

Chapter 4

Scientific research and the marine environment

Harbinger of change: the significance of the Southern Ocean

4.1 Compelling evidence was provided to the committee from several submitters and witnesses in relation to the unique environmental importance of the Southern Ocean. Dr Bruce Mapstone, Chief Research Scientist at CSIRO, emphasised that research in Antarctica and the Southern Ocean provided important knowledge to advance Australia's economic and environmental wellbeing and its security, as well as its international influence.¹

4.2 The Southern Ocean was particularly recognised as an important harbinger of Australian and global climate change. The first evidence that ocean acidification as a result of increased absorption of carbon dioxide was having an effect on living organisms was found in Southern Ocean waters.²

4.3 Dr Mapstone highlighted two crucial ways in which the Southern Ocean was indicating and influencing change:

Australian research has shown that the Southern Ocean soaks up more heat and carbon dioxide than any other latitude region globally, helping to slow the pace of climate change. The key question is whether the region will continue to provide that service into the future.

Sea level rise is an aspect of climate change that will have one of the most significant direct impacts on human populations, including very many Australians who live around our coasts. The largest uncertainty in projections of future sea level is the future behaviour of the Antarctic ice sheet and the effects on it of warming in our Southern Ocean. We need to understand those interactions in Antarctica and the Southern Ocean better to anticipate and adapt to future sea level rise.³

4.4 Professor Nathan Bindoff from the University of Tasmania's Institute of Marine and Antarctic Studies (IMAS) elaborated on these issues, explaining to the committee that within the last two decades, scientific research in the Southern Ocean (by Australia and other countries, working in collaboration) had altered scientists' understanding of changes occurring within and between the earth's oceans. The deepest waters around Antarctica were changing rapidly in relation to other oceans, with the Southern Ocean (and the North Atlantic) absorbing heat at a faster rate than other oceans, and the Antarctic ice sheet losing mass. In a conundrum yet to be fully understood, sea ice was increasing in east Antarctica but rapidly decreasing in other

1 Dr Bruce Mapstone, *Committee Hansard*, 16 September 2014, p. 41.

2 Dr Sam Bateman and Dr Anthony Bergin, *Submission 2*, p. 3.

3 Dr Bruce Mapstone, *Committee Hansard*, 16 September 2014, p. 41.

parts of Antarctica.⁴ The importance of these factors for global ocean health, weather and climate demanded further understanding.

4.5 Scientists emphasised that these changes were of very practical significance to understanding shifts in weather and climate, especially for Australia. Witnesses from CSIRO elaborated on research undertaken which showed striking (inverse) correlation between snowfall in the region of Antarctica south of Western Australia, and rainfall patterns in south-western Australia. Reduced rainfall and periods of drought over the last century in the south-west of Western Australia could be attributed to heavy snowfall in Antarctica. While the research was ongoing, CSIRO noted its potential importance for the design of future investment in water infrastructure and management, agriculture and related issues in that part of Australia.⁵

4.6 Professors Bindoff and Boyd from IMAS agreed:

The challenge with the Antarctic ice sheet and the Southern Ocean is: how much will it change into the future? We already see it changing. We never understood how much the climate of Australia depends on Antarctica and the Southern Ocean. Some of the biggest dries – there are some beautiful records of the changing rainfall over the south-west of Australia – are connected to the ice cores that we collect...

It is the global climate, it is the Australian climate, it is a driver of Australian weather. It is a key element in the climate system and it is actually a source of key risk, particularly around sea level but also against other parameters.⁶

4.7 Professor Kurt Lambeck from the Australian Academy of Science added:

Antarctic science is important, not just for the sake of doing science, but I believe for Australia as well. A lot of the processes that go on there have an immediate impact on the Australian climate and on the ocean environment around us. Large parts of our climate, parts of our weather, are driven by Antarctic. So having a clear understanding of what is happening down there, of understanding the processes that are behind the changes that we observe, are absolutely critical. They are critical for our agricultural industry, if it enables us to improve our medium-term forecasting, for example. They are critical for our understanding of changes in the ocean circulation.⁷

4.8 The importance of Southern Ocean research to Australia is well understood by Australian scientists, including those in government agencies. The current Australian Antarctic Science Strategic Plan identifies 'Climate Processes and Change' and 'Southern Ocean Ecosystems' as two of four key themes for Australia's research

4 Professor Nathan Bindoff, *Committee Hansard*, 16 September 2014, p. 6.

5 Dr Bruce Mapstone, *Committee Hansard*, 16 September 2014, p. 48.

6 Professor Nathan Bindoff and Professor Philip Boyd, *Committee Hansard*, 16 September 2014, pp 6-7.

7 Professor Kurt Lambeck, *Committee Hansard*, 26 September 2014, p. 8.

focus.⁸ In their evidence to the committee, CSIRO and the Australian Antarctic Division (AAD) confirmed that studying acidification of the Southern Ocean and its impacts on sea life and on climate remained high priorities for Australia's scientific research.⁹

