SUBMISSION NO. 28
Inquiry into the Role of Science for Fisheries and Aquaculture

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AUSTRALIA

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07 MAY 2012
by: .....

The House of Representatives Standing Committee on Agriculture, Resources Fisheries and Forestry

Inquiry into Fisheries and Aquaculture Science

Submission from James Cook University

1. Introduction

James Cook University (JCU) welcomes the opportunity to make a submission to the Standing Committee's inquiry into into the role of science for fisheries and aquaculture.

In summary, JCU submits:

- Australia has vast marine territories and there is an imperative to understand these ecosystems
- Australia's fisheries are generally managed to high global standards.
- There is a clear need for integrated research to address social and economic challenges and opportunities of fisheries.
- Australia is a significant hub of fisheries expertise and leadership in the Asia-Pacific region.
- There is a well-established link between scientific knowledge and sustainability (ecological and economic) of fish stocks.
- Lack of baseline data and ongoing research impedes commercial fishing, managing biosecurity risks and equitable management of commercial and recreational fishing stocks.
- There is a poor understanding of physiological limits of most commercial taxa and their ability to adapt to climate change.
- Reduced investment, especially at State level, and inadequate co-ordination between State and Federal agencies are hampering fisheries management particularly of lesser known species
- Research collaboration and co-locations between State and Federal research and management agencies and universities are an efficient and effective way to develop capacity and critical mass

JCU has considerable expertise and investments in fisheries and marine sciences. In the Commonwealth Government's Excellence in Research in Australia (ERA) ratings, JCU is the only Australian university to receive the top rating of 5 for *Fisheries Science* (this grouping includes both wild fisheries and aquaculture). JCU also gained an ERA 5 rating for *Ecology and Environmental Science*, which includes a substantial marine component.

JCU's fisheries and aquaculture research is acknowledged for both its academic excellence and its policy and industry 'impact' through, for example; informing the implementation and management of marine zoning to protect biodiversity in world heritage-listed marine systems; developing best practice and innovation in aquaculture and aquatic biosecurity; and in the world-leading management of tropical ecosystems and fisheries. Focal areas of this research include climate change, marine habitats, water quality, macrofauna such as sharks, key target and by-catch species, iconic marine wildlife (such as turtle and dugong) and social and economic aspects of fisheries.

2. Fisheries and Aquaculture Research is critical to Australia

Australia has marine territories that are about 1.4 times that of the Australian land mass. Moreover, a great proportion of this area includes waters that are over two km deep. Australia has an obligation, through international law, to understand and investigate these waters and the ecosystems associated with them.

Commercial fisheries, especially on the shelf (~ 180,000 tonnes pa), are worth about $2b in direct income. Australia's fisheries are generally managed to very high standards (on a global scale), though the knowledge base that underpins this is primarily focussed on key target species.

Despite these high standards, most Australian fishing businesses are struggling to compete on the domestic market with the increasing amounts of cheap imported seafood that has not been caught or grown with any environmental accountability.

This is not helped by the lack of public awareness of the significant disparity between imported and domestic standards and regulatory regimes. Moreover, unfavourable exchange rates in the past few years has made it difficult for Australian fish products (both wild caught and grown) to compete on the international market. Consequently there is a real risk that many parts of the Australian fishing industry will be unable to survive the current market conditions.

Integrated research to develop innovative solutions to the social and economic aspects of fisheries is urgently needed if Australia is going to retain this mainly regional skill base. Supporting fisheries with triple-bottom line research will ensure there is ongoing capacity to provide sustainable, high quality seafood for the nation into the future. This is a non-trivial need, given the significant health benefits of increased consumption of seafood and the national priorities to maintain healthy ecosystems and foster resilient regional communities.

Recreational fishing is Australia's most popular sport and in some areas the quantity of fishes taken exceeds that of the commercial catch. Knowledge about this growing sector and its likely impacts on a range of target species (and associated ecosystems) is small and fragmented at best. Without a substantial investment in social and economic research into recreational fishing practices and impacts, Australian fisheries management will be increasingly compromised as the sector continues to grow. There is also a growing need to resolve the allocation of fish resources between commercial and recreational sectors in many areas. As human population increases, and with it the number of recreational fishers, issues around resource allocation will become increasingly heated. Often such conflicts are based more on perception than on scientific fact. Thus improved information on the take of recreational fishers, and mechanisms for using scientific data to resolve resource allocation questions, will enable equitable use of Australia's wild fish stocks.

For indigenous populations in remote parts of Australia seafood represents not only a primary source of protein to feed isolated communities but also potential employment opportunities. Under Australian law indigenous people are also entitled to take endangered species such as turtle and dugong. Without research there is little capacity to understand how to work with indigenous people to ensure their legitimate fishing-related activities are sustainable and best practice.

