

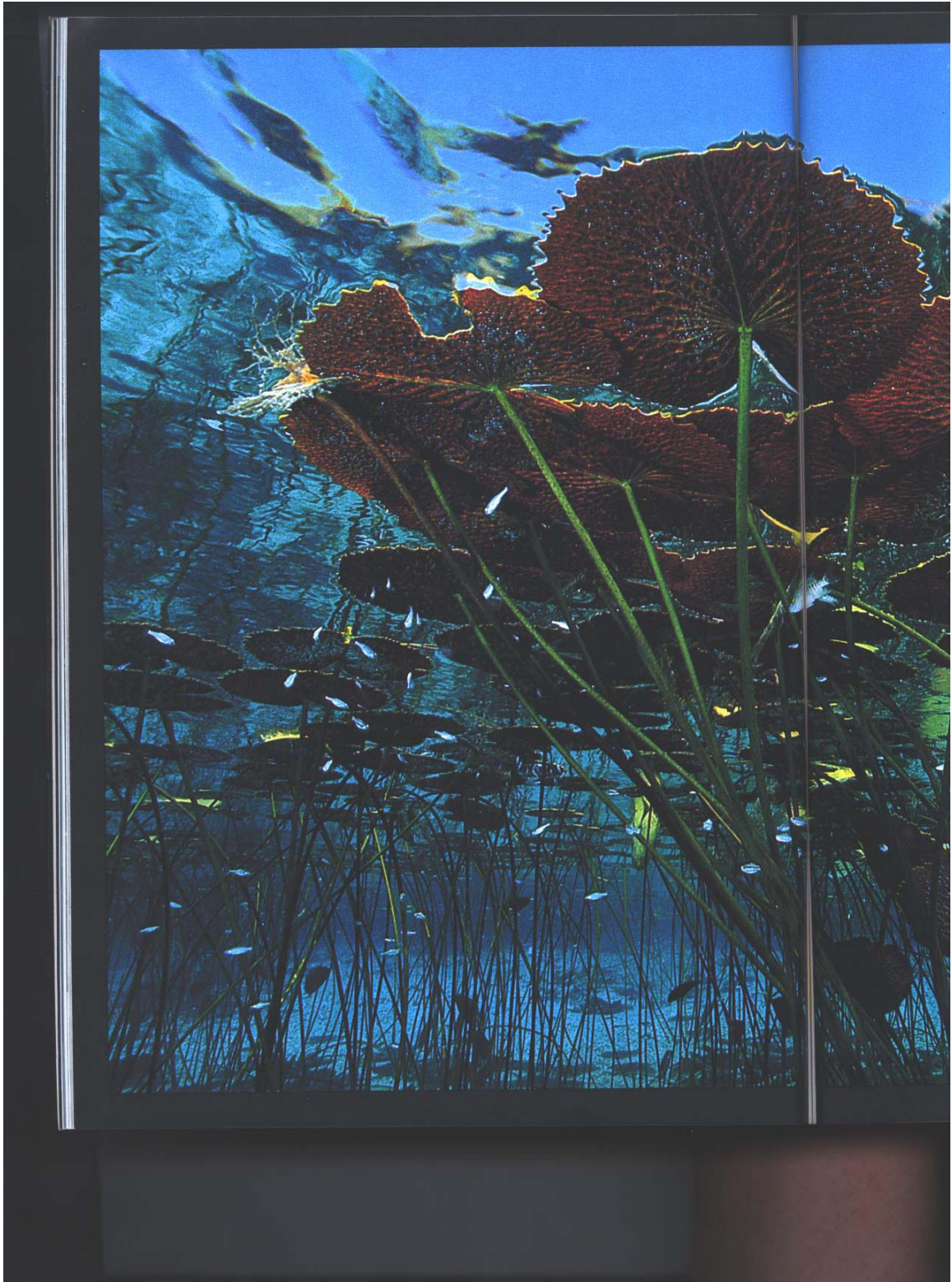
**CUATRO
CIÉNEGAS**

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 pupfish, tetras, and cichlids feed in their shade. Because the water comes from deep underground, no sediments mar visibility, which is limited only by distance and light.

