Butterfly biosensors offer habitat hints

Tropical butterflies, already valued for their beauty and grace, show promise as ecological workhorses in the emerging field of biodiversity conservation, preliminary research suggests.

The goal — to use butterflies and other selected invertebrates as indicators of environmental health — remains years from attainment. But ecologists have provided a strong theoretical basis for using these sensitive species in making land-management decisions. And now, some of the first experiments designed to test this approach appear to verify that butterflies can serve as environmental "markers" for a host of variations within their local ecosystems.

So-called indicator groups have long been popular among scientists concerned with pollution-related issues. Like canaries in a coal mine, these species — if chosen correctly — provide early warnings of subtle but significant environmental changes.

Conservationists now seek to identify a few key species that might do for biodiversity what previous indicator groups have done for pollution control. Many insects have complex life cycles that include leaf-feeding caterpillar stages, pupal phases and adult stages requiring specific interactions with flowering plants. This leads some ecologists to suggest that such creatures may prove ideal indicators of local environmental stability and plant diversity.

Claire Kremen, a conservationist with the Xerces Society in Portland, Ore., mapped butterfly distributions in various terrains within the southeast rain forest of Madagascar. Using two different computer programs designed to detect correlations between local conditions and species distributions, she identified an array of butterfly species that appear useful as indicators of subtle habitat differences there. Butterfly data from environmental "edges," where forest preserves border agricultural plots, may someday help planners decide what kinds of land use to permit alongside protected areas, Kremen says. She described her study this week in Snowbird, Utah, at the annual meeting of the Ecological Society of America.

Ecologists hope to identify other animal species — ranging from soil-dwelling organisms to small vertebrates — as biodiversity indicators in other environs, adds herpetologist Peter B. Pearman of Duke University in Durham, N.C. Some frogs may prove useful, he says, because of their need for both aquatic and terrestrial habitats.   — R. Weiss

A-bomb babies: Mental blows, social woes

The Japanese call them "pika" children, meaning "children of the flash." They were still in the womb in August 1945 when the atomic bombs that leveled Hiroshima and Nagasaki sent their mothers reeling. They are the youngest survivors of the atomic bomb — but 45 years later, they are far from the luckiest.

Within a decade of the bombings, scientists had already documented fetal brain injuries and subsequent mental retardation in children born to mothers who were within 2,000 meters of ground zero when the bombs exploded. Last year, reassessments of those early data revealed links between stages of fetal development at the time of the bombing and the likelihood of severe mental retardation (SN: 12/23&30/89, p.404). In particular, fetuses exposed between the 8th and 15th weeks of gestation suffered the highest subsequent rates of severe mental retardation, small head size, convulsive seizures and poor performance in school and on IQ tests.

After reviewing magnetic resonanace images of the brains of five adult pika children, along with the results of one autopsy, epidemiologist William J. Schull and pediatrician James N. Yamazaki now suggest that the radiation not only destroyed brain cells but also disrupted the complex migrations of such cells during fetal development.

Weeks 8 through 15 of gestation correspond to two critical events in brain development, explains Schull, of the University of Texas Health Science Center in Houston. "This is the time when neurons are produced in their greatest number. It is also the time when those neurons will migrate from their proliferative zones to the cortex [outer surface] of the brain, their ultimate site of function," he says. "The brain scans have shown that impairment of migration will culminate in these cells being in the wrong place — and if they're in the wrong place, they do not do the right thing."

Confounding factors of war, however, prevent Schull and Yamazaki from attributing cases of mental retardation solely to radiation. "Some [mothers] were rendered unconscious as the powerful blast of wind picked them off the ground and threw them several meters away," the researchers write in the Aug. 1 JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION. John D. Boice Jr., an epidemiologist with the National Cancer Institute, cautions that such blast effects — along with malnutrition, infection and other stresses of war — may also have influenced the pika children's condition.

Biologically assaulted before birth, pika children went on to suffer repeated sociological blows. Yamazaki, who last fall interviewed families of pika children in Japan, says the pika label carries a severe stigma there. As adults, these individuals have difficulty finding employment, and some have been institutionalized, explains the University of California, Los Angeles, pediatrician. "Some parents don't want to talk about it because they fear discrimination against family members," he says.

Moreover, the researchers note, "new worries beset many of these parents, for they are now 60 to 70 years of age and fear for the future care of their [handicapped] children."   — W. Stolzenburg