

WORKSHOP MINUTES
Where to Next? Ideas for the New SCAR Biology Programs
Wednesday 29 July 2009
In Conjunction with SCAR X Biology Symposium, Sapporo, Japan

1. Background

- EBA will finish in 2013 if not earlier – so it is time to start contemplating a new program.
- 1 or 2 new programs could be put forward for biological sciences to SCAR.
- A new program could potentially start before EBA finishes.
- So we want to start talking about ideas for the future.

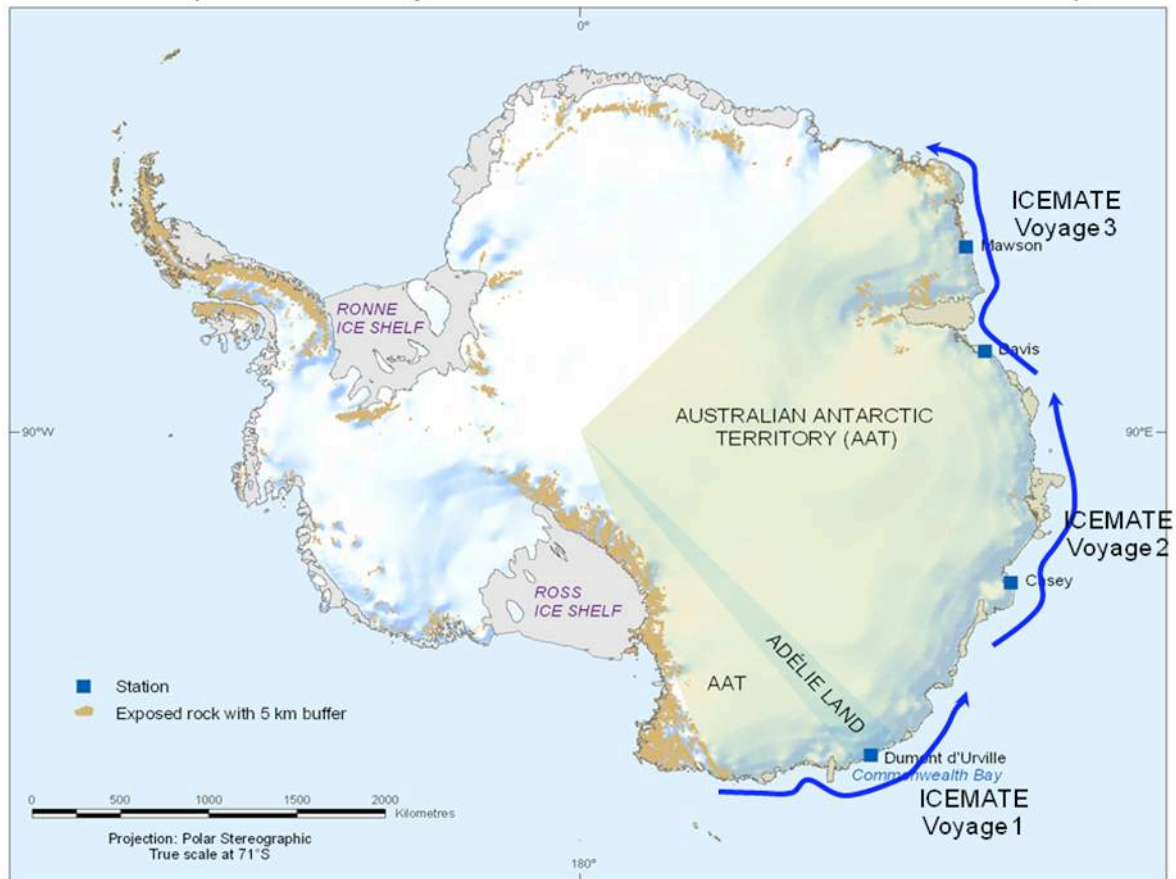
2. General thoughts presented by Martin Riddle

- Antarctic research is: Expensive, logistics intensive and remote.
- So our work needs to be relevant, well planned, well implemented and the science needs to be excellent.
- What makes life sciences relevant?
 - Linked to climate change (Getting your work into IPCC assessments in a timely manner, SOOS (Southern Ocean Observing Systems), BIO SOOS? Terrestrial SOOS?)
 - Linked to Regional Management (CCAMLR – stock assessments, dependent and associated species, bioregionalisation)
 - Linked to Local Management (CEP – human impacts research, applied environmental research, environmental domains analysis)
- So we should develop a framework to focus and harness scientific expertise – and we should not try and accommodate everything – so focus a broad range of relevant expertise.
- What should we do?
 - Biodiversity research leading towards ecoregionalisations
 - Developing bio-observing tools to feed into climate change agenda
 - Observing – testing the predictions
- Biodiversity priorities:
 - Filling in the gaps
 - Environmental patchiness in time and space (exposure times, disturbance events, landscape modelling)
 - Connectivity-‘Genes to Geosciences’
- There are huge gaps in the coverage of marine work along the East Antarctic coast line.
- Most of the work in the pelagic area and the benthic work is very sparse.
- Huge gaps in CTD profiles from marine mammals.
- But we are not starting in a vacuum:
 - Environmental domains analysis developed for the terrestrial environment does provide a framework for biological work;
 - Antarctic bioregionalisation work – still has relatively little data for the areas – but provides a framework to set up and test hypotheses.
- Initial concept of CEAL Census of East Antarctic Life – build on CAML – thoughts on where Australia would go next.
 - Use Aurora Australis for 30 days over 3 year sampling in years 1,4 and 7 for coastal marine biodiversity surveys – use ship as floating station to deploy terrestrial

