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18. T. Wada, T. Tachibana, Y. Shimura, K. Okada, unpublished data.
19. We thank the Nottingham Arabidopsis Stock Centre (University of Nottingham, UK) for providing the seeds of *gl2-1* and *ttg-1* mutants; S. Ishiguro and other members of our laboratory for suggestions; D. M. Marks and J. W. Schiefelbein for discussions; and A. Kawai for making the transgenic *Arabidopsis* lines. Supported by a Grant-in-Aid for Scientific Research (A) number 08408031 and a Grant-in-Aid for Scientific Research on Priority Areas number 06278103 from the Japanese Ministry of Education, Science, Culture and Sports and by funds from the Joint Studies Program for Advanced Studies from the Science and Technology Agency of Japan.

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TECHNICAL COMMENTS

Distribution and Causation of Species Endangerment in the United States

A. Dobson *et al.* (*1*) provide a description of the geographic distribution of endangered species in the United States. They also examine the associations between the density of endangered species and the intensity of human economic activities, with the use of the annual statistical survey of the United States (*2*). Their effort (*1*) was too abbreviated for prudent policy implications. The statistical survey of the United States does not provide data on all economic activity, and it says nothing of endangerment causation. Extrapolating correlation to causation is fraught with assumption (*3*).

With the use of the only encyclopedic account of endangered species available (*4*–*6*), we compiled a database of the 877 American threatened and endangered species listed by the U.S. Fish and Wildlife Service up until 1995 and the causes of their endangerment that have been operational since passage of the Endangered Species Act. We identified 18 causes of endangerment (Table 1).

Most endangered species are endangered by several causes, and it is rarely possible to determine the relative importance of each cause. By the time a species is endangered, however, any loss of individuals is critical, so that the "relativity" of importance loses relevance for any given species. We suggest, therefore, that the importance of a cause to overall species endangerment generally corresponds to the frequency with which it is found to endanger species.

Dobson *et al.*(*1*, p. 552) found that "the overall density of endangered species is correlated with one anthropogenic and one climatic variable (correlation coefficient $r^2 = 0.80$, $P < 0.01$): the value of agricultural output and either average temperature or rainfall." Agriculture is a major cause of endangerment, but it is less important than nonnative species and urbanization (*7*). Furthermore, there is a host of economic activities that greatly exceeds agriculture in importance, in a cumulative sense (Table 1).

The emphasis of Dobson *et al.* (*1*) on the concentration of endangered species in "hot spots" tends to discount the fact that species are endangered in all 50 states (*8*). (Agriculture alone endangers species in 35 states and Puerto Rico.) Many people might welcome the new study without a concomitant care for the species diversity. It offers policymakers living in 47 states an opportunity to skirt the issue by pointing to Hawaii, California, and Florida and claiming that sanctuaries in those states are sufficient. If population size and per capita consumption are not addressed in the policy arena, then accelerated extinctions will clearly proliferate, and human economy will be severely and forcefully adjusted to fit within the limits of its natural capital stocks. Other efforts (for example, assessments of species distribution) may delay economic adjustment from an administrative time perspective, but can only prolong extinction for a blink of evolutionary time.

Table 1. Causes of endangerment for species classified as threatened or endangered by the U.S. Fish and Wildlife Service.

Cause	Number of species endangered by cause and rank of frequency*	Number of species endangered and rank of frequency†
Interactions with nonnative species	305 - 1	115 - 8
Urbanization	275 - 2	247 - 1
Agriculture	224 - 3	205 - 2
Outdoor recreation and tourism development	186 - 4	148 - 4
Domestic livestock and ranching activities	182 - 5	136 - 6
Reservoirs and other running water diversions	161 - 6	160 - 3
Modified fire regimes and silviculture	144 - 7	83 - 10
Pollution of water, air, or soil	144 - 8	143 - 5
Mineral, gas, oil, and geothermal extraction or exploration	140 - 9	134 - 7
Industrial, institutional, and military activities	131 - 10	81 - 12
Harvest, intentional and incidental	120 - 11	101 - 9
Logging	109 - 12	79 - 13
Road presence, construction, and maintenance	94 - 13	83 - 11
Loss of genetic variability, inbreeding depression, or hybridization	92 - 14	33 - 16
Aquifer depletion, wetland draining or filling	77 - 15	73 - 15
Native species interactions, plant succession	77 - 16	74 - 14
Disease	19 - 17	7 - 18
Vandalism (destruction without harvest)	12 - 18	11 - 17

*Including Hawaiian and Puerto Rican species. †Not including Hawaiian and Puerto Rican species.

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2. U.S. Bureau of the Census, *Statistical Abstract of the United States: 1991* (U.S. Government Printing Office, Washington, DC, 1991).
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6. W. Beacham, *The Official World Wildlife Fund Guide to Endangered Species of North America*, vol. 4 (Walton Beacham, Washington, DC, 1994).
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people, the area is classified by the U.S. Bureau of the Census as urban. Urbanization endangers species by replacing habitat directly and by depleting resources needed to support urban economies.

