BIODIVERSITY AND ECOLOGY

Impeccable timing

S. SOUTHERLAND

Science **324,** 791–793 (2009)
The northern shrimp — a small, sweet-tasting crustacean — times its reproduction so that hatchlings can feed on the local spring algal bloom. A new study, which used a decade of satellite-derived data from the North Atlantic Ocean, suggests that although this local adaptation is highly effective, it is also extremely vulnerable to climate-related changes.

Peter Koeller of the Bedford Institute of Oceanography in Dartmouth, Nova Scotia, and colleagues found that, although an increase in sea surface temperature is thought to kick-start the spring bloom, egg development and hatching times for the northern shrimp are governed by local bottom water temperatures throughout the North Atlantic. At its southernmost limit in the Gulf of Maine, where bottom temperatures are the warmest in the shrimp's range, egg-bearing females adopt an additional strategy — overwintering in nearby cold waters — to ensure that egg hatching coincides with the plankton bloom.

The authors deduce that the ability of this species to time its reproduction carefully could be threatened by climate change if surface and bottom waters were to respond differently. Given that the species comprises more than 70 per cent of the 500,000 tons of coldwater shrimp harvested annually worldwide, such impacts could have commercial implications.

Olive Heffernan

ADAPTATION

Risky response

CDC / JAMES GATHANY

PLoS Negl. Trop. Dis. **3,** e429 (2009)
In an effort to combat warming-induced drought, Australians may be clearing the way for the spread of dengue fever. A recent move by the government to encourage households to install rainwater storage tanks may provide a breeding ground for the insect that transmits the disease, raising the risk of future outbreaks, finds new research.

In an ecological modelling study, Nigel Beebe of the University of Queensland and colleagues found that the mosquito that transmits dengue fever, *Aedes aegypti*, could potentially occupy a range that includes most major cities in Australia. It is currently found only in northern Queensland, however, because its distribution is limited by the availability of suitable breeding sites. On its own, further warming up to 2050 is unlikely to cause the mosquito to spread more widely — but the government-subsidized water tanks, which over one-fifth of Australian households have already installed, could allow it to gain a foothold outside Queensland.

Once infected mosquitoes have arrived, say the authors, dengue transmission could be aided by rising temperatures, which may lengthen the warm season in which the virus can pass to humans.

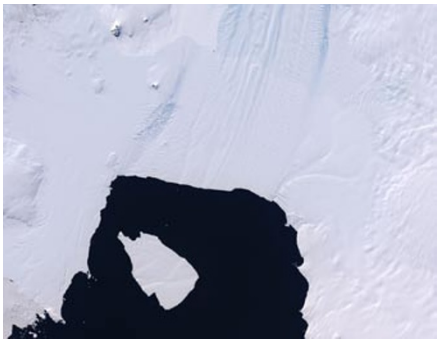
Alicia Newton

CRYOSPHERE

Cautionary collapse

Science **324,** 901–903 (2009)
Small shifts in climate could lead to a rapid disintegration of the West Antarctic Ice Sheet. But new research suggests that the effect of such a collapse on sea level rise has been significantly overestimated.

Jonathan Bamber of the University of Bristol, UK, and colleagues used an ice-sheet model, combined with recent studies of seabed topography and ice-sheet elevation,



NASA / JESSE ALLEN / US GEOLOGICAL SURVEY

to examine how sea levels across the globe would change with a sudden collapse of the underwater portion of the West Antarctic Ice Sheet. They show that the volume of ice lost would be smaller than previously anticipated and estimate that sea levels would rise by no more than 3.3 meters on average — considerably less than the 5 to 6 meters usually quoted. However, marked regional variations mean that the impact on coastal areas could still be devastating. Sea level rise along the eastern and western coasts of the United States, for example, is expected to be 25 per cent greater than the global mean.

Importantly, the regional pattern of sea level rise is insensitive to how much of the ice collapses or how fast. Thus, US coastal cities should prepare for the worst.

