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The Hon Dick Adams MP
Chair, House of Representatives Standing Committee
on Agriculture, Resources, Fisheries and Forestry
PO Box 6021
Parliament House
CANBERRA ACT 2600

Dear Dick,

I am pleased to offer the attached submission from the Northern Territory Department of Resources, Fisheries Division to the House of Representatives Standing Committee on Agriculture, Resources, Fisheries and Forestry inquiry into the role of science for fisheries and aquaculture. As you will see the Territory has a proud history of sustainably managing wild fisheries and aquaculture resources and operations. This success has been a result of collecting scientific knowledge on harvested species, creating strong partnerships across the tropics to facilitate efficient research projects and the development of innovative research techniques.

We thank you for providing the Territory with the opportunity to provide a submission to the inquiry and look forward to learning the outcomes of this work.

Yours sincerely

BRYAN McDONALD
A/Executive Director Fisheries

Tel
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May 2012

Attachment A

Submission by the Northern Territory Department of Resources regarding the inquiry into: The role of science for fisheries and aquaculture

The following is a submission to the inquiry in accordance with the Terms of Reference provided by the House of Representatives Standing Committee on Agriculture, Resources Fisheries and Forestry.

a) *the relationship between scientific knowledge of fish species, ecosystems, biodiversity and fish stock sustainability;*

The Fisheries Division of the Northern Territory Department of Resources (NT Fisheries) has a strong history of sustainably managing local fisheries. Scientific knowledge of the biology of harvested species has been a critical part of this success. NT Fisheries regularly collects information on exploited species such as size/age at maturity, reproduction, natural mortality, stock structure, vulnerability to capture and survivorship if and when released. Furthermore, the Division also obtains data on current harvest rates, the size structure of harvested species and catch compositions through tag/recapture and fishery observer programs.

This work is often undertaken in collaboration other local agencies such as Charles Darwin University, Australian National University and the Australian Institute of Marine Science (North Australia Marine Research Alliance) and other jurisdictional fisheries research agencies(Tropical Fisheries Alliance) to ensure that research efforts in Northern Australia are coordinated. Likewise, NT Fisheries adopts a partnership approach with all local stakeholders when setting priorities and conducting research.

NT Fisheries recognises the importance of monitoring ecosystem health and maintaining biodiversity to underpin sustainable resource use. Research on environmental drivers of barramundi and mud crab stocks has demonstrated a positive correlation between the amount of freshwater flow reaching the estuary and stock size. NT Fisheries has also been involved in large collaborative projects to identify key food webs in the tropics. Studies on species such as barramundi utilise methods that assess the biodiversity of an area as many small fish and crustaceans are important prey items for this species.

Scientific work undertaken by NT Fisheries has led to the development of innovative techniques such as the "Genetag" hook, which facilitates the collection on tissue samples (for DNA analysis) without bringing the fish on board (thereby reducing stress on the fish). This technology is now routinely used by fisheries scientists elsewhere in Australia and around the world.

The continued sustainable harvest of NT fish stocks requires further investment in fisheries and aquatic ecosystem research to determine appropriate harvest rates for target species and maintain the ecosystems that underpin the health of these fisheries.

b) fishery management and biosecurity, including but not limited to:

- *the calculation and monitoring of stock size, sustainable yield and bycatch, as well as related data collection*

NT Fisheries obtains catch (and bycatch) records from all commercial and Fishing Tour Operator (FTO) activity in the form of daily log books. This information provides an invaluable source of data on the type and quantity of fish caught, when and where they were caught, the type and configuration of fishing gear and the duration of fishing.

This data, along with the biological information collected in (a), forms the basis of NT Fisheries' stock assessment programs. Stock health is assessed by comparing current harvest rates with the maximum sustainable yield and current egg production with that prior to fishing. This is achieved through the use of catch histories, knowledge of a fish's biology and its susceptibility to fishing. It is then possible to determine if historical harvest rates have caused the stock to be overfished and whether current harvest rates are causing overfishing.

The information described above is also used to inform fishery specific Ecological Risk Assessments and to determine appropriate trigger reference points for any future changes in catch, effort or bycatch levels in a given fishery.

