New approaches to zoology: Plenary 2

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

- Back to the future: Aerial surveillance from 'blimps' for ecology and conservation (Kye Adams *et al.* University of Wollongong)
- Using drones to monitor large and complex breeding bird colonies (Mitchell Lyons, University of NSW)
- Sniffing solutions to enhance koala conservation (Romane Cristescu *et al.* University of the Sunshine Coast)
- Collect, connect, upscale: revolutionising the uptake of citizen science in bird research and conservation (Micha Jackson, University of Queensland).

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

PAUL WILLIS: I have so many questions I don't know where to start. No, it's obvious where I start - I can't go past koala clap and crap detection. Let's face it, ladies and gentlemen, it's somewhat loving, and what actually went through my mind when you were showing us what the dogs are capable of, I thought about other applications where dogs' sense of smell comes into play, such as truffle hunting, and I was wondering have you done any experimenting around the different breeds and if there are breeds that are better at being able to do this sort of scent tracking. But also, when it comes to truffle hunting, pigs are actually better at it than dogs. So, have you thought about bringing some pigs into the equation?

ROMANE CRISTESCU (University of the Sunshine Coast): It's very easy for me to answer that second question first. We have tried and our animal ethics committee said no.

PAUL WILLIS: Really?

ROMANE CRISTESCU: But we still think it's potentially really good because pigs are really good at sniffing.

PAUL WILLIS: But you could simultaneously raise your own bacon. What about other dog breeds then?

ROMANE CRISTESCU: So, everyone has kind of got a different answer to that, so I'll give you mine first. I think every breed is great. It's more a question of personality, so you need a dog that can be motivated throughout the day but that also will not chase wildlife for conservation purposes. That's the added difficulty that we have - Some animals are more inclined to chase.

We are trying to test it too, because that's just my feel, and the way to do that is to have lots and lots of dogs which is really hard. So, we actually - it's a nice link - we call on the citizen scientists and their pet dogs. We have been training about 50 different dogs and so far, it's not a breed thing but we're halfway through analysing the data.

PAUL WILLIS: Excellent, interesting. If there was a common theme that was touched on through the presentations in this session it was not so much exploration of the technology that you're interested in, but how to extend that by integrating it with other technologies and other datasets. For instance, Mitchell, you were talking about it's one thing to have the drone ships, but then you need ground truthing. Could you look at photogrammetry and other survey techniques and how you can integrate that in with drone data to improve the quality of the dataset?

MITCHEL LYONS (University of New South Wales): Whenever you fly drones, you have a large range of datasets that come along with that and one of it is the imagery, but the other one is that you also create 3D data about the landscape. The way you actually generate the imagery is by first generating a 3D reconstruction of the landscape and that's used to autocorrect all the imagery.

Something we did try was using the 3D point cloud to try and see if we could see the nest, because they make the nest by bashing down the lignum and making these little mounds. It works okay locally but the problem is there's also lots of little bushes everywhere that look like a nest. Certainly, it can be one of the layers that feeds into some kind of predictive or remotesensing based model, so it's just one kind of branch on the tree.

PAUL WILLIS: And are you convinced that you're surveying at the right wavelength? Would you get a different result if you were to maybe go to infrared?

MITCHEL LYONS: Yes. It would be actually really quite useful to, say, have almost like a hyperspectral sense of doing this stuff, because the guano would have a very different signature to everything else in the landscape. The only problem is that the more wavelengths you try to measure, the bigger the sensor becomes, which means the bigger the

drone becomes, which means the bigger the effort of doing the survey, the less survey area you can survey. We have used infrared drones and that helps distinguishing live and dead vegetation and water, but unfortunately, the bigger hyperspectral sensors have to go on bigger copters which means we definitely couldn't survey a colony of that size.

PAUL WILLIS: So, Kye, integrating with other datasets. You've got the cameras on the blimps. What about ground observations, and how can you integrate those datasets in what you're seeing out of the blimp?

KYE ADAMS (University of Wollongong): Yes, that's a very interesting point that was raised in our talk as well with integrating multiple datasets. I suppose with the blimp, for our purposes, the most useful data that probably the government will get out of it would be beach visitation rates and people using the water and how they're using it, in terms of tourism and that kind of thing. So, there's not just wildlife but also watching human activity. Obviously, there would be privacy concerns; some people might not want to be watched. So, we're doing social surveys in conjunction with our research to make sure people understand what the blimp is there for and seeing whether they're comfortable being monitored.