4.9 Dr Steve Rintoul from CSIRO summed up Australia's approach:

Our science over the last decade or so has shown that the Southern Ocean is critical for many aspects of the earth's climate. If it changed, climate would also change. So a large part of our work is aimed at detecting changes in the Southern Ocean and explaining why they are occurring.¹⁰

Protecting the southern waters: Australia's environmental engagement

4.10 The Antarctic Treaty System (ATS) was developed with a strong emphasis on sustainable and effective management of the pristine environment of the Antarctic region. The Madrid Protocol declares Antarctica to be a 'natural reserve devoted to peace and science' and creates detailed rules for the protection of its environment and associated ecosystems.¹¹ As noted in chapter 3, the CAMLR Convention adopts an ecosystem-based approach to ensure the protection and sustainable use of marine life in the Southern Ocean.

4.11 The Department of the Environment advised the committee that Australia was a leading participant in the international mechanisms established under the ATS to meet its environmental objectives. For example, Australia had been 'the key proponent' in the recent development of a multi-year strategic workplan for the Antarctic Treaty Consultative Meeting (ATCM).¹² The Department of Foreign Affairs and Trade noted in its submission that the 2014 ATCM had elected Australia's candidate as chair of the Committee for Environmental Protection (CEP) under the Madrid Protocol. The department described this as 'tangible recognition of the continuing contribution Australia is making to Antarctic governance'.¹³

4.12 Australia was also an active member of the Council of Managers of National Antarctic Programs (COMNAP), and within this forum had facilitated discussions on improved environmental outcomes, as well as a Southern Ocean Observing System

8 Australian Government, *Australian Antarctic Science Strategic Plan 2011-12 to 2020-21*, March 2011, tabled by Dr Tony Fleming at the committee's public hearing on 16 September 2014, p. 13.

9 Dr Steve Rintoul, *Committee Hansard*, 16 September 2014, pp 45-46; Dr Nick Gales, *Committee Hansard*, 16 September 2014, p. 56.

10 Dr Steve Rintoul, *Committee Hansard*, 16 September 2014, p. 42.

11 Department of Foreign Affairs and Trade, *Submission 6*, p. 4; Department of the Environment, *Submission 15*, p. 7.

12 Department of the Environment, *Submission 15*, p. 7.

13 Department of Foreign Affairs and Trade, *Submission 6*, p. 2.

workshop and resulting think tank, with the objective of coordinating and enhancing efforts by all nations and bodies to gather data from the Southern Ocean.¹⁴

4.13 The 20 Year Strategic Plan stated the importance of ensuring continued understanding of, and commitment to, the Madrid Protocol, particularly given speculation about the possible interest of some nations in re-negotiating its environmental protection provisions. The Plan recommended that Australia undertake diplomatic and practical activities to support the Madrid Protocol, including capacity building and education with other parties and prospective parties.¹⁵

Marine Protected Areas

4.14 One key initiative raised with the committee was Australia's proposal, in collaboration with France and the European Union, to establish a network of new Marine Protected Areas (MPA) under CCAMLR, in waters off East Antarctica claimed as part of the Australian Antarctic Territory. The MPA would not prohibit fishing or scientific research in those areas, but ensure that they were conducted sustainably under agreed terms. The Department of the Environment described this initiative as 'significant not only in terms of Australia's marine environment conservation objectives, but also...a major step in marine area protection within the context of the ATS'.¹⁶ Consensus was not reached on this proposal at CCAMLR's 2013 meeting; however, Australia was continuing its diplomatic efforts to seek agreement on the measures in 2014.¹⁷

4.15 EDO Tasmania and the Law Council of Australia were two of several organisations that expressed support for Australia's efforts to establish marine protected areas in Antarctic waters, including the new proposals.¹⁸ Ms Jess Feehely of EDO Tasmania spoke to the committee about the unique biodiversity of the waters involved, and the usefulness of establishing MPAs as a framework for best-practice management of research and conservation.¹⁹

4.16 Mr Martin Exel from Austral Fisheries sounded a note of caution in regard to Australia's commitment to the establishment of MPAs:

If you set aside too big an area as a marine protected area, unless you have the adequate monitoring and surveillance, it will simply become a red target for illegal fishermen. So when you are setting marine protected areas you need to make sure that there is adequate resourcing and funds so that you can have the science, monitor what is going on and actually create

14 Department of the Environment, *Submission 15*, pp 7-8.

15 AJ Press, *20 Year Australian Antarctic Strategic Plan*, July 2014, p. 49.

16 Department of the Environment, *Submission 15*, p. 7.

17 Department of Foreign Affairs and Trade, *Submission 6*, p. 4.

18 EDO Tasmania, *Submission 8*, p. 4; Law Council of Australia, *Submission 19*, p. 5.

19 Ms Jess Feehely, *Committee Hansard*, 16 September 2014, p. 20.

surveillance to prevent anyone doing what you do not want them to do there.²⁰

Committee view

4.17 The committee recognised the compelling evidence provided that monitoring and better understanding changes in the Southern Ocean, and their impact on the Australian and global climate, was important to our national interests. As such, and also bearing in mind the concomitant benefits of such research for Australia's standing in the ATS, the committee believes that continued prioritisation of Southern Ocean climate and ecosystem research is necessary.

