Quota and ACE prices, assess industry wide versus individual QMA quota owner considerations of environmental risk factors and seek to understand how environmental risk and uncertainty are assessed in Pāua and other fisheries, and where possible other primary industries. This project will explore whether environmental risk and uncertainty is factored in fishery management internationally through reaching out to networks in ocean accounting (Jan Bebbington), SeaBOS (Martin Exel - an initiative of the top ten seafood companies in partnership with the Stockholm Resilience Centre), the Ocean Risk Resilience and Action Alliance (ORRA) (via Karen Sack), and Jim Leape (Stanford Centre for Ocean Solutions)¹¹.

This RA will:

- develop a methodology to estimate cost benefit ratios of particular response options from a do-nothing approach to a full-ecosystem-based fisheries management resilience plan that may, for instance, entail large scale land based reseeded centres (i.e. taking Pāua to 30-50mm) to overcome recruitment failure from acidification and any related risks.
- develop an interactive interface to the model that allows multiple factors and considerations to be applied and which produces possible scenarios for impacts to quota values and annual income streams i.e., if “this” happens the impacts will be “X” but if action a + b occur then the impacts may be “-X” thereby strengthening the “value” across multiple value streams.
- begin building into the model ways that industry can analyse where best to invest scarce resources to off-set/minimise the risks from environmental and climate change related impacts in order to protect their Pāua related investments.

RA3 will produce: **Output 2: Integrated Calculating Model** of environmental risks and uncertainties facing the commercial Pāua wild harvest sector (fishery and infrastructure) including investment options analytical approaches, and **Output 3. Document factors** that might prevent use of the model for other locations, fisheries (e.g. lobster) and industries, together with the modifications that would be needed.

¹⁰ https://www.frdc.com.au/sites/default/files/products/2016-059-Climate_Adaptation_Handbook_Updated_June11_2021_WEB.pdf

¹¹ Terra Moana’s Katherine Short has these relationships.

RA 4: Produce guidance and prioritised commercial wild harvest pāua sector strategic responses to address environmental risk and uncertainty, in the context of introducing ecosystem-based management into Aotearoa New Zealand marine management.

This RA aims to create resources for seafood companies to better assess, articulate and report risks and feed into fishery adaptation/risk/ecosystem-based management plans. It will document the process of the research, obtaining the data, developing environmental change estimating factors, and building the model. Working with iwi and key industry stakeholders (PAU2, PIC, Quota Owners and ANZ NZ) in workshops and wānanga, the model will be refined and documented so that the seafood sector, and their lenders can operate such models in other seafood businesses (and potentially other primary industries). Contingency planning for if the fishery becomes environmentally unviable will be initially explored with stakeholders i.e. possibly including moving to shore-based juvenile rearing facilities.

The guidance will also summarise the key strategic responses (e.g. riparian planting to reduce sedimentation, remote environmental sensing), identified in RA1, that can help reduce environmental risk and uncertainty and any progress that may be made in collaboratively exploring these with stakeholders, including any guidance on the apportioning of investment that is required to design and implement such responses.

In at least one final project workshop with the advisory group, research team and key stakeholders (PAU2, PIC, Quota Owners and ANZ NZ, and Government), we will identify the opportunities/challenges of integrating new risks into existing organisational metrics, and explore co-developing a strategy to translate environmental risks, uncertainty and opportunities into operations and future planning. This workshop will share the new *Seafood Business Environmental Risks, Uncertainties and Opportunities (calculating) Assessment Tool* and explore collaborative investment for key strategic responses.

We will also work with the Sustainable Seas Communications Team to socialise the results of the project to the seafood, recreational and customary fishing sectors through producing a public summary of the project, and online (Sustainable Seas and project partner websites and webinars), as well as through social media of project participants and their organisations.

Output 4. Final Project Report summarising the *Environmental Risks and Uncertainties facing the Commercial Pāua Sector, their Financial Implications, and Guidance for Investing in Response Strategies*.

Output 5. Public Summary summarising the *Environmental Risks and Uncertainties facing the Commercial Pāua Sector, their Financial Implications, and Guidance for Investing in Response Strategies*.