PAUL WILLIS: You just touched on another question that was raised in my mind, not only in this session but also in the previous session, and that is what's the legality of you guys going out and recording data using recording machines? If you're recording sound, if you're recording images, I know from coming from a media background that technically what you're doing is illegal because you are covertly recording the environment. Have you had to take this into consideration in any of your studies? Have you had to put up signs saying "Beware, we are currently conducting surveillance in this area"?

KYE ADAMS: We do put up signs but they're not really for privacy issues. It's mainly to make sure people don't sue us if they do get bitten under our equipment, saying there's a trial in progress and we're not confident in our platform in preventing a hundred per cent of shark incidents. And particularly we don't need animal ethics or human ethics to do our surveys. People's faces aren't recognisable in any of our footage, so they're just small specks.

PAUL WILLIS: Yes, it's a really interesting area. As I said, coming from a media background, there is a lot of literature on what you can and you can't film. Even if someone is not recognisable, if you are covertly filming, if they're not aware that you're filming, then even if you don't publish those images you can get into a lot of trouble. So going back to the last session, for example Cathy [Herbert], you know, it's all very well sticking a camera on a kangaroo, but are there legal issues around permission to film in the area where those kangaroos are if someone was to come into shot? Do you have to take into consideration the legal aspects around that?

PAUL MEEK (NSW Department of Primary Industries): You're completely correct. We've looked at this issue with Professor Des Butler from Queensland University, and camera trapping and people is a real risk. We've published a couple of papers on it now to try and give people a heads-up and, yes, you do have to give people advanced warning. The worst scenario for you is a person with information on individuals who's transferring that information over social media. The moment you actually transmit it and pass it on, you're then at risk.

So, the advice we've had from Des is that we need to advertise that we are doing the work and if you get pictures of people, you need to be very careful about how you manage them. His advice is delete them. But even if you go to every extreme to protect yourself, there's still a chance that you will be prosecuted and I believe, speaking to him about three months ago, he's writing a paper on the issues of privacy when using drones.

So, if you want to talk to Des Butler, he's in a position of authority to help us with that advice because we all are at risk now with collecting images of people. The most important thing he taught me was every time I deploy a camera trap it's always for wildlife, it's never for people, because the moment you start monitoring people, it triggers a whole suite of other Acts for surveillance and then you've got conditions like the police do for monitoring.

PAUL WILLIS: The rollout of technology has gone way ahead of the rules and regulations and now, because of social media and because it's so easy to take images on your phone and broadcast them instantly, the old rules around getting permission for filming of property, of people, of individuals, *et cetera*, they've more or less gone out the window, and the rule of thumb at the moment is that if you are conspicuously filming, then for anybody who is in that shot and anybody whose property is in that shot, the conspicuous filming is tantamount to their giving permission to being in there.

If they come up to you and say, "I don't want to be in the shot," then you have to respect that, but when you go to covertly filming all that goes out the window and you can get into a lot of trouble.

Ladies and gentlemen, it's time to hand this plenary over to you. Do we have any questions, and because we've got the time, you can also ask questions of members from the previous session as well.

JACQUI MARLOW: My question is to Romane. You said that you've got all this information about where your koalas are and then you said you're actually working with infrastructure in Queensland. What effective things have you had happen in koala conservation?

ROMANE CRISTESCU: Thank you for this question. It's very hard to get redesign, I'm not going to lie to you.

So, sadly, when we are called, they already have their design and they're just asking us to confirm or tell them whether they're going to impact on the koala. But we have had mitigation measures included.

So down the line, you're not redesigning but at least you're putting appropriate fencing and underpasses. In our work that mitigation was based on our result of both koala presence but also the genetic connectivity. We ask them to maintain that genetic connectivity and then down the track, they also use all data to calculate offsets.

ANDREA GRIFFIN (University of Newcastle): Micha, I have a question for you. Your take-home message was that we should encourage local birding groups to share data rather than keep them to themselves. Some of us have had experience of trying to obtain data from these local birding groups and encountered some resistance to that, and that seems kind of surprising, because you think shouldn't the overall shared goal of conserving these birds be the primary motivation and be enough to incentivise them to share, but it doesn't seem to be the case, in my experience.

