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Conversation with Stephen Buckland

David L. Borchers and Eric Rexstad

Abstract. Stephen Buckland is an Emeritus Professor of Statistics at the University of St Andrews, a fellow of the International Statistics Institute (1995) and a fellow of the Royal Society of Edinburgh (2007). He received his PhD in Statistics from the University of Aberdeen after being appointed a lecturer at the age of 21 at that university. After working as a senior scientist for the Inter-American Tropical Tuna Commission and a Statistician with the Scottish Agricultural Statistics Service (now Biomathematics and Statistics Scotland), he was appointed chair in statistics at St Andrews in 1993. He has made significant and sustained contributions to the development of statistical methods for ecological applications over a period of more than 40 years.

He has co-authored four books (*Birds of North-east Scotland [2], Introduction to Distance Sampling [3], Estimating Animal Abundance [1]* and *Distance Sampling: methods and applications [5]*) and two edited volumes *(Advanced Distance Sampling [4]* and *Modelling Population Dynamics [7]*). In addition, his body of research publications and software has produced in excess of 40000 citations indicating the influence of the statistical methodology he and his collaborators have developed.

He has served as editor-in-chief of Journal of Agricultural, Biological and Environmental Statistics (2015-2019) and associate editor of both Biometrics (2005-2011) and the Australian and New Zealand Journal of Statistics (2001-2002). He also served on the editorial board for Ecological Monographs and Environmental and Ecological Statistics. He established the Centre for Research into Ecological and Environmental Modelling at the University of St Andrews and co-founded the National Centre for Statistical Ecology. He has mentored 20 PhD students.

His career culminated with the receipt of the Guy Medal in Gold awarded by the Royal Statistical Society in 2019. Since his retirement, he continues to make contributions in statistical ecology while serving as a volunteer warden for the Scottish Wildlife Trust.

Key words and phrases: statistical ecology, distance sampling.

Here we are in the Centre for Research into Ecological and Environmental Modelling, known as CREEM for short. It is a centre that Steve Buckland, who is joining me today, was instrumental in setting up. We are going to be quizzing Steve on his career.

David L. Borchers is Professor, Centre for Research into Ecological and Environmental Modelling University of St Andrews St Andrews Scotland. (e-mail: dlb@st-andrews.ac.uk). Eric Rexstad is Senior Research Fellow, Centre for Research into Ecological and Environmental Modelling University of St Andrews St Andrews Scotland. (e-mail: eric.rexstad@st-andrews.ac.uk).

1. EARLY EDUCATION

Borchers: We will get to the formation of CREEM in due course, but we are going to start way back when, before you went to university. You grew up in south-west England. Is there anything prior to university that influenced your career path?

Buckland: Yes, although probably not to do with mathematics or statistics. From a very young age, I was interested in natural history. I remember when I was six, I think, my sister had a field guide of British birds, and it fascinated me. I was interested in insects, plants, and everything from a very young age. Later on, I became a keen bird watcher too.

But on the mathematics side, I remember my mother always almost assumed that I would become an accountant because I was good at maths. Later on, at secondary

school, I had just one session of career advice. Based on having filled in a short form, I was told I should be an actuary!

Borchers: Advice that you then duly went ahead and ignored.

Buckland: I actually took a course in actuarial mathematics and statistics as an undergraduate. And I even applied for a couple of posts. I found the course to be incredibly dull. A lot of memory work, and not anything that fascinated me at all. So by the time I was getting interviews, I was thinking, no, I am not going to accept this post if I am offered it.

Borchers: This was after you went to University of Southampton, where you did a degree in mathematics. At that point, had you given up on the natural sciences and opted for mathematics?

Buckland: I had. And at that time, when I went to university, I had never done any statistics. I had no knowledge at all of computing. In my first year there, I took one course in each. In those days, computing was a matter of punching cards. And then you would submit the cards to the computer centre, and you would get them back the next day. If there was only a little bit of paper attached, you knew that it did not run. You would go through the process again.

I felt I should continue with either computing or statistics for job opportunities, which left statistics. At that time, this was not a particularly positive choice because I barely understood anything in my first course in statistics. It was the lowest mark I got at the end of my first year. But then I took a second course in probability and distribution theory, and that had a much better lecturer, and halfway through that, things just clicked into place. And that was the first university course that I got 100% on.

