Devil's Hole: Desert Home of the Pupfish

by Hillary Hauser, FN '89

Photos by Jack McKenney

In a parched desert of Nevada there is a prison camp sunk into one side of a volcanic mountain. Giant coils of barbed wire tangle with the metal mesh of a high, impenetrable fence to seal off a confining pit from the outside world. At one end of this rocky jail is a heavy gate, sealed shut with a massive chain and padlock and opened only periodically by officials from three different American agencies. Just inside the gate, a steep rock cliff is bridged by a wooden ladder, propped against its uppermost ledge. A rock slope descends the rest of the way into the bottom of the cavern, where a rectangular trough of water emerges from underneath the mountain. The water is warm, clear—and bottomless. The pool is a flooded earthquake fault.

Crystal Spring, a sinkhole fed by Devil's Hole over 2 miles away; water pushed up into the spring at the bottom of the pond, 30 ft. deep.

Sign at entrance to Frank Schneehagen's house.

Dr. Jim Deacon, guardian-scientist of the Devil's Hole pupfish, in front of padlocked gate to the site.

This is Devil's Hole

The gate, fence, barbed wire, chain and padlock are not to keep criminals contained nor monsters confined. They are there to protect an endangered fish no larger than a minnow. A sign at the front of the site explains that within these confines is the last remaining population of *Cyprynodon diabolis*, the Devil's Hole pupfish.

Underwater photographer Jack McKenney and I had tried for weeks to get permission to dive and photograph Devil's Hole, but the restrictions are severe. The site is a national monument, administered by the National Park Service, and NPS representatives explained to us very simply that no one had been allowed to dive in Devil's Hole for years.

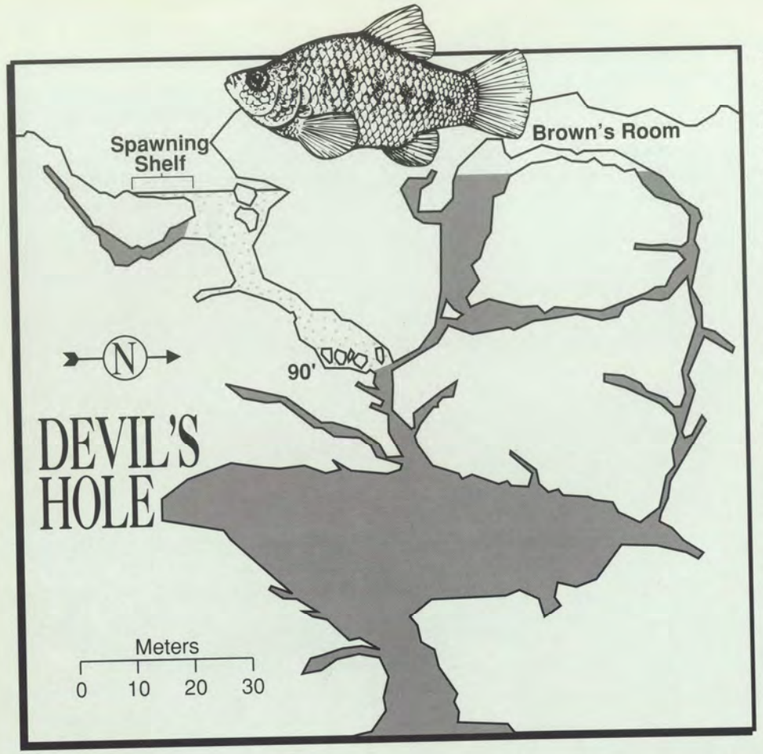
The restrictions were put into place for two reasons: two divers had died in the flooded cave (never recovered), and, the fate of the pupfish rests on their habitat remaining undisturbed.

The Devil's Hole pupfish reminded me a little bit of the snail darter that halted the multi-million dollar construction of a dam in Tennessee. In 1976 the Devil's Hole pupfish stopped the pumping of water from the nearby area of the Amargosa Desert. In this atmospheric frying pan of the world, water is the gold sought by impassioned men with dissimilar interests. Farmers want the water to irrigate the desert, but pumping lowers the water level within Devil's Hole enough to dry out the shallow habitat of the pupfish.

The tug-of-war comes up repeatedly, and at the time we wanted to explore Devil's Hole, another group of developers was talking about pumping water from the underground springs. However, it wasn't going to be an easy fight for the

Author exploring Devil's Hole near the surface of the opening.

Frank Schneehagen's house.



developers. In 1971, one group of entrepreneurs managed to start pumping without restrictions, and after a group of concerned naturalists and the National Park Service saw what was happening, they went to the U.S. Supreme Court in 1976 to stop them. In a landmark decision which for the first time made the connection between surface water and ground water, the fish won. The protection of the approximately 300 Devil's Hole pupfish now left in the world is a matter taken very seriously by their guardians, the National Park Service.

