
Scientists and the media: the struggle for legitimacy in climate change and conservation science

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Despite the uncertainties associated with forecasts of the possible negative effects of climate change on natural environments, such research is often widely reported in the news media. Here we review the presentation in the UK news media and on the internet of an academic study published in *Nature*, forecasting future global extinctions as a result of climate change. The results and conclusions of the study were widely misrepresented, especially in the news media, to make the consequences seem more catastrophic and the timescale shorter. Representations of the original article on the internet were more variable, with several sites ranked highly on popular search engines being overtly critical of the underlying science. We suggest that such polarised representations of environmental science are indicative of a 'struggle for legitimacy' between environmentalist and anti-environmentalist groups, with potential negative consequences for public trust in science.

Despite an overwhelming scientific consensus that humans are influencing the planet's climate, a vigorous debate has continued in the global news media as to whether climate change is really happening,¹ and what the consequences may be for humans and ecosystems. Both environmentalists (mainly campaigning environmental NGOs) and climate sceptics (mainly not-for-profit organisations, business funded foundations, and private individuals) seek to convince the public of the legitimacy of their beliefs through the appropriation and dissemination of scientific information.

The communication and interpretation of science to the general public is achieved through a variety of media, the most important of which are the traditional print media, television, radio, and, now, electronic channels such as the internet. Because 'the media' are viewed collectively as such a powerful tool for influencing public opinion, it is understandable that environmentalists will want to maximise the exposure of science supporting their agenda. Unfortunately, the careful, measured language of science is not well suited to the soundbite sensationalism that is the typical mode of communication of most of the contemporary news media. The distortion of information that occurs as science is translated into the language of the popular media has led to accusations of press sensationalism both by scientists² and by an increasingly influential array of 'anti-environmentalist' and sceptical individuals³ and organisations. However, it has also been argued that sensationalism is acceptable if it brings an environmental message (for instance about the potential ecological effects of climate change) to the attention of the public and polity.⁴

In this review we take as a starting premiss that environmental scientists (as distinct from, for example, environmental activists) have a prime responsibility to report findings that are likely to be of concern to society, and to do so in as accurate, objective and simple a fashion as possible. In order to achieve balance, accuracy and impact (i.e. improved public understanding of environmental science), scientists need to understand better the process by which their science is transformed into news, including how different political and social groups seek to influence this conversion. As a contribution to improved understanding, we have reviewed the flow, translation and transformation of information from a scientific paper on climate change and species extinction into a national and international media story. We also reflect on our own (eventful and somewhat naive) interventions in this process, and assess the representation of this same story on the internet. Finally, we go on to discuss ways in which environmental groups and other organisations may seek to legitimise their positions through the appropriation of peer reviewed science.

CASE STUDY: PREDICTING EXTINCTIONS IN A WARMING WORLD

On 7 January 2004, the journal *Nature* published a study that modelled the potential effects of global warming on the distributional ranges of certain groups of land animals and plants.⁵ The results of the study suggested that given a number of key assumptions and under 'moderate' climate change scenarios, between fifteen and thirty-seven per cent of the 1103 species considered within the study would be 'committed to extinction' by 2050. The authors described these percentages as being 'an estimate of proportions of species committed to future extinctions as a consequence of climate change over the next 50 years', and 'not the number of species that will become extinct during this period'. Furthermore, they noted, 'decades may elapse between [the reduction of appropriate habitat through climate change] and extinction'. In short, the study claimed that if the assumptions and predictions of the model were valid, then a proportion of the species studied would eventually occupy environmental conditions incompatible with their long term survival.

This study received global press coverage. We reviewed twenty-nine reports in the UK's national and local newspapers and found a systematic pattern of errors in twenty-six of them (Table 1). The most significant misrepresentation of the study's findings was the frequently repeated contention that over a million species would go extinct due to global warming by 2050 (twenty-one reports). Just two reports explained that only a few species would actually be extinct by 2050; two reports went so far as to suggest that a third of all the world's species would become extinct. No report specified the full reported range of uncertainty, which was between 5.6 and 78.6 per cent of species committed to extinction due to climate change.

