



COMMONWEALTH OF AUSTRALIA

# Official Committee Hansard

JOINT STANDING COMMITTEE ON THE NATIONAL CAPITAL  
AND EXTERNAL TERRITORIES

**Reference: Adequacy of funding for Australia's Antarctic program**

TUESDAY, 16 MARCH 2004

HOBART

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## JOINT COMMITTEE ON THE NATIONAL CAPITAL AND EXTERNAL TERRITORIES

Tuesday, 16 March 2004

**Members:** Senator Lightfoot (*Chair*), Senator Crossin (*Deputy Chair*), Senators Hogg, Lundy, Scullion and Stott Despoja and Mr Causley, Ms Ellis, Mr Neville, Mr Snowden, Mr Cameron Thompson and Dr Washer

**Senators and members in attendance:** Senators Hogg, Lightfoot and Scullion and Mr Causley

### **Terms of reference for the inquiry:**

To inquire into and report on:

The adequacy of funding for the Australian Antarctic Division to meet the four goals set for advancing Australia's Antarctic interests:

- Enhancing Australia's influence in the Antarctic Treaty system;
- Protecting the Antarctic environment;
- Understanding Antarctica's role in the global climate system; and
- Conducting scientific research of practical, economic or national significance.

That the basis of the inquiry into the adequacy of funding for the Australian Antarctic Program be extended to include the Annual Report of the Department of the Environment and Heritage for 2002-03, which was presented in the House of Representatives on 4 November 2003 and stands referred to the Committee for any inquiry it wishes to make.

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**Committee commenced at 9.06 a.m.**

**GIDDINGS, Ms Lara, MHA, Parliamentary Secretary to the Deputy Premier**

**JOHANNES, Mr Eric Gregory, Acting Deputy Secretary, Programs and Enterprise Improvement Division, Department of Economic Development**

**SCOTT, Mr Alistair Edward, Manager, Nature Conservation, Department of Primary Industries, Water and Environment**

**CUSICK, Mr Peter, Acting District Manager (South East), Tasmanian Parks and Wildlife Service**

**CHAIRMAN**—I declare open this first public hearing of the Joint Standing Committee on the National Capital and External Territories inquiry into the adequacy of funding for Australia's Antarctic program. It is a function of the federal parliament to participate in developing law and policy to scrutinise government action and public administration and to inquire into matters of public interest on behalf of all Australians. A system of federal parliamentary committees facilitates the work of the federal parliament. A resolution of appointment, passed by the House of Representatives on 14 February 2002 and by the Senate of 15 February 2002, is the source of the authority for the establishment and operations of the Joint Standing Committee on the National Capital and External Territories. The committee is appointed to inquire into and report to both houses of parliament in an advisory role on a range of matters relating to the territory of Cocos (Keeling) Islands, the territory of Christmas Island, the Coral Sea islands territory, the territories of Ashmore and Cartier Islands, the Australian Antarctic Territory, the territory of Heard Island and McDonald Island and also Norfolk Island.

In September 2003 the committee resolved to conduct an inquiry into and report on the adequacy of funding for the Australian Antarctic Division to meet the four goals for advancing Australia's Antarctic interests: enhancing Australia's influence in the Antarctic treaty system; protecting the Antarctic environment; understanding Antarctica's role in the global climate system; and conducting scientific research for practical, economic and/or national significance purposes.

At the conclusion of the inquiry the committee will table its findings, conclusions and recommendations in the federal parliament, a report of which will be publicly available. The committee normally authorises submissions for publication and they will be placed on the committee's web site. Some copies are also available here today from the secretariat staff. To date the committee has received 24 submissions from interested parties. If you would like further details about the inquiry, please ask any of the secretariat staff present at the hearing for this assistance—Mr Clements, on my immediate right, and Mr Baker, on my far right.

I now turn to the proceedings at hand and welcome Ms Giddings and representatives of the Department of Economic Development, Government of Tasmania. The hearings are legal proceedings of the parliament and warrant the same respect as proceedings of the parliament itself. Giving false or misleading evidence is a serious matter and may be regarded as contempt of parliament. The committee prefers that evidence be taken in public, but if you wish to give confidential evidence to the committee you may request that the hearings be held in camera and

the committee will consider your request. The committee has received submission No. 20 from the Government of Tasmania. Are there any corrections or amendments you would like to make to your submission, Ms Giddings?

**Ms Giddings**—No.

**CHAIRMAN**—Do you wish to make an opening statement?

**Ms Giddings**—Yes thank you, Chairman. I thank the committee for this opportunity to personally present Tasmania's position in relation to this inquiry into the Australian Antarctic territory. Tasmania has a significant history, which spans 200 years, in Antarctica, the sub-Antarctic and, of course, the Southern Ocean. We are proud of our state's active role in supporting Australia's interests in the Antarctic and Southern Ocean region and we are keen to develop further this strategically important partnership. Our strong focus on the Antarctic and Southern Ocean region is demonstrated by the creation and work of Antarctic Tasmania—that is our state department office—and we are the only state government in Australia with an office dedicated to Antarctic affairs. Our efforts are guided by a formal government policy on the region titled 'Tasmania's Antarctic, sub-Antarctic and Southern Ocean Policy Framework'. This framework is currently being revised and a new policy is being developed which will guide our involvement over the next three years.

The Tasmanian government actively promotes Hobart as a cost-effective, convenient and strategically important base for Antarctic and sub-Antarctic programs. We are recognised internationally as one of the five major gateways to Antarctica and, in partnership with key Commonwealth and other agencies and industry, we actively support cooperative efforts to build the Antarctic sector in Tasmania. This can be seen in the Government's work to host several important international secretariats and the active support that we provide to other Antarctic organisations in Hobart. Examples of this include CCAMLR—Convention for the Conservation of Antarctic Marine Living Resources—and that is a major international Antarctic fisheries organisation that was established in Hobart back in 1982. We also have the secretariat of the international Antarctic organisation of COMNAP, which has been based in Hobart since 1997 and now shares accommodation with Antarctic Tasmania. We have the new Antarctic Climate and Ecosystems Cooperative Research Centre, which was secured in a seven-year program grant that began operations on 1 July last year. This CRC is expected to employ up to 65 research staff and Tasmania is contributing up to \$500,000 in in-kind support to the centre over the next three years.

We also have the Tasmanian Polar Network, which is the peak Antarctic industry organisation in Australia and provides the unique link between government and industry, enabling us to work together to promote Tasmania's Antarctic capabilities. The government provides annual funding and secretariat support to this group. The group is made up of a lot of small businesses in this state which provide things such as apple huts, food supplies and shipping supplies. It also comprises the key institutions—the Australian Antarctic Division and others are represented—so it is quite an important network that exists here.

As a side point, we took a trip to New Zealand last year to see how Christchurch was operating as a gateway to Antarctica, and we found that they had a very loose network, which was not as effective as our own. Interestingly, we managed to stir the possum's nest over there,



so to speak, and now they have tightened that up to a large degree in order to emulate what we are doing here.

The Tasmanian government is also currently supporting Australia's bid to host the secretariat of the International Agreement on the Conservation of Albatrosses and Petrels in Hobart. Australia's Antarctic and Southern Ocean activities have important political, economic, scientific and social benefits for Australia and, in particular, Tasmania. Realisation of these benefits requires adequate levels of funding. The Tasmanian government considers the provision of funding for two key project areas as a current priority. The first of these is the continuation of the provision by the Australian Antarctic Division of logistical support for activities on Macquarie Island. The second is the full implementation of the Australian Antarctic air link between Hobart and Casey station in East Antarctica. I will address both these areas in turn.

Macquarie Island is a Tasmanian nature reserve, a biosphere reserve and a World Heritage area. It is a living laboratory from its rocks right through to its wildlife. The successful management of the island depends on a close and cooperative relationship between the Tasmanian Parks and Wildlife Service and the Australian Antarctic Division as the rangers rely on logistical support from the AAD to access and work on Macquarie Island. The highest priority identified in Tasmania's draft 2003 management plan for Macquarie Island is the eradication of the introduced species. Since the successful eradication of cats was declared in 2002, rabbits, rats and mice now pose the main threat to the natural values of this World Heritage reserve, particularly for the conservation of threatened species that rely on the reserve for breeding and nesting. One of those, of course, is the albatross. We know a lot about the effects of long-line fishing on albatross, but we also must make sure that we protect them where they are actually breeding. An eradication program is urgently required and should be undertaken within the next two years to prevent irreparable damage to the island's ecosystem and to its threatened species. A program is now being developed by the Nature Conservation Branch of the Tasmanian Department of Primary Industries, Water and the Environment. Funding for this project will be sought in the near future. This program will help to meet Australia's obligations under the World Heritage Convention and the Environment Protection and Biodiversity Conservation Act 1999. The assistance of the Australian Antarctic Division will be essential if this program is to succeed. We understand, however, that the AAD is considering winding back its operations on Macquarie Island in favour of funding research program priorities on the Antarctic continent and on Heard and McDonald Islands. Any attendant loss of logistical support work would have major implications for the ongoing management and protection of Macquarie Island.

The Australian government must be aware that any downsizing of its present financial commitment to Macquarie Island will have a devastating effect on Tasmania's ability to continue its current management on the island. It will also come at a time when the Commonwealth government is already being criticised heavily for reducing its financial commitment to World Heritage areas in Tasmania. By extension, this would impact on Australia's investment in the preservation of a World Heritage asset that is a national as well as a State responsibility. Funding to the AAD must be sufficient to enable it to continue to provide logistic support for management, research and long-term monitoring programs on Macquarie Island while also undertaking new research from Heard Island. We certainly do not want to give the impression that the research the AAD wants to do around Heard Island is not important—of course it is important. But the research that has been happening on Macquarie Island is also very important and we cannot get away from the fact that long-term research has been conducted there—by

both the AAD and the Bureau of Meteorology. That long-term—40 years, 50 years—span of collection of data is crucially important for climate change research as well.

Also of critical importance to Australia is the full implementation of the Australian-Antarctic air link between Hobart and Casey station in East Antarctica. The most exciting aspect of this project is its capacity to draw members of other nations' Antarctic institutions to Hobart and its ability to expose these members to all that Australia and Tasmania have to offer to the Antarctic community. The Tasmanian government believes that the air link can provide a powerful incentive for other national Antarctic programs to consider using Hobart as the preferred gateway to the east Antarctic region. It will also deliver tangible political, economic and social benefits. For example, the French Antarctic program, which is comparatively small scale, currently spends in excess of \$2 million annually on goods and services sourced from Tasmania. Russia, China, Italy, Japan and Estonia could reasonably be expected to contribute in the order of \$8 million to the Tasmanian economy if they were to take advantage of the air link.

Who knows how far this contribution could grow, noting that the United States' Antarctic program invests about \$42 million annually into the Christchurch economy. With the full-scale implementation of the Australian Antarctic air link and expansion of Hobart's role as an Antarctic gateway by the year 2010, the value of the Tasmanian Antarctic sector could reasonably approach \$150 million annually. It is currently around \$100 million annually, \$50 million of which stays within the state. This is a substantial contribution to the Australian economy and it is even more important to Tasmania's smaller regional economy. It would also represent quality investment, often in leading-edge technology and infrastructure.

In terms of ongoing funding arrangements, I would urge the committee to also note the importance of the existing programs and projects of the division, such as their research into Antarctic and Southern Ocean environments, servicing national and international expeditions, providing a focus and location for international forums and commercialising research and industrial opportunities. Antarctic, sub-Antarctic and Southern Ocean science and research is of vital importance to Tasmania, with key political, economic, scientific and social benefits resulting from Tasmania's unparalleled tradition of supporting Antarctic endeavours.

Tasmania is very proud of its traditionally active role in supporting Australia's interests in the Antarctic, sub-Antarctic and Southern Ocean, and Tasmania is also very interested in and committed to developing this strategically important partnership further. In order to maintain Australia's strategic presence in the Antarctic, sub-Antarctic and Southern Ocean region and the benefits that flow from that presence, funding should be expanded for a program that is of profound significance to the state, the community and the globe.

**Mr CAUSLEY**—I took note of your comments about Macquarie Island and federal responsibility. I hear that from every state I go to. I dare say that we are always hearing that it is a federal responsibility and I guess the leading question is: how much does Tasmania contribute to Macquarie Island?

**Ms Giddings**—We do contribute a fair bit. We have our rangers down on Macquarie Island, so we have the salaries of those rangers. It is a Tasmanian territory—we do not shy away from that. I did say in my earlier comments that it was a state as well as a Commonwealth responsibility. When we declare areas around Australia as World Heritage areas, we do so

because they are of international significance, as well as of Australian and, in a sense, Tasmanian significance. The Commonwealth government cannot continually back away from its responsibility to what is of international significance. So, yes, I am quite happy to put on the table that the state has a responsibility; but I also want to put on the table that the Commonwealth does as well.

**Mr CAUSLEY**—Looking at the economics of servicing the Antarctic—it is a very big area—why should some of that area not be serviced from Melbourne?

**Ms Giddings**—Because it is important to have what these days we term ‘clusters’. We have a critical mass here in Hobart particularly, which supports our Antarctic community. In fact, we have about 15 different state, national and international organisations that are devoted to science, logistics and fisheries management in the Antarctic. That generates about \$100 million a year for the Australian economy, \$50 million of which stays here. We have an Antarctic community, which employs almost 800 people in Tasmania. We are home to 65 per cent of the Antarctic scientists in Australia. We have this strong Tasmanian Polar Network of these businesses: they discuss together what is going on in Antarctica and they work out what is required down there. We have small businesses in Kingston; we have shipping suppliers on the wharves here—they are all doing their bit to support the Australian Antarctic program. That includes research on how you keep food and preserve it for longer in a cold climate—for example, bananas go brown very quickly and it is very difficult to keep fresh bread and vegetables. We have businesses here which undertake that research. We have businesses that can work directly with the AAD in terms of their needs. We have infrastructure such as the apple huts—even though they are moving a bit away from apple huts nowadays—and we have everything here to enable people to work and network together. Once you start spreading out these institutions and bodies, you dilute the impact or the strength of the community which is basically working towards the same end. I think it would be a backward step to start spreading these things out to other places because different parts of Australia say, ‘What about me!’ Sometimes we just have to accept that here in Tasmania we have had that long-term connection with Antarctica and the institutions have built up here. We have international secretariats here; we have strong business support here; we are the natural gateway—we are in fact recognised as one of the five gateways around the world. So let us not start diluting it.

**Mr CAUSLEY**—But would you not agree that it is also the responsibility of the federal government to ensure that taxpayers’ money is used in the most efficient way? To that end should we not look around to see whether we can service that area in a more efficient way?

**Ms Giddings**—I believe that the federal government did look very closely at the air link. They also looked at Albany as the base for that air link. In that sense we were very pleased that the federal government settled on Hobart to be the base and it does make sense—we are closer to Casey station. All these things take investment and infrastructure. Do you want to start doubling up? You have infrastructure here. Do you want to double up in Albany just in case you want to have a flight from Albany down to Casey or vice versa? You do not; you make critical and important decisions so that you are not spending taxpayers’ money twice, in effect.

**Senator SCULLION**—Coming from the Northern Territory, I can tell you that we have absolutely no intention of taking over the very critical role Tasmania plays in the Antarctic process. I am very interested in that aspect of the discussion and I will probably come to that in a

moment. I am particularly interested in your role on Macquarie Island. There are a number of programs there which, as you have indicated, are critically important to the Australian Antarctic Division and they are closely related to Tasmania's economic prosperity and all those sorts of things. It has been put to me that the way we are going to pay for this new air transport system is in fact by rationalising the currently existing operational programs within the AAD—that there will be a reduction of operational programs and research across the board so that the lease payments to the two CASA players effectively are amortised within that process. Those are some of the reasons why potentially there will be less work done on Macquarie Island as priorities shift to work elsewhere. Do you think that is an effective way to deal with this issue—by effectively taking resources out of operational programs? Clearly that will have a detrimental impact, in my view, on those operational programs. Could you comment on that?

**Ms Giddings**—Certainly. I cannot really comment on how the AAD shifts its money around to allocate to air links and prioritise programs. I am not involved in that aspect of it. What I can say is that the state government strongly supports the air link and we will strongly support the federal government adequately funding that air link and providing extra funding for the infrastructure that will be required so that there are no pressures on the Antarctic Division to shift moneys from scientific programs into the air link itself. I think that the federal government needs to have some foresight with the air link so that in the end it will provide avenues of not just supporting Australian programs but potentially supporting other nations' programs too. Those nations will have to pay for the service that they use in going down to Antarctica, so there may be ways that the AAD can get other funding to support the air link and make it more viable. But in the short term that is not going to happen. That sort of thing happens over many years of negotiations between nations. In the short term, I think the federal government does have to support the air link properly and not just require moneys to be shifted from one part of the agency to another.