WATER LILIES, *NYMPHAEA AMPLE*



A Desert Realm of Fish

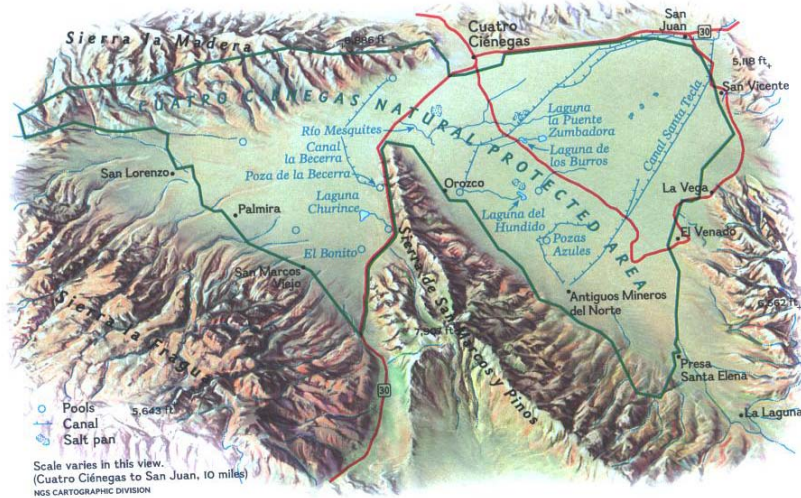
■ A small valley in the Chihuahuan Desert, Cuatro Ciénegas harbors within its 500 or so square miles one of the world's rare inland-desert wetlands.

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

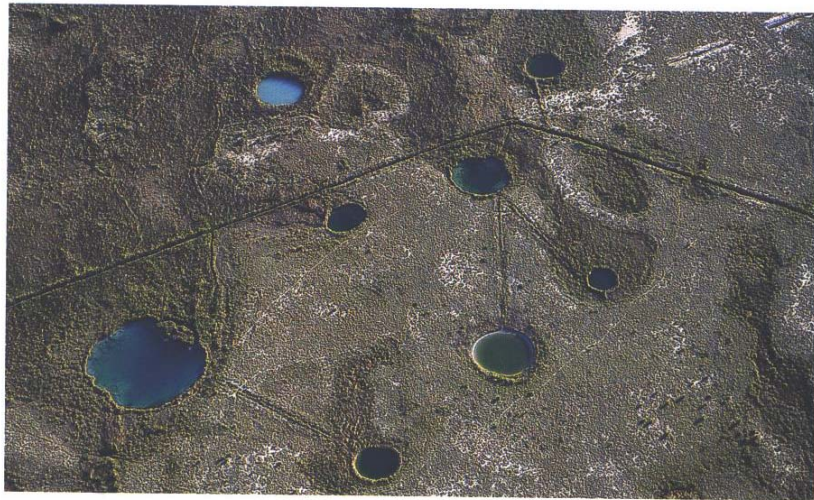
1978 to photograph box turtles, the count was not in. Now more than 60 species found only here have been identified, ranging from cactuses to snails, scorpions, fish, and reptiles. What's more, hundreds of non-endemic species make the valley a biological garden.

