

New approaches to zoology: Plenary 3

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Following the third session of the forum, we held a question and answer session facilitated by Paul Willis. The presentations covered by this plenary session were:

- Citizen science for turtles: Risk, potentials and successes (Claudia Santori, University of Sydney)
- Unleashing the potential of citizen science for NSW (Erin Roger, NSW Office of Environment and Heritage)
- How social media can create impacts for research (Paul Willis, Media Engagement Services)
- A citizen-driven tool to help monitor avian biodiversity in urban greenspaces of Sydney (Corey Callaghan, University of New South Wales)
- Where the wild things go: a new epoch for animal biotelemetry (Peggy Newman, Atlas of Living Australia)

The posters covered by this plenary session were:

- From scats to traps: how scat samples paved the way for future research (Rebecca Gooley, University of Sydney)
- Characterising the diet of Tasmanian devils introduced to an offshore island (Elspeth McLennan, University of Sydney)
- What we can do with poo: studying the gut microbiome of the endangered Tasmanian devil (Rowena Chong, University of Sydney)
- Using passive acoustic recording and automated call identification to survey koalas in the southern forests of New South Wales (Brad Law, NSW Department of Primary Industries)

The following is a transcript of the plenary proceedings, lightly edited for readability.

PAUL WILLIS: It's terrific, the whole citizen science field - what a wonderful resource it is, not only in zoology and the earth - the biological sciences, but there have been citizen science projects in astronomy, and - all over the place. Terrific stuff, but when you think about what you've presented to us, there's a preponderance of citizen science projects about the charismatics. Lots of warm furrys, lots of birds, how do we encourage citizen science around the less desirable aspects of zoology? Do we need to set up a slug watch? Do we need to think about how we market invertebrate zoology to citizen science? Is this a realistic problem, can we generate a citizen science body around an unpopular or unappealing subject area? Any thoughts on that idea?

PEGGY NEWMAN (Atlas of Living Australia):

Yes, I have thoughts. How many people here have used iNaturalist? Does anyone come across it? It's a fairly broad citizen science platform where it encourages crowd-sourced identifications. People who are interested in a particular species can go and find other people who are interested in a particular species, and what's grown out of that? I don't have broad experience with it, but I know for example, in New Zealand, there's a really active fungi community, so I think if you build the right platform, - and we can see that through the development of all smaller citizen science platforms - those people do find each other.

PAUL WILLIS: That kind of work is going on, we do have slug watch out there, do we?

PEGGY NEWMAN: I think the iNaturalist platform is useful for those sorts of things because it's broad enough to cover any different types. You can go in and take photos of the thing that you're interested in, or you can just register yourself as a person who is interested in the thing.

PAUL WILLIS: Even things like mosquito watch?

PEGGY NEWMAN: Yes.

PAUL WILLIS: Mozzie-watch wouldn't necessarily be popular, but would be a wonderful citizen science project, if we could get citizens interested in mosquitos.

ERIN ROGER (NSW Office of Environment and Heritage): That's actually a big global project. The United Nations is backing that one, it's called the global mosquito project. Obviously financed out the health industry, and the human implications for us being able to track and monitor mosquitos already there.

PAUL WILLIS: So, citizens are signing up for mosquito watch?

ERIN ROGER: Absolutely.

PAUL WILLIS: Fantastic, fantastic. So, that is happening. Let's just briefly bring in the posters [as part of the forum, posters were presented]. I had a quick look over the posters - A common theme seems to be poo, and Tasmanian devils. So, for those of you who didn't get a chance to have a look at the posters, can we just quickly describe your posters, please.

REBECCA GOOLEY (University of Sydney): My poster was working with scat samples that were opportunistically collected - - -

PAUL WILLIS: Scat samples is such a nice term.

REBECCA GOOLEY: It's a nicer term

PAUL WILLIS: We're talking shit.

REBECCA GOOLEY: Yeah.

PAUL WILLIS: Carry on undeterred.

REBECCA GOOLEY: Scats were collected in the remote areas of Tasmania, where it wasn't known if Tasmanian devils actually existed, and it was difficult to get there, you have to either travel by helicopter, or ship. So, it's a remote area, and we were able to confirm that devils did exist there, and furthermore, that paved a future research program that showed that they were disease free, which was very exciting because pretty much all of the Tasmanian devil populations that we know about have Devil Facial Tumour Disease.

PAUL WILLIS: Fantastic. Okay.

ELSPETH MCLENNAN (University of Sydney): My poster was looking at devils from Maria Island, which were introduced there from captive facilities. Devils were never on Maria before, so we were interested in what would happen if you introduced a predator into what's essentially a naïve system. We had done scat surveys there before, just using traditional morphological methods, but that's really hard to define down to the species level, so I'm looking to use a barcoding technique. This is basically using genetics to see if we can improve on that, so they can get a good idea of whether devils are really targeting specific groups, and if we can perform mitigation strategies for those species.

