

ATTACK ON the ARMY ANTS

How one of the largest, most complex, and most aggressive organisms on the planet was captured.

Text by BRIAN L. FISHER Photography by DONG LIN



THE PLAN WAS SIMPLE: JET down to Trinidad, track down a nest of a million army ants, suck them up in a vacuum cleaner and, twelve hours later, install them in a 500-square-foot glass arena back in San Francisco.

For eight months we had been negotiating all the permits and design issues of this innovative project. No one had ever attempted to keep army ants alive for a whole year in captivity. The escape-proof cages were built and tested. Cricket farms were standing by, ready to begin shipping the 15,000 crickets a week necessary to feed the colony.

Then, on April 2, two weeks before departure, the airline called and said they had canceled our flights. They had reviewed our request and concluded it was too great a risk to fellow passengers to share a plane with a million voracious

insects. Their research had revealed that army ants can kill a horse and they would not accept the responsibility. Despite my assurance that there would be no horses on the plane, they were adamant.

Ants are one of the great success stories in the history of terrestrial life. There is nowhere you can live and not meet an ant. If you took all the humans alive today and then gathered up all the world's ants, they would be roughly equal in weight.

Ants are the only lifeform that competes with humans for dominance. Ants are rulers of their tiny, hidden world, a world near our feet that most of us ignore—unless you are a kid or have a house infested with the ubiquitous Argentine ants. But these overlooked creatures are essential for healthy habitats. They are the glue that holds many an ecosystem together.

The dominant, big bad wolf of the ant family are the army ants—the Huns and

Tartars of the insect world. The majority of army ants are subterranean like those belonging to the genus *Neivamyrmex*, found in Northern California. Our objective, however, was to capture the spectacular South American species *Eciton burchelli*, which nests and forages above ground. Army ants never hunt alone, but instead dispatch a pack of cooperative, leaderless hunters to locate and overwhelm prey. They run down and attack their victims en masse, and use their cooperative skills to dismember creatures often much larger than themselves and carry their booty home.

This contrasts with other types of ants which first send out individual scouts to locate food sources and only later recruit additional help. Because these wolf packs sweep clean all prey within range, army ants must continually migrate to new foraging locales and never construct permanent nests. Instead, they form bivouacs, temporary, above-ground nests made out of their own bodies. They link legs together, creating a tightly woven mesh of bodies and legs that form chambers for the brood and queen. They also link legs when traveling to make bridges to cross streams and to fill in gaps in the trails.

Capturing a single army ant is very different than capturing an entire colony. Individually, they can only inflict an irritating sting, but as a group, they become a pack of remorseless hunters. It's this behavior that caught the attention of the airline agent and grounded our mission. Reports of army ants killing horses, or needing flamethrowers to control their rampage, as in the story of "Leiningen vs. the Ants," are exaggerations, but they are based on a modicum of truth.

THE ARMY ANT DISPLAY WAS TO BE the star exhibit of the California Academy of Sciences' new building, due to open in less than a month. Over the previous eight months we had met with inspectors from the California Department of Food and Agriculture (CDFA) and U.S. Department of Agriculture (USDA) who had guided us through their complicated requirements. The ants had to be 100 percent contained. If a single ant specimen were found outside the containment facility, we would be shut down and the ants



destroyed. Our secret weapon was liquid Teflon. The same stuff that keeps eggs from sticking to frying pans is also too slippery for ants to gain a footing. By building an overhanging barrier painted with liquid Teflon we could keep the ants in the exhibit and off the streets of San Francisco—not that they would survive the cold weather for long.

Obtaining an import permit turned out to be much harder. Since 9/11, the transport of live animals has been tightly regulated. They can no longer be brought into the country as personal baggage on planes. Their importation requires the use of bonded carriers, and a five-day quarantine. Such a delay would kill the colony: army ants are unable to survive more than half a day without food before they start eating their young. This time our secret weapons were inspectors Robert Dowell from the CDFA and Anthony Jackson from USDA, who petitioned Homeland Security for a one-time exception. Finally, after many months of waiting, we got our permit. The only stipulation was that our first port of entry into the continental United States must be in California, and

Left: An army ant “major”—a member of the imperial guard responsible for guarding the colony and the queen. Its enormous mandibles, designed for piercing, are held high ready to strike. **Above:** Medium workers foraging. By combining their strength, they can form bridges of their own bodies, and make trapeze systems to scale smooth vertical surfaces.

