

HOUSE OF COMMONS  
ORAL EVIDENCE  
TAKEN BEFORE THE  
SCIENCE AND TECHNOLOGY COMMITTEE

**MARINE PROTECTED AREAS IN THE SOUTHERN OCEAN**

MONDAY 13 MAY 2013

JANE RUMBLE, DR PHIL TRATHAN and DR CHRIS DARBY

Evidence heard in Public

Questions 1 – 34

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## Oral Evidence

Taken before the Science and Technology Committee

on Monday 13 May 2013

Members present:

Andrew Miller (Chair)  
David Morris  
Stephen Mosley  
Graham Stringer  
Roger Williams

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**Examination of Witnesses**

*Witnesses:* **Jane Rumble**, Head of Polar Regions Unit, Foreign and Commonwealth Office, **Dr Phil Trathan**, Head of Conservation Biology, British Antarctic Survey, and **Dr Chris Darby**, Stock Assessment Co-ordinator, Centre for Environment, Fisheries and Aquaculture Science, gave evidence.

**Q1 Chair:** Can I formally welcome the witnesses and, for the record, invite them to introduce themselves?

**Jane Rumble:** I am Jane Rumble, head of the polar regions department in the Foreign and Commonwealth Office.

**Dr Darby:** I am Chris Darby from the Centre for Environment, Fisheries and Aquaculture Science, which is CEFAS. I co-ordinate the stock assessment and management advice team there.

**Dr Trathan:** I am Phil Trathan, head of conservation biology at the British Antarctic Survey, part of NERC.

**Q2 Chair:** First, can I focus on the South Orkneys? Why was the marine protected area near the South Orkneys set up, and what was hoped to be achieved?

**Jane Rumble:** The UK had been very keen to establish the concept of marine protected areas in the southern ocean for quite some time. In about 2006, we started putting in some general papers about marine protected areas—what they are and the sort of tools you might use to establish them—and we were building up the kind of profile that you might follow through in order to establish a marine protected area.

The South Orkneys was the area that we chose to use as a demonstration to take it forward. It was an area where there was clear scientific justification, on which Phil can comment, to make it a marine protected area. As part of the demonstration that we were making both to the Antarctic Treaty Consultative Meeting and CCAMLR—the Commission for the Conservation of Antarctic Marine Living Resources—we used the South Orkneys as the model to go through this process. In 2009, the scientific committee of CCAMLR agreed that this process had been thorough and was scientifically based and led, and so the commission decided that it would go ahead and adopt it.

**Dr Trathan:** The analysis that we undertook at the South Orkneys highlighted a number of different regions that we felt were worthy of protection, but we felt that for some of them it might be more difficult to follow through with an example in the beginning.

For example, there are oceanographic features that encircle the Antarctic continent, and some of the areas around the South Orkneys are important for biodiversity, and we did not think those would be easy to follow through. So we selected one area, but we have intentions of going back and producing other suggestions for marine protected areas to the CAMLR Commission.

The first area basically provides protection for the Weddell front, which is an important part of the Weddell-Scotia confluence. It is important for the transport of krill to South Georgia; it protects important benthic biodiversity. The biodiversity at the South Orkneys is thought to be more diverse than that of the Galapagos. I am sure you would agree that that is quite a high level of biodiversity worthy of protection. It also protects critical penguin foraging habitat after they have finished breeding. They go on to moult after their breeding is complete. That is an incredibly energy-dense period for them. They need to replace their feathers completely, so they have to have good foraging conditions to generate that energy level. It also provides representative protection for a number of types of habitat across the South Orkneys, so it was selected for a number of reasons.

**Q3 Chair:** Those are the reasons why it was selected. Has it achieved any of the goals yet?

**Dr Trathan:** Part of the objective in setting up a marine protected area is that nothing happens and the ecosystem continues as it was beforehand without any fishing potentially disturbing that. We are in the process of developing a monitoring programme.

I have been working with colleagues from Argentina and the WWF. We have been tracking penguins to see that they still use this habitat during the post-breeding period, and they do. We are working with Norwegian colleagues. They have a survey that covers the whole of the South Orkney shelf and just runs into the protected area, so that is a good monitoring effort. The British Antarctic Survey established an oceanographic mooring to the north of the protected area last year, and we are hoping that will give us good monitoring data as well.