L. LINKS TO PHASE I RESEARCH

The research will draw on the results from Phase I projects:

2.2.1 Creating value from a blue economy, building on the understanding of the various ways that a blue economy can be described and the additional ways of knowing success.

3.2.1 Whai Rawa, Whai Mana, Whai Oranga: the Māori marine economy, building particularly on the structures and operating principles of Māori marine organisations, particularly with respect to sustainability and strategy time-lines.

4.2.1 Tipping points in ecosystem structure, function & services, building on the understanding of practices that reduce resilience.

M. LINKS TO & INTERDEPENDENCIES WITH PHASE II RESEARCH PROJECTS

The project will share learnings with project 2.2 Restorative Economies, around investment opportunities and methods for assessing these, and will learn from:

- 1.1 Cumulative stressors, especially the work being conducted around effects on kelp and methods to assess risks of CE and recovery rates.
 - 2.3 Indigenising the blue economy, especially economy imbued with mātauranga Māori, Te Tiriti o Waitangi principles, and a focus on Māori wellbeing, human potential, and relational balance.
 - 4.3 Enabling kaitiakitanga and EBM and T1 Awhi Mai Awhi Atu, especially around contextualising management and restoration within an EBM/kaitiakitanga context.
 - T2 He Pou Tokomanawa, particularly within its focus on restoring kelp.

Through ongoing meetings and contributions to workshops, it will provide input into:

- 3.1 Perceptions of risk and uncertainty.

- 3.2 Communicating risk and uncertainty.

N. VISION MĀTAURANGA (VM)

Pāua is a taonga species and PAU2 Iwi Quota Holders are 71.9% of the fishery. Ngāti Kahungunu, Ngāti Porou, Rangitane – and other Tairāwhiti Māori are important geographically and have a significant interest in maintaining the value of their quota and seeing it used in a fashion that supports kaitiakitanga and cultural wellbeing, including upholding customary fishing. The project initially arose from discussions around the development of a PAU2 resilience management strategy, proving the opportunity to broaden this into a fuller analysis of business and infrastructure risks and thus to inform resilience and fishery management planning that will maintain businesses, investment, quota value and the fishery cultural values.

This project has a commitment to the concepts behind the Vision Mātauranga policy, which will be met through engaging with the PAU2 stakeholders, mainly through PAU2 meetings and some specific wānanga. We have allocated specific funding to support Māori who would not otherwise be able to attend these wānanga, for example Pāua divers. We will also be including iwi representatives on our advisory group (see VM P2).

Vision Mātauranga Deliverables

Partnerships:

VM P1 This project will draw on Terra Moana’s experience and relationships from having chaired the PAU2 fishery (over a decade) with key Executive Members from the Wairarapa area and representing Māori quota owners. Terra Moana also has current relationships with the following relevant people which can be drawn on as appropriate: Trevor Moeke (Takitumu Seafoods), Maru Samuels (ICP), Dean Moana (Ngāti Porou), Shade Smith (NKII), Jenny Apatu-Mauger (Independent), Te Kaha Hawaikirangi (Napier Port), and Desna Whaanga-Schollum (Mahia, Sustainable Seas).

VM P2 An Advisory Group¹² will be formed, and the following have been approached and are willing to participate in the project: Toa Pomare, Chair PAU2, Ngāti Kahungunu approached through Trevor Moeke, Ngāti Porou through Dean Moana, Maru Samuels (ICP), and Mark Ngata, Moana New Zealand.

Distinctive Contribution:

VM D1. The project will result in distinctive and innovative outputs specifically tailored to Māori interests around business risks and strategies that meet structures, timelines, and operating principles of Māori marine organisations. The strong presence of key Māori people on the advisory board will continue to direct the relevance, and the development of the model and help ensure that it represents Māori seafood sector interests related to business risks and strategies, and the timelines and operating principles of Māori marine organisations.

VM D2. Project outputs are aligned to the identified issues and aspirations of iwi partners.

VM D3. RA1 will scope the intersection of environmental risks and emergent legislative change pertaining to Pāua (taonga) species, and thereby identify possible future directions for industry to consider (see Milestone 1.5).