Borchers: Good grief! So you decided to go the route of statistics, not because you liked it, because at that point, you did not find statistics particularly interesting. It was a strategic career choice at that point.

Buckland: Yes, combined with the fact that I found that pure maths at university was not like pure maths at school. At university, pure maths seemed to be more divorced from the real world than at school. As a consequence, I decided, okay, I will carry on with statistics. The second course went really well, and that was quite a theoretical course. Then there was a statistical methods course, and we had to analyze 10 different data sets. Up until then, I would sort of chose subjects that I could do well at without having to work hard. I had to work hard at the stats methods course, but I really enjoyed it. It made me realize that I could possibly combine my interest in natural history with my career.

Borchers: That was still when you were at Southampton?

Buckland: Yes, second year of Southampton.

2. GRADUATE TRAINING

Borchers: You finished at Southampton and went to University of Edinburgh. Tell us why you did that.

Buckland: I remember writing to the British Trust for Ornithology in my third year at university, shortly before I was due to graduate, asking whether they would employ me, whether they had any jobs for a statistician. And I got a very nice letter back saying they would love to have me, but presumably I would like to be paid!

I had decided by then that I wanted to be an applied statistician. And there were two good biometry masters degrees in the UK at the time. One was at Reading, which was far too close to London for my liking. The other was in Edinburgh, and I had recently been on holiday with my parents to Scotland for the first time, three or four years earlier, and really liked it. So I decided to apply to Edinburgh.

Borchers: Were there individuals, either at Southampton or University of Edinburgh, who influenced you?

Buckland: Well, I should thank Brian Bailey at Southampton because he is the one who gave the probability and distribution theory module. It is the kind of material that could have put me off. Instead, it really clicked for me.

At Edinburgh, David Williams was my supervisor for my master's dissertation. He had been to Australia and had come back with a mark-recapture dataset on galahs, a species of cockatoo. They are regarded as a pest in grain-growing areas. The study birds were wing-tagged and around New Year, quite a few tags would be returned with a bullet hole through the centre. I was told that this was because galahs were extremely noisy when they were coming out of the nest around Christmas time, when Australians are often suffering from hangovers. They were considered a farm pest. It was not just shooters who targeted them either. Someone had the idea of checking a wedge-tailed eagle's nest one time and found a pile of tags in the nest. Eagles even went for specific colours of tag. If you have a flock of these galahs flying up, one with a nice target on it, helps not only the shooter, but also the eagle.

Borchers: Did you put that in your analysis? That is obviously the kind of tag that affects the probability of recapture.

Buckland: Well, it certainly affects the probability of survival. The survival curves I calculated suggested that the population would not be self-sustaining. But then, of course, the study was in one area. There was nothing to measure permanent immigration. The tags themselves really reduced the survival of the birds.

Borchers: That was your first introduction to mark recapture, on which you went on to do considerable work. I presume it was also a nice combination of your interest in birds and wildlife and mathematical statistics. You then went on to get a lectureship in Aberdeen.

Buckland: Yes.

3. FIRST LECTURESHIP

Borchers: How did that come about?

Buckland: I would like to say that it was my ambition, but at the time I was pretty shy. I could not see myself standing in front of university students. But there were very few jobs going. I applied for two. One was in a research group looking at sheep genetics at a research institute near Edinburgh. The other was a lectureship at Aberdeen.

The sheep genetics job I was interviewed for and they offered it to another candidate. A few days later, I went to Aberdeen for an interview. There were three others interviewed. I was age 21 at the time and had not yet completed my MSc. The other three candidates had completed their PhDs. I remember sitting in the room with them and they were talking about their PhD research. I did not understand a word of it. I assumed I had absolutely no chance. I was ready to go birdwatching after the interview.

After we had all been interviewed, again, we were all in one room, and someone came through and I was called back in. To my complete surprise, they offered me a post, a permanent lectureship.

When I got back to Edinburgh, I learned the research institute wanted to see me next day. The first person apparently had turned them down. I spent an afternoon at the research institute. To be honest, I struggled to maintain an interest in what they were saying because it seemed a very dull job. Any uncertainty I had about taking a university post disappeared. It was going to be more of a challenge, more interesting to do the university post.

Borchers: So you were a bit nervous about lecturing when you took that post?

Buckland: Yes, extremely.

Borchers: But presumably the prospect of being able to do research was the attractive thing? Or being in control of your research?