No one is allowed in Devil's Hole. Period.

I had heard about a scientist who studied the pupfish extensively, who had been a star witness in the Supreme Court trial. This scientist, Dr. James Deacon, made a dive every month in Devil's Hole to check on the progress of the fish and to count them. I telephoned Deacon and told him what I wanted to do. He thought about it, then said that, well, he needed a safety diver.

I leaped at this suggestion. I also got permission from the Park Service to make one dive in Devil's Hole as Deacon's safety diver, and I felt very lucky, indeed. After that, no one would get in, I was told by the Park Service, and even Deacon's monthly dives were being cut to two per year.

So, McKenney and I arrived in Death Valley during one of its big heat spells, and Death Valley is, in summer, the hottest place in the world.

The first thing we did was get lost. We couldn't find any of the smaller springs we had heard about, or even Devil's Hole itself. As we bumped along a hot, dusty road in the Amargosa Desert of Nevada, where Devil's Hole is located, we came across a sign that made us stop:

"BEWARE OF WILD DOGS AND BUCKSHOT!"

We drove past the sign into a fenced area and toward a tin shack set in the middle of a large collection of rusted bedsprings, old appliances, benches, kitchen sinks, machinery, and other odds and ends. The only thing missing from this collection of swap meet items was a rusted-out car on its axles—a sight quite common in the desert.

A man emerged from the tin house—without a gun. He didn't seem belligerent, either.

"We're lost," Jack called out. "Could you tell us where Devil's Hole is?"

"Sure!" said the man. "Why don't you come in and sit a bit?"

He led us over to an area of his yard which was fenced in by the circular ends of enormous wood spools, near an arbor of grape vines. He pointed off in the distance. "See that mountain over there?" he asked. "The very last one of the bunch?"

We said that we did.

"See that dark spot, near the base of it?"

We made out the dark spot.

"That's Devil's Hole."

We walked back to his house and he introduced himself to us as Frank Schneehagen. "You know," he said, "There's a hole right here, next door. A big one. Used to be bottomless until one of those atomic bomb blasts caved the thing in."

Jack and I looked at each other.

"It's deep," said Schneehagen. "Sand is boiling up all the time."

"We'd like to see it," I said. "Could we?"

"Sure!" said Schneehagen. He gave us directions on how to get there, through his property, and he told us to leave the gate down so that his horses could get back in.

In ten minutes, Jack and I were looking at Schneehagen's spring. Officially called Big Spring, it is 12 feet deep and the sand is boiling up at the bottom just as he had described it. Contrary to his imaginative tale, the pool hadn't really been caved in by a bomb blast at all, but was instead a perfect example of the geologic phenomenon of the desert sinkhole—where water continues to dissolve the bottom of the pool as it pushes up from an underground water supply. This spring was an important link in the mysterious, unseen network of fresh water which tunnels everywhere underneath Death Valley, under the sand on which we were now standing.

The desert of Death Valley is geology in action, a silent, eternal kiln where panoramic rocks are fired day after day in sun that never quits. It is a harsh, untamed land that bears names like Furnace Creek, Desolate Canyon, Badwater, Dante's View, Hell's Gate, and Ash Meadows—home of Devil's Hole. The land seems fluid still—old and dried geologic rivers still appear to boil, bubble, move, crack and fault. Mountains have spilled their volcanic ooze down bumpy canyons, leaving roller-coaster paths of heated chocolate layered in vanilla-colored pumice and sand. Dark rivers of black ash snake through mounds of caked mustard clay. Sharp, jagged crags, once buried deep in granite, shoot upward in violent explosions and freeze in mid-air. The land is untouched by man because it is so untouchable, and the only evidence of his being there are the occasional giant anthills where he has dug for minerals.

It was hard for me to imagine that at one time the dry, salt-encrusted desert in which we now stood was a fertile, green, fresh-water land of lakes and rivers. And it was even harder to imagine that an enormous amount of fresh, pure water continues to remain hidden underground.

The geologic history of this desert tells us how the water system came to be. In late Precambrian and Early Cambrian time, Death Valley was beneath the sea, The shoreline, it is estimated, lay to the east near modern Las Vegas. By the Middle Cambrian to Permian time, 550 million years ago, the skeletal carcasses of innumerable generations of corals, shellfish and other sea animals had created an enormous mass of lime and sand, and this mass was then consolidated into a limestone and dolomite layer more than two miles thick in some areas, perhaps only tens of feet in others.

In Mesozoic time (225–65 million years ago), a chain of volcanoes arose, one along the present Sierra Nevadas, and the sea withdrew. The limestoned Death Valley region became a highland.