**Q4 Chair:** As I understand it, there are restrictions on fishing or dumping within this area. How are they enforced? Who practically polices the system?

**Dr Trathan:** Ms Rumble might be able to correct me here. The obligations of CCAMLR fall upon the member countries. It is up to member Governments to permit activities that members undertake in the Antarctic, so any fishing or science activities would have to be regulated by the national Government of that particular member. It is for the individual member to fulfil its obligations to CCAMLR.

**Jane Rumble:** That is right. A flag state authorising a fishing vessel to undertake activity in the southern ocean would make clear what the convention and conservation measures say, of which this is one, so they would be aware that a marine protected area had been established. Every vessel that fishes in the southern ocean has to have an up-to-date vessel monitoring system, which is basically a satellite pinging its position. That goes to the CCAMLR secretariat in Hobart.

If anyone who was legally licensed to be there had breached the MPA, they would notice that there was a fishing vessel in the area. It could transit it, but if it was going very slowly, or behaving in a way that suggested it was fishing, you would be able to pick that up. The area of the southern ocean that this marine protected area is in also has a little bit—not a lot—of tourism traffic going from South Georgia to the South Orkneys down to the peninsula,

so they would also report, and do regularly report, on every fishing vessel that they see and what behaviour they are undertaking. So you are right; it is not the most heavily policed area in the world, but there are good indications that—

**Q5 Chair:** It is also an area where there are sensitive diplomatic issues to deal with. Is there good co-operation between the various nations involved in these projects?

**Jane Rumble:** Yes. Because this area is south of south of 60°, it is entirely within the Antarctic treaty area, which means that the political complexities that you mention are covered by the treaty and so territorial sovereignty issues are suspended. Therefore, south of south of 60° there is very good co-operation, and everybody is involved in reporting any fishing activity that they see in that region.

**Q6 Chair:** If one of our vessels encounters a foreign vessel fishing improperly, are there adequate mechanisms for bringing that person to book?

**Jane Rumble:** Yes; it depends on the circumstances. There is not a great deal of traffic down there. For example, if one of our science vessels had appropriately designated CCAMLR inspectors on board, or it was HMS Protector, they could mount a boarding and check out what was going on. They would have the right to do a CCAMLR inspection. If it was a reporting from the secretariat or another cruise ship that the vessel was simply in the area, it would be quite difficult, without them giving evidence, to show that that vessel was either fishing or undertaking dumping or discharge. That said, it would be reported back to the flag state, which would have an obligation to question the vessel, investigate and submit a report to CCAMLR. There would be a certain level of follow-up, and whether there was a full prosecution would depend on how much evidence there was

**Dr Trathan:** And then the state would have to have a compliance discussion with that vessel as to whether it had complied with the conservation measures.

**Q7 Graham Stringer:** Following up Andrew's question, I know it sounds silly, but, if a fishing vessel is flying the skull and crossbones and seriously wants to break the law and make a lot of money from fishing, what happens to it? What you are saying is that the mechanism seems to rely on states following the rules. If I am of no state and want to go and fish there, what are the consequences?

**Jane Rumble:** You are quite right. CCAMLR is an agreement binding only among its 25 members, so countries that are not members or parties to CCAMLR are not bound by any of its agreements. CCAMLR reaches out to any country that has a potential involvement through its nationals or flag state vessels, or has any other links to southern ocean fishing activity, to encourage that state to join the party.

But you are right that there is still some illegal fishing activity in the southern ocean, and these vessels tend to flag to states that have little oversight of their fishing registry. If they are stateless and you can catch them, you can mount a boarding because it is illegal to be stateless in the high seas. If, however, they are of another state that is not a party to CCAMLR, you get into difficult legal regimes about whether you can or cannot board without their authority, but then you get into diplomatic action. For example, Panama, which has had a very big flag state registry, has just acceded to CCAMLR. There is a lot of outreach to try to get countries on board, but there are still pockets of problems.

