Australian National University

CSIRO

Centre for Biodiversity Analysis

cba.anu.edu.au

2013-14 Annual report

October 2014

1. Director's summary

Our second year has been one of consolidation, following the establishment and rapid growth of the CBA in 2012-13. I am really pleased that we now have almost 60 labs across ANU and CSIRO engaged, including new appointees to both ANU and the CSIRO National Collections. As important is connecting the postdocs and graduate students from the two institutions, as these people represent the lifeblood of the future, and, frankly, are those that have the greatest capacity to learn and exploit the rapid advances in Biodiversity Science.

This year, we asked our postdocs to take the lead in nominating discipline areas and taking on organisation of CBA "skills" workshops. The outcome was two great workshops – one on analysis methods in population genomics, and the other on macroevolutionary analyses in R. A third, more opportunistic workshop on "DNA target enrichment for phylogenomics" was connected with the 50th annual meeting of the Australian Entomological Society. Each of these was very popular, including attendees from all over Australia, as well as ANU and CSIRO. Importantly, they also provided an opportunity for Early Career Researchers to mix with each other, as well as with the international presenters (some of whom were also postdocs). Clearly, this is the sort of thing that the CBA should continue to support – postdocs, start scheming…

Our annual conferences, this past year on "Understanding biodiversity dynamics using diverse data sources", continue to be very successful. This meeting, supported jointly by CBA and a CSIRO-OCE Cutting Edge Science Symposium grant, focussed on bridging the science challenges across understanding large-scale biodiversity dynamics (macroecology & macroevolution) and phylogenetic and species-level bioinformatics. This is a domain ripe for rapid advances, and CBA members are working right out there on the bleeding-edge. For the coming year (2014-15) the CBA conference will focus on "species delimitation" – especially opportunities from genomics, combined with traditional phenotypic systematics, to enhance our knowledge of species and phylo-diversity.

CBA invests its limited resources to promote stronger collaborations across ANU and CSIRO through several mechanisms, including the workshops and conferences described above. But, not surprisingly, an activity that generates strong engagement is our "Ignition Grants", for which joint ANU/CSIRO teams can apply. This year we extended these from $5K to $10K and also invited CBA postdocs to apply. The focal area was on innovative use of natural history collections. The response was awesome. Unfortunately, we could only fund a six of the many excellent proposals received and we encourage those not successful and other CBA consortia to come back for the next round. Those funded (see below) illustrate the strong potential for innovative applications of the world-class collections held by the CSIRO on behalf of the nation.

This was also a challenging year as we all sought to navigate the extensive restructuring of CSIRO and shifts in commonwealth government priorities. In the new CSIRO structure, the CBA now sits in the Ecosystem and biodiversity knowledge and systems program of the Land and Water Flagship of CSIRO, ably led by Ian Creswell. The CBA also provides a crucial link between the ecosystem and macroecology expertise in this program and the evolutionary biology and systematics expertise within the CSIRO's National Research Collections of Australia. In this context, I am pleased that Ian Creswell will join Andrew Young as the CSIRO members of the CBA management ("Liaison") committee. I also thank Owain Edwards for his sterling contributions as CSIRO representative on this committee over the last year. I also note that the newly appointed Director of the ANU Research School of Biology, Allen Rodrigo is very supportive of our efforts, as was (and still is) the previous Director, and now Dean of the College of Medicine, Biology and Environment, Kiaran Kirk.

Despite the recent convolutions, there has been substantial progress at the highest levels in strengthening the ties between ANU and CSIRO as a "National Agricultural and Environmental Sciences Precinct". One manifestation has been CBA's involvement in a bid to the SIEF Board for infrastructure investment in genomics, metabolomics and informatics; specifically, in establishment of innovation and training labs, accessible by teams of ANU and CSIRO researchers, at the interface of genomics, bioinformatics, and spatial modelling. This initiative, if successful, will further build collaboration and momentum in biodiversity science across the two institutions.

Finally, let me add my thanks to you all for helping to establish and build the CBA. We can only be as good as our members and supporters, and based on their willingness to "cross the road" to build for the future. And then there is our wonderful coordinator, Claire Stephens, without whom none of this would be possible.

