

# THE CRITICAL VALUE OF LONG TERM FIELD STUDIES AND DATASETS - PLENARY 2

## ROYAL ZOOLOGICAL SOCIETY OF NEW SOUTH WALES 2016 FORUM

Held at the Australian Museum, William Street, Sydney on Saturday, 5 November 2016

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Speakers in this session were:

**Jonathan Majer** – University of Western Australia. Long-term invertebrate studies: problems, pitfalls and probabilities.

**Alan York** – University of Melbourne. Long-term effects of prescribed fire regimes on beetle assemblages in a temperate eucalypt forest.

**Heloise Gibb** – La Trobe University. Do arid-zone ants undergo boom-bust population fluctuations in response to the El Niño Southern Oscillation?

**Brad Law** – NSW Department of Primary Industries. Long-term studies of bat populations in forests: we have the technology.

**PAUL WILLIS:** Let's kick off with a theme that came through this particular session, and that was the underlying trends of climate change. Essentially, no matter how long your dataset, you're looking at a system in a state of flux and you don't have any baseline of a pre flux, pre climate change model. Does that make your life more difficult when trying to put together a long term dataset to get an idea of what's actually happening?

**JONATHAN MAJER** (University of Western Australia): It's fortuitous, or unfortunate, in Western Australia, that I happened to start monitoring ants at exactly the time the climate changed. There's a disjunct in the rainfall pattern from the mid 70s onwards which is exactly the time we started that work, so in this instance, the issue is not there, but I agree, it can be a problem.

**ALAN YORK** (University of Melbourne): A comment from the Victorian example. Because previous work had indicated that vegetation response was closely linked to post fire rainfall, weather stations were set up across the experimental study area. These data were available so we could link short term responses to weather variables. As the study has progressed, and we can translate weather variation to climate, we can include climate as a factor. So it is important that these other variables are collected as well as the variable of interest.

**HELOISE GIBB** (La Trobe University): I'd agree with that. All systems are continually changing, whether it's

climate or some other factor, so I think that we should not be expecting to have a stable baseline to start with.

**PAUL WILLIS:** And Brad, if I can actually tweak that question a little in your case. When you put up your examples around areas of logged and unlogged forest it went by a bit quickly for me. I'm only a palaeontologist, so it takes me a while to assimilate information, but if I read that correctly, were there any study areas that were logged while you were doing studies so you've got pre logging data for a particular area?

**BRAD LAW** (NSW Department of Primary Industries): Of the two examples I gave, the final one was logged prior to our study. We were assessing regrowth that was already 15 years old, so it had partially already established and was still changing over the time period that we looked at it. The study at Eden had an alternate logging arrangement, logging alternate coupes, so the very first alternate coupe logging took place in the 1970s. We were able to come before the second round of alternate coupes were logged in the late 1990s, so we were able to look at that change.

**PAUL WILLIS:** So were there occasions when you could say, "This is the original state of this particular coupe without any logging, and then the logging occurs and then these are the changes we observed"?

**BRAD LAW:** We certainly have information on the particular sites prior to logging, but the other thing to consider is that bats are flying animals. They are quite mobile and whatever that state a logging coupe is in, is strongly influenced by the surrounding landscape. So it does make some difference what happens in those surrounding areas as well as in the logged coupe.

**PAUL WILLIS:** What I'm driving at is the context of designing a long term study where you know that there's going to be some kind of change going on. It is predicting that change and designing your long term study so that you can get as much pre change data as possible. Am I making any sense here?

**BRAD LAW:** Yes, ideally you would have pre disturbance data to make comparisons. You also have control sites, so there are spatial controls for comparison. Logging is such a long term change that we made the decision for some of our studies to come in at a particular time after the logging, but where the

regrowth is still at a very young age. We're looking at that particular change. Sometimes you have to make those kind of decisions. Ideally, it is good to start before things happen, but using a combination of approaches helps you accumulate that data over time, because the change after logging is very, very long term.

**PAUL WILLIS:** Coming back to the rest of you, have you had any, "Bugger me," moments during long term studies when you thought, "Something has occurred and if only I'd been measuring such-and-such a parameter, I would have a better handle on what was going on here"? Do those sorts of changes occur in the real world when you're actually pulling these sorts of studies together?

