



ENVIRONMENT

Pacific Division Meeting Probes Threats to Hawaiian Paradise

WAIMEA, Hawaii—From their research station high on the forested slopes of Mauna Kea, Rebecca Cann and Leonard Freed have watched with alarm in recent years as a beautiful orange bird called the akepa has plunged toward extinction in their study site. They have seen females begging for food until their voices faded to silence, and young and old birds die en masse.

At the recent annual meeting of the AAAS Pacific Division, researchers described the collapse of the akepa as just one of many ominous signs for the Hawaiian paradise. Native birds are threatened by introduced predators and diseases. Land snails with exquisite shells have suffered from deforestation and shell collectors. Sea turtles are injured and killed by fishing crews. Brackish coastal ponds that are home to rare flora and fauna have been undermined by an invasion of nonnative fish.

“The serious problems of environmental stress and degradation are not unique to Hawaii—they’re being felt to varying degrees on most islands and many coastal areas in the Pacific Basin,” said the division’s executive director, Roger Christianson, a biologist at Southern Oregon University. “The meeting provided researchers and educators across a wide array of disciplines an important forum in which to discuss their efforts to study and, hopefully, protect these treasures before they disappear.”

The Pacific Division’s 89th annual meeting brought more than 300 researchers, educators, students and others to the Island of Hawa’i—the Big Island—from 15 to 20 June for serious scientific discussion and a celebration of Pacific Island culture. More than two dozen symposia, lectures, and workshops ranged across fields and included sessions on nanotechnology, science education, neuroscience research into health problems shared by indigenous people in Hawaii and Alaska, and U.S.–Asia scientific cooperation.

But the recurring theme of the meeting was the profound environmental challenges confronting the Pacific islands, many of which were protected by isolation until humans arrived.

At a half-day symposium, top malacologists described how humans and nonnative predators—including rats, pigs, and voracious meat-eating snails—have decimated native land snails that are important cultural figures for indigenous Hawaiians. Already, as many as 80% of the species are gone.



Endangered: *Achatinella sowerbyana*

“You knock out one species, and you knock out another species, and you knock out another species—at some point, something is going to happen,” said Michael G. Hadfield, a professor of zoology at the University of Hawaii at Manoa. “There is going to be a shift, and that ecosystem is not going to be what it was before.... The snails are the canary in the coal mine—they’re telling you that something isn’t right.”

The family of Hawaiian honeycreepers, including the akepa, has followed a similar arc:

They evolved to broad and colorful diversity, but many are now extinct or endangered.

The akepa had held its own between 1987 and 1999 in the presence of Japanese white-eye, an insect-eating bird introduced to Hawaii in 1929. But beginning in 2000, the husband-and-wife team of Freed and Cann noted a dramatic increase in the number of white-eye, and as that bird increased, it competed with the akepa and other native species for food. During 2006, the akepa population collapsed. The endangered akiapolaau and Hawaii creeper also declined.

Between 2000 and 2005, Cann, Freed, and colleagues came to a startling realization: “Young females had all but disappeared in the population.” They determined that early-nesting females normally produce sons, the larger sex. “Food limitation has now become more severe over the season,” Cann said, “so only early-nesting females were breeding successfully, with adverse consequences for the population.”

Facing long odds, researchers now are working to save native snails and birds. Hadfield’s colleagues are studying snail DNA and breeding them in their laboratories. While the akepa is being bred in captivity at a Hawaiian center affiliated with the San Diego Zoo, Freed is urging U.S. wildlife authorities to control white-eyes to protect native birds.

In a plenary address, outgoing Division President Terrence Gosliner described how

INTERNATIONAL

AAAS Science Literacy Text Translated into Japanese

When a group of Japanese scientists and educators sought a way to boost the scientific literacy of their nation’s citizens, they were inspired by AAAS’s *Science for All Americans*, using it as a guide “to show the essence of science to be shared by all people,” said Kazuo Kitahara, a theoretical physicist and director of Japanese science literacy initiatives.

Just 3 months after its release, the Japanese translation of the seminal science literacy text already has been downloaded more than 3000 times from the Web site of AAAS’s Project 2061, demonstrating that the education concepts in the book have global applications.

Science for All Americans defines what every high school graduate should know and be able to do in science, mathematics, and technology in order to understand and thrive in the modern world. The new translation was funded by the Japanese government’s Ministry of Education.

Science for All Americans served as a basis for Project 2061’s *Benchmarks for Science Literacy*, a curriculum-design tool for educators. Both also have been translated into Spanish and Chinese. “I’m delighted that so many countries continue to find *Science for All Americans* useful to their efforts to improve science education,” said Jo Ellen Roseman, director of Project 2061.

Science for All Americans was first published in 1989 by Project 2061, AAAS’s long-term initiative to reform science, math, and technology education at the K–12 levels. Free online copies of the text and its translations are available at www.project2061.org/publications/sfaa.

