

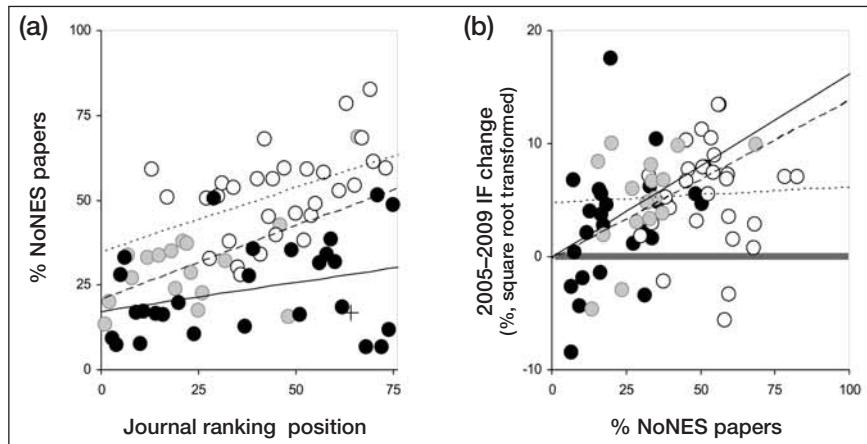


## Language bias in ecological journals

Peer-reviewed letter

Given the unquestionable dominance of the English language in scientific communication (Hamel 2008), researchers who are non-native English speakers (NoNES) are at a disadvantage when trying to publish their work (Jaffe 2003; Primack *et al.* 2009). Standards of quality for English writing in scientific journals are constantly becoming more demanding and tend to be higher in more prestigious journals (Meneghini and Packer 2007). However, possible patterns emerging in the publication record of ecological journals resulting from those constraints have, until now, not been analyzed.

I used the Thomson Scientific's Web of Knowledge database to search for "articles" and "reviews" published between 2000 and 2009 in the 75 top-ranking ecological journals, according to their 2009 Impact Factor (IF) from the Journal Citation Reports (JCR). For each journal, I recorded the percentage of papers authored exclusively by ecologists from non-English-speaking countries (% NoNES papers) – that is, those that did not include any author from countries where English is the primary spoken language (Australia, Canada, Ireland, New Zealand, South Africa, UK, US). I assumed that authors whose affiliations indicated that they were from non-English-speaking countries were NoNES, although the search was based on addresses as supplied by the authors and not on their actual nationality (Borsuk *et al.* 2009). I also assumed that, in a given publication, written proficiency in English grammar and usage is ensured by having at least one author from an Anglophone country. I used the journals' ordinal position when ranked by their 2009 IF as a measure of their relevance. I also calculated the percent change in IF in the last 5 years (ie  $\{[IF_{2005} - IF_{2009}] \times 100\} / IF_{2005}$ ). Finally, I recorded each journal's



**Figure 1.** (a) Percentage of papers authored exclusively by scientists from non-native English-speaking countries (% NoNES papers) in relation to the ranking of 75 ecological journals according to their Impact Factor (IF), shown separately for journals published in North America (black circles, solid line), Britain (gray circles, dashed line), and in non-English-speaking countries (unfilled circles, dotted line). The plus sign (+) marks a journal published in Australia. Analysis of covariance; journal ranking (covariate)  $F_{1,70} = 13.4$ ;  $P < 0.001$ ; journal's location of publication (factor)  $F_{2,70} = 31.2$ ;  $P < 0.001$ ;  $r^2 = 0.57$  (factor  $\times$  covariate interaction was not significant and was thus deleted from the model). (b) Relationships between the % NoNES papers and the change in IF of ecological journals between 2005 and 2009. The horizontal gray line separates journals with increasing and decreasing IF. Simple regression;  $F_{1,68} = 8.3$ ;  $P = 0.005$ ;  $r^2 = 0.11$  (neither the journal's location of publication nor its interaction with % NoNES papers were significant and were thus deleted from the model).

location of origin (journal country/territory in JCR) and categorized journals accordingly as belonging to: (1) non-English-speaking countries; (2) UK; or (3) North America (US and Canada).