Do you have any insights into what the hurdles are? Why is the sharing difficult for these groups?

MICHA JACKSON (University of Queensland): I think it's an important question generally, and I think it's not in any way specific to any discipline or any subset of particular species or anything. There's probably lots and lots of ways you could be thinking about this question, but I guess the most important thing to think about is good communication in terms of what the output is going to be and how you're going to communicate that and maintaining that well along the whole track.

In my previous role, I worked with land management groups in remote areas across northern Australia and the same thing came up. I think in many cases there's been a history of researchers approaching communities, approaching local groups, asking for all sorts of things and then that group never hears anything from those people again, or the output that came out, which might have been a very long way down the track, was not exactly what the group was expecting in the first place.

I think every local area has different histories with this sort of thing. There's also personalities and all this sort of thing, but I honestly think that good communication is the key thing around all of this, and having frequent open conversations amongst likeminded people and reinforcing the goals that we have in common is the best approach.

People often don't spend time on communication because they think it should be self-evident - "Obviously this is going to have a great conservation outcome. It's going to go in the Journal of Applied Ecology," and that's good for everyone, right? Well, maybe that's not the starting point for everyone. We need to remember to have those open, honest conversations from the beginning, and I think just maintaining dialogue is probably the best.

PAUL WILLIS: Are there also questions there though, of when you get into that level of data sharing, who continues to own that data and what are their expectations out of that data sharing? If you're borrowing someone's data from one of the birdwatching apps, will they expect to be included in the authorship of any publication? Why are there three birdwatching apps? Do they talk to each other and are they three separate datasets? Shouldn't they all be one? Shouldn't they learn to grow up and work together? It's a really complicated area there.

MICHA JACKSON: It is, and I think investigating in having forums for lots of people to talk about this together is another thing. We often don't spend the time to actually have a whole forum talking about these types of issues, and they're not simple issues.

The other thing to keep in mind is for a local group, for example, having one bad experience where maybe they shared their data and the expectations that they had weren't met, or it wasn't talked through or whatever - that can sort of sour people's willingness to contribute their data over the long-term. When people are volunteers and putting in lots and lots of valuable person hours doing things, it's reasonable to expect that they will want to have a proper conversation about the basis of this. So now that big data is really opening up so much, I think having forums that do focus on this issue, even though it can be tedious for all of us, is actually really important.

STEPHEN AMBROSE (Ecological consultant): Just to follow-up on that last point, I'm the former head of research at what is now BirdLife Australia, and so the issue that's just been discussed was sort of foremost in my mind during that time as well. One of the other added complications is the contractual agreement that those groups have with the granting agency that gives the money to collect the data, so often it's beyond really the decision making of that community group or NGO in terms of getting the information to a third party.

PAUL WILLIS: I'll take that as a comment.

DEBBIE SAUNDERS: I've spent many years working on citizen science projects, which are invaluable for conservation, and one of the challenges that is constantly coming up for us is getting people to submit their records for specific types of surveys.

I think it's fantastic having these different apps, and a lot of people are now using eBird instead of perhaps using Birdata. One of the things that I think is concerning - I'll be interested to hear your thoughts - is until we have this global integration of these databases, should we be encouraging local people in Australia to use, say, Birdata, which is then actively used for conservation by government

agencies and the like. If we're collecting data, putting it into eBird and it's based in the UK and our government agencies don't have access to that as readily - I'm not sure if they do or not, but I'll be interested to hear your thoughts.

MICHA JACKSON: I would say that the best thing we can do is probably encourage people to contribute their data to all of them because then we know that there's not going to be that limitation. Like I said, I think there's no reason why just because you collect the data once that you should submit it to one place.

So what we can be doing to help people is make it as easy as possible to contribute data to as many platforms as possible, because these different platforms, as you said, may be accessed by different end users; government might have access to some and not others; the way the data is outputted might be easier for some organisations to deal with than others. The best way that we can get the most out of the data collection is to try and get the data into all of them.

PAUL WILLIS: So, in many ways it's parallel to things like should you be on Google Scholar or Academia or Research Gate

MICHA JACKSON: Yes, you should be on all of them. I think it's our job to make that as easy as possible for the people who are out on the ground doing the hard yards collecting the data.