Reports by fishery observers show that most commercial fishing gear used in the NT is moderately to highly selective either by design or through careful use (e.g. setting on particular tides etc.). Much of the incidental catch is considered byproduct (which is sold for human consumption or used as bait) rather than bycatch. Hence, the discarding of bycatch in the NT is relatively low compared to other jurisdictions.

- *the effects of climate change, especially related to species dispersion, stock levels and impacts on fishing communities*

NT Fisheries has been involved in several projects assessing the potential impacts of climate change on fish stocks. One project considered the possible effects of various climate change scenarios on key target species based on their biology. The species most likely to be negatively impacted are those occurring in freshwater, estuarine and coastal environments. Clearly, without scientific knowledge on each fish's biology, this assessment would not have been possible.

Any impacts of climate change on susceptible fish species would probably be felt less in Darwin (which is by far the largest port in the NT) than the smaller ports of Nhulunbuy, Groote Eylandt and King Ash Bay because of the diversity of species sold through the NT's capital. For example, if barramundi and/or mud crab stocks suffered significant declines due to climate change, fishing activity (particularly commercial fishing) may cease in these smaller communities. Measures to mitigate the impacts of climate change (where possible) include NT Fisheries support for the development of resilient and adaptive fishing communities via national extension and adoption pathways.

- *pest and disease management and mitigation*

Pleasure craft from overseas wishing to enter Darwin marinas are inspected and treated for marine pests to minimise the risk of their transmission and establishment. The same process is applied to apprehended illegal foreign vessels (*i.e.* illegal foreign fishing or suspected illegal entry vessels). There is no capacity at present to inspect or treat international commercial vessels. However, a nationally coordinated regulatory model for vessel bio-fouling management, as proposed by the Commonwealth Department of Agriculture, Forestry and Fisheries (DAFF), will close this biosecurity gap.

Monitoring for marine bio-fouling organisms occurs across the NT coastline including Darwin and Gove harbours for the early detection of marine pests. Early detection is critical to limiting the spread and increasing the possibility of successful eradication of pests.

Scientific investigations, including environmental and pathological analyses of fish and invertebrate mortality events in the wild are routinely conducted to determine their cause/s and to eliminate the possibility of exotic diseases. The translocation of diseased animals is prohibited under the NT *Fisheries Act 1988*. The transport of fish and aquatic life within and between the Territory and other jurisdictions is regulated under the same act.

- *minimising risks to the natural environment and human health*

NT Fisheries manages aquatic resources under the *Fisheries Act 1988* in accordance with the principles of ecologically sustainable development (whether managing a single fish species or an ecosystem) to ensure appropriate protection of fish and fish habitats. Consequently, all allowable fishing gear must have minimal impact with non-target species and the wider environment.

Commercial fishers have a long history of working with NT Fisheries to reduce the environmental footprint of their activities. Notable examples include the design of a finfish trawl net that excludes Threatened, Endangered or Protected species (and a significant amount of bycatch) and also modifications of other nets to avoid interactions with protected sawfish.

In addition, fisheries with export approval are subject to regular assessment against the Australian Government's *Guidelines for the Ecologically Sustainable Management of Fisheries* under the *Environment Protection and Biodiversity Conservation* [EPBC] *Act 1999*. These guidelines ensure that the fisheries are managed in ecologically sustainable way, with low bycatch, minimal interaction with protected species and limited impacts onthe ecosystem/s in which they operate.

NT Fisheries and other NT Government agencies conduct routine and episodic sampling of fishes and aquatic invertebrates in order to monitor pollution and diseases in NT waterways. Most sampling takes placenear point sources such as tailings and effluent discharges associated with mines and major population centres.

- *cooperation among Australian governments on the above*

There is strong cooperation between state, territory and Commonwealth governments with regard to fisheries science, management and biosecurity. Highlights include the National Priorities Forum, the North Australian Fisheries Management Forum and the Research Providers Network. The NT, QLD and WA also have an established collaborative arrangement to coordinate tropical fisheries science (Tropical Fisheries Alliance). Other examples of inter-governmental cooperation (particularly with respect to biosecurity) are provided elsewhere in this document.

c) research, development and applied science of aquaculture, including:

Commercial fisheries in the NT are sustainably managed and there no plans to transition from wild capture to aquaculture production in the near to medium term. Aquaculture production of food fish in the NT is small by national and international standardsbut there is considerable scope for development of the industry. Issues related to aquaculture development in the tropics are discussed below.