Publications authored exclusively by NoNES constituted 34.4% of the total publications selected for analysis within the database. The % NoNES papers published in selected journals increased consistently as journal rank decreased, with (on average) a gain of 2.6% for each 10th-position loss in rank (Figure 1a). The % NoNES papers of a hypothetical "average" journal from the selected dataset (ie with an IF around 3) would be more than double if that journal were published in a non-English-speaking country than in North America (49.8% to 23.6%), with intermediate values in the case of British publications (34.6%). The combined effects of journal rank and location of publication explained a marked 57.3% of the variation in % NoNES papers.

Do these patterns indicate that the publication output of non-native

English-speaking ecologists is being hindered by language-related problems? This seems to be supported by previous work relating English language skills and research output of either individual scientists (Vasconcelos *et al.* 2008) or countries (Man *et al.* 2004), as well as by the high rejection rates of manuscripts submitted to journals by NoNES (eg Primack and Marrs 2008). However, other factors could also influence these results. For example, it could be argued that Anglophone countries have a long scientific tradition of ecological research and thus are able to produce higher quality papers. Nevertheless, this is not fully supported by other analyses, which show that papers in ecological journals do not differ in their citation rates regardless of whether their first author is a native English speaker (NES) or a NoNES (Borsuk *et al.* 2009). Moreover, ecological journals that have higher % NoNES papers tend to be those that have had the largest recent increases of their respective IF values, a pattern that is

especially clear for journals published in English-speaking countries (Figure 1b). This means that the science produced by ecologists who are NoNES is adequate enough to raise the average citation rates of journals, or is at least not so deficient as to harm their scientific prestige.

The language bias seems much stronger than any other possible source of inequality among ecologists (eg Primack *et al.* 2009). I have argued elsewhere (Clavero 2010) that the unequal competition for publication between scientists – NES and NoNES – is a clear example of linguistic injustice. In my opinion, native-English-speaking editors and scientists should be aware of their advantageous position and assist non-native English-speaking writers with their English writing, while native-English-speaking publishers should provide English editing services to non-native English-speaking ecologists who submit quality science.

Regardless of how it is accomplished, clearly these issues must be addressed in order to attain greater fairness in scientific publication (Clavero 2010). Moreover, besides ethical concerns, there are other reasons to facilitate the access of non-native English-speaking authors to international scientific publication. For example, an unknown amount of ecological research, undoubtedly including some “good” science, may in effect be lost to a wider international audience when it is not published in English, mainly as a result of the language limitations of non-native English-speaking ecologists (eg Waal 2003). This loss in information may hinder the development of meaningful meta-analyses (eg Dunn *et al.* 2007). Finally, by studying Figure 1b, editors wanting to raise the IF of their respective journals may even find more practical reasons to promote works by NoNES.

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- Borsuk RM, Budden AE, Leimu R, *et al.* 2009. The influence of author gender, national language and number of authors on citation rate in ecology. *Open Ecol J* 2: 25–28.
- Clavero M. 2010. Awkward wording, rephrase: linguistic injustice in ecological journals. *Trends Ecol Evol* 25: 552–53.
- Dunn RR, Sanders NJ, Fitzpatrick MC, *et al.* 2007. Global ant (Hymenoptera: Formicidae) biodiversity and biogeography – a new database and its possibilities. *Myrmecological N* 10: 77–83.
- Hamel RE. 2008. The dominance of English in the international scientific periodical literature and the future of language use in science. *AILA Rev* 20: 53–71.
- Jaffe S. 2003. No pardon for poor English in science. *The Scientist* 17: 44–45.
- Man JP, Weinkauf JG, Tsang M, and Sin DD. 2004. Why do some countries publish more than others? An international comparison of research funding, English proficiency and publication output in highly ranked general medical journals. *Eur J Epidemiol* 19: 811–17.
- Meneghini R and Packer AL. 2007. Is there science beyond English? Initiatives to increase the quality and visibility of non-English publications might help to break down language barriers in scientific communication. *EMBO Rep* 8: 112–16.
- Primack RB and Marrs R. 2008. Bias in the review process. *Biol Conserv* 141: 2919–20.
- Primack RB, Ellwood E, Miller-Rushing AJ, *et al.* 2009. Do gender, nationality or academic age affect review decisions? An analysis of submissions to the journal *Biological Conservation*. *Biol Conserv* 142: 2415–18.
- Vasconcelos SMR, Sorenson MM, Leta J, *et al.* 2008. Researchers’ writing competence: a bottleneck in the publication of Latin-American science? *EMBO Rep* 9: 700–02.
- Waal FBM de. 2003. Silent invasion: Imanishi’s primatology and cultural bias in science. *Anim Cogn* 6: 293–99.

