Reuters Institute Fellowship Paper

University of Oxford

THE BADGERS MOVED THE GOALPOSTS:

REPORTING SCIENCE IN THE BRITISH MEDIA

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Michaelmas Term 2014

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1. INTRODUCTION

"As we face major global challenges of climate change, population growth, threats to food and water security, human and animal diseases and terrorism, there has never been a time when there has been a greater need for science and engineering to contribute to good policy making and sound government. (Government Office for Science, October 2009)*"*

Professor Sir John Beddington, former Government chief scientific adviser

1.1 Science in the headlines

In October 2013, the then Secretary of State for Environment, Food and Rural Affairs, Owen Paterson, gave a TV interview for the regional BBC news programme Spotlight. It was one of a series of media interviews he gave that day, to defend the controversial policy of culling badgers in the English countryside. The badger is native to Britain, and has been present since the end of the last Ice Age 12,000 years ago (Drury, 2014). Tales of the secretive mammal have become part of the fabric of British cultural life, through literature like Kenneth Grahame's Wind in the Willows, which has been read to children as a bedtime story for decades. The badger is perhaps Britain's most popular and romanticised mammal (Barkham, 2014), but not among many farmers, who blame it for spreading tuberculosis (TB) to their cattle, affecting their livelihoods.

The political debate over TB and badgers has "turned and U-turned for 40 years" (Barkham, 2014). After many years of scientific inquiry, pilot culls finally began in August 2013. By October, the government-backed policy of shooting badgers secretly in darkness in an attempt to control the spread of TB to cattle had already been the subject of hundreds of articles in the British press. The policy was running into trouble. Shooters had failed to kill the required number of badgers set by the government as a measure of success, targets had been revised down amid confusion over the size of the badger population, and the cull had been extended. When pressed on why the government had taken this action, the interviewer accused the minister of

“moving the goalposts on all fronts”. Mr Paterson made the memorable reply: “I am not moving anything – the badgers are moving the goalposts.”

Soon Twitter was flooded with mocked up pictures of badgers playing football. Within a few hours, the website UsvsTh3m, run by Trinity Mirror, had published a digital penalty shoot-out football game with badgers in goal. The next morning, several newspapers carried cartoons satirising the comments. The event marked a farcical turn in British press coverage of the issue, which has long polarised views. On one side was the National Farmers’ Union (NFU), the architect of the cull, backed by officials at the Department for Environment, Food and Rural Affairs (Defra). On the other side was an amorphous group of opponents, from hard-line hunt saboteurs to NGOs to local people who did not want to see badgers killed in their neighbourhood. Caught in the middle were scientists, many reluctant to comment on what was increasingly being described by ministers as a “science-led policy”.

The policy over badgers and bovine TB is not alone in being presented as being backed by evidence, despite opposing sides using science to justify their cause. Many stakeholders in an issue, including government and NGOs, have claimed to base their views on science, from the introduction of GM crops to the use of neonicotinoid pesticides (Wildlife and Countryside Link , 2013). In many contentious environmental issues there is as much disagreement over the science behind a policy as over the policy itself. Wildlife and Countryside Link, an umbrella group for voluntary wildlife and conservation groups, posed questions about the links between scientists and policy makers in its 2013 debate, UK natural environment: evidence-based policy or policy-based evidence? (Wildlife and Countryside Link , 2013):

“How can the public decide what is true when there appears to be so much scientific disagreement? Do we need to find a better way of publicising the scientific consensus? Is the government playing fast and loose with the evidence and, if so, what should be done about it?”

The dissemination of scientific advice by government has had a chequered past in the UK. Public faith in scientific advice from ministers was seriously undermined by mad cow disease, or BSE, in the 1990s. The scandal was followed by a series of debates

involving science policy, from the merits of growing GM crops to the culling of badgers in the English countryside. There has been a proliferation of what ministers frequently describe as science-led policies. However, politicians have been accused of "cherry picking" science to justify political policies and of not being transparent about the balance of scientific evidence behind them (Monbiot, 2013). Similar concerns have been raised in other countries. In Canada, there were protests in the scientific community when government scientists were banned from speaking to the media without an official present (Goldenberg, 2012). In Japan, public trust in science and policymaking was damaged by the earthquake, tsunami and Fukushima nuclear disaster of March 2011, which has been cited as an example of where communication between scientists and policymakers failed at a time of crisis (Tateo, 2014):

"Many experts appeared in the media and spoke out about evacuation, food safety and other issues, but there was no mechanism to integrate their views for the benefit of the public and policymakers. At the same time, many people lost confidence in the words of scientists who were working closely with the government or the nuclear industry. Public trust in both science and policymaking was severely damaged."

The international community is making efforts to strengthen scientific advice to government (Tateo, 2014). In April 2013, the Global Science Forum of the Organisation for Economic Co-operation and Development (OECD) set up an expert group to look at the roles and responsibilities of scientists in policy making. In October 2013, the United Nations announced it was establishing a scientific advisory board for its Secretary General. According to Tateo (Tateo, 2014) :

"We sit at a crossroads in modern science. A redefinition and reconstruction of science and society relations is an urgent task. And a critical aspect of that is to effectively mediate between science and policy making. Failure to address these issues will impede wider efforts to rebuild public trust in science, and hold back other innovations to address social challenges."

In the UK, it has been argued that the lack of serious discussion with the public about scientific issues is having a damaging effect on policy decisions. According to Lisa Jardine, professor of renaissance studies at University College London (UCL),

president of the British Science Association and chair of the Human Fertilisation and Embryology Authority, we urgently need to address "a curious lacuna, a fissure, between the way policy is developed in key areas that engage the public, and the way these policy decisions are delivered to the public. Think fracking, think badger culls, think BSE (Press Association, 2013)".

1.2 Rationale of the study

The most widely-covered science news stories in recent years in the British press include a range of topics, from reports of the discovery of the Higgs boson in July 2012, revelations in January 2013 that frozen beef burgers in British supermarkets contained horsemeat, to the start of the badger cull in Somerset and Gloucestershire in August 2013 (Ipsos MORI, 2014). In this paper the culling of badgers was used as a case study to examine wider issues involving science, media and policy. According to the research for Ipsos MORI, debates around contentious topics, like the badger cull, "boiled down to discussions of scientific authority".

"There is no consensus on authoritative sources, but there is a widespread view that politicians lack credibility in scientific debates unless they have the backing of respected organisations," the report found. "By contrast, scientists, particularly those with official positions, are often seen as uncontroversial authority figures online."

In the case of the badger culling debate, as with other contentious areas, science can be "cherry picked" to justify opposing positions. When science becomes entangled with politics, some scientists are unwilling to engage with the media, fearing their views will become politicised. Political policy decisions become blurred with scientific judgements, leaving the public confused about who and what to believe. This analysis of coverage of the badger cull in British newspapers is designed to examine these issues.

1.3 Methodology and research focus

More than 200 articles taken from six British newspapers were analysed over a two-year period from October 2012 to October 2014 to look at the relative contributions of key actors in the badger culling debate. Six newspapers were chosen for content analysis, namely the left-leaning broadsheets *The Guardian/Observer*, the right-leaning *Daily and Sunday Telegraph*, and the right-leaning tabloid *Daily Mail/Sunday Mail*. The content analysis investigated the following questions: Who were the main voices quoted in British newspapers on the badger culling debate, as measured by the number of articles with voices from different actors and the number of times each actor was quoted? How strong was the presence of voices of scientists compared with other voices in the debate? And, of the various roles that scientists can play in public policy debates, what was the balance between those roles? The results of the content analysis were then put into context and interrogated by a series of semi-structured face-to-face and telephone interviews with leading scientists, journalists and policy makers. Finally, a concluding chapter summarised the main findings, and made several recommendations for action and further research.

2. COMMUNICATION OF SCIENCE AND THE ROLE OF THE MEDIA

2.1 Science and society

Public outreach has become an essential part of the work of many scientists and an activity encouraged by universities and research councils. However, the relationship between journalists and scientists can be difficult at times – with perceptions by journalists that "scientists are unable to leave their ivory tower to explain in clear and accessible terms the knowledge they generate and the concepts they employ every day" (Maille, 2010). Meanwhile, some scientists are reluctant to participate in public discussions because they fear that by simplifying their message they may lose credibility with their peers or be misrepresented (Ashe, 2013). Some scientists complain about the results of their attempts to communicate with the public through the media, despite being aware that it is becoming an essential activity (Maille, 2010):

"Scientists are increasingly aware that popularisation to the general public - and not only diffusion between peers - has become an activity they cannot escape, especially if they work on issues that create social debates. Indeed, when journalists are covering scientific issues, the "scientist/expert" is their first source in 38% of the cases, way ahead of government officials (18.7%), private industry (13.4%) and interest groups or activists (5.2%) (Einsiedel, 1992)." (Maille, 2010).

