Has Climate Change Taken Prominence over Biodiversity Conservation?

DIOGO VERÍSSIMO, DOUGLAS C. MACMILLAN, ROBERT J. SMITH, JENNIFER CREES, AND ZOE G. DAVIES

The growing prominence of climate change has led to concerns that other important environmental issues, such as biodiversity loss, are being overshadowed. We investigate this assertion by examining trends in biodiversity and climate change coverage within the scientific and newspaper press, as well as the relative distribution of funding through the World Bank and the National Science Foundation, since the late 1980s. Our indicators substantiate some of these fears. To prevent biodiversity from becoming a declining priority, conservationists need to analyze the discourse surrounding climate change and determine how it has become the predominant environmental topic. In addition, given the common drivers of biodiversity loss and climate change, we argue that win–win solutions must be sought wherever possible. Conservationists need to be proactive and take this opportunity to use the mounting interest in climate change as a flagship to leverage more support and action to prevent further biodiversity loss.

Keywords: content analysis, extinction, global warming, investment, media

Since the turn of the century, climate change has become an increasingly dominant environmental issue, with world leaders labeling it as the greatest challenge faced by humankind (e.g., Bunn 2009). Nevertheless, analyses by the Millennium Ecosystem Assessment and the United Nations Environment Programme suggest that climate change is only part of a complex suite of pressures that have a profound negative impact on ecosystems globally (MA 2005, UNEP 2007). Similarly, in a recent meta-analysis in which the detrimental effects of different types of environmental change on ecosystem function were examined, it was shown that biodiversity loss was comparable in magnitude to climate change (Hooper et al. 2012). However, in recent years, some authors have expressed concern that the importance of climate change has been overstated in relative terms (Botkin et al. 2007, Jetz et al. 2007, Randin et al. 2009, Willis and Bhagwat 2009) and, as a direct consequence, has deflected both attention and funding from other important environmental problems, including biodiversity loss (Noss et al. 2012, Zaccai and Adams 2012). Here, we investigate these assertions by reviewing temporal trends in biodiversity and climate change coverage within the scientific and newspaper press, as well as the relative distribution of funding through the World Bank and the National Science Foundation (NSF; box 1).

During the last two decades, press attention devoted to biodiversity has remained stable, representing, on average, 0.51% of the articles written annually (box 2, figure 1a). By contrast, the percentage of climate change reports rose prior to 2007 ($F(1,18) = 16.38$, $p < .001$, $r^2 = .51$) by 0.03% (standard error [SE] = 0.008) per year and surpassed biodiversity for the first time in 2005, at 0.74%. Since 2007, no directional trend has been evident for climate change, but coverage remains significantly greater than in the past (prior to the break point, median = 0.26%; after the break point, median = 1.38%; Wilcoxon signed-rank test, $W = 0$, $p < .001$). Given the agenda-setting ability of the media (McCombs and Shaw 1972, Boykoff 2007, Warren 2012), such a surge in attention is an important indicator of how climate change has become more of a mainstream issue than biodiversity loss is. Indeed, an analysis of Google search patterns between 2004 and 2010 by Mccallum and Bury (2013) showed a more extreme scenario, with public interest growing in relation to climate change but declining for both biodiversity and conservation. The reasons underpinning such results are likely to be complex. However, it has been proposed that climate change has a higher profile because the associated policy responses will involve major economic sectors and because the concept of biodiversity loss is harder to comprehend and measure (Zaccai and Adams 2012).

BioScience 64: 625–629.
doi:10.1093/biosci/biu079 Advance Access publication 11 June 2014

Box 1. Data collection.

Newspaper press coverage

We estimated the percentage of articles covering biodiversity or climate change through a content analysis of four US broadsheet newspapers (*The New York Times*, *The Washington Post*, *The Wall Street Journal*, and *USA Today*) and four UK broadsheet newspapers (*The Guardian*, *The Independent*, *The Times*, and the *Financial Times*). These titles were selected on the basis of their wide readership, broad political stance, and nontabloid nature. Controlling for these three factors is important, because they are known to influence editorial policies (Boykoff 2007, Gentzkow and Shapiro 2010). Data collection was conducted in LexisNexis, which archives material from 1989 to the present. The climate change keywords were *climate change* and *global warming*; the biodiversity keywords were *conservation* and either *biodiversity*, *species*, *habitat*, *wildlife*, *nature*, or *environment*.