**Senator SCULLION**—I notice as part of your policy approach, and I think it is a very refreshing approach to Macquarie Island, you have said that for educational purposes and tourism and research purposes your charter is pretty much, 'We encourage people to go and enjoy this wonderful heritage area that we have invested in and set aside.' There seems to be a bit of a cringe mentality within the division that Antarctica is a beautiful place and we need to look after it, but we do not really want people to have a look at it. You have to be an expeditioner or something like that to go and see it. There are plenty of photos if you want; we can send you a postcard. Tourism seems to be a bit frowned on. Obviously it has an impact on Tasmania and opportunities for Tasmania. What do you think should happen in the Antarctic itself? Do you think we should open it up eventually to tourism? It would certainly be consistent with your policy, Ms Giddings. I was wondering if you could help me.

**Ms Giddings**—We do have a limit on the number of people who can go to Macquarie Island, and that limit includes the park rangers as well as the scientists. What is left from that can be tourism. That is to ensure that we protect the values of Macquarie Island and do not have thousands of stomping tourists going there. In fact, it is very restricted as to which parts of the island they can actually walk around. If anything, we have received some complaints, but people may say otherwise, that some tourists would like to be able to go further afield and they are not allowed to.

In terms of tourism in Antarctica itself, the Australian Antarctic Division is a scientific and a logistics organisation; it is not a tourism organisation. Its members want to be able to get on with their job, so I can understand that they do not want to get too involved in that side of it and they are certainly very protective of their air link. It is an air link to support scientific work; it is not an air link for tourism. I know that there is a lot of debate internationally about tourism and Australia has input into that. Also the state government sends representatives to IAATO, where we voice our opinion as well.

Tourism will be addressed in the policy that we are developing at the moment. We do need to protect Antarctica's values. It is a unique, virtually untouched environment. We do not want to see what is happening around the Antarctic Peninsula, where ships are virtually hiding behind icebergs in order to give their own tourists a wilderness experience when in fact there are a couple of other ships with other tourists just a short distance away.

We also have to accept that east Antarctica is not the Antarctic Peninsula either. Just the fact that it is so far away from New Zealand, from Tasmania and mainland Australia means that it will not have the appeal that the Antarctic Peninsula has for tourism. So its natural distance will keep tourism numbers down, to some degree anyway. But you can leave from Chile or Argentina and be on the Antarctic Peninsula within about three days, I think it is. To get down to Casey from here you are talking about five or six days and to Mawson it is about 12 to 14 days. It is a much longer trip and over very heavy seas—I have experienced it myself.

**Senator SCULLION**—I am looking forward to that.

**Ms Giddings**—You must go. We want anyone and everyone to go.

**Senator SCULLION**—I have followed a bit of the history of Macquarie Island. Clearly it is a World Heritage Area that is currently being impacted on. First it was the cats; we have knocked off the cats and that is tremendous. But with every fiddling with an ecosystem, whether it is natural or unnatural, the balance then suddenly changes. I understand that now the rats and mice are absolutely having a heyday because there are no cats around. Then we knock off the rats and the mice—and I am assuming you can share with me the plan to do that, and particularly whether you have any policy approach to a viral release, a calicivirus or something like that. Because it is an island, how are you going to measure the impact of that? What sort of raptors are currently almost dependent on the rats, the mice and the rabbits? Are you actually going to measure the impact of change on the other aspects?

**Ms Giddings**—I will just make a couple of general comments—and there might be somebody else here who can provide the more specific information that you are looking for. I would make the point that it was a joint project to get rid of the cats; it was a federal and state government project. We continue to look for that support for both of us to be involved. We do have this draft plan looking at the eradication of the mice, rats and rabbits, for which we will be looking for federal government support. They have successfully eradicated these pests on Campbell Island, the New Zealand sub-Antarctic island, so we know we can do it; it is just a matter of going about it. As to how you do that, I am not sure whether there is someone here who can answer that question.

**CHAIRMAN**—Before that happens, Ms Giddings, would you be kind enough to make copies of that document available?

**Ms Giddings**—This one is a draft.

**Mr Scott**—Yes, it is very much a draft, but of course we will supply it.

**Ms Giddings**—And you would like the cats as well?

**CHAIRMAN**—I would appreciate that one as well.

**Ms Giddings**—I will table both of those for you.

**Mr Scott**—I guess we would have to look at the policy regarding the release of the virus, in conjunction, though, with the Commonwealth authorities. We have been using myxomatosis down on Macquarie for quite some time, as you may be aware. That has been very helpful in keeping the rabbits to a certain level and has been used over the last 10 or 15 years.

**CHAIRMAN**—But not calicivirus, Mr Scott?

**Mr Scott**—No, that has not been used there. I am uncertain as to whether the conditions would be conducive. As I say, I think it has been more successful in warmer areas. However, it is a very humid environment, of course, so there may be some opportunities.

**Mr Cusick**—On this last voyage, which came in on Friday, we brought back some blood samples to look at whether or not the rabbits in particular had built up a myxo-immunity, and also to check in relation to calici, because normally the cooler climate rabbits there do not react so much to the calicivirus. So we are looking at that issue, that if those tests prove positive we may have an opportunity to release calici. But, as Alastair said, calici normally does not work that well in cooler type climates.

**CHAIRMAN**—So you have trialled calici there?

**Mr Cusick**—No, we are actually doing blood tests. We just got blood samples back on the last boat.

**CHAIRMAN**—That is with the intention of trialling it then?

**Mr Cusick**—To see whether or not it would be effective on the rabbits.

**Ms Giddings**—I do not know how effective the calicivirus has been here in Tasmania.

**Mr Cusick**—Very limited.

**Ms Giddings**—So it is probably not going to be that effective down there.

**Mr CAUSLEY**—So you have not tried 1080?

**Mr Cusick**—No, not that I am aware of.

**Mr Scott**—That would be an option. That was used on Campbell Island, as you may be aware. It was a fairly expensive operation, with helicopters and broad-scale drops. That will be the sort of model project that we would look at, with Commonwealth assistance. As you said, it is quite expensive. The estimate for eradicating cats, I think, is more than \$4 million, with funding from both state and commonwealth governments and also from the division itself. So that is the sort of quantum of funds that would be required, but once it is done it is done and I guess that is how it should be seen.

**Senator SCULLION**—I would like to move to another policy area. I understand your policy is called ‘Tasmania’s Antarctic, Sub-Antarctic and Southern Ocean Policy Framework’—probably a bit of a brave statement in regard to your jurisdiction. Could you briefly talk to me about the Southern Ocean policy in regard to Macquarie Island. I only really understood the jurisdictional responsibilities over the last couple of days. What sort of fisheries management plan have you got for state waters and what plans for the use of the fisheries within your jurisdiction?

**Mr Cusick**—That is out of my jurisdiction.

**Mr Scott**—That is a question we might have to take on notice.

**Senator SCULLION**—I understand, looking back historically to when it was a declaration, there are actually state waters around Macquarie Island, and the management of those particular waters to three nautical miles lies within the jurisdiction of Tasmania, not the Commonwealth. I am just interested. Perhaps you can take that on notice.

On a general point, I am very impressed that you have come here and said, ‘What is good for Tasmania is good for me.’ A bit of self-interest does not go astray. I think that is fantastic and I think the way that you have this collegiate approach is a very sensible approach to these things. I have to say we do have issues about Macquarie Island. Your total budget for Macquarie Island is \$180,000. You are saying, ‘Look, Commonwealth, it is very important to the economy of Tasmania.’ In response we have given you what we spent annually in GST. About \$10 million has been returned to Tasmania and yet you are sitting here saying, ‘It’s quite okay, we’d really like to help you; help us fix the rabbits and it would be really handy if you could come down and help; and the Commonwealth should really invest more,’ and all those sorts of things. Yet out of the GST that was returned to Tasmania you see fit to invest some \$180,000 in Macquarie Island. I can see that \$500,000 of in-kind payments have been made here. It seems like it is a bit out of whack. What about Tasmania throwing in a bit?

**Ms Giddings**—Let us not forget that 40 per cent of our state is in some form of reserve and park system as well and a large part of that is World Heritage. Let us not also forget that the federal government has a responsibility.

**Senator SCULLION**—Indeed, I am not shirking that.

**Ms Giddings**—That is also reducing, which is putting increased burden on our state government as well. One of the things that we are finding with this so-called bucket of GST

money is that the Commonwealth government keeps on withdrawing money from one sector and saying, 'You're getting it in the other.' So I do not actually believe that there is much extra income coming into this state. There is also—and I do not have all the facts and figures in front of me to give you the outline of it—the Natural Heritage Trust fund. A lot of the rest of Australia thinks that Tasmania did very well out of the first sale of Telstra through the Brian Harradine program. Yes, on the face of it we did do very well out of negotiations that Brian Harradine did, but when you actually look at what the federal government did following that negotiation period you find that a lot of recurrent expenditure of the federal government was shifted into the Natural Heritage Trust fund programs. For example, the World Heritage funding shifted from recurrent funding into the Natural Heritage Trust, as did funding for the Landcare and Coastcare groups. That all shifted from recurrent into the Natural Heritage Trust. So let us not have this illusion that Tasmania does really well out of the federal government all the time. What we do have is, through history, a sub-Antarctic island, which has become Tasmanian territory. We are very proud to have it and we do our best in managing that and managing it for all its values. But it is also a World Heritage area and there has to be some responsibility from the federal government in relation to that.

One of the issues that we saw in the submissions was the cultural heritage aspect. We did not address that in our submission, but there is a really strong cultural heritage aspect to Macquarie Island as well, which requires some support. It was a whaling station; there are still the old pots and bits and pieces around there that require some protection. Yes, the federal government has provided a lot of support for our program on Macquarie Island by providing that logistical support, by helping to provide the infrastructure, the means of getting there and also, importantly, the people whom you require to have a station there—from the doctor to the carpenter to the mechanics—people with those sorts of skills whom you require to keep the base operational. We have worked well with the Australian Antarctic Division and the federal government in that sense. We are very concerned that a withdrawal, whether it be complete or partial, of the Australian Antarctic Division will have that impact on our program. Yes, we will have to find the funding to continue to maintain and manage Macquarie Island. That is why we are here; we do not want to see that happen and we want to make sure the federal government does adequately fund the Australian Antarctic Division so that it can continue to pursue the whole gamut of scientific programs that it has without, as you pointed out, having to cut back on those scientific programs in order to support the priorities of the federal government with the air link too. So we cannot expect large bodies like the Australian Antarctic Division to do everything it has been asked to do, plus have an air link, without having extra funding. It does require extra funding. Let us not lose this opportunity to note how important Macquarie Island is to climate change research. I have read the documentation here from Environment Australia which says that that climate change research is important down on Heard Island because it is a little bit further south—there are the glaciers you can measure and the like. But Macquarie Island also has an important role to play there. The Bureau of Meteorology certainly point that out in monitoring of long-term ozone impacts and global change impacts. One of the points that has been made to me is that if we can, through that research, give information to people so that they start changing the ways they do things to deal with climate change, and doing that ends up saving billions of dollars, then that relatively small investment we are making now in continuing that research down there is worth while.

**Senator SCULLION**—I do not think there has been any indication from my perspective that the \$86 million that we provide for the maintenance and management of the program is going to



be reduced. I think you will have to admit that it is a substantial program. I do not want to dwell on that, Ms Giddings, but Tasmania's investment is pretty stark. The actual figures just do not stack up. I am right with you, this is all very important, but would there not be some vested interest in your department saying to the Tasmanian government, 'This money is actually spent in Tasmania; the GST returned just on those funds could give you a real autonomy to underpin a lot of the work that is happening on Macquarie Island'?

**Ms Giddings**—In terms of walking the talk, so to speak, I think you will find that the Tasmanian government does do that. It is not always in basic dollar terms, it can be in in-kind support—and we are very pleased that we have the ACE CRC here. We have provided \$500,000 of in-kind support for that program. Of course we wanted the ACE CRC here and we wanted to support that bid, but that is not a state government bid in that sense; it is a federal government funded program. Yes, Macquarie Island is a bit different in that that is our state territory, and you are also quite right in saying that we do not have jurisdiction over the Antarctic, but we do, in terms of Australia, have a responsibility to do our bit in promoting Antarctica and our connections to Antarctica so that we do attract other institutions like CCAMLR, like COMNAP, like the French Antarctic program. We are hopefully about to get the Estonian program as well. All these programs have a financial benefit, not only for Tasmania but also for Australia as a whole.

What we also do, which I have not mentioned here, on a local level is continue to make sure that Antarctica is a part of Hobart and a part of Tasmania, because that is important. We have a mid-winter festival every year, it attracting up to 30,000 people last year. We did have, unfortunately, the demise of our Antarctic Adventure Centre in Hobart, but the commitment of the state government has been to invest \$600,000-odd into our Tasmanian Museum and Art Gallery to ensure that we have an adequate display there which explains not only to Tasmanians but also to our national and international visitors exactly what Australia's role is in Antarctica—the science that comes out of there; and our historical links and contemporary links with Antarctica. So, in terms of walking the talk, I think the state government does actually do its fair bit in this area. We recognise that, yes, we have received support from the Commonwealth and, yes, any withdrawal of that program or change to the program would have a financial impact on this state, which the Commonwealth has to recognise.

**Senator HOGG**—I did not ask my question up front because it will have to be taken on notice. So that the committee can get a proper appreciation of what the state does, I wonder if you could prepare a chart or a table for us which outlines the major areas of state government expenditure in respect of the Antarctic or related projects, whether they are jointly funded situation or state funded, and which gives us some idea of the staffing levels and how those have changed from five years ago, three years ago, to now. That will give us an appreciation of what the government is putting in. That can be either in kind or cash—if you can identify that for us as well—because clearly at the centre of this inquiry is the issue of funding. So I am trying to get a very simple analysis. I do not want a 15-page detailed analysis. I want the key projects and the key areas so that we as a committee can sit back and identify that reasonably easily and look at how the commitment of the Tasmanian government has changed from five years ago to three years ago to now and how joint funding arrangements have been effective as well. I think that will assist greatly.

**CHAIRMAN**—I have just got a couple of questions, Ms Giddings. You said that you restrict tourists to certain parts of the island or words to that effect. Do you have a ranger down there?

**Ms Giddings**—We do.

**CHAIRMAN**—Is he full time?

**Mr Cusick**—We have a full-time ranger on the island. During the summer when the tourist vessels go down, we have two rangers on the island. One of those rangers is a senior person.

**CHAIRMAN**—Yes, that is interesting. Macquarie Island has natural barriers anyway, has it not, to people coming ashore with the massive precipitous areas that prevent tourists from disturbing nesting birds, seals and protected species? What else does the Tasmanian government do on the island apart from that very important funding of rangers there?

**Ms Giddings**—That is what we do. We fund our Parks and Wildlife Service to be there to manage the island.

**CHAIRMAN**—Okay. We have identified the rangers. More specifically—

**Ms Giddings**—Perhaps it would help if we tabled the draft management plan for Macquarie Island. I do not have a copy of the document here with me, but I can give it to you. That document would give you the details of what we do down there.

**CHAIRMAN**—Can you give the committee an idea? Generically, what other things do you do?

**Mr Scott**—We have ongoing research programs that are funded by the state government; some of the research work involving the albatross as a threatened species, vegetation-monitoring work, geological work and also work done in conjunction with the division and other institutions.

**CHAIRMAN**—With the AAD?

**Mr Scott**—Yes, that is right. Also work that has just been completed on the cat eradication program. The state's contribution to that was around \$1 million which matched the NHT contribution. That was also supported by the division as well. So that is the sort of work that we have been doing over the last five to 10 years and which is seen as the first phase of the eradication of feral pests—the rabbits and the rats.

**CHAIRMAN**—Yes. Have you completed or do you have any figures for the economic modelling of the introduction of the air link? It would appear, at least on the face of it, that the air link will take away some of the shipping movements. If that is not true, perhaps you would be kind enough to let the committee have the modelling that you have done to give us some idea of the net value, the net gain, of the air link?

**Ms Giddings**—You would have to discuss the shipping arrangements and the air link itself with the Australian Antarctic Division. From conversations I have had with them, they will still

require resupply of the bases which will require shipping and they will still have their marine science voyages as well. In fact, by removing the need for the *Aurora Australis* to keep on delivering scientists to each of the bases it actually frees up the *Aurora* to do what it was designed to do, which is to be a marine science ship. But as to exactly how many voyages they will have and that impact you would have to ask the Australian Antarctic Division. Certainly we do not want to see the shipping leave the Hobart port either and, with the focus on Heard and McDonald islands, Fremantle and Albany become the closer ports for servicing that area. That happens already to a degree, but Hobart is still the primary port, the primary gateway, for the AAD and, as I said, a lot of the infrastructure, the services of businesses that support their program are here.

**CHAIRMAN**—I know of no plans to change that, incidentally. I have been on this committee for nearly seven years and no plans have ever been put before the committee to change Hobart or Kingston as the base, if that is a modicum of reassurance to you. But obviously, as you said, Heard and McDonald are closer to the western part of Australia and also of course Davis and Mawson are closer as well, and one of the West Australian towns may play a role as a subsidiary airport or an airport that will be closer to the point of no return. As you are aware, having been to the Antarctic, 10 minutes can make a big difference to the climate down there as to whether or not you can land an aircraft. So I think that is being considered.