Scientists, unlike journalists and politicians, are highly trusted by the public. A survey for the Wellcome Trust found that 59% of UK adults had very little or no trust in journalists; while 47% had very little or no trust in ministers. Conversely, 66% of adults had complete or a great deal of trust in university scientists, although the figures were lower for government scientists (34%) and industry scientists (32%) (Wellcome Trust Monitor, 2012).

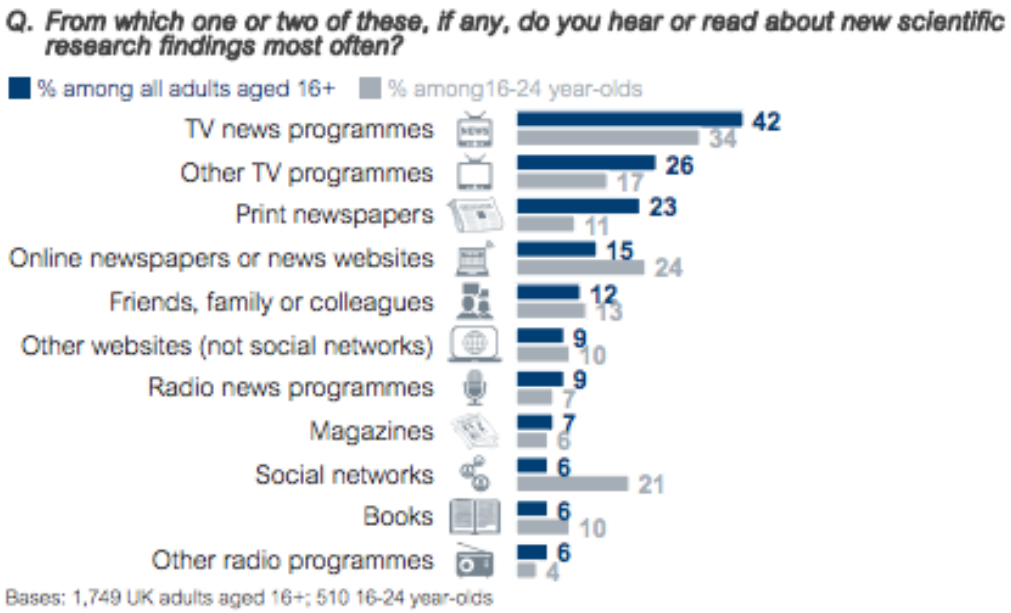
The work of scientists is rated highly by the public. Nine in ten think scientists play a valuable role in society (Ipsos MORI, 2014). The public also wants to know more about science, with 72% agreeing that is important to know about science in their

everyday lives, compared with 57% in 1988 (Ipsos MORI, 2014). In the UK, people are more likely to feel very well informed about science (17%) than in other EU countries, such as Italy (7%), and Ireland (14%) (European Commission, 2010). However, 50% of people questioned considered scientists secretive and four in ten considered them poor at communicating (Ipsos MORI, 2014). Most European citizens agree that scientists do not put enough effort into informing the public about new developments in science and technology (European Commission, 2010). There have been calls for a more open dialogue between scientists, policy makers and the public (European Commission, 2013):

"Science and technology have an impact on almost every part of our daily lives. In spite of this there can be a degree of ambivalence about science in our wider society, and past research has shown that there is not always a widespread understanding of science, or scientific methods. This has led to calls for a more open dialogue between scientists, policy makers and the general public."

The media plays a crucial role in the communication of science. Few people have direct dealings with scientists, with the majority learning about scientific developments through television, radio, online and print. In the UK, 59% of adults find out about science most regularly from TV, compared with 23% for print newspapers and 15% for online newspapers or news websites (Ipsos MORI, 2014) (see Figure 1). According to the Special Eurobarometer 401 (European Commission, 2013), people still tend to get most of their science news from traditional media such as television and print newspapers, although online sources, including news websites and social networks are becoming more widely used, especially among young adults.

Figure 1: People's most common sources of information about science



Source: Public Attitudes to Science, 2014, Ipsos Mori

In the US, the influence of the legacy media appears to be waning when it comes to science news. According to a 2014 survey by the National Science Board, most Americans (43%) listed the internet as their main source for science and technology news, up from about a third in 2010 (Columbia Journalism Review, 2014). There is also evidence that the perceived role of journalists in explaining the impact of science is diminishing in the eyes of European citizens. A European survey found the perceived role of newspaper journalists declined from 25% in 2005 to 16% in 2010; with a similar trend in TV journalists (32% in 2005 compared with 20% in 2010). Meanwhile, the perceived quality of consumer organisations in explaining the impact of science increased from 16% in 2005 to 23% in 2010 (European Commission, 2010). Government representatives went up from 6% to 11% while the perceived influence of politicians remained low (5% in 2005 vs 6% in 2010) (European Commission, 2010).

2.2 Scientists and policy making

Crises such as BSE, SARS and avian flu illustrate the realities of making "evidence-based policy", where scientific uncertainties make it difficult to put firm policies in place and “policy remains filled with politics, values and difficult choices that demand open debate”. (Stilgoe, 2013). Since the 1980s, UK policy makers have moved away from a technocratic model, where experts contributed to decision making away from public scrutiny, towards a more democratic model, where the public and a variety of scientists and ethicists, are involved in policy making (Stilgoe, 2013). The bovine spongiform encephalopathy (BSE) scandal has cast a long shadow over the government’s approach to scientific advice. At the height of the crisis in May 1990 John Gummer, then Minister of Agriculture, dismissed uncertainties about a new disease in cattle, trying to convince the public that beef was safe by feeding his four-year-old daughter a burger in front of the press. The official public inquiry in 2000 by Lord Phillips came up with a number of conclusions in terms of trust, openness and uncertainty (Stilgoe, 2013):

- Trust can only be generated by openness
- Openness requires recognition of uncertainty, where it exists
- The public should be trusted to respond rationally to openness
- Scientific investigation of risk should be open and transparent
- The advice and reasoning of advisory committees should be made public.

BSE and debates over other science-related issues such as GM crops and IVF led to the setting up of new bodies such as the Human Fertilisation and Embryology Authority, the Human Genetics Commission and the Food Standards Agency, which built policy based on advice from scientists and other stakeholders, including the public, ethicists and social scientists. Many of these bodies have since been downsized. According to Stilgoe (Stilgoe, 2013): “There is a danger that, as crises fade, administrations forget the importance and the complexity of building conversations between scientific experts, policymakers and the public.”

2.3 Models for communicating science

The traditional model for scientific communication is the "deficit model", based on the idea of a linear flow of information from the scientist to the journalist to the public. This model is now considered "archaic and simplistic" in science communications theory, but some scientists still adhere to it (Ashe, 2013). For effective communication, modern scientists need to be aware of the social context in which they speak and the role they play in policy making. They must also keep in mind that scientific uncertainty, which is inevitable at the frontiers of science, can often be used by those who want to cast doubt on scientific knowledge by giving the impression that too little is known to make any meaningful statements about risk (Ashe, 2013):

"It can be used to create the impression of ignorance and promote inaction when the scientific community are largely in agreement about the extent of the problem and believe that it is important to address it."

Scientists clearly play a role in policy making – they publish research, serve on government committees and carry out other roles that are relevant to policy (Currey, K., Clark, S.G., 2010). However, they do so using different methods, with different goals and with different levels of engagement (Currey, K., Clark, S.G., 2010). Professor Roger Pielke has defined four idealised roles for scientists in the policy making process, which rely on different conceptions of democracy and science (Pielke, 2007):

- The **pure scientist** is concerned with generating facts for the pool of human knowledge, with no consideration of how they are used and no direct connection to decision makers.
- The **science arbiter** answers factual questions posed by a decision maker but avoids normative questions, based on judgements, in favour of positive questions, which can be resolved by science, at least in theory.
- The **issue advocate** engages with decision makers seeking to reduce the choices of policy available by promoting a particular course of action justified

based on expert knowledge and understanding.

- The **honest broker of policy alternatives** (commonly shortened to **honest broker)** participates in decision-making alongside a range of other stake holders to expand and clarify the number of choices available, without being prescriptive about a particular policy choice.

Professor Chris Rapley of UCL has suggested a fifth role he believes scientists should collectively fulfil, that of:

- The **science communicator**, which involves engaging with the public and explaining what scientists are doing, why they are doing it and what results they have obtained (Rapley, et al, 2014).