**Q8 Graham Stringer:** Can you quantify the amount of unlawful fishing going on?

**Jane Rumble:** CCAMLR used to make estimates every year. They had come down between 2008 and 2009 to 10, or maybe seven, eight, nine. Since then it has found it increasingly difficult to quantify, because, if vessels are not sighted, it is difficult to estimate

whether or not they are there. In 2012, it concluded that probably about seven hardcore vessels, if you like, were operating in the southern ocean. Therefore, their catch was based on evidence from elsewhere about how much such a vessel would be likely to catch, and that catch is taken off what CCAMLR agrees should be the legal quota.

**Q9 Graham Stringer:** Changing the subject completely, in the three proposed marine protected areas that CCAMLR considered last year, how strong was the scientific evidence in support of them?

**Dr Trathan:** There has been quite a lot of discussion at CCAMLR probably over the past three or four years. If you take the proposal for east Antarctica, there is very much less scientific data available for that area. It is relatively sparsely surveyed. Therefore, the objectives for that series of MPAs are to have representative protection of habitats that are characteristic of a particular community, whereas the Ross sea is slightly different.

There is a lot more knowledge about the science and ecology of the Ross sea, so there are slightly different objectives for that marine protected area. There is a special general protection area, a special research zone and a spawning zone. Both of the networks aim to have reference areas for scientific study, particularly for climate change, and that will be one of the big parts of understanding how the system will change. We need to set aside pristine areas for the future.

**Q10 Graham Stringer:** You have stated elsewhere that the scientific evidence from the commission's scientific committee was dismissed. What advice was given, and what advice was dismissed or you claim was dismissed?

**Dr Trathan:** I believe you are probably referring to the letter in *Nature*.

**Graham Stringer:** That is right.

**Dr Trathan:** Essentially, you have to recognise that the fishing nations when negotiating these want to have economic benefit from their fishing fleets. If you sign away an area of the ocean that potentially could be productive for 10, 20, 30 years, they are concerned about the economic benefit. It goes right to the heart of the text we were talking about earlier for the CAMLR Commission. It is balancing conservation against rational use—against fishing.

I am almost certain, although I would not want to put words in the mouths of any of the fishing nations, that their concerns are economic. They want to be certain that the conservation benefits match the economic losses that they feel they might sustain.

**Q11 Graham Stringer:** I understand that argument, but are you saying they have scientific arguments and they are disputing the facts as reported about the scientific basis? I understand the economic arguments against the conservation arguments, but is there any serious rejection of the science that the committee has brought forward?

**Dr Trathan:** One of the suggestions was that other science could be put on the table. Most of the work done for the east Antarctic was developed by a relatively limited number of nations, and similarly for the Ross sea. Initially, two proposals were developed by a small group of members. I think some of the fishing nations felt there was data that they could contribute to those analyses. They were not necessarily thinking that the science was not up to scratch but there were other bits of data that could be incorporated.

**Jane Rumble:** The scientific committee of CCAMLR has quite a broad scientific remit, so in addition to looking at the kind of pure science—what is there and what the ecosystem is—it also does a lot in terms of stock assessments. Because we were going through a smaller incremental stage, the South Orkneys MPA is not quite at the level of ambition of east Antarctica and the Ross sea, which involves quite a bit of potential

displacement of the fish stocks. Chris can explain the potential impact that that might have. So the science of where you are taking your catch versus the wider stock also comes into play.

**Q12 Chair:** Before you explain that, Dr Darby, it might be helpful if you say whether you think the methodology used is adequate for assessing the stocks.

**Dr Darby:** Yes. CCAMLR has a very conservative approach to opening up stocks and fishing them. Phil talked earlier about the large catches taken during the 1970s where species such as rock cod were fished to very low levels. Eastern bloc fleets moved around and fished out these areas, and it is taking a long time for those fish species to recover. Given that history, when CCAMLR was set up it was trying to prevent it occurring again. It has gone the opposite way and it is now erring on the side of science and gradually opening up areas.

Not all of the Antarctic peninsula area is open to fishing. There are closed areas at the moment for which there are no data but they will be opened up in the future. You get closed areas; you get some that are called exploratory fisheries, of which the eastern Antarctic is one, where nations have to register what experiments they are going to do and how much catch they are taking, and they have to do tagging studies and things like this, which is critical to the assessment. That build-up of information allows for the catch to be increased as more and more scientific knowledge comes about. Where there is a little information, CCAMLR is managing that quite well.