**Ms Giddings**—I think, with respect, Senator, those issues were looked at at the time when it was being decided whether Albany or Hobart would be the base for the air link. The decision was made that Hobart would be the base. At this stage the flights that occur are between Hobart and Casey, not between Mawson and Hobart or Davis and Hobart, so the point of no return is actually closer, if we are going to get down to semantics.

**CHAIRMAN**—I do not think it is a matter of semantics, and I am not going to argue the point with you. While I appreciate all your advice, Ms Giddings, I just mention the fact—that Davis, Mawson, Heard and McDonald are indisputably closer to Western Australia.

**Ms Giddings**—Yes, and I agree that there may well be pressure to have more ships leaving from Fremantle and Albany. In terms of the air link, I do not actually agree at all with what is in the submissions before the committee. I do not believe there is a requirement to have any second airport to service an Antarctic air link. The air link means that intercontinental flights are between Hobart and Casey, of which Hobart is the closest port of call. In terms of intraflights, those are within Antarctica, and Albany, Fremantle, Hobart or anywhere else is a factor in that. So, while I am interested to see that Albany is still quite keen to have a piece of the air link cake, in reality I do not think that is an issue at all.

**CHAIRMAN**—I appreciate that and the committee will take note of what you have said. I thank you, Ms Giddings and gentlemen, for your attendance here today. If there are any matters on which we might need additional information, the secretary will write to you. On behalf of the committee, thank you again for your attendance here today.

[10.00 a.m.]

**BINDOFF, Associate Professor Nathan, Senior Lecturer, Institute of Antarctic and Southern Ocean Studies, University of Tasmania**

**GLENN, Professor Andrew, Pro Vice-Chancellor (Research), University of Tasmania**

**MICHAEL, Dr Kelvin, Acting Director, Institute of Antarctic and Southern Ocean Studies, University of Tasmania**

**CHAIRMAN**—I welcome representatives from the University of Tasmania. Before we ask any questions, do you wish to make an opening statement, Professor Glenn?

**Prof. Glenn**—Yes, if I may, Chair, just to make a number of fairly general points. The first is that the University of Tasmania has developed a number of theme areas. It has a very strong view that we cannot be all things to all people and therefore we want to have some areas of particular focus. Given our history, given the presence of a number of other research collaborators, including the Australian Antarctic Division, CSIRO Marine Research, one of those thematic areas for the university is Antarctic and Southern Ocean studies. So it is one of the five thematic areas that the university has put particular emphasis upon. We have concentrated that, particularly in terms of research, but also we do have an honours program that has run for a considerable time now and the university will be moving to increase its offerings in undergraduate courses in Antarctic studies.

The second general point I would make is—and I think this is a good news story—that I think the collaboration between the major players, particularly those based in Tasmania in terms of Antarctic research and Antarctic studies, is of a very high order. From the university's perspective, the extremely good collaboration we have with the Antarctic Division, with CSIRO Marine Research, the Bureau of Meteorology and so on has been, and we expect will continue to be, of substantial benefit to the university and I think the access that our students and others have to people in the division and CSIRO Marine Research is extremely good. I am sure many members of the committee will know that there is a very substantial critical mass of people who are working in Antarctic and marine science who are based in Hobart and I think there are some very substantial benefits that we will derive from that proximity. It is very much our view that those relationships and the development of critical mass and the most appropriate sharing of infrastructure is important and that we use the public dollar to the best possible effect.

**CHAIRMAN**—Thank you, Professor. I might, on behalf of the committee, just advise that the submission by Mr Andrew McMinn that was received by the committee in February has been withdrawn.

**Senator HOGG**—We heard a bit yesterday about the quality of scientists who are going down to the Antarctic over the summer break in particular. The point was made to us in broad terms that those who are going are not necessarily the best qualified, those with the best experience or those who have the most to gain out of it but generally those of a younger breed.

Perhaps the advent of the air link will bring back top-quality scientists to the Antarctic. Is that your experience?

**Prof. Glenn**—I will make some general remarks, but the two gentlemen on my left and right are the experts in this area. I am not an expert in this—

**Senator HOGG**—Neither am I. That is why I am asking.

**Prof. Glenn**—so perhaps I can give a general perspective from where I am sitting and ask my colleagues to make some more specific remarks. It seems to me that the advent of an air link will bring some very significant economies and efficiencies. At the moment my sense is that it is actually very time consuming for people to take the sea voyage down and back and there is quite a lot of time in which some researchers may not be particularly active. I think one of the things that I would be looking for from our organisation's perspective is, for some projects, greater effectiveness in that when people are there they are working, they are getting the work done and then getting out rather than spending in some cases perhaps unnecessary time down on the continent.

**Mr CAUSLEY**—Could you see other universities throughout the world using that air service to take scientists down there to do research?

**Prof. Glenn**—My understanding is that is what the New Zealanders do.

**Prof. Bindoff**—I will speak first for marine science. I am one of those younger scientists, I suppose.

**Senator HOGG**—I am young too. I just thought I would let you know that.

**Prof. Bindoff**—I have spent a year at sea between Antarctica and Hobart over the last 10 years. For a period there I had spent a voyage every year in the Southern Ocean and collectively over the last 10 years we have seen an enormous growth in international collaborations. With the Americans we have had follow-on experiments, we have had the first experiments against the Antarctic continent and in all those voyages we would have had a mix of age groups. So PhD students have had experience at sea on the *Aurora Australis* with us. We have had senior scientists go. In fact, at times the *Aurora* has had 10 to 15 containers on the back. The total participation in one experiment was about 70 scientists. I cannot recall how many of them were international but I would say about 20 of the science component people on that ship were international. I think the problem of age for marine science is less relevant because very often the marine science has a larger fraction of the total voyage time and so participation in the marine science by senior staff is less problematic because they are working for most of the time they are out there and the overheads are less of a problem.

For continental work I think there is a possible issue. Some people will have projects which will involve just two or three days of work in Antarctica and the total time to travel by ship to Antarctica and return might still be two months. That is a big overhead and when you get to my age that can become a little bit daunting with other commitments particularly because, for the university system, we are geared to a lot of proposal writing during January and February, which is essential to preserving the funding base and, consequently, you become a little bit more

reluctant to go south. However, I would say it is not totally distorted; we have colleagues from the university community who are older than I am and still going to Antarctica. I sit on a panel within the Antarctic Division which assesses the proposals each year and, while there is good access for PhD students, we do see a pretty good range of older, more mature scientists, if you like, participating in the programs and going to Antarctica.

**Senator HOGG**—Are you able to give us some sort of analysis of the seniority of the people who have gone in, say, the last two years? Are you able to rank them on some sort of scale?

**Prof. Bindoff**—I do not actually have statistics, but that is a question we could look at on notice.

**Senator HOGG**—Yes, I am asking you to take it on notice, just so that we can get a feel for it. We get these claims made to us, so it would help if you could give us some idea whether, over the last two years, some of the people who were selected to go could be classified as senior scientists. These people would also include, I suppose, your PhD students. If you can give us some sort of feel, then we have an idea. That would be helpful.

**Dr Michael**—Not ducking the question, but those are statistics that could be easily provided by the Antarctic Division themselves, because they maintain statistics on all scientists or all people who participate in Antarctic projects. It depends on how you ask the question, whether you are asking about participation by individuals, by people who are chief investigators on projects. If I could also answer your first question: I think this is a complex issue and I do not think there are any glib answers. I think that, as you follow a scientist's career from early career research, including PhD, into more senior ranks, you find that they will tend to do less in the way of fieldwork because they have more in the way of high-level administrative and coordinating duties. Let me also say that part of the University of Tasmania's commitment is to training high-quality PhD students. While there are a significant fraction of scientists who are PhD students undertaking research in Antarctica, that does not equate to poor science, or not the best science. The thing to remember is that these young PhD students, these scientists in training, are backed up by their high-level supervisors who sometimes will be with them but will always be back in Australia providing support and advice. So I do not think the question of the age of the performers is a tricky one.

**Senator HOGG**—I do not think it was necessarily the age; I think it was the experience as well. You could have some people in their middle age who could well be very experienced and well-credentialed people. So age might be not a sole determining factor.

**Dr Michael**— Seniority.

**Senator HOGG**—Seniority. We are trying to get some feel for what happens from your perspective. Undoubtedly the division will give us their perspective as well. The division will operate, I presume, on resources outside of yourselves, will it? You are not the sole supplier of scientists, are you?

**Prof. Glenn**—No.

**Senator HOGG**—That is what I mean.

**Prof. Bindoff**—No, but the Antarctic Division track every person who goes to Antarctica, so they in fact have the global statistics for the entire population.

**Senator HOGG**—And we need to get a feel for how you put your part in that together.

**Mr CAUSLEY**—My question probably leads on from that. There is a significant taxpayers' investment in the whole operation in the Antarctic. Australia is probably, except for the US, the biggest contributor. Where are we going in this research? Are we there just because it is there—Antarctica is there and therefore we should be there? What is the background that you as a university see of the research we are doing down there and the benefits to Australia?

**Prof. Glenn**—I think Australia has jurisdiction over, what, 40 to 45 per cent, something of that order, so we have some fairly significant responsibilities for that territory. I guess we would see the University of Tasmania making a contribution to information that will help the nation to meet those obligations. There has been a significant focus of research in climate change. Later on today I think you are going to hear from the CRC people about their activities. We see that there is important research for the national interest, significant research interest from the researchers, because there are some interesting questions, just basic questions, of asking why this is so. As a university, we try to marry those two issues of contributing to nationally important issues and being, if you like, socially responsible but also affording researchers the opportunity of pursuing their own directions in research, and I think the Antarctic enables us to do that very well.

**Prof. Bindoff**—So one way to look at the future is to look a little bit at the past. Before 1992, I guess, there was barely an oceanography program in the Southern Ocean. The Southern Ocean is a key component to the global climate system. One of the surprises that has come out of model simulations of the fully coupled system of oceans and atmospheres is that the overturning circulation could collapse in the future, so this is a significant change in the way the ocean behaves—and this is projected into the future. We have done quite a lot of work in looking at signals of climate change within the Southern Ocean. The ice sheet itself is important for sea level rise, there are questions about whether the ice sheets will retreat into the future, how much they will retreat, how much they will melt and cause sea level to rise into the future. These are all profound questions for a global system.

There are some very exciting new kinds of technologies that are arriving, autonomous instruments, that we can put out in the Southern Ocean. These autonomous instruments can collectively in the next decade equal the total number of measurements that were made in the past 100 years, so the possibilities for really great advances in understanding the oceans is actually coming in the next decade, I think. From that understanding of the oceans we will have, I think, a better understanding of the way the oceans impact on Australia, how Australian rainfall, for instance, in the southern margins of Australia are affected. We will be able to detect perhaps sooner the effects of climate change—so validate the theories that have come from models and scenarios that have come from models. These are some of the exciting things, I think, that are coming from climate change research and the Southern Ocean is a central part of that; the Antarctic ice sheet is an important part of that. I guess discussion will come from the Antarctic Climate and Ecosystems Cooperative Research Centre. There are questions to do with the carbon cycle—how will the carbon cycle change into the future. We have to understand the current, if you like, carbon cycle processes. Currently the Southern Ocean is thought to sequester

25 per cent of the carbon that goes into the atmosphere. It is an important part but it is not the biggest part of that carbon cycle. Earlier I talked about this overturning circulation, so you can think of around Antarctica the densest waters are formed—

**Mr CAUSLEY**—We had that explained to us yesterday.

**Prof. Bindoff**—Did you? Someone has stolen my thunder!

**Senator HOGG**—Yes. That is the trouble with the committee system.

**Mr CAUSLEY**—Could I ask the question: what would evolution do? I do not know whether you can answer that.

**Prof. Bindoff**—That is outside my area, but the advance in the future is to understand how that carbon cycle will change in future climates, so these things are linked. And then it comes to the ecosystems, which I guess someone else has probably talked about already.

**Mr CAUSLEY**—This is all adding to broad knowledge, I accept that.

**Prof. Bindoff**—Absolutely.

**Mr CAUSLEY**—I know scientific places well, so I accept that, but it seems to me that Australia is making a very big contribution of this knowledge in Antarctica. The US is probably putting in a fair effort as well, but they would be the two big efforts, would they not?

**Prof. Bindoff**—There was a very small amount of Southern Ocean oceanography before 1992, so as a result of the Antarctic CRC there was an oceanographic program and it brought together researchers. Only a relatively small amount of money was actually being applied. What has happened is that we have created quite a lot of enthusiasm. We have discovered new sources of bottom water and this has led to increased participation from the Americans and the British. The British have a very substantial Antarctic program. They also have a very substantial oceanography program. We have seen increased participation by the French, in part related to the activities that have been going on collectively. We are having follow-on experiments undertaken by the Italians in the areas that we have actually to some extent first explored. So I would say that it is in part the focus that the Australian activity has given to oceanography in the Southern Ocean that has actually drawn in others as well. The Germans have big activities, south of South Africa, and I think collectively in fact you are seeing a relatively small investment in the global picture by Australia leading to a big investment in the Southern Ocean, and yet it is our major ocean— actually next to us.

**Senator SCULLION**—I have a number of questions. Perhaps I will finish up and then just ask you questions on notice if you could provide those. I am very interested in this collaborative approach you have internationally. Wherever you go, the University of Tasmania generally is associated very much with Antarctic research. A lot of the area obviously would be applied science. How do you ensure that there is no duplication? It is all a very new area. Pretty much wherever you go there is something to get excited about, something new to find, in the process. How do you go about ensuring that we do not duplicate some of the research areas that are



happening? Do you actually have a process to ensure that all around Antarctica the other countries and other institutions are not duplicating some of the work that is being done?

**Prof. Bindoff**—Do you want me to talk to that?

**Senator SCULLION**—Yes.

**Prof. Bindoff**—The people in Hobart are participating in various international committees. The world ocean circulation experiment—we have people who were on the scientific steering group of that committee—basically carved up the ocean and worked out the participation of all of the nations that were involved in that experiment. That led to no duplication unless we wanted to duplicate. We would duplicate to create time series. The oceans are naturally fluctuating, so you have to go and repeat your measurements and we have done that. We have a famous section from Hobart to Antarctica which was repeated six times. It will be repeated in a year or two into the future and it is a way of establishing a baseline, if you like, for climate change type research and climate variability type research. We have avoided duplication because of our very strong participation in those international committees. Ships are allocated, we work this out, and then within the Antarctic Division there are more committees which assess proposals and in fact ensure that there is no duplication but rather that there is synergy. We spend quite a lot of time making sure that we get the right years for particular experiments and where we want to go. This is all worked out four to five years in advance. My contract might end, but I have actually got voyages into the future. There is an enormous amount of communication, if you like, via those international committees because of our participation in them. Am I answering your question?

**Senator SCULLION**—Yes. I am not sure whether there is some understanding of the principle of the international committees

**Prof. Glenn**—My sense, Senator, is that there may be less duplication of activity in Antarctic research than there is in many other areas of research where there are not such well-established collaborative networks. The community is a reasonably small one and the networks are fairly intense; so, whilst I do not think anybody would say there is no duplication, there is certainly a minimum of duplication of effort.

**Senator SCULLION**—I know many of your answers are focused quite obviously on more the biota and the marine biosphere, but what about more terrestrial areas of study—mineralogy? Do you have a department of geology? Do they often go down and what sort of a focus do they have in trying to work out what sort of resources are available in Antarctica? What sort of role does the university play in that area?

**Prof. Glenn**—In fact, in the former Antarctic CRC, the predecessor to the current ACE CRC, there was a geoscience program, but there is no geoscience program in the current CRC, and neither do we have a very big effort in that area. Exploration geoscience is a particular strength of the University of Tasmania, but the effort is really in other parts of the world, particularly in South America.

**Senator SCULLION**—Is that due, do you think, to the Madrid protocol? Is that the reason why we have not such a focus on those issues?

**Prof. Glenn**—Yes, and the determinants there are that most of our work is done in collaboration with large mining companies.

**Senator SCULLION**—Okay. Perhaps I could put this on notice. I wonder if you would be able to provide us with the names of some research programs that, with the advent of the air transport system, may be possible but which are not currently possible that would give us an indication of the sort of work that may be able to be done that is not done now. I am not sure whether you can provide me with this now, but have you been asked to provide any advice to the Tasmanian government on the eradication of noxious feral animals on Macquarie Island? Have you been involved in that process at all or have you been asked for advice on that matter?

**Prof. Glenn**—I am not aware of any formal advice, but there may well be links between our research and the department. We do have very close linkages, but I could try to find out if there are those linkages in principle.

**CHAIRMAN**—To what part of the Antarctic territories of Australia do you attend or have you attended, including McDonald and Heard islands and the bases of Casey, Davis and Mawson? What part do you attend?