4.18 Moreover, protection of the marine environment in the Southern Ocean and Antarctic waters benefits both Australia's standing in the ATS, and its interests in fisheries and science. As such, the committee encourages Australia's continued leadership in regional environmental work, including specific initiatives such as the creation of new marine protected areas in East Antarctica.

Recommendation 8

4.19 The committee recommends that researching the impact of changes in the Southern Ocean on the Australian and global climate remain a strategic priority in Australia's future planning and resourcing of scientific research.

Recommendation 9

4.20 The committee recommends that Australia continues its advocacy for the establishment by CCAMLR of new Marine Protected Areas in the waters of East Antarctica.

Scientific research: the currency of the ATS

4.21 In addition to the special environmental and climatic significance of the Southern Ocean noted above, IMAS commented that many Australians relied in other practical ways on Australian research conducted in the Southern Ocean. These included farmers who drew upon meteorological information gathered there, fishing companies who operated in some of the remotest waters of the world, and the many Hobart-based businesses and stakeholders who operated in and around the region.²¹

4.22 Submissions and evidence from the Australian fishing industry confirmed the practical importance of science to its work. Mr Martin Exel from Austral Fisheries observed that 'we want very much effective, accurate science, and that goes straight to our allowable catches'.²²

4.23 Professor Anthony Worby from the Australian Academy of Science agreed:

From observations that have been made in the Southern Ocean since the early nineties we know that the Southern Ocean is fresher, warmer, more

20 Mr Martin Exel, *Committee Hansard*, 16 September 2014, p. 26.

21 Dr Julia Jabour, *Committee Hansard*, 16 September 2014, p. 2.

22 Mr Martin Exel, *Committee Hansard*, 16 September 2014, p. 22.

acidic and lower in dissolved oxygen than it was several decades ago. That points to some fairly fundamental changes that are happening in the Southern Ocean and it is important that we understand what those processes are if we are to understand the likely future impacts on climate and ecosystems and, therefore, fish stocks. So a lot of that work, our understanding of ecosystems in the Southern Ocean, feeds for example into the Convention on the Conservation of Antarctic Marine Living Resources. Australia holds a very important place in those negotiations. I would expect over time that the pressure within that forum for more fishing and greater exploitation of resources will come to bear. So Australia, from its research, brings value into those kinds of fora in being able to articulate the benefits of a precautionary approach to fishing, for example.²³

4.24 Austral Fisheries and AFMA both highlighted the benefits of bilateral cooperation with France in relation to scientific research of fish stock movements and related ecosystem development on the Kerguelen Plateau. Both industry and government encouraged the continuation and further development of that work as a priority.²⁴

4.25 Beyond the specific applications of the science conducted in the region, the inherent value of Australian scientific research in the Southern Ocean and Antarctic waters was emphasised repeatedly during the inquiry. The committee heard scientific research described as the 'currency of influence' in the ATS, and various submissions and witnesses emphasised that a strong and credible scientific research profile was essential to the maintenance of Australia's influence among the nations operating in Antarctica.

4.26 The Australian Academy of Science, for example, argued that:

...participation as a Consultative Party [in the Antarctic Treaty System] is dependent on demonstration of a substantial scientific program. Actively pursuing our role as a major Consultative Party ensures that Australia's Antarctic interests are not diminished. Regardless of what path or direction Australian investment in Antarctica takes in the next 20 years, it is of fundamental importance to demonstrate that we have a credible, competitive scientific program that is producing high quality, scientific outputs and delivering high quality scientific outcomes.²⁵

4.27 The Department of the Environment concurred:

Australia's prominent role in science, operations, environmental protection and international cooperation in Antarctica and the Southern Ocean over the

23 Professor Anthony Worby, *Committee Hansard*, 26 September 2014, p. 11.

24 Austral Fisheries, *Submission 13*, pp 4-5; Australian Fisheries Management Authority, *Submission 11*, p. 11. The 20 Year Strategic Plan also recommended the prioritisation of research in the HIMI territory and its surrounding waters: AJ Press, *20 Year Australian Antarctic Strategic Plan*, July 2014, p. 55.