As for the other established fisheries—the Ross sea, the South Georgia fishery and places like that—the methods are appropriate. They have been reviewed, and the science behind them is accepted internationally as the way to do stock assessments, and also the quotas that are set are based on harvest control rules that have been evaluated, so the setting of the TACs from those assessments is well considered.

The problem with the MPAs is that you are looking at a finer scale. You are looking at smaller areas within the stock area. You are looking perhaps at a spawning or juvenile closure, and you have movement between those. On top of that, you have the sort of things that Phil talked about earlier. You have predators like penguins feeding on krill in some areas, or other species, so the whole mixture of trying to bring together all these various bits of science to define the MPA in one go is taking longer than expected.

The assessment science is there. Within the Ross sea, the movement of fish is known through tags and things like this, so we are getting a good picture of what is going on, but some nations are saying, “You have said this is a spawning or juvenile area, but I have caught adults there”, so it is the bringing together and tidying up of the loose ends that needs to be done to convince the fishing nations that they are not losing out by doing this.

One of the other problems we will have is that, once you close off an area, you displace the vessels somewhere else and you move them within the area. The North sea was one case where the spawning area was closed and the fishery moved on to juveniles. They killed more fish by doing that because it is the weight of fish, not the number, that is considered. Therefore, for a tonne of juveniles you kill more fish. You have to do that sort of balancing act in designing these things. They are not simple, as many people believe; they are quite complicated, because you have different life stages everywhere. Therefore, you have to think this through before you start to hardwire it. One of the concerns of the fishing nations is that this could be established for quite a time before it is opened up and looked at again or it is monitored.

**Q13 Graham Stringer:** It almost seems counter-intuitive to protect areas where there has been an ice shelf collapse. Why is it important to protect those areas?

**Dr Trathan:** I think those will be really interesting science reference areas for the future. At the moment, there is little exchange with the water column because it is closed over

the top. There is no exchange with the land, so there is no run-off other than ice. When the ice shelf goes, you move from an oligotrophic environment where there are very little nutrients, and potentially you have run-off from the land, larger amounts of nutrients and sunlight hitting the surface of the ocean, so you will have more productivity from the ocean. You will be able to look at the development of the benthos in what will be absolutely unique positions.

We cannot predict exactly where these are going to happen. We do not necessarily need to protect all areas after they have collapsed, as long as we have the opportunity to do some science first, and then they may well go back to areas that can be fished. Those early stages will be extremely exciting scientifically.

**Q14 David Morris:** In November 2012 why did the negotiations in the commission break down?

**Jane Rumble:** The 2012 discussions were on the east Antarctic and Ross sea marine protected areas. As Phil and Chris have just mentioned, some members felt that there was additional science that they had not had a chance to input into each of the proposals. In particular, the Ross sea one was running on a parallel track. There were two proposals, one from the United States and one from New Zealand, both of which had been submitted the year before. On a scientific basis both were considered to be reasonably sound, but they were looking at different objectives.

When it came to the political discussion, people like me, who do not understand all the science in great detail, were saying, "Where do we go with this? Which of these objectives has the highest profile?" They were tasked to come up with a single proposal, which they successfully did, but it was after the scientific committee had met. Although we as the UK and many other members were content that both of these proposals were scientifically sound so that when they came together there was no change in the science, other members felt that this should go back to the scientific committee for reassessment.

In the case of east Antarctica, the issues were similar for both and they were not quite ready to agree MPAs, so there was also some discussion about whether further science ought to be done on that area.

**Q15 David Morris:** Do you anticipate any progress being made at the meeting this summer? Do you think that the main objectives of what broke down previously will be met?

