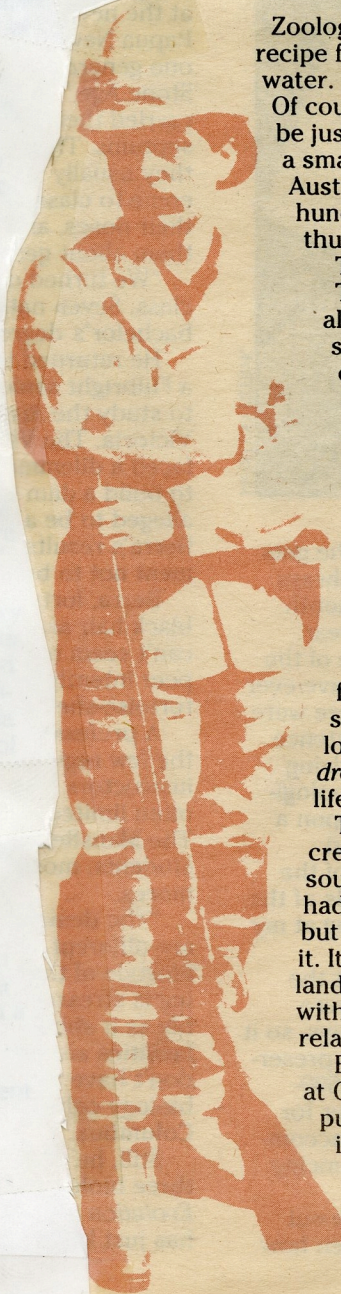
Of Instant Fish and Pickled Sharks

By Steve Benowitz



Zoologist Tim Berra has a simple recipe for making fish—just add water.

Of course, the conditions have to be just right. For starters, you need a small, dry lake bed in southwest Australia. Then add several hundred gallons of water. A brief thundershower might do.

Ten minutes later, poof! Fish.

That's Berra's explanation, albeit exaggerated, of how he stumbled upon a strange, tiny creature known as a salamanderfish. When water's plentiful, it lives in small, isolated pools of dark water, dining contentedly on insect larvae.

But when the harsh Australian landscape turns bone dry, the fish simply disappears. It follows the water table below the ground's surface.

In fact, if you brush away a few inches of sand, the squirming, two-and-a-half-inch-long *Lepidogalaxias salamandroides* suddenly comes back to life.

The salamanderfish, a bizarre creature found only in the southwest corner of Australia, had been named and classified, but little else was known about it. It was an enigma, isolated in a land famous for its unique fauna, with no apparent close biological relatives.

Berra, a professor of zoology at Ohio State's Mansfield campus, had traveled to Australia in 1986 for a three-month stint as a research associate at the Western Australian Museum to do a taxonomic study of the fish.

The fish, however, seemed to have other ideas—it confounded researchers. What, for example, was it doing living in isolated pools of water the size of a large closet? And when the water evaporated in periodic dry spells, what became of the fish?

Serendipity—and evolution—lent a hand.

"One field trip coincided with a storm," Berra explains. Pools completely dry one day had water the next morning. "We caught fish where there had been dry sand the day before, indicating the fish had to be down in the dried mud. They must have burrowed down when the water disappeared.

"I went back a year and a half later, and eventually we simply dug up and sifted sand and found some of the tiny fish. It was like looking for a needle in a haystack," he says.

He and his colleagues subsequently conducted another experiment. They found a dry pool and, using a fire truck, filled it with 2,700 liters of water. "It was amazing that I caught fish within 10 minutes. It truly was instant fish."

He thinks the fish must follow the evaporating water into the ground. "We found fish just a few inches to two feet below the surface," he says. "We know the salamanderfish are not eating during this period, but we're not sure just what is happening to their metabolism. They apparently can breathe through their skin."

Berra found that the fish has an extremely large, strong skull for its size and that its spinal column bones are separated, providing the power and flexibility to dig into the sand.

The African lungfish is a variation on this biological theme. It weaves a mud cocoon, complete with a tiny surface tube, and can remain under

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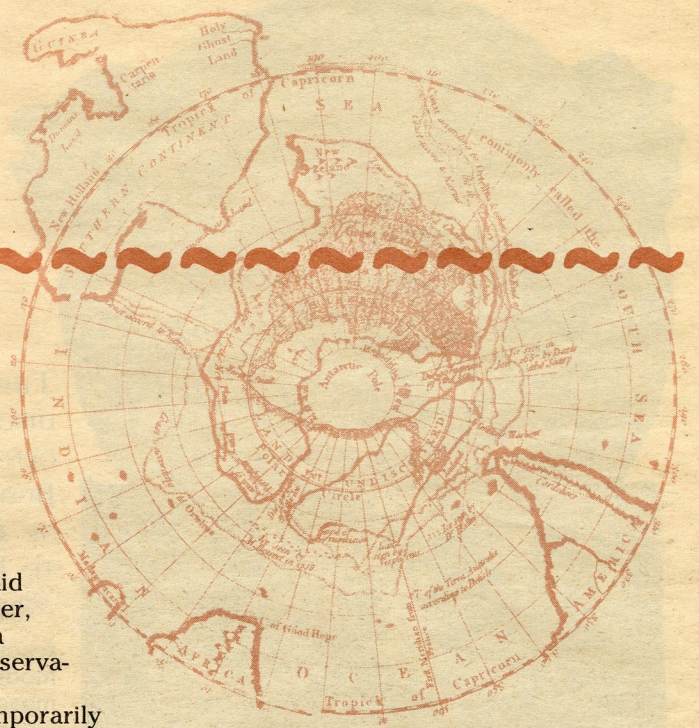
PICKLED SHARKS



