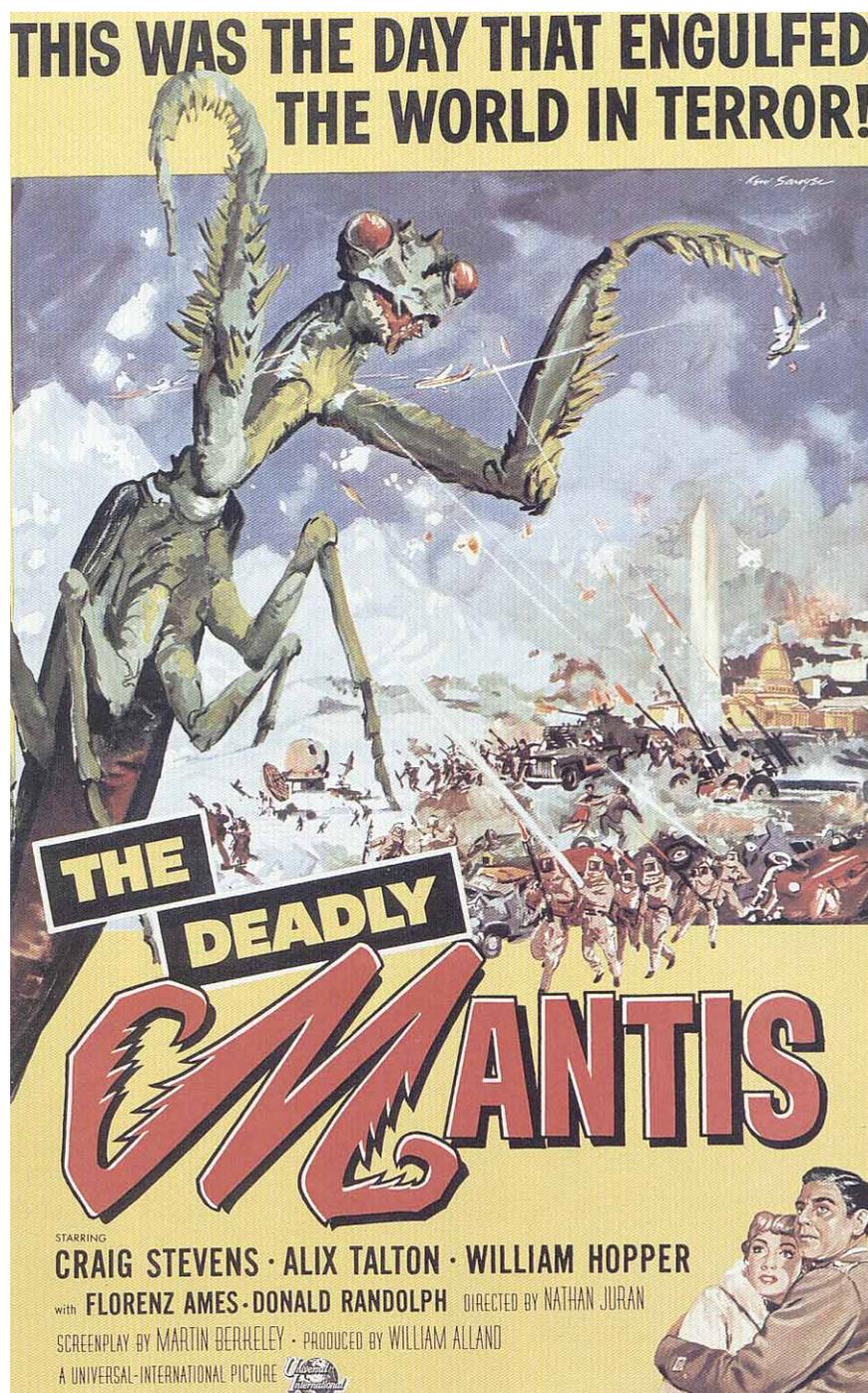


# Desperately Seeking Charisma: Improving the Status of Invertebrates

STEVE NASH



Maybe your Uncle Lester, a determined foe of garden pests, likes to tease about starting a “save the earwigs” campaign. Or a winking colleague proposes a new pressure group, People for the Ethical Treatment of Insects—the acronym is pronounced “petty.” Invertebrate conservation biology is a subject made to order for gibes. *Homo sapiens* is for the most part a vertebrocentric species, prejudging the spineless classes as near invisible and boring at best, and as ugly, small, mean, indestructible, overfecund disease vectors at worst.

