CUATRO CIÉNEGAS

Mexico's Desert Aquarium

Smack in the middle of the blazing Chihuahuan Desert, a snorkeler scans the bottom of a spring-fed pool for aquatic life. Known as Cuatro Ciénegas, or "four marshes," this unique region of sparkling waters was recently set aside by the Mexican government as a biological reserve.

Article and photographs by GEORGE GRALL
Long-stemmed water lilies reach for the hot Mexican sun while schools of pistolfish feed in their shade. Because this water comes from deep underground, no sunlight reaches the bottom, which limits only the depth of marine life.
A Desert Realm of Fish

A small valley in the Chihuahuan Desert, Cuatro Ciélegas harbors within its 500 or so square miles one of the world's rare inland-desert wetlands.

Underground water — some warm, some cool, most of it highly mineralized — flows to the surface through a little-understood system of subterranean channels, probably from deep aquifers. While human beings have been exploiting this water for centuries, only recently have biologists discovered that an amazing number of other species have been exploiting it as well.

When I first came here in 1978 to photograph box turtles, the count was not in. Now more than 60 species found only here have been identified, ranging from cacti to snails, scorpions, fish, and reptiles. What's more, hundreds of nonendemic species make the valley a biological garden.

Where there is water, so are there fish — in the lagunas (lakes), in the pozas (pools), and in the many canals, such as those tapping the blue waters of Pozas Azules (bottom right). Countless pozas are natural aquariums, with only a few hundred gallons of water. Even the larger lagunas are seldom more than 260 feet wide or 25 feet deep. In Pozo de la Becerra — "pond of the young calf" — tetras swirl about diver Jesus Lopez.
Salt and Water of the Earth

A chilly Río Mesquites zigzags through a marsh of salt grass, sedges, and bunchgrasses east of the Sierra de San Marcos y Pinos (above right). In the foreground lies one of the valley’s many salt pans, or salinas, formed when runoff collects in depressions then evaporates. The region’s salt marshes are alive with snakes, turtles, and fish. In the surrounding desert scrub, and in mountain chaparral, graze wild horses and burros, introduced from Europe by the conquistadores.

Local naturalist José “Pepe” Lugo examines a bone-dry travertine limestone channel (above left), one of many mysteriously dried-up waterways. “Some of the pozas have also dried up,” he says. A resident of the region for 75 years, Lugo had a number of species named after him by biologists grateful for his knowledge and assistance. He worries of the valley’s water and the aquifers for irrigating the fields, though scarcer now than ever.

When I talked to Minckley of Arizona State University, acting dean of the University of Arizone's College of Natural Science, he agreed that the valley's aquatic life is threatened, not just by water users but by increasing recreation and development. The valley is a desert oasis, a refuge for life in a place where it should be impossible to live.
knowledge and tireless assistance. He worries that use of the valley’s surface water and the pumping of aquifers for irrigation may be causing the water table to fall, though scientists have not confirmed this.

When I talked with W. L. Minckley of Arizona State University, acknowledged dean of Cuatro Ciénegas biology, he agreed that the valley’s aquatic habitats are threatened, not just by local water users but also by increasing recreational use.

“Both national and international efforts are needed to preserve this spectacular wetland for posterity,” he warns.

The Cuatro Ciénegas region has been inhabited for some 10,000 years; the first canals were probably dug by Spanish settlers in the 1600s. Most of the valley’s water is too laden with minerals for human consumption, and farmers using it for irrigation usually have to mix it with fresh water.
Adapted to Life in a Poza

Like a desert-bound Galápagos, Cuatro Ciénegas has enjoyed the relative isolation and geologic stability necessary to foster a remarkable variety of endemic species. Of the 16 fish species in the small valley, eight are endemic only here.

Two varieties of the cichlid *Cichlasoma minckleyi* are sustained by one of the most diverse populations of endemic aquatic snails in North America. Clustering around springheads (above right) and hiding in sediment created by their own feces, most of the snails are about an eighth of an inch across. To uncover them, one variety of this three-inch-long cichlid (left) cruises along the bottom, fanning the sediment. Swallowing snails whole, it is able, with a set of powerful teeth halfway down its muscular throat, to crush their shells and consume their flesh. I was often amazed to hear, from halfway across a poza, the underwater grinding sounds of cichlids feasting.

A second variety of this cichlid species, with smaller throat teeth, lives off what appears to be sand along the bottom of pozas and lagunas. But it is actually the rich detritus of snail feces and bacteria that grow in them. With mouth agape, the cichlid (far left) targets a spot on the lake bed, then plunges tail-deep into the sediment (center). After feeding, the fish ejects with a puff the matter it cannot digest.

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Survivors at
Aquatic Tur

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Mexico's Desert
Survivors and Their Aquatic Turfs

Unique in its ways, the Coahuilan box turtle—like this pair in Laguna de los Burros—spends much of its time underwater. While other box turtles evolved as land creatures, the Coahuilan remained aquatic, or may have returned to the water from land as local desertification occurred. Omnivorous, it feeds on plants and small fish—anything it can catch. A spring pool embraces two worlds: one above and one below the waterline. Surrounded by cattails, most pools are alive at the surface with Mexican ducks and migratory waterfowl. Underwater their character is dictated largely by water temperature. Fed by a cool spring, Laguna del Hundido is often green with stonewort algae, which in turn swarms with endemic shrimp. An inch-long female grass shrimp (above left) carries eggs in her abdominal pouch, through which developing embryos are visible.

Pugnacious and posturing, a male Coahuilan pupfish bites a rival’s anal fin (left). During breeding season males will not tolerate one another’s presence. Hardy survivors, little more than an inch long, Coahuilan pupfish can withstand especially high temperatures and salinity. During rare spells of rain, or when variation in a spring’s outflow causes local flooding, they swim into the temporary waters, only to be stranded in hot, saline cracks and pools. Awaiting rescue, a few live to fight another day.
Spawned by water and wind over the ages, the valley’s gypsum dune fields are the only ones in Mexico. Formed downwind of saline lakes, the dunes—like these near Laguna Churiñas—are a dwindling habitat for many desert species. Intensive mining for use in wallboard and fertilizer had substantially reduced the dunes by November 1994, when Cuatro Ciénegas was decreed a natural refuge. Conservationists hope that further encroachment will be regulated and that Mexico will be able to protect one of North America’s rarest environments.