Craig Moritz
CBA Director

2. Executive summary

2.1 CBA Director and Coordinator

- CBA Director: Craig Moritz craig.moritz@anu.edu.au
- CBA Coordinator: Claire Stephens claire.stephens@anu.edu.au (50% position, Mon-Wed)
- Located in the Gould Building (116 Daley Road), Research School of Biology, ANU

2.2 CBA Liaison Committee members

- **ANU:**
  - Justin Borevitz - Division of Plant Sciences, Research School of Biology
  - Scott Keogh - Division of Evolution, Ecology and Genetics, Research School of Biology
- **CSIRO:**
  - Andrew Young - National Research Collections Australia, Facilities and Collections
  - Andy Sheppard (2012-Nov 2013) - Biosecurity Flagship
  - Owain Edwards (Dec 2013-July 2014) - Ecosystems Sciences
  - Ian Cresswell (Aug 2014-current) - Ecosystem & Biodiversity Knowledge & Systems, Land and Water Flagship

2.3 CBA membership

- Currently 58 lab leaders and research scientists are involved with the CBA cba.anu.edu.au/about-us/people
- Lab leaders and research scientists from ANU and CSIRO are from a range of areas relevant to the CBA's core focus of incorporating genomics and/or spatial ecology into the discovery, understanding and protection of Australia's biodiversity:
  - **CSIRO:**
    - Ecosystem and Biodiversity Knowledge and Systems (Land and Water Flagship)
    - National Research Collections Australia (Facilities and Collections)
  - **ANU:**
    - Research School of Biology (Evolution, Ecology & Genetics and Plant Science)
    - Fenner School of Environment and Society
    - Department of Archaeology and Natural History
    - Centre for Aboriginal Economic Policy Research
- Postdoctoral fellows and postgraduate students are considered CBA members by affiliation of their lab / research group. They are included on the CBA email list.

2.4 CBA website cba.anu.edu.au

- Key role is to connect information relevant to the CBA mission and focus across CSIRO and ANU and is used to publicise CBA and other relevant events, highlight our research and advertise funding opportunities and student projects.
- Website includes:
  - Information on the CBA (Background, Aims, etc.)
  - List of Members and links to their own institutional pages
  - Research highlights (contributed by ECRs)
  - CBA-funded Ignition projects
  - Opportunities, including CBA and external grants and funding, student projects and job advertisements
  - Public policy areas (linked to relevant CBA Highlights, Projects and News and external Department of the Environment biodiversity policy pages)

- News and events, which includes both CBA news and events (eg. workshops and conferences) and external news and events that may be of interest to CBA members

2.5 Hardware and equipment

- Purchase of a large 256 GB RAM node computing cluster located in, and operated by, the Genome Discovery Unit (ANU). Contact Jason Bragg (jason.bragg@anu.edu.au) for details on capabilities and access (2013 - $30K).
- Contribution to the establishment of the experimental genomics facility based at the Research School of Biology (RSB), ANU, and accessible to CBA members (2014 - $15,000).
- Contribution to the RSB 2014 Equipment and Infrastructure Scheme - transcriptome analysis software (2014 - $2,000).

2.6 CBA activities (further details of 2013/14 activities below)

- **Joint ANU-CSIRO projects**
  1) How local is local? Landscape genomics in Yellow box (2012)
  2) Hybrid history: deep sequencing of the Tasmanian blue gum (2012)
  3) Species discovery and refugia in the monsoonal tropics (2012)
  4) Evolutionary processes in Billy buttons (2013)
  5) A curation community for coral environmental genomics (2013)
  6) Species boundaries in Australian orchids (2013)
  7) Climate change and ecosystem structure, function and composition (2013)
  8) Palaeoecological indicators of biodiversity change through time (2013)
  9) Collections-based landscape genomics: Red-browed finches as a test case (2014)
  10) Genome skimming with degraded DNA from herbarium specimens (2014)
  11) Molecular phylogeny of *Helicoverpa* from museum specimens (2014)
  12) Penguin ectoparasites of the Southern Hemisphere (2014)
  13) Bringing next generation approaches to conservation genomics using museum collections - Rock wallaby museum skinomics (2014)
  14) Eucalyptus genomics (2014)

- **Annual conferences**
  1) Biodiversity genomics (2013)
  2) Understanding biodiversity dynamics using diverse data sources (2014)
  3) Species delimitation in the age of genomics (2015)