Meaningful Outcomes:

VM M1. The project reflects Māori aspirations within the PAU2 Management Committee framework and has the direct aim of maintaining quota value by going beyond business as usual and considering Ki Uta Ki Tai and the implications of holistic management.

VM M2. Through the advisory group and the wānanga the project creates the opportunity for direct talks between Quota holders, Pāua related businesses and employees, ANZ Bank, and potentially also the Aotearoa Circle Seafood Adaptation Taskforce.

O. ENGAGEMENT REQUIRED WITH IWI AND STAKEHOLDERS

An Advisory Group is mooted with indicative interest already from Dean Spicer/Christine Smith (ANZ), Volker Kuntzsch (given Aotearoa Circle Board Co-Chair and seafood knowledge), Nigel Bradley (response strategies, innovative financing), Storm Stanley (Chair PIC), and Clifford Baird (MPI). We also intend to ask Bryce Davies¹³, Senior Manager Government and Stakeholder Relations, IAG¹⁴. Confirmed interest in supporting the project has also been secured from key Māori interests: Toa Pomare, Chair PAU2, Trevor Moeke, Ngāti Kahungunu, Dean Moana, Ngāti Porou, Maru Samuels, Iwi Collective Partnership, and Mark Ngata, Moana New Zealand. Exact Project Advisory Group participation will be confirmed in consultation with the Challenge Leadership and liaison with potential participants.

¹² Exact composition and outreach to be agreed with the Challenge when the project shape is finalised.

¹³ Mr Davies led the development of the first Resilient New Zealand report on the role that businesses can play together to help New Zealand be better prepared for, and recover from, future natural disasters. Resilient New Zealand was set up by engineering, banking, insurance, telecommunications, and aid organisations to identify, champion and advocate ways New Zealand can be more resilient to natural disasters.

Before IAG, Mr Davies held roles across the insurance and banking sectors.

¹⁴ <https://environment.govt.nz/what-government-is-doing/areas-of-work/climate-change/adapting-to-climate-change/climate-change-adaptation-technical-working-group/>

- Iwi engagement will be facilitated, as detailed above in VMP2 and the Advisory Group.
- The Pāua Industry Council (PIC) will be involved through participating in workshops, on the advisory group and through the contribution of Tom McCowan in RA1 and RA2 work.
- As the banker to 60% of the seafood sector ANZ NZ will contribute capability and guidance, through membership of the advisory group and, through the provision of a modeller to assist with RA3 and 4 (Christine Smith).
- Participation of the Aotearoa Circle Seafood Adaptation Taskforce in the advisory group would provide the opportunity to link with the ICP, FNZ and KPMGs climate change capability (clarification being sought).
- Participation of MPI is likely to be through Cliff Baird who has indicated his interest in being involved on the advisory group.

The advisory group is intended to be virtual with in-person workshop attendance when that becomes possible. At a minimum it will meet quarterly for 2 hours.

P. PROJECT COMMUNICATIONS

[150 WORD MAX.]

Our primary means of communication will be directly with key partners (virtual, and face to face when allowed), and via email, phone etc. We will also work with the Sustainable Seas Communications Team to socialise the results of the project to the seafood sector through producing a public summary of the project, and online (Sustainable Seas and project partner websites, and webinars) as well as through social media of project participants and their organisations.

The final RA (RA4) will include exploring partnerships (private, public, sectorial, financial, academic) to ensure wide understanding and support for the strategic responses and via creating a public summary of the research.

Q. RISK & MITIGATION

Project Risk/s

- The political implications of raised expectations for immediate action by some sectors of impending environmental change impacts and a perceived view that removing commercial fishing will solve future problems.
- Unwillingness by any key participant to accept their responsibilities to deliver a “shared” solution.
- Creating a perception that fishery quota value is diminished by environmental risk.
- Failing to generate momentum towards collaborative co-design of place-based response strategies.

These risks are mitigated by taking a broad holistic perspective with a group of iwi and key stakeholders that have already demonstrated their desire to create long-term strategies, by being able to bring in big players such as Moana New Zealand, the ANZ NZ bank, and potentially the Aotearoa Circle, and by regular, clear communication with the Challenge Leadership and advisory group.

R. CONSENTS & APPROVAL required to undertake research

[150 WORD MAX.]

- NA

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