biologists by helicopter along the coast and small boats to get into shallow areas – then the ship would work on continental shelf. Move on average 50 km a day – so cover 1500 km of coastline – this would be superficial but give a good geographic spread.

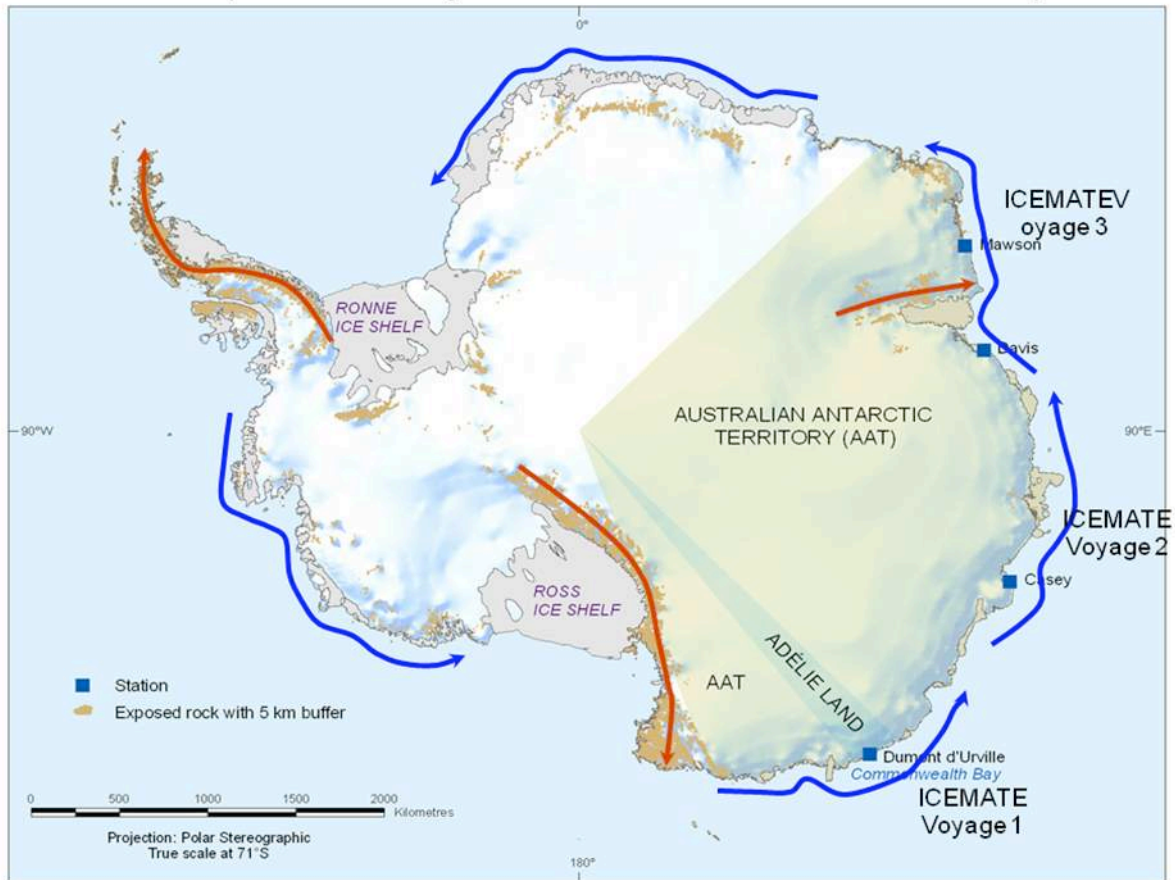
- Focused more on environmental factors that control the distribution, abundance and dispersion – patchiness and variability – particularly strong in Antarctica.
- Gradient from fragmented to connected. Most fragmented to more connected ecosystems from lakes – ice free land – near slope and shelf benthos - shelf and abyss benthos - pelagic communities in the water column.
- As the concepts developed the emphasis has changed to focus more on the spatial and temporal processes that lead to variability, impacts and change. ICEMATE – Impacts and Change in East Antarctic Marine and Terrestrial Ecosystems (see figure below)

