



# LGP WORKSHOP MEETING MINUTES

WEDNESDAY 7 JULY 2010

ANNUAL ANTARCTIC CONFERENCE, UNIVERSITY OF CANTERBURY – 3.30-5.30PM

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## 1. LGP PRESENTATIONS

### Introduction by Megan Balks

- Overarching Hypothesis
- 8 key questions
- Steering Committee
- Antarctica NZ support – LGP Project Manager and Antarctic logistics
- International collaboration
- Studies 4 sites over the last 8 years – Cape Hallett, Terra Nova Bay, Granite Harbour, Darwin Glacier Region.
- About to visit the 5<sup>th</sup> and final site at the Beardmore Glacier, through US programme support.
- Purpose of this workshop is to talk about where to from here for the LGP.

### Vonda Cummings

- Representing the LGP marine groups – Ken Ryan (sea ice algae), Mary Sewell (meroplankton), Vonda (coastal benthic ecosystems), Phil Lyver (Adelie penguins) and Craig Marshall (phylogenetic histories of marine and terrestrial fauna).
- All undertaking distinct work, but interrelated – building a picture on the ecosystem as a whole.
- See that latitude is not the greatest driver – so generally no links with latitude (except for meroplankton).
- Productivity is important – so will try and see how this drives changes and distribution patterns – will explore existing data sets to help this.
- Planning a synthesis paper with the terrestrial group. Suggest a part I and part II to be submitted to the same journal – sometime in Mid 2012.

### Jonathan Banks

- Looking mainly at LGP Key Question 2 - What is the role of persistent, large-scale ice structures in defining community composition?
- Work on springtails.
- See distinct breaks in distribution associated with big ice structures e.g. the Drygalski Ice Tongue – these are barriers to rafting.
- Also looking at mites – these are better dispersers than springtails though there are still large areas with no mites.
- Ice structures are likely to be significant barriers to springtail and mite dispersal
- Ongoing work will resolve distributions and barriers for other invertebrates along the Victoria Land/Trans Antarctic gradient
- Planned visit to Beardmore region in Jan 2011

### Kurt Joy

- Looked at the geomorphology of the Darwin Glacier region – glaciology, geomorphology and meteorology.
- Particularly the age of the landscape around the Darwin.
- How big were the landscapes at the Last Glacier Maximum?
- Using cosmogenic dating to show that some moraines are pre-existing landscapes.

## Fiona Shanhun

- Working in the Taylor Valley mostly.
- Soil CO<sub>2</sub> depth-profiles
- Carbonate precipitation in these soils
- Assess the relative contributions of biotic and abiotic processes to soil CO<sub>2</sub> fluxes in Antarctic soils
- Determine whether or not there is net carbon storage in ice-free areas of Antarctica through formation of pedogenic carbonate
- Undertaking lab experiments re carbon storage in soils.

## Megan Balks

- Working on soil distribution, climate, and bacterial diversity
- Soils on Seabee Hook have been impacted by penguins for >1000yrs,
- Soils in active penguin colonies have high microbial biomass but low microbial diversity, dominated by *Firmicutes* (bacteria). At Cape Bird one ribotype comprised 99% of clone library. Tolerant of extreme conditions (high osmotic potential due to high NH<sub>4</sub><sup>+</sup>, high salt).
- First report of microbes from Antarctic groundwater. Data indicate that the microbes can be active under *in situ* conditions.
- The composition of microbial communities varied substantially between sites and was discriminated, by multivariate statistics, on the basis of soil properties.
- Factors such as surface age, micro-climate, and parent material have a greater influence on soil properties than latitude.
- Active layer depth decreases with increasing latitude, and has marked between-season variability.
- Soils in the Lake Wellman area have low microbial abundance and diversity compared to soils from further north. *Adhaeribacter* and *Arthrobacter* dominate soils from the Darwin region (Aislabie in prep.).
- Plans for 2010 and beyond
  - New Programme: Environmental domains classification for the Ross Sea region
  - 2010-11
  - Soil Characterisation in Beardmore Glacier Region
  - Installation of two new climate stations to complement existing network and improve understanding of upland areas.
  - 
  - Collect soils from Wright Valley to improve our understanding of relationship between soil microbial diversity and soil taxa.

