

■ The Hooded Pitohui's POISONOU



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Discovery in New Guinea Rainforest Raises Tantalizing New Questions

By Christopher Hallowell

The first time Jack Dumbacher's hand felt on fire as he worked in the Sepik River region of Papua New Guinea, he shrugged off the pain. His hands were a mess, anyway, lacerated and punctured by the beaks and claws of the panicked forest birds he extracted each day from the mist nets strung along ridge tops. This new sensation was merely one more insult. He assumed he was having an allergic reaction to a plant he had touched, or to a pesky insect.

He remembers licking a cut on his fiery hand that day; his mouth caught fire, as if he had been eating a hot pepper, before going numb. He shrugged that off, too. "Between getting cut, being bitten all the time, getting sick, this didn't seem like anything extraordinary at the time," he recalls.

Most of the nets' quarry during those months of field research in 1988 were Raggiana Birds of Paradise, Papua New Guinea's national symbol. Dumbacher, a graduate student in ecology, was assisting Bruce Beehler of the Smithsonian Institution in a study of this species' unusual mating behavior, in which males cluster on a tree and advertise themselves to females. "A male bordello," Beehler calls the behavior, which in ornithological parlance is termed "lekking."

Occasionally the nets snared a Hooded Pitohui

(*Pitohui dichrous*), not an uncommon bird in New Guinea but a species that prefers thick forest rather than the thinner-foliaged ridges. As they did for all the other catches, Dumbacher and Beehler extracted these dove-sized birds with black heads and orange breasts, and weighed, sexed, and banded them before releasing them. It was when Dumbacher was untangling a Hooded Pitohui that he felt his hand burning and the hot pepper sensation in his mouth. But he was yet to make the connection.

The following year a high school student helping out on the project happened to mention that he had had a similar reaction as he unsnarled a Hooded Pitohui. At this news, Dumbacher recalls, he felt a surge of excitement that comes only with profound revelation.

The next time he caught one of the birds, he clipped off a tiny bit of feather and put it in his mouth. His lips and tongue began tingling and then went numb. Now Dumbacher was ecstatic. He sampled feathers from two other pitohui species, the Variable and the Rusty. No reaction.

He sent specimens of all three to John W. Daly, a bio-organic chemist at the National Institutes of Health in Maryland, for analysis.

Scientists studied New Guinea birds for years before anyone realized that the Hooded Pitohui carried a toxin. Native tribes knew the bird was inedible.

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The results were startling. They turned the ornithological world topsy-turvy and are now delighting researchers with the years of fieldwork they see ahead. The substance that had numbed and tingled Dumbacher was a potent toxin, technically known as a homobatrachotoxin, a steroidal alkaloid that irritates nasal and respiratory tissue. No other bird had ever been reported to possess it. When Daly injected low levels into mice, partial

paralysis and prostration resulted. At high levels, the mice went into convulsions and died.

The skin and feathers of the Hooded Pitohui contained the highest levels of the toxin; the Variable had somewhat less; and the Rusty, just minute amounts. Equally surprising was the confirmation that the toxin is identical

to that of poison-dart frogs, brilliantly colored little creatures inhabiting the Amazonian rain forest halfway around the world. When sensing danger, the frog exudes the poison on its back in a milky substance as a chemical defense mechanism. Native people dip the tips of blowgun darts in the poison for hunting small game, hence the name. John Daly, who has researched the frog species at length, knows of one incidence in Colombia in which an Indian killed a white settler with one poisoned dart. Though the toxin level in the Hooded Pitohui was far

less concentrated than in poison-dart frogs, here was an example of convergent evolution neat enough to make a biologist giddy.

About the time that the bird's toxicity was confirmed, Dumbacher was looking around for a subject for his doctoral dissertation. He found it in the Hooded Pitohui. He is now at the University of Chicago analyzing data on the species, at the threshold of a long-term study to determine why and how this species possesses the poison.

"There are a jillion and one unanswered questions about this species," exclaims Beehler. "As of now, we haven't answered any of them."

The most obvious question is why does the toxin exist in the species at all. Does it serve as a defense mechanism against birds of prey common in New Guinea, such as Meyer's Goshawk, the Little Eagle and Doria's Hawk? If so, is the toxin's presence merely a chance event in what Beehler terms the "mindlessness and headlessness" of evolution? Is that why no other bird species is known to carry the poison?

Did the species happen to evolve consuming a noxious chemical which natural selection then turned into a defense mechanism? Does it acquire the toxin by eating a poisonous plant or insect, or through a chemical precursor that is then transformed into the poison? Or is the source of poison fixed in the bird, as is true in species of salamanders and puffer fish in which intestinal bacteria foment toxins?

The Variable Pitohui contains lesser amounts of the toxin. In some areas, the Hooded and Variable pitohuis are almost indistinguishable.