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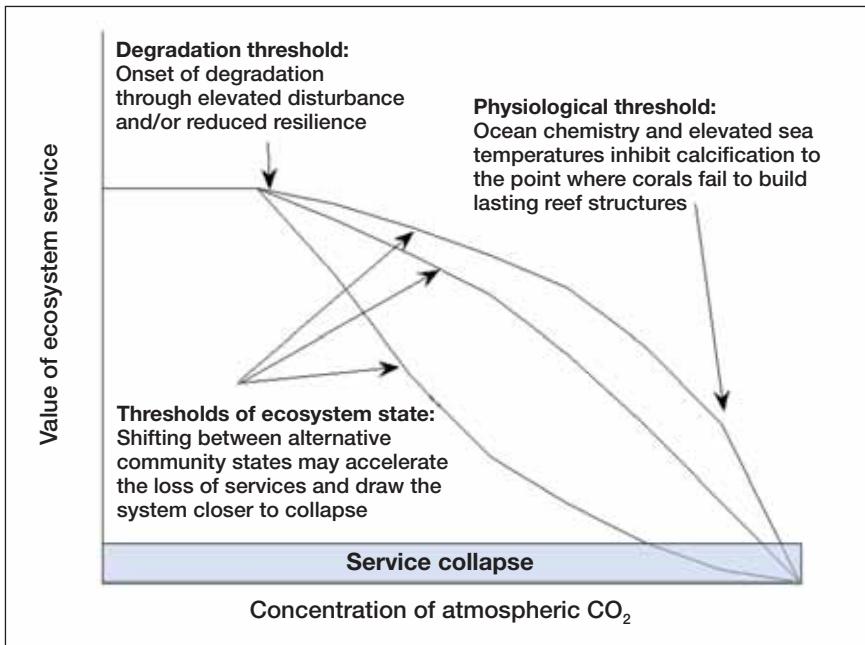


## Revisiting climate thresholds and ecosystem collapse

Policy dialogues regarding climate-change mitigation require the setting of “safe” targets for atmospheric carbon dioxide ( $\text{CO}_2$ ) concentrations. These targets are influenced by analyses of the response of ecosystems and society to rising levels of greenhouse gases. Much of the science has focused on the existence of threshold levels of  $\text{CO}_2$  beyond which systems will gather momentum toward a deleterious state (Lenton *et al.* 2008). Policy makers are familiar with thresholds, but confusion exists over the consequences of exceeding these limits. This is partly because some systems respond to multiple types of threshold, and we lack a nomenclature to distinguish their nature and impacts. Without such structure, there is a risk that policy makers will fail to discriminate between the consequences of exceeding different types of threshold. Doing so could lead to grossly misplaced policies.

The problem can be illustrated by looking at coral reefs. “Threshold” literally means the level beyond which a new event occurs and although reefs face several types of threshold, not all imply ecosystem collapse (Figure 1). First, there is a *degradation threshold* beyond which the average state of an ecosystem begins to degrade. A recent report called for a reduction of  $\text{CO}_2$  levels from their present level of 387 parts per million (ppm) to < 350 ppm in order to return the environment to the conditions to which corals are adapted (Veron *et al.* 2009). The rationale is simple, in that once atmospheric  $\text{CO}_2$  exceeded ~340 ppm in the early 1980s we began to witness large-scale coral bleaching, caused by rising sea temperatures and greatly exacerbated by climatic oscillations such as the El Niño–Southern Oscillation. Three hundred and fifty ppm is a threshold beyond which the average state of a reef ecosystem becomes degraded, but this does not imply ecosystem collapse.