Challenges facing aquaculture development

Australia faces a growing challenge to balance population growth, economic growth and food production with social and environmental values, particularly in the face of global climate change and its uncertain impacts. Aquaculture can play a major role in meeting the future food production needs of Australia, both by making appropriate investment to improve its current industries and to establish new industries (species and farming regions).

Tropical Australia's potential for aquaculture development

Tropical aquaculture, including on-shore, near-shore and offshore industries, has significant untapped potential to contribute towards meeting the future food production needs of Australia. Australia's northern coastline has 1.2 million hectares that are potentially suitable for aquaculture. It is likely that over the next 30 years a number of factors will come to play to increase investor interest in tropical aquaculture. Of particular importance are the diminishing opportunities for aquaculture development in the southern states due to competing coastal uses, and the desire of Indigenous people living in the tropical north of Australia to co-invest in the sustainable use of their marine resources. A large percentage of potentially suitable areas of the northern coastline are owned by Indigenous Australians. Aquaculture could play a pivotal role in the future livelihoods of these coastal communities, both through small-scale community-based enterprises and through large-scale joint venture partnerships with private aquaculture companies and investors.

Strategic investment support system

Unlocking the full potential of the sustainable growth of tropical Australia's aquaculture industry requires a cross governmental decision support system for aquaculture planning and implementation along the northern coastline. Such a spatial planning framework integrates a range of disciplines in addition to the applied science of aquaculture, such as the

environmental, social and economic sciences, climate change science, and resource use research.

There is significant potential for the federal government to partner with those of the NT, WA and QLD to meet the challenge of rigorously evaluating the potential for aquaculture to attract significant investment to the north and to provide economic and social benefits to northern coastal communities, whilst conserving the ecosystem health of the region and accommodating resilience to climate change. In this way strategic and cost-effective investment in science and commercial aquaculture development in the tropical north would be assured.

Challenges facing aquaculture science

Decisions on future R&D investment in aquaculture must consider the many challenges currently facing the industry.These include:

- *Improving the efficiency and reliability of animal production*

It is recommended that the focus should be predominantly on existing species already under aquaculture production. There has been a culture within the scientific community to research and develop the 'next big thing', with an expectation with each new species under investigation that it will succeed and be more profitable and productive than those that have been researched before. There needs to be more emphasis on research and development of existing species such as salmon, prawns, oysters, abalone and barramundi to ensure their sustainability and (with the exception of salmon and oysters) for them to migrate from relative small-scale industries to commodity species with high levels of production.

In the NT over the past four years there has been an increasing focus placed on species that do not require the addition of large amounts feed for them to grow. The relative isolation of the NT, the increasing costs of power and freight and the desire for economic developments in remote communities mean that species such as tropical rock oyster, giant clams and sea cucumbers (all of which do not require additional feed and have reasonably high market values) are attractive candidates for economic development in remote areas. However, as per the comment in the previous paragraph, this new species development needs to be in balance with supporting existing industry and the NT actively supports research to improve the sustainability and profitability of its two largest aquaculture industry sectors, pearls and barramundi. Both these industry sectors are under significant financial stress and have a need for R&D to improve production efficiency including (in the case of barramundi) improved feed utilisation and growth rates and (for pearling) improved and more consistent pearl shape and lustre. Genetic improvement programs for both these species can be targeted to address these R&D requirements.

- *Reducing energy demands through the use of alternative energy sources (such as solar, tidal)*

Energy costs are escalating at a rapid rate. Aquaculture industries are generally energy intensive (e.g. aeration and water pumping costs) and in the case of the NT, the high cost of both inward and outward freight is an additional burden. With the impending introduction of

the Carbon Tax it is expected that energy and freight costs for aquaculture farms will increase significantly again. This may have the effect of forcing operators in remote and regional Australia out of business. Alternative energy research can play a role in assisting aquaculture production remain competitive in Australia but the forecast returns from this research are predicted to be some way off which in many cases may be too late for Australian aquaculture farmers.