Dowell had to meet our flight to take control of the animals upon entry.

With the exhibit’s opening date looming, the issue now was finding a way to transport the ants. Our only hope would be a private jet. The Academy reached out to its community, and seven days before the planned departure, a generous volunteer offered to fly down to help capture and bring back the ants.

On to Trinidad

A WEEK BEFORE THE CAPTURE was scheduled, I flew to the island of Trinidad off the coast of Venezuela. After a two-hour discussion with customs explaining why I was traveling with two new yellow shop-vacs and a large generator, I was allowed into the country.

By the time I arrived high up in the hills at the Asa Wright Nature Center it

was past midnight. The humid night was filled with the smells of the tropics. As ants forage both night and day, I set off immediately into the forest in search of our prey. We had chosen *Eciton burchelli* because of its broad palate—it eats all types of live animals.

To find ants, it is easiest to walk park trails until you find a column of raiding workers. Focusing on the tiny circle of forest floor lit by my headlamp, I noticed a colony of ants in the genus *Pachycondyla* running around their nest entrance with their brood clutched in their mandibles. Obviously something was afoot. I began to dig up their nest and found that they were being attacked by subterranean army ants of the rare genus *Cheliomyrmex*, a group that had never previously been recorded from Trinidad. I took this as a good sign.

I spent all night and the next day looking for raiding columns, criss-crossing the



The army ants' bivouac. Above: The inquiline beetle (bottom right) is an ant mimic. It lives and feeds in the "nest," trusting to its camouflage and antlike smell. It secretes a sweet sugary fluid in return for room, board, and protection.

trails and listening for the ant birds that eat insects fleeing in front of raiding ant colonies. Late in the afternoon, after checking every trail in the reserve, I headed down to a cave where a colony of oil birds roosted. But there were still no army

ants, and I was beginning to despair. Our plane was on a tight schedule as we had a firm date with inspectors in Puerto Rico.

As I got up to return to the center, I saw, off to the left, a column of prey-laden army ants speeding across a fallen log. I set off to follow them in the last light of the day. They went down a steep slope to a river, then crossed the river on bridges built with their own bodies. On the other side, the ants went straight up a 100-foot bank too steep for me to climb and disappeared. Luckily, I found another way up and relocated the column of ants heading back to their bivouac.

A few days later, we located a second colony a few miles away. We decided to keep tabs on both colonies, checking in on them every four hours in case they began to migrate through the forest.

We needed a way to capture the ants rapidly before they could escape and without getting ourselves stung—or at least not much. We decided to test the shop-vac on a colony of leaf cutter ants. We hooked it up to the 93-pound "portable" generator and sucked away.

Life Cycle

ECITON BURCHELLI go through a nomadic phase of 11 to 16 days of hunting followed by a statory (stationary) phase of 19 to 22 days. During the statory phase, the queen's abdomen expands and she begins to produce a mass of eggs—up to 2.5 million a year. The eggs hatching into larvae marks the end of the statory phase.

The synchronous arrival of the mass of hungry larvae triggers the nomadic phase of daily raids and nightly emigrations to a new

