constant through the doubling, however, unsolicited grants have always been higher. We must preserve the strength of the unsolicited investigator-initiated R01 program as the backbone of discovery. Today, the R01 program is the largest program at NIH, in both dollar amounts and number of grants funded. In absolute dollars, the R01 program has grown the most—the total number of dollars awarded to R01s has almost doubled in recent years, growing from $5.3 billion in 1998 to $10.1 billion in 2006. The rate of increase slowed following the doubling of the budget, yet during the period between 2003 and 2005 the R01 total funding still increased by $500 million.

However, for NIH's overall mission to succeed, NIH complements R01s with other investments to fill knowledge gaps and fund emerging areas of science. We consistently reach out to the scientific community to help inform our decisions as to where the R01 mechanism cannot meet the needs of science or scientists. The NIH Roadmap stimulated much discussion in this regard. It is not one large initiative created from the top down, but is composed of several hundred highly competitive awards that emerged from extensive discussions with working scientists at large.

We also recognize that it is important that the size of grant awards rise in parallel with biomedical research inflation. This long-term strategy allows researchers to maintain their purchasing power. This said, in the face of unrelenting budget constraints, we made the difficult decision to reduce all noncompeting Research Project Grant (RPG) commitments by 2.35% in FY 2006 and 3.0% in FY 2007, freeing up an estimated $1.35 billion over the lifetime of these grants to invest in more competing RPGs, including R01s.

Science is about people. And current constraints are putting some categories of scientists at particular risk. We strongly advocated for the next generation of scientists through new grant programs for new investigators (*1*), and this year we are working to support first-time and more established investigators who are at risk of losing their laboratories because they receive review scores on their R01 renewal applications that are near but beyond the payline (*2*).

We are delighted that Congress increased the FY 2007 budget by $687 million. In total, we are now able to support more than 10,000 competing RPGs, 1000 more than in FY 2006. Yet, the nation still faces daunting scientific and health challenges. We should strengthen our common efforts to speak out about the importance of medical research to the nation's health. The fundamental problem for the research community is the loss in purchasing power relative to the ever-increasing scope of research needs and demands. As scientists, we need to express a broad, compelling vision for the future of science, health, and medicine if we are to sustain NIH's noble mission. A recent vote of renewed confidence in NIH by Congress through the NIH Reform Act of 2006 permits some optimism.

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Are There Too Many Scientists?

IN THEIR LETTER "DECLINES IN FUNDING OF NIH R01 research grants" (8 Sept. 2006, p. 1387), H. G. Mandel and E. S. Vesell reiterated the widespread concern that the low level and recent decline in funding NIH R01 grants has long-term negative consequences for the future quality of science. Weinberg has also commented that the shift away from funding small, independent research groups is detrimental to the progress of science (*1*). I agree with these sentiments, but there is another side to the funding issue: Are there too many people trying to do science?

In both the United States and Canada, the budgets of the major national agencies that fund biomedical research have more than doubled during the past decade. At least some of that money has made it to the pool that supports investigator-initiated research, yet excellent proposals from excellent researchers are still not being funded, and the situation has become worse in the past year (*2*). We could lobby for another doubling of the funding, but I see no reason to expect the outcome to be different: The total amount of science would increase, but the probability of continued funding and the perceived desirability of science as a career would not.

Is there a point at which a society is doing enough science? Is science so important that we should always want to increase the rate at which we do it? Or is it like almost every other government-funded activity, where the proponents always want more even if we are not sure that more is better? If there were only 100 scientists applying for R01 grants each year, there would be widespread agreement that this is not enough to sustain a vibrant research enterprise; if there were a hundred million, even the most ardent supporters of research would agree that this is too many. The right number, or range of numbers, must be somewhere in between. We could lobby to keep doubling the funding and hope to reach the point where all of the good science was being funded. However, if funding for science is like funding for medical care, education, or war, there is no precedent to expect that increases in funding will ever match the ability to spend the funds, for better or worse. Alternatively, or in addition, if we don't like the model of funding that we have created, we should debate the merits of limiting the demand for research grants rather than just increasing the supply of money.

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Fishing for Good News

IN THEIR REPORT "BIOMASS, SIZE, AND TROPHIC status of top predators in the Pacific Ocean" (15 Dec. 2006, p. 1773), J. Sibert *et al.* consider the effects of fishing on certain top predators in the Pacific Ocean. The bad news in their Report is that two large and extremely valuable tuna species have declined steadily and that the proportion of large fish has been reduced by 80%. The good news is that two smaller and significantly less valuable tunas and a commercially irrelevant shark have either not declined or have increased slightly. Sibert *et al.* conclude that the impact of fisheries on Pacific top predators is "not catastrophic" and that fishing has had only "minor impacts" on pelagic ecosystems. Both conclusions merit reexamination.

When are we to consider the impacts of a fishery to be catastrophic? Fisheries managers from eastern North America, unfortunate witnesses to the collapse of some of their most valuable top predator fisheries, no doubt look enviously west at the Pacific. But must our definition of a fisheries catastrophe be an empty ocean? We are all starved for good news from the seas. However, I would argue that we have little reason to rejoice over news that the Pacific's most desirable tunas are becoming smaller and less numerous as their diminutive, less valuable, and less palatable

Letters to the Editor

Letters (~300 words) discuss material published in *Science* in the previous 3 months or issues of general interest. They can be submitted through the Web (www.submit2science.org) or by regular mail (1200 New York Ave., NW, Washington, DC 20005, USA). Letters are not acknowledged upon receipt, nor are authors generally consulted before publication. Whether published in full or in part, letters are subject to editing for clarity and space.