## Feature



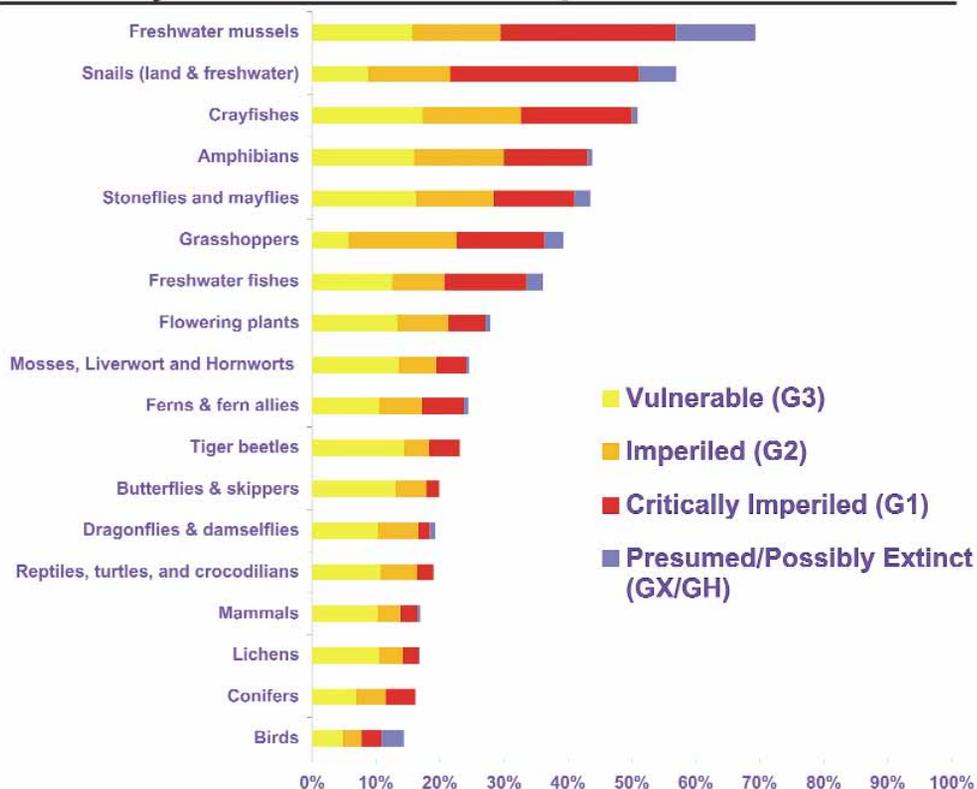
*Tasty and easy to catch, these spectacular land crabs (Cardisoma guanhumi) are collected by the thousands throughout the Caribbean for their meat. Overharvesting of this species has already caused significant population declines in some areas, forcing governments in the region to set limits on crab trapping. Photograph: Piotr Naskrecki. (This photograph and others in this article by Piotr Naskrecki are selections from an exhibit called “Vital Variety: A Visual Celebration of Invertebrate Biodiversity,” currently on display at the American Museum of Natural History, New York. Naskrecki is director of the Invertebrate Diversity Initiative at Conservation International.)*

“I wish I had a dime for every time someone has asked me why we should care about an insect,” says Ming Lee Prospero, a wildlife biologist who breeds dozens of endangered American burying beetles at the Roger Williams Park Zoo, in Rhode Island, for a reintroduction project on Nantucket. The beetles are pretty cool—or would be, with the right public relations campaign. A mated pair of the striking red, orange, and black, 1.5-inch carrion beetles can tug a fresh carcass of, say, a mourning dove several feet, completely bury it to keep it away from competitors, strip it of feathers and skin, and then use the burial chamber as a food source and incubator.