PAUL WILLIS: Okay.

ROWENA CHONG (University of Sydney): My poster is about my work using scat samples to study the gut microbiome of the Tasmanian Devil. Our previous research has shown that captive devils have significantly lower microbial diversity in their gut microbiome compared to wild devils, so, part of my research is to look at whether when we release captive devils back out into the wild, whether their gut microbiome can change, whether they can reacquire that wild type microbiome. We've collected scat samples from captive devils being reintroduced into the wild at different time points, and looking at their microbiome changes throughout time.

PAUL WILLIS: Okay. Brad, were you the last poster?

BRADLAW (NSW Department of Primary Industries): I did have a poster. It wasn't very scatty, but it was example

of how you would do an acoustic survey for koalas. We collaborated with Paul Roe, who spoke earlier today, and we did a trial in the southern forests of New South Wales to look at how you would use sound recorders to detect koalas. The male koalas produce a loud bellow during the spring season, and we did co-locate our sites with sites that the NSW Office of Environment and Heritage used to survey koalas by scat, so we compared the two methods. We looked at how different environmental variables would affect the recording of those koala calls, and it proved to be a good method. We had about 3,000 hours' worth of recordings, and we could extract the data from that using an automated software method, which worked quite well.

PAUL WILLIS: Excellent. So, ladies and gentlemen, do we have any questions arising out of that last session, or out of the posters?

PAUL ADAM (University of New South Wales): The comments that you just made about particular groups, the mozzie watch program in New South Wales, it's very active, it's run through the Department of Health, by the governments medical entomologist, there is active monitoring of those sorts of things. When it comes to slugs, I don't know about Australia, but one of the first of the biological Atlas' produced for Britain was for slugs, that was a long time ago.

PAUL WILLIS: I was talking about those in the context of a citizen science projects.

PAUL ADAM: They were citizen science projects.

PAUL WILLIS: Okay, right.

PAUL ADAM: Of course, there's been a long tradition of citizen science in the sense of people collecting data on a systematic grid cell basis for all sorts of obscure groups. The British like to think they invented it, but they didn't. In fact it started in the Netherlands 20 years earlier. So, there's that side of things which is very well established, and as for fungi, there's very active fungal recording in New South Wales at least, and in Victoria, and I think in Tasmania at least so, you know, these groups have their devotees.

I agree with the point that Claudia [Santori] raised, in that it seems to me that there are different types of citizen science, and we're in grave danger of losing some of them.

Darwin was a person who, having all the Wedgewood money, was able to pay his own way and do his own thing. But there's a long tradition of medical doctors, clergyman and all sorts who've done science out on their own, major projects in which they control. However, it's increasingly difficult for those sorts of people these days, because of all the licensing conditions that exist. A further problem is

journals - major journals, or at least some of them, are very reluctant to publish papers from somebody from a private address anymore. That's a dying aspect of citizen science, I think, perhaps, we need to be a bit worried about.

With a citizen science program, it does get all sorts of people in, gets them enthused, and it's great. One of the disadvantages of getting old is you get more cynical.

PAUL WILLIS: More cynical?

PAUL ADAM: More cynical, it is possible. One of the things that does concern me about a lot of the enthusiasm of governments around the world for citizen science is because they're not paying their own scientists anymore, so many institutions are being gutted and downsized, that the only way that we're going to get this data which we need for natural resource management and other things is by dragooning the public into doing it for free.

PAUL WILLIS: It wasn't so long ago that we called citizen science, volunteers.

PAUL ADAM: Yes, and the sorts of things that Erin was talking about, they do enthuse people, and they get people actively involved, and hopefully convert some of them into lobbyists for the particular thing that they know something about. But I think a lot of those programs are very often for professional scientists rather than the public. This also tends to make a distinction between the scientists and the amateurs whose knowledge is critical for citizen science.

PAUL WILLIS: Okay. Well, let's break that down then into two points. I'll just throw it open to the panel from the last session, around first of all, are we watching the demise of the citizen scientist while we're watching the rise of the citizen science. Do you think that that's actually happening? Any commentary?

ERIN ROGER: I think those were great points Paul, I think you see both, I think you see from the top down, so government is pushing this, I take your point about cutbacks to government, and perhaps as another vehicle to collect that data that now there isn't the staff to do that, and that's certainly been raised quite a bit in this context.

But, I think the challenges that we have globally, you wouldn't have enough paid scientists as it is to be able to collect the data at the scales that we need. In terms of the amateurs, we've done actually some research around that, and there isn't a lot of grass roots interest at the moment in Australia, in terms of people coming from the bottom and wanting to initiate a project, but that certainly is much larger in the US, for example, where citizen science has more funding under the Obama administration, it was certainly a legislative requirement, and absolutely, the Europeans are well ahead of Australia in this space.