Buckland: Yes, I was pretty naive in those days. So I did not really know much about what research meant. The only taste I had had of it was the master's dissertation. But I realised that at the research institute, I was on a specific project, one that I struggled to find interesting. That is what I would have to devote my time to. Whereas at the university, I realised that I would have more choices.

Borchers: You went into that job with a bit of trepidation because of the lecturing. What were your impressions once you got there? How did you like the job?

Buckland: I remember being very nervous at first teaching. I discovered that the students I was teaching had been doing statistics just as long as I had. But it went okay. I realised that I could do the job at least as well as some of my colleagues and superiors. I guess if they had been a very intimidating group, that might have been a different story. But as it was, the department was not in great shape. It was a statistics department, not mathematics. Most of the staff were research inactive.

I felt I could do better than many of my colleagues. One of whom that I would not say this about is Sheila Gore, now Sheila Bird, who of course has had a high-powered career in medical statistics. After she left, Paul Garthwaite joined the department, and he and I enjoyed working together, resulting in several papers.

Borchers: Would it be true to say that because that research group was not that strong, and you thought you could do as well as some of them, was a confidence booster?

Buckland: I guess so. But I do not know how research active I would have become if it had not been for the fact that ecology was very strong at Aberdeen. In particular, ornithology was very strong at Aberdeen. I gave advice on statistics to several of the PhD students at the time I was there. Stephen Baillie (later head of research at the British Trust for Ornithology) was one of those. A few of the ones who were there at the time went on to careers in ecology, high-powered careers.

Borchers: I am speculating here; the way you were treated there and the environment you found yourself in, did that influence the environment that you went on to create later in your career?

Buckland: I would say what I got out of it was how not to do it.

Borchers: But were there any individuals there that you looked up to and you thought of as role models? Sheila Bird, for example. And what was it about them that you admired?

Buckland: Sheila Bird was energetic. She was a very good colleague, very supportive. Yes, I definitely would have learned from her to work within a group.

Borchers: The fact that they were strong on birds and ecology in particular, did that really cement your interest in combining statistics and ecology?

Buckland: Yes, also, it was not just an interest in mark-recapture that I got from the Edinburgh master's programme. The direction of my research was influenced by another colleague who was the best student on that masters, Richard Hayes, who went on to the London School of Hygiene and Tropical Medicine eventually, into medical statistics. His master's dissertation was on line transect sampling. Because he had moved to a different research area, he asked if I would be willing to take material from his dissertation and write it up for publishing.

Borchers: So that led to the ground-breaking Hayes and Buckland paper [6]. It was his work that you took over?

Buckland: Yes.

Borchers: You ran with that, to put it mildly.

Buckland: Yeah, so that was very influential.

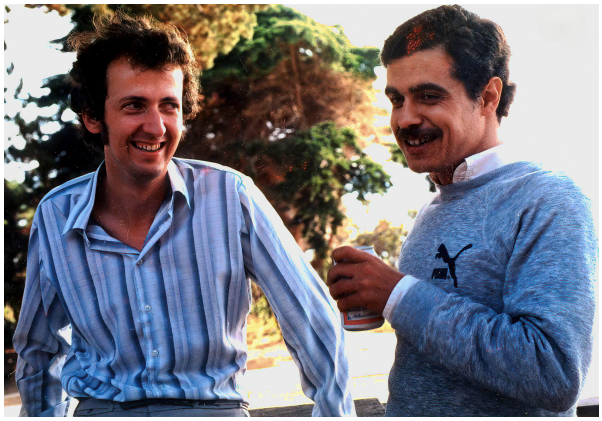

FIG 1. *Steve Buckland (left) and Alejandro Anganuzzi (right) while both were working at the Inter-American Tropical Tuna Commission.*

4. POSTS OUTSIDE OF ACADEMIA

Borchers: After that, you decided to leave academia and move to the Inter-American Tropical Tuna Commission (IATTC) in La Jolla California. What led you to do that?

Buckland: Phil Hammond, who later joined the biology faculty at St. Andrews, invited me to apply a year before I did because I had a project on at Aberdeen at the time, a bird atlas project. In the meantime, Phil moved on, but his successor then contacted me.

Borchers: Tell us about the work that you did at IATTC and about the highlights and difficulties.