*Two endangered American burying beetles (Nicrophorus americanus), a once common species that has nearly vanished from eastern North America, feast on a chicken gizzard. Photograph: Chris Carlton, Louisiana State Arthropod Museum.*

## Proportion of U.S. and Canadian Species at Risk by Plant & Animal Group



This chart shows the percentage of species across 18 plant and animal groups (39,000 species assessed) that are at risk of extinction; the different colors indicate different levels of risk.

An examination of this chart reveals that invertebrates inhabiting fresh waters are particularly at risk, with up to 70 percent of the species in one group, freshwater mussels, either already recently extinct or at risk of extinction. Reprinted courtesy of NatureServe.

The reintroduction experiment, supervised by the US Fish and Wildlife Service, is now in its tenth year, but whether it has been successful in establishing a self-sustaining population of burying beetles is still unknown. Once common across eastern North America, the beetle is now found only in a handful of small, isolated populations. The reasons for the speed and extent of its disappearance are still largely a mystery, but the burying beetle is emblematic of many other vanishing invertebrates. Habitat destruction, invasive aliens, climate change, pesticides, pollution, and perhaps Uncle Lester are taking their

toll, in the now-familiar, honey-I-ate-the-planet scenario that makes humankind an urgent “species of interest” for scientists who normally study other organisms.

Zoologist Larry Master of NatureServe, a conservation data network, says 20 to 35 percent of known terrestrial invertebrate species in North America are “in some kind of conservation jeopardy.” For example, half of the species of terrestrial snails, one-fifth of butterflies and skippers, a quarter of 104 kinds of tiger beetles, a third of grasshoppers, 18 percent of moths, and 90 percent of cave-

dwelling organisms are vulnerable to extinction.

“Groups that are the subject of much popular public and media attention, such as birds and mammals, are proportionately and numerically much less at risk,” according to Master.

Princeton zoologist Claire Kremen points out that invertebrates are almost unimaginably diverse. Insects alone make up more than half of the planet’s 1.75 million or so described species. Of the eight million or more different species that may exist undescribed, 80 percent are probably insects. In an Amazon rainforest ecosystem, invertebrates account



*Many tiger beetle species inhabit sandy areas such as riverbanks and pine barrens; this species appears on Staten Island and eastern Long Island. Although this tiger beetle is relatively common, a closely related species, the Puritan tiger beetle (*Cicindela puritana*), is threatened by flood control projects that prevent sandy riverside beaches from forming. Photograph: Piotr Naskrecki.*

for an estimated 90 percent of the animal biomass, and they probably number in the billions, compared to mere hundreds or thousands of birds and mammals.

### The “who cares?” question

Invertebrate specialists insist that it is not only the so-called keystone species at the top of the food chain that hold up the arch of the biome but also the tiny organisms that crawl around in the dirt under the whole structure—the little things that run the world, in E. O. Wilson’s phrase. The ecosystem services that invertebrates supply are no less crucial because they go unappreciated. Some

are decomposers—those earwigs—recycling waste organic matter and aerating, building, and blending soils. Invertebrate herbivores shape the ecology and evolution of plants. Predator species control and help stabilize the populations of the animal organisms they feed on.

Kremen’s lab group has studied the role of insects as pollinators in California melon fields. The researchers found that fields adjacent to natural areas, and farms where pesticide use is curtailed, sustain a far broader mix of pollinator species, in much higher numbers. This could save farmers the cost of importing

honeybees to their fields and result in higher melon production. Getting that kind of story in front of food producers and the public at large is crucial, Kremen says, now that more invertebrate researchers must think of themselves as conservation biologists.

“What’s crucial is for people to understand how important these organisms are to their own survival,” she adds. “For pollination, we’re relying entirely on one species, the honey bee. But the domesticated colonies have declined by 50 percent in the last 50 years. What if they keep declining? If we also fail to care for the other wild pollinators, by



*This flat, nearly translucent green planthopper escapes detection by blending in with the leaves on which it feeds. Photograph: Piotr Naskrecki.*

using pesticides and destroying their habitat, we may be out of luck one day on food production and...other services that are less well studied.”

At a recent symposium at New York’s American Museum of Natural History, characterized by one of its organizers as a “coming out party” for invertebrate conservation biology, several speakers noted that agriculture, properly adapted, can serve as a repository for invertebrate diversity rather than a near-sterile wasteland.

