The turmoil at the biosafety level 4 (BSL-4) facility comes in the wake of a takeover of the lab's scientific direction by the Pasteur Institute in Paris. The Mérieux Foundation teamed up with Pasteur after failing to convince funding bodies to finance the lab's estimated $1.4 million annual budget. In exchange for footing a still-undecided portion of the lab's bills, Pasteur insisted that one of its own scientists become director (*Science*, 30 June, p. 2298). That presented a problem, however, as Fisher-Hoch has a contract naming her director until February 2002. At the foundation's request, she says, she prepared a proposal for a new contract. Fisher-Hoch agreed to give up the directorship if she could run some of the lab's international relations and do research into a Lassa fever vaccine.

Fisher-Hoch claims she received "no reply at all" to the proposal before being "presented simply with an ultimatum to get out of the lab." Foundation Secretary-General Claude Lardy counters that she personally told Fisher-Hoch that the proposal was "completely unacceptable" because it gave her too much independence and authority. Complicating matters, Fisher-Hoch has been in hot water over an incident earlier this year in which she allegedly stored potentially virus-infected blood samples in the lab before it was certified to hold them. Fisher-Hoch denies the allegation, saying that the samples were drawn from healthy doctors and nurses during a workshop in Liberia. Nevertheless, the primary grounds for Fisher-Hoch's dismissal, cited in a 28 June letter to her from the foundation, are that she spoke with journalists about the foundation's decision to replace her as director.

On the way out? Hot-lab director Susan Fisher-Hoch is fighting her dismissal.

CREDITS: (LEFT TO RIGHT) R. GAILLARDE AND R. BÉNALI/GAMMA; DON WINDSOR

Fisher-Hoch has hired an attorney to help fight her dismissal. In the meantime, no one is about to suit up for the pathogen lab: Local officials have delayed the facility's opening, planned for this month, until whoever takes over presents bona fide credentials for running a BSL-4 facility. **–MICHAEL BALTER**

EVOLUTIONARY BIOLOGY

Chewed Leaves Reveal Ancient Relationship

God, the great British geneticist J. B. S. Haldane once remarked, must have "an inordinate fondness for beetles." And certain beetles have an inordinate and, it turns out, historic fondness for ginger plants. Paleontologists have discovered how ancient this culinary preference really is by studying fossils of damaged leaves. The data help push back the time when a group of beetles called leaf beetles evolved their great diversity and demonstrate just how faithful some species can be to their favorite foods. The results are also convincing paleobotanists that they can sometimes glean more about their plant's ancient past from a chewed-up leaf fossil than from a pristine one.

On page 291, paleobotanist Peter Wilf of the University of Michigan, Ann Arbor, Conrad Labandeira, a paleobiologist at the Smithsonian Institution's National Museum of Natural History in Washington, D.C., and their colleagues describe a new beetle fossil based not on traces of the insect skeleton—in fact, the insect itself never even shows up in the fossil record—but on the distinctive gouges the beetles left when they munched on 11 ginger leaves many millions of years ago. The chew marks of the newly described *Cephaloleichnites strongi* prove that leaf beetles underwent rapid evolution and diversification more than 65 million years ago—far earlier than the oldest fossils of insect bodies suggest—possibly taking advantage of (and perhaps influencing) the rapid diversification among flowering plants occurring at the same time.

What's more, *C. strongi* represents the earliest known rolled-leaf beetle species, hundreds of which today still are picky eaters, preferring just one of the ginger- and heliconia-like plants in the Zingiberales order. For decades, ecology students have learned about this impressive array of beetle-plant pairings, in which different rolled-leaf species adopt the same lifestyle but on their own distinct host plant. This new work adds "a historical dimension to this emblem of tropical biology," says Brian D. Farrell, an insect evolutionist at Harvard University. Adds Phyllis Coley, a tropical ecologist at the University of Utah, Salt Lake City: "The beetles and the gingers are an extremely old and conservative pairing, which in turn suggests that each could have had profound selective effects on the other."

