A photograph of a dense, moss-covered forest wall. The scene is filled with various types of ferns and other plants. A prominent feature is a green, hexagonal metal frame that is partially obscured by the vegetation. The lighting is soft and natural, highlighting the textures of the moss and the vibrant green of the plants and the frame.

From fungi
to tree ferns,
BioBlitz volunteers
have twenty-four hours
to document every
living thing on
the volcano

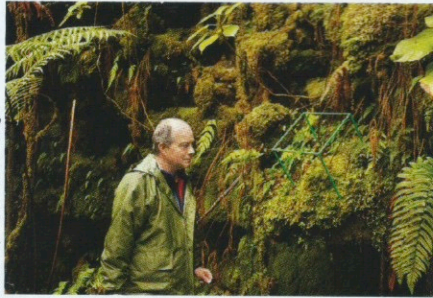
SLICE OF LIFE

STORY BY **SAM 'OHU GON III**
PHOTOS BY **DAVID LIITTSCHWAGER**

When the US National Park Service and the National Geographic Society

announced that they were going to conduct a BioBlitz at Hawai'i Volcanoes National Park in 2015 as a way to celebrate the centennial of the National Park Service, relatively few people knew what that meant. As the announcement put it, over a brief two-day period, people would be invited to "join forces to discover and inventory as many living plants and creatures as possible in the 333,086-acre national park." Expert-led inventory teams would be dispatched throughout the park to explore the biodiversity that thrives in recent lava flows and native rainforests, from the coastline to the summit.

As a conservation biologist who delights in observing the flora and fauna of Hawai'i and who has explored these Islands from sea level to mountaintop, I had an immediate response to the BioBlitz announcement: I want in! No matter how many times you visit a native ecosystem in Hawai'i, you are likely to see something new. The Hawaiian Islands can boast more ecological diversity in one specific location than any other place on Earth. Far from white sandy beaches



Courtesy David Liittschwager

and swaying palm trees, in Hawai'i you can go from geologically fresh and uncarved gentle slopes to sea cliffs that are among the highest in the world. From lands that were created just this morning—still barren and devoid of life—to climax forests supporting thousands of species. From cinderlands as dry as any of the world's deserts to arguably the wettest spot on

Earth. From coastal dunes at sea level to snowcapped volcanic summits. Couple this remarkable habitat diversity with the extreme isolation of the Hawaiian Islands and you'll find species that evolved here that are like no others on the planet, co-adapted and balanced and forming an amazing array of ecosystems.

Hawai'i Volcanoes National Park on Hawai'i Island is itself nothing short of astounding in its diversity. At the summit of Mauna Loa volcano, there are snowy alpine cinderlands and steaming sulfur vents. From there you descend through both dry and wet montane forests with towering koa and 'ōhi'a trees, past one of the most active volcanoes on the face of the planet, Kīlauea, and down to a coastline striped with glistening fresh lava flows. Thousands of species of Hawaiian plants and animals live there. I knew the bio in the park was remarkable—and I was sure the blitz would prove it.

Just what is a BioBlitz? Unlike most biological inventories, a BioBlitz is consciously designed to involve the public, so that instead of a highly structured and specialized field survey, a BioBlitz has



Students from O'ahu's Star of the Sea School, seen here on the Sulphur Banks Trail in Hawai'i Volcanoes National Park as part of the park's 2015 BioBlitz. The cube they're holding belongs to renowned nature photographer David Liittschwager, who has taken it around the world to document the awe-inspiring number of species that can be found within one cubic foot. "It's a way to delineate a space, a voluntary set of blinders," says Liittschwager, seen above with the cube near Thurston Lava Tube.



Students helping to document biodiversity in the park used an app called iNaturalist, which allowed them to record their observations and submit them to a species database. “We’re used to seeing young people bent over their phones,” says Liittschwager, “but in this case, they’re doing it in direct connection with the plants and animals around them.”

more of the atmosphere of a festival. A BioBlitz can occur anywhere and is meant to open participants’ eyes to the biodiversity right around them—in their neighborhoods and public places. And because these events bring together members of the public with biologists, participants have a chance to meet scientists that they would otherwise not be likely to interact with—a much more exciting way to learn about biodiversity, the plants and animals around us, and how to best coexist with them.

The term “BioBlitz” was first coined by Susan Rudy, a National Park Service naturalist who helped to organize the first

BioBlitz in 1996 in Washington DC, at the Kenilworth Aquatic Gardens. Since then BioBlitz events have been held in locations around the world, from Australia to Israel, in over a dozen countries in Europe, Asia and the Americas. The BioBlitz at Hawai’i Volcanoes National Park capped a ten-year effort that traveled across the United States, stopping along the way at the Santa Monica Mountains National Recreation Area, Indiana Dunes National Lakeshore, Biscayne National Park, Saguaro National Park, Rocky Mountain National Park, Jean Lafitte National Historical Park and Preserve and Golden Gate National Park.