Politics was also on the agenda. Scripps Institution oceanographer Jeremy Jackson warned that “science-

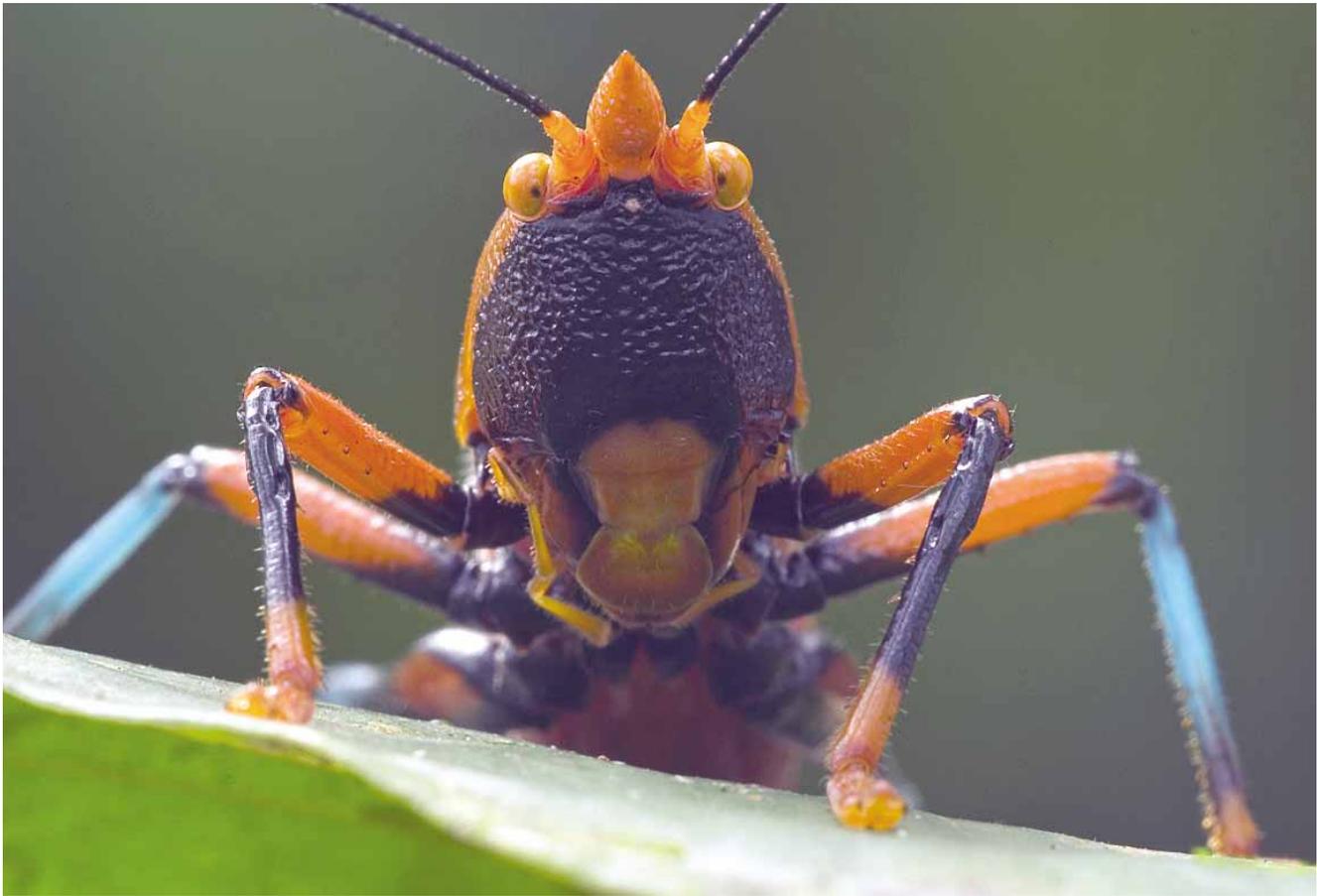
as-usual” cannot meet the challenge of our ecologically disrupted oceans. They are quickly losing habitat-structuring species—including invertebrates such as coral—to ruinous climate change, pollution, bottom-scraping trawlers, dynamiting, and overfishing, he said.

