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CALIFORNIA TURTLE & TORTOISE CLUB

The Tortuga Gazette

Volume 61, Number 2 • March/April 2025

A Parrot-beaked Tortoise (*Homopus areolatus*) photographed in habitat in South Africa. Photo © 2023 by Marienne de Villiers

featured species

Chersobius and *Homopus* species

Southern Africa's Dwarf Tortoises – an Overview by M. A. Cohen

Five of the most diminutive tortoises known to science are endemic to the Cape of Africa, specifically to the nations of South Africa and Namibia.

In the local Afrikaans language, the term for this group of tortoises is padloper which translates as "path walker," referring to the minute pathways that the tiny tortoises forge as they travel through their grassland habitats. Among the padlopers is the smallest tortoise in the world, *Chersobius signatus*, commonly called the Speckled Tortoise.

Previously, taxonomists classified all five dwarf tortoise species as members of the *Homopus* genus within the Testudinidae chelonian family. In 2018 chelonian researchers Margaretha Hofmeyr and William Branch published a paper in the *African*

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Journal of Herpetology that made the case that some *Homopus* species to be reassigned to the *Chersobius* genus based on morphological* evidence and ecological differences. Morphological differences include the number of clawed toes on their forefeet and variations in the number of carapacial scutes, among others. The scientific community has largely accepted the authors' assertions as valid.

Differences in the ecological preferences of the two genera include the following: *Chersobius* species tend to inhabit rocky, arid outcroppings, while the *Homopus* species inhabit more mesic environments, those with a moderate amount of moisture.

The **Karoo** of South Africa is a semi-desert region in the Eastern Cape, Western Cape, and Northern Cape provinces comprising one-third of the country's total land area. From the indigenous Khoisan language, karoo translates as "land of thirst." The karoo features aridity, temperature extremes, and low annual rainfall with mostly low-growing succulent and subshrub vegetation.

The following sections provide an introduction to each of the three species in the *Chersobius* genus and the two species in the *Homopus* genus.

The genus *Chersobius*
Five-toed Dwarf Tortoises

Chersobius boulengeri, Karoo Dwarf Tortoise

Also known as Boulenger's Cape Tortoise, the Karoo padloper is an endangered species endemic to the Succulent and Nama Karoo biomes in the Eastern Cape, Northern Cape, and Western Cape of South Africa, and it is one of the four species of dwarf tortoises endemic to the karoo region.

A wild Karoo padloper photographed in 2022 in the Western Cape of South Africa. Photo by Marius Burger. Public domain.

The carapace of the karoo padloper may be uniformly tan, reddish-brown, or olive-brown. Its comparatively large plastron may be solid yellow, tan, or olive, or its scutes may be marked with dark patches or borders.

The diet of the karoo padloper consists of native grasses and small herbaceous plants. Despite its small size, many biologists consider *C. boulengeri* an ecosystem engineer because it consumes five species of the native *Hermannia*, commonly known as doll's roses, and disperses the *Hermannia* seeds during its travels throughout its range. Doll's roses are subshrubs in the tortoises' ecosystem (Loehr et al., 2023).

Female *C. boulengeri* have a unique nesting pattern, laying a single-egg clutch twice a year in spring and fall.

Invasive, non-native grasses overtaking the Karoo Plain threaten the species. These intruder plant species promote wildfires and out-compete the native shrubs and grasses that provide nutritious forage for dwarf tortoises.

* **Morphology:** the branch of biology concerned with the form and structure of organisms.

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Because it is associated with specific ecosystems and vegetation types, *C. boulengeri* is a habitat specialist with low reproductive rates and population densities, putting the species at considerable risk. Several other threats that contribute to the endangered status of the species include crow and raven predation, climate change, livestock grazing, road construction, and shale gas exploration.

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Chersobius signatus, Speckled Dwarf tortoise

The speckled Cape tortoise, also known as the speckled dwarf tortoise and the speckled padloper, is another endangered member of the genus *Chersobius*. It is the smallest tortoise in the world, reaching a maximum carapace length of only 3.7 in. (9.6 cm).

The species is native to the Western Cape and the Northern Cape of South Africa where it inhabits rocky terrain in the Succulent Karoo and Fynbos biomes within its range.

The speckled tortoise shelters in rock crevices offering protection from extreme temperatures and predation. It often basks near its rock shelter in winter and spring, the seasons when forage is most plentiful, to thermoregulate and digest efficiently.