- *Reducing nutrient outputs and improving community understanding of nutrient management in aquaculture systems*

Nutrient management in aquaculture remains a priority focus area for environmental campaigners opposed to aquaculture development. This is despite considerable investment by industry and government into research which has repeatedly demonstrated that for Australian aquaculture nutrient management is very rarely a problem. In many instances aquaculture farms discharge water or higher quality than they take in.

In Queensland recently there was the example of one farm which took nearly 10 years to obtain environmental approval for its expansion. This was despite it demonstrating that water quality and nutrient discharge was not an issue. The final permit was granted by the Federal government on the condition that the farm could not discharge any water. The technology for "no-discharge" prawn farms has not been developed yet, making this a pointless approval. The effect of such decisions is to deflate investor confidence and jeopardise industry growth and ultimately threaten food security.

Initiatives to capture and re-use aquaculture produced nutrients should be supported and expanded. Activities such as fertiliser production from aquaculture wastes and complementary crop production (aquaponics - the simultaneous production of fish and vegetables) need more research and development investment.

- *Efficient management ofaquatic animal health issues*

Aquatic animal health remains as a major risk area to Australian aquaculture production. The majority of species in Australia have only been the subject of intensive production for a relatively short period of time. As such (and this has been seen frequently) new and emerging fish diseases threaten production.

Australia needs to maintain and actively support research into aquatic animal diseases and be ready to respond appropriately when new diseases emerge and when known diseases appear in a wider host range. To help manage aquatic animal diseases it is vital that Australia maintain effective, risk-based biosecurity policies to limit the chances of importation of diseases of economic importance from overseas or the movement of such diseases between Australian jurisdictions.

- *Enhancing product quality, value adding and marketing*

In order to maintain (or improve) its competitiveness, Australian aquaculture needs to continue R&D into product quality (increased shelf life, consistent flavour and appearance) and find new and innovative ways to value add and market its product.

- *Development of sustainable and cost effective feeds that reduce demands on wild harvest fishmeal and fish oil*

The use of fishmeal and fish oil (FFO) obtained from wild harvest fisheries remains as a contentious issue for aquaculture worldwide. Despite demonstrating that the wild capture industries are (for the most part) managed sustainably, the increased need for FFO by China (the world's largest user of these products) means that the finite wild supply must be supplemented. Research into FFO replacement for a wide range of aquaculture species must be supported as a priority activity.

- *Transitioning from the use of wild broodstock to full domestication using genetic selection and associated tools*

The use of wild collected broodstock has served the Australian aquaculture industry well over the past few decades. As the industry matures, and in order to address current industry issues relating to production efficiency and economic pressures it is now important to develop targeted genetic improvement programs. Genetic programs can be used to improve growth rates, increase feed utilisation efficiency, and improve disease resistance and product quality. Without improvements of this nature it will be difficult for Australian produced product to effectively compete with cheaper imports.

- *Planning and implementing adaptive strategies to projected climate change impacts (including systems, species and human health)*

With linkage to the genetics dot point above, the Australian industry needs to be positioned to take advantage of any opportunities presented by changes in the climate and also be prepared to take remedial action in situations where climate changes may prove detrimental to a species or production system.

d) governance arrangements relating to fisheries and aquaculture, including the implications for sustainability and industry development;

The harvest of aquatic organisms in the NT is controlled by the *Fisheries Act 1988* and several fishery-specific management plans. Amendments to these regulations are generally developed through a number of Management Advisory Committees (MAC's). Membership of these groups typically comprises representatives of the commercial, recreational, fishing tour operator and indigenous fishing communities. The primary aim of the MAC's is to ensure that the fishery operates in an ecologically sustainable manner, but they also consider a range of other (sometimes conflicting) issues such as resource allocation, industry development and access rights. The MACs provide advice to the Executive Director, NT Fisheries who then forwards recommendations to the Fisheries Minister.

The Australian Quarantine and Inspection Service (AQIS) within DAFF is responsiblefor the management of biosecurity threats from international vessels (including apprehended illegal vessels). NT Fisheries manages the marine pest biosecurity threats associated with international pleasure craft entering Darwin. The NT *Fisheries Act 1988* contains provisions that enable the Executive Director, NT Fisheries to control aquatic pests and diseases through

the quarantining and treatment of infected areas, placing restrictions on vessel movements and by ordering infected vessels to be treated or to leave NT waters.

