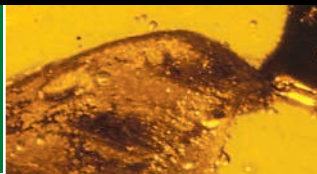


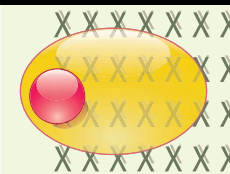
The chemistry of carboniferous amber

51



How to generate hypotheses

53



LETTERS | BOOKS | POLICY FORUM | EDUCATION FORUM | PERSPECTIVES

## LETTERS

edited by Jennifer Sills

### Think Big, Eat Small

B. WORM *ET AL.* ("REBUILDING GLOBAL FISHERIES," RESEARCH ARTICLES, 31 JULY, P. 578) REPORTED cases in which effective fisheries management was based on catch restriction, gear modification, and closed areas. Consumers can also play a role in the future of fisheries. The demand for fish continues to increase yearly—is it possible to maintain the benefits of fish consumption while minimizing the risks to both human health and global fisheries?



**Sardines.** Small pelagic fish such as sardines contain more nutrients and fewer contaminants than larger types of fish.

Fish at the top of the food chain can become significant repositories for a range of contaminants both natural and anthropogenic and may also have low concentrations of key nutrients. The flesh of most large predator fish from warm water fisheries (big tuna, swordfish, marlin, shark) usually is low in omega-3 fatty acids and high in mercury/selenium ratios (*1*).

Small pelagic fish, such as sardines, herrings, anchovies, and mackerel, however, have not been subject to the same overfishing pressure that has befallen almost all of the larger fish species. They not only provide higher levels of beneficial nutrients but are also significantly lower in contaminants ubiquitous to the marine food chain. They are also very affordable.

Consumers' choices are more and more influenced by health and environmental considerations. That could make a difference.

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### Public Trust Doctrine: Too Limited

AS SOMEONE WHO HAS LONG ADVOCATED A coherent national ocean policy, I agree with M. Turnipseed and her colleagues that properly framed public trust concepts regarding the United States's marine environments could be an important component of federal oceans law ("Legal bedrock for

rebuilding America's ocean ecosystems," Policy Forum, 10 April, p. 183). However, the public trust doctrine—described by Turnipseed *et al.* as a "legal concept that obliges state governments to manage certain natural resources in the best interests of their citizens"—is not necessarily the "legal bedrock" that the authors portray it to be, particularly if the goal is broad-based ecosystem management.

The authors rely heavily on California's public trust doctrine, which is one of the two most expansive and ecologically protective versions of the public trust doctrines in the United States (Hawaii's is the other). Each state has its own version of the doctrine, and most have not been nearly so willing to extend their public trust law to aquatic ecosystem protection.

Indeed, as framed by the U.S. Supreme Court in the seminal case of *Illinois Central Railroad Co. v. Illinois*, 146 U.S. 387 (1892), the public trust doctrine has two main components. First, it prevents states from giving private persons control over the beds and banks of navigable waters, and hence control over the waters themselves. Thus, the resources protected under the doctrine include only bed-based natural resources such as oil and gas, gravel, and occasionally shellfish.

Second, the public trust doctrine classically preserves only three public uses of the navigable waters themselves: navigation, commerce, and fishing. This last use underscores the need to carefully construct any public trust doctrine for the United States's marine waters. Many marine fish populations are in dire trouble (*1–4*), and enshrining a right to fish in federal law would undermine, rather than promote, effective ocean ecosystem management.

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### Public Trust Doctrine: Too Broad

IN THEIR POLICY FORUM ("LEGAL BEDROCK for rebuilding America's ocean ecosystems," 10 April, p. 183), M. Turnipseed *et al.* claim that extending the "public trust doctrine" to all U.S. ocean waters would more effectively promote cooperation in ocean governance than the "failing status quo." However, the authors fail to consider viable nonregulatory solutions to ocean management, such as long-term leases, second-bid

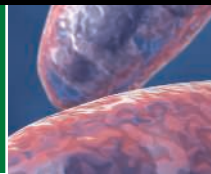
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Pathway to long life

55



Mitochondrial calcium transport

57

auctions, and other public-private contractual arrangements—alternative governance mechanisms that are now commonly used to manage a wide variety of common-pool natural resources, including public lands, fisheries, and water resources (1).

In addition to conservation goals, federal ocean agencies must balance an array of competing uses of ocean resources, including energy, fishing, shipping, tourism, and military. With so many competing stakeholders in play, the public trust doctrine is too broad to provide effective guidance in ocean management. Instead of a top-down, one-size-fits-all approach, Congress should confer on U.S. ocean agencies the legal authority to experiment with alternative mechanisms to determine which solutions best promote efficiency and equity among these myriad competing uses.

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## Public Trust Doctrine: In Need of Integration

THE POLICY FORUM “LEGAL BEDROCK FOR rebuilding America’s ocean ecosystems” (M. Turnipseed *et al.*, 10 April, p. 183) brings much-needed attention to ocean policy reform. The authors address the problem of too many agencies having management authority with little overall coordination. The authors’ focus on the public trust doctrine as a solution seems misplaced, however.

Most of the agencies managing resources in the Exclusive Economic Zone (EEZ) already work under a public-benefit mandate. The problem is that these agencies do not coordinate or integrate their work. It is unclear how the extension of the public trust doctrine out to the EEZ through executive order, legislation, or judicial interpretation would lead to more integrated management.

Before we introduce new laws and regulatory bodies or give existing agencies further mandates, we must research the success (or failure) of existing legislation that aims to protect the public trust. I worked for 8 years

implementing the Massachusetts regulatory program that administers the state’s Public Waterfront Act of 1866. The Act protects the public’s right in tidelands for “fishing, fowling, and navigating” and draws its legal basis from the public trust doctrine (1). Many properties within the jurisdiction of this program are not in compliance. The problem is not the lack of a legal basis but rather the limited resources allocated for compliance and enforcement with the law’s mandate (2).

