SUBMISSION NO. 36
Inquiry into the Role of Science for Fisheries and Aquaculture

Department of Climate Change and Energy Efficiency: Submission to the Standing Committee on Agriculture, Resources, Fisheries and Forestry inquiry into the role of science for fisheries and aquaculture

Introduction

Addressing climate change is one of the key economic, social and environmental challenges facing Australia and the rest of the world.

The Government has a comprehensive plan for a clean energy future which includes introducing a price on carbon from 1 July 2012, and taking action and creating incentives to reduce carbon pollution in low cost ways. These initiatives to reduce Australia's carbon pollution will contribute to global action to stabilise the concentration of greenhouse gases in the atmosphere as soon as possible to avert 'dangerous climate change' and will help support Australia's efforts to build global action to reduce emissions.

The Australian Government also recognises that some level of climate change is now unavoidable, and that effective climate change policy must respond to both the causes of climate change as well as its consequences.

Work carried out by the Department of Climate Change and Energy Efficiency reveals that climate change could pose some very significant risks to the sustainability of fisheries and aquaculture in Australia and that climate change science can be expected to be of increasing importance to the future management of fisheries.

Understanding the impacts of climate change on fisheries and aquaculture and adaptation options

Climate change will increasingly impact upon Australian fisheries and aquaculture in coming decades. Changes to ocean temperature, currents, winds, rainfall, extreme weather, ocean chemistry and nutrients supply are likely to have significant impacts on marine ecosystems. This will lead to changes in species dispersion and stock levels and impact on fishing communities. While climate change may present some opportunities, it is likely that overall, climate change will pose significant challenges to the fisheries and aquaculture sector.

In 2008, the then Department of Climate Change commissioned the CSIRO to review the potential impacts of climate change on Australia's fisheries and aquaculture. The review, entitled *Implications of Climate Change for Australian Fisheries and Aquaculture: A Preliminary Assessment*[1], found that there are likely to be significant climate change impacts on the biological, economical and social aspects of Australian fisheries, and that the productive ecosystems that support today's near-shore commercial fisheries may well be changed irrevocably.

The impacts of climate change will differ among regions and fisheries according to the physical changes in the regional environment, for example:

- Western fisheries are most likely to be affected by changes in the Leeuwin Current;

[1] The *Implication of Climate change for Australian Fisheries and Aquaculture: A Preliminary Assessment* report is available on the Department of Climate Change and Energy Efficiency Website at www.climatechange.gov.au/publications/fisheries/fisheries.aspx.

- Northern fisheries are most likely to be affected by changes in precipitation. For example, prawn fisheries and other estuarine-dependent fisheries throughout northern Australia appear to be sensitive to climate-related changes in rainfall and freshwater flow;

- South-east fisheries are most likely to be affected by changes in water temperature.

Some analysis has been undertaken of the likely impacts of climate change on high value commercial fisheries. The Department of Climate Change commissioned a study in 2009, entitled *East Coast Tasmanian Rock Lobster Fishery: Vulnerability to climate change impacts and adaptation response options*[2]. This report found that climate change is expected to have a significant impact on the Tasmanian rock lobster industry while identifying several possible measures to assist with adaptation responses. Projected impacts include:

- By 2070, waters as warm as those off the New South Wales coast will be experienced off eastern Tasmania, associated with reduced ecosystem functioning and productivity;

- Long term declines in recruitment of lobsters and declines in larval settlement;

- Declines in lobster biomass; while initial warming may result in increases in biomass through increased growth, this will likely be followed by a reduction in biomass due to declines in recruitment;

- The spread of a second species of lobster (the eastern rock lobster);

- The spread of a damaging sea urchin - a rock scraping organism that degrades ecosystems, reducing lobster habitat. However, as large lobsters eat sea urchins, careful management of large lobsters could help control sea urchin populations.

More broadly, the Pacific Adaptation Strategy Assistance Program (PASAP), managed by the Department of Climate Change and Energy Efficiency as part of Australia's International Climate Change Adaptation Initiative, assessed the effects of climate change on the distribution and abundance of tunas in the Pacific. This assessment predicted that the spawning habitat of South Pacific Albacore tuna will move progressively eastward during the 21st century and that this could have negative implications for fisheries in Australia, New Zealand, New Caledonia, Vanuatu, Fiji, and Tonga.