Against this backdrop, there is little consensus on where the boundaries lie between communicating scientific facts and giving opinions. Some have argued that scientists should have a narrow remit in influencing policy making by sticking purely to scientific facts, rather than giving a view on how these facts might impact on policy decisions. For example, the chief scientific adviser at Defra, Ian Boyd, (Boyd, 2013) has warned against scientists giving personal views on government policy:

"Strictly speaking, the role of science should be to provide information to those having to make decisions, including the public, and to ensure that the uncertainties around that information are made clear. When scientists start to stray into providing views about whether decisions based upon the evidence are right or wrong they risk being politicised. In general, it is important for scientists to stick to the evidence and its interpretation."

According to Professor Boyd, policy making relies not only on scientific evidence but on many other factors, and can be a "messy, sometimes chaotic, process because it needs to include social, electoral, ethical, cultural, practical, legal and economic considerations in addition to scientific evidence". He says the scientific community needs to build a strong sense about how it fits in, to ensure that its contribution to future decisions can be maximised. "This means sticking to the evidence and describing clearly what it does and does not say; expressing the balance of risk

associated with one or other policy option and avoiding suggesting that policies are either right or wrong; and being willing to make the voice of science heard by engaging with the mechanisms already available through science advisory committees, by working with embedded advisers (such as myself), and by being the voice of reason, rather than dissent, in the public arena."

Others have argued that rather than the government getting the balance right in allowing scientists' voices to be heard without facing accusations of politicisation, they are stifling scientific debate (Monbiot, 2013).

3. THE BATTLE OVER BROCK

The roots of the current debate over the culling of badgers go back more than 40 years. The animal was first proposed as a carrier of TB in 1971, when a badger was found dead on a farm in Gloucestershire, leading to the first demands for culling. Farmers have lobbied for years for badger control measures to tackle the rising problem of cattle TB in England. Over the 10 years to 2011, bovine TB cost the taxpayer £500m (Barkham, 2013). In 2012, 37,753 cattle in England and Wales were slaughtered because of TB.

In the 1970s experimental gassing of badgers took place in England, but the practice was stopped in 1982, following protests from animal welfare groups and experiments showing it was inhumane. In 1998, the then Labour government set up what remains the biggest scientific endeavour to examine badgers and bovine TB, the randomised badger culling trial (RBCT) or Krebs trial, as recommended by an independent scientific review group, chaired by Professor John Krebs.

The experiment cost £49m and culled 10,979 badgers in an attempt to examine whether killing badgers reduced bovine TB in cattle. It found that, at most, culling could reduce the incidence of TB in cattle by 12-16% over nine years. John Bourne, the scientist who led the trial, concluded that culling badgers could make "no meaningful contribution" to the control of bovine TB. The then Labour government took this advice. The coalition that replaced Labour in 2010 used data from the same trial to justify a pilot cull of badgers in two areas of England – Gloucestershire and Somerset (Barkham, 2013).

The NFU, an influential body which represents British farmers, was the architect of the pilot cull, overseeing the formation of companies set up to run the culling operation, with support from Defra and money from farmers. A wide range of different animal welfare groups opposed the cull, including the RSPCA, Badger Trust, Humane Society International, Stop the Cull campaign, and Gloucestershire Against Badger Shooting (GABs), together with public figures such as the musician Brian May and hunting saboteurs.

The pilot culls began in August 2013, with Owen Paterson defending the decision and Labour attacking it. It was to be monitored by an independent body of expert scientists, the Independent Expert Panel (IEP). Contractors were licensed to carry out the culling by shooting free-running badgers at night, or trapping them in cages and then shooting them. However, rumours soon emerged that the culling teams were not reaching daily targets. An overall target had been set to kill 70% of badgers. The figure was calculated to avoid the perturbation effect, where badgers that have survived move around to establish new social groups, risking the spread of TB (if too few badgers are killed), and the risk of local extinction (if too many badgers are killed). In October, the environment secretary made his comments that "the badgers have moved the goalposts" and the cull in Somerset was extended by three weeks in an attempt to meet new targets, which had been revised down. In November, the Somerset cull ended, having failed to reach its target and the Gloucestershire cull was abandoned, again falling short of the target set by the government.

It later emerged that only about a quarter of badgers culled had been killed by controlled shooting, the method the pilot scheme was meant to test. Meanwhile, assessments by the IEP showed that the badger culls in England failed both on humaneness and effectiveness (Stoddard, 2014). The IEP report (Independent Expert Panel, 2014) concluded:

"Current evidence suggests that culling badgers over a 6-week period by shooting, or by shooting and cage trapping, fails to meet the criteria of effectiveness set out by Defra. Evidence suggests that between 7.4% and 22.8% of badgers that were shot at were still alive after 5 min and therefore were at risk of experiencing marked pain. We are concerned at the potential for suffering that these figures imply."

The environment minister announced that the culls would not be rolled out to other counties in England as planned. However, the pilot culls would continue for a second year in Gloucestershire and Somerset from August 2014, without oversight from the IEP, which enraged opponents. "Everything's failed – the politics, the democracy, the science, and this is what we're left with – a farce," Jude Walker of GABs told *The*

Guardian (Barkham, 2014). *The Guardian* described the pilots as “an unmitigated disaster on the government’s own terms” (Barkham, 2014):

“Owen Paterson complained that the badgers moved the goalposts, and now the environment secretary has taken his ball home. The abandonment of a wider roll-out of the badger cull is a stunning and unexpected game-changer. Badgers have proved harder to kill than a rare piece of conviction politics.”

Meanwhile, an editorial in *The Daily Telegraph* suggested that the trials had not only failed but that they had “almost certainly” increased the spread of TB among cattle (Lean, 2014): “Owen Paterson famously once accused the badgers of ‘moving the goalposts’. It's now clear he has shot the ball into his own net.”

At the time of writing, the second year of culling is over and a decision on how to proceed appears to be on hold until after the general election in May.

4. CONTENT ANALYSIS AND INTERVIEWS

4.1 Introduction

The Lexis-Nexis search facility was used for the study. The key words ‘badger cull’ were entered with the additional filter ‘at the start’ for the time period from 1 October 2012 to 1 October 2014. The ‘at the start’ option reduced the number of articles that appeared, but was a sufficiently large sample size for the purposes of this study. The articles that appeared in the print versions of the newspapers were analysed but online versions were excluded. News reports, features, opinion or comment pieces, and editorials were included, but letters were removed from the sample. The search options often came up with several repeats, which were removed from the sample. The research questions addressed in the design of the content analysis are outlined below.

4.2 Research methods and questions

Research questions:

(1) Who were the main voices quoted in British newspapers on the badger culling debate, as measured by the number of articles with voices from different actors and the number of times each type of voice was quoted?
(2) How strong was the presence of voices of scientists compared with the presence of other voices in the debate?
(3) Of the various roles that scientist can play in public policy debates, as defined in section 2.3, what was the balance between those roles?

The research coding sheet can be found in the appendices.

4.3 Results of the content analysis

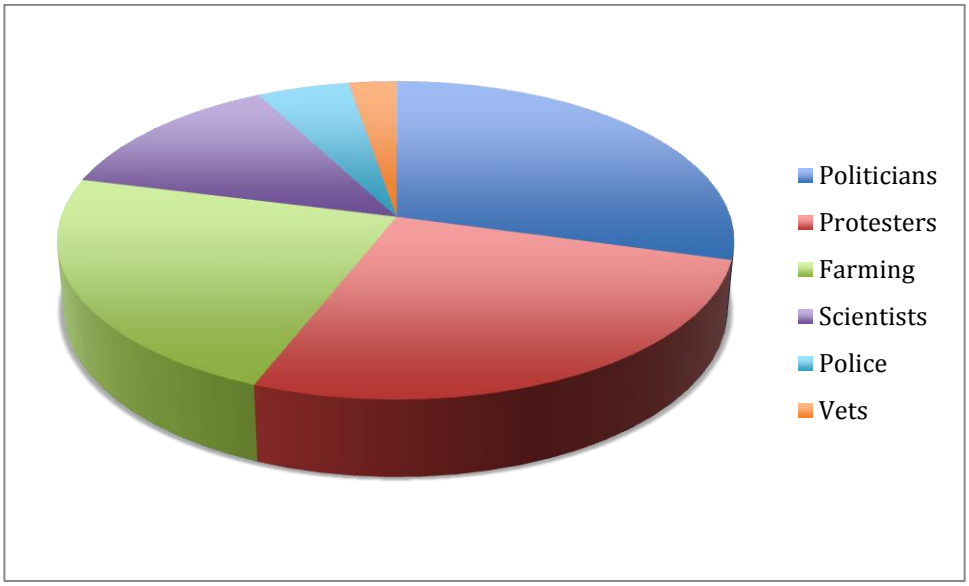
The original search yielded 276 articles. A number of articles were excluded, including letters and repeats, leaving a total of 160 articles. Further details of classifications and exclusions can be found in the appendices. Of these 160 articles, 85 were from *The Daily Telegraph*, 42 from *The Guardian*, 16 from *The Daily Mail*, 9 from the *Sunday Telegraph*, 5 from *The Observer* and 3 from the *Mail on Sunday*.