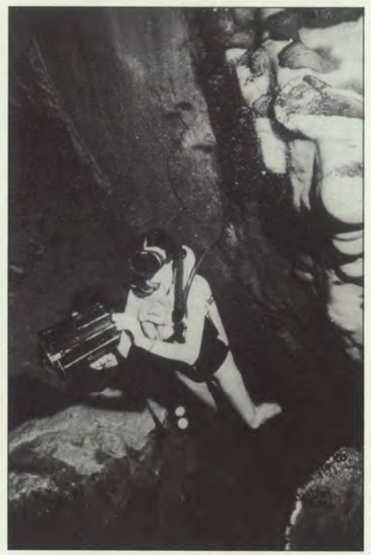
Limestone is porous, and the rainfall from a big area of Nevada northeast of Ash Meadows and Death Valley collected underground and formed a major water table. This water, as it began to run in the direction of Ash Meadows, dissolved the limestone as it went. In some areas where it collected and pooled, it began to eat upward through the limestone until the surface land collapsed downward, creating the sinkhole. Devil's Hole, which extends into the earth from the base of an unnamed mountain was first formed by one of the earthquake or faulting actions of the Mesozoic period, and then it filled with water. The water began to eat away at the limestone fissures, enlarging the caverns and creating new passageways, new tunnels, new chambers.

Using our snorkeling gear to investigate, McKenney and I could see that the bottom of Schneehagen's spring in Ash Meadows was disintegrating before our eyes. During some geologic time down the road, the bottom of that spring would collapse, perhaps opening up into some enormous chamber like that of Devil's Hole.

We tried to find and explore as many open pools as we could in this desert area. Some of them were so shallow we couldn't totally submerge ourselves, yet we could photograph the freshwater life we found. In one shallow pond we stumbled across a species of crayfish which had been introduced into the pond. The crayfish appeared to be doing very well.

We made a dive in Crystal Spring, a sinkhole fed by Devil's Hole over two miles away. When I free-dived to the bottom of the spring, I could feel the enormous force of water coming in from the bottom, almost 4,000 gallons per minute. At the height of the 1971 pumping, it declined to 1,670 gallons per minute—almost half its normal capacity. Crystal Spring is one of the bigger holes in the area. The smaller pools, under such use, would literally dry up, never to return even if the pumping were stopped. Once dry, always dry—because the arteries that carry the water collapse.

Author at 90 ft., looking at Anvil Rock; safety line leading up to Brown's Room can be seen in background.



Author exploring the sides of the Devil's Hole cave.

The main flow of water into Crystal Spring comes in at the deepest part, in 30 feet of water. We also saw it pushing through the bottom in the shallower areas, creating little circles of bubbling sands where the pupfish liked to congregate. It was as if they enjoyed the massage they got from the miniature water jets.

Water

Although there seems to be an infinite amount of it running through this complicated desert network of underground passageways, what happens in one spot directly affects another. The Devil's Hole pupfish was stranded in Devil's Hole 20,000 years ago, when the freshwater system of the desert began to dry up and recede. Because Devil's Hole is one of

the habitats higher up, it was the first to be stranded—the first of the desert pupfishes to begin evolution into its own, distinct species.

The continuing dessication of the desert has placed some species of middle-desert pupfish in danger of similar isolation and reduced survival odds. The Tecopa and Shoshone pupfish are extinct already, and the Warm Springs pupfish are endangered. The lower-desert pupfish, such as those in Crystal Spring, were all right at the time—because at that level, the water is still flowing between the springs and ponds where the fishes live and breed.

All pupfish species tolerate periodic difficult living conditions, usually associated with summer heat. When the sun is hot, their habitats dry up, and some pupfish survive parched summers in homes the size of a teacup. Salinity levels increase, and the desert pupfish is the only fish in the world that can tolerate such concentrations of salt. The fish also withstands freezing temperatures of winter and a host of other difficulties which include aggressive non-native species of fish and crayfish that fight the pupfish for food and territory.

The irony is that the adaptable little fish may not be able to withstand what human beings do to it—and that is why there are constant battles in Ash Meadows over water rights. That is why government officials are keeping such tight rein over human intrusion into Devil's Hole.

We arrived at Devil's Hole at 8 a.m. on the morning of my appointed dive with Jim Deacon. At 8:30, Deacon arrived, along with Pete Sanchez from the National Park Service and a representative from the Bureau of Land Management. The gate was unlocked, and we all labored at getting our diving gear down the ladder to the edge of Devil's Hole.

Deacon laid down a narrow bridge of boards over the shallow shelf of bright green algae where the pupfish live, and then we all geared up. There would be three of us on the dive—Deacon, me, and Park Service safety diver Bob Todd. As I made my way across the narrow boards in my heavy diving gear, I looked down at the tiny fishes, each one of them no bigger than a minnow. They swam leisurely around their shelf, picking at algae, oblivious to the human *sturm und drang* above them.