**Dr Michael**—I think that the university has had research programs in all of those areas.

**CHAIRMAN**—Including Macquarie?

**Dr Michael**—Including Macquarie Island, yes. There is strong zoological research, botanical research and some geological research that is carried out with Macquarie Island and its base, as well as research on foraging animals, seals and penguins, which frequent the waters around Macquarie Island.

**CHAIRMAN**—What about the continent?

**Dr Michael**—Pretty well all-encompassing. There are field programs based at each of the three mainland stations and to a lesser extent field programs that work in more remote areas such as the Prince Charles Mountains and other field sites. Some of those are geologically based, which partially relates to an earlier question from Senator Scullion, but they are always limited to some extent by the availability of field accommodation and intracontinental transport.

**CHAIRMAN**—Did you have any opportunity or did you provide any information or advice to the federal and the Tasmanian state governments with respect to, say, an alternative method of branding elephant seals and other types of mammals at Macquarie? Did that fall within your particular sphere of expertise or you felt that it did in advice to either government? I am anxious, Professor, to establish the alternative to identifying itinerant visitors to Macquarie.

**Senator SCULLION**—Branding tourists!

**CHAIRMAN**—Perhaps excluding Homo sapiens.

**Prof. Glenn**—Certainly there has been some discussion about various ways in which animals can be identified and I know there has been quite a degree of discussion between some of our researchers and people in the state government.

**CHAIRMAN**—Could you elucidate?

**Prof. Glenn**—There were a set of animals which were hot-branded. People had some discussion about cold-branding. The issues of tagging and so on were looked at.

**CHAIRMAN**—What was the ultimate do you think? What was the outcome of that and what was the identifiable measure that was taken?

**Prof. Glenn**—I think branding had been used in the past by the Antarctic Division. There were various cohorts and animals that had been branded that were used by various organisations, but the branding was stopped and other means of identifying animals are used. My memory is—and I would stand corrected on this—that they are using tagging.

**Dr Michael**—That is something we may have to take on notice and refer to the school of zoology.

**CHAIRMAN**—I would appreciate that very much indeed. Perhaps I could get back to the continent again and of course to Heard and McDonald. The Madrid protocol with respect to mining or any sort of extractive process from any part of the continent has still some decades to run—probably 40 years. Do you think that aspect of the protocol needs to be revisited now rather than at some later stage when you may have wished you had taken up the issue earlier?

**Dr Michael**—I think probably not. I think that the minerals aspects of the protocol were well advised at the time. I think that, while there may be significant mineral resources within Antarctica, the current state of knowledge is that the cost to extract minerals from Antarctica currently is astronomically high and for those fields of various minerals to become economically viable would require the exhaustion of existing sources of those minerals, which is something that is not forecast to take effect until a long time into the century. I do not think it is a real issue at this point.

**CHAIRMAN**—What about oils? It seems to be a commodity that can be extracted practically from any part of the world and in the harshest of conditions. Isn't that something that ought to be looked at? In other words, do you think that there is a reason to revisit the protocol not just in extending that ban but perhaps in seeing if there is not some process that can be worked out that is beneficial to mankind in supplying cheaper oil—I am just hypothesising here—as well as perhaps using that process and the profit from that process to enhance research on the continent, given that the continent is an immense size, much greater than Australia?

**Dr Michael**—I am not an expert in the field, but I hesitate to feel that oil sourced from Antarctica would be a cheaper fuel. It would only be cheaper if the rest of the oil was close to running out. I think that there are real engineering challenges in sourcing oil from Antarctica and I am also not aware of any large oil fields that have been identified in the region.

**CHAIRMAN**—I think the reason they have not been identified, Dr Michael, is that there have been very few surveys done—

**Dr Michael**—That is probably true.

**CHAIRMAN**—to identify them, not to mention the centre of the continent several kilometres below the surface of the ocean as well. What about protecting the environment in Antarctica? Is enough being done? Is enough money being spent and how much is enough? I guess my question raises questions too, but in practical terms is enough money being spent, is it being spent in the right areas of protecting the Antarctic environment and should governments be doing more, not just the federal government but the state governments as well?

**Dr Michael**—From my perspective, I think the Australian Antarctic Division as the lead agency within the Australian Antarctic territory has had a good program in environmental protection and encompasses a lot of areas, such as seeking to reduce the burning of fossil fuels, seeking to reduce impacts of humans on populations of various biota and looking to repatriate waste from Antarctica. There has been a lot of effort to clean up the environment around Casey Station in particular and there have been surveys of the amount of or potential for further environmental damage in the terrestrial and marine environments as a result of our presence there. I see that the Human Impacts Program, which is one of the research programs run by the Australian Antarctic Science Advisory Committee, is focusing quite well on these issues.

**CHAIRMAN**—For some reason the Antarctic seems to epitomise people's concern about global change, about the change to the global climate, and people's concerns about it. Maybe it is seen as the harbinger of global climate change. Do you think that more should be done—and this is not a rhetorical question—about alerting the public to change through the various Antarctic ecosystems, given that a lot of people, for instance, think that the melting sea ice is likely to raise the level of the sea or the oceans, which it is not, or that melting icebergs would also add to the volume rise of the sea? Should not the public be alerted in more lay terms, more easily comprehensible terms, because that is what people think; they think that the Ross shelf is breaking up and therefore that is going to cause a rise in the oceans?

**Prof. Bindoff**—There are misconceptions about climate change and the misconceptions can be problematic. I also think of the confusion about the ozone hole and climate change when really those two things are largely different. So the short answer is, yes, obviously more communication. We do spend quite a lot of time—I was a member of the old Antarctic CRC—communicating much of the results of climate change and describing the sorts of things that are changing in the ocean, for instance, that is my speciality, but also we have done things on sea level rise and so on. You can spend a large amount of your time communicating, so it is quite a big overhead, but perhaps the area that we have communicated most strongly in is through participation in the intergovernmental panel for climate change documents. Australia has played an important role in that. They have very good summaries of the physical processes. Perhaps that is not quite for lay people, but it is certainly a very good document for describing the current state of knowledge about the climate system, and Antarctica is part of that.

**CHAIRMAN**—I would certainly like—and I am sure my colleagues would as well—to talk to you gentlemen for a considerable time longer, but unfortunately we are not able to do so. If

there are any matters on which we might need additional information, our secretary will write to you. On behalf of the committee, thank you very much for your attendance here today.

**Proceedings suspended from 10.41 a.m. to 10.52 a.m.**

**CHURCH, Dr John Alexander, Program Leader (Sea Level Rise), Antarctic Climate and Ecosystems Cooperative Research Centre**

**HAWARD, Dr Marcus Geoffrey, Program Leader (Policy), Antarctic Climate and Ecosystems Cooperative Research Centre**

**MAPSTONE, Professor Bruce David, Chief Executive Officer, Antarctic Climate and Ecosystems Cooperative Research Centre**

**CHAIRMAN**—I welcome representatives from the Antarctic Climate and Ecosystems Cooperative Research Centre. The committee has received a submission No. 12 from the Antarctic Climate and Ecosystems CRC. Before we ask you some questions, do you wish to make an opening statement?

**Prof. Mapstone**—I would like to very briefly cover some of the premises on which we put a submission before the committee, largely as background I suppose. I would start by highlighting something which you have no doubt heard many times that Australia has major international standing in Antarctic and Southern Ocean affairs ranging from policy through its influence in the Antarctic treaty system, CCAMLR, the International Whaling Commission and so forth, all the way through to quite basic research into processes affecting Antarctica and the Southern Ocean. The importance of Australia's activities in the Southern Ocean I think is becoming clearer and of greater impact as we learn more about the global significance of Antarctica and the Southern Ocean in processes such as global climate change, greenhouse gas processes and their impacts on both the Southern Ocean and Antarctic ecosystems and in communities in Australia, in the tropics and in other parts of the world.

I think in that context it is fair to say that Australia has an outstanding record of research provided by a diversity of institutions, universities throughout Australia, the CSIRO, the Antarctic Division and the previous Antarctic focused cooperative research centres. I do not think we can afford to rest on our laurels. I think we as a community need to maintain a stable observational program in the Antarctic and Southern Ocean, comprised of both ongoing monitoring activities related to atmospheric research, climate, ocean currents and so forth and new and novel research activities. I think we also, because of the increasing recognition of the importance of the whole region in global climate processes, should be seeking to enhance our international collaborations and certainly remaining in the forefront of international affairs in Antarctica and preferably becoming more of a leader than we have been in the past, particularly at a time when globally research focus on the polar regions is building.

There is coming up in a couple of years time the international polar year at which there will be a tremendous amount of focus on polar processes, both north polar and south polar, and we have a great opportunity to be major players in that. The outcomes of that focus I think will be of significance throughout the world. I suppose in terms of the short to medium-term support of Australia's activities in the Southern Ocean we would suggest that the introduction of an air link will be of great benefit for a variety of reasons. It will allow us to do things that we cannot currently do, but we would argue that the introduction of an air link, if it comes at the cost of a reduction to existing facilities, particularly vessel time in the Southern Ocean, means that we

may gain in some areas but will lose in others and I do not think we can afford to be going backwards.

**Mr CAUSLEY**—Vessel time on marine research are you talking about?

**Prof. Mapstone**—Vessel time available to marine research. Clearly our interest in the committee's considerations is research focused. We would like to see an air link introduced, but we would like to see it introduced in the context of maintaining an active vessel program in the Southern Ocean and we would like preferably to see that vessel program a little more efficiently streamlined than it is currently whereby vessels go down there to resupply the bases and come back, and that is a purpose-built trip, if you like, for the appropriate vessels, and other vessels are commissioned to support research.

In that way, I think, if that strategy is able to be maintained or developed, then not only do we increase our capacity to do world-leading research but also we increase it disproportionately, other than you would expect just from an increase in funding, because we improve significantly the efficiency of getting people to and from the Antarctic, to and from research vessels. We also cut away a lot of the lost time that is currently associated with having people sitting on vessels not doing the things that they are on their way to do. That arises simply because at the moment we have a program which necessarily has to compromise science, resupply and transporting personnel to and from Antarctica all on the one trip.

I do not want to say much more except that I think, historically, we as a nation had a diverse research interest in Antarctica. I would hope that we would keep that diversity of research interest because there are many facets of that place which are of value in their own right, hence the conservation premium put on the area, but also as we are learning increasingly have impact implications far beyond the Antarctic and Southern Ocean, right up to the equator and beyond.

**Senator HOGG**—The title of your organisation leads me to an issue that I raised yesterday at the division itself. Your title is the Antarctic Climate and Ecosystems CRC, which I understand. How much of what you look at is just a reporting of the facts of what is happening here rather than necessarily the science of what might be happening throughout the whole of the world system? In other words, is your focus solely on observation, basically, of what is happening here rather than trying to find a relationship between the cause of what might be happening in, say, the tropics or in the equatorial regions? Are you solely focused in this region?

**Prof. Mapstone**—I will make an initial response to that and then I might hand over to John, who has outstanding international experience in those topics. The answer to your question is no, we are not solely focused just on things that are over the horizon to the south. That is the area of focus of our field studies, predominantly, although we do have some complementary studies into the Pacific and Atlantic oceans because we need to understand the ocean dynamics globally. Our focus, though, in the majority, is in terms of fieldwork on the Southern Ocean. The reason we do that is that those processes about which we are learning in the Southern Ocean are significant and are, in some cases, drivers of processes that go right up to the equator, across the equator and into the Northern Hemisphere; they have implications elsewhere.

The way in which we explore those is through international cooperation with people all around the world who are doing complementary work elsewhere. We are putting all the pieces

together and we are providing a key piece. But also we have a strong foundation in previous CRCs and a strong base in the next five to seven years of doing simulation modelling, where we take our field observations and put them into the models of the global climate systems to predict what will happen over the next decades elsewhere in the world in terms of sea level rise and carbon budgets. In fact, at the moment we are also looking at ways of expanding our focus. We hope to be able to put on additional resources to look at the regional implications in southern Australia of what we are learning about climate and oceanographic processes in the Southern Ocean. I will ask John to make some points on that score.

**Dr Church**—I just reinforce what Bruce has said. We have a focus much more than just the Southern Ocean and the Antarctic region in understanding the implications for Australia and for the globe. In my own area of sea level rise, or in the areas of global and Australian climate, or the oceans' role in taking up carbon dioxide, you can only address these things through taking a global perspective, through international collaboration. That international linkage is essential for ensuring not only that there is minimal overlap between groups but also that there are no gaps. I think that is probably where we are in maintaining Australian standards in the Southern Ocean—that there are gaps in the program rather than overlaps. It is an issue, speaking internationally, that we do raise standards to the highest level.

One of the important aspects, I think, where this international and global perspective is important, is initiating and maintaining a stable observing system. That is where I think it is important that we focus on the Southern Ocean in our region, where we can use our resources most efficiently. The Southern Hemisphere and the Southern Ocean are vast and we cannot do it alone. We have to learn to utilise the international systems that are available—satellite systems in which Australia invests very little. Basically, the observation information from satellites is free of charge. But, to utilise that to the maximum, we need to invest in observations and we need to ensure that Northern Hemisphere nations—the US, UK et cetera, nations with the major resources in the world—also invest globally, including in the Southern Hemisphere, including the Southern Ocean, and not restrict their resources to the Northern Hemisphere. So the answer is yes, we do have a much broader perspective, but it is also important that we invest in observing in our region to leverage all the resources.

**Mr CAUSLEY**—Could I just go back to a couple of my themes in this particular area. I note that Australia probably leads the way in many of these areas in research, and I dare say that collectively does a lot of good. I can understand research in the marine area where obviously there is a potential for some return to Australia in resources you might be able to catch. Some of the other areas, I suppose, are global and more debatable—the areas of climate change and the hole in the ozone layer. It is interesting for me to contemplate that my grandchildren might be standing knee deep in water. There is very little we can do about some of these things. It is interesting to have the knowledge. It is like knowing when the next meteorite is going to hit. What can you do about those things? I think Dr Church might have just touched on this a while ago. What sort of coordination do we have internationally in these research areas so that we are not just out there doing the research, that there are others who are doing this research? Do we have this cooperation? Do we have the organisations in place whereby people get together scientifically to contemplate what research should be done in this area?

**Prof. Mapstone**—The answer to the latter part of your question is yes, I think there is a very well-established system of international collaborative arrangements focused on research in the



Southern Ocean and Antarctica. In fact, it goes beyond that, focusing on research globally that deals with the same issues of climate change, sea level rise, carbon dioxide and so forth. As John as pointed out, these are global processes; you cannot just hive off part of the southern bit of the world and say, 'We can take care of that, we know what's going on there; whatever is going on elsewhere won't affect us.' It does not work that way. So the international coordinating processes, about which John can speak knowledgeably because he is part of them, go an immense way to avoiding duplication, making sure that the research that has been done by different countries in different parts of the world, or indeed in the same parts of the world, are complementary, not competitive. This is from a conceptual level right down to how you put the different bits of research together operationally, making sure that, if we go out and do some work, when we come back with our datasets we can actually put them together. We do not want to find that they do not mesh with each other. So I think we are very well catered for in that regard. I have come to this field relatively recently. My experience is tropical and I would have to say that in tropical marine research, fisheries research, there is nothing like the same degree of national or international coordination of research and expertise. So I think the answer to your question is a resounding yes but I would ask John to comment further.

**Dr Church**—I can only reinforce that, internationally, climate and global change research are very well connected, very well organised through programs like World Climate Research. Members of the CRC and, more broadly, members of the scientific community here in Tasmania are very well connected to that. I can point to my international travel, and my email exchange attests to that. If anything, we are probably too well connected, but I think we need to be able to influence the Northern Hemisphere nations to make sure that some of our issues, and particularly the Southern Ocean, are not neglected internationally.

**Mr CAUSLEY**—How is that done? Is it done through the United Nations or is it done through conferences? None of us can escape email, we know all about that, but how do you coordinate that?

**Dr Church**—There are four major international global change programs: the World Climate Research Program, which is run by what is called the Joint Scientific Committee for the World Climate Research Program and is cosponsored by the World Meteorological Organisation; the Intergovernmental Oceanographic Commission; and the International Council of Science. There are three other programs: IGBP, the International Geosphere Biosphere Program; the International Human Dimensions Program; and DIVERSITAS. The Joint Scientific Committee for the World Climate Research Program met in Russia just last week. I was at that meeting and we met with the other three programs as well. Then there is a whole network below that of different committees and groups. As you pointed out, when you get into climate change research, there are many acronyms and many interacting organisations to try to make sure that the important issues are tackled efficiently and effectively.

**Mr CAUSLEY**—And in the usual scientific way these scientists have papers, white papers and things like that.

**Dr Church**—Absolutely. Peer reviewed publications are absolutely essential for maintaining quality. Could I return to the first part of your question, which was: why do it? My children are going to be knee deep in water, but we cannot do anything about this. There is also a point to understand and that is whether they are going to be ankle deep in water standing on the beach or

waist deep in water. There are important issues for Australia and for our neighbours if the sea level rises. Australia is a dry continent. Projections for the net evaporation/precipitation are for it to become a dryer continent. Are the issues facing Western Australia at the present time, with major water supply issues in Perth, part of climate change and do we anticipate those to continue and to get worse or is that part of natural climate variability? These are important issues for planners and they have very long lead-times. Putting in the infrastructure for the water supply in Perth has implications for decades into the future.