The results are presented in Table 1 and Figure 2.

Table 1: Category of voices by newspaper

	Gov't	Other MPs	NFU	Farmers	Police	Chief vet	Other vets	Vet bodies	Anti cull orgs	Unofficial anti cull protesters	IEP	Other scientists	Scientific adviser
Sunday Telegraph	9	3	4	5	3	0	0	0	8	4	0	1	0
Daily Telegraph	70	13	27	38	13	4	2	1	59	21	12	18	1
Guardian	36	12	18	16	9	2	2	0	27	8	7	26	2
Observer	4	0	2	1	0	1	1	0	5	1	0	2	0
Daily Mail	15	3	8	7	4	0	1	1	13	3	4	3	0
Mail on Sunday	1	1	3	2	0	0	0	0	3	0	0	0	0
Total	**135**	**32**	**62**	**69**	**29**	**7**	**6**	**2**	**115**	**37**	**23**	**50**	**3**
Percentage of total articles	**84%**	**20%**	**39%**	**43%**	**18%**	**4%**	**4%**	**1%**	**72%**	**23%**	**14%**	**31%**	**2%**

Figure 2: Balance of coverage of main actors in the debate



4.4 Analysis of results

Analysis of the articles in the sample revealed that:

- Government political voices, such as ministers and officials from Defra were mentioned in 135 (84%), while non-governmental political voices such as opposition MPs were mentioned in 32 (20%).

- The NFU was mentioned in 62 (39%) of articles and farmers in a further 69 (43%).

- The police were mentioned in 29 (18%).

- The chief vet, Nigel Gibbens, was mentioned in 7 articles (4%), other vets in 6 articles (4%), and veterinary bodies such as the British Veterinary Association (BVA) in 2 articles (1%).

- The voices of official anti-cull organisations, such as NGOs, were mentioned in 115 articles (72%) of articles, with unofficial anti-cull voices, mainly high profile individuals opposed to the cull, in a further 37 (23%).

- The Independent Expert Panel, commissioned by the government to oversee the cull, was mentioned in 23 articles (14%) and scientists not belonging to the IEP in a further 50 articles (31%).

- Professor Ian Boyd, chief scientific adviser at Defra, was mentioned in 3 articles (2%).

The culling of badgers is a highly controversial issue and, as Table 1 shows, it appears that newspapers were providing balance mainly through quoting government voices (84%) against anti-cull organisations (72%), often in the same article. The use of opposition voices was quite low (20%) but not unexpected as arguments for and against culling were not purely political. Taken together, political voices across the spectrum were the most highly represented in news articles, mentioned a total of 167 times in 160 articles (some articles included both government voices and opposition MPs).

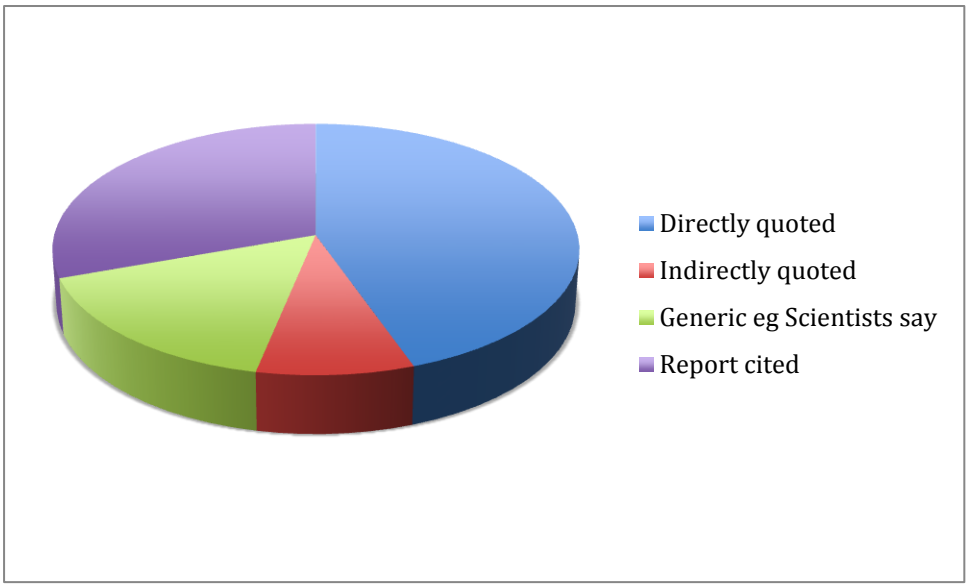
Anti-cull organisations were mentioned in 115 of 160 articles (72%). Individuals opposed to culling were mentioned in 37 of 160 articles (23%). The voices of the anti-cull lobby was therefore heavily represented, mentioned 152 times, slightly below that of political voices. Then came the views of the farming community. Farmers were mentioned in almost half of articles (43%), with the NFU cited in 62 articles (39%). This added up to a total of 131 mentions, slightly below that of the anti-culling lobby. Debate over the cost and methods of policing was also a theme of press coverage. The police were mentioned in 29 articles (18%). Veterinary voices received relatively little coverage. The government chief vet, Nigel Gibbens, who played a key role in the debate at times, was mentioned in 7 articles (4%), other vets in 6 (4%) and veterinary bodies in 2 (1%). The chief vet was mainly referred to in quotes and statements from the NFU.

In terms of scientists, the IEP was mentioned in 23 articles (14%) and other scientists in 50 (31%). The chief scientific adviser to Defra, Ian Boyd, was mentioned in 3 articles (2%). Scientific views were therefore above those of police and veterinary groups but below those of farmers, anti-culling campaigners and politicians in terms of the amount of coverage in the newspapers analysed.

4.5 Scientific voices

Scientists as a group, made up of university and other scientists, including the IEP, and the chief scientific adviser, were quoted 92 times either directly, indirectly, generically, or in reports. The main way their views were reported were as direct quotes (41), followed by reports (28), generic mentions (15) and indirect quotes (8) (Figure 3).

Figure 3: Proportion of scientists quoted directly, indirectly, generically and through reports

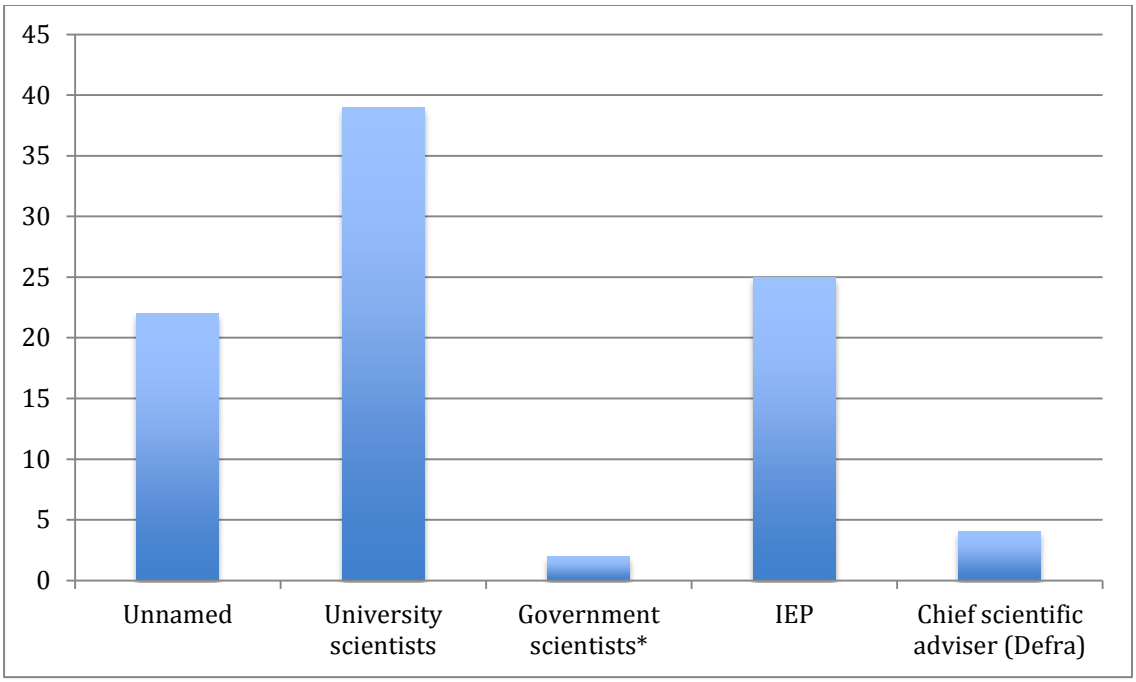


4.6 Attribution

A total of 14 scientists were named. Their names are listed in the appendices. Many of these scientists were quoted multiple times. One of these scientists, the chief scientific adviser, was affiliated to Defra; another, Dr Chris Cheeseman, was a former government scientist; but the vast majority (12) were independent university scientists, including two university scientists who were members of the government's IEP (Prof Tim Coulson and Prof Ranald Munro) (Figure 4).