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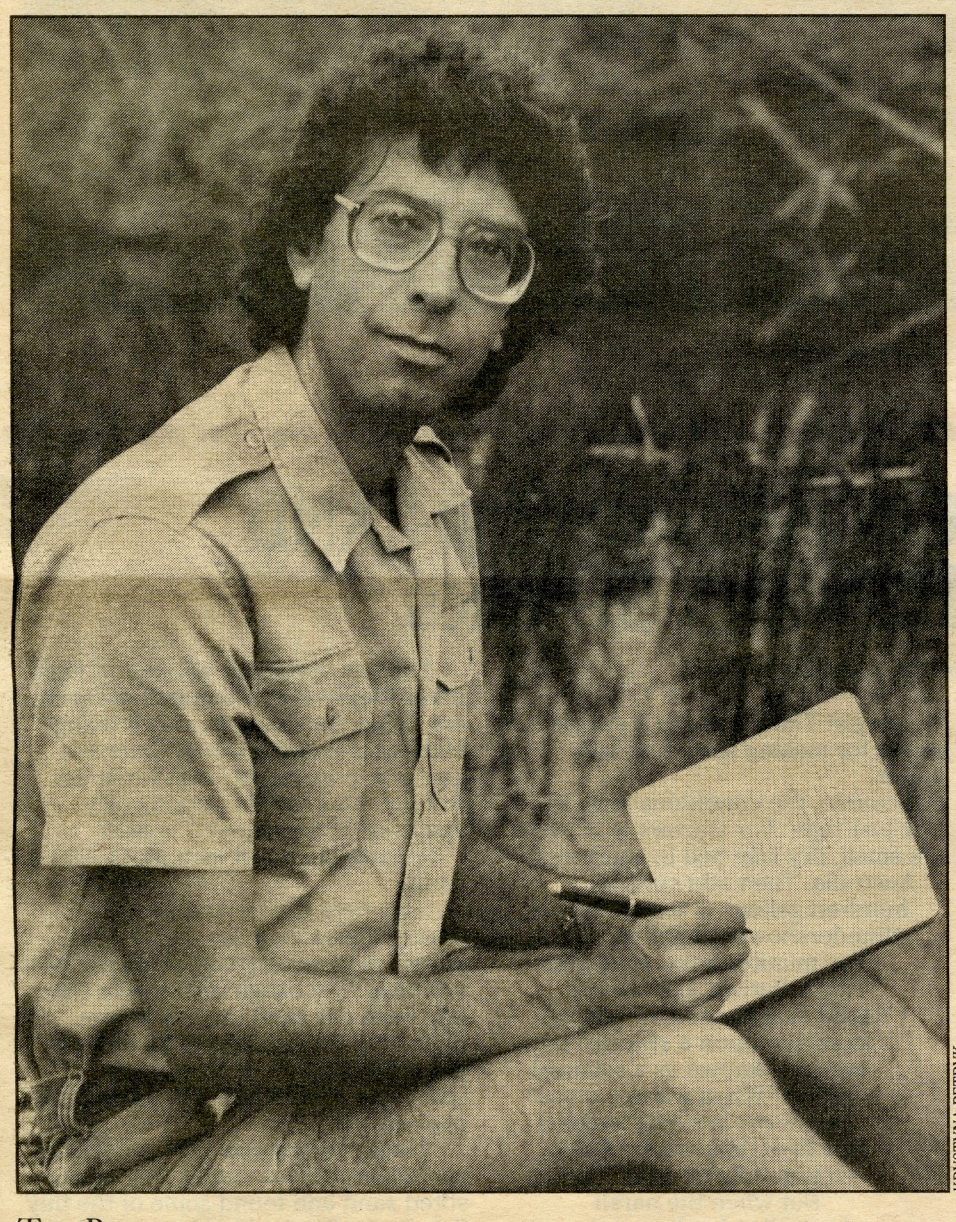
dry lake beds for up to four years. "But that's a substantial, foot-long fish. This is a tiny two-inch thing. It must go up and down like a yo-yo because those small pools of water evaporate quickly in the hot sun.

"Now we know how they live without water: they burrow down and live in the damp sand. It shows the incredible adaptability of organisms to occupy a vacant ecological niche. Here's a habitat that's not being utilized. It's evolution at work."