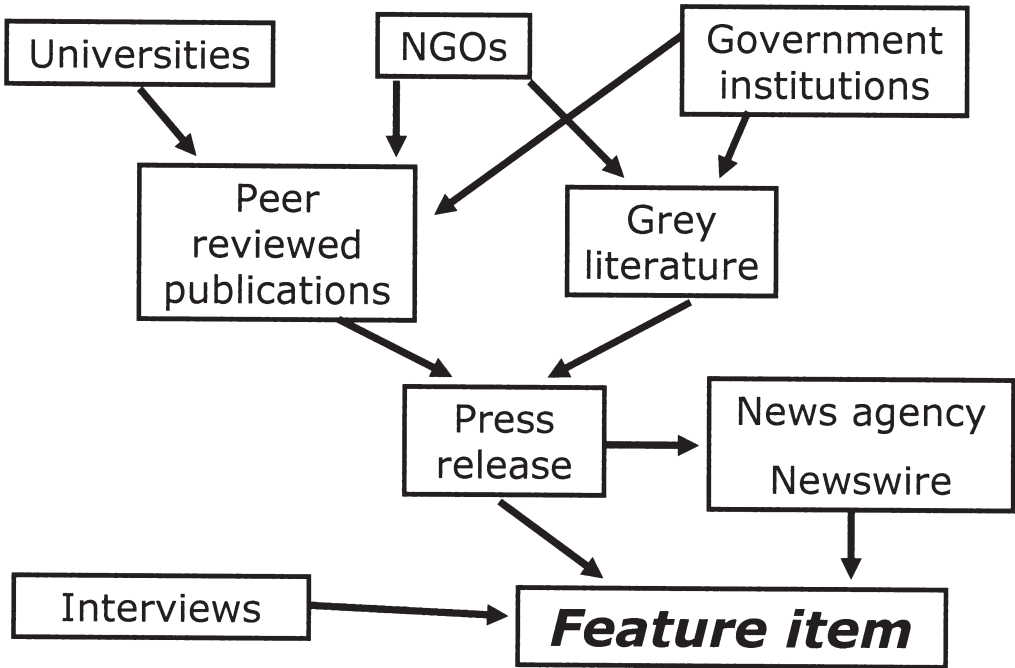
In seven reports, the study's lead author, Professor Chris Thomas, was quoted as saying: 'If the projections can be extrapolated globally, and to other groups of land animals and plants, our analyses suggest that well over a million species could be threatened with extinction as a result of climate change.' This powerful statement, which amongst other assumptions must presuppose a particular (large) estimate of global biodiversity, was not qualified with any information on the basis of the extrapolation, or the great uncertainties concerning global species richness estimates.⁶ As a consequence, the public was in effect asked to accept this dire prediction at face value. In contrast, a university level education in

Table 1 Survey of newspaper reports: secondary items include letters and editorials

	Primary reports	Secondary items
<i>Claims</i>		
Million or more species extinct	14	7
Species extinct by 2050	10	3
Quarter of all life forms extinct	1	2
Quarter of all land animals/plants extinct	7	1
Third of all life forms extinct	2	0
Third of all land animals/plants extinct	1	0
<i>Qualifications</i>		
Based on millions of unidentified species	0	0
Only a few actually extinct by 2050	2	0
Phrase 'committed to extinction' used	1	0

the natural sciences teaches that the number of species described is in the region of one and three quarter million;⁷ the number of yet undiscovered species of arthropods is probably in the range of four to six million,⁸ rather than the much used value of about thirty million.⁹

The origin of the majority of the cruder generalisations and extrapolations in the media can be traced back to the original press releases and agency newswires (see adjacent figure for a schematic representation of the role of press releases in the translation of science into news). The first release (7 January 2004) was from the University of Leeds, the institution