- **Visiting scientists, training workshops and seminars**
  1) BEAST2 workshop - Joseph Heled (2013)
  2) Geneious workshop - Steve Stones-Havas (2013)
  3) Genetic analysis for population studies workshop - Peter Smouse (2013)
  4) BEAST2 workshop and RSB Director's seminar - Alexei Drummond (2013)
  5) R "Bootcamp" workshop - Australian Bioinformatics Network (2013)
  6) IBS Early Career Conference Keynote speaker - Matt Fitzpatrick (2014)
  7) RSB Director's seminar - Eddie Holmes (2014)
  8) Population and landscape genomics workshop - Matteo Fumagalli, Anders Goncalves da Silva, Rose Andrew, Justin Borevitz, Kevin Leempoel (2014)
  9) Computational macroevolution and phylogenetic comparative methods workshop - Dan Rabosky (2014)
  10) DNA target enrichment in phylogenomics workshop - Oliver Niehuis (2014)
  11) Genome assembly and target enrichment in non-model organisms workshop - Matt Fujita (2014)

- **Outreach & promotion**
    1) Conference workshop - The contribution of biodiversity genomics to policy and management (2013)
    2) Evening science discussion - Current practices and future goals for conservation planning based on the increasing availability of new, large-scale biodiversity data (2014)
    3) Atlas of Australia Two-way Indigenous Engagement Case Study (2015)

3. CBA activities

3.1 Ignition projects

Each year CBA funds a number of small pilot projects, called **Ignition projects**. These aim to 'kick-start' new ANU-CSIRO collaborative research, with the intention that results will subsequently form the basis of more substantial research proposals and collaborations.

The scope of an Ignition project needs to be within the CBA's core focus of incorporating genomics and/or spatial ecology into biodiversity analysis. Funding may cover fieldwork, sample preparation, next-generation sequencing, technical salaries or data analysis. Workshops/meetings that have significant outcomes for future ANU-CSIRO collaborative research are also considered.

All proposals must show a direct, and genuine, collaboration between at least one member of an ANU and a CSIRO research group. Group leaders, postdocs and/or students may be included on up to two project submissions per funding round.

For the 2012-2013 funding rounds up to $5000 per project was offered. For the June 2014 round, we made available up to $10,000 per project. For the 2104 round we also particularly sought projects that proposed novel use of biological collection material and/or data
cba.anu.edu.au/opportunities/grants-funding/ignition-projects

CBA, along with CSIRO's National Research Collections Australia (NRCA), has also committed funding ($10,000) for eucalypt genomics research, with the aim of producing an integrated eucalypt research strategy across the relevant CSIRO and ANU research groups. Table 3.1 summarises the **11 Ignition projects** CBA funded in 2013-14.

Table 3.1 2013-14 funded Ignition projects

Date	Project cba.anu.edu.au/research/projects	$
2013	**Evolutionary processes in Billy buttons** Alexander Schmidt-Lebuhn (CSIRO), Justin Borevitz (ANU)	5,000 *lab work*
2013	**A test of the power of genotype by sequencing (GBS) for delimiting species boundaries among incipient species of Australian orchids** Rod Peakall (ANU), Celeste Linde (ANU), Mark Clements (CSIRO)	5,000 *lab work*
2013	**A curation community for coral environmental genomics** Alexie Papanicolaou (CSIRO), Owain Edwards (CSIRO), Sylvain Forêt (ANU)	5,000 *salary*
2013	**Future ecosystem states: linking ecophysiological cues and thresholds to climatic regimes, variability and weather extremes** Kristen Williams (CSIRO), Simon Ferrier (CSIRO), Craig Moritz (ANU)	5,000 *workshop*
2013	**Palaeoecological indicators of biodiversity change through time** Simon Haberle (ANU), Dan Rosauer (ANU), Geoff Hope (ANU), Kristen Williams (CSIRO)	5,000 *workshop*
2014	**Molecular phylogeny of *Helicoverpa* from museum specimens** Andreas Zwick (CSIRO), David Yeates (CSIRO), Tom Walsh (CSIRO), Karl Gordon (CSIRO), Craig Moritz (ANU), Dave Rowell (ANU)	10,000 *lab work*
2014	**Genome skimming with degraded DNA from herbarium specimens** Alexander Schmidt-Lebuhn (CSIRO), Adrienne Nicotra (ANU)	9,180 *lab work*
2014	**Penguin ectoparasites of the Southern Hemisphere** Katherine Moon (ANU), Ceridwen Fraser (ANU), Bruce Halliday (CSIRO)	8,100 *lab work*
2014	**Collections-based landscape genomics: Red-browed finches as a test case** Kerensa McElroy (CSIRO), Norman Warthmann (ANU)	9,683 *lab work*
2014	**Bringing next generation approaches to conservation genomics using museum collections – Rock wallaby museum skinomics** Sally Potter (ANU), Maxine Piggott (ANU), Jason Bragg (ANU), Matthew Morgan (CSIRO), Leo Joseph (CSIRO)	10,000 *lab work*
2014	**Eucalyptus genomics project/s** Linda Broadhurst (CSIRO), David Bush (CSIRO), Brendan Lepschi (CSIRO), Justin Borevitz (ANU), Norman Warthmann (ANU), Megan Supple (ANU) and Jason Bragg (ANU)	10,000 *lab work*