Government scientists can be defined in different ways, operating in different capacities, from chief scientific advisers within government departments to scientists employed by executive agencies, such as the Animal Health and Veterinary Laboratories Agency (AHVLA) and the Animal and Plant Health Agency (APHA). The role of chief scientific advisers is clearly defined and their dealings with the press are bound by the civil service code. Scientists working for executive agencies appear constrained about commenting publically on controversial issues at the science policy interface. In the sample studied, quotes were given to the press by a single retired government scientist, 12 university scientists including two members of the IEP, and the Defra chief scientific adviser.

Figure 4: Number of quotes by different categories of scientist

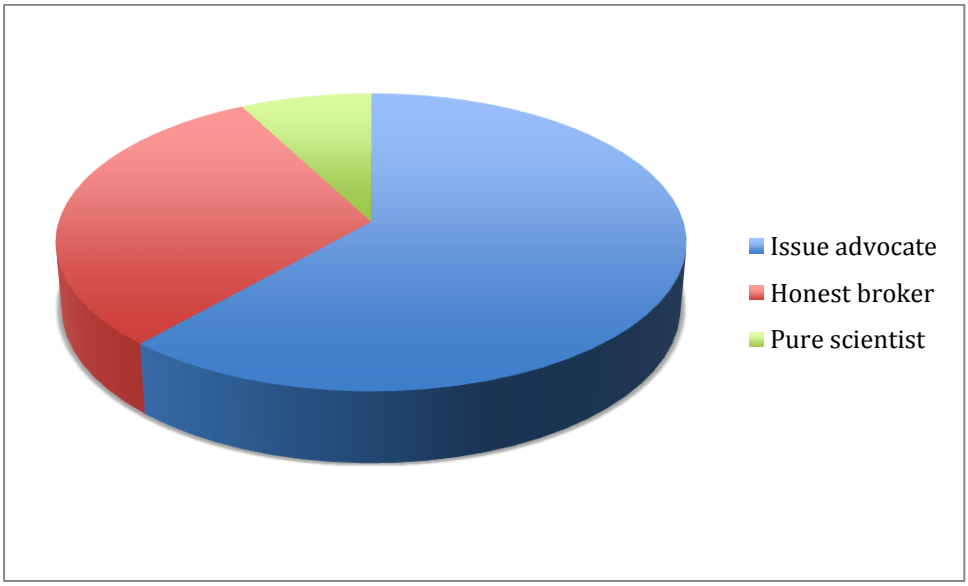


* Retired at the time quoted.

4.7 Roles of scientists

The role of scientists in policy making in the sample of newspaper articles studied was then analysed according to the categories defined in section 2.3. Professor Ranald Munro of the IEP was excluded from the analysis as he was named in a single article in the sample, which was only to give no comment as the panel's report had not been completed at that stage. The remaining scientists 13 fell into three groups – pure scientist (1), honest broker (4) and issue advocate (8), on the basis of their role in the sample analysed (Figure 5).

Figure 5: Proportion of scientists in role of issue advocate, honest broker and pure scientist



It is important to note that the distinction between the role of the honest broker and the issue advocate is blurred. The scientists recorded as issue advocates were put in that category either because they had a clear agenda as being part of the political machinery of Whitehall, because they expressed their scepticism on the decision to cull badgers in a letter to the press, or because they were directly quoted in the press disagreeing with the decision to cull badgers. In addition, some of the scientists changed their role during the cull. The scientist recorded as a pure scientist was categorised on the basis of a quote given to the press in the sample of articles, but subsequent interviews he took the role of an issue advocate on badger culling. Thus it would appear that the majority of scientists in the sample were issue advocates, with the rest taking the role of honest broker.

4.8 Interviews

Two journalists, four scientists and two independent experts on science, the media and policy were interviewed face-to-face or by telephone. Both journalists had written

by-lined pieces included in the sample. The four scientists were in the sample that formed the content analysis and contributed to the badger cull debate (see notes in appendices regarding Professor Godfray). A list of interviewees and questions can be found in the appendices.

Interviews with journalists

Damian Carrington, Head of Environment at *The Guardian,* wrote many of the stories included in the content analysis. He managed to secure exclusive interviews with leading scientists, many of whom had strong opinions.

"I personally didn't find it difficult to get on the record quotes from people who knew a lot about the area," he said. "A group of scientists were unusually vociferous on the topic because it had really got under their skin; they felt the science was being ignored. All these people were prepared to put their head above the parapet."

On the issue of scientific evidence being spun to advance a particular argument, he said the results of scientific research on the scale of the RBCT could not be spun. "The results of the RBCT were really clear, you can't spin it," he said. "I couldn't find an independent scientist who thought that the risks involved in the badger cull – as proposed by the government – were worthwhile."

While the RBCT delivered a very clear result, the current government proposed a trial with significant differences, which meant "there was a no man's land in the middle, which was contestable…In the end science will only take you so far, that's where the politics comes in". He said scientists can be cautious about speaking out on contested issues. With subjects such as climate change, for example, some "are reluctant to go beyond the evidence - they don't want to engage in what that might mean for society".

He believes that scientists have a role in policy making that goes beyond the traditional model of dispensing scientific advice without regard for how it is used. "Personally I feel scientists do need to go beyond generating the data," he said. "Most scientists are paid by taxpayers – they work for us."

He highlights the stance of the IPCC at the climate talks in Copenhagen, which shows the "powerful way in which science can move beyond just giving the knowledge and going to the next stage of being part of the policy". He added: "The IPCC – they show it is eminently possible to be policy relevant, but not policy prescriptive."

The mid-market tabloid, *Daily Mail* took a different approach from *The Guardian* in its coverage of the badger cull. While scientific evidence was discussed, much of the coverage centred on what was happening on the ground in the regions affected. **Ryan Kisiel** reported on the badger cull, although he has since left the newspaper to work as a journalist at *The Sun*.

His role was to report from the field on events in Somerset and Gloucestershire, from the perspective of the communities affected. He felt that while the science and the arguments for against the cull were important, the "real story" for him was what was happening on the ground. "The story in the *Daily Mail* at the time wasn't about scientists, it was about what was happening on the ground. It was the human side of the story," he said.

The paper's perspective was to focus on local communities and how they were affected, including the farmers whose herds had been destroyed, and the implications of the actions of protesters. "You've got two things that you're covering – one is the protest groups, the other is the farmers."

Interviews with scientists

Professor Lord John Krebs was the government adviser responsible for the scientific review in the 1990s, which found that badgers were a wildlife reservoir of bovine TB and could pass the disease to cattle. The report recommended setting up a trial cull of badgers, the RBCT or Krebs trial (Krebs, 1997), which remains the largest body of scientific evidence on badger culling. As one of the UK's most eminent scientists, Lord Krebs has been widely quoted by the media on the issue, describing the policy as "mindless" in an interview with *The Guardian* (Carrington, 2012).

In his view, broadsheet press coverage of the pilot badgers cull was “pretty good”. “I can’t think of anybody who’s covered it really badly or misrepresented the evidence or sensationalised the story beyond what it deserves,” he said.

In his view, the university scientists quoted by reporters were the ones who were “on the radar screen of journalists”. He was approached for interviews because the press knew he had written a report on bovine TB and was an authority on the issue. He said other scientists spoke out for a variety of reasons – because they had been quoted before on the matter, because they were part of the IEP or because they had worked with badgers for a long time and were “passionate about defending the badger”, quite apart from their scientific stance. “I think there are a few people who have used memorable phrases and are willing to speak to the media, they get asked over and over again,” he said. “I don’t think there’s anything magical about the four or five names that keep cropping up, they’re the few that have spoken out and the journalists go back to them.”