**BRAD LAW:** In our study in Eden we are using bat detectors, and we set them off the tracks in amongst the dense regrowth vegetation and look at changes over time. It became apparent to us that the tracks that run through regrowth actually provide important habitat for bats. We had ignored that in the initial stages, so we subsequently included that component of the habitat. When we started we weren't aware just how important it was.

**HELOISE GIBB:** You know, looking back on longer term datasets you always think, "There's something I could have added in."

**PAUL WILLIS:** Give me an example. Is there one that occurred in your particular study?

**HELOISE GIBB:** I could say for the dataset I used is a collaboration with the Desert Ecology Research Group. I came in at a late stage, and it's a very difficult field site to monitor, but if you really wanted to test the correlation between the vegetation and the ant activity, you'd want vegetation data that was collected not only when you did the ant sampling but over the period beforehand.

**PAUL WILLIS:** Hindsight is always perfect vision. Alan, you had a comment?

**ALAN YORK:** The study in northern New South Wales at Bulls Ground that I was involved in was a comparison of a three year burn cycle against a long unburnt control. We produced some results that showed that frequent burning had dramatic effects on the insect communities. By observing the sites, we noticed there were lots of logs that were a consequence of several cultural practices in the 1950s and lots of litter around the logs. I had a student at Wollongong Uni who sampled the leaf litter around the logs on the frequently burnt sites and, lo and behold, we found all the species of ants that we thought were missing were in these micro refuges in the burnt areas. That was a pretty interesting finding, which had management implications. If you wanted to burn frequently, you needed to create refuges.

**JONATHAN MAJER:** With our burns studies in Western

Australia, we always like to have unburnt reference sites, and the entire northern Jarrah Forest was burnt at some time or other. You're never really quite confident about the reference site, although the-then forest department did have one plot called Amphibian that they had kept fire out of for many years. It's probably about 60 years now, so there is that reference. It is very hard to find such sites. Also, with the mine site rehabilitation studies, we always try to find undisturbed benchmark areas. Some of the mining is carried out in a patchwork of agricultural landscapes, so it can be difficult, in fact sometimes not possible, to find reference sites because the whole site has been modified in the first place. So, yes, we do get those problems.

**EMMA BURNS** (Australian National University): My question is for Brad, but it's probably relevant for each study. What is the cost in terms of capital expenditure to get the infrastructure in place upfront, and then are there any efficiencies in relation to revisits?

**BRAD LAW:** The approach I took was to build my research onto existing programs. The site near Barrington Tops was a long term hydrology research study area where the infrastructure had already been set up to compare unlogged with logged catchments. We started after the regrowth was established. When I started with the state government, there just weren't the resources to start a new program.

There was a number of existing programs available for me to work with, and in terms of the ongoing cost, I haven't ever tried to actually put a dollar figure on it. I've been lucky enough to be in a position to plan ahead over some period of time, and rather than necessarily always looking to do annual sampling over a long period of time, going back every three or four years and trying to pick the methods that are efficient in collecting data, has meant that the actual cost of carrying out our research has really not been that great.

**EMMA BURNS:** So is it feasible to do a cost benefit analysis to demonstrate that point empirically?

**BRAD LAW:** Yes, absolutely it's feasible to do. We've just never sat down and done it.

**JONATHAN MAJER:** Invertebrate work is relatively inexpensive providing travel is not a big issue. The cost comes in terms of the sorting afterwards, because a day in the field is worth about a week in the lab doing the sorting. Being a lecturer helps by having students involved, but I do counsel against putting it all in the hands of a succession of different technical assistants or students. You have to have quality control of the sorting. In our case, we've never let the students just hand in the finished product. We have always verified all the identifications to ensure continuity over the long term.

**ALAN YORK:** When we went back for the 2012

re-measurement, we employed a post doctoral project manager because they're dealing with ten academics who are only interested in their own sub project. So Marcus went back and re established all the plots, set up standard protocols, managed the database and then managed storage of those data at the end. So, yes, it was really important to have that continuity across all of the sub projects.

