

Blurring Wallace's Line

By Robert R. Dunn

As a few lost letters may make a sentence unintelligible," Alfred Russel Wallace once wrote in a paper on the geography of the Malay Archipelago, "so the extinction of the numerous forms of life which the progress of cultivation invariably entails will necessarily obscure this invaluable record of the past."

When Wallace recorded those thoughts in 1863, the evolutionary record of the fauna and flora of Southeast Asia was clearer than it would ever be again. That "invaluable record of the past," and Wallace's own detailed observations of it, led to Wallace's momentous insights about natural selection and biogeography.

What Wallace found was that many of the organisms he studied were restricted to single islands or groups of islands, and that such idiosyncratic distributions of species often told important stories about the past. In Bali, he found "birds of the genera *Copsychus*, *Megalaima*, *Tiga*, *Ploceus*, and *Sturnopastor*, all characteristic of the Indian region." On a subsequent trip, to an island little more than fifteen and a half miles away, he noticed that "on crossing over to Lombock, during three months collecting there, not one [of the bird genera he had observed on Bali] was ever seen." More than a century before the acceptance of the theory of plate tectonics, Wallace began to imagine the movements of continents that might lead to such distinct variety and patterning.

I crossed Wallace's line when I traveled recently from Australia to the Malay Archipelago. It should have been easy to observe the transition in organisms that Wallace recorded: kangaroos in Australia that give way to tapirs in Asia; Australian cockatoos that cede to hornbills in Southeast Asia. But when I landed in Singapore, the first thing I saw was a cockatoo. Such introduced species, dragged across Wallace's Line, have partly obscured it, and helped blot out the traces of evolutionary history that the boundary had preserved for so long.

The evolutionary record has been most obscured on the island-nation of Singapore, where Wallace did most of his collecting. More than 99 percent of the mature forest that once covered the island is gone [see "Singapore's Vest-Pocket Park," by Jamie James, April 2004], and Singapore has lost about half its animal species in the past two centuries. The last tiger—from a population so numerous in Wallace's time that they terrified him at night—was killed in 1930 [see photograph above].

Deforestation and the loss of indigenous species have all been far more dramatic in Singapore than anywhere else in Southeast Asia. Still, Singapore is hardly unique. Recent studies by Barry W. Brook of Northern Territory University in Darwin, Australia, Navjot Sodhi of National University of Singapore, and their colleagues noted that forests are disappearing in this region faster than anywhere else on the globe—at a rate of about 0.9 percent annually, compared with 0.4 percent a year in Africa and South America. Another study found that more timber has been harvested in Borneo alone in the past two decades than from Africa and South America combined.

During his stay in the Malay Archipelago, from 1854 until 1862, Wallace collected 900 new species of beetles, 200 new species of ants, fifty new species of butterflies, and 212 new species of birds. If current estimates of extinction rates are correct, between 13 and 42 percent of all species that inhabited the region at the beginning of the nineteenth century could be gone by 2100. Yet, sadly, not only has the evolutionary record been blurred, but a valuable baseline for estimating the changes of the past century and a half—Wallace's own observations and collections—has also been undermined by a lack of reliable biohistorical research. Finding clear examples of individual species that Wallace observed in abundance but that today are rare or extinct is no easy task. No comprehensive list of the species Wallace collected exists, or, to my knowledge, is even in the works.

The key to Wallace's particular contributions was his ability to recognize biogeographic boundaries. That ability rested on the possibility of moving among neighboring islands that clearly demonstrated differences in plant and animal species. Yet in Bali today, for instance, Wallace would be hard-pressed to find birds of the *Copsychus* and other bird genera he wrote about. They survive, all right, but they are hiding in ever-diminishing patches of forest. Wallace would now have to travel farther down every trail, deeper into every forest refuge, to observe what he could so plainly distinguish from boats and coastlines in the mid-nineteenth century.

ROBERT R. DUNN is a postdoctoral investigator in the department of ecology and evolution at the University of Tennessee. His research focuses on the biogeography of ants.