So, I think Australia is still early days in terms of the grass roots movement, but we need to recognise that it can come from all different directions.

PAUL WILLIS: That covered off on both the questions really, didn't it? So, do we have any comment on the second question, that being around the question - the rise of citizen science in effect, it's undercutting the work of science in the government, which can say, look, science is being done, we've got all these citizen scientists out there doing all this wonderful stuff, that's going to affect funding, isn't it? Any commentary there?

CLAUDIA SANTORI (University of Sydney): I don't really have the specific answers to that comment, or question. But I had a bit of an example of the rise of the citizen scientist figure. For our project, we actually involved very experienced citizens that, you know, they used to do their own turtle watching and they know their sites really well, and they're really, really passionate about turtles, and involved them in TurtleSAT, and so we kind of help each other and collaborate in a way.

Perhaps this is not generalisable, but in our case, we have instances where people perhaps would do their own thing, and collaborating - we are in a way, making use of their knowledge on the ground, and they can have an output where their efforts can be useful in terms of academic publications and so on, so there can be some collaboration there.

PAUL WILLIS: I can see Paul's point, you know, the fact that we've got citizen science on board and people doing stuff, that's great, there is an obvious benefit in that, it's just that question, is there a possible negative side, because, you know, all this activity is going on, and so the funding people can say, well, all that activity is going on, what do you need more money for?

COREY CALLAGHAN (University of NSW): I don't disagree, but I think you have to couch it differently. I think you have to think about funding, and I think that you need to think critically about what we can get out of citizen science, and so it's more about targeted spending. So, if you know what you can get from the citizen science initiative, there's always going to be things that you necessarily can't get, right? So, there's always going to be more detailed data that you need, like, reproductive success, going in and collecting what scientists have been trained for, and I think that that's where the differentiation comes, and more strategic spending would be my answer to that comment.

PAUL WILLIS: Okay, let's move on for another question.

[NAME NOT PROVIDED]: I have a question for Claudia. It struck me with the turtle project, that when we go out and we study animals, we are subject to very close ethics scrutiny. To get permission to even send a small team in to go and look at nests of something is quite difficult. Is

somebody giving some thought to the impact that we might be having on your animal group in particular about sending maybe, hundreds of people now, or thousands of people, in hunting for these animals - it might become a sort of game where they want to find more and more, and it might escalate. Are we thinking about the levels of disturbance that we might be creating as a consequence?

CLAUDIA SANTORI: Thank you for your question, that's a very good point. At the moment TurtleSAT as a project is not organising structured surveys - sometimes they happen, people just organise some turtle watches - but normally, they're just quite haphazard observations - some people might walk around the wetland where they live nearby, and they might bump into a turtle or see one basking and those are the kind. So, it's not so much going and looking for turtles in the bushes or looking for nests necessarily.

In the case of nests, the majority of nests that are found are because they're dug up by foxes. Foxes find more than 90 per cent of nests, and they eat the eggs pretty much as soon as they're laid, so the vast majority of our nesting observations are dug up nests - there's really no disturbance in that sense. For the turtles, mostly are either roadkill, or maybe basking observations, because it's quite hard to actually see a turtle walking around apart from sometimes longnecks.

ERIN ROGER: Just quickly for the chair, the animal ethics committee was here, and it's certainly something that they're starting to think about in New South Wales, in terms of the approvals for citizen science surveys, and when we go out and lead bird surveys, we always get an animal ethics application for that, so it's coming, people are thinking about it, and what the implications are.

JACQUI MARLOW: I'm a citizen scientist, with Erin Rogers actually, and we set up a roadkill reduction committee after 2001 when we found we had major roadkill on the northern beaches [of Sydney]. We have been effective in getting a \$7,000,000 overpass planned for the Mona Vale Road upgrade, and another \$2,000,000 overpass planned, so that the connectivity remains between Garigal National Park and Ku-ring-Gai National Park. Our biggest problem has been what I asked Romane about - how do you effect change? We have lots of information coming in, but you take it to politicians, there was a Premier of New South Wales who shall remain nameless, who was even presented with a baby wombat, looked at it, and went "ugh", and did not respond to our needs for connectivity.

So, citizen science can be driven by the need to effect change, but we still come back again, and again, to how do we effectively effect change at a government level? By the way, there is a roadkill website called www.wildlifemapping.org. Please put in roadkill data. It works all over the world, actually.

PAUL WILLIS: Maybe a catchier name might be www.splat. Anyway, we'll take that as a comment. Here we go, a question over here.