ICEMATE – Impacts and Change in East-Antarctic Marine and Terrestrial Ecosystems



- But then can we drop East Antarctica in the title and establish a framework around the Antarctic? (see figure below)

ICEMATE – Impacts and Change in Antarctic Marine and Terrestrial Ecosystems



- Latitudinal Gradient Project) (LGP; www.lgp.aq) teaches us a lot about patchiness and variability – and there is much more to learn.
- ICEMATE objectives:
 - Scientific
 - Establish a biodiversity baseline for (East) Antarctica terrestrial and near-shore marine environments;
 - Identify processes determining natural spatial and temporal variability so that trends associated with anthropogenic climate change can be recognised;
 - Determine key relationships between genetic diversity, populations, communities and landscape.
 - Policy
 - Support management measures to protect the living resources of Antarctica;
 - Contribute to the development of a representative area protection system for Antarctica;
 - Support the work of the CEP.
- Need to look at the characteristics of a fragmented environment and how that might provide a framework for a new programme.

- Habitat fragmentation occurs from small to large scale and is seen in marine and terrestrial environments eg lakes, isolated ice free areas and the shallow near-shore marine benthic areas.
- ICEMATE proposal has 30 investigators from 5 different countries – with a range of expertise. Passed science review but needs logistics support.

3. South American Context - Lucia Campos

- In South America – most countries are very interested in the relationship between South America and Antarctica and the influence on each other – environmental changes and effect of life on the continent.
- South America got 5 years funding – for work along similar lines that Martin described. Past 6 years using nested designs in Admiralty Bay – mainly because of ASMA – looking at biodiversity in world of continuous change.
- So could compare with the ICEMATE side of the work – Peninsula work to compare with East Antarctic work – lots of things to compare between east and west Antarctica. If using similar protocols or sampling designs then data would be comparable – so happy to cooperate in that sense.
- Thinking in terms of terrestrial, marine and atmosphere – have 28 years of meteorological information from King George Island. Benthic data coming together too. Thinking of life in a changing environment not just in the ocean. So would be interesting to put everything in this framework.
- Brazil has a new vessel which has multibeam and equipped with oceanographic equipment to use in 10/11. Also potential for science exchange for fellowships and traveling and receiving visitors in Brazil to establish a stronger international cooperation.
- So if we are in a framework of life in a changing environment – Brazil would be very interested in this idea.

4. Discussion

- Martin Riddle: ICEMATE is a work in progress – it has gone through peer review and is highly rated, so it has scientific endorsement, but the details could be modified based on what can be build on the legacy of EBA, CAML, IPY etc generally.
- One thing that particularly stands out during this conference is the emerging amount of information from the marine mammal community and the identification of hot spots. How could this fit into the future program design?
- Purpose of this discussion is to start stimulating discussion and develop a community that positions the life sciences for the next round of SCAR programs. EBA is going to 2013 – so we need to be well positioned to develop a significant framework to follow on.
- Julian Gutt: Speaking as the co-chair of the SCAR cross actions group of predictions of ecological environment which is about the cooperation between physics and biology i.e. ecology. Happy to see this approach – data modeling and ground truthing the models. Wants to emphasise two important aspects of the presentations:
- Very broad geographical coverage – one problem is that we don't know how much this refers to inshore ecosystems. Traditionally those working off shore with phytoplankton

don't feel at home under SCAR while there are other groups who work successfully in Antarctica who are not here and we should leave the door open for these people. A large geographical coverage is very important.

- Target sites – monitoring or long-term observations – we do need to use these terms if we are to observe the changes – we can't talk about seeing ecological changes as a result of climate change without long-term observations. So we need some representative sites to keep monitoring around the continent. We need to observe and predict the response of the ecosystem to climate change.
- Don Cowan: When we talk about gaps in the system, this is not only in the marine system but also in the terrestrial environment. We need to ask where do we see gaps in our knowledge base in terrestrial biology? The larger the species size, the more we know about it – and as you go down in size we know less about diversity, density and function. We know lots about microbial diversity in 1 or 2 selected areas in the Peninsula and the Dry Valleys, but other areas we know nothing about as these are rarely or never visited, or they were visited before modern techniques were available to us. So there are opportunities to fill in the gaps in the terrestrial environment.
- Martin Riddle: Filling in the gaps in both the marine and terrestrial environments is certainly part of the thinking. Would not like to see a split between terrestrial and marine work, but to have common themes with both terrestrial and marine contributions.
- Steve Pointing? Ice free systems have been shown to have self organized patchiness in their ecosystems – Antarctic systems are perfect to try to model this. Must be included.
- Martin Riddle: Spatial and temporal patchiness and period of exposure should be taken into account.
- Francoise Hennion: People are quite happy with EBA as it is a large framework that most subjects fit in to, so addressing the proposal about not trying to do it all – the wide framework would be better as good science can be developed only with conceptual questions.
- The key topic for biological science programs in Antarctica - is that they are somehow relevant to global change. Want to ensure that the Sub Antarctic Islands are also included as they are also relevant even though they are not part of the continent. They have been called the 'Sentinels to climate change' – with processes sometimes closer to those seen in temperate biota.
- Should also include more of the phenotype work in the framework – not everything can be described by genetics and genomics, physiology for instance is also very important to understand adaptation.
- Martin Riddle: We really need to consider if we are trying to accommodate everyone's ideas or trying to sharpen our focus and direct our expertise in specific areas. For