I will stick with climate change for the moment. Some climate change is inevitable, no matter what we do. What the impacts of that are, how we adapt effectively and how we plan effectively for that are less clear at this stage, and that is what the climate research needs to be aimed at. We can also minimise or affect the amount of climate change we have. However, we should not be solely focused on climate change. Australia has a very strong drought/flood cycle, as we all know. That is affected by the ocean-atmosphere interaction and it has predictability. That has been demonstrated over the recent decade. At the moment, though, our ability to predict the climate six months or more in advance is limited to regions. Our challenge is how to extend those regions more broadly around Australia to allow better farming practices and better water management issues and how to extend the lead-time from the current relatively short lead-time that we now have. The two challenges facing the World Climate Research Program are: what part of the climate system is predictable and how to improve those predictions and make them more valuable to society and, secondly, what is the impact of climate change?

**Senator SCULLION**—I have a pretty close relationship to a number of CRCs. CRCs seem to be looking for a bit of a commercial bent at the end and you articulated this as part of your principle. What are the commercial opportunities? There is a cringe mentality when we talk about Antarctica. I am not looking at canning seals particularly, but there is a whole range of sustainable use opportunities down there. What opportunity have you identified, apart from climatology? Everybody in Tasmania, I understand, is a climatologist. Are there any other opportunities that we could look at in a commercial sense?

**Prof. Mapstone**—From our perspective it is early days on the commercialisation front. As you rightly point out, an important component of CRCs generally is commercial benefit, economic benefit, to the country. We have been going a tad over six months now and we had a full-time commercial development manager start in January who has been supplied as an in-kind contribution by the state of Tasmania. So we are taking the issue of commercialisation very seriously. Are you asking whether we have identified something that we can put into the marketplace as a result of our research or some spin-off products or processes that we can market internationally?

**Senator SCULLION**—Spin-off products—you are talking my style.

**Prof. Mapstone**—Not yet, but I think there is potential there. This is in the realm of, if you like, direct economic benefit, marketplace benefit. We had a board meeting last week and the strategic issue for the board meeting was how we deal with this commercialisation in what is essentially a policy driven research arena. The answer is, 'We are not sure yet,' but the board's direction was very clearly that there should be at least two streams of commercialisation agenda: one of them about processes and products for the marketplace and the other about being able to quantify the economic benefits of the things John has been talking about. Traditionally, we do

not do that very well, so it may be that at the end of the day we do not have lots of marketing things that arise out of the CRC activities.

**Senator HOGG**—Could I just interrupt there. Could some of that come down to intellectual property?

**Prof. Mapstone**—It is all about intellectual property. The first step is identifying what it is, who owns it and what its potential is. To get the focus back a bit to the commercial prospects for Antarctica, I think there are significant economic benefits that will derive from the research that is done on Antarctica as part of the Australian Antarctic program. We have a pretty shocking track record of being able to put dollars and cents figures on the benefit that arises from knowing better what the climatic regime is going to be over western Australia or southern Australia. We need to get a handle on that, but there is no doubt that there is an opportunity cost of not knowing that things are going one way or the other in a regional planning sense. We do not want to be putting coastal developments in places where we expect that they will be highly risk-prone in terms of storm surge, sea level rise and so on. That will cost the country. Some of the other issues, mineral exploitation or oil or whatever, are not things that will arise out of our activities. We do not have research programs in that area and they ultimately will be issues that will be resolved in the international forum. I will ask Marcus to speak to this in a moment.

**Senator SCULLION**—Perhaps krill patties—there is some other sustainable use!

**Dr Haward**—One of the last projects in which the social scientists in my research group were involved with colleagues from the Antarctic Division was to look at the patent databases on krill products as a way of trying to get a handle on what was happening with the krill. In the 1970s you saw a spike in patents when the first big krill fisheries were done by the subsidised fleets of the Eastern bloc. But it is interesting to see that in the last four or five years the number of patents has again spiked. There are about 34 to 40 patents being issued under the US system, most of them towards aquaculture feed. This was an interesting exercise because there are about 300 patents on krill products out there. I can give you the specific numbers, but I do not have that research with me. The change has been from human products to aquaculture-feed products for obvious reasons. The krill provides a close in the loop of that process. The management of that fishery is going to be significant and part of the basic research that we have undertaken in the ecosystem. My colleagues in the CRC will help us understand more about that. We need to have an understanding of the basic relationship between krill and predator, and also of what happens to the krill stocks in terms of climate variability and change. Krill is a potential activity and obviously others are eyeing it off as well. You do not put a patent in if you are not serious about it.

**Senator SCULLION**—Are there any other sustainable use issues that you have come across in your research?

**Dr Haward**—With colleagues, both in government and in the CRC program, we are working on the problems of sustainable marine resource management, fisheries particularly. The problem of IUU fishing is a significant one from a policy perspective, as you would be aware. The high cost of enforcing our interests in Heard and McDonald islands is significant. We are looking at tools that we can use to restrict that problem. We will never get rid of it, but Australia has taken a significant role in CCAMLR to support the use of trade measures, catch documentation and

other strategies, as you are aware. Those are the sorts of issues there. Increasing understanding of oceanographic conditions may have other impacts, including understanding more about impacts on Australia, as Bruce has indicated, of a range of coastal activities that are not necessarily directed simply to marine resource exploitation.

**Senator SCULLION**—As part of your charter you put that you really need to support the funding arrangements for other Antarctic programs. Also, as a CRC, I suppose part of your charter is to develop industry relationships. You have spoken about the charter in terms of the ship, the marine assets and some rationalisation of those assets that you think needs to occur—a splitting of the responsibilities, if you like: transport should be transport and dedicated marine time should be marine time. I would have thought that the CRC would be ideal to have discussions with industry in having several ships visiting their fishing activities. As you know, they have a pretty good relationship with government in other areas. So what moves has the CRC made to ensure that you have a good collaborative relationship with industry in regard to research in the future?

**Dr Haward**—In a sense we are already talking with major players in the Southern Ocean, Australian legal fishing operations, particularly Austral Fisheries. As you know, they are very keen and very supportive of Australian activities in terms of work recently over summer. We are talking with them and they are very keen to be involved in looking at the way in which they can provide opportunities for particularly marine resource related research that can be undertaken off their platforms, off something like the *Austral Leader* or the *Southern Champion* rather than, say, the *Aurora Australis*.

**Prof. Mapstone**—I might add a little bit there. One of the strengths and a weakness of a CRC, I suppose, is that we do not have an infrastructure in our own right. We CRCs, by definition, are about bringing together existing research infrastructure and putting it together with existing industry and so on. For example, the data that already comes from those vessels operating in the Southern Ocean via the observer programs that are run on them will feed into the work that we do insofar as it is appropriate. We are always keen to extend the range of data that we can collect if it is feasible and worth while. I think there may be some potential to get additional data on those vessels, perhaps by putting other people focused on fishery issues on those vessels at times. As Marcus has said, we engage with the operators and we are engaging with the Antarctic Division's programs as well in order to try to do that in a cost-effective way; it is not going to impact on the fishing activities. I do not think we can lose sight of the limitations that go with that. Again, harking back to my background, my history is in tropical fisheries where we ran observer programs. They are great because you get to learn a lot about how the industry works and you get a lot of information that you could not otherwise get. But they are only great insofar as you can get that information whilst the fishermen are doing their business. They are not going to divert their activities and go off and spend two months doing an oceanographic cruise for you at no cost. I think that is where the existing vessel arrangements are crucial for research that is not targeted at a fishing industry directly. We must maintain those other research dedicated voyages in order to get the information that allows us to look at, for example, the ecosystem basis of managing the krill fisheries and finfish fisheries and other activities in the Southern Ocean.

**Senator SCULLION**—Could you provide me—on notice—with some information on how the \$500,000 in-kind contribution from the Tasmanian department is made up? You said there was one person, I think.

**Prof. Mapstone**—There are a couple of different ways they do it. They provide a person and they pay the full salary of that person; they provide some operating money to cover that person's travel and so on. They also have, as per our agreement, an amount which they promise each year to support training and development activities, particularly in the area of commercialisation. That is where the money comes from.

**Senator SCULLION**—But that has not been expended yet because we do not actually have any particular projects in that area—and I understand that.

**Prof. Mapstone**—We just have a person on board. She has already been to one course on identifying and managing IP in these sorts of institutions. She is currently engaged with some private consultants, I think operating out of Adelaide, whose business is to offer training in IP identification and protection management in the interests of commercial development. I think we are making reasonable progress, given that she started on 12 January.

**Senator SCULLION**—Could I ask you to take on notice to give a detailed breakdown of what that contribution consists of.

**CHAIRMAN**—Perhaps I could start with Dr Church and ask about the difference between the phenomenon of global warming induced by present population and the fact of the globe's creation. When I started doing geology I think it was said to be four billion years old. That has now extended out to about 12 billion years, yet when I was a little boy it was only six days old—it took six days to create. There are some discrepancies in geological time. Back in the early Cambrian period Australia was divided up into perhaps five or six major islands. Coming down to the Canning Basin was a sea that came out at the Great Australian Bight, the pre-Cambrian rocks and the Kimberley were above water; the Pilbara was above water and the Archaean Shield in Western Australia was above water, but that was about all in the east; I am not too sure about the rest. Certainly significant parts of that were under water. I would not expect that that was due to any human activity back then.

Could you please explain about global warming, which is a misnomer because the globe is not getting warmer? Parts of it may be, but Mongolia is not getting warmer, the Antarctic itself is not getting warmer, the island of Taiwan is not getting warmer, if you go by recent statistics, and neither are parts of Argentina. I picked those out purposely because they are widely separated. How does one get some easily understood, unambiguous direction as to where the world is going in terms of global warming? I do not like using that phrase, but it is the most popular one to use and people like it. The fact is that this has all happened before; it has happened many times before. We are currently, for instance, 100 metres below probably one of the greatest periods of water on the earth. How do we differentiate between that and getting the message out to the public that there is no need to panic yet, that the Seychelles Islands are not going to be flooded, that Fiji is not going to be left with just a few mountain peaks and so on?

**Dr Church**—You are right in identifying that there have been changes in climate on the historical and prehistorical time scales and most recent of those changes are the glacial-

interglacial cycles. We are now in an interglacial part of that cycle. The last glacial-interglacial cycles are thought to have been forced by changes in the earth's orbit of the sun, which then drove various feedbacks in the climate system, particularly the formation of ice sheets in the Northern Hemisphere and the impact that had on albedo or through the feedbacks associated with carbon dioxide levels in the atmosphere. These together might help to explain the variability over the last several ice ages. The situation we are in now, though, is that the level of carbon dioxide in the atmosphere is over 370 parts per million compared with the pre-industrial value of 280 and the value during the glacial times of roughly 180 parts per million.

**CHAIRMAN**—Sorry, which glacial time was that?

**Dr Church**—The last glacial maximum, for example, or the glacial maximum before that?

**CHAIRMAN**—Okay. Can you give us that in millions of years or rather perhaps in tens of thousands of years.

**Dr Church**—The last glacial maximum was about 20,000 years ago and they had roughly a 100,000-year cycle. The present CO<sub>2</sub> levels in the atmosphere have not been experienced in the last 420,000 years.

**CHAIRMAN**—As a result of glacial cores? Is that how that is established?

**Dr Church**—That is from glacial cores; that is right. You can see the oscillation between values of roughly 180 to 280 parts per million in a glacial-interglacial cycle. We are now at 370 heading towards the order of 700 and higher by the end of the 21st century. These values have not been seen for the last 420,000 years, as I said, and suggestions from sediment cores are that current CO<sub>2</sub> levels have not been exceeded in the last 20 million years. As to global average temperatures, the best estimates are a rise of roughly 0.6 degrees Celsius from 1860 to the present, most of that occurring in specific time periods, the most recent one from roughly 1970 to the present. When you try to understand the reason behind that temperature rise you then need to build models of the climate system and understand the impact of greenhouse gases and other variables forcing the climate system—the solar forcing, volcanoes and the natural internal variability of the system as well as the greenhouse forcing.

**CHAIRMAN**—What about global cooling? Does that also come into your equation?

**Dr Church**—The approach used to identify the different forcing mechanisms does not specify a priori, whether it is warming or cooling. There are some factors that warm the planet, there are other factors that cool the planet, and it is the balance between these that determines the future.

**CHAIRMAN**—Sorry, what I was getting at was whether there is an inexorable aspect to global cooling, central core cooling, which is no doubt taking place.

**Dr Church**—That is on a very much longer time scale and the ice age cycles, glacial-interglacial cycles, are in longer time frames than we are presently imposing on the climate system, so we are talking about changes in the next several decades through to several centuries versus a much longer time scale associated with glacial cycles and even longer time scales associated with the cooling of the core of the earth.

**CHAIRMAN**—So you are saying that they are so minuscule that they are not part of the equation; they are not necessary to be part of the equation?

**Dr Church**—Changes in solar forcing are an important part of the equation. Changes in volcanic forcing are an important part of the equation. It is thought that some of the warming earlier in the century was as a result of changes in solar forcing. However—how shall I say this?—the conclusion with respect to the warming over the last 50 years is certainly that human activities are the prime reason.

**CHAIRMAN**—Thank you. I really appreciate that answer, and my next question relates to the ultimate demand of people on the globe for commodities, whether it is wheat, rice or farm produce or whether it is those that we rely on directly from the ground, and mining rather than harvesting such as our commercial elements—copper, nickel, cobalt, zinc or petroleum products and so on. I suppose it would be nice to have a view, which some people seem to have, that we are all going to live without any extractive industries, that we are not going to scar or clear the earth anymore and that the future is going to make nirvana perhaps look like a present day Chechnya, that we are all going to be well educated, that we are going to while away our time doing second degrees and that we really will not need anything because we will recycle all that we need and that even water and minerals will come as a result of recycling everything from the refuse that we collect. That is not possible.

How does one cope with, say, locking up an area like the Antarctic from any exploitation whatsoever? That is what happened with the Madrid protocol. We can go down there, we can scratch away at the surface, we can see veins of copper. No doubt the copper contains microscopic traces of something else, probably silver, perhaps a bit of gold, and these things are apparent on the surface. As a continent that broke away from Gondwanaland and broke away from one of the richest mineral areas in the world, it does not take too much of a mental extension to understand the potential for those minerals to also occur on a landmass that is much greater than Australia's and if the continental shelf is taken into consideration then it is exponentially greater than Australia. How does one satisfy governments throughout the world that ultimately will be signatories to a new Madrid protocol that we need to extend that in order to protect the continent? I am not sure at this stage from what or whom and for whom because it is rather an exclusive club that has access to that vast continent, its wonderful scenery and its pristine marine animals. That exclusivity perhaps needs to be extended to people as part of the saving, if you like, of the Antarctic continent, to preserve it for whatever reason you want. Maybe you just want to look at it. How does one then make plans to make sure that if it is not going to be protected any longer we are going to lock it up? Alternatively, how do we also have a contingency plan to allow for the orderly exploitation of the continent and at the same time preserve it—not too many forests down there—for the betterment of mankind?

**Dr Haward**—One of the interesting challenges—and you are quite correct—is that the Antarctic Treaty parties were regarded as a club and the Malaysian challenge in the 1980s basically requested that the United Nations take over the management of Antarctica, as you will probably recall, and implement the common heritage principles on the Law of the Sea Convention to allow the resources of Antarctica to be available to the world community. What is interesting is that over the last few years Malaysia's position on that has changed. Malaysia is now actively involved in Antarctic research, and in fact recently it strongly supported the

development of the protocols protection processes at the same time as encouraging increasing research, knowledge and understanding of the Antarctic.

Clearly decisions made in 1991 relating to protocol reflected a period of time before that. The prohibition on mining activities that you, Senator, hint at is sometimes mentioned as 50 years. It was actually an indefinite ban on mining until all the treaty parties agreed that it would happen but, if that did happen, it would be a decision made through international processes in which Australia would, no doubt, have some involvement and interest. I cannot see into the future and it is just crystal-ball gazing, but 70 years of bipartisan support on our claim and our notion of sovereignty down there would disappear, so we would have interests in that particular area.

The success of the Antarctic treaty system, though, is in fact very much in relation to seeing it as a special area. The treaty itself declared the area as a land of peace and science. It is the most successful multilateral disarmament treaty, amongst other things. It was in fact set up at the height of the Cold War; it removed a substantial proportion of the earth's surface away from global conflict and it has been highly successful through scientific collaboration and then diplomatic linkages. Those processes obviously continued from 1957-58 through to 1961 with the entry and the force of the treaty, through the various instruments attached to it, the protocol being the last of those. Things do change. Currently the treaty parties are looking at the problem of tourism—the management of tourism—and we will discuss that in the next couple of months at our meeting.