The conversion of science into news

generating the research, and carried the headline 'Climate change threatens a million species with extinction'. It is here that the 'million species' reference first appears, along with the unattributed claim that a quarter of land animals and plants may go extinct. In fairness, the press release then goes to some lengths to explain that extinctions will occur '*eventually*' [their emphasis] and not in the next fifty years. The resulting newswires from the big press agencies varied in their veracity. The Dow Jones International News newswire (7 January) was relatively cautious in tone: 'Hundreds of species of land plants and animals around the globe could vanish or be on the road to extinction over the next 50 years if global warming continues'. On the other hand Reuters' newswire (7 January) stated that 'Global warming could wipe out a quarter of all species of plants and animals on earth by 2050'. We suspect that this was the basis for many of the mistakes and exaggerations communicated in the UK press the following day.

Some senior politicians were quick to align themselves with the notion of impending environmental calamity. For example Margot Wallstrom, EU Environment Commissioner, wrote in the *Guardian* newspaper that 'Many people had a lot to say about the recently published study that suggests global warming could wipe out a third of the planet's species by 2050', and the Irish Green Party's Leader John Barry publicly threw his support behind a Friends of the Earth campaign to reduce carbon emissions and stop 'the extinction of a quarter of the world's species by 2050'. When the research was discussed in the UK House of Commons, Margaret Beckett, UK Secretary of State for Environment, Food and Rural Affairs, stated that the 'study that has been published today indicates that between 15 per cent and 37 per cent of land species in the area that was studied could face extinction *by* 2050 [our emphasis]. However, it is important for the House to understand that the impact of the highest predictions of global warming would have an even more disastrous effect. So it is not an exaggerated report that assumes catastrophe; it refers to the expected impact of climate change' (quoted in *Hansard*, 8 January 2004). Since these proportions were not projected to face extinction by 2050, then her interpretation, if not the report itself, could indeed be accused of exaggeration.

In the conservation lobby, many of the largest and best known NGOs produced their own press releases or ran news stories on their websites. WWF-UK went a step further and used the research in its funding efforts: on 12 January (four days after the bulk of the news coverage) it mailed its membership on the subject of a 'conservation emergency!', with the opening line 'you've no doubt seen the recent press and television headlines – by 2050 global warming could wipe out one million species of animals and plants'.

INTERNET REPRESENTATIONS

As more people use the web to find and interpret the results of scientific research, the scientific community needs to focus on how the social and spatial dynamics of web dissemination might affect public understanding of science. The next generation of web-literate laypersons could easily be misled or polarised, thereby undermining the considered public debate that underpins effective environmental policy. This topic has so far received little attention and we are aware of no published studies examining, for instance, how scientific information is translated and interpreted as it passes through electronic media, or whether there are any differences between representations of environmental science in the print and electronic media.

One thing seems sure: the world wide web gives voices to many groups invisible in the mainstream press, including some with extreme and unorthodox viewpoints. Unlike in scientific journals, the science appearing on the web is not subject to external review or assessment. Consequently, as Stuart Pimm and Jeff Harvey put it, ‘the web is full of unselected ideas’.¹⁰ In the context of the environmental movement, this might be where we see evidence of a sceptical-environmentalist backlash against the sensationalising tendencies of the mainstream press.¹¹

To explore how environmental websites represented the *Nature* article, we reviewed the fifty most highly ranked sites on the three most popular search engines (Google, Yahoo, MSN) during the first two weeks of August 2004. To reduce search bias we used a very simple combination of words and phrases, namely ‘Thomas’, ‘climate change’ and ‘extinction’, linked together with the Boolean operator ‘AND’. When reviewing the sites we included in our analysis only those that gave some interpretation of the original report.

Sites were classified by a simple typology reflecting ownership and, to some extent, mission. The categories used were: ‘media’ (19 hits); ‘non-profit’, which included environmental NGOs and ‘anti-environmentalist’ foundations (22); ‘educational’ (mainly universities) (4); ‘personal’ (1); ‘governmental’ (8); and ‘bulletin’ (1). Sites were also categorised as to whether they questioned the validity of either the results or the conclusions of the Thomas *et al.* study. Websites referring directly to the Thomas article were recorded and ranked for each search using the three search engines, and then a combined rank was calculated based on the relative usage of each search engine by the general public according to www.nielsen-netratings.com.