However, there is little consolidated knowledge of the potential impacts of climate change. Much of the evidence for climate change impacts on marine fisheries has been inferred from studies of climate variability because of the difficulty in experimenting or observing change in wild fisheries and a lack of long-term data. For most fisheries little is known about how climate change will affect:

- Population dynamics, for example the timing of spawning, or the tolerance to increased water temperatures;

- composition and interactions within communities

- structure and dynamics of communities, including changes in the productivity due to physical changes in the environment such as wind-driven upwelling.

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[2] *East Coast Tasmanian Rock Lobster Fishery: Vulnerability to climate change impacts and adaptation response options* is available online at www.climatechange.gov.au/publications/coastline/east-coast-rock-lobster.aspx.

Despite the Tasmanian Rock Lobster being a relatively well researched fishery, key gaps in our knowledge remain. These include understanding the full impact of increased temperatures, ocean acidification and other variables on lobster growth and recruitment, understanding responses by recreational and commercial fishers to climate induced changes and our capacity to explore long-term adaptation.

Robust scientific understanding will allow for better risk management, reduce the cost of managing the impacts of climate change and enable exploitation of potential opportunities.

To help the managers of marine fisheries prepare for the consequences of climate change the Department of Climate Change and Energy Efficiency has entered into a cooperative arrangement with the Fisheries Research and Development Corporation to support research to implement the *National Climate Change Adaptation Research Plan for Marine Biodiversity and Resources* (the Marine Biodiversity and Resources NARP)[3], developed through the National Climate Change Adaptation Research Facility. The aims of the Marine Biodiversity and Resources NARP are to:

- identify the research required to help managers of coastal ecosystems and marine environments and associated industries and communities prepare for the consequences of climate change;
- set adaptation research priorities based on these gaps;
- identify capacity that can be harnessed or needs development in order to carry out priority adaptation research.

The cooperative arrangement is funding 16 research projects under these priority areas and a communication project with a total value of $6.3 million. Research projects commenced in 2010 and are due for completion in 2013.

The importance of climate change science

Climate change science will play an increasingly important role in informing management decisions within the fisheries and aquaculture sector.

In recognition of the need for a nationally coordinated approach to climate change science in Australia, the Government released the 2009 *Australian Climate Change Science: A National Framework* (the Framework)[4]. The Framework identifies national climate change science priorities for the coming decade and sets out ways to harness our full science capacity to address them.

The Framework identified coasts and oceans as a key challenge where climate change science is needed to deliver the information that will inform important decisions over the next decade. The Framework noted;

> 'Ocean warming, changing ocean currents and ocean acidification are also increasing stresses on marine species, changing their distribution and putting many marine ecosystems at risk.'

The Framework further recognises that to deliver the information needed by decision makers, science must be supported by appropriate investment in people and infrastructure. Sustained support and development of people and infrastructure is essential to ensure Australia has the underlying

[3] *National Climate Change Adaptation Research Plan for Marine Biodiversity and Resources* is available online at www.nccarf.edu.au/content/narp-marine-biodiversity/

[4] *Australian Climate Change Science: A National Framework* is available online at www.climatechange.gov.au/publications/science/cc-science-framework.aspx

capability and capacity needed for an innovative and effective national climate change science effort and to deliver the information needed by the adaptation research community and decision makers.

Through consultative processes with Departmental stakeholders, specific science deliverables under the Framework have been identified. Meeting these science deliverables will be critical to informing management decisions in the fisheries and aquaculture sector. The science deliverables include:

- Accurate tracking and process studies of ocean heat content, ocean mixing, salinity, acidification and sea level rise and incorporation of this understanding into climate models;

- Accurate tracking and process studies of coastal and boundary currents including the East Australia Current and Leeuwin Current and incorporation of this understanding into climate models;

- Improved understanding of the influence of, and likely changes to, large scale climate drivers, such as the El Niño Southern Oscillation;

- Development of seamless climate prediction, from seasonal to long-term;

- Investigation of how the frequency and intensity of extreme events may change in the future; and

- The delivery of climate change information to all Australians, including the provision of technical advice.

Further work has been undertaken to identify how the scientific community will work together to improve integration, coordination and collaboration and support the delivery of world-class climate change science.