Second, many ecosystems, including coral reefs, exhibit phase shifts and



**Figure 1.** Multiple thresholds acting on the ecosystem services of coral reefs.

even multiple stable community states, if resilience is lacking. For example, heavy depletion of herbivores on some Caribbean reefs reduced the ability of coral communities to recover after disturbance and resulted in a switch of community state to one dominated by seaweed. Dynamics of this type are usually driven by ecological feedbacks and are a major focus of ecological science. In this case, thresholds of ecosystem state might be defined as sets of conditions that determine whether the ecosystem will exhibit natural recovery or shift inexorably toward a different and less-desirable state (Mumby *et al.* 2007).

Yet a third type of threshold can occur at even higher levels of CO<sub>2</sub> (Figure 1). Here, the environment becomes so hostile that fundamental physiological functions are grossly impaired. Coral reefs provide an excellent example of such a *physiological threshold* because of their vulnerability to rising levels of CO<sub>2</sub> (Hoegh-Guldberg *et al.* 2007). There remains great uncertainty over precisely when and where such physiological functions effectively cease. Rising sea temperatures stress corals and reduce their growth, and extreme events cause mass mortality. Ocean acidification may depress growth and other functions further, but the degree to which corals are

negatively affected is highly uncertain.

It is conceptually useful to distinguish different types of threshold because the processes involved are different, their onset may occur sequentially, and it forces us to distinguish ecosystem degradation from collapse (Figure 1). System “collapse” depends on the particular ecosystem service or attribute being considered and will vary from one function to another. For example, collapse of the ability of corals to form accreting reef structures may arise through persistent algal phase shifts (ecosystem state thresholds), physiological stress leading to low calcification rates exacerbated by erosion (physiological thresholds), or a combination of both. Modeling the interactions among thresholds requires a multidisciplinary approach and remains a considerable challenge.

Failure to recognize that not all threshold transgressions imply ecosystem collapse could have profound consequences for global poverty and human health. Within several months of a widely publicized report being published that called for long-term CO<sub>2</sub> levels of 350 ppm (Veron *et al.* 2009), we observed identical responses by a senior government legislator to the UN Framework Convention on Climate Change (COP 15) and a senior representative of the UN

Convention on Biodiversity who questioned the value of conservation efforts for coral reefs based on a misunderstanding of thresholds. Both observed that since the threshold of 350 ppm CO<sub>2</sub> for coral reefs has already been exceeded and may be an infeasible target, why should investments in reef management continue? Both representatives had implicitly assumed that exceeding the 350-ppm threshold implied inevitable ecosystem collapse (even though this was not stated in the paper) such that further conservation investments would yield negligible benefits. This assumption was incorrect because coral reefs did not collapse once 350 ppm was exceeded and they still support vital ecosystem services, including coastal defense and food security, albeit at potentially reduced levels. Indeed, investments in reef management are more important than ever in order to minimize the loss of services and stem the rise of poverty in coastal communities dependent on reefs. A more transparent means of communicating the consequences of crossing thresholds is needed to help busy policy makers use scientific advice effectively.

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Hoegh-Guldberg O, Mumby PJ, Hooten AJ, *et al.* 2007. Coral reefs under rapid climate change and ocean acidification. *Science* 318: 1737–42.

Lenton TM, Held H, Kriegler E, *et al.* 2008.

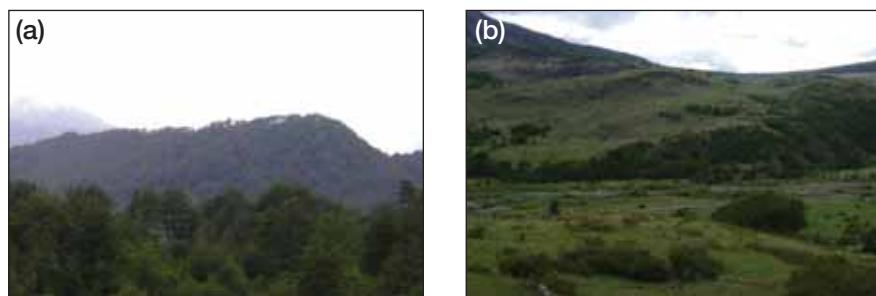
- Tipping elements in the Earth's climate system. *P Natl Acad Sci USA* **105**: 1786–93.
- Mumby PJ, Hastings A, and Edwards HJ. 2007. Thresholds and the resilience of Caribbean coral reefs. *Nature* **450**: 98–101.
- Veron JEN, Hoegh-Guldberg O, Lenton TM, et al. 2009. The coral reef crisis: the critical importance of < 350 ppm CO<sub>2</sub>. *Mar Pol Bull* **58**: 1428–36.
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## Dams and afforestation plans in Chilean Patagonia