Each scute on the carapace of the speckled padloper is marked numerous small, dark patches or radiations on a cream-colored or yellowish background. Its plastron is cream or yellow with faded darker blotches on each scute. Its head and limbs are tan to yellow with darker markings.

A wild speckled tortoise photographed in South Africa.
Photo © 2012 by Gawie Malan

Speckled dwarf tortoise females typically lay 2 to 3 single-egg clutches each nesting season, which occurs in spring. The egg is comparatively large and the female's carapace may actually increase in size to accommodate the egg, shrinking once nesting occurs.

Threats to *C. signatus* populations include habitat degradation, destruction, and fragmentation due to agricultural development in its range. Climate change models predict that the Succulent Karoo will experience increases in temperature and decreases in rainfall, and the increased aridity will have a negative impact on survival of the species.

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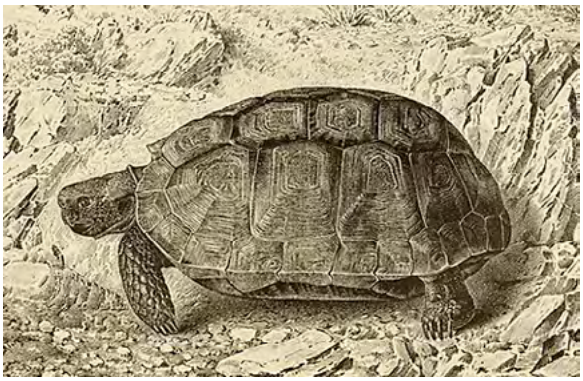
Chersobius solus, Nama Dwarf Tortoise

Endemic to southern Namibia, just northwest of South Africa, the Nama dwarf tortoise is also commonly called the Nama padloper and Berger's cape tortoise.

Researchers discovered the first living population of the species in 1955. A subsequent study of individuals in this population revealed that it is a dwarf tortoise with the characteristic five clawed toes on its forelimbs.



Rendering illustration from the book *Sitzungsberichte* published in 1910. Public domain.

The carapace of *C. solus* is slightly domed and brown with darker scute borders. Its head and limbs are shades of brown. The Nama dwarf tortoise grows to a maximum carapace length of 5.9 in. (15 cm), and males are typically smaller than females.

Females usually lay a single egg, occasionally two, when nesting in winter or spring. The egg is laid under shrubbery or in rock crevices.

The species is not well-studied. Its habitat is the arid, rocky, sparsely vegetated Namib desert and the grasslands of the Aus region. In habitat, it feeds on the local vegetation, including succulents and herbaceous subshrubs.

W. R. Branch published a paper in 2007 in the *African Journal of Herpetology* detailing the morphology of the "new" Namibian species. He assessed *C. solus* for the Red List of the International Union for the

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Conservation of Nature (IUCN), determining that it has Vulnerable status, restricted distribution, fragmented populations, and declining habitat quality.

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The genus *Homopus* Four-toed Dwarf Tortoises

A parrot-beaked dwarf tortoise photographed in South Africa. **Photo © 2024 by Marienne de Villiers**

Homopus areolatus, Parrot-beaked Tortoise

Homopus areolatus has several common names besides the parrot-beaked tortoise, including the parrot-beaked dwarf tortoise, the common padloper, and the areolated tortoise. The adjective 'parrot-beaked' refers to its distinctive, hooked, tricuspid (i.e., three-pointed) upper jaw.

The species is endemic to the Western Cape and the Eastern Cape of South Africa. A relict population is known from some areas in the Northern Cape. *H. areolatus* occurs in arid scrub ecosystems with dense shrubbery under which it shelters from the hot sun. It is the only dwarf tortoise species that does not live in a rocky habitat.

Biologists call the parrot-beaked tortoise a medium-sized dwarf tortoise, reaching a carapace length of 4.7 in. (12 cm). Each ventral (back) and pleural (side) scute on the carapace of the male has a large, brown areole surrounded by annuli (growth rings) that may be yellow, brown or black. The head and limbs of the species are yellowish- to reddish-brown.

The male of the species is smaller than the female, and the plastrons of both are flat. The snout of the male becomes orange-red for a few weeks during the spring breeding season. The carapace of the female is more uniformly colored (gray, olive, or brown) than that of the male. The female nests once a season, from April to November, and lays a clutch of one to four eggs.