example, to get resources through the AAD – you have to show that some of the hard decisions have been made about focus. We do need to demonstrate this focus.

- Ken Halanych: One way to demonstrate focus is to go wider. Climate change is about how that change affects humans and biological systems. So we actually need to go wider and include the geology and the physical sciences. We need a more interdisciplinary program looking forward – that's how you get resources. Lots of physical sciences are a lot further forward than biologists as they are able to observe systems more easily. Approaching this from genetic connectivity – this work will give our science more value. Bring geologists in to answer biology questions.
- Martin Riddle: Definitely want to include physical sciences and bring geological expertise into a program that primarily focuses on the biology.
- Dan Costa: There is a big advantage of being focused spatially in terms of bringing a taxonomic framework to the same suit of locations. For example, studying sea-land interactions in the same site with coordinated efforts in terms of how you pick these locations. Need to work on all things in the same place. Need to integrate studies in one place at 1 time. Think about what you would learn about a community if you learn about it in one site. These interactions are what develop hot spots in ecology. There are tremendously rich research questions in how you will fit this all together. Will only learn this when you look at how this all works together in a consistent site and time frame.
- Elie Poulin: Need to emphasise the point of biological invasion – this will be the main impact of change in Antarctic systems – marine or terrestrial. Marine will be more complicated than the terrestrial environment. Because of long-term monitoring of spatial distribution, we know there is a high variability in time and space – so will take a long time to detect trends on this time scale. So looking at change in ecosystems is a key word.
- Michael Stoddart: If we are prepared to be one sixth of SCAR then we should continue this discussion. But if we wish to take on more of the SCAR resources – then we need to come forward with more than one programme. If we need money for science coordination – then we need to do this. But if we do want money for science coordination – then we should be creative about how develop the program to SCAR going into the future. Our relevance in the ATCM will be higher if there is more than one biological programme. So the challenge is to package it in a way to politically maximize the amount of funds that come our way.
- Martin Riddle: The thinking has gone down the biodiversity track – but have been imagining 2 or 3 themes – with the observing theme being discrete or connected that could run in parallel. In the physical sciences – there is lots of emphasis on understanding the processes – so we could have one strand on this too.
- Julian Gutt: We need a question driven discussion. We need two clear, relatively independent questions then this is the best argument to get 2 programmes.

- Lucia Campos: This is about the method of strategy – we have a strategy with questions, different projects can be set up but in some way they would converge or be integrated in the end. So questions would be separate but there would be integration in the end.
- Dana Bergstrom: Two themes are coming out of this discussion.
 - Focus on hot spots where questions are on connectivity and hot spots;
 - Biodiversity and filling in the gaps.
- Dominic Hodgson: SCAR already has a germinating model on how to do this. We have discipline based work but we also now have cross disciplinary workshops which are relatively underdeveloped. There is the potential for cross linkage workshops to generate questions that are not discipline exclusive. So we should ask what are the key questions that we can ask that combine oceanographers and biologists? So we need research in two phases – more inclusive data gathering to detect and monitor change, and then cross-linkages with specific questions that need to be addressed by combining the community – e.g. ocean acidification, which no individual discipline can tackle alone.
- Ad Huiskes: We don't really have till 2013 to get a new programme going. Other disciplines in SCAR have already started to re-define their research. So if you want 2 new programmes – you need to put up a plan pretty early e.g. at the next SCAR Open Science Conference in 2012.
- Ken Halanych: There has been lots of discussion about ecological topics. Other big areas of biology are physiological adaptation and using genetic tools.

5. What Next?

- Minutes of this meeting will be circulated round the EBA community with a request for further ideas to be submitted.
- Will then need an indication from people who will put the work into this kind of a proposal.

Postscript

If you have any comments or suggestions you would like to add to those discussed at the workshop, please send them to:

Shulamit Gordon at s.gordon@antarcticanz.govt.nz

All additions will be compiled for further discussion.