“Unwelcome news about the world we live in has become classified very cleverly as advocacy,” Jackson said. “If we go out and observe the world and what we observe is not what they want to hear, then the way they deal with us now is to say that we’re biased advocates for a point of view.” He charged that the

current Bush administration “has carried this to absurd levels.”

Jackson is working with filmmakers in California to try to reach a public “that thinks *USA Today* is an intellectual publication” with simple, direct messages. He urged his colleagues to “wade in...and say what we think. And we’ll be wrong some percentage of the time, and we are really afraid to do that. So I think a big component of courage would be a major contribution.”

Public education also takes more light-hearted forms, such as the Insect Fear Film Festival, now in its 21st year of screening old bug-monster movies to



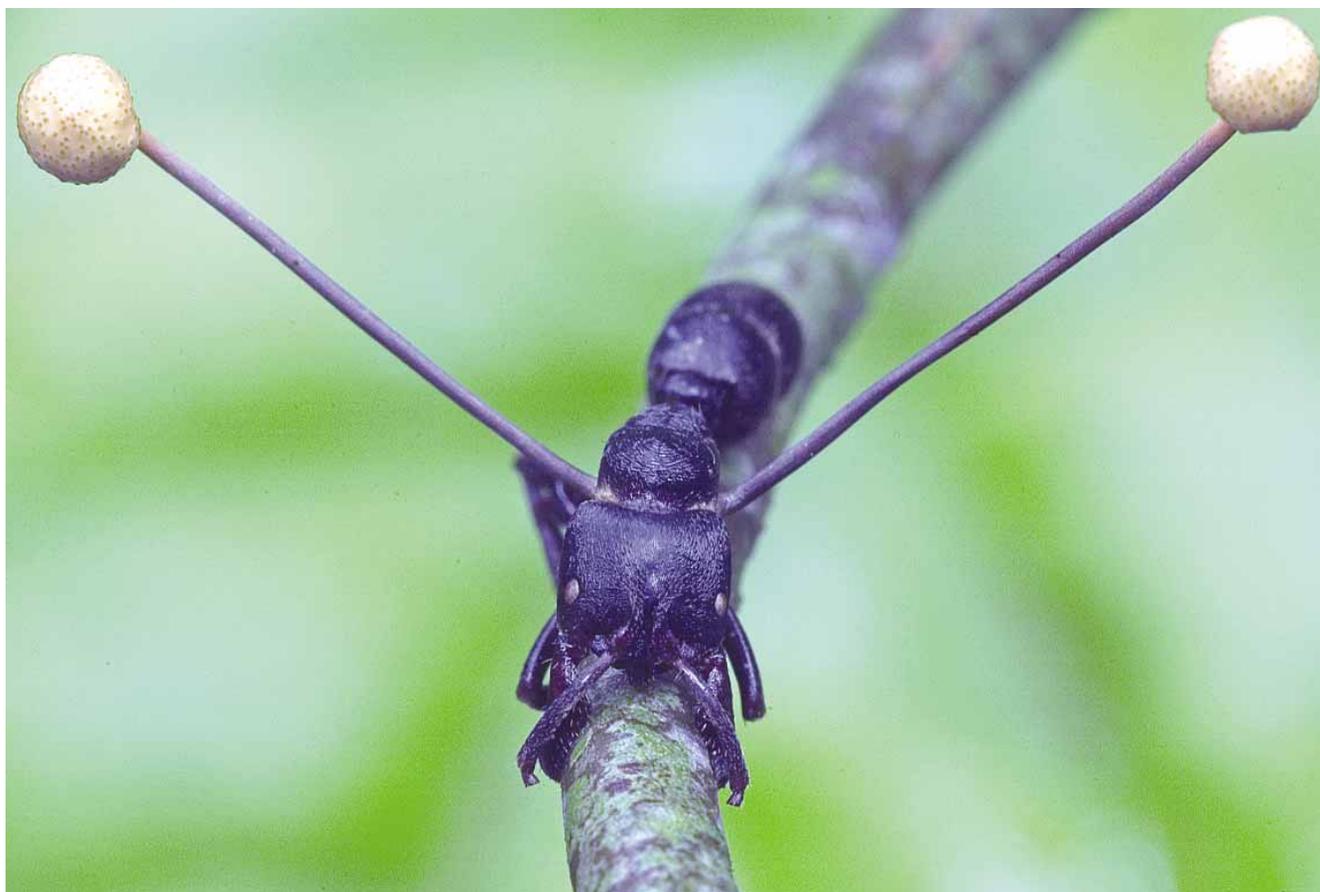
*Thousands of new invertebrates are discovered each year, and scientists estimate that several millions more remain unidentified. This katydid, discovered in 2003, lives only in the highly threatened rain forests of West Africa. Photograph: Piotr Naskrecki.*