Academic peer-reviewed paper coverage

The percentage of articles covering biodiversity, climate change, or a combination of both topics was generated through a content analysis of academic journals indexed in Thomson Reuters Web of Science. The climate change keywords were *climate change* and *global warming*; the biodiversity keywords were *biodiversity* and *conservation*.

Project funding by the World Bank

We calculated the percentage of funding allocated to projects with a focus on biodiversity, climate change, or both topics, through a content analysis of the World Bank's online project database. The analysis was restricted to the International Bank for Reconstruction and Development and the International Development Association, whose funds are managed solely by the World Bank. The preexisting database project labels *biodiversity* and *climate change* were used for the search.

Project funding by the National Science Foundation

The percentage of funding allocated to projects centered on biodiversity, climate change, or both topics, was assessed through a content analysis of the National Science Foundation's online database. The climate change keywords were *climate change* and *global warming*; the biodiversity keywords were *biodiversity* and *conservation*.

Box 2. Statistical analyses.

The presence of temporal signals in the data sets was tested using linear and piecewise regression models. Piecewise regression fits different functions over discrete ranges of the explanatory variable, with the break point being the threshold x-axis value that separates the segments and produces the minimum deviance. For each data set, the alternative null and one- and two-segment models were compared using information-theoretic methods. Because the sample sizes were smaller than 50, second-order Akaike information criterion (AICc) values were used to control for the number of parameters and to assess model parsimony. All averages provided are medians because the data were not normally distributed. The differences between medians (e.g., before and after the break points or between data sets) were established using either a Wilcoxon rank-sum test or a Kruskal–Wallis test, followed by a Bonferroni corrected Mann–Whitney U post hoc test where that was appropriate. All analyses were carried out in R (version 3.0; R Foundation for Statistical Computing, Vienna, Austria).

Novacek (2008) suggested that the "media obsession" surrounding climate change has provided a strong incentive for biodiversity conservationists to align their research more closely with the climate change agenda. In such a scenario, one would expect the percentage of papers with a dual focus (climate change and biodiversity conservation) to increase, whereas the percentage of those centered solely on biodiversity would be expected to decrease as authors reframe their work to make it more relevant or attractive to a wider audience. When we investigated publication trends in the peer-reviewed literature, we found little evidence to support this hypothesis (figure 1b). The percentage of papers addressing biodiversity loss and conservation has risen through time ($F(1,24) = 1703.0$, $p < .001$, $r^2 = .98$) at a modest rate of 0.01% (SE = 0.0003) annually. For both climate change and dual focus papers, the number of publications also grew significantly, but with a discernible acceleration after 2006 (climate change prior to the break point, $F(1,22) = 984.5$, $p < .001$, $r^2 = .98$, rate per year = 0.011%, SE = 0.0003; climate change after the break point, $F(1,4) = 2921.0$, $p < .001$, $r^2 = .99$, rate per year = 0.066%, SE = 0.001; dual focus prior to the break point, $F(1,22) = 57.34$, $p < .001$, $r^2 = .75$, rate per year = 0.0003%, SE = 0.00004; dual focus after the break point, $F(1,4) = 41.84$, $p < .05$, $r^2 = .95$, rate per year = 0.007%, SE = 0.001). Nonetheless, even by 2010, the percentage of papers written with a dual focus (0.03%) remained a fraction of those published on only biodiversity (0.35%) or climate change (0.49%). In addition, as one