They were tiny little fishes under enormous lock and key.

I carefully put one foot on the very

Author sinks into the dissolving limestone bottom of Crystal Spring. (Illustrates how the water pushing up from beneath the pond continues to dissolve the floor of Crystal Spring. I quit "sinking" into the limestone sand when it came up to my waist!)

edge of the shelf and lowered myself backward into the clear, blue water. As I waited for the others, I looked down and could see the first ledge below me at about 30 feet. The water was warm—92 degrees—which was like swimming in nothing, and it was so clear that visibility might have been 300 feet It was like soaring in air, the closest thing to flying I'd ever known.

The three of us sank down through that giant, water-filled crack in the earth, a crack so deep that it hasn't been bottomed. The sides of the main shaft were of white limestone laid down 550 million years ago, which had been sculpted over the years by water into smooth slopes on either side. Rusty colored organic material on top of elevated ridges of stone created an ethereal, other-worldly effect.

At 60 feet I turned and looked up toward the surface. The bright blue of shallow water illuminated the main shaft and silhouetted the configurations of the sloping wall on the right side. From where I was, I could see people standing on the rocks above, almost as clearly as if there had been no water between them and me. Just as distinct was the long, rectangular lamp which hung over the water, a lamp which is positioned over the pupfish shelf and turned on when algae production needs a boost.

Turning again toward the bottom, the three of us turned on our lights. We sank to 90 feet, where an enormous flat stone, named Anvil Rock, signaled the deepest part of our dive. This stone, shaken loose from above, also marks the deepest spot where the pupfish wander from their shallow shelf. Deacon started counting at this point, and after I watched him for a while, I began to explore again.

I knew that below Anvil Rock a narrow funnel leads to 160 feet and the deeper chamber. Only a few divers from a Devil's Hole expedition in the mid-sixties had seen this chamber, and to explore it, a diver needs good lights and a safety line system. This was not on our agenda.

I could see the safety line that I knew led upward from Anvil Rock into the underground, air-filled cave called Brown's Room, a huge underground chamber accessible only through a narrow slot that angles off to the left of Anvil Rock. Merl Dobry, a diver who had mapped Devil's Hole in the mid 1960s, had told me about Brown's Room. He had talked about the tight squeeze past the opening, how a diver's tank would barely clear the passageway, but that on the other side of the narrow slot was an enormous, flooded room. Swim up to the surface, he said, and you'll find yourself in an air-filled chamber beneath a mountain, closed off from the outside world.

Divers (left to right: NPS Diver Bob Todd, author Hillary Hauser [in middle] and Dr. Jim Deacon) prepare for dive into Devil's Hole. Algae shelf where Devil's Hole pupfish feed can be seen at far right, underneath oxygen monitoring system. Long white light in the left of the photo is moved during winter months over the algae shelf to stimulate algae production.

About a month after the exploratory dive with Deacon and Todd, McKenney and I came back to Devil's Hole with this specific goal in mind. Proceeding carefully past the pupfish on the surface, we sank down the main shaft of Devil's Hole to Anvil Rock and then made a dash for the permanent safety line trailing through the narrow passageway that leads to Brown's Room. With our lights picking the way through the narrow, dark crack going upward, we followed the line. The back of my tank scraped against the limestone wall over my head and I pulled myself along on my stomach, looking for the opening that would lead us into the cavern.

We came to it, and squeezed through. Now at the bottom of the cave, we focused our lights upward, illuminating the enormous limestone walls of Brown's Room. They rose up from 80 feet of dark water. Conglomerates of granite jutted through the whiteness of the limestone to create an eerie underwater work of art.

We moved quickly up the safety line toward the top of the cave. At the surface, we broke through to air but didn't dare to take our scuba regulators out of our mouths, for we had no idea what the composition of the air was in that underground room. I looked around in amazement. The cavern of Brown's Room is enormous, probably 50 feet from the surface of the water to the ceiling. About 10 feet above me, a dry passageway led off into the dark. The walls of the chamber were rusty brown, the water very still except for our rippling of it.

We switched off our lights and the room became pitch black. We were completely sealed off from the outside world, underneath a mountain. That was enough!

We free-fell along the safety line until we came to the narrow slot leading to the main shaft. As I squeezed through and came out at Anvil Rock, I looked toward the dim blue of the surface 90 feet away. As we swam up, I took in the incredible sight of the sun's rays beaming down from the surface. I thought to myself right then that the Devil's Hole pupfish are living in a palace fit for the king of fishes.

Hillary Hauser, FN'89, *is a journalist, author, photographer, and scuba diver who has authored numerous magazine features and several books. Her* Call To Adventure *(Bookmakers Guild, 1987) includes stories of modern exploration undertaken by many members of the Explorers Club.*