In the first half of 2015 CBA will host an informal, day-long symposium for each of our Ignition grant recipients (2012-2014) to share their progress and/or results.

Figure 3.1 Foci of some of the 2014 Ignition projects, clockwise L to R: pinned *Helicoverpa prepodes*; herbarium specimen of *Ozothamnus alpinus*; Little Blue Penguin (*Eudyptula minor*) with a tick (*Ixodes* sp.); Yellow-footed rock-wallaby (*Petrogale xanthopus*); Red-browed finches (*Neochmia temporalis*).

3.1.1 Progress made on 2013 Ignition projects

Evolutionary processes in Billy buttons Alexander Schmidt-Lebuhn (CSIRO) and Justin Borevitz (ANU)

- cba.anu.edu.au/research/projects/evolutionary-processes-billy-buttons
- Field and lab work and bioinformatics are now completed (Figure 3.2).
- Sequencing of 224 specimens of *Craspedia* found distinct genetic clusters that both contrast with, and help resolve those species delimitated by morphology alone. Phylogenetic analyses are continuing.
- Schmidt-Lebuhn is presenting the results of this ignition project at the Australasian Systematic Botany Society meeting on Next Generation Systematics in New Zealand in November, 2014.
- Schmidt-Lebuhn has continued his collaboration with ANU, with a new ignition project with Adrienne Nicotra (Table 3.1).

A test of the power of genotype by sequencing (GBS) for delimiting species boundaries among incipient species of Australian orchids Rod Peakall (ANU), Celeste Linde (ANU) and Mark Clements (CSIRO)

- cba.anu.edu.au/research/projects/species-boundaries-australian-orchids
- Progress on this ignition grant was delayed in 2013-14 due to staffing changes in the Peakall lab, but the proposed project will continue in 2014-15 (the grant has been extended).

A curation community for coral environmental genomics Alexie Papanicolaou (CSIRO), Owain Edwards (CSIRO) and Sylvain Forêt (ANU)

- cba.anu.edu.au/research/projects/curation-community-coral-environmental-genomics
- Annotations have been produced for all the currently publicly available coral transcriptomes (18 species).

- A web-based graphical interface to browse these annotations has been developed (Figure 3.2). http://130.56.251.82/Coral_Sylvain/