25 Australian Academy of Science, *Submission 5*, p. 2.

past century has yielded substantial influence within the ATS, and a range of concomitant benefits to Australia.²⁶

4.28 Some witnesses went as far as to link continued resourcing of Australia's science-based international influence to the ability to maintain our claims to sovereignty in Antarctica and its waters:

Underfunding and downsizing scientific resources will reduce our research capacity and ultimately undermine our leadership in the scientific community, an important currency in Australia's status in the Antarctic Treaty System. Without a commanding sovereign presence in the Australian Antarctic Territory and its exclusive economic zone, Heard and McDonald Islands and their EEZ and Macquarie Island and its EEZ, the validity of our claim to 42 per cent of the Antarctic continent and the maritime zones generated from that land claim will be more difficult to sustain.²⁷

4.29 As Professor Lambeck said to the committee: 'If we claim to manage a large part of Antarctica then we also have to do the supporting science'.²⁸

4.30 The AAD is responsible for the coordination and implementation of Australia's scientific research in Antarctica and the Southern Ocean, in line with the whole-of-government strategy agreed in the Australian Antarctic Science Strategic Plan.²⁹ The department advised that in 2012-13 the Australian Antarctic Science Program undertook 61 science projects involving 136 scientists from 36 Australian institutions, including research conducted in collaboration with 71 institutions in 23 other countries.³⁰

4.31 The department cited sea ice research as a key marine science priority for Australia, noting in particular a 'major and highly collaborative' marine science project undertaken in East Antarctica under Australian leadership, the Sea Ice Physics and Ecosystems Experiment (SIPEX). The SIPEX II voyage, undertaken by the *Aurora Australis* in the 2012-13 season, involved 51 scientists from 9 countries, and was followed in 2013-14 by the participation of six AAD scientists on a German-led multinational mission to continue research on sea ice and Antarctic krill in the Southern Ocean. The department said that these missions 'demonstrated the value of bringing large international teams of researchers together to undertake complex projects that address key global issues'.³¹

26 Department of the Environment, *Submission 15*, p. 10.

27 Dr Julia Jabour, *Committee Hansard*, 16 September 2014, p. 2.

28 Professor Kurt Lambeck, *Committee Hansard*, 26 September 2014, p. 9.

29 Australian Government, *Australian Antarctic Science Strategic Plan 2011-12 to 2020-21*, March 2011, tabled by Dr Tony Fleming at the committee's public hearing on 16 September 2014.

30 Department of the Environment, *Submission 15*, p. 8.

31 Department of the Environment, *Submission 15*, p. 9.

4.32 The 20 Year Strategic Plan also highlighted the SIPEX project as an example of Australian leadership in major collaborative science in the region.³²

4.33 The CSIRO cited its key research priorities in the Southern Ocean, in line with Australia's Antarctic Science Strategic Plan, as: marine living resource analysis, Southern Ocean dynamics and the implications for the climate, Southern Ocean carbon analysis, ozone hole observation and analysis, greenhouse gas observation and analysis, and climate and earth system simulation.³³

4.34 Dr Tony Press expressed the view in the 20 Year Strategic Plan and in his evidence to the committee, that the arrangements under which Australia conducted its official Antarctic science programs were fundamentally sound. 'I have seen other national Antarctic science programs around the world and I think Australia has it just about right'. In the Plan Dr Press described Australia's model as a 'hybrid' one, in which strategic priorities are set by government through the Antarctic Science Strategic Plan, and the government pursues those objectives directly through its science programs in AAD and also CSIRO. This is then complemented by private research supported by government through various competitive grants schemes, assessed against the same research priorities.³⁴ Dr Press told the committee that the hybrid model 'has been very effective in harnessing the full science potential that the various parts of the research community in Australia can provide.'³⁵ The Australian Academy of Science agreed that the 'current mixed-model approach' to the coordination of Australia's scientific interests was 'highly effective'.³⁶

4.35 Widespread concern was expressed, however, that Australia's investment in Antarctic and Southern Ocean science was in decline. In its submission, the Department of the Environment acknowledged that marine science conducted by the AAD had reduced over the past ten years, primarily due to the competing demand on the *Aurora Australis* to undertake resupply. Marine science days undertaken by the ship had reduced from an average of 66 per year between 1990 and 2007, to an average of 28 days between 2008 and 2014.³⁷

4.36 The 20 Year Strategic Plan stated that:

Australia has been active in Antarctic science for over one hundred years, and in the post Second World War period, one of the leading countries in Antarctic scientific research. Australia's pre-eminence in Antarctic research capability and output is now declining due to historical under-funding and

32 AJ Press, *20 Year Australian Antarctic Strategic Plan*, July 2014, p. 60.

33 CSIRO, *Submission 14*, pp 5-6.

34 AJ Press, *20 Year Australian Antarctic Strategic Plan*, July 2014, p. 33.

35 Professor Anthony Press, *Committee Hansard*, 16 September 2014, p. 61.

36 Australian Academy of Science, *Submission 5*, p. 4.

37 Department of the Environment, *Submission 15*, p. 13.

the emergence of other countries as big players in Antarctic and Southern Ocean research.³⁸