Buckland: The statistician who had worked with Phil Hammond there was Jeff Laake. Jeff was still based in San Diego at the time. That is the first time I met with him. He and Phil Hammond had developed methods for estimating trends in dolphin populations that were impacted by the tuna purse seine fisheries. There were various reasons why their trends might have been biased. I was taken on to further develop methods to get more reliable estimates of trend. I worked with Alejandro Anganuzzi (Fig. 1) on developing methods. I was there about two years.

Borchers: Then you moved back to Scotland, but not back to academia. You moved back to the Scottish Agricultural Statistics Service, which is where I started working for and with you. What prompted that move?

Buckland: I had the option to go back to Aberdeen University. But at that time, the department was vulnerable. It was not generating external income. It was not generating research for the most part. Sheila had moved on by that time. I proposed setting up an applied statistics unit to generate research external income. The head of department there responded. He was very keen to get me back. But of course he would have to be head of the unit.

Then I was approached by Rob Kempton, Scottish Agricultural Statistics Service; offering a senior post instead of a junior one.

Borchers: Tell us something about the work you did at the Scottish Agricultural Statistics Service, SASS for short.

Buckland: SASS had headquarters in Edinburgh, but I was based at the Macaulay Institute (now the James Hutton Institute), a land use research institute. We provided consultancy service to the scientists there. While I was there, part of the time I was also a statistician for the Centre for Ecology and Hydrology at Banchory. And also for the Fisheries Research Services Station that has now closed at Torry in Aberdeen.

Borchers: These were separate from your jobs at SASS?

Buckland: They were contracted through SASS. I remember, we had to keep a track of how much time we spent on each project. At the peak, I was having input to about 25 projects a week.

Borchers: Did you keep track of your hours?

Buckland: Well, they were fairly long, but it was split between so many projects that I am not sure how long that would have been sustainable. There was also the issue that there was one group there that Rob Kempton particularly wanted me to work with. They just saw statisticians as a threat.

I was asked to look at their group's estimates of bracken cover in Scotland, because their estimates were three times higher than the estimates of the soil survey group at the same institute. It was perfectly obvious what was going on. The soil survey group went to every five kilometre square intersection in the country and recorded what was at that point. But the remote imaging group were using satellite imagery and classifying each raster, whether it had bracken or not. Of course, these are squares of quite a size.

Borchers: So they are not 100% bracken.

Buckland: Yeah. And it is perfectly obvious, but the head of the imaging group told me that I might be a very good statistician, but I knew absolutely nothing about their area. And he was going to prove that systematic sampling that the soil survey people were doing systematically avoids bracken. That was not a particularly rewarding group to try to work with.

Borchers: Were there any collaborators that you developed there, or role models that you looked up to or could take examples from?

Buckland: Rob Kempton and SASS, now BioSS. It was a fantastic group to work with. At the research institute, to be honest, it was difficult finding good people. David Elston, who was previously based at SASS headquarters in Edinburgh, moved to my group at the Macaulay, and was an inspiring and enthusiastic colleague.

There were good people at the Macaulay who I enjoyed working with such as Iain Gordon and Colin Campbell, but for the most part, it was quite appealing to have the opportunity to come back to academia.

5. CHAIR IN STATISTICS AT ST ANDREWS

Borchers: This was going to be my next question because in 1993 you decided to move back to academia (Fig. 2). Why was that?

Buckland: I remember that the person appointed to replace me at SASS was moving from academia. I mentioned that I was moving back to academia to give me more freedom to work on what I was most interested in. He commented that that was why he was joining SASS. I thought at that point, he was not going to be very successful there. (He lasted a year, after which David Elston was appointed to head the group.)

Borchers: What were your ambitions when you came back to academia?

Buckland: The group at St Andrews had some good senior staff. But the younger staff were not research active. And again, it was at a time when statistics departments were disappearing around the UK and being swallowed up by maths. If that is not done with care, they get replaced by mathematicians because when you advertise a post that can be either maths or stats, you will get lots of able, pure mathematicians applying and very few statisticians. I was anxious to build the group here, which was still large compared with many other places at that time. I was anxious to secure its future. And for that, I saw it as essential to bring in external income. It was very difficult to get research council income. My reason for bringing you (Borchers) first to SASS and then with me to St. Andrews was because I knew you had the ability to attract the kind of funding that we had the potential to pursue.

Borchers: I would think it is quite unusual for a person that young in their career to have that broad national oversight of what is going on in stats departments across the country. How did you come to have that sort of breadth of vision?