8. S. E. Auslander, *Arizona Daily Star* (10 February 1997), p. A12.

2 April 1997; accepted 7 July 1997

Response: It is not unexpected that the results of our stepwise regression analysis (*1*) do not parallel perfectly Czech and Krausman's ranking of known causes of endangerment, because the focus and the scale of analysis, as well as the categories used in the two methods differ. Nevertheless, for the continental United States, we identified the value of agricultural output as the top anthropogenic predictor of endangered biodiversity, and agriculture ranks just behind urbanization in the table presented by Czech and Krausman. Moreover, an analysis of threats to endangered species using data from the *Federal Register* (as opposed to the sources cited by Czech and Krausman) reveals that agriculture affects more endangered species than urban development (*1*). Their statement that other activities have a greater cumulative effect than a single variable like agriculture misses the point of stepwise linear regression, which ranks the predictive power of dependent variables relative to one another, individually (*2*).

As do previous commentaries on our paper (*3*), Czech and Krausman imply that we favor a conservation strategy based solely on endangered species hot spots. We recognize that identifying national hot spots is but one component of many strategies that are required to successfully conserve biodiversity. We maintain, however, that this component is an essential one, given the urgency of the problem. Much as we agree that the increasingly consumptive human population of the United States is the root cause of our environmental crisis, it would not be wise to wait for policy-makers to agree on and implement the fundamental changes to the economy and society required to guarantee the long-term survival of endangered species. With funding for endangered species protection increasing at a much slower rate than the number of endangered species (Fig. 1), it would be irresponsible for scientists to stand aloof from the search for pragmatic, real-world strategies that can be applied in the short term, such as the identification of hot spot areas where focused conservation efforts might prevent the impending loss of hundreds, if not thousands, of species.

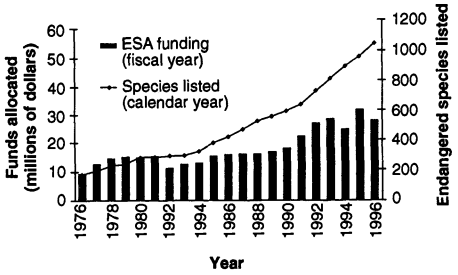

Fig. 1. Funds allocated for the U.S. Endangered Species Act (ESA) and number of species listed as endangered. Funds in millions of constant 1976 dollars per fiscal year. Number of species listed as endangered per calendar year are current through 31 October 1996. Source: U.S. Fish and Wildlife Service.

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(*continued from page 1025*)

■

No Such Correspondence

In a response to technical comments about a Research Article (*1*) on the presence of polycyclic aromatic hydrocarbons (PAHs) in the martian meteorite ALH84001, Simon J. Clemett and Richard N. Zare (20 Dec. 1996, p. 2122) stated (p. 2123), "Simoneit and Hites suggest that the PAHs originate from the 'thermal degradation of (extraterrestrial) biopolymers.' " This statement and quotation were not supported by a citation. Later, a correction stated (4 Apr., p. 21) that the response by Clemett and Zare "should not have included (in the last paragraph, p. 2123) reference to unpublished correspondence by Simoneit and Hites. . . . "

We would like to make it clear that no such correspondence (unpublished or not) exists and that we disagree with the substance and implications of the statement that was attributed to us.

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1. D. S. McKay *et al.*, *Science* **273**, 924 (1996).

Editor's note: Clemett and Zare's mention of nonexistent correspondence resulted from a confusing presentation of materials sent to them by *Science*. It should have been omitted from their response before publication, and the subsequent correction was also incorrect. *Science* regrets the two errors.

Corrections and Clarifications

In the article "Researchers and lawmakers clash over access to data" by Jocelyn Kaiser (News & Comment, 25 July, p. 467), Joe Alexander should have been identified as deputy assistant administrator for science in the Environmental Protection Agency's Office of Research and Development.

In the caption for the picture at the top of page 1983 in the article "Candid cameras for the nanoworld" by Ivan Amato (Imaging Special Report, 27 June, p. 1982), the water affinity of the two groups was erroneously reversed. The phrase should have read, "A 60-micrometer-wide pattern of water-loving carboxyl groups and water-shunning methyl groups."

In the report "Differential effects of early hippocampal pathology on episodic and semantic memory," by F. Vargha-Khadem *et al.* (18 July, p. 376), the following sentence should have been included in note 32: "We acknowledge the generous cooperation of Beth, Jon, Kate, and their families throughout the course of this study. We are indebted to them for their patience and support."

The name of Carlos Bustamante, the last author of the report "Folding-unfolding transitions in single titin molecules characterized with laser tweezers" by M. S. Z. Kellermayer *et al.* (16 May, p. 1112), should have been followed by a double dagger, to indicate that he was a corresponding author, rather than an asterisk.

Letters to the Editor

Letters may be submitted by e-mail (at science_letters@aaas.org), fax (202-789-4669), or regular mail (*Science*, 1200 New York Avenue, NW, Washington, DC 20005, USA). Letters are not routinely acknowledged. Full addresses, signatures, and daytime phone numbers should be included. Letters should be brief (300 words or less) and may be edited for reasons of clarity or space. They may appear in print and/or on the World Wide Web. Letter writers are not consulted before publication.