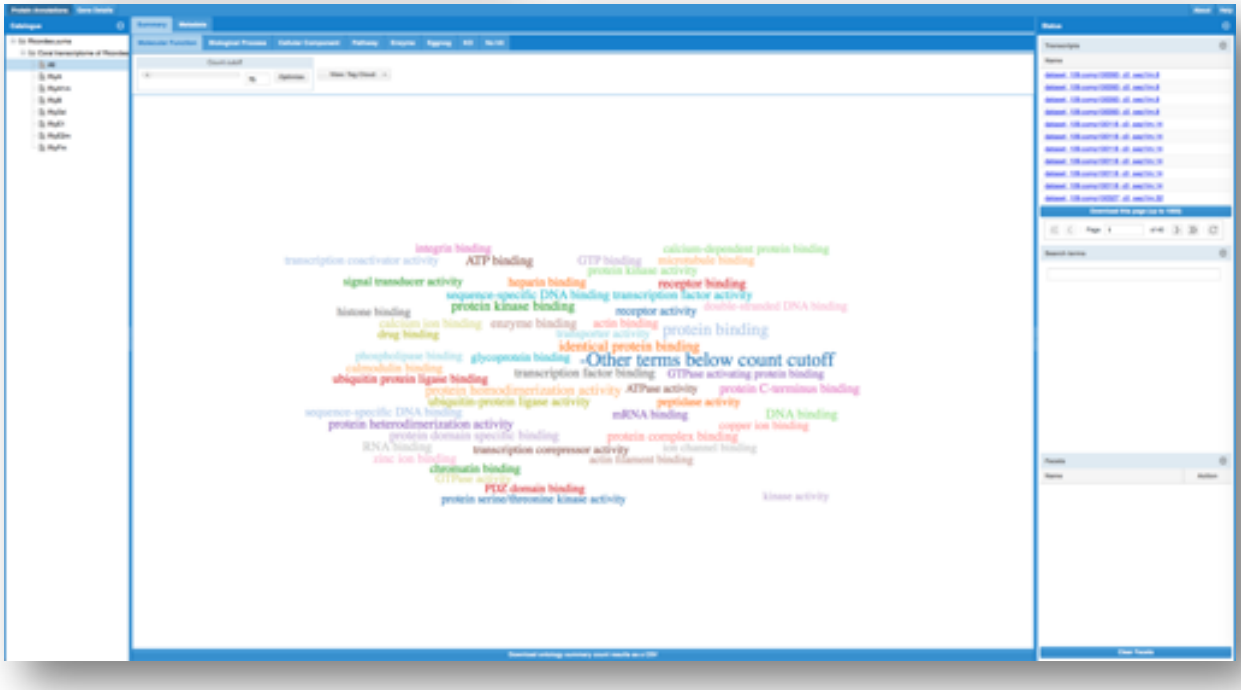

Figure 3.2 Some of the 2013 Ignition projects (clockwise L to R): *Evolutionary processes in Billy buttons:* one of the Billy button species sampled, *Craspedia aurantia* from Kosciuszko National Park; *Palaeoecological indicators of biodiversity change through time*: workshop participants - Kioloa Coastal Campus 17-21 Nov 2013; *A curation community for coral environmental genomics*: screen shot from the web-based graphical interface developed to browse the annotations for all the currently publicly available coral transcriptomes.

Future ecosystem states: linking ecophysiological cues and thresholds to climatic regimes, variability and weather extremes Kristen Williams (CSIRO), Simon Ferrier (CSIRO), Craig Moritz (ANU)

- cba.anu.edu.au/research/projects/climate-change-and-ecosystem-structure-function-and-composition
- A one-day scoping workshop was held on 29 April 2014 to initiate collaborative research around a series of core topics aimed at the development of climate variables that better reflect thresholds for bio- and agro-ecosystems. Invited participants: 7 ANU and 8 CSIRO.

- The workshop itself was notable in bringing together organismal biologists and climate statisticians and modelers to discuss how to develop climate layers that best represent the challenges to species and ecosystems.
- The workshop has helped Williams to develop connections across ANU, CSIRO and beyond, including with the Ecosystem Modeling and Scaling Infrastructure (eMAST) team from the Terrestrial Ecosystem Research Network (TERN).
- Another outcome is that CSIRO has agreed to fund a "pilot" for six months on climate extremes and staff time will be made available to build continent wide layers for biologically relevant variables relating to climate extremes.
- CBA has also committed to supporting at least one more follow-up workshop on climate extremes.

Palaeoecological indicators of biodiversity change through time Simon Haberle (ANU), Dan Rosauer (ANU), Geoff Hope (ANU), Kristen Williams (CSIRO)

- cba.anu.edu.au/research/projects/palaeoecological-indicators-biodiversity-change-through-time
- Key palaeoecological researchers were invited to participate in a four-day intensive workshop to collate multi-site palaeoecological data into a format suitable for analysis (Figure 3.2) (11 participants from ANU, 1 from CSIRO and 8 from other institutions).
- The first of two proposed papers from the workshop, "Rewilding the tropics, and other conservation translocations strategies in the tropical Asia-Pacific region", has been accepted by *Ecology and Evolution*. The funding from CBA is stated in the acknowledgements.