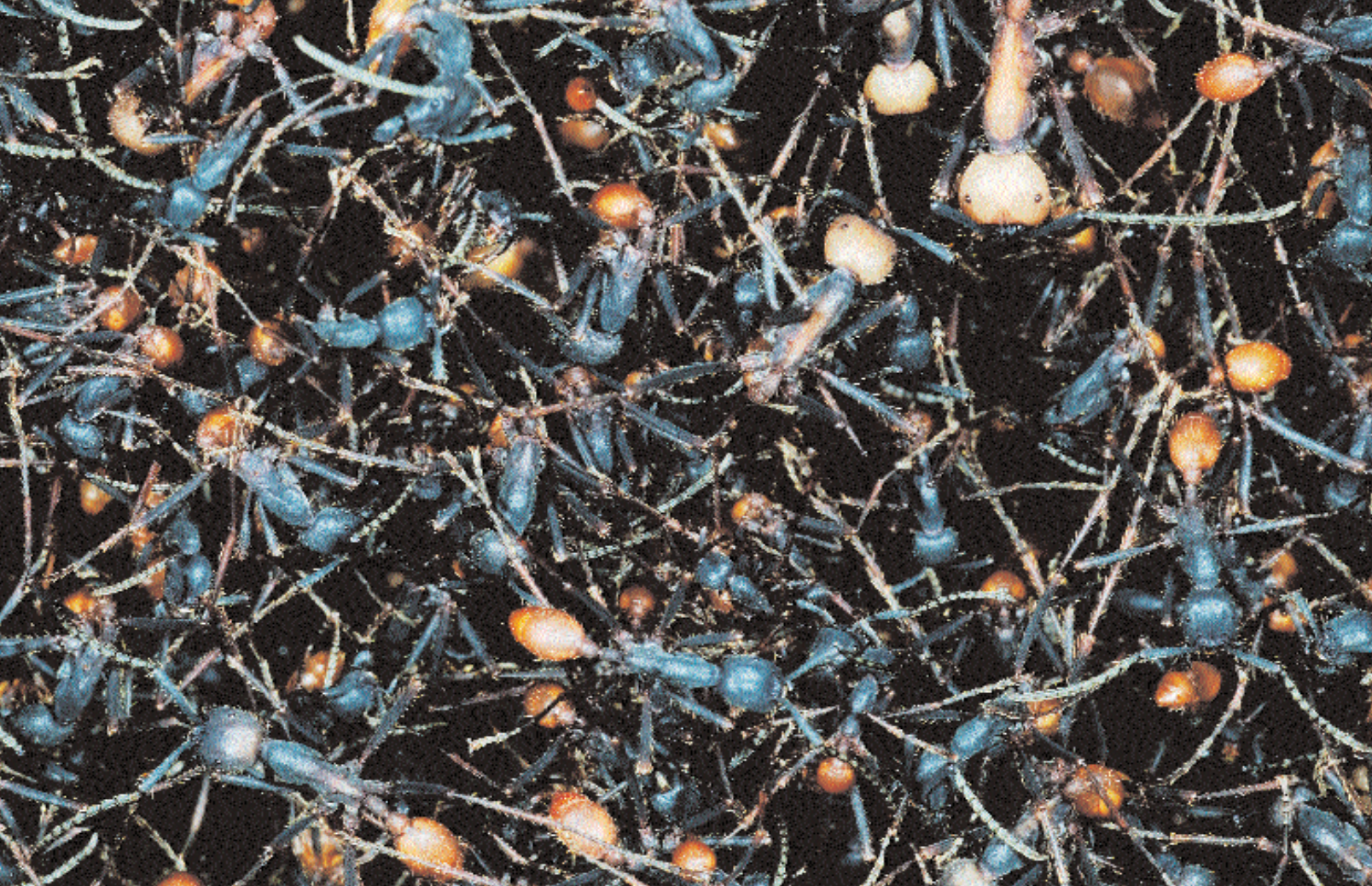
bivouac site. The queen stops laying eggs and her abdomen shrinks, easing the strain of daily travel. The nomadic phase ends when the larvae are mature and form cocoons. With fewer mouths to feed, the colony raids become less frequent. When a new generation of workers emerges from their cocoons, the next nomadic phase begins. It's time to feed the next batch of larvae.

There are four distinct castes of workers: minims, medium workers, submajors

and majors (soldiers). Submajors transport the food, carrying it, and the brood, from one nest to the next. Majors, with big mandibles, defend the colony. They surround the queen to protect her when the nest is disturbed. Minims and medium workers forage and care for the nest. Minims also tend to the queen.

A worker can live up to a year, but it's a risky job. A queen can live for five to ten years.

—B.F.



Then we opened the vacuum to find a thousand headless ants.

Over the next days, in between the four-hour checks, we modified the shop-vac to prevent decapitation. We shortened the hose, cut off the intake flange, but still had too many headless ants. If we lost a few workers, the colony would still live, but if we killed the much larger queen, the colony would soon die. The inspired solution was to fill the bag first with paper towels to cushion the ants' landing. One day before the due departure date, we were ready.

We chose to capture the cliff-climbing colony which was still bivouacked where I had found them. This script was as follows: At 4 a.m., we would check their location one last time and hope that the ants had not moved to some inaccessible fallen tree. At six we were to assemble with the equipment at the bivouac. An hour later we needed to be back at the nature center and ready to drive to the airport for an 11 a.m. departure. This was our one chance to collect an army ant colony. The rehearsal was for one show only.

The night before, it began to rain. When I went to check on the colony, I was relieved that the ants had not moved, but I was now worried about the rain. We could not collect wet ants that would quickly spoil in the bags, let alone hope to navigate the steep slopes with the heavy generator. By morning the rain had let up and we slowly made our way to the site. With the mud and steep terrain, our progress seemed interminable as we laboriously hauled the generator and shop-vacs up the slope.