3. Aquaculture is the basis of substantial export industries and is critical for long-term food security

Australia has world-leadership status in many areas of aquaculture. Although national aquaculture production is small by international standards, Australia provides a hub of expertise and stewardship for the Asia-Pacific region and leadership in best practice. Major regional concerns, and a focus for research are: fish disease, environmental mitigation for zero nutrient emissions; polyculture; stock improvement; genetic health; and avoidance of genetic contamination of wild stocks.

Australia excels in modular aquaculture systems (e.g. *Cell Aquaculture Inc*), and the application of technology to farm high value species (i.e., pearl oysters, marine shrimp, Atlantic salmon and seaweed aquaculture), which contribute to ~ 60% of industry value. If Australian seafood production is going to grow through aquaculture R&D and transitioning from wild to farmed fisheries there needs to be synergisms between research and environmental policy development to ensure that world-leading research and closure of lifecycles of new aquaculture species can be translated into production.

At present there often is a clear disjunction between potential to farm new species and regulations restricting aquaculture growth, often based on precautionary principles and lack of scientific data. The same mismatch also significantly impedes growth of established industries. In Queensland, for example, the location of aquaculture farms and stringent environmental restrictions means no new farms can be established until water remediation problems are solved.

Aquaculture of new species (and current species in some cases) also cannot develop in the absence of baseline data on disease threats, genetic impacts and environmental footprints – all areas where science is lacking and funding opportunities to support such research are limited.

4. The relationship between scientific knowledge of fish species, ecosystems, biodiversity and fish stock sustainability

There is a well-established link between scientific knowledge and sustainability (both ecologically and economically) of fish stocks. Well studied species are more likely to be well managed and achieve their maximum sustainable yield or maximum economic yield. This paradigm has underpinned fisheries management in Australia for several decades, with scientific research targeted at key commercial and recreational species.

However, a reduction in the resources allocated to fisheries research at both state and federal levels has meant management agencies can struggle to base decisions on high quality science. As the allocation of resources has become tighter, there has been a reduction in the research capacity of fisheries agencies, especially at the state level. For example, NSW has largely lost its research capability through weak long-term planning and a lack of consideration for the building of human research capital and relevant expertise over decades. In this environment universities have become more prominent in the provision of fisheries research capacity. This has taken the form of either formal partnerships (e.g. IMAS [Tasmania], QTAAS [Queensland]) or informal alliances).

One relatively new addition to the fisheries management framework in Australia has been the introduction of Ecologically Sustainable Development (ESD), and the associated Wildlife Trade Operation (WTO) approvals process through DSEWPaC. This has implemented an improved ecosystem management approach to Australian fisheries (both state and federally managed) and will achieve long-term benefits for

Australian ecosystems. However the scientific knowledge on which ESD and the WTO process needs to be based has provided an additional cost to fisheries and fisheries management agencies, diverting resources from target research on key species. In an environment of reducing investment in fisheries research, such increased costs have further diluted the ability of research agencies to provide the scientific knowledge for effective fisheries management. Further, the policy tension between the WTO process and national economic benefit (through fisheries aiming to achieve maximum economic yield) has imposed greater costs in terms of research, monitoring and management.

5. *Fishery management and biosecurity*

There is a variable history of accurate stock assessment and ongoing monitoring in Australia which has, at times, led to collapses in fish stocks (e.g. gemfish in NSW). Inadequate collaboration and coordination of priorities between state and federal authorities, as well as lack of sufficient resources, has resulted in patchy data and, in some cases, even a lack of one-off stock assessments of key commercial species. The biggest challenges for the calculation of these parameters are data limitation for species where there has been little research and monitoring of fisheries. Efforts need to be increased to collect data on these lesser known species so that improved assessment can provide estimates of sustainable yield. Monitoring programs, fishery-independent surveys and the development of assessment techniques for data limited species are all critical to improving fisheries management. The lack of these parameters means that more conservative approaches need to be taken to management, which normally reduces yield, and thus the economic benefits to the nation.

Climate change ranks as one the top emerging threats facing fisheries resources worldwide. There is a poor understanding of physiological limits of most commercial taxa and their ability to adapt to change as well as the resilience of ecosystems that support fisheries. Changing ocean temperatures have already been documented to have caused changes in the distribution of fish stocks, and this is likely to continue. This will have implications for where wild fisheries operate, and as a result may require changes in how fisheries are managed.