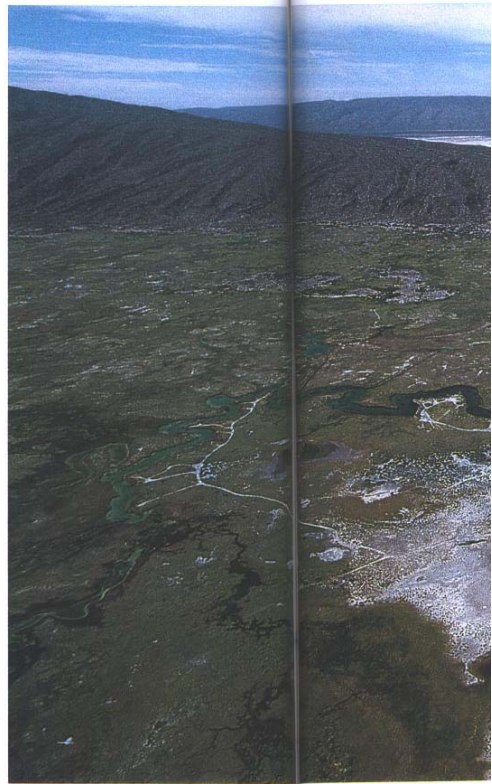
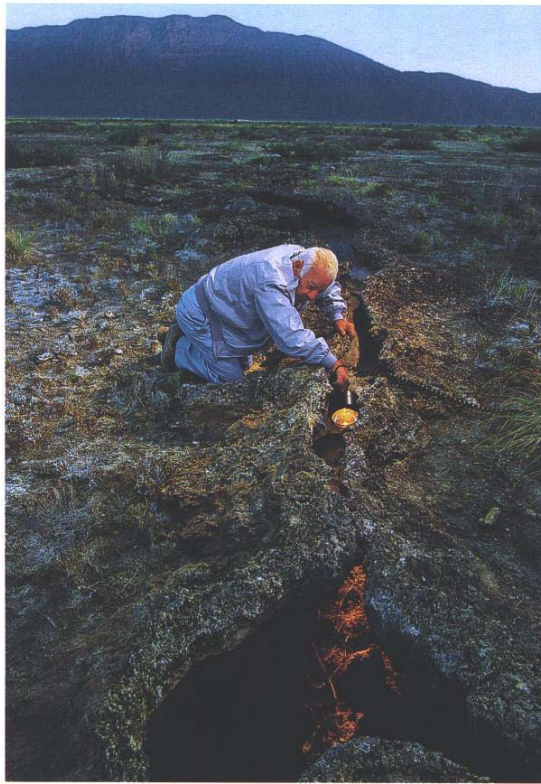
Where there is water, so are there fish — in the *lagunas* (lakes), in the *pozos* (pools), and in the many canals, such as those tapping the blue waters of Pozas Azules (bottom right). Countless pozos are natural aquariums, with only a few hundred gallons of water. Even the larger lagunas are seldom more than 250 feet wide or 25 feet deep. In Poza de la Becerra — “pond of the young calf” — tetras swirl about diver Jesus Lopez.





5,100 ft,
San Vicente
La Laguna





Salt and Water of the Earth

■ A chilly Río Mesquites zig-zags through a marsh of salt grass, sedges, and bunchgrass 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 technical assistance. He was instrumental in the use of the valley's water and the pumping of aquifers for irrigation, causing the water table to fall, though scientists have not confirmed this.

When I talked with Minckley of Arizona State University, acknowledged dean of Cuatro Ciénegas biology, he agreed that the valley's aquatic life is threatened, not just by water users but by increasing recreational



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water users but also by
increasing recreational use.

Mexico's Desert Aquarium

"Both national and interna-
tional 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 found 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



MEXIPYRGUS SPP.

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.

George Grall is the staff photographer for the National Aquarium in Baltimore, Maryland. His work on seahorses appeared in the October 1994 GEOGRAPHIC.



aphic, October 1995



Mexico's Desert Aquarium



PALAEEMONETES SUTTRUSI (ABOVE); CYPRINODON ATRORUS (BELOW)



Survivors and Aquatic Turtles

■ Unique in its Coahuilan box turtle pair in Lago Burros—spends time underwater box turtles evolved creatures, the Coahuilan remained aquatic returned to the land as local desert occurred. Omnivorous feeds on plants fish—anything A spring pool

Mexico's Desert



TERRAPENE COAHUILA



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.

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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 Churince – 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. □