**Jane Rumble:** We are trying to be optimistic. A run of meetings is coming up. The week after next at the Antarctic Treaty Consultative Meeting in Brussels many of the key players will be in attendance. There will be several side meetings about marine protected areas to try to deal with some of these concerns. There has been quite a bit of bilateral lobbying with some of those countries who had most of the concerns, so by the time we get to Germany I would hope that we would be in a stronger position than we were in October. We would be optimistic that an agreement could be reached there, but we would hope that at least it would give the opportunity to square away all the problems and we would be in a position where CCAMLR could adopt both the marine protected areas quite soon.

**Q16 David Morris:** What action do you think the UK Government should be taking to protect these areas? Do you think there is more that the UK Government should be doing to protect these areas also?

**Jane Rumble:** The east Antarctic region proposal is supported by the EU. We have agreed that that support should be given. It is not an area in which the UK has a great deal of direct knowledge; it is not where we have our Antarctic programme, although we collaborate quite closely with the Australians and French. We have seen the science that they have done and peer-reviewed it, so we have been giving diplomatic support to that proposal.

We are a fishing nation and there is a British company operating two vessels in the Ross sea. We have been working very closely with them to make sure they are content with the proposals. The combined proposal now on the table was only agreed during the last CCAMLR meeting, and, even then, only three days before the end of the meeting; so there was limited time to look at that. We have been working with the industry on that proposal, and colleagues at the table have been spending a lot of time talking to US and New Zealand scientists to look at some of the questions and concerns that have been raised to make sure that we have the best possible answers so we are in a position to support it going forward. We have questions on the proposals ourselves, so we have been working through those two, but, generally speaking, we are supporting as much as we can.

**Dr Darby:** The main issue is the strengthening of their proposals. Where they are a bit woolly on the science, or where we think they could be clearer in their arguments to the fishing nations, it is helping them to strengthen their arguments.

**Dr Trathan:** But it is also an opportunity for those nations that feel they have data that is appropriate to bring it forward. I think there is an obligation on them to do that at this meeting.

**Q17 Chair:** Do you think the Government could do more to encourage other players to be, in a sense, more transparent?

**Dr Trathan:** We probably could. For any future UK-led proposal that we might develop, we need to lobby across CCAMLR members capitals before we embark on quite a lengthy science programme. If we are not going to get it agreed, there is no point in doing it. I would hope that we can engage with other members as a priority to get something that would be acceptable.

**Q18 Chair:** Ms Rumble, within this rather complicated, scientifically-led debate, how do you ensure that our science counsellors in the various key countries are aware of the nuances of what is happening inside this debate?

**Jane Rumble:** Because the east Antarctic and Ross sea are not our direct proposals, we are supporting them. We are in a slightly different position than we were when we were proposing the South Orkneys. At that point, we were much more proactive in doing our own lobbying through our own posts. In this context, we are currently in a more supportive role. We have not been doing direct diplomatic lobbying; it has been much more about Phil and Chris doing a lot of the scientist-to-scientist lobbying.

We have been having a lot of conversation with the US and New Zealand, particularly on the Ross sea, but at the moment their steer is that they would prefer to lead. They have already been to some of the capitals of the countries that expressed concern. They are going somewhere else at the end of this week. We will meet them next week at the Antarctic Treaty Consultative Meeting, and there will be broader meetings with different players in which we will be playing a more active supportive role. It is slightly different from our more proactive approach on the South Orkneys when we were lobbying for our own proposal.

**Dr Trathan:** That is why I say that, if we were to lead another proposal for areas other than the South Orkneys, we would want to have a political mission.

**Q19 Stephen Mosley:** “Hugh’s Fish Fight” has raised concerns about the sustainability of the southern ocean krill fisheries. In your opinions, are they being managed sustainably?

**Dr Trathan:** I suggested earlier that the amount taken at the moment is very small. Currently, it is 200,000 tonnes out of a stock for the south-west Atlantic of 60 million tonnes.

The way that the catch is managed is very complex. I will have a go at trying to explain it; just glaze over if I lose you.

There is a stock assessment of 60 million tonnes. The modelling suggests that we could take 9% of that, which is about 5.61 million tonnes. Before that can be taken, CCAMLR has agreed that it has to have a management process in place and active that will stop any impacts upon penguins, seals or any other krill-dependent predators. Therefore, it has what it terms a trigger level, which is 620,000 tonnes, so it is about 10% of the TAC. That has been sub-divided spatially. There are four areas according to the FAO statistical sub-areas. The 620,000 tonnes are split spatially. At South Georgia, for example, I think 289,000 tonnes could be taken, and there are various figures for the other statistical sub-areas in the south-west Atlantic. At this level it is a very low catch. If you compare it with European levels of harvest control, it is vanishingly small as a percentage. I think at that level it is sustainable.