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The species seen here were all found within the cube after it was placed near the Thurston Lava Tube. "In what was an abbreviated exercise with the students, we found more than twenty species," says Liittschwager. "Liverworts, mosses, ferns, spiders, millipedes, true bugs, isopods and spring-tails. I'm always surprised because it's still just one cubic foot. It's a tiny piece of the world." And in this case, notes Liittschwager, not only was the area tiny but also remote and relatively new. "Even on Hawai'i's youngest island, you can find highly diverse, very rich places."



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Here in Hawai'i many biologists over the years have explored the ecosystems and cataloged much of the native biodiversity, but any modern biologist admits that there are still new species to be found whenever a region or an ecosystem type has been poorly explored. We might have a good handle on the birdlife of Hawai'i, for example, but in the realm of invertebrates especially, so small that they escape casual notice, the rule is: When you look more closely, you are guaranteed to find something new. This is called "drawing back the veil" on the true abundance and distribution of flora and fauna: The more you look, the more intensively a system is examined, the closer you come to revealing the true diversity of a place.



In this day of digital connectivity, when we all have the ability to pinpoint our location via GPS, take high-resolution photographs and document our observations via a smartphone app, citizen scientists are starting to play a major role in helping to draw back the veil. To harness a small army of dedicated citizen observers, the park selected locations in a variety of ecosystem types and assigned biologists to work with small teams over the course of the two-day blitz. Some citizen scientists were armed with insect nets, others with cameras and small collection bags, and all with a special phone app called iNaturalist that ensured the consistent documentation of observations that would normally have gone in a scientist's field notebook.

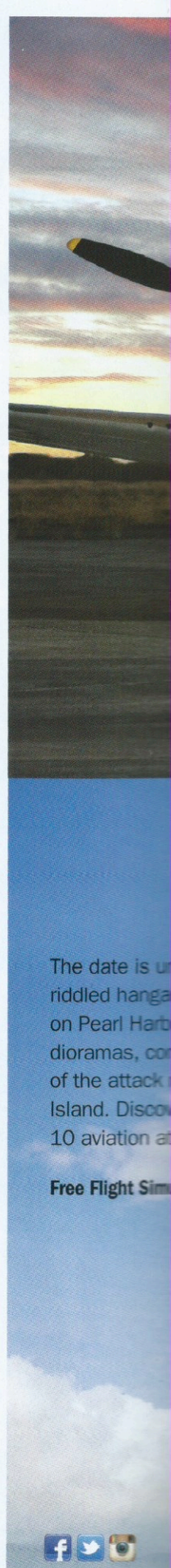
The BioBlitz happened May 15 and 16, 2015 and it brought together more than 150 leading scientists and traditional Hawaiian cultural practitioners, more than 750 students from public and private schools across the archipelago and thousands from among the general public. My BioBlitz team was a mix of middle-school

students, curious visitors to the park who'd come from out of state and local retirees: Our human diversity was worthy of the biological diversity we were exploring.

Our team was stationed up in the high montane lava slopes, gathering dry moss in the cracks of the lava. We were looking not at the moss itself but at what lived within it: Hawaiian species of tardigrades, or water bears. On the first evening, members of the BioBlitz staff soaked some of the moss we'd collected in fresh water, and by the next day I was in one of the event tent pavilions, searching for the water bears with a stereomicroscope connected to a big video screen. BioBlitz attendees were delighted when we found some—eight-legged, eyeless "bears" with curved claws and mouthparts designed to pierce and suck moss cells! The finding was also a confirmation that Hawai'i Volcanoes National Park, like Haleakalā on neighboring Maui, would be rich in water bears. Prior to the BioBlitz, not a single species of water bear from the park had ever been documented.

Another team stationed near Thurston Lava Tube recorded everything from the trees overhead to the liverworts growing on the dripping basalt faces surrounding the lava tube entrance, from the native honeycreepers singing above to the tiny invertebrates that hid in the wet lava crevices. That team was composed of nature photographer David Liittschwager (whose images accompany this story) and students from O'ahu's Star of the Sea School. The students marveled at the biological treasures they documented. As eighth-grader Tim Johnson enthused: "We found five happy-face spiders! That was the first time I had ever seen a Hawaiian happy-face spider in my life!" As his classmate Melia Nishimura summed up the weekend, "There is so much life that I've never seen before."

In the land of Pele, it is impossible to separate science from culture, so Hawai'i Volcanoes National Park combined the BioBlitz with its annual cultural festival. Participants had a chance to learn how the living world is integrated into Hawaiian culture and how Hawai'i's dynamic ecology is reflected in its stories and traditions. Each participant had a chance to focus intensively on the diversity of life in a small portion of the park and came away inspired by the enthusiasm of the biologists who revel in even the tiniest elements of our living world. As one Hawaiian saying puts it: I ka nānā nō a 'ike. Through observation comes learning. **HH**



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