Buckland: I do not know. I do not really think of it in terms of breadth of vision. I guess the fact that statistics groups were disappearing all around the country was a big warning flag for me.

Borchers: You came here with the ambition of solidifying the department by getting external income. What was your approach to developing a research programme here?

Buckland: I would like to have had research council funded research students to get things going. I remember Simon Wood was my first academic recruit on coming here. After I had been here just over a year, he and I both put in for funding for a single research student each from NERC (National Environment Research Council) and our proposals had to score 6.5 or higher to have a chance of being funded. Mine scored 4-something. Simon scored 3-something. We know just how good Simon is.

That sent me a message that we are not part of the network that you need to be to get that kind of funding. Instead, I went for funding from organisations that had a problem to be solved that was a suitable problem for a research student to tackle. That, combined with one or two students who were self-funded, allowed us to start building a group based on research students.

FIG 2. *Steve Buckland circa 1995, shortly after taking the post chair of statistics at Univ. of St Andrews.*

Borchers: You had this active vision of solidifying the department by bringing in external funding. Having tried for NERC, you decided that to do that, you needed to get PhD funding from sources other than the standard research councils. That was all driven by this desire to strengthen research in St. Andrews, was it?

Buckland: Yes, and I realised that I had to play on the contacts I had to have much prospect of bringing in funding.

Borchers: You went on to build this incredibly strong research group, which has persisted to this day, even after you have left. I am interested, how you did that? How did you select the people to work with and how did you nurture them to build the strength of this group?

Buckland: As I said earlier, if you advertised a post in statistics, there tended to be very few applicants. You were just hoping that someone really good would apply. I was very fortunate to recruit you and I was very fortunate to recruit Simon to the staff.

In terms of research students, I guess at that stage, we were known enough that people interested in applying statistics to ecology would have heard of us. So Rachel Fewster, for example, knocked on the door one day and despite being given strong advice that she could go somewhere better, she chose to come here. Also the kinds of projects for which we had funding would only appeal to students interested in applying statistics to real problems.

I remember having one very strong pure mathematician, exceptionally strong pure mathematician applying for a post with us. We ended up not offering it to him because there was nothing to indicate he was really motivated to solve real world problems.

Borchers: Nevertheless, you have got some incredibly theoretically strong research staff and students. Rachel and Simon have been two examples.

Buckland: Yes, and I think you have to have theoretical strength in the group. But you want to see some evidence that theoreticians are actually interested in applying methods. They both definitely showed that. I think also you need a group with a range of strengths. Ben Baer, for example, he is a great asset to this group, quite theoretical, but we have also got very applied people. I think that is crucial to a successful group like this. It is also crucial that you play to each person's strengths, whereas so often academics seem to seek out people's weaknesses.

Borchers: How did you go about playing to their strengths?

Buckland: You let people take initiatives when hopefully most people know what their own strengths are. That tends to steer their initiatives. Unless you think it is a very bad idea, I would encourage people to take their own initiative.

Many academic groups are really hierarchical. I do not think that works well. I think PhD students can be just as important contributors as senior staff to a group like this. I think some PhD students know what they want to do. They know how to get on with it. You let them get on with it. Other students need more support and more direction. I would say that at least two of the research students I supervised started off in a way that left me quite concerned whether they would actually get their PhD and yet produced great PhDs at the end of it.

Borchers: So how did you decide? Because, I mean, taking such good care and looking after the interests of your staff takes time away from research. Every hour or two that you spent with developing a student or a staff member, is an hour or two that you could have spent doing research. Were you aware of that cost at the time and how did you prioritize those two things?

Buckland: I decided early on that there is a limit to how much you can do on your own. To make more progress, you actually need a group. For me, the most rewarding work was having a team, achieving more than any one of the individuals could, or even as a set of individuals could do.

Borchers: Another question relating to how you managed PhD students and staff was how did you decide how much responsibility to devolve to your staff or to your PhD students?

Buckland: I am not sure that I made a conscious decision. It was what responsibility were they happy to take. If they wanted the responsibility, let them get on with it. As a PhD student, you are not so tied to results that even a postdoc is. Unless you think they are doing something that is a waste of time, I would be inclined to let them get on with something that they felt was important and they felt motivated to tackle.