So who knows what will happen in the future. To benefit Antarctica perhaps as something that is locked up may 'outweigh' the potential for exploitation in the sense that you have a control there—and I am a political scientist; I will defer to my scientific colleagues—you have an area that you understand has a significant role in the global system, the earth system. Pressures on those resources may increase but, equally, we may be able to find other ways to more easily and cost-effectively harvest the resources that are down there. Certainly there are pressures on the Antarctic. We already see it with illegal fishing in the margins. A few years ago there was interest in prospecting for meteorites on the surface by collectors going down there. That was an interesting debate about whether that was actually prospecting, which was banned under the protocol, or scientific research, which is undertaken.

I am not answering your question directly, but I think that if the world community faced these issues that are raised the debate would be there, and I am sure that there would be ranges of opinion, depending on particular interests as there were in the 1980s when you had the Malaysian-led push for a different regime. Australia and the treaty parties said in the late 1980s that the Convention on the Regulation of Antarctic Mineral Resources activity, CRAMR, was no longer suitable and reflecting our interests, so we, after signing that treaty, actively moved with France and Belgium to overturn that in a sense—perhaps not to overturn it but to step back from it and look at a more environmentally focused protocol. So those big decisions will be there for the next generation. I cannot see it happening in the next 50 years of the protocol. It is an interesting hypothetical question and, sure, in 50 years time we may be forced to confront these big questions and then the same debates that were raised perhaps in the 1970s about the mineral and other resources down in Antarctica will be raised again.

**CHAIRMAN**—I hope they are and I hope the question is a precipitating factor in perhaps having a divergent thought on where the Antarctic goes in the future.



**Prof. Mapstone**—I just want to add that certainly we are not in a position to say when those things will be revisited, if they are revisited, or to prescribe what the outcome will be.

**CHAIRMAN**—We do not know the outcome, that is the problem.

**Prof. Mapstone**—But I think there are some other issues which are unresolved in the Antarctic and Southern Ocean. Bioprospecting, for example, is one such issue—going and fossicking for bioactive compounds that may have pharmaceutical uses and so on. Pretty much as I understand it, and Marcus may correct me here if I am wrong, it is outside all existing international agreements, so it is not clear how one gets on if one wants to go down there and fossick, take compounds from the Antarctic and use them to develop pharmaceuticals. It is unclear what one's standing would be and how it would sit in the context of the Antarctic treaty system, so there are some issues like that that are coming up.

Coming back to the subject of the inquiry, a significant contributor to Australia retaining influence over how those issues are resolved, whether it is bioprospecting now, in the next few years or revisiting the Madrid protocol in a few decades, will be the strength of Australia's engagement with Antarctica. If we have, as we do now, a very strong and leading Antarctic program, then I think we will retain a very influential position in those international negotiations. If we do not, then we will be relegated to some degree—

**CHAIRMAN**—It would not be in Australia's interests then to have the United Nations take over the administration of the continent, would it? We would get one vote.

**Dr Haward**—True.

**Prof. Mapstone**—I think we have—and again I think Marcus may wish to comment here—a disproportionately large influence on the processes of the Antarctic treaty system now, in part because of the magnitude of the territory that we oversee but in part also because of the strength of the Antarctic program that Australia runs in a variety of areas.

**Dr Haward**—Clearly the committee members have hinted at the size of the United States program but, from work we have done in the previous CRC, we would see us as certainly punching above our weight in terms of the size of our program and the commitment of our scientists and the contribution they make. John has hinted at the perils of being in international meetings and the cost in time, but Australian scientists and diplomats have significant positions in the Antarctic Treaty mechanisms. We are regarded as a solid citizen in those fora and that contribution is in fact longstanding—it goes right back to the treaty meetings, the conferences, and the set-up. So we have half a century of involvement in the formal processes and a lot longer in our scientific endeavours, going right back to Mawson and even the Tasmanian, Louis Bernacchi, who was in the first wintering party in the 1890s.

**CHAIRMAN**—I know all sides of politics are very proud of the contribution that is made by the AAD and the personnel obviously who contribute to that. There is no question about that.

**Senator SCULLION**—Your role, Professor, in your organisation is clearly central in a coordinating role. This is my own personal view, but everything I have been associated with over the last week, in reading a lot of material and speaking to people over the last couple of days,

indicates that significant opportunities exist to capitalise on bioprospecting. Those opportunities are currently stymied by incapacity—and it is not from any mischief—to move on the treaty front about bioprospecting. I think it is a single issue. There are other issues associated with that, but this is a single issue. Hopefully by the time we next meet the CRC is a principal project. You mentioned in your initial response the sorts of issues you are dealing with in the commercial area, but clearly I would see the role of the CRC as a principal project. You could talk about it being the role of the Antarctic Division, the CSIRO and whoever else, but clearly it would lie with the CRC. Any movement on that front would be a significant move forward for Australia's interests. It is all very well to say, 'Let's go back and continue to measure the sky and the air and everything else.' It is all wonderfully esoteric and I am sure very important to science and the wider community, but the wider community needs convincing that we have to have fewer nurses and policemen in order to provide more for this research. The argument is that we have to give to the wider community some tangible outcomes, apart from finding out how deep we are going to be in the water in our great-great-grandchildren's time. You can understand the difficulty we have in trying to project the importance of Antarctica without having some fiscal benefit to Australia, and I think that is certainly a current impediment. Could you give me a time line about the treaty process under which some of those changes can be made and negotiated?

**CHAIRMAN**—If you would be kind enough to make it short, it would be appreciated.

**Dr Haward**—The key issue is obviously the difference between scientific research, which is currently able to be undertaken in the Southern Ocean under the Antarctic treaty system, and commercial activities, which raise a whole range of other questions within the treaty framework. One of the ways to advance it in the short term would be to raise the issue at the Antarctic Treaty Consultative Party meeting, formally for Australia to put up a paper perhaps and get agreement on that. In the longer term, it would take a couple of meetings to get a regime in place for that.

**Senator SCULLION**—Am I to understand, Professor, that that may happen?

**Prof. Mapstone**—The paper would go forward

**Senator SCULLION**—How do we kick it off?

**Prof. Mapstone**—That would have to be kicked off by the policy instruments, the Australian Antarctic Division. As a research agency, we are not privy to those fora. I might add, though, that already Marcus and his colleagues in our policy program have been to an international workshop to look at this issue, among others, and have a project looking at the policy implications of bioprospecting in the Antarctic. So, in the way that we can contribute by research, we are already.

If I might just go back to the esoteric great-grandchildren issue, the issues with which we are dealing are not quite so esoteric if you take a lead from a report leaked from the Pentagon earlier this year—not a mickey mouse institution, one would assume—which had, as one part of their predictions, very extreme changes occurring in some parts of the globe in 20 years. That is in my lifetime; my grandchildren might not even be born. I think the issues we are dealing with here may be tangible much more quickly than we would like to think. Where I think the Antarctic program fits into that is resolving whether we are talking 20 years, in which case we need to start

thinking about it really soon, or whether we are talking great-grandchildren time, in which case there is a bit more time.

**CHAIRMAN**—Thank you very much, Professor Mapstone, Dr Haward and Dr John Church for appearing before the committee this morning. We very much appreciate your time here today. It is a pity that we always invariably run over time when we have these discussions on the Antarctic. If there are any matters on which we might need additional information, the secretary will write to you.

[11.55 a.m.]

**HAYMET, Professor Anthony Douglas John, Chief, Marine Research, Commonwealth Scientific and Industrial Research Organisation**

**CHAIRMAN**—I now call the representative of the Commonwealth Scientific and Industrial Research Organisation. Welcome, Professor Haymet. The committee has received a submission, No. 14, from the Commonwealth Scientific and Industrial Research Organisation. Are there any corrections or amendments you would like to make to that submission?

**Prof. Haymet**—No, sir.

**CHAIRMAN**—We will get straight on to our questioning.

**Senator SCULLION**—In your submission there seems to be a theme that you have generally supported all the research, as would be expected with the key role that the CSIRO plays in that regard, but there seems to be very much a focus on the marine science and climate aspects of the direction in which you think you should be going. I just wondered—it begs the obvious question—whether the terrestrial aspect is simply too boring. Have we done it to death? Do we know everything we need to know about Antarctica? Why is it that CSIRO as an organisation—and I know it spreads across every aspect of science—is basically not interested at all in anything to do with the continent itself, apart from the climate and the marine science?

**Prof. Haymet**—That is a very good question. Under the conditions of the treaty at the moment, CSIRO is a very practically oriented organisation. We are responsible for delivering Australia's climate predictions and the Southern Ocean is a major driver for that climate. So that is an area of focus. My division also does extensive research on all Australia's fisheries, national and international, so again that is an aspect on which we focus. Other areas that involve research that is currently proscribed in Antarctica—for example, geological exploration—are not currently addressed by CSIRO and clearly our focus in the area of geological exploration is terrestrial Australia.

**Senator SCULLION**—So, in a way, it is central to the Madrid protocol to protect and value the environment that is Antarctica. If we can be very frank and have a very practical answer, it could well be that other organisations similar to CSIRO in the other participating nations in Antarctica have very much the same approach. Put simply, we are not likely to get so many real returns out of a terrestrial area, so we will focus on other areas, but this will obviously lead to a deterioration in what we actually know about the changing terrestrial environment in Antarctica. One would think that that would be a principal impediment to our understanding and particularly to our being able to manage that sort of environment. So would you say in that context that the Madrid protocol could well be an impediment to understanding and managing the environment of Antarctica in the context of your previous answer?

**Prof. Haymet**—No. Because CSIRO is not doing work in the terrestrial part of Antarctica does not mean Australia is not. Our colleagues in the Antarctic Division regularly do transects across Antarctica doing all kinds of experiments and our international collaborators and Australia

regularly collect data from mainland Antarctica. My answer was just confined to what CSIRO is doing.

**Senator SCULLION**—But as our principal research body—and I do not want to bang on about it—it does not see terrestrial as quite as sexy as the other areas. I think your answer is quite right: the Madrid protocol could have something to do with it. What do you think—and this may be difficult for you to answer but please give it a go—the CSIRO's views are on Antarctica? Do you think that it is at the very top of the list? What priority do you think CSIRO places upon Antarctica in its research priorities in the global sense and the Australia-wide sense?

**Prof. Haymet**—I think it is very high because we recognise that the Southern Ocean is a principal driver for Australia's climate and the international climate. I think there is no higher priority in the public good side of what CSIRO does. If I could be blunt about it, CSIRO will deliver to IPCC in September the calculations for the fourth assessment for global climate change over the next 100 to 200 years. In a few years time we will deliver the fifth assessment. What will be the change between those two calculations? It will be our knowledge of the Southern Ocean which has improved and to some extent our understanding of aerosols. But one of the three key improvements that we need to give better climate forecasts for all of Australia—all of Australia meaning our agricultural sector, our marine industries, our urban energy usage—is an increased understanding of the Southern Ocean. That is the long and the short of it.

**Senator SCULLION**—So, as an organisation, CSIRO think they hold Antarctica very high in their priorities. Everybody sits around the table and if you are into the Arid Zone Research Centre you probably do not want to talk about Antarctica. There is competition for funds. So you believe that CSIRO really have it very much at the top of their priority list?

**Prof. Haymet**—Absolutely, and it is not just CSIRO. Our colleagues in the grain RDC ask us how can we deliver better predictions for Queensland farmers and the answer is by improving our understanding of the world's climate drivers and putting that into Australia's climate program. So I think it is top priority. I think we also need it to be because, as some of my colleagues said earlier in the day, we are a net user of satellite data, which is very important for many of the things that CSIRO delivers, both on land and sea. We currently do not pay for that. We get basically free satellite data from other countries and the informal quid pro quo for that is that we give our Southern Ocean data to the international community, and that has been a very successful model of international cooperation. We do not want our contribution to the international community of climate forecasting to dry up, so we need to continue our investment through the Antarctic Division, through our partners, into understanding the Southern Ocean.

**Senator SCULLION**—Do you think this information sharing and the relationship you have with our international partners is an equitable relationship? Do you think that they are giving us as much information as CSIRO hand out?

**Prof. Haymet**—We get heaps more from them than we give.

**Senator SCULLION**—A good answer. You say in your submission that there should be a greater flexibility in the use of our resources. Could you expand on that, please?

**Prof. Haymet**—I should declare that in my previous life as a professor at Sydney University I did a small part of my research in Antarctica and benefited as a professor being able to fly to the Antarctic mainland with Kiwi and US flights from Christchurch; so, personally, I am a great supporter of our air service. I think it completely changes the kind of people that you can get to Antarctica. It allows you to draw upon Australia's great university resources without disrupting your regular teaching and other duties at a university. There is the ability to go for six weeks or in some cases less. Some of my senior colleagues went to Antarctica for two weeks to get fishing programs established and then were able to come back and teach their classes. I am a very strong supporter of moving to an air link because it will open the doors for many more Australian scientists to be able to work successfully in Antarctica.

The corresponding accompaniment to that is a potential decrease in our marine voyages, and of course that is a great concern to me because we currently use many different vessels travelling in the Southern Ocean, especially the *Aurora Australis* but also vessels from France—the *Marion Dufresne* and so on—to launch our robotic floats and other scientific instruments. They are all part of our network of understanding the Southern Ocean. So we would be very disappointed if establishing this important air link were to lead to an undercutting of our very successful marine operations in that area. I am one of the three major partners in the ACE CRC and deployment of up to 30 robotic floats in the Southern Ocean is a major piece of infrastructure that the CRC has delivered for Australia. Those floats are deployed off basically any voyage we can find that is going in the correct part of the Antarctic Ocean south of Australia. It is very important to me that we continue and, if possible, expand that kind of investigation.

**Senator SCULLION**—You also submit that you think there should be an increase in the proportion of the allocation of the Antarctic Division's spending in scientific and, I think the term was, environmental research. Do you have some idea of what the proportion would be at the moment? Perhaps you could take that on notice and give me an indication of where you think the proportion should go.

**Prof. Haymet**—First, let me say I think you should ask the Antarctic Division for that information.

**Senator SCULLION**—It was in your submission; that is why I am asking.

**Prof. Haymet**—Yes. It was the CSIRO opinion. It is no secret, I think we are on a very good track and I am very supportive of the last 10 years of close cooperation between CSIRO and the Antarctic Division and the University of Tasmania. We have come together in the Antarctic CRC, but it is no secret that the Antarctic Division has two missions. It has a mission of occupying Antarctica to underpin our claim of 44 per cent of the continent and it has a scientific mission. If you contrast that with our colleagues in the British Antarctic survey, you will see that they have only a scientific mission. My personal opinion is that those two missions should be clarified and that occupying Antarctic territory is a very different mission from doing science on the Antarctic continent.

**Senator SCULLION**—So do we need to be multiskilling? I think it is easier to make a plumber into a scientist than the other way around. Can you give me some practical examples of how we might achieve that? I can understand the point you make, that the mission needs to be

more focused, but my observations are that the majority of the people are essential functionaries to support scientific work in Antarctica. I am trying to think how you can change that. Could you perhaps give me some practical examples of what you mean? Say, in a greenfields environment, how would we start off again? How would we do it differently to reflect that?

**Prof. Haymet**—Having been to Antarctica only three times, I am certainly no expert.

**Senator SCULLION**—You are three up on me, Professor.

**Prof. Haymet**—Others are more experienced. But, from my colleagues in NASA and also my colleagues in my sister organisation in Japan, I am aware that there is a great advance in robotic technology. After all, we are able to explore much of Mars with robots; we do not have to send people to Mars. My colleagues in JAMSTEC explore the world's deep oceans and are also looking at doing that robotically rather than having manned vehicles that go seven kilometres into the world's oceans. There is a cost differential of at least a factor of 100 between having a person there and not having one. That applies to Mars or the bottom of the world's oceans. So, to respond to your kind invitation, I would be looking at robotic opportunities in order to get more bang for our buck in the Antarctic scientific environment.

**CHAIRMAN**—I can never arrive at a layman's answer for the concentration on the Antarctic by various continents, mostly from the north and Australia of course, which plays a seminal role down there both scientifically and in other areas of manning those bases on a continuous, round-the-clock, round-the-year basis. But, given the landmass in the north, given the population that is in the Northern Hemisphere—China, India, North America, Russia, Europe—and there is very little by comparison in the Southern Hemisphere, what bearing does the population in the north have, and potentially have, on the wellbeing of the Southern Ocean and the Antarctic continent?

**Prof. Haymet**—That is a very good question. I think it has both a potentially very positive bearing and a potentially negative bearing. We are alone down here in the Southern Ocean—Australia is the only developed country in the Southern Ocean, with due respect to our colleagues in New Zealand. So when we want to understand the Southern Ocean with a massive oceanographic expedition we cannot partner with South Africa, or even India, Chile or Argentina. We really must look to our Northern Hemisphere colleagues for that kind of support. That kind of support is being delivered increasingly because Northern Hemisphere nations see that the Southern Ocean's circumpolar current as the unique difference between the north and the south. There is an open passage around the Antarctic continent, which means that the circumpolar current is a major driver to the world's climate.