**PETER BANKS** (University of Sydney): I just wanted to pick up on something that Jonathan said. What strategies do you think are needed to tap into the resources that people, like you, who have retired and have these long term datasets, in order to make them more accessible?

**JONATHAN MAJER:** With ants, there are long term depositories of insect data and there are people like Rob Dunn, and Heloise here as well, who are collating databases on ant surveys. I'm sure there are people doing other groups around the world and extracting trends over time and space from these datasets

I learnt computing on a Macintosh and the university forced me to go over to PCs for a while because we leased them. I lost quite a few files in the exchange. When I retired, I went back to Macintoshes immediately. I lost more files from the PC in that case.

**PAUL WILLIS:** Isn't technology wonderful?

**JONATHAN MAJER:** Yes, so hard copies are a good thing to have, and basically deposit them in museums, if you possibly can. I omitted to mention that not only have we deposited our ant collection in the museum, which has the original code numbers and now has the definitive determinations of these ants, and the intermediate names they went through when they changed names multiple times, we have also deposited the reference collections from the individual studies we've done. It might have been Alcoa species 1, Alcoa species 2, 3 and 4, so one has access to that as well. But I really don't know what the answer is about preserving the data, because you put it on certain databases and then they become unreadable after a period of time because of the superseding of the software.

**HELOISE GIBB:** I mean, the dataset that I was talking about today, and I think also what you were talking about, Alan, was actually started before us. We're also talking about young scientists and how they can get into this long term data. You don't always have to start up your own long term dataset. There will be elements of long term datasets that need someone who is specialised in a particular area, who can value add, and then eventually to make really good long-term datasets, there will need to be a succession of datasets. They will need to be inherited by someone else. I think perhaps it's something that can be incorporated into grant applications. You've got a particular question, and if you've also got this long-term data that you can build on, even if it was primarily collected by somebody else, I think that's beneficial for answering a lot of questions.

**BRAD LAW:** From a government perspective, our department has been responsible for a range of long-term experiments and a lot of data have accumulated and a lot has never been published. It is a great resource for other people to use and we're going through a process now of making sure that that's all databased in a way that can be accessible to people, and also making it widely known that the data exist so that people can come along and do something with it.

**PAUL WILLIS:** Your comments on saving data there, Jonathan, does bring to mind the story that's going around the internet of the parent who showed their child a 3 and a half inch floppy disc and they said, "Great! You've just 3D printed the Save symbol." A question up the back up here.

**PETER JARMAN** (Tasmania): Most speakers have been talking about the emergent properties of assemblages or populations. Peter Fleming, and now Brad, have talked about data at the individual level. I wanted to ask Brad, are there other properties of individuals that are being monitored, things other than longevity, like pregnancy rates or birth intervals, that can be interpreted as changing over time?

**BRAD LAW:** With our banding data, every bat that we catch we record reproductive status and weight as part of looking at survival and population size. The challenge is to have the time and resources to delve into all the data that's been collected. We're focusing on the key aspects that we think are important, but there is a wealth of data that's been collected.

We have another project where we work on a species of bat that can't easily be detected with bat detectors. We've radio-tracked these bats over a series of times and we've looked at what trees they use as roost trees and how that changes before and after logging.

**TERRY DAWSON** (UNSW): There is another set of data that's been neglected here, and these are unpublished PhD theses. This has always worried me. I've been very active in getting my students to publish their theses, but there's still data in them that hasn't been used. At Fowlers Gap we have copies of most of the theses that have been done over the last 30 to 40 years, and if they're not at Fowlers Gap, then they're in the University of New South Wales library. There's a huge goldmine of data there that's never going to see the light. People don't know it's even there. There are some really good studies, but for some reason, they were just never published.

There are hard copies of these theses available, but how do you get them into the system? They're technically available to be looked at, and the university has talked about getting all these scanned, which will probably mean they will all disappear sometime. This has always worried me. A lot of our grant money went into supporting these students and in a lot of cases, it's very good data, very good

stories, a lot of behavioural ecology of kangaroos still not published, as well as a lot of other stories.