Borchers: I know from personal experience, that is not all that you did because when the SCANS (Small Cetaceans in European Atlantic waters and the North Sea) experimental survey happened, you asked me if I wanted to go to Denmark and take charge of it. I did not think I was capable of that, and when you asked, I thought "Who, me?" It was an enormous confidence booster. It was not me taking responsibility, you just chucked it at me.

Buckland: I could just chuck things at you and you would just go with them.

Borchers: But that was a general strategy then, was it?

Buckland: Where I thought people would do a great job of it, yes. Give it to them and let them get on with it.

Borchers: As well as your own research, you have created CREEM in the first place, but also other research groups. Here is a quote, which I think is very appropriate here. "Leadership comes from inspiring others." You certainly did that. How did you do that?

Buckland: I wish I knew because I do not think of myself as being an inspiration. I have never set out with a view that, okay, I need to inspire these people. Whereas some people do. Simon Wood, I would say, is inspirational. I do not think I am.

Borchers: I think you have too low an opinion of yourself. One of the things when you first came here, you set up the contract research group in the University of St. Andrews. I know because I was there, that was a fish completely out of water. There was no group like that. Can you tell us something about the challenges of setting that group up and how you got it to succeed?

Buckland: Well, I think probably you (Borchers) should be asking yourself that. Because without you, it would not have succeeded the way it did. It is quite remarkable how much work we built up together. You were very much an equal partner in that.

If I had not managed to recruit someone, either you or someone very like you, I think it would have been a much tougher job. At that time, I did have reasonable support from the head of school. They were quite relaxed about this being something quite different coming into the school. I never really thought at that stage, is there going to be opposition to doing this? There was never any interference at that stage in doing it.

It was what I liked about coming to St. Andrews. I had the freedom to develop things as I saw fit. I did have a discussion with Richard Cormack back on the train from a meeting at one time, where in the first year or so, Richard would try to steer me. In that conversation, I said that I am going to have to do things my way to make them work. But that is the only conversation I had where I felt it necessary to say something like that.

Borchers: Richard was retired by then, obviously, because you took his post.

Buckland: He worked for a year of overlap. He was working part-time for that first year. It was probably towards the end of that year that we had that conversation.

FIG 3. *Dedication of CREEM centre, September 2003. Steve Buckland (left), Prof John Lawton, chief executive NERC (centre) and Brian Lang, Principal of St Andrews Univ. (right).*

6. BUILDING RESEARCH ORGANISATIONS

Borchers: One of your major achievements while at the university, has been the creation of CREEM, the Centre for Research into Ecological and Environmental Modelling (Fig. 3). Can you tell us something about how that came about and why it came about?

Buckland: I would love to say it was a positive reason, but around 1997, the then Principal, Struther Arnott, had got it into his head that the contract staff we had were clearly not suitable for submitting to research assessments. Our student numbers in statistics were low. I discovered afterwards that was because the mathematics advisors were advising them not to do statistics.

Arnott wanted to close down statistics and move me to biology. He did not say so, but the way he was talking me down in this school and talking me up in biology made me suspect that. I mentioned it to the then head of mathematics. A year later, he told me, that he thought I was being paranoid. But he said that someone had since told him that that was exactly what Arnott was trying to do. But my response was to propose CREEM.

Fortunately, we had John Harwood in biology who was very interested in being part of it. And so that staved off the closing of statistics. The then dean, who was from biology, also wanted to close statistics and make us consultants in biology; those of us who were not terminated.

Borchers: That gave you the motivation for making CREEM, but you needed the funding. You had had bad experiences with NERC before. How did you go about looking for funding for CREEM?

Buckland: There was a joint infrastructure fund that you could apply for developing infrastructure. At the time, we had run out of space in mathematics.

We based the proposal on the Observatory building. But it became clear as we were getting the proposal together that the proposal to renovate and extend this building was not getting the attention it needed from the estates office. We got very good reviews of our proposal, but were told that the proposal for developing this building was totally inadequate.

Because it got such good reviews, it was then put to what was then called SHEFC, Scottish Higher Education Funding Council, who had some funding for projects of that type. They funded a proportion of the original proposal. I think it was three quarters from memory. We had to cut back some of the plans. However, that funding allowed us to develop this building and get support staff in and really get the centre off the ground.

Borchers: The centre has been incredibly successful and persisted even beyond your departure. What things do you attribute that to? Why has it been successful and why has it persisted?