DAFF recently circulated a draft regulatory impact statement for the introduction of nationally consistent regulations and procedures for the management and treatment of marine pests on internationally travelled vessels. Two options were presented in the paper, one being a regulatory model and the other an educational model with voluntary compliance.

The NT supports a nationally consistent approach to bio-fouling management through a risk-based, regulatory model. This approach is considered the best option to reduce and manage the risk of non-indigenous marine species establishing in Australia. It is recognised that market forces alone (under a voluntary compliance regime) are unlikely to force action to minimise impacts of introduced marine pests to the broader community unless direct action is taken.

If managed correctly, the regulatory model should benefit the Australian maritime industries by protecting valuable port and shipping infrastructure. Unrestricted access to Australian ports is important, particular in relation to shipping in the oil and gas industries. If the situation ever arose where an Australian Port was quarantined because of pest incursions then the flow on costs to commercial shipping and fishing industries would be significant.

Other governance arrangements impacting on fisheries and aquaculture production and trade include "Country of Origin" labelling (administered by Food Standards Australia), 3rd party accreditation processes (e.g. Marine Stewardship Council certification) and the approvals necessary to secure market potential (e.g. exemptionsfrom the *EPBC Act 1999* in order to export product).

e) *current initiatives and responses to the above matters by state, territory and Australian governments;*

Each Australian state and territory has a fisheries and aquaculture research and development plan/strategy in place to guide the direction of associated research in that jurisdiction. These plans, which are usually current for three to five years, are developed by relevant agencies in collaboration with representatives from aquaculture, biosecurity, wild harvest and conservation groups/associations.

The Fisheries Research and Development Corporation (FRDC), which invests in fisheries and aquaculture research around Australia, also has a research, development and extension plan in place. Priorities for FRDC investment are identified through state and territory Fisheries Research Advisory Boards (FRABs), again consisting of a variety of stakeholders. The FRDC also manages a number of subprograms on specific topics, such as aquatic animal health and Atlantic salmon aquaculture.

The NT Government supports the national bio-fouling management regime proposed by DAFF. The NT is considering broadening its focus on biosecurity management for marine pests to include all internationally travelled vessels entering Darwin Harbour (as opposed to justinternational pleasure craft seeking entry to Darwin marinas). It is anticipated that any changes implemented for biosecurity management for NT waters will be consistent with

management procedures currently being developed by the Western Australian and Commonwealth governments.

The NT government supports a number of initiatives related to aquaculture research and development. These include partnering with the CSIRO to seek investment in a decision support system for tropical aquaculture planning, development of a genetic improvement program for farmed barramundi and social research into suitable aquaculture farming systems for Indigenous people. Other programs to assist industry and Indigenous groups include obtaining export approval for CITES listed species (bred in captivity), assessment of tropical bivalve quality assurance, production research intoemerging tropical speciesand market access for tropical species.

f) any other related matter.

The Northern Territory Government places critical importance on developing economic opportunities for Indigenous Territorians. To this end, NT Fisheries is engaged in a number of projects which aim to involve Indigenous communities in fishing and aquaculture.

These include:

- The establishment of a support network to provide technical and administrative assistance to Indigenous owned and operated fishing and aquaculture businesses in East Arnhemland. This includes the employment of a dedicated commercial fishing mentor to work directly with the communities to transfer skills and knowledge.
- The development of new fisheries opportunities by investigating the potential of near shore fish species. The success of this initiative will be underpinned by sound scientific research of the stock structure and harvest potential of these species.
- Training Indigenous Marine Rangers in scientific methods to enable them to contribute to the collection of scientific data for the management of the NT's fisheries resources. Ranger groups have recently increased their participation in fisheries compliance activities and are actively exploring opportunities to be more involved in fisheries research.
- The creation of a fisheries science mentoring program to further develop the scientific skills of Indigenous Territorians.
- The establishment of pilot projects to research and develop appropriate marine species for aquaculture in remote NT communities. These projects are being operated in association with the communities and industry partners and are currently investigating the farming of sea cucumbers, giant clams and tropical rock oysters.

Over 80% of the Territory's coastline is owned by Indigenous people. Research and development of tropical fisheries and aquaculture is seen as a vital investment in improving the opportunities for economic development in remote locations.