Searches generated fifty-five sites referring directly to the Thomas article and providing some comment/discussion of its content. Many webpages appearing in the first fifty sites were rejected from the analysis on the grounds of being completely irrelevant (no mention of the Thomas article) or providing no interpretation of the paper whatever. Of sites that matched our criteria for analysis, the majority (thirty-three) were from the US, with the UK in second place (ten). Sixteen of the sites appeared in the top fifty ranked sites on all three search engines. In contrast to the news media coverage only twenty-three sites said that extinction would occur by 2050, and only twenty used the ‘million species or more’ estimate of global extinction. Although only ten sites were overtly critical of the Thomas article, four of these appeared in the top ten highest ranked sites overall (Table 2).

Table 2 Top ranked internet sites (see text for details)

Rank	Website owner	Critical
1	Leeds University (press release)	No
2	Conservation International (report)	No
3	Center for the Study of Carbon Dioxide and Global Change	Yes
4	Science and Environmental Policy Project	Yes
5	Oxford University (expanded media article)	Yes
6	NASA (report)	No
7	Earth Crash Spirit (personal site)	No
8	National Geographic	No
9	Co2andclimate.org	Yes
10	CBC News	No

None of the media sites were sceptical of the underlying science or questioned the credibility of the projections. We suspect this is because many of their reports were culled directly from press releases or the news media. The environmental NGO sites were also more likely to use the uncritical and sensationalised version of the story that appeared in the press.

Websites adopting a critical approach to the original paper were mostly those of self-styled 'not-for-profit' foundations with an explicit right-leaning political agenda. These groups, commonly categorised as 'anti-environmentalist', could be considered as an adversary in a fight for credibility with the environmental movement, where both sides use interpretations of scientific information from peer reviewed journals to legitimise their views. Interestingly, none of the critical sites based their criticism on the sensationalised misrepresentations that were so prevalent in the press reports from January 2004, but instead focused on perceived scientific inadequacies in the *Nature* article.

For instance, the Center for the Study of Carbon Dioxide and Global Change (third in our ranking – see Table 2), with a mission to 'disseminate factual reports and sound commentary on new developments in the world-wide scientific quest to determine the climatic and biological consequences of the ongoing rise in the air's CO₂ content', commented:

it is clear that their results are forced by the calculations, confounded with statistical bias, lack supporting real-world evidence, and are perforated with speculation. It would thus appear that their doctrine of 'massive extinction' is actually a case of 'massive extinction bias.'

Another website ranked in our top ten (Table 2), the Science and Environmental Policy Project define themselves as a 'non-profit, 501(c)3 educational group, with a mission to clarify the diverse problems facing the planet and, where necessary, arrive at effective, cost-conscious solutions'. Once again, their criticism was almost exclusively aimed at the science underlying the original paper and concluded with the following statement:

Obviously, there is a lot to criticize in this paper. What is surprising is that something with such inconsistencies and unrealistic assumptions made it unscathed through the review process in such a prestigious journal as *Nature*.

It is clear that the wider discourse on the internet has some similarities with the media coverage, but that the 'anti-environmentalist' sites are more likely to try to use scientifically derived (if spurious) arguments to legitimise their positions. Perhaps significantly, even though there was criticism of the Thomas paper from within peer reviewed scientific journals,¹² these arguments do not seem to have been adopted by the environmental-sceptic community.

None of the critical websites in our survey criticised or recycled the erroneous press coverage. This is surprising, and does not seem to support the recent claims by George Monbiot and his colleagues that the media is propagating and inspiring anti-environmentalist sentiment:

The science of climate change is under attack – an attack that is coordinated, well-funded and given constant play in the media. The stronger the scientific consensus on climate change becomes, the more the media suggest that the science is uncertain.¹³

Another trend indicated by this limited sample is that even though there are relatively few anti-environmentalist sites on the internet, they tend to rank high on search engines. There are several possible reasons for this. First, the search terms we used may have selected sites

possessing an explicit science bias in their content. Second, many of the media and environmental NGO sites used existing press coverage that referred to the keywords less frequently. Third, the climate sceptics may be more adept at designing sites that will rate highly in internet searches.