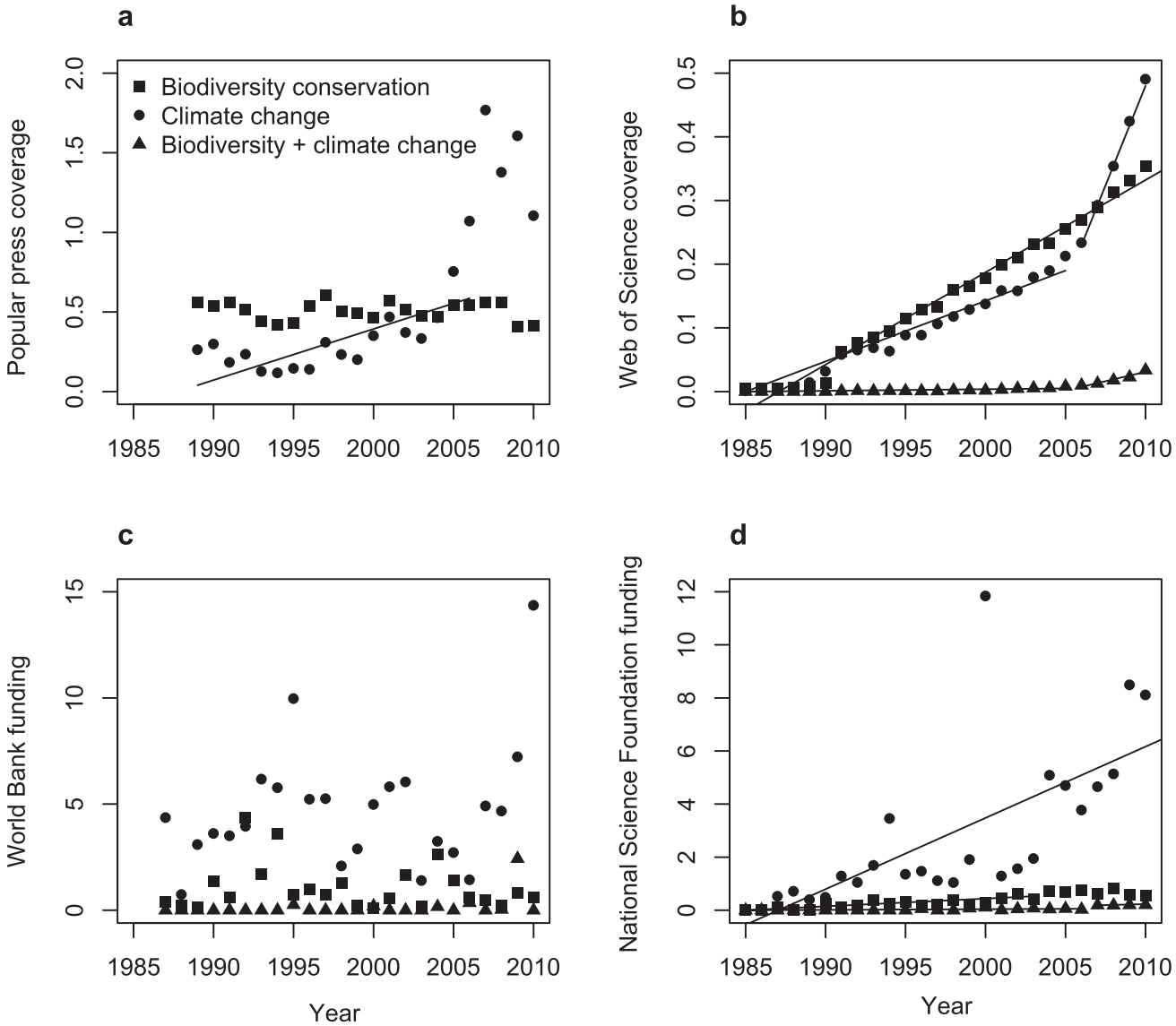

Figure 1. Temporal trends for biodiversity and climate change annual representation (as a percentage) in (a) newspaper articles, (b) academic peer-reviewed papers, (c) World Bank funding allocations, and (d) National Science Foundation funding allocations. The lines represent statistical trends through data segments or complete data sets.

would hope and predict, the notable increase in climate change articles being published within journals preceded that observed in the newspaper press (figure 1a, 1b).