In terms of government scientists the most relevant voices would be either the government’s chief scientific adviser or the chief scientific adviser in Defra, but they are bound by the civil service code not to be critical of government policy, he explained.

“The departmental chief scientific advisers are bound by the civil service code not to comment publically, particularly critically, about government policy, and that’s an interesting question because if they are meant to be independent chief scientific advisers why should they be gagged in the same way all civil servants are?”

Lord Krebs chaired a report by the House of Lords Scientific Advisory Committee (House of Lords Science and Technology Committee , 2012), which looked into the role of departmental chief scientific advisers, including the specific question of whether they should be prohibited from speaking out if they disagreed with government policy. “The answer from the government is they are civil servants, they’re bound by the civil service code so they can’t criticise ministers,“ he said.

Another potential obstacle in the communication of science is that there are often no firm answers. The nature of science was "sceptical inquiry, trying to find out the truth and challenge whatever results and evidence has been produced", he said, rather than the common portrayal of scientists as "purveyors of some sort of absolute truth that everybody's agreed on". He said there were three specific issues around bovine TB that made it a difficult scientific message to get across. It is "a very messy problem" in that the data from the Krebs trial is "not absolutely water tight and clear cut"; different interest groups had "chosen to wilfully cherry pick bits of the data"; and different scientists have put different interpretations on the results as they exist.

He said Pielke's categorisation of the honest broker role in science policy making was difficult to stick to as the "personal reality is that it's extremely difficult to police the boundary between honest broker and advocates".

"I wouldn't claim I'm guilt free on that, " he said. "I do basically see myself in the honest broker role – presenter of the facts as I see them with all their weaknesses, the things I've talked about. On the other hand it is quite difficult once you have looked at the facts and come to a view about them to stop being an advocate for that point of view. So I am actually an advocate for not culling badgers because I think that's what the facts support. I think of myself as an honest broker but acknowledge that it is hard to remain completely neutral and you become something of an advocate."

Tim Coulson, Professor of Zoology at the University of Oxford, was a member of the IEP, which oversaw the 2013 pilot cull. Professor Coulson said the leaking of their report on the cull meant the panel was unable to do media interviews on their findings as planned, as the results had already been made public. He made the decision to use social media to publicise his views on the conclusions of the report, including writing a blog. "They [ministers] were putting a spin on it," he said. "They made it look as if it had been more successful than it was so that what made me decide, right, I think someone from the IEP should speak up." He added: "What they were trying to do was scientifically flawed. They said they were going to continue monitoring at some level but they had changed two things – one, the way they monitored, and secondly the way the cull was done, because they changed best practice."

He and the chair of the committee, Ranald Munro, decided to do press interviews while other members of the panel preferred not to comment. Some have told him he was "brave" to air his views, but as a fully independent scientist he did not mind entering the debate. "I think we have to be honest to the science that we have done," he said. "You can say this is what the science says, with this degree of certainty or this degree of uncertainty. And when we make those statements as scientists we want to be able to back them up. I think that's a really easy and straightforward thing to do and it's why I was prepared to do this. "

He said he has a lot of respect for the government scientists who worked on the badger cull, but he suspects that they felt they could not join the debate, as it had become a party political issue. He believes there is a role for scientists to be better informed about how to deal with government and policy makers. "I think there's quote a lot of confusion amongst scientists on how they should feed in or even should they feed in. "

Professor Christl Donnelly of Imperial College London leads a research programme that develops statistical methods to analyse the epidemiology of infectious diseases. She has provided scientific advice to government on bovine TB and served as deputy chairman of the Independent Scientific Group on Cattle TB (1998 to 2007), overseeing the Krebs trial. She was also a member of the Krebs Committee (1997), which recommended the trial.

She said she did not make a deliberate effort to conduct science related to policy but "fell into it". She worked as a scientist in the team that was given access to government data on BSE in 1996, which was "extremely challenging and exciting and had a big media impact". She said government scientists "feel constrained in what they're allowed to say for obvious reasons", but as an independent scientist she did not have to be concerned about that, and had played a range of roles at the interface of science and policy, including the honest broker role.

She said it was important to consider scientific uncertainty when making policy decisions. One example would be a new infectious agent where there are big unknowns.

"A reasonable consensus may not be possible other than the consensus that there are a lot of things you don't know," Professor Donnelly explained. "That may be difficult for policy makers but I think that it is important for them to be presented with that."

She said there were some cases in the media reporting of the badger cull where sound bites were "cherry picked" to support a particular view, including her own comments in media interviews and particular quotes from her scientific papers.

"A wide range of people have views, but whether or not badgers should be culled is not just a scientific question," she said. "There's the science of how it's done and what its impact is but whether or not it's worth it is not a scientific question. There are other aspects, there are moral and ethical aspects and that's something that anyone can have an opinion on. But I think it's important being interviewed as a scientist to try to stick to what you are commenting on as a scientist and what is a personal opinion."

She pointed out that after a great deal of scientific work from 1998 onwards, including a trial costing £50m, few people had changed their minds on badger culling. "In the end only an extremely small number of people actually changed their mind on it, which suggests that it wasn't the evidence that was driving the policy on this issue."

She said it was important for scientists to step up to the role of engaging with policy makers if they felt comfortable doing that. "It's a challenge but you need to defend your work. The better we can be informed by science, the better decisions people make."

Charles Godfray, Professor of Zoology at the University of Oxford, leads an international panel of scientists who take areas of policy concern and controversy, such as bovine TB control, and attempt to set out the science evidence base in a policy neutral way. He has worked on a number of scientific advisory committees to

government. He said the role he chooses to play with bovine TB is to attempt to be an honest broker but on other subjects, such as climate change, he is an issue advocate. Scientists play two different roles in policy – as honest brokers and as issue advocates – and may play different roles on different subjects, he said. Pielke's definition of the honest broker is seen by some to be "relatively simplistic", but it was a very useful criterion in practice, he said. "No one who thinks carefully about this thinks you can be an absolute honest broker but it is a good role to attempt to be," he said. " It's not that being an honest broker is better than being an advocate but one just has to be clear about what one does. I think when we as scientists are advocating things, then we do bring new things to the table, but then so does a farmer, so does a social scientist and so does someone who's spent their whole career working in Whitehall. So I think there is a role for the expert advocate but one must not invoke the authority of science outside its proper sphere."

He said when setting out the background to a particular issue, journalists should ideally use honest broker science. "I think the critical thing is that when the media is trying to give the background of the subject that they are clear about what is science and what is economics and what is politics. And that when they set out the evidence base then they do it using honest broker science."

He said some scientists were not prepared to talk about the badger cull because it was such a complex and political issue. In his view, scientists in government research agencies are in a very difficult position because they are working for government, and should be protected from talking to the press because "it puts unnecessary pressure on these individual scientists". The most appropriate route for the media was to go through the chief scientific adviser or other body in a government department, he added.

Compared with 25 years ago, scientists now treat their role of engaging with policy very seriously, he said. Oxford University regards academics who do a lot of policy work as supporting a modern university's contribution to society.

Interviews with independent experts on science, the media and policy

Fiona Fox, director of the Science Media Centre, said that in her view media coverage of the badger cull was "good". The story was mainly covered by scientists and environment correspondents – the "beat reporters" - who were "prepared to get under the skin of the story", she said. But she said the badger cull was similar to other debates, such as bees and pesticides, where there was a culture of "not wanting to speak out against government".

"The story suffered from not having more scientists willing and available to speak out," she said.

The controversy over the effects of neonicotinoid pesticides on the bee population was a "classic example", she said. There were good scientists on both sides of the argument, but the story was problematic to report because the results of government field trials, which formed a key part of the argument, had not been published for peer review. Her experience from media training government scientists was that they are often reluctant to speak to journalists because they are scared that they will be "politicised".

Government scientists should have more freedom to engage on matters of science and society, as they are not part of the political process, unlike scientific advisers to government, she said. "They're not government scientists in Whitehall, part of the political machine," she explained. "Where there's a big row in society, scientists are still afraid. Publically funded scientists should be allowed to speak in these debates involving contested science."

She highlighted an example where a government scientist at a scientific research agency was warned not to speak to the media by a government press officer even though the interview was not of a controversial nature. She puts this down to concern from civil servants that "because they're government scientists, journalists will treat them differently and give them a bad time". In regard to the badger cull, if government scientists are against the policy "Defra doesn't want them saying it publically," she said.

