8 Nelson, B.W. and de Oliveira, A.A. (2001) Área botânica. In *Biodiversidade na Amazônia Brasileira: Avaliação e Ações Prioritárias para Conservação, Uso Sustentável e Repartição de Benefícios* (Verissimo, A. *et al*., eds), pp. 132–176, Editora Estação Liberdade
9 Rylands, A.B. *et al*. (2001) Species and subspecies of primates described since 1990. *Neotrop. Primates* 9, 75–78
10 Thiollay, J.M. (1989) Area requirements for the conservation of rain forest raptors and game birds in French Guiana. *Conserv. Biol.* 3, 128–137
11 Gentry, A.H. and Emmons, L.H. (1987) Geographic variation in fertility and composition of the understorey of neotropical forests. *Biotropica* 19, 216–227
12 Connell, J.H. (1971) On the role of natural enemies in preventing competitive exclusion in some marine animals and in rain forest trees. In *Dynamics of Populations* (den Boer, P. and Gradwell, G., eds), pp. 298–313, Centre for Agricultural Publishing and Documentation, Waneningen, the Netherlands
13 Woodroffe, R. and Ginsberg, J.R. (1998) Edge effects and the extinction of populations inside protected areas. *Science* 280, 2126–2128
14 Terborgh, J.W. *et al*. (2001) Ecological meltdown in predator-free forest fragments. *Science* 294, 1923–1926
15 Losos, E. and Leigh, E.G. (2004) *Tropical Forest Diversity and Dynamics: Findings from a Large-scale Plot Network*, University of Chicago Press
16 Chagnon, F.J.F. and Bras, R.L. (2005) Contemporary climate change in the Amazon. *Geophys. Res. Lett.* 32. doi: 10.1029/2005GL022722
17 Wright, S.J. *et al*. (1999) The El Niño Southern Oscillation, variable fruit production, and famine in a tropical forest. *Ecology* 80, 1632–1642
18 Walker, G.K. *et al*. (1995) Impact of ongoing Amazonian deforestation on local precipitation: a GCM simulation study. *Bull. Am. Meteorol. Soc.* 76, 346–361
19 Rosenfeld, D. (1999) TRMM observed first direct evidence of smoke from forest fires inhibiting rainfall. *Geophys. Res. Lett.* 26, 3105–3108
20 Cochrane, M.A. and Laurance, W.F. (2002) Fire as a large-scale edge effect in Amazonian forests. *J. Trop. Ecol.* 18, 311–325
21 Noss, R.F. (2001) Beyond Kyoto: forest management in a time of rapid climate change. *Conserv. Biol.* 15, 578–590
22 Schwartzman, S. and Zimmerman, B. (2005) Conservation alliances with indigenous peoples of the Amazon. *Conserv. Biol.* 19, 721–727
23 Colinvaux, P. (2005) The Pleistocene vector of Neotropical diversity. In *Tropical Rain Forests: Past, Present, and Future* (Bermingham, E. *et al*., eds), pp. 78–106, University of Chicago Press
24 Ferreira, L.V. *et al*. (2001) Identifição de áreas prioritárias para a conservação da biodiversidade por meio da representatividade das unidades de conservação e tipos de vegetação nas ecorregiões da Amazônia brasiliera. In *Biodiversdade na Amazônia Brasileira* (Verissimo, A. *et al*., eds), pp. 25–38, Instituto Socioambiental, São Paulo, Brazil
25 MMA (2002) *Biodiversidade Brasileira: Avaliação e Identificação de Áreas e Acões Prioritárias para Conservação, Utilização Sustentável e Repartição de Benefícios da Biodiversidade Brasileira*, Brazilian Ministry of Environment

0169-5347/$ - see front matter Published by Elsevier Ltd.
doi:10.1016/j.tree.2005.10.009

Letters

Consensus on climate change

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A remarkable achievement of the climate change research community is that climate change is now a major topic on the political agenda. However, there is a large difference between the consensus reached on climate change among scientists and that reached by the political community.

Prior to the Group of Eight's (G8) annual summit 2005, a draft statement with the formulation that there is 'increasingly compelling evidence of climate change, including rising ocean and atmospheric temperatures, retreating ice sheets and glaciers, rising sea levels, and changes to ecosystems' raised serious debates among representatives of G8 countries [1]. This statement was eventually substituted with 'climate change is a serious and long-term challenge that has the potential to affect every part of the globe' [1,2]. Whereas the draft statement is specific and decisive, indicating that climate change is a current problem, the final statement is weak, vague and, in its temporal perspective, in clear contradiction to the findings of climate impact research over the past decade. It is still allowing individual governments to defer action in favor of 'more research'.

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Available online 25 October 2005

An increasing number of climate impact studies (Figure 1) of a range of species, habitats and regions, as well as cross-taxonomic review articles [3–8], provide compelling evidence that climate change is already affecting the behavior and distribution of species and the composition and structure of communities and ecosystems; facts that were recognized as a breakthrough of the year in 2003 [9]. The wheel of scientific knowledge would be turned back at least a decade if this research is called into question with the claim that more research is needed [10]. More research will be valuable, but is not needed to show that climate change is already affecting the Earth in multiple ways.