Buckland: I think to some extent, the time was right for the area we were working in. I think we had a lot of contacts around the world who spoke highly of what we did. Having experienced very negative reviews for a number of years, we were getting good reviews on proposals. I think it was just a matter of getting sufficiently well-known, achieving enough that people took notice. Once you have an international reputation, it becomes so much easier to recruit good staff. That is what allows it to continue.

Borchers: One of the other groups you were instrumental in creating, was the National Centre for Statistical Ecology. That was quite a different sort of group because it spanned multiple organisations and multiple universities. Can you tell us something about what motivated that, how it came about, and what the main challenges were?

Buckland: That was with Byron Morgan at Kent and Steve Brooks, who was then at Cambridge. The three of us were interested in statistical ecology. We could submit proposals to set up groups to engender cross-group communications and so on. We went for an award from that source. The three of us went for an interview and that went well. This got us our first tranche of funding to set up the centre.

There was funding for PhD students, so we prioritised projects that had supervision from more than one of the groups. To increase the cross-group cooperation, in addition to on-line seminars, we had biennial summer meetings, each hosted by one of the members of the centre, just to get more interaction going. It was quite a different problem from having everyone in one building.

Borchers: What were the main challenges, and what did you learn from that experience of setting up NCSE?

Buckland: Once we got the funding, I cannot really think of major challenges to doing it. I guess the challenge is to build the links across the groups and make them feel like a unit rather than disparate groups. I do not think you can ever fully achieve that when you are spread throughout the country.

Nevertheless, I think the different groups tended to get on well together, and it was a nice community to be part of.

Borchers: Looking back at your career, what bit of research provided you with the most satisfaction within statistics and then also outside of statistics?

Buckland: I do not know that I can make the distinction between the two, because the research that gave me the most satisfaction was methodological developments that a user community really found useful. It was statistical development, but for the benefit of a user community that are not adroit at statistics.

Borchers: You spend considerable time servicing the user community, and every bit of time you spend doing that was time taken away from pursuits that the Research Excellence Framework (REF: the periodic national evaluation of UK university's research quality and its impact outside of academia) would have valued.

You had that cost-benefit decision to make. How did you make that decision, and what motivated you?

Buckland: That has definitely been used against us on occasion. We have staff here who are superb members of the team, but who do not have the publications that you would submit to REF.

On the other hand, Impact swings things the other way. I think now the group is so well placed because in the last REF, the school did brilliantly in Impact and not so great on research efforts. So suddenly, I think it is appreciated what the applied side achieves. We seem to have very good support, not just from a great head of school at the moment, but also from university administration.

Borchers: What you are saying is that you were ahead of your time, that you prioritised stuff which only later the universities caught up with prioritising.

Buckland: Not, I would say, ahead of my time, but it was clear that the strength of statistics, of applied statistics especially, is to have impact. Whether or not it is recognised in the REF, it generates external income and it generates a reputation. Even without that REF recognition, it was very important. Of course, REF recognising it meant that those many university groups who do not have much external impact and income, see that it is important. People can react in one of two ways to that. One is they want to knock it because it is something they do not have as an option. But others will give us better support because we bring that to the university. I think it is the latter attitude that dominates now.

7. REFLECTIONS UPON CAREER

Borchers: What collaborations were most rewarding for you?

Buckland: Certainly collaborations within CREEM have always been very rewarding. Outside of CREEM, I would have to mention David Anderson and Ken Burnham. They are complete opposites in many ways.

David Anderson is a businessman, organises things, he could be pretty stubborn and he did not like being contradicted. Ken Burnham was the methodology person, very adept at developing the methodology, less good at communicating it. But doing a couple of workshops with them on distance sampling, really showed me how that should be done.

We based how we set up workshops here on what David had set up. I think the way he communicated with non-statisticians at the workshops made an impression on me.

Byron Morgan has been an important collaborator, even though I do not actually have much research with him. We have a joint book about to be submitted to the publisher, but otherwise I have very little in the way of joint publications with him. On the other hand, we have worked closely for many years now, and he has been a great person to work with. As a supportive colleague, someone who is easy to work with, and great to work with, Byron is fantastic.

Borchers: What characteristics do you admire most in people you have worked with, and what are the main role models over your career that you have had? Who are the main role models?

Buckland: I do not have a fixed set of characteristics in mind, because different people bring different strengths. I guess I will start with Richard Cormack as a role model for both what is good and what is bad. Richard Cormack could be a very tough taskmaster, and he was not the type to build a group and run it.