**PAUL WILLIS:** Data hidden in unpublished PhDs. Have you encountered this problem? Jonathan, you've got a comment there?

**JONATHAN MAJER:** It's a very good point. I think most universities now, with current theses, the candidates are encouraged to deposit eTheses; however, there is the backlog and it would be very good to see those scanned. In addition, one would need very good key words and cross referencing so people can access these things. I'm constantly struck by the number of people who are rediscovering the wheel because they're unaware of what has been done before.

**PAUL WILLIS:** Okay. We've got one last question and we might be able to squeeze this in.

**JESSICA O'DONNELL** (Australian Museum): I'm talking last today, and I just want to say that I'll be talking about an opportunity for things like old PhD theses to actually be transcribed online. I'm just hearing a lot of the same things, and the DigiVol program at the museum is a really great potential resource for actually capturing all these data.

**PAUL WILLIS:** In the best Tony Jones style, I think I'll take that as a comment. To go round the panel before we wrap up, how many of your long-term studies started out being planned to be long-term studies, and how many of them just grew into being long-term studies? So how much planning upfront did you have around the longevity of the studies?

**JONATHAN MAJER:** Well, one, the Alcoa study, it did start off as a long-term study; the others were opportunistic.

**ALAN YORK:** From a different perspective, I inherited a number of studies that other people had set up. The problem, which has been identified by many people over the years, is they were never resourced to last the length of time that they needed to be, so people like me appear, get some money, do some work, and then it goes into an hiatus for a while. The problem is the mechanism of sustaining the resources to keep things going.

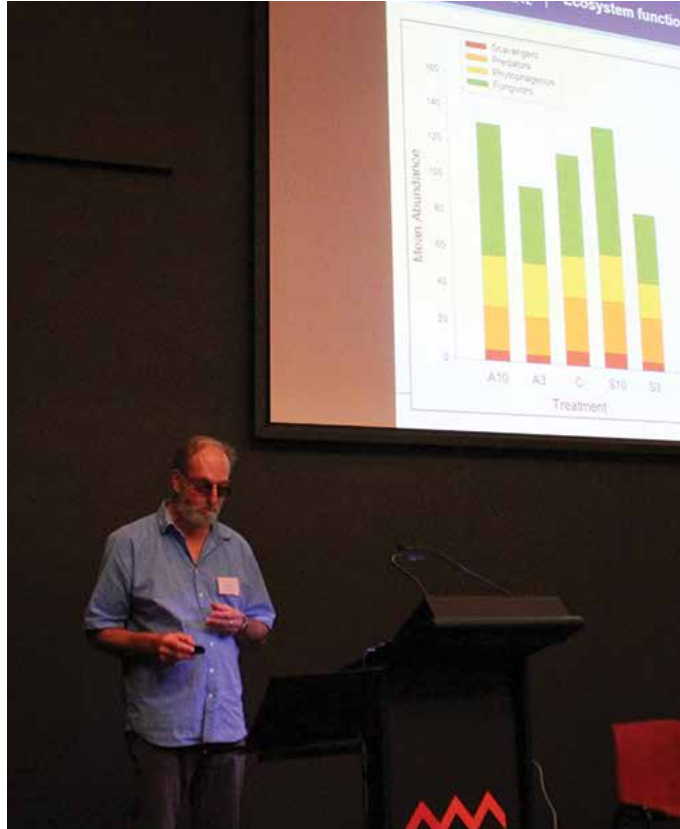
**HELOISE GIBB:** I won't comment on the study I talked about today, because that was set up by Chris Dickman. My own study has been going for longer periods, I started out with the hope of being able to do it. I wasn't necessarily thinking 20 years, but maybe six years or so, to be able to strongly detect effects. It means that you've got to be able to get more than one round of funding to get started and, once you've done that, you realise that you could keep going and so you try to do that.

**BRAD LAW:** Being a government department person, when I started I could see the value in long-term research and, at that time, that sort of work was one of the roles of government departments. I did specifically set out to either build onto projects, but also to establish long-term research projects on bats. But there were still a number of other opportunities. We had a wildfire in the Pilliga where we had existing data, and we've been able to go back and look at the effects of that wildfire. There are definitely opportunistic things that happen where you can try and make the most of them.