Two large hydropower projects (involving seven dams in total) in Chilean Patagonia will, upon acceptance of their environmental impact studies (EISs), lead to the inundation and clear-cutting of almost 12 000 ha of natural forest. The EISs presented by the hydropower companies acknowledge that vegetation (including forest cover) will be heavily impacted by each project. A companion project will also include construction of a 100-m wide, 2300-km-long power-line corridor – resulting in further clear-cutting of forest. To fulfill Chilean environmental legislation, the companies behind such projects must compensate for the area of removed forest by afforesting a similar area of land with tree species of the same type as those that have been removed. The companies claim that their afforestation plans will be highly successful, but we believe the plans associated with these projects contain important flaws that undermine their viability.

First, seedling establishment is the major bottleneck in any afforestation process. Although a precise knowledge of species' ecological requirements is recognized as essential for establishment success, the requirements of native Patagonian forest species are largely unknown. Moreover, the submitted plans that propose afforestation of Patagonian sites – where growing seasons are typically short and temperatures cold – follow tree plantation protocols developed for use in forests located northern to Patagonia, which are subject to a cli-



**Figure 1.** (a) Evergreen rainforest and (b) steppe ecosystems in Chilean Patagonia. Hydropower companies plan to compensate for inundation and clear-cutting of natural forest by afforesting the Patagonian steppe with rainforest tree species.

mate with a Mediterranean influence (Luebert and Pliscott 2006).

Second, these protocols, which have demonstrated success with fast-growing, exotic tree species (eg *Pinus radiata*, *Eucalyptus globulus*), require the elimination of competing vegetation within plantations – thereby ignoring the importance of ecological processes such as facilitation (ie positive plant interactions). Indeed, it is the presence of other plant species (facilitation) rather than their absence (competition) that determines whether slow-growing species will establish successfully at less-productive sites with relatively harsher environmental conditions (Callaway 2007). There are, however, alternatives to traditional tree-planting protocols that may better ensure successful afforestation. For example, survival of *Nothofagus pumilio* – a widespread Patagonian tree species – can be greatly increased if seedlings are planted in groups (Fajardo and McIntire 2011) instead of in isolation, as dictated by protocols.

Third, some of the sites that the companies have already acquired for afforestation are located within the steppe belt of Patagonia, where few trees occur naturally and where selected surface conditions are quite different from those of the evergreen rainforest that will be affected by the dams' construction. Thus, attempting to afforest the Patagonian steppe (<500 mm annual precipitation) with species belonging to the evergreen rainforest (>2000 mm annual precipitation; Figure 1) seems likely to fail because of the mismatch

between regional conditions and the physiological requirements of the associated species.

Finally, we believe that these afforestation plans are based on a "trial and error" approach, which is an inefficient use of time and money.

It has been suggested that large dams result in mostly negative impacts on ecosystems, and that early cooperation between ecologists, dam engineers, and affected people is essential to improve the effectiveness of compensatory measures (WCD 2000). Unfortunately, such collaboration was not considered when the afforestation plans for the Patagonian hydropower projects were being drawn up. If the current proposals are implemented as intended, another failure in environmental mitigation may be added to the list.

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Callaway RM. 2007. Positive interactions and interdependence in plant communities. Dordrecht, The Netherlands: Springer.

Fajardo A and McIntire EJB. 2011. Under strong niche overlap conspecifics do not compete but help each other to survive: facilitation at the intraspecific level. *J Ecol* **99**: 642–50.

Luebert F and Pliscott P. 2006. Sinopsis bioclimática y vegetacional de Chile. Santiago, Chile: Editorial Universitaria.

WCD (World Commission on Dams). 2000. Dams and development, a new framework for decision-making. Chapter 3: ecosystems and large dams: environmental performance. London, UK, and Sterling, VA: Report of the World Commission on Dams.

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