4.37 The Plan stated that current funding grants were inadequate to service research demand and the large collaborative projects needed in the region. As a result, 'the outlook for support for high profile, priority, collaborative science in the Antarctic is very limited'.³⁹ Professor Lambeck from the Australian Academy of Science asserted that in recent decades the number of scientists researching Antarctic issues had almost halved, with a commensurate decline in scientific output.⁴⁰

4.38 The government's allocation of two new envelopes of funding for Antarctic-related scientific research in the 2014 Budget was mentioned by a number of relevant stakeholders, and was broadly welcomed. This was comprised of \$24 million for a new 'Antarctic Gateway Partnership' fund, to be administered over three years by the Australian Research Council and utilised collaboratively by the AAD, CSIRO and University of Tasmania; and \$25 million over five years for the continued work of the Antarctic Climate and Ecosystems Cooperative Research Centre (ACE CRC), another flagship collaborative research initiative.

4.39 Witnesses agreed that the problem of long-term security for scientific research was not thereby resolved. Dr Press was mindful of the conclusion of these two funding commitments in 2017 and 2019 respectively, describing them as 'two funding cliffs' on the horizon for Antarctic science.⁴¹

4.40 The committee heard evidence about a parallel process with the potential to impact on the future of the ACE CRC, in the form of a review of Australia's suite of Cooperative Research Centres (CRCs) recently commissioned by the government and due to report in early 2015⁴². In this respect witnesses stressed that the value and achievements of the ACE CRC as a 'public-good' research centre must be acknowledged, in the face of increasing emphasis on supporting national science which directly delivered research outcomes to industry.⁴³

4.41 In addition, it was made clear to the committee that the decline in Australia's ability to conduct scientific research in the Southern Ocean and Antarctic waters was not only a question of direct research funding, but stemmed at least equally from reductions in the operational, logistical and infrastructure support necessary to mount research expeditions in the region. These were, on the whole, complex and expensive. Much of the present (and necessary) science taking place in Antarctica and its waters

38 AJ Press, *20 Year Australian Antarctic Strategic Plan*, July 2014, p. 30.

39 AJ Press, *20 Year Australian Antarctic Strategic Plan*, July 2014, p. 32.

40 Professor Kurt Lambeck, *Committee Hansard*, 26 September 2014, p. 9.

41 Professor Anthony Press, *Committee Hansard*, 16 September 2014, p. 66.

42 The Hon Ian Macfarlane MP, Minister for Industry, 'Business leader appointed to review Cooperative Research Centres', Media Release, 16 September 2014.

43 Dr Anthony Worby and Professor Kurt Lambeck, *Committee Hansard*, 26 September 2014, pp 12-13.

was also very long term in nature. Major research projects of the type conducted in the region involved lengthy planning, and observation and analysis on issues like oceanic change and climate required ongoing data collection over a period of decades.⁴⁴

4.42 There was acknowledgement that to some extent the nature of scientific research was changing. The use of new technologies including remote observation equipment was being adopted where possible, to complement the movement of personnel and vessels for research. At the same time, it was equally acknowledged that technology's utility had its limits, and would never replace the need for scientific personnel and physical presence in the region. Dr Steve Rintoul from CSIRO told the committee:

The truth is that we are doing much more remotely by satellite or autonomous gliders and floats in the ocean than we ever did before. There are more than 3,000 floats that are profiling up and down in the upper two kilometres of the ocean globally that are allowing us to really measure the ocean year round in remote places like the Southern Ocean for the first time.

The problem is that these instruments cannot measure everything that we need to know. They cannot measure carbon dioxide levels, for example...It is true for many other chemical, physical and biological parameters that we need to measure to understand what is happening to the system down there. The balance is shifting. Much more of it is being done without people on the ground, but we are not yet and are unlikely to ever be at the point where we can do everything that way.⁴⁵

4.43 Nevertheless, limited access to operational capacity in terms of ship places for scientific voyages was acknowledged by all as a key impediment to maintaining, not to mention growing, Australia's research profile. Dr Sam Bateman from the University of Wollongong suggested that from the very outset of considering research proposals, scientists were stymied by the operational limitations:

I think one of the issues here is that you have demand really being fitted to the supply of ships. If we had more ships, we would certainly be able to undertake a greater range of scientific research. The trouble at present, as I understand it, is that the scientists are not making enough proposals for the research they would like to undertake, because they know there is only the one ship available and they are unlikely to get time on that particular ship because of the other types of research and organisations that are bidding for research time. My feeling is that we need to look a bit more closely at how we set the requirements for scientific research in the Southern Ocean and Antarctic waters and make sure that we are getting a full picture of the requirements given the changing oceanographic conditions there rather than just setting our requirements to the likely ship availability...⁴⁶

44 *Committee Hansard*, 26 September 2014, pp 13-14.