**CHAIRMAN**—Does that include the Humboldt and the Leeuwin, or parts of it?

**Prof. Haymet**—No, the Leeuwin current is really due to the Indonesian through-flow, which is the link between the Pacific Ocean and—

**CHAIRMAN**—So it is exclusive of those two major currents?

**Prof. Haymet**—Yes. I am talking about something that is south of Tasmania. That is something that has opened up in geological history. When the Antarctic continent was connected to South Africa there was no circumpolar current. The start of that circumpolar current was the

generation for many of the unique species in Antarctica as cold-water fish and warm-water fish were separated. The recognition that that is a major driver not just on Australia's climate but also on the European and North American climates is, I think, a good thing for Australia because it means we can get international partners to help us pay for the cost of doing our research. Just a small example: a few weeks ago the Japanese research vessel, the *Mirai*, completed a circumnavigation of the world, starting in Brisbane last August and coming to Fremantle on Australia Day. They spent 161 days doing oceanography at 30 degrees south. Why would Japan pay for their magnificent vessel, carrying 43 scientists? Because they recognise that the Southern Ocean is a major driver of the world's climate and therefore the world's geopolitical stability. One of the big issues in Japan is whether or not the Asian-Australian monsoon will fail. That is driven by deep oceanographic factors in the Indian Ocean, but when that monsoon does fail it has major geopolitical consequences that ripple all through Asia and therefore affect Japan and Australia.

I think the explanation of why the Northern Hemisphere cares about the Southern Ocean is now clear. It is because it is the major unexplored climate driver. I think the dangers are that there is potentially a lot of wealth locked up in the Southern Hemisphere. We have seen with all the activity in toothfish pirates that many different countries, most of them sponsored by Northern Hemisphere nations, are coming to the Southern Ocean to catch our fish. I think that is a potential danger.

**CHAIRMAN**—How does Australia then alleviate the fiscal burden—it is certainly not going to have an academic one—of largely maintaining this sort of watch on the southern weather system when it is to the benefit of the north? By way of answer, I suppose, why are we not then getting more assistance in what we do—I know we get some from the United States—from other countries in the Northern Hemisphere that could utilise the research that we do down here?

**Prof. Haymet**—As I said to Senator Scullion, I think we are in a very good situation right now. We use all of the world's satellite data for free.

**CHAIRMAN**—Yes, I heard you say that. You say we net out of it.

**Prof. Haymet**—Imagine Australia having to establish its own satellite network. That would be disastrous.

**CHAIRMAN**—Would it be largely from the United States or could you—

**Prof. Haymet**—Largely from the United States, but also European and Japanese products are available to us. We also participate, for example, in the international oceanographic robotic network. We have a series of 1,000 floats that are deployed around the world. All that data is made available to every country for free. I think at this point Australia has probably paid for about 12 of them and the Antarctic CRC will deploy about 30 more over the lifetime of the CRC.

**CHAIRMAN**—So you are well in front?

**Prof. Haymet**—We are well in front. Our struggle is that we want to do more in the Southern Ocean and so we are trying to nucleate partnerships with other countries that want to go out and do in situ measurements. It is not enough just to have satellites and robots; we sometimes need to



go out to the Southern Ocean and make measurements. Of course, we get a lot from those measurements because they ground-truth our satellite observations, but we need to do more exploration, and that is of course the expensive and potentially dangerous part of Australia's research program.

**CHAIRMAN**—How does Australia justify to other countries, most of which are in the Northern Hemisphere—say, China with its 1.25 billion people; Japan with its 100 million; even little Taiwan, one-fifth the size of Tasmania, with 23 million—its approach of, 'Look, these Patagonian toothfish really belong to Australia and we are going to lock you people out,' when they say, 'But you're only 20 million people; how can you possibly utilise a resource like that that really belongs to the people of the world or the people who are prepared to harvest them?'

**Prof. Haymet**—I think it is a very difficult question, Senator. I think Australia's argument has always been that we want sustainable fisheries. We do not claim in the international fisheries environment that we want all the fish; we simply want to do enough research to establish how many fish can be taken from the seas forever so that our grandchildren and their grandchildren can take the same number of fish. I think Australia has been very consistent in that point of view and I think Australia does know how many toothfish can be taken from the Southern Ocean sustainably. Australia has a remarkably responsible toothfish industry based out of Fremantle that is scrupulous about catching a number of fish that is well below the sustainable limit.

In that fishery, as well as in the tuna fisheries to our north, the difficulty comes about once you have established what the sustainable catch is. The difficulties are twofold. One is dividing up that catch, and there is a complex network of international agreements to try to do that. Beyond that there is the issue of subsistence fishermen taking vast quantities, sometimes vastly beyond what is internationally agreed to be the sustainable catch. For example, to our north it is all very well for Australia to say we will take half the tuna on this side of the line. That goes to a large national company in Australia and the fish is sold on international fish markets. On the other side of the line you have people who are just trying to feed their families, who are not by any means getting wealthy from catching those very same fish but in fact are subsistence fishers. So that is the global question of fish in international waters and Australia has to play its part in it.

**CHAIRMAN**—Given that the United Nations is manifestly impotent in trying to deliver the international protocol on catching whales, even for scientific purposes, how do you think we could handle the fairly large exclusive economic zone that we have around the Australian possessions of McDonald and Heard, and particularly the Antarctic continent, if some nation other than Uruguay wants to come in there and say that they are going to harvest creatures from the sea in that zone?

**Prof. Haymet**—I think there are a couple of aspects to that. I think Australia needs a low-cost monitoring network to let us know when people are coming into that area. Certainly I think there are technologies available that we could deploy that are quite a bit cheaper than having a \$50 million—

**CHAIRMAN**—Satellite surveillance?

**Prof. Haymet**—Satellites, robotic floats, all kinds of technologies that probably I do not even know about and that the Australian Defence Force would be more familiar with. One has to

establish a presence. I think the vessel that is going to be deployed over the next couple of years is probably a good message to send, but I think there are lower cost ways of monitoring larger areas of the ocean. This is not a problem that is going to go away. Every major fishery in the Northern Hemisphere is overfished. Some of the Southern Hemisphere fisheries are overfished. If you look at the BRS web site, the Australian government says that some 33 of Australia's fisheries are overfished and 37 more are fully fished. Some of them we do not have data for, so the whole issue of how many fish we can reap from the sea on a sustainable basis is one that has reached a crisis point right now.

We have seen in the Northern Hemisphere that the cod fishery that was inexhaustible for the Basques and the Vikings from 600AD suddenly ran out about 100 years ago and has not come back at all. It is humbling I think for human beings to realise that such an apparently inexhaustible resource can be damaged, and who knows when it will come back or if it will come back. I think as we go further into this century we will do so with a lot of humility about things that we thought we understood or things that we thought were inexhaustible. For example, 160 years ago nobody would have imagined that putting CO<sub>2</sub> into the atmosphere would end up causing global warming, yet the consensus of the scientific community is that that is exactly what we have done. We certainly destroyed that fishery.

**CHAIRMAN**—That is not a consensus.

**Prof. Haymet**—In my opinion it is a consensus.

**CHAIRMAN**—All right. I will not dwell on that. Could I ask then, with respect to the possessions that we have down there and our desire to ensure that the resources within those perimeters are protected, whether you are satisfied that the research done with the most pre-eminent of those commercial fishes, the patagonian toothfish, has been sufficient to delineate the resource conclusively and then able to say that only X amount can be taken annually in order to sustain that resource.

**Prof. Haymet**—Yes, I am firmly convinced that the best possible fishery models have been prepared for the resource around Macquarie Island and also Heard Island and McDonald Island. I believe that the current limits that are being caught by the Australian legal fishing industry are sustainable within our current scientific knowledge.

**CHAIRMAN**—That is without any further fishing by pirates, of course.

**Prof. Haymet**—Exactly. When the pirates come in and take 10, 20 or 50 times the sustainable limit then we get into a very difficult area.

**Senator SCULLION**—But is it true, Professor, to say that because we actually calculate our management plans in terms of the patagonian toothfish and the icefish, often involving things like catch-per-unit effort, if the fishery becomes depleted, irrespective of how, we have triggers and mechanisms in plan to reduce—or we can do so within our own legislation—the capacity or the effort and output of the Australian fishers?

**Prof. Haymet**—Yes, that fishery is administered just like the tuna fishery to our north-west or to our east.

**Senator SCULLION**—I am just saying that, even if the IUU fishery is potentially depleting the stock, that is still taken into consideration in the model. Whilst we can only screw down the Australian fishers, it is still taken into consideration.

**Prof. Haymet**—It is, but of course that is the struggle. The number of fish that have been taken by illegal fishing is often very hard to pin down. It is all very well having the world's greatest fishery model, but if you do not know how many fish are being taken illegally, and almost by definition you do not know how many fish are being taken illegally, it is very difficult to get a good management strategy in place.

**CHAIRMAN**—I was born in Port Lincoln and as a young man I watched the tuna fishing. The tuna were so vast it was a bit like those North Sea cod that were depleted almost beyond recovery. How close is the tuna industry in the Southern Ocean to becoming like that unless certain stringent regulations are invoked or at least are adhered to?

**Prof. Haymet**—That is a very difficult question, Senator. I think there has been progress made in the last couple of months in terms of international tuna fishery agreements. I think our relationship with the Japanese point of view on international tuna fisheries has improved markedly recently, but I do not think one should underestimate the pressures on tuna fisheries worldwide. As naturally caught seafood gets more and more scarce, some published estimates from the Northern Hemisphere are that we have removed 90 per cent of the biomass of higher fish from the world's oceans starting from the Northern Hemisphere. If that were true, then there would be an increase in pressure on these very high-value fish. So we have seen the Australian tuna industry over a very short period going from 50c a kilogram for canned tuna and even pet food, to an industry which realises \$100 a kilogram or more sold in the Tokyo fish market. One should not underestimate that that pressure is going to continue. A country like Taiwan, for example, which is, as you pointed out, on a very small piece of land, has a very large fishing fleet that is very experienced and quite capable of going into the Indian Ocean and catching fish. In fact, it may be, by some estimates, the nation that is taking the most fish out of the Indian Ocean, even though it does not border on the Indian Ocean. I think this is a serious international issue that clearly bears upon a whole range of Australia's treaty and UN obligations. In some sense the Macquarie Island, Heard Island and McDonald Island situation is relatively simple. We lay claim to those islands. They are internationally recognised. We have a claim to the exclusive economic zone around those islands. It is a very straightforward situation. There are much more difficult situations when you have tuna that in their lifecycle range over the waters of many different nations.

**CHAIRMAN**—Given the apparent impotency of the United Nations in enforcing some of the protocols, do you think that it is time or past the time that we look at, say, the OECD, comprising developed countries—countries that will not necessarily make more decisions based on their basic need for food—playing a more prominent role in enforcing the issues of harvesting or mining food from the Southern Ocean in particular?

**Prof. Haymet**—It is a very good question, but I am afraid you have taken this simple chemist well beyond his area of expertise. I would say in reply to your question that I think Australia has had for some years a focus on the aquaculture industry and certainly that is a focus for my division and many of my colleagues in other federal and state agencies. I do think as a source of

protein for the world that Australia has been right to think about aquaculture as a potential augmentation and perhaps even a replacement for natural fish.

**CHAIRMAN**—In your view then, Professor, do you think that the federal government is playing an adequate role in encouraging and fostering the growth of aquaculture in Australia?

**Prof. Haymet**—I think the 10 points of the aquaculture action agenda, which arose out of I believe a PMSEC meeting in August 2002, are a good roadmap for Australia's development.

**CHAIRMAN**—Could you refer the committee to that particular document?

**Prof. Haymet**—Yes. There was an aquaculture action agenda issued by the Prime Minister's Science Industry and Economic Development Council. I believe the meeting was in August 2002. The Commonwealth Department of Agriculture, Forestry and Fisheries is, I believe, delivering a report on that action agenda in June this year. I think it is a very difficult question. The aquaculture industry in Vietnam is a hundred times the size of that in Australia. The aquaculture industry in Thailand is a hundred times greater than Australia's. In China it is a hundred times greater than in Australia. So we are a very small player currently on the world stage. The question that I consider often and do not know the answer to is whether we should try to compete in actually producing protein. In other words, should we grow fish in Australia or should we somehow be the brains behind the operation? Should we try to deliver intellectual property into those developing countries that will enable them to make aquacultured food more safely, more securely, with less waste, with fewer diseases and so on? I think we as a nation are right in the middle of deciding what part in that international aquaculture industry Australia wants to play.

**Senator SCULLION**—You often see photos or images of Antarctica—and I am a bit of a pragmatist in this regard—and there are obviously quite sheltered areas in Antarctica. Has the CSIRO identified any areas of potential aquaculture down there? We have krill that has certainly been identified as many thousands of tonnes under sustainable yield currently. Often people talk to me about krill being an aquaculture feed opportunity. Very cold waters are the sorts of markets that are attracting the high-order value-added products in the seafood industry like tuna—the colder the water the higher the quality. I would have thought there were some really good opportunities down there. Has CSIRO had a look for any areas down around the Antarctic continent within Australia's purview to potentially pursue the aquaculture industry down there?

**Prof. Haymet**—I think the short answer is no. The reason is that a lot of the economics of aquaculture is the cost of delivering the aquacultured fish to the market which, as I have explained, is mostly international. We have thought a lot about how far north in Australia we can get our aquaculture production to minimise that transportation cost.

**CHAIRMAN**—Professor Haymet, thank you very much indeed for your time here this morning. Thank you for your answers. You have been most informative, as indeed have the other witnesses who have appeared before us this morning. If there are any matters on which we might need additional information, the secretary will write to you. On behalf of what remains of the committee here this morning, Professor, thank you again for coming along.

[12.35 p.m.]

**ALLISON, Dr Ian, Chair, Australian Academy of Science, National Committee for Antarctic Research**

**CHAIRMAN**—I now call the representative from the National Committee on Antarctic Research to give evidence. Good morning, Dr Allison. The committee has received a submission, No. 4, from the National Committee on Antarctic Research. Are there any corrections or amendments you would like to make to your submission?

**Dr Allison**—I would like to make a couple of amendments to our written submission.

**CHAIRMAN**—Will you make those verbally or do you have them written down?

**Dr Allison**—I will make those verbally.

**CHAIRMAN**—Would you like to make them as you read your opening statement?

**Dr Allison**—Yes, I will do that. The National Committee for Antarctic Research is a committee of the Australian Academy of Science. We are a non-government organisation obviously. We have a principal role both nationally and internationally. Internationally we liaise with the main non-governmental international organisation in terms of collaborative science in Antarctica, which is called the Scientific Committee for Antarctic Research. It is part of the International Council of Science. We liaise with that body. We take a principal role in trying to have Australia actively involved in the international programs and using our influence in that to push Australia's interest and Australia's programs in Antarctica internationally. Nationally, we try to provide an open forum to publicise and promote Antarctic science within the wider research community in Australia. We have a particular interest in trying to involve the university community in Antarctica science. Later this year we plan to hold a meeting at the academy in Canberra to look at some of these issues of priority of Australia—the benefits of Australia's Antarctic science.

**CHAIRMAN**—Can you give the committee some idea of the date when that might be?

**Dr Allison**—It is 9 to 10 September. I will send the secretary a notification of this meeting once we have finalised it, which will be within the next week or two, and we very much welcome attendance of members of this committee at that meeting.

**CHAIRMAN**—Thank you, Dr Allison.

**Dr Allison**—In our submission we address one principal theme. We believe there has been a great benefit come out of the relatively small grants scheme to non-government non-CRC researchers, the Australian Antarctic Science Grant Scheme. That paid out in the order of \$705,000, I think, last year. We believe that the multipliers that come from that from the university community that has been involved have been very good; they are very high. We have been able to, I guess, increase the use of this existing infrastructure; we are seeing people

contributing new ideas and diversifying our program, which is very much focused on the strategic directions that have been defined in the Antarctic program. There has been a shortfall in the number of programs that have been assessed of scientific quality, and directly addressed strategic objectives, of around about \$400,000. We believe that there will be a great benefit in increasing that grant scheme to a moderate amount to involve more of the university commitment.

**CHAIRMAN**—Have you any idea what that might be in figures?

**Dr Allison**—Based on last year, of the order of \$400,000 for this year. We believe that money would need to be in addition to the present funding from the Antarctic Division. The initial grant scheme was set up in within the Antarctic Division and we believe that is probably as far as it can go. With the advent of air transport—and here I move on to the second issue that we did not address in our written submission—we believe there is the opportunity for a lot more involvement of university researchers, bringing in a lot more expertise, people of a senior level. I think Professor Haymet addressed that also.

**CHAIRMAN**—In what professional capacity would that be?

**Dr Allison**—The researchers?

**CHAIRMAN**—Yes.

**Dr Allison**—We believe the opportunity to undertake work in Antarctica over a short visit will bring in researchers who presently are not really into it because they have other commitments—they cannot afford to go to Antarctica for four months and undertake research.