As a young ecologist in the 1970s, Donald Strong—the fossil's namesake—could not help but notice the vast variety of rolled-leaf beetles, whose larvae take up residence inside the young, curled leaves of gingers, heliconias, and their relatives, plants that thrive in the understories of tropical forests of the Western Hemisphere. In particular, he was enchanted by what the beetles did to the leaf itself. Their damage becomes quite apparent as the leaf unfurls and serves as a lasting reminder of a beetle long gone. "It was an issue of artistry, how beautiful the damage was," recalls Strong, now at the University of California, Davis.

Telltale jaws. From the characteristic chew marks left on fossilized leaves, researchers have identified an ancient beetle and its favorite food. Rolled-leaf beetles today still munch on ginger plants, as shown by the characteristic damage on this leaf from Panama.

Over the next few decades, Strong documented the specialized associations among different beetles and particular plant species. Eventually, he learned to identify a beetle species from the leaf's chew marks, which varied according to the size and shape of the particular beetle's jaws.

Wilf came across Strong's research in 1998, when he and Labandeira were studying a different sort of insect damage—tiny fossil pellets, mysterious specks of fossilized material found on 53-million-year-old fossil leaves he had collected from Wyoming. Until that time, Wilf hadn't really noticed the chew marks. But when he and Labandeira took a second look at the leaves, "we realized the damage [seen by Strong in the modern leaves] matched beautifully with what we had," Labandeira recalls. Moreover, the fossil leaves looked very much like some modern gingers. Even after millions of years, says Wilf, "[the beetles] are eating the same thing, and they are doing it the same way."

Soon Labandeira found even older leaves bearing the telltale signs of the rolled-leaf beetle. While working with Kirk Johnson at the Denver Museum of Natural History, Labandeira noticed that some of Johnson's fossils, whose identity he didn't yet know, also had chew marks resembling *C. strongi*'s. And they, too, turned out to be fossil gingers. Because these fossils came from a North Dakota deposit dating back to the Late Cretaceous, "we now know this insect

is 20 million years older than if we just looked at body fossils," Wilf points out.

These findings lend support to a theory proposed by Farrell in 1998. Farrell suggested that most plant-eating beetles likely evolved in parallel to flowering plants and therefore were quite diverse during the dinosaur's heyday (*Science,* 24 July 1998, p. 555). But until now, there has been little supporting fossil evidence, as only one relevant beetle fossil exists from that time. Now researchers may be able to get around this lack of fossils by looking at insect damage instead, says Leo Hickey, a paleobotanist at Yale University: "The work shows the potential of an overlooked resource in [studying] the evolution of insects." Inspired by this new work, Hickey expects that he and his botanical colleagues will be giving their plant fossils a second look for signs of insect activity. Coley agrees, noting that "it seems that the use of fossil damage patterns to infer ecological and evolutionary relationships is quite powerful." **–ELIZABETH PENNISI**

ECOLOGY

When Fire Ants Move In, Others Leave

For Amy Arnett, getting a Ph.D. in biology has also meant learning to be a road warrior. Beginning in May 1997, she and Christy Royer, an undergraduate assistant, covered some 2000 hot, dusty kilometers from northern Florida to upstate New York, collecting ants at 33 sites along the way. They had set out to look at how the food resources for ant lions, insects that prey on ants, changed from north to south along the East Coast. But in the process, their research uncovered new evidence about the long-range, and potentially long-term, ecological damage being wrought by an invasive species of fire ant.

Dreaded invader. Red imported fire ants displace native ants and disrupt local ant communities.

The red imported fire ant *Solenopsis invicta* displaces other ant species and upsets the structures of native communities of ants—disruptions that appear to be permanent, Arnett and her adviser, community ecologist Nick Gotelli of the University of Vermont, Burlington, report in the July issue of *Ecology Letters*. Other studies have examined how these ants perturb single communities and how other invasive species affect the communities they move into, says David Holway, an ecologist at the University of California, San Diego. But this "is the only study that looks at the impact of an invasive species at such a broad scale."