PAUL WILLIS: But then aren't you going to end up with four copies of the same dataset?

MICHA JACKSON: Yes, but there's nothing wrong with that because all four of those copies might be used for different things. When that becomes an issue is if there's a massive time or resource cost to make that happen, but if we can make that happen seamlessly, I don't think there's any. We're not limited on a global level anymore in terms of data storage or anything like that; that's expanding so rapidly. I don't think there's anything wrong with having four copies of the same data that are used for slightly different things.

KIRSTEN CROSBY: On this same topic, the intellectual property ownership of the data, I'm going out next week for a 300 kilometre survey for a government agency. It's a confidential project. It would be really good to do my bird list on an app, but they hold the data and so the whole legality of putting out information onto these apps before the project is published. That's another comment.

PAUL WILLIS: I'll take that as a comment. Are there other comments on this particular issue, because it seems we've hit a bit of a rich vein here?

TONY SAUNDERS: I've been fairly involved with what was Birds Australia Atlas. I was actually involved in coordinating the data exchange agreement between four separate bodies, and a couple of government bodies also were trying to the share the data. I've been arguing now for about the last 10 years that what is really important is that we aim towards one data source.

The problem with putting data in several databases, and I pointed this out when I was orchestrating the data exchange agreement, is that when you've got multiple data sources, especially for threatened species or rare species, when they finally get pulled together, and they have been in, say, the Atlas of Living Australia, you start going through that, you realise that what you're doing is looking at multiple records from multiple sources sort of duplicated and they haven't been cleaned up. There are a whole lot of problems.

I also use a lot of data in my personal research and from that conference two years ago. One of the things I've got to do with the data I collected from the Cumberland Bird Observers' Club for the Cumberland Plain study that I was doing, is that I will be doing a presentation to that club to stress, "Here's why your data is very valuable and here's what we're doing with it." So you've not only got a responsibility to give that back to the researcher and the research community, but also to the data collectors so they can see the value of it.

Also, the other important thing was to make sure that data then is passed on to other groups that can then use it and then access the pooled source. The problem we have at the moment is that some of the data is agreed to be exchanged but then they can't pass on the data to other users. So, there's another hurdle to get over and I'm trying to work towards fixing that problem as well.

There are lots of problems associated with this, but I think if we work to one data source - it would be nice, for example, as an ecological consultant, you could say, "I've got one place to go for data and I'm collecting the pooled data source as well," and that's something we need to be working towards as well.

PAUL WILLIS: I think we found the subject for next year's forum.

PEGGY NEWMAN (Atlas of Living Australia): I'm from the Atlas of Living Australia, and we do aggregate all of those different datasets from all of those different areas and aspire to do that. Data quality is a huge issue, attribution to the providers of the data is a huge issue and things that we're aware of and very much working with.

We have thousands of data providers and there's huge challenges in bringing those together. We do have a lot of duplicates and that's an analysis problem rather than a data collection problem. We have huge problems with data quality and people actually stating the nature of the data and how it's collected, like collecting metadata

about the data, I think, and that's something we're doing a lot of work on, along with GBIF [Global Biodiversity Information Facility].

Attribution, I think, is also a really important thing that Micha has raised, about making sure that the data providers are adequately given recognition for the contributions that they make. We collect lots of expert data from museums and collections and also put that together with citizen science data.

PAUL WILLIS: If I could come back to you, seeing as you're operating with these databases. Another common thing that's been coming through today is that these new technologies, whether they be drones, surveillance cameras, et cetera, they are generating enormous datasets. The sheer quantity of data and its management, is that actually starting to get in the way of being able to conduct good research, or are there mechanisms for handling that quantity of data so that you can usefully apply it?

PEGGY NEWMAN: Yes, I think it's a real challenge. I'm giving a talk later about how the Atlas is managing tracking data. There's a real challenge with bringing that sort of data back in and mixing it up with the museums' and collections' data which is about specimens in drawers, and we can aggregate that until the cows come home but is it useful? So there are real challenges there, I think, and I start to wonder whether a tool like the atlas, that aggregates all this dataset, becomes a tool for discoverability of those datasets and it being up to the researcher to go and find them and manage them how they need to do their analysis work.