But when I was doing my PhD, I was a full-time lecturer, part-time PhD student. My supervisor was the head of department at Aberdeen, but he had nothing to do with my PhD, even though he was my supervisor, except that he did solve one integral that was causing me problems. But I could write to Richard Cormack at any time (no email in those days). He would take the trouble to come back with a whole set of very critical comments. You had to have quite a thick skin, but if you ignored the sarcasm in his comments, there was a lot of useful stuff in what he said. I remember he was external examiner at Aberdeen for a period, and all my colleagues heaved a sigh of relief when his term came to an end. But the quality of exam papers went downhill after his term ended. Certainly he was much more a supervisor to my PhD than anyone else. I learned from him, and I just learned to have a thicker skin too.

David Anderson, another mixed character, I would have to say was a role model, certainly on the training side, the communication side. I cannot imagine he was the easiest boss to have. He could be very set in his thoughts on some things.

FIG 4. *Members of distance software development group in 2018. Left to right: Eric Rexstad, Steve Buckland, Jeff Laake, Len Thomas, Tiago Marques, Laura Marshall, David Borchers, Rachel Fewster and David Miller.*

FIG 5. *Steve Buckland in 2019 upon receiving the Royal Statistical Society's Guy Medal in gold.*

Ken Burnham, great for very different reasons. Ken always made me feel welcome as well. I was a young researcher with no reputation, but he was very happy to spend time with me. When I went to California for an interview (with IATTC), he invited me to stop in North Carolina where he hosted me. He was great. I have got on well with him ever since. I guess those are the people who immediately come to mind.

Borchers: One last question. Looking back over your whole career, what achievement or few achievements have given you most satisfaction?

Buckland: I think I would have to pick out two. And they are both team achievements.

One is distance sampling, building up the distance sampling project. It was such a complete package. There were the methodological advances, which you contributed really strongly to, published in top journals. There were the books that made the methods more accessible to the user community. There were the training workshops. There was the listserver offering free advice to people.

There was the contract group that you (Borchers) headed that brought in funding of distance sampling, which improved our expertise and threw up problems we had not envisaged, which led on to more methodological developments. And there was software that Len (Thomas) led the development of; which was absolutely crucial to the methods being adopted (Fig. 4). That whole package, I think I would definitely rank as one of the two.

The other one has to be this place. The building itself, but especially the group within it. The fact that it is thriving, that I was able to retire with it thriving and going from strength to strength. I think those are the two things I would pick out. It is a team that brought about both successes.

Borchers: Is there anything else you wanted to say about your career?

Buckland: The biggest honour I have been awarded, by far, is the Gold Medal from the Royal Statistical Society (Fig. 5). And to be honest, I do not think I measure up to other recipients of that. You (Borchers) had the Barnett Award. I think that would have been, in a sense, more appropriate. More recognised what my strengths were. I do not have the theoretical strength that normal recipients of the Gold Award get.

Borchers: Well, we think you are being too modest.

Buckland: It came as a complete shock, because I had absolutely no idea that it had been proposed. And I would have said, no, definitely not, had I been asked. I really thought when I got an email from the Royal Statistical Society that it was some kind of scam. It appended a letter, which I wondered, is it safe to open this? But I think that is the biggest shock I have had in my whole professional career.

Borchers: Thanks so much for your time. It has been very interesting.

Buckland: Thank you.

APPENDIX: LIST OF NAMED COLLEAGUES

A number of Prof Buckland's colleagues are mentioned in the interview. In this appendix, we list them again and their affiliations at the time of Steve's interaction with them:

Brian Bailey (Univ of Southampton); Sheila Gore/Bird, Paul Garthwaite and Stephen Baillie (Univ of Aberdeen); Iain Gordon and Colin Campbell (Macualay Land Use Research Institute); David Elston and Rob Kempton (Scotland Agricultural Statistics Service); Richard Hayes (London School of Hygiene and Tropical Medicine); Phil Hammond and Alejandro Anganuzzi (Inter-American Tropical Tuna Association); Jeff Laake (San Diego State

Univ.); Simon Wood, Len Thomas, John Harwood, Richard Cormack, Rachel Fewster and Ben Baer (Univ of St Andrews); David Anderson and Ken Burnham (Colorado Cooperative Fish and Wildlife Research Unit); Byron Morgan (Univ of Kent); Steve Brooks (Cambridge Univ).

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