45 Dr Steve Rintoul, *Committee Hansard*, 16 September 2014, p. 48.

46 Dr Sam Bateman, *Committee Hansard*, 26 September 2014, p. 5.

4.44 The Department of the Environment expressed the hope that the commissioning of a replacement icebreaker for AAD, the acquisition by CSIRO of its new research vessel, and the recommendations made in the 20 Year Strategic Plan, would assist in enhancing Australia's future ability to undertake Antarctic and Southern Ocean science.⁴⁷

4.45 The 20 Year Strategic Plan placed great emphasis on the importance of maintaining Australia's leadership in Antarctica and the Southern Ocean through substantially increased funding for scientific research and for the operational support which made it possible. Its recommendations included substantially increased funding for Australian Antarctic Science grants (and not at the expense of other core functions of the Australian Antarctic program), support for the operational capacity required to undertake such research, prioritisation of collaborative research and large field-based campaigns, and development of a Commonwealth-state position on ongoing funding for collaborative research bodies, upon the cessation of current funding for the Antarctic Gateway Partnership and for ACE CRC.⁴⁸

4.46 In evidence to the committee CSIRO advised that the specific utilisation of the new Antarctic Gateway Partnership funding had not yet been determined, but active discussions between the three recipient partners were taking place. It was envisaged that some of the funds would need to be allocated to the operational costs of fieldwork and equipment in order to support the research ultimately approved.⁴⁹

Youth and experience – maintaining scientific expertise

4.47 A particular element of the future of Antarctic and Southern Ocean science raised in evidence was the impact of reducing investment on the development of future scientists and science potential. Antarctic and marine science is a significant drawcard for both Australian study, and international study in Australia. The Department of the Environment indicated that eighty students, including 53 PhD candidates, were involved in Australian science projects in 2012-13.⁵⁰ The benefits of Antarctic and marine education have also been identified as an area of comparative advantage, and of potential further growth, for Tasmania's educational and research institutions.

4.48 The committee was told of the impact of the loss of science jobs for expertise in the sector, with many experienced scientists retiring or moving away, and young scientists unable to continue working in their fields of expertise. Mr Tim Lamb, a CPSU workplace delegate from the AAD, provided a striking example:

...some of those people will retire, some will move into consultancy, many – particularly the younger ones – will need to find something else, so they

47 Department of the Environment, *Submission 15*, pp 13-14.

48 AJ Press, *20 Year Australian Antarctic Strategic Plan*, July 2014, pp 34, 36.

49 Dr Steve Rintoul, *Committee Hansard*, 16 September 2014, p. 46.

50 Department of the Environment, *Submission 15*, p. 8.

may go off and do a different job. A young woman recently had to go and find a new job; she was a recent PhD graduate; she is a travel agent now.⁵¹

4.49 The CPSU argued in its submission that the AAD was struggling to retain younger scientists 'who previously saw a future career in Antarctic work. These younger staff represent the future of the AAD and the impact of their loss is immense'.⁵² Mr Mark Green from the CSIRO staff association told the committee that budget and job cuts in key government agencies were cutting off career paths for young scientists:

It is a very difficult climate, when the two biggest employers of marine scientists are actually laying people off...we now have young scientists qualifying – doctorates and post doctorates – and they are finding it very hard to find a job. Being a barista is a career choice at the moment.⁵³

4.50 The committee heard that there was some recognition among government agencies of the need to preserve and promote Australian scientific expertise in relation to the Southern Ocean. Dr Steve Rintoul from the CSIRO advised the committee that there was positive consideration being given toward allocating at least some of the new Antarctic Gateway Partnership funding to support early- to mid-career researchers.⁵⁴

Collaboration

4.51 The committee was told that Antarctic science was almost unique among scientific endeavours in its very high levels of international collaboration. The expense and difficulty of scientific research in the Southern Ocean and Antarctica had generated a cooperative rather than competitive approach among countries undertaking research, extending as far as the creation of various bodies, including the Scientific Committee on Antarctic Research (SCAR), dedicated to multinational collaboration. SCAR made a submission to the inquiry stating that it had 'long appreciated Australia's significant contribution to science in the region and in particular to the leadership roles Australian scientists have played in SCAR programmes, committees and activities'.⁵⁵

4.52 Professor Anthony Worby elaborated on the ubiquity of the collaboration:

Most of the marine science—in fact, I could go out on a limb and say all of the major marine science voyages that are undertaken by the Australian program—would include world-leading scientists from other countries. We would always extend an invitation to world experts that can provide complementarity to our own expertise on any particular voyage, and I have to say other countries do the same thing. Australian scientists would