3.2 CBA annual conference (22-24 April 2014)

cba.anu.edu.au/news-events/understanding-biodiversity-dynamics-using-diverse-data-sources

In April 2014, CBA hosted its second annual conference, **Understanding biodiversity dynamics using diverse data sources,** at ANU and CSIRO Discovery. The symposium was jointly organised and funded by the CBA (Craig Moritz) and CSIRO OCE Cutting Edge Science (Owain Edwards, Alexie Papanicolaou and Russell Dinnage).

Participants represented an eclectic mix of theoreticians, modelers, computer scientists, biologists and geoscientists. The main aim of the meeting was to stimulate stronger integration across these disciplines and inform the development of the concepts and tools necessary to make sense of the huge amounts of data that is now being generated and which inform our understanding of biodiversity dynamics.

- Over 65 delegates attended the meeting (15 ANU; 20 CSIRO; 14 HDR students).
- 15 local and international **invited speakers** presented talks, teaching workshops and participated in two invitation-only working groups.
- Delegates presented contributed "Lightning talks" and posters.
- Four **travel grants** of $1000 AUD each were awarded to Early Career Researchers (graduate students or post docs with three years or less experience).

The symposium was structured around two interacting, complementary themes that were also the topics for the invitation-only **working groups**:

1. *Visualisation and biodiversity informatics*
    - Coordinator: Alexie Papanicolaou (CSIRO)
    - Invited participants/speakers: Karen Cranston (NESCent), Rob Beiko (Dalhousie), Ian Homles (UC Berkeley), David Kidd (Kingston), Owen McMillan (STRI), Megan Supple (STRI), Joe Miller (National Science Foundation).
2. *Inferring evolutionary and ecological dynamics*
    - Coordinator - Craig Moritz (ANU)

- Invited participants/speakers: Thiago F. Rangel (Universidade Federal do Goias), James Rosindell (Imperial College London), Marc Cadotte (Toronto), Giovanni Rapacciuolo (UC Berkeley), Greg McInerny (Oxford), Simon Ferrier (CSIRO), Renee Catullo (CSIRO), Owain Edwards (CSIRO), Russell Dinnage (CSIRO), John La Salle (ALA), Peter Doherty (ALA), Marcel Cardillo (ANU), Dan Rosauer (ANU).

These working groups served to highlight:

(i) the current disconnects between those seeking to understand ecological processes that shape current patterns of species richness and turnover (macroecology) and those focused on large-scale evolutionary dynamics (macroevolution and phylogeography), and

(ii) the potential informatics and modeling solutions to these disconnects.

Several novel collaborations have developed, including ongoing engagement of evolutionary biologists with developers of the Atlas of Living Australia to extend the informatics and visualisation support that ALA can provide to the research community.

Four skill-building **workshops** on new methods for data analysis, integration and visualisation were offered:

1. *An introduction to the GenGIS software for analysis of biodiversity data* - Rob Beiko (15 participants; 6 HDR students)
2. *An introduction to SAM (Spatial Analysis in Macroecology* - Thiago Rangel (14 participants; 6 HDR students)
3. *An Introduction to PhyloJive and OneZoom* - Joe Miller, Garry Jolley-Rogers and James Rosindell (16 participants; 6 HDR students)
4. *Visualising and combining trait and evolutionary distances for community analysis* - Marc Cadotte (13 participants; 7 HDR students)

As part of the conference, local, state and federal conservation policy makers and managers were invited to participate in an **evening science discussion.** The audience was exposed to multiple examples of new, large-scale biodiversity data, particularly evolutionary data, and associated visualisations that are being increasingly generated. A dynamic discussion followed examining the implications for current, and future, conservation policy and practice. Presenters: Joe Miller, Simon Ferrier and James Rosindell.

Table 3.2 2014 Conference budget

Expenses	Total $	Income	Total $
ECR Travel Grants	$4,000.00	CBA contribution	$30,000.00
International airfares	$32,586.96	CSIRO OCE contribution	$30,000.00
Speaker accommodation & breakfast	$10,602.00	Conference registration - Full	$4,950.00
Speaker meals, taxis, etc.	$967.29	Conference registration - Student	$650.00
Trybooking online registration site	$186.29	Workshop registration - Full	$1,600.00
CSIRO Discovery catering	$7,720.00	Workshop registration - Student	$575.00
University House catering, room & equipment hire	$10,085.70	**TOTAL**	**$67,775.00**
Conference program & posters	$648.00		
Name lanyards, holders, paper	$171.00		
TOTAL	**$66,967.24**		

3.2.1 Annual conference - 2015

cba.anu.edu.au/news-events/species-delimitation-age-genomics

In collaboration with David Yeates and Leo Joseph (National Research Collections Australia, CSIRO), the focus of the next CBA annual conference will be species delimitation. **Species delimitation in the age of genomics** will be held at Australian National Botanic Gardens 28-30 April, 2015 and supported by CBA, CSIRO (NRCA), Atlas of Living Australia and ANBG.