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counterparts increase.

It is impossible to evaluate Sibert *et al.*'s second conclusion because no data are presented on how fishing affects the Pacific "ecosystem" beyond their top predator assessments. To understand the impact of a fishery upon an ecosystem, we need information on how it influences lower trophic level organisms, primary productivity, and ecosystem processes. This is a tall order for the Pacific Ocean. However, because it has long been known that top predator depletions can dramatically reorder marine ecosystems (*1*, *2*), it is difficult, without evidence, to be convinced that removing 50 million tons of the Pacific's top predators has had only minor effects.

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Response

MCCAULEY'S CONCERNS REST ON INACCURATE assumptions and reflect unfamiliarity with fisheries management and tuna fisheries in particular. Contrary to McCauley's implied claim that species other than bigeye and yellowfin tuna are of little value, skipjack tuna is the mainstay of the global canned tuna industry, providing an inexpensive source of healthy protein for millions of people (*1*). Furthermore, blue shark is an abundant and important top predator, with annual longline catches in the western and central Pacific of 40,000 to 100,000 tons over the past decade (*2*), easily the largest component of the nontuna catch.

Reexamination of the structure and function of the oceanic ecosystem of the Pacific Ocean should be a top research priority (*3*). The ecosystem effects of fishing are generally difficult to evaluate, and there are no widely accepted indicators of them (*4*). More extensive investigations than ours of ecosystem structure in the open ocean have shown that lower trophic levels are surprisingly insensitive to reductions in top predator biomass; the expected control of food web structure by top predators has been difficult to establish (*5*).

Decreased average size and reduced biomass are two textbook examples of the effects of fishing on exploited populations. Exploiting a fish population will reduce both abundance and the average sizes of individuals in the population. Further, optimal management for yield of a single species will substantially reduce the size of the exploited population. Our results indeed show that the abundance of fish larger than 175 cm is about 20% of what it might have been in the absence of fishing. However, fish of this size were never very abundant, comprising only about 4% of the biomass in the 1950s (fig. S5). The levels to which abundance of some species have been reduced are capable of supporting maximum sustainable yield (MSY), even though they are less than 40% of what the biomass might have been in the absence of fishing. Of more immediate concern is that the levels of fishing mortality to which some species are currently subjected will ultimately cause declines to well below MSY abundance. Whether MSY is an appropriate standard for an ecosystem approach to fisheries is another question that is under investigation and debate in many ecological research centers.

The purpose of our article was not to contrive good news. Rather, we strived for an accurate view of the status of tuna stocks and their management in the Pacific Ocean. Our purpose was to show that the interactions between fisheries and the pelagic ecosystem are complex and not easily summarized in flashy, often exaggerated, headlines (*6*) proclaiming the collapse of ocean ecosystems and the end of fishing. Effective conservation measures must consider this complexity. We show that some stocks of tuna are being exploited at excessive rates. This fact and potential remedies for the problem are well known to scientists serving the agencies charged with regulating tuna fisheries. These agencies need to fulfill their responsibility to implement effective science-based regulations to maintain these stocks.

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CORRECTIONS AND CLARIFICATIONS

Reports: "A virus in a fungus in a plant: three-way symbiosis required for thermal tolerance" by L. M. Márquez *et al.* (26 Jan., p. 513). On page 514, in the legend to Fig. 4, the colors of the histogram are inverted: The number of dead plants is black, and the number of alive plants is white.

Reports: "From plant traits to plant communities: a statistical mechanistic approach to biodiversity" by B. Shipley *et al.* (3 Nov. 2006, p. 812). In the denominator of Eq. 5 on page 813, the expression in the parentheses should have been set as an exponent of *e*. The correct equation is at right.

$$\hat{p}_i = \frac{e^{\left(\lambda_0 - \sum_{j=1}^{T} \lambda_j t_{ij}\right)}}{\sum_{i=1}^{S}\left(e^{\left(\lambda_0 - \sum_{j=1}^{T} \lambda_j t_{ij}\right)}\right)}$$

TECHNICAL COMMENT ABSTRACTS

COMMENT ON "Wetland Sedimentation from Hurricanes Katrina and Rita"

Torbjörn E. Törnqvist, Chris Paola, Gary Parker, Kam-biu Liu, David Mohrig, John M. Holbrook, Robert R. Twilley

Turner *et al*. (Reports, 20 October 2006, p. 449) measured sedimentation from Hurricanes Katrina and Rita in coastal Louisiana and inferred that storm deposition overwhelms direct Mississippi River sediment input. However, their annualized hurricane deposition rate is overestimated, whereas riverine deposition is underestimated by at least an order of magnitude. Their numbers do not provide a credible basis for decisions about coastal restoration.

Full text at www.sciencemag.org/cgi/content/full/316/5822/201b

RESPONSE TO COMMENT ON "Wetland Sedimentation from Hurricanes Katrina and Rita"

R. Eugene Turner, Joseph J. Baustian, Erick M. Swenson, Jennifer S. Spicer

Törnqvist *et al*. accept the usefulness of our data but confuse hurricane landfall location with hurricane storm surge impacts, misrepresent our data interpretation, and misattribute conclusions to our study. Our study did not attempt to address the overall effectiveness of river diversions used for management purposes. We agree that river mouth sedimentation is an important geological process that may lead to marsh colonization.

Full text at www.sciencemag.org/cgi/content/full/316/5822/201c