However, the effects of changing climate of population processes, such as recruitment and survival, is more likely to have greater impact on fisheries than simple changes in distribution. Research that increases scientific knowledge of how these processes are affected, and builds them into stock assessment processes, will provide for improved future management and the setting of appropriate fishery limits to achieve maximum economic benefits for both operators and the nation. In addition, there needs to be recognition of the diverse threats to fish populations that result from climate change, including the effects of changing ocean pH, increases in severity and frequency of extreme weather, and others. All of these will have direct and indirect effects on fish stocks and the ecosystems in which they live.

Recent events in Gladstone indicate the importance of understanding interactions between the disturbance of systems, new industries and the risk of disease. There is an urgent need to develop an understanding of the role of disease in undisturbed systems to be able to identify when disease outbreaks have occurred, and how best to restore the health of species and systems. At present, Australia's approach to wild fish disease is a reactionary one, with research and monitoring normally triggered by outbreaks. Improved research of wild fish diseases in undisturbed systems will better equip regulatory agencies to deal with outbreaks.

6. R&D and applied science of aquaculture

The expansion of aquaculture is creating new industries, but aquaculture should not be seen as a replacement of wild fisheries. Australia needs to reduce the risk of losing sources of protein by having a mixed industry approach (i.e., aquaculture and wild resources). Australia's abalone industry was recognised as one of the best managed fisheries in the world (through a quota system), but a single-celled parasite has decimated the industry in many southern states. A partial solution is aquaculture with best-practice disease management and the potential to restock wild populations with more resistant young.

7. Research collaborations and training

Collaborations between universities and Federal research or management agencies such as the Australian Institute of Marine Science (AIMS), CSIRO, and the Great Barrier Reef Marine Park Authority (GBRMPA) and State research and management authorities continue to grow in importance. Increasingly these collaborations are being driven by National Research, Development and Extension Frameworks (R, D & E) for the Primary Industries.

JCU and the ARC Centre of Excellence for Coral Reef Studies (based at JCU) have extensive formal and informal collaborations with such agencies including, for example, AIMS and JCU undertaking joint supervision of PhD students.

The Queensland Tropical Agri- and Aquatic Sciences (QTAAS) Alliance is a significant new collaboration between JCU and the Queensland Government through the Queensland Department of Agriculture, Fisheries and Forestry (QDAFF). It will help deliver effective industry outcomes under four research programs: Fisheries, Aquaculture, Biosecurity and Aquatic Ecosystems. The strong synergies across the four programs enable researchers to tackle some of the complex multidisciplinary problems currently facing tropical Fisheries and Aquaculture in Australia. The QTAAS Alliance is collocating some of the QDAFF staff on JCU's Townsville and Cairns Campuses, as well as locating some JCU academics and students at State government facilities. Stakeholders will play an integral role in setting priorities and delivering research outcomes under the Alliance. This is a long-term strategy to not only enhance existing research capacity, but also co-supervise research students to train the next generation of researchers, and integrate tertiary training with job experience in both government and industry settings. Ultimately outputs from the QTAAS Alliance will result in greater productivity, cost effective use of high-cost facilities and research of greater social impact.

Collaboration and collocation is a successful strategy to build human capacity and critical mass as has been successfully demonstrated in other parts of Australia. For example, the Tasmanian and Aquaculture Fisheries Institute (TAFI) is the best established and has the longest partnership. The rationale for this approach at a State and National level is based on the need to secure food supplies for the future and to foster resilient regional primary industries and communities. Increasing the science-based capacity through building regional capability and synergism will contribute significantly to achieving these goals. Better linking of task-focused research and legislative and regulatory regimes is required.

The management of fisheries (as well as aquaculture) has to consider biological information, social needs, politics and external threats. Sound management is required to reduce negative impacts on Australian communities. Knowledge of the interactions between biological resources and society is in its infancy in Australia and requires more research. As such, the support of research that addresses social aspects of

fisheries will provide significant dividends to Australia. A key to this will be the training of practitioners of social research of fisheries and aquaculture at Australian universities.

Sustaining the acquisition of knowledge requires a commitment to training fisheries scientists of the future. There is a need to improved training in fisheries science and aquaculture science, including in social and economic aspects to provide a pool of qualified practitioners for management agencies to draw on into the future. In particular, any educational initiatives focused towards tackling Australia's declining workforce in agricultural science should also encompass fisheries and aquaculture. At present, intake of domestic undergraduates choosing aquaculture as their career path is declining, an opposing trend compared to international intakes.

There is a critical role for Australia's universities to provide both the scientific knowledge that underpins the management of Australia's wild fish fisheries and aquaculture industries, and train qualified practitioners. This should be supported and grown by targeting resources towards programs that can deliver on both of these missions and thus provide a dividend to Australia through improved management of its wild fish and aquaculture resources.