She recommends the media should do a better job at signposting the roles of scientists, particularly where government scientists are concerned. This includes avoiding referring to scientists at government research agencies as government advisers, as they are not part of the political machine. She does not go as far as some in calling for more scientists to be issue advocates as "it muddies the waters". But she says the media should make it clear when a scientist is going beyond the realms of scientific evidence and speaking from a personal position.

She said there appears to be recognition within government that science is popular in the media, which could explain why science is used by government to support policy initiatives. "Science is very popular," she said. "You've got the Brian Cox effect. There's a huge appetite for science in the media. I think this has influenced the government."

Chris Rapley is professor of climate science at UCL. He was the director of the British Antarctic Survey from 1998 to 2007, and is a former director of the Science Museum. Chris Rapley and Duncan Macmillan were commissioned by the Royal Court Theatre to write a play '2071' on climate change, which he performed at the Royal Court in 2014. He chaired the report of the UCL Policy Commission, *Time for Change? Climate Science Reconsidered* (Rapley, et al, 2014).

Professor Rapley said the science community needs to carefully think through what their roles are when dealing with issues of public relevance that are also likely to be controversial. Although these roles are rarely written down and defined, they fall into three broad categories – "do the science, explain the science and help policy makers make policy with the best possible scientific advice in its right role (the honest broker role)". The role of explaining the science not only to colleagues but to the general public was not as straightforward as it may sound, however "because quite often in a complex world, there's a myriad of evidence and it's easy for individuals or groups to either unwittingly or in some cases quite deliberately, pick the subset of evidence that supports the decision, the prejudice, that they've already established". This role involved a lot of work on the part of the scientist "to make sure you really have surveyed all the evidence and that you have considered all things in a balanced and

open minded, impartial way so that the conclusion that you come to, you're very confident about".

He said there was a role in pointing out where others may be misinterpreting the data and "to get involved in some sort of co-productive approach, where the scientist is careful only to answer positive questions, which science can address, they're not normative ones, which are to do with values".

He said the area he trained in – experimental physics – "is an emotionally ideologically and politically neutral subject", but "as soon as you start to talk about badger culling or MMR or genetically modified crops or nuclear power or whatever, then suddenly you collide with a whole load of existing beliefs or world views in peoples' minds". He said there was a fourth role for scientists in policy making, which was to advocate certain policies, which happened with the badger cull.

"In the end, scientists were asked, 'Well, should we shoot the badgers or not? ' And that's actually a policy, and it's very, very difficult not to get entangled into value judgements and into advocacy if you're not careful. "

He said some scientists argue they have a right as citizens to express their opinions and that they have a moral obligation to do so because they are better informed than most. "They're experts and indeed their expertise has been paid for by the public purse, so there's a moral obligation to stand up and be counted. I think the important thing is that they have to distinguish very clearly their role, that they're doing this as a well-informed citizen and not in their scientific role because they're doing something now which is beyond the scope of science. They're interpreting their science and expressing values and opinions that go beyond science."

The media could do more to signpost when a scientist was commenting "as an informed citizen", he said. "It would be so easy to say, 'We know you academics have a formal way of dealing with these things but how about just telling us as an individual what you really think?'" he said. "It's only those words – what do you think as a person, what do you think as an individual? Forget you're professor of this

or that. Give them public permission to adopt that other role, the role of informed citizen. “

He said most scientists get little training on media and public speaking. “Most scientists assume that it’s a linear process, that is you discover something, you tell somebody, they get it and they run off and do something, but that isn’t the way the real world works at all. “

He said as a result of the *Time for Change?* report (Rapley, et al, 2014), there are now lectures on the science policy interface and the roles of scientists in policy making in the doctoral training programme at UCL and elsewhere. But if you ask the average climate scientist, “What gets you out of bed in the morning?” they will still say their climate science, he said.

“That’s why they do what they do, that’s why they’re prepared to accept not as high a salary as they might have elsewhere, they’re curious people, and the thing that drives them is their curiosity. So they want to get out of bed and analyse their ice core, improve their model, go and fly on an aeroplane somewhere to measure something, and they don’t feel capable, trained, rewarded, encouraged to appear on *Newsnight* mudwrestling [with a politician].”

He said there was recognition within departments that impact had become a big issue, but his feeling was that this was still seen as “slightly secondary” to publishing in peer-reviewed journals.

“The public communication, the social interface, is partly recognised and rewarded, but in the end it’s the number of papers you’ve published in a reputable suitably high impact refereed journal that will determine whether your career is really successful or not. And it’s certainly true that if you spend too much time on the impact and not enough on the referred journals then I think that would have a very deleterious effect on your career. And we need to have that discussion – maybe that’s right, maybe that’s the way it should be, but I think it’s more a kind of default at present than a thought through policy.”

5. FINDINGS AND RECOMMENDATIONS

This research set out to analyse newspaper coverage of the badger cull to look at the roles of scientists in shaping public policy discourse. Follow-up interviews with leading scientists, journalists and policy makers were used to shed light on wider questions about coverage of the badger cull and other contentious issues at the interface of science and policy making. The main findings are as follows:

- Many of the scientists who were prepared to speak out did so because they were concerned that the science was being misrepresented or 'spun' by different sides of the debate. As Damian Carrington of *The Guardian* put it, scientists were "prepared to put their head above the parapet" because "they felt the science was being ignored".

- Only a handful of predominantly university scientists were named by the media, suggesting that either few scientists were willing to engage in the public debate or journalists sought comments only from a select group of scientists. "The journalists tend to come to the same few cast of characters," said Lord Krebs. "It's a kind of positive feedback." Another factor to take into consideration was that the journalistic method favours scientists who are particularly outspoken and give memorable quotes.

- Scientists in the badger cull mainly acted as issue advocates or honest brokers. The role between honest broker and issue advocate is not easy to define, as several scientists commented. Scientists are often reluctant to see themselves as issue advocates but some argue that it is their right to give personal views as "an informed citizen" and out of a sense "there's a moral obligation to stand up and be counted". Although most interviewees accepted there was a role for scientists as issue advocates, the majority opinion was that scientists must think long and hard about this role and make it clear they are speaking as an "honest citizen" and expressing a personal view. The experts interviewed were generally of the view that scientists have nothing to fear from acting as issue advocates, as long as they make it clear to policy makers and the press that they are acting in that capacity.

- Nearly all of the scientists quoted on the badger cull were university scientists suggesting either government scientists were unwilling or unable to speak to the media, or journalists were unwilling or unable to approach them for comments. Many of the interviewees believed that government scientists were constrained in their ability to engage in public debate. Indeed, the public acknowledge the distinction between university and government scientists in terms of their role, with a higher level of trust for university scientists than government scientists (Wellcome Trust Monitor, 2012).

- There were mixed views on whether it was appropriate or desirable for government scientists to be able to engage with the media on matters of public interest. According to Fiona Fox: "Government scientists should have more freedom to engage on matters of science and society, as they are not part of the political process, unlike scientific advisers to government. They're not government scientists in Whitehall, part of the political machine. Where there's a big row in society, scientists are still afraid. Publically funded scientists should be allowed to speak in these debates involving contested science." However, other experts, such as Professor Godfray, believe scientists in government research agencies are in a very difficult position because they are working for government, and should be protected from talking to the press because "it puts unnecessary pressure on these individual scientists".

It was not possible during my three-month fellowship to investigate coverage of other science policy issues, such as the debate over GM food, fracking, ash dieback, or neonicotinoids and bees. The content analysis offers only a snapshot of the role of the media in the science policy interface but paves the way for future research. On the basis of these preliminary findings, I would make the following recommendations for further study:

- **To further investigate and define the concept of the honest broker and issue advocate.** Pielke's categorisation of the honest broker (Pielke, 2007) is broadly accepted but in practice is somewhat idealised. As Lord Krebs explained, the "personal reality is that it's extremely difficult to police the boundary between honest broker and advocates".

- **To define and characterise the role of government scientists in policy**, and the framework they operate under in the public sphere.

- **To raise awareness in the media** of the different roles of scientists as issue advocates and honest brokers. Several scientists believe the media could do more to make it clear when scientists are commenting in this capacity and to consider these roles when questioning scientists. Professor Charles Godfray recommended that journalists use honest broker science when setting out the background to an issue, making clear demarcations between economics, politics and science. Further research is required to lead to further debate and guidance.

