**Te Ara Paerangi - Future Pathways submission**

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I am the Chief Scientist Fisheries at NIWA, a position I have held since March 2021. I have worked at NIWA Greta Point as a fisheries scientist for 21 years. I was a Programme Leader (jointly responsible for NIWA's Fisheries Assessment & Monitoring Programme) from 2012, and before that I was a science Group Manager for eight years.

I completed my PhD at University of Otago in 1997 and was a recipient of a NZ Foundation for Research, Science, & Technology Post-Doctoral Fellowship which supported me to work at Memorial University of Newfoundland, Canada from 1998–2000.

I have a strong science background in fisheries, with an emphasis on practical, sea-going data collection. I have participated in 59 research voyages at NIWA, and led 36 of these, including leading three Antarctic voyages on RV *Tangaroa*. Internationally, I am recognized as an expert in fisheries acoustics. I was Chair of the International Council for the Exploration of the Sea (ICES) Working Group on Fisheries Acoustics Science and Technology from 2017–19 and I am a current specialist editor for ICES Journal of Marine Science. I have authored 45 primary publications, and over 150 research reports.

With over 25 years' experience progressing through the NZ science sector, I feel that I can offer some useful insights, and I welcome the opportunity to make a submission on the Te Ara Paerangi - Future Pathways documents. This is a personal submission and the views and opinions I express are not necessarily endorsed by NIWA.

I deliberately chose to make this submission by email rather than via the online form. I have aimed to keep my points brief and at a high level but with a particular focus on my area of expertise. I have attempted to align my comments with the broad categories of the Green Paper. You are welcome to disclose this submission and contact me if you wish to discuss any aspects of my submission further.

1. Research Priorities

The major gap I see in the current NZ science system is in the **framework and support for collection and maintenance of long-term data time series**. In my field, these time series include regular surveys which monitor abundance of marine species, but there are a wide variety of other environmental monitoring metrics across a range of sectors (e.g., river flows, weather data, water quality metrics, soil indices, atmospheric gas composition). The information provided by these time-series provides the basis for much of our knowledge and is used widely by government and other agencies. In fisheries, we rely on survey series to support stock assessments used to set commercial catch limits, to assess ecosystem impacts on associated species, and to provide state of the environment reporting. Despite their fundamental importance to the science system, long-term data time series are often not considered as 'real' (hypothesis-driven) science, and certainly not as 'innovation'. Support for long-term environmental monitoring is therefore not eligible for many of the existing forms of funding within the NZ system (particularly from MBIE), and often has to be secured on an annual basis. This makes continuation of valuable time-series vulnerable to fluctuating short-term priorities and limited budgets, and therefore a constant challenge to maintain. Currently time-series vital to monitoring the NZ environment are funded by a broad mix of government

departments, CRIs, universities, and regional councils – often without centralised coordination and support.

I was grateful to note that in Section 1.2.1.4 of the Green Paper it notes that "A specific amount of funding will be allocated …. for a relatively long time ….". Once key environmental monitoring series are identified and prioritised, I think that it is critical that these are supported with stable and consistent funding across multiple years. The challenge of course is in the prioritisation, within a limited national budget. In my view, **research priorities need to take into account the principles of social, cultural, economic, and environmental benefits** with equal weighting.

3. Funding

My area of expertise is in fisheries science, which has a particular niche within the NZ science sector. Funding is primarily through Fisheries New Zealand (Ministry for Primary Industries, MPI), but is largely cost-recovered through levies on the commercial fishing industry. **The cost recovery model provides a perverse incentive** that may actively discourage research. For example, there is a powerful incentive for industry to resist expenditure on research, especially on stocks perceived as being most at risk, as the research (as well as costing money upfront) may also lead to future reductions in catch limits. Another peculiar feature of the system is calls to stop or reduce research on the basis that the quota owners cannot afford the costs. Cost recovery was subject to a 2018 MPI review (https://www.mpi.govt.nz/dmsdocument/30852-Cost-recovery-at-MPI-Findings-from-the-First-Principles-Review-of-MPIs-cost-recovery-arrangements), however the specific peculiarities of fisheries science cost recovery are not discussed, and there have been no substantive changes to the science funding model within fisheries following.

**Funding for core fisheries research has been largely static** in dollar terms, and has decreased significantly in real terms (when adjusted for inflation), since 1995. This is at odds with the general statement in Section 3.1 that "Government funding that supports research activities has increased significantly over the past 10 years". In my area, we are doing more (a wider variety of projects), and being asked for more innovation, for less money every year.

The annual fisheries research cost represents only a small proportion of the overall value of NZ wild-caught fisheries (less than 1.5% of a conservative net annual value of $1.5 B). Although it could be argued that 'user pays' is the best model for science, and that the users should pay more, it is not only NZ commercial fishers that benefit from good science, well managed fisheries, and a healthy environment.