The question is how you manage it so that it has no impact on breeding land-based predators in particular. CCAMLR has started a process of trying to develop what it terms a feedback management approach, which takes into account environmental indices, indices from monitoring penguin, seal and albatross colonies, and tries to use them as a way of seeing whether impacts are occurring on the dependent species. If CCAMLR can crack that—which I think is very difficult, but if it can—it will be an exemplar for a sustainably managed system.

**Jane Rumble:** In the marine protected area that the South Georgia Government declared in 2012, there are additional protective enhancements. There is no krill catching within 12 miles of shore, and there is also krill catching only in the winter months to avoid competition with predators. While Phil is right that within CCAMLR it is pretty precautionary, there are still quite a few unknowns. In South Georgia, where we can exercise domestic controls, we have gone even further to be extra precautionary pending all of this work to provide further advice.

**Q20 Stephen Mosley:** Can consumers in the UK, who might buy krill oil as a dietary supplement, be reassured that what they are buying is from a sustainable resource?

**Dr Trathan:** Some of the krill oil produced is Marine Stewardship Council-certified. Earlier I showed you a picture of the Saga Sea from Aker BioMarine. Their core fishery is MSC-certified. That certification was challenged by some of the NGOs, but it was upheld, and I believe it does have the MSC certification.

**Q21 Stephen Mosley:** You say “some”, which implies that some isn’t.

**Dr Trathan:** I do not know who else produces krill oil, so I was being precautionary.

**Dr Darby:** The certification is applied for by the fishery itself, or the vessel, so it may be that the other ones had not actually applied for it. Maybe they could achieve it, but it is down to certain things, like any bycatch they might have, if there is one, how they avoid sea bird mortality, the incidental catching of mammals and things like that. The industry has to invite certification for itself, and, as Phil said, some of them may not have done that. It does not imply there is something wrong with them, but that they may not have applied for it.

**Q22 Chair:** It is the sort of thing that a consumer is entitled to know, isn’t it?

**Dr Darby:** Absolutely, and that is why things like kitemarks are on the products. The consumer can look for those and find the ones that are certified and buy them.

**Q23 Stephen Mosley:** Are consumers aware that that kitemark exists?

**Dr Darby:** The MSC has been around for a long time, and there are other organisations that do similar sorts of things. As to the fisheries in the Antarctic, certainly

around South Georgia the toothfish and icefish fisheries are certified. In the Ross sea, which we have been talking about, the fisheries are certified, as is the icefish fishery around Heard Island. You will find this in European fisheries as well. Consumers can look for the logo and also at the websites where they can find out this information.

**Q24 Stephen Mosley:** But there is no record of the percentage that are certified and that are not certified.

*Dr Darby:* The MSC might keep that sort of information, but I am not aware of it. It is down to the fishery. It is the fleet fishing on a particular stock that is certified and not the stock itself.

**Q25 Stephen Mosley:** So it depends very much on whom they source their supplies from, doesn't it?

*Dr Darby:* Yes; and there has to be complete traceability. When they catch the fish, it has to be traceable through the marketing process and through to the consumer such that the consumer is aware that it has come from a verifiable source. That is an important part of the certification process.

**Q26 Stephen Mosley:** Has there been any effort to educate the consumer about the certification?

*Dr Darby:* In sea fish, around the UK, supermarkets are aware of this as well, so it is something that is being used.

**Q27 Stephen Mosley:** You mentioned ice mackerel. Are there any other fisheries at risk of over-exploitation at the moment?

*Dr Darby:* We talked about the historic over-exploitation of rock cod. That was a bottom trawl fishery. As Phil has said, apart from one area within CCAMLR, bottom trawling is now banned so that that fishery could not take off again. That leaves three main species that are now commercially fished.