Although the agreement by the G8 leaders on the statement that despite 'uncertainties remain in our understanding of climate science, we know enough to act now' [11] sounds promising at first glance, optimism vanishes upon closer inspection of the type of action referred to. The plan of action [12] largely reads like a list of reaffirmation of past agreements. Although it is generally agreed that the G8 nations have been responsible for much of the past greenhouse gas emissions [13], the leaders prefer opening yet another dialogue instead of taking prompt action for a substantial and long-term

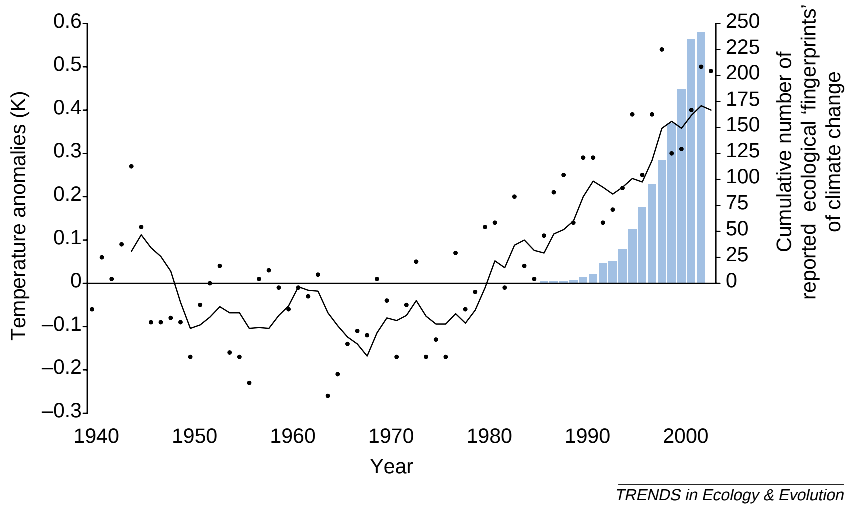

Figure 1. Annual global temperature anomalies relative to 1961–1990 average [annual values (black dots) and five-year smoothed averages (black line)] and the cumulative number of case studies (blue columns) reporting ecological 'fingerprints' of climate change [7,8,16]. Temperature data taken from [15].

reduction in net global greenhouse gas emissions. 'A disappointing failure by the leaders of the G8 unequivocally to recognise the urgency with which we must be addressing the global threat of climate change. […] We have been talking instead of acting since 1992.' (R.M. May, personal communication in [14]). The presidents of the National Science Academies of each of the G8 countries, along with those of Brazil, China and India, outlined clearly in their joint statement prior to the summit that action taken now to reduce significantly the build-up of greenhouse gases would lessen the magnitude and rate of climate change, and that failure to implement significant reductions in net greenhouse emissions now, will make the job much harder in the future [13].

What can we scientists learn from the G8 summit? There is an urgent need to not only enhance the visibility of science, but also actively communicate scientific knowledge on climate change (and other human-caused global change) to the public, and to point out to what degree it is (not) taken up in policy. Scientists need to get more closely involved in opinion-forming to influence more effectively future climate change decisions made by politicians and policy makers.

References

1 Eilperin, J. (2005) US pressure weakens G8 climate plan. *The Washington Post* 17 June, A01
2 G8 Gleneagles (2005) *Climate Change, Clean Energy, and Sustainable Development*, Foreign & Commonwealth Office (http://www.fco.gov.uk/Files/kfile/PostG8_Gleneagles_CCChapeau.pdf)
3 Hughes, L. (2000) Biological consequences of global warming: is the signal already apparent? *Trends Ecol. Evol.* 15, 56–61
4 McCarty, J.P. (2001) Ecological consequences of recent climate change. *Conserv. Biol.* 15, 320–331
5 Walther, G-R. *et al*. (2002) Ecological responses to recent climate change. *Nature* 416, 389–395
6 Stenseth, N.C. *et al*. (2002) Ecological effects of climate fluctuations. *Science* 297, 1292–1296
7 Parmesan, C. and Yohe, G. (2003) A globally coherent fingerprint of climate change impacts across natural systems. *Nature* 421, 37–42
8 Root, T.L. *et al*. (2003) Fingerprints of global warming on wild animals and plants. *Nature* 421, 57–60
9 The News and Editorial Staff. (2003) Breakthrough of the Year – The Runners-Up. *Science* 302, 2039–2045
10 Giles, J. (2005) Gloomy outlook for Blair. *Nature* 435, 862–863
11 G8 Gleneagles (2005) *Post-G8 Gleneagles Communiqué*, Foreign & Commonwealth Office (http://www.fco.gov.uk/Files/kfile/PostG8_Gleneagles_Communique.pdf)
12 G8 Gleneagles (2005) *Gleneagles Plan of Action*, Foreign & Commonwealth Office (http://www.fco.gov.uk/Files/kfile/PostG8_Gleneagles_CCChangePlanofAction.pdf)
13 The Presidents of National Science Academies (2005) *Joint Science Academies' Statement: Global Response to Climate Change*, (http://www.royalsoc.ac.uk/displaypagedoc.asp?id=13618)
14 Royal Society (2005) *Science News*, Royal Society (http://www.royalsoc.ac.uk/news.asp?id=3256)
15 Jones, P.D. *et al.* (2004) *Annual Land Air and Sea Surface Temperature Anomalies: GLOBE 1861-2003*, Hadley Centre for Climate Prediction and Research (http://www.metoffice.com/research/hadleycentre/CR_data/Annual/land+sst_web.txt)
16 Walther, G-R. *et al.*, eds (2001) *'Fingerprints' of Climate Change – Adapted Behaviour and Shifting Species Ranges*, Kluwer Academic/-Plenum Publishers

doi:10.1016/j.tree.2005.10.008