## Jenny Webster-Brown

- Looking at geochemistry of ponds at different latitudes
- See very different levels of biological production and cyanobacterial mat development in ponds at different latitudes.
- Looking at LGP Key Question 4 – how does climate affect the composition of free water.
- If there is difference seen, how do we know it's to do with latitude? It probably isn't – more due to proximity to coast and local conditions.
- Local conditions dominate over latitudinal effects (T change)
- Local/regional variability in inland aquatic systems is large
- Controlling variables include:
  - *Proximity to open seawater (regional)*
  - *Proximity to exposed soil and soil salts (local)*
  - *Residence time and history (local)*
- Cryoconites hold promise as a systems
- Independent of some of these effects
- Huge diversity of meltwater features at a particular site – what are the controlling variables?
- Held a workshop about the Terrestrial LGP publication:

- Would do synthesis paper including Microbial ecology, invertebrate ecology, landscape age/dating, geochemistry
- Common theme:
  - Landscape history more important than latitude
  - Scale an important factor (local vs regional conditions ... even mineralogy effects)
  - Include Beardmore results. 2012 preparation. Submission with marine paper so have a part 1 and 2.
- Northern site still desirable for completion of LGP

## 2. MARTIN RIDDLE PRESENTATION – AUSTRALIAN ANTARCTIC DIVISION

- Martin is the Program Leader Impacts of Human Activities in Antarctica and Adaptations to Environmental Change
- ICEMATE Objectives - Impacts and Change in Antarctic Marine and Terrestrial Ecosystems:
  - 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
    - Assist in the effective administration of the Australian Antarctic Territory
- NZ initiatives have been key to marine and aquatic work at the AAD and in the broader international community.
- The structuring of the LGP is a fine example of this.
- Also the NZ TABS work looking at physical and biological parameters – especially if this is up-scaled.
- The Environmental Domains Analysis (EDA) provides a framework for the wider biological community.
- Science to Impact.
- Australian work is impact driven – what do we want to achieve from the research – then build towards that and drive policy.
- Key Australian Policy Drivers:
  - Territories management
    - Australian Antarctic Territory
    - Territories of Heard Island and McDonald Islands
  - Antarctic Treaty System
    - Antarctic Treaty Consultative Forums
    - Committee for Environmental Protection
  - Climate change
    - Australian policy positions at United Nations Framework Convention on Climate Change (UNFCCC)
    - Intergovernmental Panel on Climate Change (IPCC)
  - National Research Priorities
    - An Environmentally Sustainable Australia
    - Safeguarding Australia
  - Super Science Initiative
    - Marine and Climate science
- Key Outcomes Required from Future Research
  - A spatial management system for Antarctica which takes into account the special characteristics of Antarctic biodiversity and environment

- A coordinated observing system for identifying, tracking and predicting change in Antarctic terrestrial and limnetic ecosystems
- An integrated observing system for identifying, tracking and predicting change in Southern Ocean ecosystems
- Procedures for preventing, mitigating and remediating the impacts of human activity in the Antarctic region
- Spatial management and ecosystem vulnerability
  - How should the non-living values of Antarctica be included in spatial planning and area protection?
  - How do spatial patterns and landscape influence vulnerability of the biodiversity of Antarctica and how must they be accommodated in spatial planning?
- Change in terrestrial and freshwater realms
  - How has terrestrial and lake biodiversity changed in the past?
  - Are changes occurring in Antarctic and sub-Antarctic terrestrial and lake ecosystems that are attributable to global change?
  - What are the key drivers of climate change impacts on terrestrial and lake ecosystems
- Change in the marine realm
  - Are changes occurring in the structure, function or productivity of Southern Ocean biodiversity?
  - What are the key drivers of climate change impacts on Southern Ocean ecosystems?
- Antarctica is a complex and highly fragmented habitat – what does this mean for protection and management?
- What are the big questions of our generations?
- There is a strong foundation for a second layer of area protection now – important in the terrestrial and coastal marine component of the science strategy.
- Our work must fit into the EDA – how is the living community driven by biological interactions?
- Infrastructure and support requirements
  - Icebreaker capable of accessing the full extent of the maritime zone off the Australian Antarctic Territory (AAT)
  - Multi-beam echo-sounder
  - Access to remote, seasonally ice-free areas throughout the AAT
  - Reliable access to station facilities
  - Access to remote sensed data
- ICEMATE – planned to use the ship as a base – to do terrestrial and coastal work. So no large camps.
- Science needs to drive the logistics.
- Current Status of ICEMATE:
  - Objectives
    - Biodiversity baseline
    - Processes of natural spatial and temporal variability so that trends associated with climate change can be recognised
    - Relationships between genetic diversity, populations, communities and landscape
  - Fits under new Australian Science Strategy under: Terrestrial and Coastal Ecosystems: Environmental Change and Conservation Streams:
    - Trends and sensitivity to change
    - Vulnerability and spatial management
    - Human impacts: prevention, mitigation and remediation
  - Logistics for ICEMATE have not yet been approved – although the objectives of ICEMATE are directly aligned to priorities under the new Australian Science Strategy, the mechanism for delivering those priorities has yet to be decided. Implementation plans for the science strategy are to be developed in Stream Workshops to be held in Hobart in September.
- In the Antarctic life sciences community there seems to be a global convergence of thinking of what priorities are now.