His next Australian adventure may take him to the tropical northern Australian territories, to a crocodile-infested estuary. Of course, if he gets bored dodging crocs, he can always go back to pickling the megamouth shark he stumbled upon last year.



KRYSTYNA PETRYK

TIM BERRA

Only four of the sharks, one of the largest species in the world, have ever been spotted, he says, and there were no official records of their existence before 1976. So it wasn't surprising that Berra, chronicler of the zoologically bizarre, should wander upon a dead megamouth on a deserted Australian beach. "It was one of the most important zoological finds of the decade, and there it was, sitting at my feet."

Two of Berra's colleagues at the Western Australian Museum were busy with other projects, he says, so it was left to him to to direct the preservation of of the 15-foot-long, 1,500-pound, plankton-eating monster for posterity, as well as write the accompanying scientific paper announcing the discovery.

"Here we are trying to figure out how to move this thing and then how to pickle it. And I had never worked with anything before that couldn't fit into a jar."

With the help of a crane and a truck, the huge creature was hauled to a freezer in Perth. Workers there dug a coffin-shaped openingin the ground, laid down swimming-pool liner, and filled the hole with a solution of chemical preservatives.

The fish had been temporarily frozen and put on public display for three hours in the museum's parking lot, and when it was put in the water, it floated. "Of course it would float," Berra says, recalling the sight with amusement. "I should have realized—it was like a giant ice cube."

They let the shark defrost enough to inject some of the proper preservatives into its body. They had to design a special 3-foot-long needle of stainless steel tubing to reach the shark's internal organs and use a garden sprayer to fill the carcass with enough chemicals to keep it preserved.

It's still there, Berra says, pickled in a pit, awaiting new museum money to construct a permanent home.

The Australia bug bit Berra shortly after he received his Ph.D. from Tulane University in 1969. Berra, with a Fulbright postdoctoral fellowship in hand, went off to Canberra, Australia, to the Australian National University. He spent a year and a half traipsing through thousands of miles of streams, studying Australian cod.

He subsequently went on to teach at the newly opened University of Papua New Guinea. "My students were one generation removed from the Stone Age," he says. "Some of them carried their pens in their nasal septums. They used the slot where they usually wore a bone. They'd come to class, pull their pens out of their noses, and here I was teaching them about genetics.

"We turned out the first graduating class. Seven native Papuans earned bachelor's degrees."

He returned to Australia in 1979 on a Fulbright senior research fellowship to study the Australian grayling in Victoria. The Victorian government faced a dilemma over whether or not to build a dam on a river that was alleged to be a grayling hatchery. Berra's results convinced the government not to build the dam.

Berra, fortyish, with thick, curly black hair and rugged good looks, can't seem to sit still. His brown eyes peer intently from behind dark tortoise-shell glasses.

A professor of zoology—he's one of the few regional campus faculty instructors who is a full professor—is often limited in his scholarly pursuits. The Mansfield campus has 1,200 students, mostly freshmen and sophomores.

"The demands at a regional campus are different," he says of his academic lifestyle of the past 19 years. "Teaching is stressed more, which is probably as it should be. But the research facilities are extremely limited, and I don't have any research-oriented biology colleagues here. They're all in Columbus."

Still, he's found the time to write three biology books. The latest, titled *Evolution and the Myth of Creationism*, has just been released.

"I got roped into that after reading a draft of a handbook for teachers that was 50 percent creationist," he recalls. "I was shocked. I remember thinking, 'It's time for scientists to do something about this.' I've worked on it for the last eight years."

Berra's natural habitat is a bookworm's delight. His Mansfield office is stuffed to the rafters with textbooks, encyclopedias, and journals. Nearly every available spot on the floor and walls is crammed with tomes on evolution, ichthyology, Australia, and more—all part of a 12,000-volume collection, he says.

Berra squeezes behind a worn wooden desk, barely visible under more stacks of books. A bumper sticker tacked to a wall behind him reads, "Apes Evolved from Creationists." It sits above a framed photograph of Charles Darwin.

"This has been my modus operandi for many years," he says, explaining his offbeat pursuits. "I go off to Australia every chance I get for a year or so where I have no other responsibilities but to do my research. Then I come back, analyze my results, and publish.

"That plan has worked for me to hold my own in the research area. I can do things that other ichthyologists can't do. In America there are hundreds of us, and we're tripping over one another. In Australia the fauna is barely known or understood.

"What makes it exciting is the risk of failure," he says. "I've gone to Australia and have done three major research projects on freshwater fishes. Each time there was the chance that I could have spent a whole year and come away empty-handed.

"The moment I scraped away the sand and found the fish, it was a great feeling. That was the reason I went halfway around the world and gave up a third of my salary on a year's sabbatical.

"Those discoveries are the 'eureka' moments of science. They're what scientists live for." ■

Steve Benowitz is a science writer and an associate editor in the Office of University Communications.