**CHAIRMAN**—What professional level? Is it a cross-section?

**Dr Allison**—Yes, it will be a cross-section. At the moment, people who go for a long time tend to be fairly junior and supervised by others. We believe that if there is an opportunity to visit for a shorter time you will have people from the full spectrum up to full professor—people with a wealth of experience. They will not be the bulk of the people there, but their presence will mean a great more expertise. At the same time, we express the same concerns that Professor Haymet made that we would not wish to see an air transport facility developed at a cost to the existing marine science program. Over the last 10 years Australia has developed an enviable reputation in marine science in the Southern Ocean and Antarctica. I really would not like to see money taken from one program to pay for another.

**CHAIRMAN**—Just on that point—I am sorry to interrupt again—if you took an aggregation of the contribution to the shipping site of the program and added that to the proposed air route, even if it detracted slightly from the traditional means of servicing the continent, isn't that really the goal, to make an aggregation a net gain?

**Dr Allison**—Yes, certainly, and there are certainly changes you can make in the way you deliver people to Antarctica, but our concern would be that you cannot do marine science from the air. You can do some remote sensing, of course, but you would not want to take away a

marine science capability. Certainly you can make an alternative strategy for delivering people to Antarctica and cutting out some of those costs but not at the cost of a marine science facility.

**CHAIRMAN**—I appreciate that.

**Dr Allison**—Our final point that we did not put in the submission is that we believe, because NCAR is involved in the international community, there are a lot of opportunities in international science. There are a number of large major programs that are coming up with such things as the International Geosphere-Biosphere Program, the World Climate Research Program and a new development called the International Polar Year, which is being proposed for 2007-08. It is the 50th anniversary of the International Geophysical Year. We think there are some opportunities there to strengthen the international collaboration. Australia has always played a major role in these international programs. The sum of the results of the individual parts of international collaboration is always much greater than the individual parts themselves. I, and the committee, believe that we should be in a position to contribute in a significant way to some of these major programs. The benefits of those to Australia would be great.

**Senator SCULLION**—Dr Allison, I have to say I am very much a cynic when it comes to how we are approaching our research in Australia and I have been associated with a number of organisations, including CSIRO and a whole range of fisheries matters. It is a very difficult area to coordinate because everybody has their own area; they are all struggling for the same piece of pie. But I have to say I have been pretty amazed. You are the National Committee on Antarctic Research. We obviously need another scientific committee on Antarctic research and, of course, AAD has to have their Antarctic science advisory committee. CSIRO, no doubt, would have some sort of committee that looks into that. Really, there is a plethora of these sorts of advisory committees about how we should go about advising. I am not saying that is a bad thing, but it appears to me that we are still in a world, in terms of Antarctica, where there is not a single body. Imagine if all the money that is spent—whether it is to individual researchers at university, through the university grants, the amount of funding that is allocated by AAD, and the amount of money that CSIRO and other bodies put in—were put completely into a pool and that was actually allocated on the basis of priority by one organisation. I would see that as the ideal circumstance, if not the circumstance at the moment. Could you give me your view about how we should be going about prioritising the actual research—not what I want to do but what needs looking at next in Antarctica from a national perspective? Who do you think should be doing that?

**Dr Allison**—That advice comes at present from the Antarctic Science Advisory Committee, a ministerial committee.

**Senator SCULLION**—Do you have a role?

**Dr Allison**—I am Chair of NCAR and an ex-officio member of that committee. Our committee is looking at the excellence of the science and the scientific priorities. We have a role in identifying gaps and trying to alert an organisation like ASAC, but the government, when it sets its objectives for an Antarctic program, takes advice from ASAC. The assessment of the individual programs, what gets up and what does not get up in Antarctica, the scientific quality and whether they need the strategic objectives, is done by an assessment committee, which is set up by the Antarctic Division but which involves external researchers.

NCAR is an organisation that basically runs on a smelly rag. We receive very little funding, in the order of \$2,000 a year, but we are an organisation that has members with a wealth of experience in Antarctic research, representing a wide diversity of organisations. We try to focus on the non-governmental sector, just because that does not have as large a say elsewhere, and we try to provide advice to bodies like ASAC, to the Antarctic Division; we try to provide some independent, expert advice.

**Senator SCULLION**—You speak again about the importance of the leverage that we get out of researchers. It has gone up now to \$700,000, I understand. There have been a number of references in most of the submissions, and this is important. You might not be the right person to ask, but it has been suggested that there are huge indications about how much money that leaves us. Do you know where I would be able to find out what that number is?

**Dr Allison**—I think the Antarctic Division has done an estimate of that. I have heard figures of the order of a factor of 10 to 15, but I would have to check that.

**Senator SCULLION**—I will try to confirm that. It might even be in their submission but I have not found it yet. In your submission you say that, if we have a decline in the funds for the university researchers, you believe there are wider issues about university researchers and their importance for funding rather than other specific bodies. Can you talk to me about why you think that this particular aspect of funding is so important?

**Dr Allison**—When you look at funding the Antarctic community, whether it be the CRC or the new Antarctic Division, you are looking at people who have great expertise in Antarctic studies with a fairly narrow discipline base. When we involve the very much wider total university community, we bring in new techniques, a whole diversity of new methods and new skills, new ways and new problems. I think any science needs those new ideas. It needs to keep regenerating itself and we just do not have that within the fairly limited Antarctic community alone. We have to be able to involve a larger community with much greater skill base. I think that is one of the strengths. That is my personal opinion.

**Senator SCULLION**—Your organisation is a very different organisation because it is effectively made up of a majority of NGOs or people or individuals who have an interest in Antarctica—

**Dr Allison**—Are you talking about the international committee scale?

**Senator SCULLION**—No, I am talking about the National Committee on Antarctic Research and I think it is refreshing because it is different. There must be an awful lot of the same players around these tables, as there is obviously with your organisation. What do you think are the principal differences between the approach of the NGOs to prioritising research and that of the remainder, or the mainstream?

**Dr Allison**—I guess I am a bit confused by the terminology because an NGO to me is something like Greenpeace.

**Senator SCULLION**—Non-government organisation.



**Dr Allison**—We are representative of research organisations that are not directly funded by government. They are not government departments.

**Senator SCULLION**—I misunderstood you then; I did take NGOs to be others generally. So what sort of organisations would you be representing?

**Dr Allison**—Mostly universities, but we also try to look broadly across the whole community. The university is a source for many of the new ideas.

**Senator SCULLION**—So what are the principal differences, apart from saying, ‘I think you should fund us rather than others’? I understand that is a self-interest thing and that is accepted, but what differences would there be in the university approach to research priorities compared with the mainstream?

**Dr Allison**—I think one of our roles is that many people in the university community are not aware of the opportunities in Antarctic science. They are not aware of what they can contribute, and that is one of the tasks that we have. At the moment they are looking at specialised skills, perhaps of individual disciplines, but there are ways of applying that to further the work we are doing in Antarctica.

**Senator SCULLION**—I suppose it is a reasonable assumption to make that universities are now providing thematic areas, particularly within Antarctica. You can do postgraduate studies in Antarctic studies now at the University of Tasmania, I understand.

**Dr Allison**—Yes, there are a few universities doing that.

**Senator SCULLION**—I am not sure I would be rushing forward to put my hand up to go and do a postgraduate course in Antarctic studies if I knew that the opportunities to visit Antarctica were limited because of our capacity to visit and those sorts of things. If we introduce this air transportation system, what sort of change do you think that will make to the university market—that is really a market of students—if we make it more accessible? Do you think that will change the market significantly?

**Dr Allison**—We are not just looking at involving students. We are looking at involving the researchers and the supervisors who have the expertise. Certainly when we are looking at postgraduate students—the future generation of people who are going to take Australia’s science forward—we want to involve them also. The air transport will open the way to get more people down for shorter periods. We have stations in Antarctica that are limited in their capacity as to the number of people they take, but people do not need to be there for as long as they are now. We can better use the existing infrastructure in Antarctica if we can get people in for shorter periods and out so we can push more researchers through over a summer. We can use exactly the same infrastructure with the addition of a new transport system—which is not minor, I admit—to get more bang for the same buck. And we will get new people involved—that is the important thing.

**CHAIRMAN**—Dr Allison, what is your opinion of the depletion of the ozone layer? Do you think a net depletion has been measured over the past decades? What part does the breaking of waves from the Southern Ocean on the southern part of the continent, particularly the Great

Australian Bight, play in the release of molecular substances from that action on the depletion of the ozone layer? Why is the ozone layer suffering depletion here in the most pristine part of the globe where there is apparently no significant release of greenhouse-damaging gases and also those fluorocarbons that evidently contribute to the damaging of the ozone layer?

**Dr Allison**—You are now asking me a question that moves away from my representation of the committee. It also moves away from my personal expertise. I can answer in part—

**CHAIRMAN**—I do apologise for that, but perhaps you could answer it in the part that you feel comfortable with.

**Dr Allison**—I cannot comment on aerosols released by breaking waves, but the major difference between the ozone depletion in the Southern Hemisphere and what happens in the Northern Hemisphere is almost what is called the polar vortex—around Antarctica, because of the atmospheric circulation, you get a wind circulation in the upper atmosphere that basically seals off part of the atmosphere in almost an experimental vial. The gases in there are the subject of cold temperatures and aggregate UV. They are gases that are contained within that atmospheric wind system, they cannot get out and mix with the rest of the atmosphere and that is why that unique situation occurs. The polar vortex forms during the winter. There is general circulation of air masses that contain ozone-depleting chemicals released in the Northern Hemisphere but circulated around the globe at high altitude until the winter when they are trapped and held in that one place. In the spring that vortex breaks down and the ozone depleted air then mixes out again around the globe. The fact of the situation is that you have that contained air mass only over the Antarctic.

**CHAIRMAN**—How does that have a global effect?

**Dr Allison**—It is depleting the ozone in that air mass and when that vortex breaks down that depleted air mass is freed globally again. It has a global impact but the greatest impact is over Antarctica and the Southern Ocean itself because that is where the most depleted ozone actually is.

**CHAIRMAN**—How does that impact over Antarctica manifest itself or how is it manifested as opposed to potentially so?

**Dr Allison**—You mean the impact of that on—

**CHAIRMAN**—Yes, the impact on the Antarctic continent. Is the ice melting? Are the glaciers breaking off?

**Dr Allison**—The impact on the continent is probably quite small, but it is the impact on marine ecosystems, the effect of the enhanced UV and the fact that if you keep depleting the ozone and spreading that depleted area you are depleting the ozone layer in the total atmosphere.

**CHAIRMAN**—There has been some evidence recently that the ozone layer may be repairing itself. Do you subscribe to that?

**Dr Allison**—It is beyond my knowledge of the situation.

**CHAIRMAN**—Okay. Let me shift to global warming. Global warming seems to have taken over in importance than the ‘breakdown’ of the ozone layer—having said that, it seems to be repairing itself. Would you agree that the scientific brain has shifted to the global warming?

**Dr Allison**—No, I think global warming has been around as a concept longer than the ozone hole.

**CHAIRMAN**—I just meant the importance of it.

**Dr Allison**—Yes, I guess we are looking at the importance of it in the public eye much more. I think it is sometimes a mistake just to look at climate change. When we look—and again this is my personal opinion, not that of the committee—at why we study natural systems in the earth it should not be just to respond to potential crises. It should be to understand that system and to be able to forecast.

**CHAIRMAN**—Be proactive rather than reactive?

**Dr Allison**—Yes. A lot of the work we are doing in climate science is aimed at improving the predictability of climate. At the moment we can predict weather, and despite all the hoo-ha we have increased enormously our ability to predict day-to-day weather out to time scales of a week or so over the last few decades. A lot of the climate science is aimed at looking at predictability of climate. The economic benefit to a country like Australia with agriculture, even giving some probability of a drier than normal year or wetter than normal year, seasons out, is massive. Certainly there are changes that we are making to the climate system that we should understand and we need to be careful of. We need to prevent them occurring, if possible, or at least work out ways of adapting to them, but I think studying the climate system is far more important than just looking at potential disaster scenarios.

**CHAIRMAN**—Is the federal government doing enough with respect to the monetary contribution it necessarily makes to meteorology?

**Dr Allison**—Again I guess I am getting beyond my area of expertise. I work in climate science. As a personal opinion I would like to see more done. I think the priorities established for that need to be settled more firmly.

**CHAIRMAN**—On your wish list, where would you like that assistance to be given—onshore Australia, in the Antarctic, out in the Pacific Ocean?

**Dr Allison**—No, I think in the Southern Ocean. The Southern Ocean is an area where there is a dearth of observations and a dearth of understanding in both what is happening in the ocean and what is happening in the atmosphere. There are ways that we can get that data robotically, as Professor Haymet was saying. I think there is a potential to involve people from the Northern Hemisphere and larger nations in what we are doing in the Southern Hemisphere. Australia will need to take a lead role in that; we cannot do it alone. I think we should be in a position where we can influence other people and get them involved.

**CHAIRMAN**—Is there any way—and you can take this on notice, if you wish—that the proposed contact with the Antarctic by air on a regular basis can be used to the advantage of

your particular expertise and that of your committee, which is quite formidable, in collecting air samples or carrying instruments that would assist you in your research?

**Dr Allison**—There is some potential for that and that is being considered in setting it up. It would be largely remote-sensing instruments. The aircraft would be flying fairly high. Some air sampling could be done.

**CHAIRMAN**—So there are airborne instruments that could be utilised and perhaps utilised fairly cheaply?

**Dr Allison**—Yes. I think there is a lot more potential for that sort of work in what is called the intracontinental air transport system that is being set up already within the Antarctic Division—that is, twin-engined planes able to operate off snow strips. They have the ability to operate not only around the continent but also to a considerable distance over the sea. I think there is a lot more potential for that research capability in those aircraft.

**CHAIRMAN**—The committee would certainly like to hear about that in more detail as time goes on, Dr Allison. My last question is with respect to the government again. I want to ask you, in other areas of Southern Ocean research, whether the government is playing a sufficient role in funding or whether there are areas that, to a scientist, are being neglected by the government. We have only an advisory capacity to the government. I have a background in geology and sheep stations—and these are not terribly much to do with the Antarctic. I am not saying they are irrelevant, but hard land and sheep stations really do not give me much expertise to assist the government in the collective advice that we give them.

**Dr Allison**—ASAC and various reviews have established the priorities in the Antarctic science program. They are largely the science concerned with the ecosystems and the preservation of those ecosystems and the climate science. I stress again that it is not just looking at disasters; it is predictability of the climate systems. Doing both of those jobs requires very large resources. It requires a large shipping capability. I would get back to one of my initial points. I think we need to maintain, and I would even suggest enhance, our present marine science capability in the Southern Ocean if we are to answer those questions in the short time scale.

**CHAIRMAN**—Does that mean adding to the bases that already exist in the Antarctic?

**Dr Allison**—No. I think it means having more dedicated marine science time. I think, equally importantly, it involves working collaboratively with other nations. I mentioned this International Polar Year. It is really a badging exercise, but it is a flag. Many people will say, ‘Let us all have one year of one-off effort where we can all put our resources in in a coordinated way.’ Maybe it is only a single snapshot, but instead of different nations measuring piecemeal pieces year after year we could get some collaboration. Dedicated marine science from Australia backed up by other countries I think is where we can really answer some of our questions in a relatively short time.

**CHAIRMAN**—Do you think there is a danger that, by having people on a permanent basis at the bases of Casey, Davis and Mawson, governments start to feel a little bit self-satisfied? Do you think that having 200 or 300 people down there on given occasions is regarded as a major

contribution to scientific research? Yet, if you analyse those people, there is not often a surfeit of scientific expertise there.

**Dr Allison**—We have moved again, even on the stations, to automatic monitoring systems. When you look at the number of people who are put into the stations over the summer now, many more than there were in the program 20 or 30 years ago, you see that they are coming from many more diverse organisations than we would feel we could represent. Those people need to move into a station that has the facilities to put them into the field, to get them doing their programs as soon as they hit the ground. That is going to be increasingly so once you get an air transport system. I do not want to comment any further. I cannot comment on whether the level of infrastructure that goes into those stations in the winter is adequate or not, but it is essential. If you are going to put a lot of researchers in and focus this on having them in the summer, some preparation is required of facilities for them to use when they get there.

**CHAIRMAN**—Can I be a bit more explicit. Do you think there is a danger that we are a bit top heavy with some of the trades, to the detriment of some scientific personnel at times on the bases?

**Dr Allison**—That is something I cannot really comment on because I have not analysed it. It is not something that our committee has looked at.

**CHAIRMAN**—Dr Allison, you have been our last witness today and we very much appreciate the contribution that you have made today and the contribution that your organisation makes to science generally in Australia. On behalf of Senator Scullion and me and our secretariat, I would like to say thanks very much for coming along. It is very much appreciated.

**Dr Allison**—Thank you for the opportunity.

**Committee adjourned at 1.07 p.m.**