3.3 Visiting scientists, training workshops and seminars

A major objective of CBA is to enhance collaboration and training opportunities via external visitors who will conduct a workshop and/or seminar during their visit to ANU and CSIRO. We welcome suggestions through out the year from CBA members on potential visitors and speakers.
cba.anu.edu.au/opportunities/grants-funding/visiting-scientist-support

In our second year we supported **eight visiting scientists** (in addition to conference invited speakers) who presented a range of well-attended workshops and seminars (Table 3.3).

Workshops and CBA seminars are open to ANU and CSIRO staff and students, and are also attended by students and researchers from the University of Canberra and interstate universities, museums and CSIRO sites.

We also promoted and hosted several special CBA seminars presented by scientists visiting ANU and CSIRO:

- Lee Belbin (Blatant Fabrications): *Atlas of Living Australia - a five year journey* (Dec 2013).
- Alan Andersen (CSIRO Darwin): *Historical biogeography shapes community ecology: Savanna ants in Northern Australia* (Feb 2014).
- Matthew Barrett (Kings Park and University of Western Australia): *Diversity and diversification of the Kimberley flora* (Jun 2014).

Table 3.3 2013-14 Visitors, workshops and seminars

Date	**Workshops and visitors** cba.anu.edu.au/news-events/past-events	**$**
Oct 2013	**R "Bootcamp" workshop** Australian Bioinformatics Network	2,500 *Sponsorship of ABN workshop*
Jan 2014	**IBS Early Career Conference** Keynote speaker Matt Fitzpatrick	5,000 *Sponsorship of IBS Early Career Conference*
Mar 2014	**RSB Director's seminar** Eddie Holmes	350 *airfares, accom.*
Mar 2014	**ECR workshop - Population and landscape genomics** Matteo Fumagalli, Anders Goncalves da Silva, Rose Andrew, Justin Borevitz, Kevin Leempoel - Four day workshop; 80 participants (12 ANU; 10 CSIRO)	6,200 *airfares, accom., venue hire, catering*
Sept 2014	**ECR workshop - Computational macroevolution and phylogenetic comparative methods** Dan Rabosky - Three day workshop 40 participants (18 ANU; 7 CSIRO)	3,500 *airfares, accom., catering*
Oct 2014	**DNA target enrichment in phylogenomics - molecular and bioinformatic principles** Oliver Niehuis - One day workshop; 20 participants (7 ANU; 6 CSIRO)	5,000 *Sponsorship of Aust. Ento. Soc. Conference*
Oct 2014	**Genome assembly and target enrichment in non-model organisms** Matt Fujita - Invitation only one day workshop; 24 participants (17 ANU; 3 CSIRO)	3,500 *airfares, accom., catering*

3.3.1 Early career training workshops

A primary goal for our second year of operation was to increase interaction among early career researchers (ECRs - post graduate students and postdoctoral fellows) across ANU and CSIRO.

In August 2013 we asked for direct input from CBA-affiliated ECRs regarding the types of training activities that would address their specific interests and requirements. Based on the ideas proposed, two CBA ECR workshops were organised in 2014 (Table 3.3).
cba.anu.edu.au/opportunities/grants-funding/training-support

Other early career training workshops CBA supported in 2013/14 included a R "Bootcamp" workshop (hosted by the Australian Bioinformatics Network); a keynote speaker (Matt Fitzpatrick) for the International Biogeography Society Early Career Conference; and a workshop presented by Oliver Niehuis on DNA target enrichment in phylogenomics (Table 3.3).

3.4 Outreach & policy

Atlas of Australia Two-way Indigenous Engagement Case Study (2014/15)

http://cba.anu.edu.au/research/projects/atlas-australia-two-way-indigenous-engagement-case-study

CBA is supporting ($30K) an Indigenous Engagement proposal by Emilie Ens (CBA affiliate and Macquarie University) and John LaSalle, Director of the Atlas of Living Australia (ALA).