—Molly McElroy



The native Hawaii akepa (left) is declining because of competition for food from the nonnative Japanese white-eye (right).

local museums could play a crucial role in Pacific Basin conservation efforts. Gosliner is the senior curator of invertebrate zoology at the California Academy of Sciences in San Francisco, and as the Academy prepares to open its state-of-the-art “green” building in September, he and his colleagues have built a Philippine coral reef exhibit in a 210,000-gallon tank.

They have collected corals sustainably, without harming the lush Philippine reefs. They have helped develop aquaculture techniques that can be used in the commercial coral trade. And, he said, the project has helped create important partnerships with conservation groups in the Philippines and the Bay Area’s large Filipino-American community.

The four regional divisions of AAAS—Pacific, Southwestern and Rocky Mountain, Arctic, and Caribbean—serve as regional networks for scientists, engineers, and other members. The Pacific Division, founded in 1914, includes 30,000 AAAS members.

ETHICS

Experts Urge Action Against Gene Doping

Scientists, governments, and sports officials should collaborate on dramatic new efforts to prevent the “imminent” use of illicit gene transfer by athletes and their medical advisers, experts said at a world conference cosponsored by AAAS.

The World Anti-Doping Agency meeting in St. Petersburg, Russia, urged scientists to document natural genetic differences in physical traits so that future tests could assess whether an athlete’s genes had been modified. Governments should develop sanctions for doctors and other licensed professionals who attempt illegal gene transfer in athletes, the group concluded. And, it said, governments should impose stronger regulation on commercial genetic technologies that are already becoming available over the Internet.

Gene doping is “feasible, inevitable, and imminent, something that will happen in years rather than decades,” said Dr. Theodore Friedmann, former president of American Society of Gene Therapy and current director of the University of California–San Diego Gene Therapy Program.

Mark S. Frankel, director of the AAAS Scientific Freedom, Responsibility and Law Program, said gene doping may become a factor as early as the 2012 Olympic Games. “The feeling is that in that amount of time, the science can make significant inroads,” said Frankel, one of the conference organizers. “In the competitive world of sports, everyone is looking for an edge, and there’s every reason to believe that coaches and their athletes, maybe even their agents, will be looking at this.”

The declaration by the World Anti-Doping Agency (WADA) was released this month after more than 60 representatives from 16 countries met for its Third Gene Doping Symposium from 10 to 11 June. In the past, WADA has fought athletes’ use of steroids, blood doping, and other artificial means of improving performance.

Gene doping would add new genes or manipulate an athlete’s own genes that control muscle growth and development or endurance, for instance. New genes could be added to cells and tissues using a targeted virus or other delivery method, but researchers are also preparing for the possibility that an athlete’s own genes could be modified by treatment with genetic elements or even drugs. These processes would exploit transfer techniques developed by researchers for therapeutic purposes, such as restoring immune function in certain genetic diseases.

Although there have been no documented cases of gene doping, the techniques used in legitimate gene therapy have grown more effective at the same time that the global marketplace has made the techniques more widely known and accessible. Together, these factors point to an urgent need for concrete enforcement and regulation measures aimed specifically at gene doping, along with a push to develop viable screening tests for illicit gene transfers, experts said at the symposium.

Friedmann predicted that athletes may be the pioneers in a new world of human enhancement, where methods of genetic manipulation are used to alter a person’s abilities or physical appearance rather than treat disease.

“Science has moved so quickly in gene therapy and because it moves so quickly, it makes the nontherapeutic use of these kinds of methods much more likely,” he noted. “And the sooner it pops up in sport, the more likely it is to pop up in other areas.”

Friedmann believes that it’s important to draw the legal and ethical lines now between gene therapy and gene doping among athletes, so that the public will understand better the risks and limitations of the science. At the moment, participants in gene therapy studies are protected by the oversight of institutional review boards, governmental agencies, and international codes of human experimentation such as the Helsinki Declaration. If athletes—and those who follow them into the new world of genetic enhancement—receive illicit gene transfers without these protections, “such manipulations would clearly be unethical,” Friedmann said.

WADA was established in 1999, an outgrowth of efforts by the International Olympic Committee to combat doping in sports. Its work is supported by governments, intergovernmental organizations, and other public and private bodies.

“I think it’s extremely important for WADA as a world organization to have feedback from a scientific organization like AAAS, bringing its voice and its reflections on some of the issues we are facing beyond the technical aspects,” said Olivier Rabin, the agency’s science director.

The Scientific Freedom, Responsibility and Law Program released a report on human enhancement in 2006 and more recently helped organize a session on human enhancement at the 2008 AAAS Forum on Science and Technology Policy in Washington, D.C.

The risks associated with fledgling genetic technologies—such as the cases of leukemia that developed in children treated with gene therapy for x-linked severe combined immunodeficiency, or “bubble-boy disease”—are well known among researchers. WADA supports an extensive education program to warn the sports community about these potential dangers, but Frankel said he was surprised to hear how often researchers are contacted by coaches who volunteer their athletes as test subjects for gene-transfer experiments.

—Becky Ham

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