large audiences, with a full complement of media coverage, T-shirts, and invertebrate reality checks as a counterweight to the cinema stereotypes. The audience is invited to see and handle a variety of live specimens—a “meet the stars” opportunity—such as tarantulas, hissing cockroaches, and tobacco hornworms. On occasion, deep-fried waxworms, stir-fried silkworm pupae, and lollipops with maguery worms are served. The University of Illinois event was initiated by May Berenbaum, now head of the Department of Entomology.

For more tender ages, coloring books and grade-school curricula can bring the fascination of invertebrates into focus. “We haven’t gotten the story out to the public about the indispensability of invertebrates,” said Sacha Spector, director of the museum’s invertebrate conservation program. “One of the things I like most is getting kids to look at them under a microscope. Because once they do, an entire new world is opened up for them—eyes and legs and a mouth—and it stops being this speck that’s easily stepped on.”

### **The worldwide web of invertebrates**

Advances in technology also hold some promise. Instead of exchanging specimen organisms through the mails for study and identification, for example—a slow, expensive, and damage-prone tradition—high-resolution images and data are now increasingly available on the Internet. Thousands of katydids and bush crickets are on view along with complete descriptions and even some sound files, for example, at [www.tettigonia.com](http://www.tettigonia.com). Type “Paraguay” in the distribu-



*A parasitic fungus infected this 12-millimeter-long ant, releasing chemicals into its nervous system that compelled it to climb up a nearby plant. The ant will soon die, and the fruiting bodies of the fungus now sprouting from the ant's head will drop spores designed to infect a new host. Some farmers spray their crops with other species of parasitic fungi to control pests such as locusts and grasshoppers. Photograph: Piotr Naskrecki.*

tion box and records for 42 taxa appear, including hyperdetailed images of the wing and head of *Caulopsis oberthuri*, which would doubtless have been tough for researchers to arrange to get a look at in earlier times. At another Web site, more than 28,000 species from the entomology collection of the Museum of Comparative Zoology at Harvard University—one of the largest in North America—are on offer.

For science, these innovations may help reduce the dimensions of the “black hole” of ignorance about invertebrates,

only a small fraction of which have been described, let alone comprehended in detail. Ironically, a new species of centipede was discovered in Central Park, across the street from the Museum of Natural History, only two years ago. “It tells us something shocking about what we don’t know, rather than what we know,” museum provost Michael Novacek said at the time.

Biologists will have turned a corner in public education when the citizenry can appreciate the need to protect the tenuous hold on existence of a species like

Southern California’s Delhi Sands flower-loving fly. Its endangered status thwarted the entrepreneurial plans of a few *Homo sapiens* recently and seemed to galvanize a somewhat sarcastic public mistrust about invertebrate conservation. Land developers brought flyswatters to public meetings. A bullied US Fish and Wildlife Service, charged with developing a conservation plan, worried about squandering its meager fund of public goodwill.

In the meantime, invertebrate conservation biologists may have to coach

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themselves to stave off depression, an occupational hazard. "What keeps me going are little rays of hope, here and there," Kremen says. She cites the rise in sales of organic food, which should help the pollinators, and a recent decision by the Madagascar government to extend protection to as much as 10 percent of the nation's land surface.

World per capita consumption of fresh water has declined, aquatic ecologist David Strayer says, thanks to drip irrigation systems, which "means more to freshwater invertebrates than any invertebrate-based conservation effort I can think of."

And Australia, Jeremy Jackson notes, has announced that it will zone and control use of the ocean out to 200 miles beyond its terrestrial borders. "That," he said, "is a revolution."

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