To date, scientists and academics more widely have generally shown very little interest in how their work is represented on the internet. Our survey suggests that a more in-depth understanding of how science is translated and represented on the internet might be important for the development of evidence based environmental policy. With more students at all levels of education getting information from the internet it is also important that educators understand internet biases in reporting of science and are able to advise their students how to develop the critical analytical skills needed to sift the information and make sense of the varying messages.

Pimm and Harvey¹⁴ recommend four ways in which the credibility of a site might be assessed. First, check the data: strong arguments are based on data from primary sources that are available for scientific scrutiny; spurious and erroneous arguments are often backed up with data from secondary sources or even hearsay. Second, arguments couched in hyperbolic language may be masking a lack of understanding or data. Third, check the credentials of the authors: are they from a respected institution? have they published peer reviewed articles on the subject under discussion? Finally, it is also worth looking at who funds the website as this may give some indication of any underlying agendas. However, even with all these precautions there is huge scope for being misled or misdirected and for work to appear out of context. For instance, in the course of compiling this review we were amazed to find a complete Spanish translation of the web-published supplementary material for our *Nature* comment on media treatment of the Thomas paper,¹⁵ replete with Oxford University logo, on an Argentinian anti-environmentalist website. Similarly, whilst the institutional home of an author provides relevant context, the history of science illustrates that figures close to the heart of the scientific establishment have often got it seriously wrong: argument by authority is no substitute for rigour in presentation of arguments.

A case could also be made for the establishment of websites modelled on the 'sifting process' of peer reviewed academic journals, designed to provide unbiased and accurate dissemination of environmental science. Many individual scientists and research groups already have their own websites, but these are generally highly technical and/or naive in their broader policy interpretation. In the present case, we identified few sites that gave a balanced assessment of the Thomas *et al.* study. Instead we found a battle for scientific credibility and legitimacy between factions on either side of the environmental debate. Where important work such as the Thomas *et al.* paper comes into the public arena, there is an obvious need for a definitive, authoritative and realistic web resource written in accessible language that is explicit about the assumptions and limitations of the work. This would not, of course, do anything to prevent the work being appropriated and used to legitimise advocacy of environmental and anti-environmentalist causes, but it would counter some of the wilder claims made on both sides of the debate.

TRUST AND SCIENTIFIC LEGITIMACY

Because scientific rationalism is a key tenet of contemporary policy, it is crucial that politicians and policy-makers are informed by a balanced assessment of scientific

knowledge. Oversimplistic treatments of scientific findings and departures from rational objectivity risk undermining public trust in the natural sciences and could play into the hands of anti-environmentalists.

Where scientific results have a high degree of uncertainty, for example forecasts of potential consequences of climate change on biodiversity,¹⁶ there is considerable scope for media misrepresentation. This places a considerable onus on scientists to report their science responsibly and without undue exaggeration. Doing so in the non-technical terms necessary to ensure clarity is vital for maintaining the independence and integrity of public policy. If the public loses trust in scientists then policy risks being set by vested interests. Overstating the implications of preliminary research opens environmental science up to damning critiques by the anti-environmentalist lobby. This could increase public cynicism and complacency about climate change and loss of biodiversity, in much the same way that the 'over-egging' of intelligence reports on weapons of mass destruction affected public attitudes concerning politicians' motives for the Iraq war.

The scientific and conservation community needs to take a responsible attitude towards disclosure of research findings on climate change, and should seek to inform the public about the treatment of uncertainty within their analyses. Practical steps might be for scientists to direct media communication on this topic towards journalists with whom they have an established intellectual relationship; for high profile journals to pay particular attention in briefing statements to conveying information as to the limitations of the study in question; for leading research groups to run and maintain accessible and informative websites; and for scientists to write to newspaper editors, trustees of major charities and politicians with clarifications on misleading reportage of their science.