Another potential ramification of the prominence attained by climate change could be the skewing of funding priorities, which would result in more investment in climate change research at the expense of biodiversity conservation, despite both being complex and multidisciplinary problems. The comparable data on funding allocation needed to determine whether this assertion is valid are scarce, either because the information is not available to the public or because agencies tend to have specific terms of reference. However, two large funding bodies, the World Bank and the NSF, have open-access searchable project databases that allow for an unbiased assessment of the relative investment in climate change and biodiversity conservation projects. No temporal relationships were apparent in World Bank funding over the two decades (figure 1c), although the organization has prioritized climate change over biodiversity conservation, with substantial differences in the percentage of annual investment for the former (climate change, median = 4.52%; biodiversity, median = 0.06%; dual focus projects, median = 0.00%; Kruskal–Wallis test, $\chi^2 = 55.11$, $p < .001$, with the climate change median being significantly higher than the other two). Similarly, the NSF has also favored climate change research, potentially to the detriment of biodiversity (figure 1d). The percentage of annual investment directed toward climate change has risen steadily ($F(1,24) = 22.28$, $p < .001$, $r^2 = .48$) by 0.3% (SE = 0.06) per year, to 8.11% in 2010. For biodiversity, there was

an increase ($F(1,19) = 34.73$, $p < .001$, $r^2 = .67$) of 0.03% (SE = 0.004) annually until 2004. Since then, the expenditure each year has remained static at, on average, 0.65%. The rate of investment on dual focus research has grown since 2007 ($F(1,4) = 678.9$, $p < .05$, $r^2 = .99$) to 0.21% by a rate of 0.009% (SE = 0.0003), from 0.003% (SE = 0.0009) per year previously ($F(1,22) = 14.52$, $p < .01$, $r^2 = .43$). This rise is relatively small and does not mitigate the plateauing expenditure on biodiversity research, even if conservationists are integrating aspects of climate change into their grant proposals.

Although painting only a partial picture of the intricate and multidimensional relationship between climate change and biodiversity issues and, in turn, how this translates into media coverage, academic research outputs, and funding, the indicators that we consider here verify that climate change has indeed been attracting greater attention in recent years. Moreover, the patterns in NSF investment suggest that biodiversity loss may be being overshadowed by climate change, as previous authors have feared. To prevent biodiversity from becoming a declining public and political priority, conservationists need to study the discourse surrounding climate change and ascertain how it has been elevated to the predominant environmental topic in recent years. Evidence of such an approach is already being seen with the establishment of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), an international body for the coordination and synthesis of our scientific understanding of biodiversity loss (*www.ipbes.net*). The Intergovernmental Panel on Climate Change (IPCC), which was awarded the Nobel Peace Prize in 2007 for its efforts to build up and disseminate knowledge related to climate change (*www.ippc.ch*), has served as a model of how biodiversity ecosystem service research could be more effectively brought to bear on environmental policy, management, and awareness (Larigauderie and Moonie 2010).

In addition, conservationists must take advantage of the increased interest in climate change by promoting policies that address both issues, because many of the solutions advocated to mitigate climate change could have synergistic value for biodiversity (Caparrós and Jacquemont 2003, Kim 2004, Turner et al. 2009, Hunter et al. 2010). An example of a potential win–win scenario is the evolution of the United Nations's Reducing Emissions from Deforestation and Forest Degradation (REDD) program (*www.un-redd.org*), which is a collaborative initiative among governments, nonprofit organizations, and the private sector with the aim of decreasing carbon emissions from forest exploitation in developing countries, into REDD$^+$. The objective of REDD$^+$ is not just to secure carbon storage but also to create additional cobenefits for local communities and biodiversity. Such mechanisms avoid the artificial prioritization of one particular environmental threat over another, providing unifying approaches that can be promoted to different stakeholders (Grainger et al. 2009). In summary, conservationists need to be proactive and take this opportunity to use the growing interest in climate change as a flagship to leverage more awareness, support, and action to prevent further biodiversity loss.