- The direction that the LGP has gone have made a huge influence on international thinking and setting the Australian direction in terrestrial and coastal marine work over the next 10 years, as well as directions in the new SCAR proposals.
- Agreed community approach is up-scaling of work so we can build this into models and predictions.
- Life sciences lagging physical sciences a bit because they are more complex, but the LGP has now created the framework for international collaboration.

### 3. WHERE TO NOW?

- Steering committee suggestion:
  - Complete Beardmore work
  - 2 linked synthesis papers
    - ⇒ terrestrial and marine
    - ⇒ to submit in 2012.
    - ⇒ Jenny Webster-Brown and Vonda Cummings have agreed to lead.
    - ⇒ 2 seasons at a northern site – TNB-Hallett 12/13, 13-14???
- Have almost run the course of the LGP.
- Rejecting the original hypothesis – should it evolve or start afresh?
- Take the best features of the LGP:
  - Bringing together wide range of small research groups within one framework
  - Medium term plan that allows shared logistics to reach further afield than normally possible
  - Improved communication and interdisciplinary co-operation between group
- Evolve into an AGP (Antarctic Gradients Programme) or EGA (Environmental Gradients in Antarctica)
  - ⇒ Environmental Gradients at range of scales
  - ⇒ Longitudinal and latitudinal gradients
  - ⇒ Salinity gradients
  - ⇒ Moisture gradients
  - ⇒ Surface age gradients
  - ⇒ Climate gradients
  - ⇒ Altitudinal gradients
- New Steering committee to develop new framework of key questions/hypotheses/outcomes
- Aim for marine and terrestrial combined effort with 2 field seasons in region between TNB and Cape Hallett
- Develop further international co-operation -
  - ⇒ Australia, Korea, Italia, USA, Russia
  - ⇒ New SCAR bio programme
  - ⇒ AntNZ project manager support critical to success

#### 4. DISCUSSION – FUTURE PLANS

- Joint publication not to be a review paper, but a synthesis paper.
- 2 seasons up north with access to more inland sites – interested people re: Jenny, Charlie lee, Bryan (if the right site can be found) and Megan. 12/13-13/14 timeline.
- Support the evolution to a wider gradients programme.
- Need a formal way to let the international community know of this direction change.
- Need clear vision of **outcomes – job for the new committee.**
- Keep gradients theme – add modelling and prediction and up-scaling = a nice fit.
- New Committee:
  - Old ones could stay on
  - Interested people to put their hand up.
  - Need a fast momentum in the new LSSC.
  - Do we have an international steering committee with Italy, Australia, Korea and US? Could be a good idea.
  - Video link up meetings
- Could forge a connection with Russia as the Russian Vessel Akademik Federov is due to work in the Ross Sea Region – Ed to follow up.
- What will happen re LGP Project Manager role? Success of the LGP has a lot to do with the management of the project.
- Rather than a gradient project – why not just look at patterns and processes? Haven't we moved on from Gradients with more targeted and specific questions?
- We have a better idea of processes, but it's a stronger study with a framework and this is what the latitude did with LGP.
- Gradients could be a negative if too constraining.
- Are we moving on from the key Questions?
- Want to be aligned with ICEMATE and the new SCAR biology programme
- The value has been through the brand of the LGP – given it international recognition and scientific credibility.
- Latitude or gradients shouldn't have to be constraining – don't want to lose the brand.
- In the LGP, we didn't restrict ourselves to latitude
- Antarctic Gradients programme is good – give a backbone and framework to look at processes and drivers.
- Need to think of currency (i.e. what is current). The EDA has currency. The outcome is the EDA model. 'Domain' makes you think of a survey, but it is more about processes than a survey.
- The key thing that is demonstrated is the up-scaling – detailed information to the big picture to modelling to policy. This needs to get picked-up by IPCC and CEP.
- Need reliable surrogates to upscale information.
- Need to bring the EDA into the LGP – this is important for future direction.
- Strategic site selection – core people going to sites and what data do we need from sites to help models.
- Need the same methodologies at each site – i.e. a threshold of data at each sites – need to push for this to happen.
- EDA provides the framework to bring things together internationally. Also fits in one of the proposals for a new SCAR Biology programme.
- Ant NZ to move this forward.

## 5. CLOSING

- Thanks to:
  - Everyone who is here today
  - All groups who have contributed to LGP
  - Steering committee members who help keep us on track and lead a lot of the effort in publications
  - Shulamit Gordon for her able management and getting us all organised
  - All of Antarctic NZ for the awesome support that has made LGP possible.