Once at the site, we began by applying duct tape to the tops of our boots, shirt cuffs, shirt buttons, and collars to keep the ants out. Then we assembled the vacuums and turned on the generator. As soon as the generator began to hum, the bivouac came alive. Ants began shooting out of holes in the rotting log and scurrying in all directions. There was no time to waste. The bivouac was dissolving.

Our rehearsals paid off. With the team standing three feet away from half a million ants, we sucked the last paper towels into the bags, put our hands on the huge log,

and ripped open a section to reveal a three-foot long squirming mass. The firm fabric created by a half a million linked ants seemed to turn to liquid as irate warriors raced toward our feet. As we vacuumed up the first layer of ants along the outer wall of the bivouac, a huge chamber of cocoons, the next brood ready to hatch, was revealed. For ten minutes we vacuumed every ant in sight, and then it was over.

We put the bags into a lightweight wooden box designed to provide a viewing port for customs inspections. But we had little time to appreciate our formicine beauties or celebrate a successful hunt. By the end of the day, a half a million ants had been transported to San Francisco, given a clean bill of health and released into the waiting display area just in time for the exhibit to open.

Above: The ants form bivouacs by linking bodies and locking their tarsal claws together.

Special thanks to expedition members Dave Chan, Dong Lin, John Lattke, Ray Mendez, Carolyn Thomas, Chad Byers, and Shawn Byers.



Chapter II: Costa Rica

THE ARMY ANT COLONY SETTLED into their new home in San Francisco easily and all seemed to be going well. Then, four months into the experiment, we discovered that these fearsome predators had an Achilles heel. Dermestid beetles, feeding on dead crickets and molted skins, were hitchhiking in from the cricket farm that supplied the ants their meals.

Although army ants have a reputation of devouring everything in their path, the larvae of the beetles proved to be immune from attack. The larvae have long, and apparently toxic, hairs which prevented the ants from grabbing hold. Instead, the tables were turned and the ant larvae and

their food supply fell prey to the beetles. The ants, which had survived longer than any previous colony in captivity, succumbed within a week.


But the museum was not ready to give up on army ants. So last October, we made another foray into the tropics, this time to Costa Rica. Again, time was critical. Having located two colonies of ants, both in dense tangled masses of dead branches and roots, we set out at midnight, lugging our vacuum cleaners. Angry ants rained down on us by the thousands as we vacuumed away. It was a badly-bitten trio of biologists that rushed our prize to the airport for the first flight out. Though we fed the

ants 25,000 maggots before sealing their transport container, we knew they could not survive more than a day without food.

After a lengthy discussion to convince the airline to accept our two oversized crates of very active army ants, which were exuding a strange smell of rotten socks, we relaxed and waited for the final boarding call. But bad weather in San Francisco saw our flight cancelled. Our choice was to wait for the next flight departing in two days, or take the last flight to Los Angeles. We made a frantic call to San Francisco, then scrambled aboard the LA flight without clearance to land the ants.

When we arrived, Homeland Security insisted they had to follow protocol and send the ants to quarantine—in a cold warehouse. What's more, we had to get import permits which, if we were lucky, would take two days. Once again, CDA Inspector Robert Dowell came to our rescue. Awoken at 2 a.m., he put on his Superman suit and flew down to LA on the first plane.

By nine the ants had been cleared and United Airlines graciously allowed them to board. But wait. Homeland Security insisted that all bags must be opened for inspection—ants or no ants. Bob Dowell made it clear that if the container was opened, he would not take responsibility for the outcome. After a brief discussion between Dowell and the agent of the gruesome possibilities of 100,000 ants escaping, the agent agreed that an x-ray would suffice. We ran for the flight.

By midday, 30 hours after capture, having slept only three hours of the last 48, Jim Evans, Jonathan Katz, and I were back at the Museum. As we entered the ant exhibit shouldering our booty in large containers, a large group of visiting schoolchildren, their faces packed along the glass wall, chanted “Let them go, let them go.” This was the closest an entomologist could hope to come to starring in a rock concert. The kids counted down from ten and, on cue, we set them free. 



Top: Author Brian L Fisher (right) and colleagues vacuum up close to a million army ants from a colony in Trinidad. Above: A few hours later the ants are emptied out into the exhibit area of the California Academy of Sciences in San Francisco.

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