51 Mr Timothy Lamb, *Committee Hansard*, 16 September 2014, p. 29.

52 Community and Public Sector Union, *Submission* 20, p. 2.

53 Mr Mark Green, *Committee Hansard*, 16 September 2014, p. 32.

54 Dr Steve Rintoul, *Committee Hansard*, 16 September 2014, p. 46.

55 Scientific Committee on Antarctic Research, *Submission* 3.

participate in German, American and French expeditions that are also undertaking research, so it is very much an international space that we operate in.⁵⁶

4.53 Many witnesses before the committee stressed the importance and efficacy of continued and strengthened international collaboration to ensuring that the expensive and challenging business of Southern Ocean research could be effectively undertaken. Dr Tony Press endorsed the generally positive assessment of Australia's scientific partnerships with other countries, but also believed that collaboration within Australia, and between Australia and other nations, could be further improved: 'it can get better...it is certainly very, very good but not excellent'.⁵⁷

4.54 The need for continued Australian investment to enable this country to be an attractive collaborative partner was apparent, and the impact of the Australian situation on our ability to be an international leader pertinent. Professor Philip Boyd from the University of Tasmania offered the example of young international researchers who had come to work in Australia but were now 'twiddling their thumbs' because of the unavailability of ship days, unsure whether and when they would have an opportunity to conduct their research.⁵⁸

4.55 For its part, the commercial fishing sector is already engaged with scientific research, and regards it as within its interests to work with the scientific community. In its submission, Australian Longline Pty Ltd endorsed the value of Australian scientific research in the region, both for its direct impact on the industry, and for maintaining Australia's influence within the ATS.⁵⁹ Mr Martin Exel from Austral fisheries advised the committee that the industry provided approximately \$1.25 million per annum in direct funding for scientific research, with a commensurate contribution in kind including the carriage of scientific observers and equipment on voyages. The commercial fishing companies also conducted at least 20 days per year surveying as a condition of their licences. Mr Exel said from the industry's perspective:

The operations and the work we do with researchers we can always extend as long as it is done in a way that does not directly impede or cost too much...We are happy to consider any offers.⁶⁰

Committee view

4.56 The committee was convinced by the comprehensive and compelling evidence confirming that scientific research in Antarctica and the Southern Ocean is a worthy investment, as a public good and as a practical underpinning to significant Australian national interests. Australian leadership in the ATS, in environmental

56 Professor Anthony Worby, *Committee Hansard*, 26 September 2014, p. 13.

57 Professor Anthony Press, *Committee Hansard*, 16 September 2014, p. 65.

58 Professor Philip Boyd, *Committee Hansard*, 16 September 2014, p. 9.

59 Australian Longline Pty Ltd, *Submission 9*, p. 2.

60 Mr Martin Exel, *Committee Hansard*, 16 September 2014, p. 23.

protection, and Australia's sovereign and economic interests require continued strong investment in Southern Ocean science. Indeed, Australian investment is already so deeply embedded — one need only consider the millions in current spending on new vessels for AAD and CSIRO — that to fail to maximise our scientific potential would make no sense.

4.57 The committee welcomes the government's commitment of new funding in the 2014 budget for scientific research, in the form of the Antarctic Gateway Partnership, and continued support of the ACE CRC. The committee was also encouraged by the assessment of Dr Press and others that Australia's arrangements for managing scientific research in accordance with agreed national priorities were effective and appropriate.

4.58 The committee recognises nonetheless that scientific research needs to be better resourced, and that such resourcing needs to be secured over the long term, to provide the foundation for Australia's participation in the major and collaborative projects crucial for Southern Ocean and Antarctic research.

4.59 Efficiencies may come from better alignment and rationalisation of existing programs. The new Antarctic Gateway Partnership has provided a platform for a badly-needed injection of additional resources, but the committee was not entirely clear on what it may offer that was not already captured in existing collaborative initiatives between the same organisations, notably the ACE CRC. Naturally, a desperate research sector is happy to accept whatever resources government is prepared to give, in whatever form. However, with the completion of current funding on the horizon for both the Gateway Partnership and the ACE CRC, there is an argument for exploring whether research funding sources can be more efficiently streamlined.

Recommendation 10

4.60 The committee recommends that an immediate commitment be made by the government to continue funding for Antarctic and Southern Ocean scientific research beyond the sunset dates of existing collaborative initiatives in 2017 and 2019.

4.61 The committee further recommends that appropriate funding for Antarctic and Southern Ocean science be assured through a commitment in the Budget process to a funding cycle reflecting, and integrated with, the ten-year cycle of the Australian Antarctic Science Strategic Plan, and in line with Recommendation 13.

4.62 The committee is particularly concerned to ensure that Australia continues to provide a hub of scientific excellence and a coterie of world-class experts in relation to Antarctic and Southern Ocean science. With budget cuts biting into that expertise, the committee believes that supporting early-career scientists is essential, both financially, and through practical initiatives for mentoring and the sharing of knowledge within the Antarctic science community, especially among Tasmania-based organisations.