Based in SE Arnhem Land, the project aims to demonstrate the value of the ALA to Indigenous Australians, the value of Indigenous knowledge to non-Indigenous Australians and promote cross-cultural ways of knowing and managing Country. This is especially important given the high, yet still poorly documented, biodiversity in Indigenous Protected Areas.

Using local Indigenous knowledge, biodiversity data from SE Arnhem Land will be put into the ALA using both Western scientific names and information, and indigenous names, uses and significance.

Field guides, local herbaria and preserved fauna collections and school learning products will be generated for the local Ngukurr community, Yugul Mangi Rangers and proposed SE Arnhem Land IPA.

Figure 3.3 Emilie Ens, Yugul Mangi Rangers and local school girls in SE Arnhem Land.

The project also aims to:

- Build local capacity of Rangers to better understand the locations/habitat and status/condition of fauna and flora from Indigenous and Western perspectives;
- Facilitate intergenerational transfer of Indigenous knowledge;
- Create clearly definable employment pathways from school to Rangers and related research opportunities;
- Provide employment opportunities for elders; and
- Engage the whole community in Caring for Country activities.

4. Summary of discoveries made, or other achievements, including Project IPR, other IPR and Confidential information.

Nothing to report other than that above.

5. Interactions and developing interactions with third parties.

5.1 Science and Industry Endowment Fund (SIEF)

CSIRO has been working with ANU to establish a **National Agricultural and Environmental Sciences Precinct** via the SIEF Research Infrastructure (SIEF RI) program.

Moritz, on behalf of the CBA has been involved in a bid to the SIEF Board for infrastructure investment in genomics, metabolomics and informatics; specifically, in the establishment of innovation and training labs, accessible by teams of ANU and CSIRO researchers, at the interface of genomics, bioinformatics, and spatial modelling.

This initiative, if successful, will further build collaboration and momentum in biodiversity science across ANU and CSIRO.

5.2 National Environmental Research Program (NERP)

In response to the 2014 call for potential future environmental research priorities, Moritz submitted a proposal to the NERP introducing the CBA and our potential in the development of translating new biodiversity research capability, outcomes and technologies to policy-makers.

The submission, **Translating new research capacity for decision-making,** advised that biodiversity science, which underpins much of environmental decision-making, is rapidly advancing. However, government agencies often lack the internal skills and detailed knowledge to make maximum use of this new knowledge. At the same time, the academic community that drives these advances often lacks the drive or capacity to translate new research capability and results for management and decision-making.

The proposal highlighted several benefits to the Department of Environment including genomic technologies and spatial environmental analysis for monitoring and assessment of ecosystem protection and health, and translating data into policy-relevant knowledge.

6. Financial statement

- The core CBA budget is $200K/year, shared equally by CSIRO and ANU.
- In the Centre's second year, funds were allocated to the Experimental genomics facility, Ignition projects, our second annual conference, external visitors and ECR-led training workshops.
- In our third year, projects, annual conference (Species delimitation), workshops, including ECR-led workshops, and visitors will continue to be funded.
- Third-year spending will also focus on public policy engagement, including the Indigenous engagement case study, and honours and postgraduate student initiatives, such as scholarships and internships.

Table 6.1 Budget summary for Years 2 & 3 of operation

Item	YR 2 proposed	YR 2 actual	YR 3	Notes for YR3
Coordinator: C Stephens (50%)	40	40	41	
Bioinformatics support: J Bragg (24%)	27	27	28	
Outreach & promotion	30	0	80	Indigenous Engagement Case Study ($30K) Public policy engagement & communication (genomics perspective) Internships of PhD top-ups in translating genomics to policy
Projects (including field work, travel, meetings & technical salaries)	70	70	60	~$60K committed in 12-14 $60K new funds (2 rounds) in 14-15
Hardware & equipment	15	11	25	
Annual symposium & training workshops	50	37	50	Annual conference ($30K) Workshops ($20K)
Short term visiting fellowships	30	0	20	
Carryforward	-65		-170	~ 170K cfwd from 13-14
Total	**197**	**186**	**134**	**76K remaining to allocate! Hons $5K topups?**