CONCLUSIONS

The case study discussed here demonstrates the use of an environmental science paper published in a high profile international journal to engender public perception of a 'hot crisis' – an imminent environmental disaster that may affect us all. This will be credible to the public if the disaster does indeed occur in the timescale suggested, or if a clear response is seen to avert it. If not, then there is a danger that environmental scientists and the environmental movement more generally will be seen to be crying wolf and may accordingly suffer a loss of credibility and legitimacy. Eventually this could lead to public apathy and even 'conservation fatigue', with highly counterproductive outcomes for the environmental movement. Furthermore, it stands in the way of scientists who use more conservative, and possibly realistic, assumptions getting their work into the media. For instance, at least in the short term it would be difficult to persuade a newspaper to give similar exposure to a peer reviewed paper predicting the extinction of seventy thousand species by 2200.

We should also not forget that the anti-environmentalist movement, feared to be powerful in the US, might be especially aware of exaggerated claims. The media, by setting up such obvious straw men, play straight into the hands of vested interests whose environmental agenda has potentially disastrous consequences for biodiversity and human health. Ever since Bjorn Lomborg¹⁷ published his one-sided but widely reported attack on the sloppy science and propaganda commonly used by the environmental movement, it has become increasingly important for scientists and the media to exercise caution in relaying information with high degrees of uncertainty.

There are several potential reasons for the widespread misreporting of climate change science in the media. First, newspaper science editors and journalists may lack a grasp of the theoretical models, assumptions and extrapolations that characterise much climate change and conservation science. The perceived need to present stories as soundbites further promotes oversimplification and hyperbole. Second, science reporters may be relying too much on secondhand press reports and press releases rather than checking their facts or going back to the original study, despite the easy online accessibility of sources such as *Nature*. Equally, researchers, scientific institutions and journals could take more care in the preparation of press releases, which often act as a source of much hype and simplification in the news media.¹⁸ Faced with tight deadlines, many journalists may place an unwarranted degree of trust in the press releases and newswires they receive. Third, it might serve the interests of particular actors in the chain to 'sex up' a story, for instance by linking climate change to the imminent threat of mass extinctions. By this means proprietors sell papers, journals generate citations, scientists gain profile and research funding, conservation charities generate donations, and politicians gain an agenda that may attract votes and enhance careers.

It is of course all too easy to point to deficiencies in press coverage; it is far harder to come up with practical solutions for both scientists and journalists. Although not always possible, careful scrutiny of the original peer reviewed article may often avoid some of the grossest misrepresentations. Even though environmental editors may not be experts in the field, they should still be able to derive something from scanning the original work. However, even top journals let through speculation and inference that can fan the flames of a media story. A good illustration of this can be seen in a recent article in *Science* on population declines of birds, butterflies and vascular plants in the UK whose abstract concluded, perhaps unwisely, with the suggestion that the study provides evidence that the 'world is experiencing the sixth major extinction event in its history'.¹⁹ Unsurprisingly, the following day's headlines hardened the story so that the study was said to provide the first 'hard evidence' of the next mass extinction.²⁰

Phone interviews also seem to be an unusually poor way of extracting information. Sadly it is almost trivially easy to sucker scientists into saying something indiscreet or technically incorrect (a trap we have fallen into ourselves²¹). Allowing interviewees to check copy would be one way to rectify some of these problems, although in our experience journalists generally seem very reluctant to engage in this way.

Finally, scientists should think carefully about promoting work in an emerging field where the results are still in a preliminary stage of testing or development. A recent report by the Office of Science Technology and the Wellcome Institute²² concluded that the UK lacks a framework within which people can access information about new science, allowing them to assess and judge information and its implications. Without such a framework it is inevitable that we will see many more fights for legitimacy, as advocates of different environmental philosophies seek to exploit the multiple modes of public communication available to them.

NOTES

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