Anna Armstrong

ENERGY

Biofuel boost

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J. Am. Chem. Soc. **131,** 6508–6515 (2009)
Biofuels release less carbon dioxide than their petroleum-based counterparts, but the intensive agriculture and processing needed to convert biomass into common fuel drives up their overall carbon footprint. Genetically engineered microbes may change the equation, however, allowing biofuel to be produced in a way that is both efficient and sustainable, according to scientists.

Christopher Voigt and colleagues at the University of California, San Francisco used a unique approach to manufacture microbes that could transform biomass into methyl halides, a precursor to products ranging from polymers to gasoline, in quantities with

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near-commercial potential. Methyl halides are produced naturally by plants, fungi and bacteria at low levels. The researchers chemically recreated all 89 genes that allow these organisms to produce the molecules and inserted them into a common form of yeast. From there it was a team effort: bacteria were fed a variety of agricultural waste products, including the leaves and stalks of corn and the fibrous residue of sugar cane. As they were eating, the bacteria released acetate, which the yeast consumed. Instead of the customary alcohols, the engineered yeast began churning out methyl halides.

Though industrial-scale facilities to convert methyl halides to fuel may be a way off, the group says that this approach could eventually enable biofuels to be created with low energy consumption and without diverting land away from food production.

Alicia Newton

ATMOSPHERIC SCIENCE

Secondary sources

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Proc. Natl. Acad. Sci. USA
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The climate-cooling haze that covers the southeastern United States in summer comes largely from an underappreciated source, new research shows. Large numbers of aerosol particles are forming, say scientists, when organic gases released mainly by trees react with pollution released by human activity.

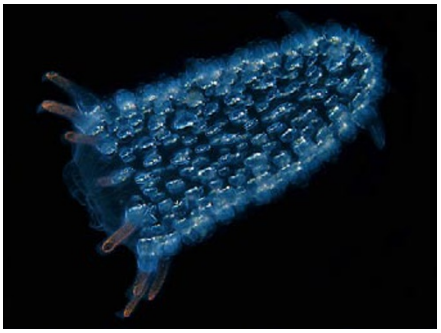
Allen Goldstein and colleagues at the University of California, Berkeley used satellite and ground-based measurements to examine concentrations of aerosols in the atmosphere over the entire United States. They found that in the southeastern US the observed patterns could not be explained solely by manmade aerosols — previously thought to be the main source. Concentrations in the region were considerably higher in summer than in winter, especially over forests that release more organic gases as temperatures climb. Warmer individual days also increased both the forest emissions and the overall aerosol levels, suggesting that most of the summertime haze is created when natural and anthropogenic emissions react, forming a secondary aerosol layer.

Further warming could result in an even denser cooling haze over the region, putting a brake on increasing summertime temperatures — unless reactive pollutants emitted from tailpipes and smokestacks are reduced.

Anna Barnett

BIODIVERSITY AND ECOLOGY

Pyrosome pump



NICK HOBGOOD

Limnol. Oceanogr. **54,** 1197–1209 (2009)

Common jelly-like creatures known as pyrosomes transport vast amounts of carbon to the sea floor, finds a new study. The research by Mario Lebrato and Daniel Jones of the National Oceanography Centre at the University of Southampton, UK, provides new evidence of the importance of gelatinous zooplankton in the marine carbon cycle.

Lebrato and Jones used a remotely operated vehicle equipped with underwater video cameras to survey the sea floor off the Ivory Coast of west Africa after the mass deposition of thousands of pyrosome carcasses between February and March 2006. The creatures piled up on the sea bed, in some regions exceeding 4,000 per 100 square metres. The researchers found that carbon constituted a third of the body mass of sampled carcasses, exceeding previously recorded levels in any gelatinous creature. They estimate that the pyrosomes contributed more than 5 grams of carbon per square metre — and in some cases as much as 22 grams per square metre — to the seabed in the studied area, which covers over 13,000 square metres.

Eight types of animal, together with bacteria, were found feeding on the carcasses, suggesting that gelatinous carbon is a key — and previously unappreciated — component of the marine food web off the Ivory Coast. The authors say that pyrosome carcasses probably have an important role in transporting carbon from the sea surface to the sea floor across the globe.

Anna Armstrong

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