Recommendation 11

4.63 The committee recommends that future allocation of research funding for Antarctica and the Southern Ocean include specific funds to support young and early-career scientists, in recognition of Australia's comparative advantage in maintaining world-class scientific expertise in these fields into the future.

4.64 The committee further recommends that government agencies and scientific research organisations, particularly the science community based in Tasmania, work to develop a program of mentoring to facilitate information-sharing and professional support between experienced and retired scientists and those commencing in the field.

4.65 The committee acknowledges that restoring Australia's scientific activities is at least equally about addressing the essential capacities that support scientific research: operational and logistical funding and staff, vessels and infrastructure. These issues are discussed further in the following chapter.

Mapping the southern waters

4.66 The need to invest in enhanced maritime mapping in the Southern Ocean was a further issue raised with the committee. Dr Chris Carson from Geoscience Australia told the committee that:

the Australian Antarctic marine jurisdiction around the coastline of the Australian Antarctic Territory actually represents quite a large area, about 2.2 million square kilometres, roughly 15 per cent of Australia's marine estate. Yet, less than one per cent is adequately mapped by modern seafloor mapping techniques.⁶¹

4.67 In its submission Geoscience Australia argued that mapping the Southern Ocean sea floor was an effective means of demonstrating and reinforcing Australian territorial sovereignty in the region. Marine geoscience surveys were essential for defining Australia's maritime boundaries on its extended continental shelves in the Southern Ocean, and also on the Antarctic ice-fringed coast, which was subject to changes over time and therefore needed ongoing monitoring.⁶²

4.68 Geoscience Australia asserted that contributing to mapping the Southern Ocean sea floor would be another significant demonstration of Australia's scientific engagement, enhancing Australia's presence and influence in the ATS, while providing a practical resource to ATS bodies such as CCAMLR.⁶³ Geoscience information obtained by Australia was, for example, used to support Australia's ongoing advocacy within CCAMLR for the establishment of new marine protected areas in East Antarctica.⁶⁴

61 Dr Christopher Carson, *Committee Hansard*, 26 September 2014, p. 18.

62 Geoscience Australia, *Submission 12*, pp 11-12.

63 Geoscience Australia, *Submission 12*, pp 3, 7.

64 Geoscience Australia, *Submission 12*, p. 8.

4.69 Improving geophysical information would also provide critical support for a number of functions aligned with Australia's national priorities in the region, including scientific research, environmental and fisheries management, navigational safety and search and rescue.⁶⁵

4.70 Geoscience Australia regarded the acquisition of Australia's new research vessels, the RV *Investigator* and the new icebreaker, as providing the opportunity to address the present lacuna in mapping the maritime region and support the geoscience objectives identified in its submission.⁶⁶ Indeed, the committee observed during its inspection of the RV *Investigator* that it was equipped with a gondola fixed underneath the ship containing modern sonar equipment, allowing for the possibility of enhanced mapping activities.⁶⁷

4.71 Geoscience Australia recommended that Australia develop and undertake a priority-driven seafloor mapping program in the Southern Ocean and Antarctic waters. Geoscience Australia provided a detailed set of priorities for such a mapping program. Notably, it advised that mapping in Australia's HIMI maritime jurisdiction was inadequate, and that improved mapping in the heavily-used near shore areas close to Australia's Antarctic bases should be a priority.⁶⁸

4.72 The agency also mentioned the potential for further international collaboration in this regard, drawing attention to geoscience cooperation already taking place under bilateral arrangements between Australia and Japan. Germany, France, the United States and Italy were other nations engaged in mapping in the Southern Ocean, with whom Australia could pursue collaboration.⁶⁹

Committee view

4.73 It seems self-evident that if Australia is to claim and exercise sovereignty and influence and appropriately pursue its interests in the Southern Ocean, it must know the terrain. The committee was surprised to learn of the paucity of seafloor mapping and geoscientific information available to support Australia's many activities in the region, including its own maritime jurisdiction. The committee commends the submission from Geoscience Australia in offering a cogent argument and clear priorities for a Southern Ocean mapping and geoscience program, and joins that agency in urging that, with the arrival of new and well-equipped vessels for the purpose, this work be taken forward.

65 Geoscience Australia, *Submission 12*, p. 3.

66 Geoscience Australia, *Submission 12*, p. 8.

67 CSIRO Marine National Facility, information sheet distributed to committee and oral briefing provided to the committee during tour of the RV *Investigator*, 15 September 2014, Hobart.

68 Geoscience Australia, *Submission 12*, pp 3, 10-11.

69 Geoscience Australia, *Submission 12*, pp 9-10.

Recommendation 12

4.74 The committee recommends that resources be dedicated to the development and implementation of a Southern Ocean mapping program, as a whole-of-government initiative under the guidance and coordination of Geoscience Australia, and that such a strategy be included in future decisions about the allocation of funding and vessel time.