MEL SNAPE (ACT Government): I just had a comment on that, and something that was brought up before. One of the issues we face with citizen science is that whilst there's a massive amount of data collected, the data itself isn't really science, it's data, and I guess the role of the government organisation, or the university using that data to answer a question, and what the Atlas of Living Australia is doing is definitely going to help with that sort of stuff. But it's stuff that we've heard lots about, about teasing apart distribution data based on where people are actually looking, and actually using that to adjust management. So I guess that's where the role of the employed scientist is going to be pretty stable, I think, because you need the data collection, whilst that's often the expensive bit, it's also normally the easy bit, so you still need those people employed to actually make sense of the data and change policy, or whatever it is.

PAUL WILLIS: I can imagine that trolls in one form or another could be a problem with any online endeavour, like an online citizen science survey, how do you control for the tourist operator who sees more turtles than anybody else, because that's going to be good for his business, or the roo shooter who might bring in a number of subtle biases as to how many roos he sees, because that's going to affect his business. Are those sorts of potential biases, is there anything you can do about them? Can you identify them?

CLAUDIA SANTORI: For our platform, citizen scientists are encouraged to upload a photo - Not everybody does, but that would be a way to validate whether they actually saw something. It could be an old photo or whatever, but they are encouraged to put as much information as possible, so that we can have a look and check.

PAUL WILLIS: But, if they wanted to bias it, and they find one turtle and they take half a dozen photographs of it from different angles, and submit that as half a dozen different sightings, maybe even spread out over a couple of days to try and cover their tracks, would you be able to spot that kind of thing?

CLAUDIA SANTORI: It depends on how you're looking at the data, and what type of questions you're interested in to answer with the dataset. For spatial analysis for example, you could do something called data thinning - you could set up a grid and take random observations in say, any grid point, so if you have say, 20 in one location, you treat it as one and so on. This is just one example of the things that you can do, so that you can have a more even spread.

MR KOM: From your experience with social media platforms, can you give us some leads on how social media can be effectively used to influence politicians and policy, or is that another topic for another symposium?

PAUL WILLIS: That's a whole seminar in itself. If you want to include politicians in your social media network, go through Twitter, that's where the politicians tend to go through, as evidenced by Donald Trump. Twitter can be a very useful way of connecting with politicians, but also with bureaucrats in the public service in the area that you are interested in.

My words of advice around including politicians in your social media feed is try not to be partisan, so if you have the minister for the environment in your social media feed, make sure you also have the counterpart from the opposition, and also do not follow politicians that are not relevant to your research, because that then starts to make your whole feed look politically biased, and you don't really want to have - maybe you do want to be identified as a particular political persuasion, but that is the problem with just unregulated admission of politicians and political leaders into your social media network.

It is a really useful way of engaging with politicians, because politicians are very keen on social media, and so if they are aware of you, and you are posting stuff earmarked for them on social media, there's a damn good chance that they'll actually see it, whereas if you'd just write a letter in, you might get a response, but only you and the minister will have seen that, whereas if you put a tweet up saying, hey minister so and so, what about this situation? Not only are they likely to respond, but lots of people will see that message, and so therefore they're more likely to respond. So, yes, it can be a very useful tool for encouraging political dialogue, shall we say.

A further question is, will publication on social media jeopardise your research publications in peer review journals. It can, if you put the wrong stuff up, and

one thing that you need to be cognisant of before you hit send is, will this post jeopardise a peer reviewed publication that hasn't been published? There is lots of other stuff that you can talk about that will not compromise a peer reviewed publication, but that nonetheless tells the story of your research, so there's - again, I've got a whole workshop around what is appropriate to publish, and what not to publish.

Can I quickly give you my two rules about engagement on social media? I call them my mum and dad rules. The mum rule is never put anything online that my mum would be embarrassed to see. It's about online behaviour. It's about behaving nicely, and I'm not saying my mum is a prude, but she would be intensely offended if I was to be rude in public, or abusive or whatever, so before I hit send, I think of what my mum's face would look like if she read that post, and if she's got that look on her face, I don't hit send.

The dad rule is never put anything online that my dad wouldn't understand. This goes to the heart of comprehensibility. I'm not saying my dad is thick, but he had nothing to do with my research. My dad was a professional musician all of his life. He was a smart enough bloke, he didn't finish high school, but he was an intelligent average kind of guy, and if I had to put together a particular complicated story on Catalyst for instance, I would run the script past him before I would go and record it, and if he got it, I knew I'd got it right. If he didn't get it, then I knew I had to go and rewrite that script until dad understood. So, remember the mum and dad rules, and that will steer you clear 90 per cent of the time, on social media.

Ladies and gentlemen, can we have a big round of applause for the posters, and the last session. Thank you very much.