- **To raise awareness among scientists** of their different roles in policy making and how they can communicate their views clearly to the public through the media. Several interviewees called for better training of scientists in this area, although it was acknowledged that many scientists have no ambitions to enter the policy arena. Questions were also raised about how to reward university scientists for engaging in public debates, given the importance of science in the modern world and the special status of scientists in terms of public trust. Some research institutions, such as Oxford University, regard their scientists' involvement in policy making as part of their contribution to society, as Professor Godfray explained. According to Lord Krebs, most modern scientists are willing to present their work to the public – and part of the role of funding from the government and the research councils required a willingness to publicise their research. Professor Rapley said there needed to be a wider discussion in society about the balance between scientists being rewarded for their contribution to knowledge in terms of publishing papers and their contribution to society in terms of public engagement. Dr Helen Czerski of UCL, who presents science programme on the BBC, said forward thinking universities were getting better at finding ways to recognise public engagement and participation in policy making. "It is changing but there does need to be some kind of understanding that as scientists do more of that, less

science overall will get done, there's only a limited amount of time in the day, but the science that is done will probably have more impact."

ACKNOWLEDGEMENTS

I would like to thank my supervisor, James Painter, for his invaluable help and advice throughout the course of this research. I am also grateful to the staff at the Reuters Institute and the other Fellows for making my time at Oxford so enjoyable and memorable. I would like to thank the BBC and the Reuters Foundation for making this Fellowship possible. Finally, a big thank you goes to my family for their boundless support, encouragement and understanding.

APPENDICES

Research Coding Sheet

1.Publication:

2. a. Number of articles found:……..b) when repeats removed:……..

3. Of which: a) number in which government political sources quoted……..b) of which, number in which non-government political sources quoted…….c) of which, number in which NFU quoted……d) of which, number in which farmers quoted…….e) of which, number in which police sources quoted……f) of which, number in which government chief vet quoted……g) of which, number in which other vets quoted……h) of which, number in which veterinary bodies quoted……i) of which, number in which official anti-cull campaigners quoted……..j) of which, number in which unofficial anti-cull campaigners quoted…..k) of which, number in which independent expert panel of scientists quoted…..l) of which, number in which other scientists quoted……..m) of which, chief scientific adviser to Defra quoted.

4. Which of the following categories was the main way that scientists were included in the articles:

i) where named, scientists were quoted directly:……
ii) where named, scientists were quoted indirectly:……
iii) where scientists were not named, but scientists were quoted or described generically (e.g. scientists say that…)
iv) where the names of scientists or bodies of scientists were mentioned as part of a report, although they were not quoted.

6. For each of the articles in section 4, list the names of the scientists and bodies of scientists mentioned (on a separate sheet):

7. Balance of coverage of different voices in the debate:

Total number of government and non-government sources quoted (categories a and b)……

Total number of farmers and farming bodies quoted (categories c and d)……

Total number of police sources quoted (category e)…….

Total number of veterinary sources quoted – chief vet, veterinary bodies, individual vets (categories f, g and h)…….

Total number of anti-cull campaigners quoted – official and non-official (categories I and j)……

Total number of scientists/Independent Expert Panel/chief scientific adviser (categories k, l and i)….

8. Types of scientists: For each of the named scientists/body of scientists, what role were they playing in policy making:

i) presenting scientific facts with no concern for how they are used (pure scientist role)
ii) answering factual questions put by a decision maker but avoiding normative questions (science arbiter role)
iii) presenting uncontested scientific advice and making honest judgements about policy (honest broker role)
iv) engaging with a decision maker with the aim of reducing the scope of choice available by promoting a particular course of action (issue advocate).

Notes on methodology

- The National Trust has a policy of taking a neutral stance on badger culling. However, the organisation's chief executive Helen Ghosh was reported to have written to the environment secretary questioning the "scientific rigour and credibility" of the badger culls. Therefore, the body was included in the category official anti-cull for the purposes of this research.

- Prof John Bourne was variously described as scientist and vet in newspapers that were included in the content analysis. He was classified as a scientist for the purposes of this study, although he has a background as a veterinarian.

- Letters, reviews, repeats, corrections and clarifications, and the occasional online article picked up by the search were discarded.

- Where the nature of anti-cull campaigners was not specified i.e. referred to as campaigners generally, they were classified as official anti-cull campaigners rather than unofficial ie. hunt saboteurs or individual campaigners acting independently. For example, GABS was included in the category of official, as was Stop the Cull.

- Natural England is a wildlife executive agency that reports to the government. Where the views of Natural England as an organisation were mentioned it was included under the category government political voice.

- Mark Jones, a vet who works for the animal welfare organisation, Humane Society International UK, was a vocal opponent of the cull. His voice was recorded under anti-cull campaigners rather than in the veterinary category.

- Voices recorded under political government included ministers, officials from Defra and conservative MPs who are allied to the government position on culling. Voices recorded under political, non government, included opposition

MPs and MPs who are not allied with the official government position on culling, such as backbenchers.

- Two named scientists were removed from the analysis. Prof Charles Godfray was not included as he was mentioned only once and out of context in a feature article. Paul Caruana, a former government scientist was not included as he was quoted in the context of a leak of information about the progress of the trial rather than in a scientific capacity.

List of named scientists

Professor Sir Patrick Bateson, Professor of Zoology, University of Cambridge
Professor John Beddington, Oxford Martin School and University College London
Professor Ian Boyd, chief scientific adviser, Defra
Professor John Bourne, former Chairman, Independent Scientific Group on Cattle TB
Dr Chris Cheeseman, former Food and Environment Research Agency scientist
Professor Tim Coulson, Professor of Zoology, University of Oxford
Professor Christl Donnelly, University College London
Professor Lord Krebs, University of Oxford
Professor David Macdonald, University of Oxford
Professor John McInerney, University of Exeter
Professor Lord Robert May, University of Oxford
Professor Ranald Munro, Royal Veterinary College
Professor Robbie McDonald, University of Exeter
Professor Rosie Woodroffe, Zoological Society of London

Questions for scientists

Media coverage

What do you think of the way badger culling is being covered in the British press?

What made you speak out on the issue?

Why do you think so few scientists are willing to be quoted on this?

Could the media do more to represent the voices of scientists?

Please give examples/suggestions.

Have you ever felt your comments/views as a scientist have been spun to the press by politicians, NGOs or others?

Science and society

What stops scientists engaging more fully on controversial issues underpinned by science which are important to society?

Could the government do more to allow scientists to speak openly on such matters?

What sort of measures might help?

Role of scientists

As a scientist how important is it to you to be involved in decision making on matters that affect society?

What role do you think you best fit into with regard to your role as a scientist in policy making (**pure scientist, science arbiter, issue advocate,** or **honest broker).**

Questions for policy makers

Press coverage

What do you think of the way the issue of badger culling is being covered in the British press?

Why do you think so few scientists were willing to be quoted on the issue?

Public engagement

What stops scientists engaging more fully on controversial issues such as badger culling, fracking and GMOs?

Could the government do more to allow scientists to speak openly on matters underpinned by science, which are important for science and society?

Is a new framework needed?

If so, do you have any suggestions for how to proceed?

Scientific models

How much freedom should scientists have to speak on matters of public policy?

A model has been proposed for scientists in policy making, called the honest broker of policy alternatives. In this role, scientists fulfil the role of expanding the scope of choice for a decision maker through the integration of knowledge and a broad consideration of possible alternatives rather than the old model of simply presenting scientific facts and avoiding normative questions. What do you think of this model? Is it realistic?

Questions for journalists

Press coverage

What do you think of the way the issue of badger culling is being covered in the British press?

Do you think that science was spun by either or both sides in the badger debate to advance their argument?

Please give examples.

Scientific voices

Were scientists willing to talk to you?

If not, why not?

Why do you think so few scientists were willing to be quoted on this issue?

Science and society

What stops scientists engaging more fully on controversial issues such as badger culling?

Could the government do more to allow scientists to speak openly on matters underpinned by science, which are important to society?

List of interviews

Damian Carrington, Head of Environment, *The Guardian*, Face-to-face interview on Monday 24 November

Fiona Fox, Director, Science Media Centre, face-to-face interview on Monday 24 November

Ryan Kisiel, former reporter at the *Daily Mail* newspaper, telephone interview on Tuesday 25 November

Professor Chris Rapley, Professor of Climate Science, UCL, face-to-face interview on Thursday 27 November

Professor Tim Coulson, Professor of Zoology, University of Oxford, face-to-face interview on Monday 1 December

Lord Krebs, Principal, Jesus College, University of Oxford, face-to-face interview on Tuesday 9 December

Professor Christl Donnelly, Imperial College London, telephone interview on Tuesday 9 December

Professor Charles Godfray, University of Oxford, face-to-face interview on Wednesday 17 December

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