We have talked about krill. The second one is icefish. That is fished in the southern Indian ocean and around South Georgia. Again, that has an assessment process. Because we have not got all the information we require from a stock assessment, a survey is done and the TAC is set on the results of it. It is a population estimate from a trawl survey, and then a fraction of that population, which is generally around 5% of the actual level, is allocated to the TAC, and the rest escapes effectively and is left in the water. That also takes place around the southern Indian ocean. As for the icefish there, there is a similar method for assessing stocks and they are considered to be sustainably fished.

You then move into the toothfish fisheries, which we touched on briefly. For South Georgia, the Ross sea and the Heard Islands, you have full assessments with all the information. Those are used to set TACs according to a CCAMLR harvest control. It is very similar to icefish. It projects forward and leaves a certain amount of population in the water over succeeding years, such that the fishery does not have the impact of reducing the population. Again, those have been peer-reviewed and are accepted as ways of producing the TAC from the assessments as a sustainable way of fishing it.

**Q28 Chair:** On the point about dietary supplements, environmentally what is the soundest way for somebody to take in such a dietary supplement—by eating mackerel or krill—or is there a better, more sustainable way than using krill? What would you do for your health?

**Dr Trathan:** If you will excuse the joke, I would refer you to my mother-in-law, who has a background in nutrition.

**Dr Darby:** Apparently, krill oil does not have the side-effects of cod liver oil. That is why it is liked.

**Jane Rumble:** The main message, going back to the general advice, is to find a supplement that has Marine Stewardship Council-certification as coming from a sustainable source.

**Q29 Chair:** Whatever it is.

**Jane Rumble:** Yes.

**Q30 Chair:** We should really emphasise that.

**Dr Trathan:** Yes.

**Q31 Roger Williams:** We have heard about the run-off of rainfall or snow from land where the ice shelf has disappeared, bringing nutrients into the southern ocean. Are there any other effects of climate change?

**Dr Trathan:** There are numerous impacts we should probably watch out for. One of the things I should have added to my response to Graham Stringer is that the Antarctic treaty meeting of experts recommended that ice shelves should be protected for exactly the reasons we advocated in our proposal to CCAMLR, so we were following up a scientific initiative taken at the meeting of experts in 2010.

In answer to your question, one of the key areas we need to think very carefully about is ocean acidification. We should expect to see the impacts of OA in the southern ocean, possibly before other areas of the world's oceans. The impacts are likely to affect the larval stages of a number of organisms. We have seen from research that the Australian Antarctic Division has already carried out that ocean acidification levels could impact on krill development at embryonic stage. Potentially, that could have a very far-reaching impact. Ocean acidification and temperatures are the two that are going to have very considerable impacts on the physiology and energetic demands of a lot of species. Species might well be able to buffer themselves if they can have a sufficient nutritional supply; it might just be more energetically demanding to do a particular behavioural activity. I think that is an area for a lot of research in the future.

**Jane Rumble:** In the broader context of Antarctica, climate change potentially opens this up and makes it more accessible, so, coupled with all of the environmental and scientific concerns, there will also be the concern of greater accessibility, more pristine areas being suddenly ice-free and how they will develop, what potential impacts human activity might have on those, the introduction of non-native species and so on. There is a whole raft of challenges, which we are already facing in the Antarctic peninsula. The British Antarctic Territory is one of the fastest-warming areas on the planet, so a lot of this is at the front and centre of our minds.

**Dr Darby:** We have examples from the north-east Arctic where the cod and haddock have increased in abundance and productivity. It is believed that that is because of the release of nutrients and things like that, so it is not all a negative situation. We have to watch out for both cases. When you are designing the harvest control rules that you use for setting TACs, these sorts of things need to be built into them. We need to be aware when doing our forecast of TACs how this might be taken into consideration. Generally, you take a worst case scenario and build that into it to make sure that, if that sort of thing does happen, the harvest or exploitation rate is set at such a level that you can avoid even those bad scenarios in the future because you are fishing at such a low level.

**Q32 Roger Williams:** We have heard that the krill catch is sustainable because it is relatively small compared with the size of the population. Will climate change affect sustainability? Will climate change have an effect on the population? Therefore, will fishing that is sustainable at the moment continue to be sustainable in the future?