Acknowledgments

The authors acknowledge Laure Cugnière for insightful comments on a previous version of the manuscript, as well as the anonymous reviewers. DV is funded by the doctoral program (through fellowship no. SFRH/BD/60993/2009) of the Fundação para a Ciência e Tecnologia, part of the Portuguese Ministry of Education and Science.

References cited

Botkin DB, et al. 2007. Forecasting the effects of global warming on biodiversity. BioScience 57: 227–236.

Boykoff MT. 2007. Flogging a dead norm? Newspaper coverage of anthropogenic climate change in the United States and United Kingdom from 2003 to 2006. Area 39: 470–481.

Bunn ID. 2009. The United Nations and climate change: Legal and policy developments. Pages 61–72 in Nelson GL, Hronszky I, eds. Sustainability 2009: The Next Horizon. American Institute of Physics.

Caparrós A, Jacquemont F. 2003. Conflicts between biodiversity and carbon sequestration programs: Economic and legal implications. Ecological Economics 46: 143–157.

Gentzkow M, Shapiro JM. 2010. What drives media slant? Evidence from U.S. daily newspapers. Econometrica 78: 35–71.

Grainger A, et al. 2009. Biodiversity and REDD at Copenhagen. Current Biology 19: R974–R976.

Hooper DU, Adair EC, Cardinale BJ, Byrnes JEK, Hungate BA, Matulich KL, Gonzalez A, Duffy JE, Gamfeldt L, O'Connor MI. 2012. A global synthesis reveals biodiversity loss as a major driver of ecosystem change. Nature 486: 105–108.

Hunter M Jr, Dinerstein E, Hoekstra J, Lindenmayer D. 2010. A call to action for conserving biological diversity in the face of climate change. Conservation Biology 24: 1169–1171.

Jetz W, Wilcove DS, Dobson AP. 2007. Projected impacts of climate and land-use change on the global diversity of birds. PLOS Biology 5 (art. e157).

Kim JA. 2004. Regime interplay: The case of biodiversity and climate change. Global Environmental Change 14: 315–324.

Larigauderie A, Mooney HA. 2010. The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services: Moving a step closer to an IPCC-like mechanism for biodiversity. Current Opinion in Environmental Sustainability 2: 9–14.

[MA] Millennium Ecosystem Assessment. 2005. Ecosystems and Human Well-being: Synthesis. Island Press.

Mccallum ML, Bury GW. 2013. Google search patterns suggest declining interest in the environment. Biodiversity and Conservation 22: 1355–1367.

McCombs ME, Shaw DL. 1972. The agenda-setting function of mass media. Public Opinion Quarterly 36: 176–185.

Noss RF, et al. 2012. Bolder thinking for conservation. Conservation Biology 26: 1–4.

Novacek MJ. 2008. Engaging the public in biodiversity issues. Proceedings of the National Academy of Sciences 105: 11571–11578.

Randin CF, Engler R, Normand S, Zappa M, Zimmermann NE, Pearman PB, Vittoz P, Thuiller W, Guisan A. 2009. Climate change and plant distribution: Local models predict high-elevation persistence. Global Change Biology 15: 1557–1569.

Turner WR, Oppenheimer M, Wilcove DS. 2009. A force to fight global warming. Nature 462: 278–279.

[UNEP] United Nations Environment Programme. 2007. Global Environment Outlook: Environment for Development. UNEP. Publication no. GEO-4.

Warren C. 2012. Risk and the sacred: Environment, media, and public opinion in Bali. Oceania 82: 294–307.
Willis KJ, Bhagwat SA. 2009. Biodiversity and climate change. Science 326: 806–807.
Zaccai E, Adams WM. 2012. How far are biodiversity loss and climate change similar as policy issues? Environment, Development and Sustainability 14: 557–571.

Diogo Veríssimo (verissimodiogo@gmail.com), Zoe G. Davies, Robert J. Smith, and Douglas C. MacMillan are affiliated with the Durrell Institute of Conservation and Ecology, at the University of Kent, in Canterbury, United Kingdom. Jennifer Crees is affiliated with the Institute of Zoology, part of the Zoological Society of London, also in the United Kingdom.