To jump-start integrated management in the EEZ, we need much more than legislative, judicial, or executive backing of fundamental principles. We need regulatory mechanisms that have been proven to be effective in other comparable contexts, as well as recognition of the regional benefits of the wise use of the sea.

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#### Response

We welcome Craig’s support for the notion that establishing public trust doctrine principles in the United States Exclusive Economic Zone (EEZ) could prove important to federal oceans law and policy. Notwithstanding her concerns, the doctrine has burst out of its original confines—courts in many states (such as Florida, Louisiana, New Jersey, and Virginia) have expanded the doctrine’s scope to protect various natural resources and public uses, and in so doing have authorized the protection of aquatic ecosystems (1–4). Additionally, several courts have concluded that the corpus of public trusts must be preserved—not just for the benefit of the current generation, but also for future generations [e.g., (5)]. Thus, far from enshrining a right of today’s citizens to fish, applying the public trust doctrine would impose an obligation to manage fishing in federal ocean waters in a sustainable manner. Moreover, improved understanding of the interconnectedness of ocean ecosystems lends weight to the conclusion that ensuring the

ability of future generations to fish will require an ecosystem-based management regime created by means of a coastal and marine spatial planning framework (6, 7).

Guerra-Pujol asserts that we promote a public trust doctrine–based ocean policy at the expense of property rights–based management programs. However, a federal public trust doctrine would not preclude the establishment of, for example, oil, gas, and renewable energy leases and fisheries catch-share programs; instead, it would guide the development of these policies such that they protect the public interest (8).

Finally, Portman questions the added value of a federal ocean public trust doctrine when ocean-related agencies already have various mandates to act for the benefit of the U.S. public. But firmly establishing the public trust doctrine in the EEZ would explicitly impart a suite of specific duties and responsibilities to federal ocean trustees of the kind that are assumed by trustees of public, private, and charitable trusts (8, 9). The duties include those mentioned above—to preserve the trust corpus and to deal impartially among all beneficiaries (both present and future)—as well as the duties to administer the trust solely in the interest of the beneficiaries and to provide complete and accurate information to trust beneficiaries regarding the management of the trust (10).

The Massachusetts Public Waterfront Act regulatory framework has not been successful because of noncompliance and lack of enforcement. Such a circumstance should not disqualify the public trust doctrine from informing national ocean policy. Indeed, it did not prevent the Massachusetts Ocean Management Plan from identifying its impetus as the state’s public trust doctrine (11).

Would applying the public trust doctrine to the EEZ help to establish the necessary incentives, responsibilities, and powers for federal agencies to work in an integrated fashion toward long-term sustainable ocean management? We think so; by providing a common, overarching public trust mandate, as well as a suite of enforceable trusteeship duties, the doctrine would work at multiple levels to help Congress and federal agencies

### 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](http://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.

reshape the regulatory framework used to manage U.S. ocean space and resources. It would provide the bedrock for the new national ocean policy envisioned by the president—a policy that emphasizes both inter-generational ecosystem protection and stewardship (7).

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### CORRECTIONS AND CLARIFICATIONS

**News of the Week, SciencInsider:** "From the *Science* policy blog" (7 August, p. 665). Richard E. Besser is the former acting director of the Centers for Disease Control and Prevention. His first name is listed correctly in the online *SciencInsider* blog.

**Reports:** "The C-Ala domain brings together editing and aminoacylation functions on one tRNA" by M. Guo *et al.* (7 August, p. 744). On p. 747, the citation to Fig. 4D should instead cite fig. 56.

**News of the Week:** "NOAA project to measure gravity aims to improve coastal monitoring" by B. Johnson (24 July, p. 378). The article incorrectly described how gravity is calculated. Gravity is determined through the difference between the measurement of an onboard gravimeter and

aircraft accelerations from GPS positioning. NASA's Gravity Recovery and Climate Experiment satellite is a source of global gravity data but not a source of vertical accelerations for the aircraft.

**News Focus:** "Deadly flights" by A. Curry (24 July, p. 386). The ultrasonic calls made by the bat *Nyctalus noctula* are around 22 KhZ, not 32 KhZ as noted in the story.

**This Week in Science:** "Swimming through sand" (17 July, p. 242). The credit for the image should have been "Ryan Maladen and Yang Ding; Ryan Maladen and Lionel London (inset)." The online version has been corrected.

**Perspectives:** "How did the turtle get its shell?" by O. Rieppel (10 July, p. 154). The photograph shows a North American snapping turtle (*Chelydra serpentina*), not a Chinese soft-shelled turtle (*Pelodiscus sinensis*) as indicated by the caption.

**Reports:** "Ventral tegmental area BDNF induces an opiate-dependent-like reward state in naïve rats" by H. Vargas-Perez *et al.* (26 June, p. 1732). The second author of the paper was credited incorrectly in the author list. His name should be listed as Ryan Ting-A-Kee. The name has been corrected in the HTML version online.

**Perspectives:** "Extreme spinning tops" by M. Kramer (12 June, p. 1396). In the first paragraph, the rotation rate of neutrons stars was mistakenly given as up to 43,000 times per second. It should have read 43,000 times per minute.

**Table of Contents:** (13 March, p. 1395). In the description of the Report "Paternal control of embryonic patterning in *Arabidopsis thaliana*" by M. Bayer *et al.*, the term "cytoplasmic gene" was incorrect. The sentence should read "Transcripts of an IRAK/Pelle-like kinase gene from sperm are translated after fertilization and control asymmetric zygotic division."