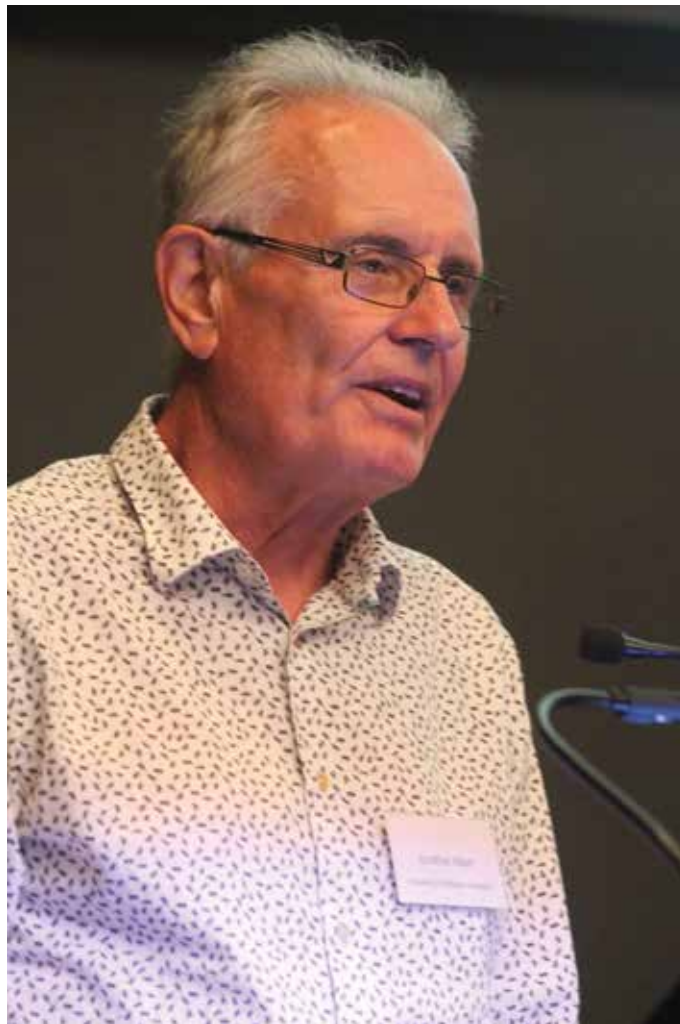
**PAUL WILLIS:** Ladies and gentlemen, can I call on you for a huge round of applause and appreciation for our speakers in the second session today.

**PLENARY 2 ENDS**

PHOTOGRAPHS



Alan York.  
All photos by Dan Lunney.



Jonathan Majer.



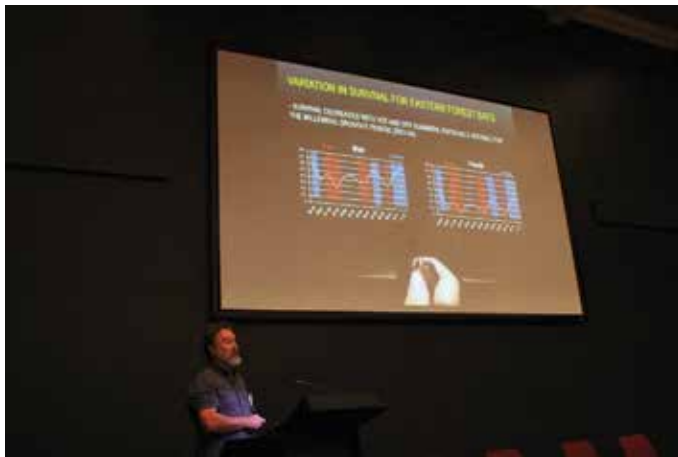
PHOTOGRAPHS



Heloise Gibb on left. Council members of the Royal Zoological Society of NSW, Peggy Eby, centre, and Adele Haythornthwaite (chair of this plenary) right, managing the computer for the forum.



Heloise Gibb.



Brad Law.



Panel discussion: from left, Jonathan Majer, Alan York, Heloise Gibb and Brad Law.