**Dr Trathan:** It will change the balance point of a lot of those situations. The UK, together with Norway, was instrumental in highlighting the impacts of climate change to CCAMLR in 2008. We followed up with a couple of papers in 2009. I was subsequently invited to the first meeting of the committee for environmental protection, part of the Antarctic Treaty Consultative Meeting, and the scientific committee of CCAMLR, to talk about climate change impacts.

The legal instruments that manage the southern ocean are cognisant of the impacts of climate change. Changing management models is a slow process, but hopefully part of the krill feedback management process that I have already talked about should address that. It is not just an issue for the southern ocean or poles; it is an issue for temperate and tropical areas as well, so climate change will impact fisheries.

**Jane Rumble:** It is one of the key priorities for the UK delegation to CCAMLR. The UK is one of the few countries that have independent scientific Antarctic advisers on the delegation, so through the British Antarctic Survey we were doing considerable climate change research. That gets fed into the way we approach CCAMLR. Not every delegation does that. Working with Norway, we wanted to get climate change on the agenda precisely to address the questions you are asking, because we do not really have the science at this stage definitively to answer them.

**Dr Trathan:** One of the strengths of the British Antarctic Survey as a multi-disciplinary organisation is that it can feed in a lot of disparate science that has relevance to managing the southern ocean.

**Q33 Roger Williams:** Dr Trathan, you talked previously about the role of the marine protected areas in improving our understanding of the effect that climate change may have. What are the gaps in our understanding at the moment, and how could they be closed with the work done in the marine protected areas?

**Dr Trathan:** If we take the species I am most familiar with—I have done most of my research on penguins—in the Antarctic peninsula region I have shown how their populations are changing. We are uncertain about how krill fishing close to their colonies might impact upon them, how the historical harvesting of whales and seals might impact them and how climate change might impact them. We need to set aside reference areas where we can begin to disentangle some of those different confounding issues. Having reference areas where they are not impacted by fishing upstream of them is going to be very important. If we want to understand how species might cope in future, we need such reference areas that can form part of an MPA network.

**Dr Darby:** Climate change is obviously a long process that we have to disentangle from our data. One of the problems in the Antarctic is not the paucity but scarcity and uncertainty of data. We have a little bit from here and a little bit from there, and it can be uncertain, because when you go back and measure the same thing twice it can give you a variable result. Therefore, taking fishing out of the equation allows us statistically to remove something and look at the processes without that noise from fishing.

Hopefully, we can get an answer sooner by taking that out rather than having it in there as a factor that you then have to try to model out at the same stage. Taking out the fishing uncertainty allows you to get to the natural variability, and then we can give some advice based on that.

**Q34 Stephen Mosley:** Last year we ran a short inquiry into the proposed merger between the British Antarctic Survey and the National Oceanography Centre. One of the concerns in our report was that we did not think NERC had fully considered the geopolitical aspects of the British Antarctic Survey's work and its role with the Foreign Office. My question to the Foreign Office rep is: what engagement would you expect with NERC when it comes to the management and geopolitical aspects of Britain's role in the southern Atlantic and the Antarctic?

**Jane Rumble:** We had quite considerable dialogue with NERC over the last year or so. We were very clear about ensuring that the British footprint in the region was not affected. When they went ahead with consultation about the proposed merger, that was solely about how the two institutions would be managed within the UK.

We had agreement with NERC that we would not lose the British Antarctic Survey brand for all the activities in South Georgia and British Antarctic Territory and that they would continue to operate broadly as they are: the footprint would not be impacted and we would still have a single point of contact for all other Antarctic expertise. We gave them criteria and a list of things that we thought were germane to the presence. They were consulting on the management of these two organisations within the UK that would not have a great effect on the presence. They concluded that the merger would not go ahead, but we were very clear that we should not put in jeopardy the dual mission of the British Antarctic Survey.

**Stephen Mosley:** That probably sums it up very nicely, doesn't it?

**Chair:** That is a very clear position, which chimes very much with the thinking of this Committee. We did not want to see that dual role put in jeopardy. Ms Rumble and gentlemen, thank you for an informative session.