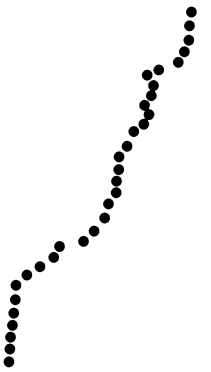
These fire ants entered the southeastern United States about 70 years ago, likely hitching a ride with produce from Argentina or Brazil, and have spread as far north as winter freezes will let them. They are infamous for their sting, which "you never forget," says Gotelli. They can also make pastures uninhabitable for livestock and chew up telephone wires. But "what people [haven't understood] is the ecological havoc they are wreaking," says Kenneth G. Ross, an entomologist at the University of Georgia, Athens.

As Arnett and Royer drove along the East Coast between 25 May and 3 July, they would scan the horizon for a sampling site—an open field next to a forest—roughly every 30 to 50 miles. In both the field and the forest they would make a 5-meter-by-5-meter grid in which they buried 25 small plastic tubes, each placed so its lip was flush with the ground. Soapy water at the bottom of the tube prevented the escape of any creature that crawled in over the next 48 hours. In this way the roving researchers could get a quick snapshot of the ants active in both habitats.

When they retrieved the tubes, Arnett and Royer could tell right away whether fire ants were present. If none were there, the tube was relatively empty, likely containing only about 20 ants of assorted species. But if the red ants were there, as many as 500 individuals would be crammed into each tube—a readily visible mass. Almost all would be the red imported fire ants, which live in denser populations than do native ants.

Overall, the effort netted more than 14,000 ants, and with the help of Harvard ant specialist Stefan Cover, they identified 81 species, including *S. invicta*. What was surprising was the distribution of those species. The researchers had expected to find more native species in the southern part of the country than in the north, as species diversity tends to increase closer to the tropics.

But where fire ants were present, that gradient was disrupted. Arnett and Gotelli found that, as expected, the number of species rose with decreasing latitude—from just a few in New York to 15 in southern Virginia. But the number of native species dropped off at sites farther south, slipping back down to four in Florida, Gotelli and Arnett report. "These changes correlate very strongly with the presence and absence of fire ants," points out Lloyd Morrison, an entomologist at the U.S. Department of Agriculture's Agricultural Research Service Center in Gainesville, Florida. (North Carolina is the northernmost range of the red imported fire ant.)



Hot on the trail. Researchers surveyed ants at 33 sites (dots) along the East Coast.

Gotelli and Arnett can't tell from their survey whether the missing species are locally extinct or just very rare. But the drop in biodiversity could represent a significant loss for these areas, notes Ross, because of the critical role ants play in recycling nutrients and other biological material. Although the red imported fire ants are voracious feeders, they may not redistribute nutrients in the same way that a variety of other ants—each with its own particular habits—would, Gotelli explains. What's more, the steadily declining number of ant species found below the northern limit of the red fire ant suggests that habitats don't recover their biodiversity with time.

Not only does the red ant reduce the overall number of ant species at a given locale, but it also alters the community structure. When Gotelli and Arnett analyzed their data, they found that certain native species tend to coexist with certain others, likely dividing up the resources to make efficient use of what's available. Some might eat seeds; others might concentrate on leaves, for example. But where fire ants are present, those associations break down—a change that could affect the efficiency of the food webs at those sites, Gotelli suggests.

All in all, says Ross, the study "shows very nicely the large-scale ecological effects [red ants are having] on other ants"—and it was a trip well worth taking.

–ELIZABETH PENNISI

CREDITS: (TOP TO BOTTOM) A. ARNETT; K. ROSS/UNIVERSITY OF GEORGIA, ATHENS