The point in Section 3.1.2 of the Green Paper that "revenue **competition can form barriers to collaboration and connections**" is important and valid. Although the aim of a market-based competitive funding model is increased efficiency and value, there is a large administrative burden associated with tendering for work for which there is often no market – meaning for many fisheries projects there is no competition. I am pleased to note that MPI has recently adopted multi-year contracts across some research projects that reduces administration, and also allows for increased certainty and therefore better medium-term workforce planning.

There is a **significant infrastructure cost associated with maintaining key assets and developing expertise.** In fisheries, this includes research vessels. The funding system needs to take account of this. NIWA has been particularly successful in maintaining NZ's research vessel capability, but this has been achieved by taking on commercially and internationally funded work to make up for

decreases in dedicated NZ funding, and reduced fisheries survey contracts. The recent increased prevalence of small 'desk-based' consultants who do not invest in capital expenditure, play no role in training/mentoring of new scientists, and lack long-term commitment to NZ science is a threat and makes ongoing justification for such investment challenging.

4. Institutions

NZ Fisheries Research Services became part of NIWA in 1995. In my opinion the **separation of science from the management, compliance, and funding roles of a government department has been largely beneficial**. This has allowed for increased collaboration with other science disciplines within NIWA and exposure to a wider variety of research projects. Independence from a compliance role is particularly valuable when dealing with stakeholders and has helped in producing objective science outcomes. I support the maintenance of a science system where scientists are at 'arm's length' from management and policy.

The challenge with separation between science and state is the **need for communication on research priorities and alignment of capabilities with national science needs**. In fisheries, there has been a disappointing trend over past 10 years to no longer consult research providers on research planning because of a perceived 'conflict of interest'. This is unfortunate as researchers usually have a very good understanding of where future research is required and what is involved. The irony, in fisheries at least, is that industry stakeholders are formally consulted both around research priorities and also on funding.

CRIs like NIWA have consistently **high and reliable expenditure/investment on capital items and staff capability** that supports research for NZ. This is a benefit of the CRI model as it allows our science to be somewhat insulated in the face of changing short-term budgets, competing priorities, and fluctuating numbers of government contracts. The use of profit to reinvest in science resources and infrastructure has allowed NIWA to act strategically and plan long-term. However, as NIWA's costing is based on this capital investment strategy, the perception from our clients (including government) is that we are 'expensive'. I am not convinced that any move towards more centralised ('coordinated') decisions on capital investments would be beneficial. Although the principle is sound, the more parties involved, the greater the competition for resources and a reduced likelihood of stable and strategic investment.

5. Research workforce

In my personal experience, most people embark on careers in science for passion rather than profit. But it is **increasingly difficult to attract and retain good staff** in a changing world where there are much more lucrative career options for bright and motivated young people in other sectors (especially IT). As noted in the Green Paper, reliance on funding from competitive and unpredictable sources also means that early career researchers are particularly vulnerable.

In general terms **NZ universities are not adequately equipping young researchers for careers in fisheries research**. Most of our recent recruits are from outside NZ or are New Zealanders who have trained overseas. In my opinion, there are four reasons for this:

1. NZ universities do not have access to the assets and resources (e.g., research vessels) which are required to do large-scale fisheries research

2. With a few exceptions, academic staff at NZ universities are not trained in fisheries. Much of the focus in the marine environment is on conservation biology and ecology.
3. There is inadequate support to enable students to work within CRIs.
4. There is little incentive for CRI scientists to supervise students, as this is time consuming, requires considerable personal investment, and does not generate revenue.

There are some successful initiatives to address these issues. Establishment of joint university-CRI research centres facilitates co-supervision of students, graduate scholarships from MPI have supported thesis research in relevant topics, and summer internships (e.g., Blake Trust) provide opportunities for a small group of students to participate in research voyages. However, I would like to see us build on this to try and internally train and develop New Zealanders (and especially Māori and Pacific people) to support the future needs of NZ.

Science education and engagement starts at school, and greater focus on science and investigation at primary school (and better science training of teachers) would be a great start, but is perhaps outside the scope of this discussion? In the tertiary sector, support for scientists from other institutions to participate in lectures and supervision of students would be beneficial in breaking down barriers between academia and external researchers. **I strongly endorse the concept of internships and fellowships**, potentially supported by base grants, to provide early career researchers a secure and stable step into a science career. The post-doctoral fellowship scheme, formally funded by Foundation for Research Science and Technology, was the catalyst for my personal career – allowing me to expand on my thesis research (which was a small-scale local study) and grow into working on large nationally important fisheries. Post-graduate internships/fellowships are the equivalent of apprenticeships for scientists. For this to be successfully implemented, as well as support for the early career researcher, there needs to be adequate support and recognition for mentoring/supervision.