The IUCN classifies *H. areolatus* as a species of Least Concern, primarily because healthy populations exist in several protected areas, national parks and nature preserves, within its range. Habitat destruction is impacting the species' unprotected natural habitats, and some populations in these areas are already in decline. Additional threats include predation by pied crows and mammals, and wildfires that are often fueled by invasive, non-native grasses.

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Homopus femoralis, Greater Dwarf Tortoise

Also known as the greater padloper, *Homopus femoralis* is endemic to higher elevations in the Eastern Cape and the Northern Cape of South Africa. The species prefers the savannahs and grassland velds (Afrikaans for "fields") within its mountainous range, and only sometimes occupies rocky areas.

A greater dwarf tortoise photographed in South Africa. **Photo © 2022 by Berkeley Lumb**

With its 6.6 in. (16.8 cm) maximum carapace length, the greater padloper is the largest of the five dwarf tortoise species. Its brown or olive carapace has scutes with darker borders when the individual is young, and the dark borders fade as the tortoise ages. Its head and limbs are yellow to tan. The male and female both have flat, yellow or olive plastrons.

The female *H. femoralis* is typically larger than the male. She lays a single clutch of one to four eggs once during the spring nesting season. Researchers observe that *H. femoralis* has a comparatively low activity level and is most active during the rainy summer season occurring from October to March. The species appears to brumate during the winter season, June to August, often sheltering in the protection of a rocky crevice.

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The greater padloper is currently listed by the IUCN as a species of Least Concern because it is common in some areas and is generally widespread within its range. As with many other species, habitat destruction due to residential and agricultural development poses a threat to tortoise populations in unprotected areas, and vehicles cause the deaths of tortoises crossing roadways.

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All species of dwarf tortoises are listed in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora, a global trade agreement protecting animals and plants from the threat of commercial exploitation. Ω

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Southern California's Wildfires: Impacts on Your Pet Turtles and Tortoises by Karen Berry

California Turtle & Tortoise Club (CTTC) has members who live in or near areas affected by the destructive Altadena and Palisades wildfires that began on 7 January.

Just as the smoke, ash, and particulates from the fires have had adverse impacts on people living nearby, exposure to the chemicals spread by the smoke and wind are equally serious for the local wildlife and for people's pets.

CTTC suggests that anybody anywhere near the fire areas who had smoke, ash, or other particulates in the air should have their tortoises/turtles examined by a veterinarian. Even water turtles in ponds that dove to the bottom and stayed there have to deal with the contaminants dissolved in the water as well as those in the air.

These animals are all very sensitive to smoke, chemical odors, and toxins from burning plastic. They are susceptible to smoke inhalation just as we are, and that can cause lung infections and other respiratory issues. They often don't show symptoms right away, and many people would not know what to look for.

Do ***NOT*** allow your tortoises to eat the edible plants in your yard if you live in or near a fire area. Plants will absorb fire-related toxins from the air and soil while producing the oxygen we breathe.

The Valley chapter has anecdotal information from a member in the West Valley about the immediate effect on her desert tortoise and a resulting recurring health issue.

Please consider a visit to your veterinarian if your pets were exposed to smoke, ash, or particulates from the fires. Ω

Turtle Survival Alliance Announces Historic Repatriation of 912 Critically Endangered Tortoises Seized in Thailand—Turtle Survival Alliance press release

- Turtle Survival Alliance, in collaboration with Malagasy and Thai authorities, successfully repatriated 912 critically endangered tortoises to Madagascar, marking a pivotal victory against global wildlife trafficking.
- This operation dismantled a transnational trafficking network, uniting Malagasy and Thai authorities, conservation organizations, and international partners in a shared effort to combat biodiversity loss.
- Turtle Survival Alliance will carry out the rehabilitation of the tortoises with the goal of rewilding them to their natural habitat. This process will be guided by Turtle Survival Alliance's science-based reintroduction practices to ensure the tortoises' survival and successful integration into protected ecosystems.

Antananarivo, Madagascar—December 13, 2024—Turtle Survival Alliance is proud to announce the successful repatriation of 912 endangered tortoises to Madagascar, following their seizure in a landmark international wildlife trafficking case. Among the returned tortoises are 757 Spider Tortoises (*Pyxis arachnoides*) and 155 Radiated Tortoises (*Astrochelys radiata*), both listed under CITES Appendix I and classified as Critically Endangered on the IUCN Red List. This operation, a collaborative effort between Malagasy and Thai authorities with the support of international organizations, is a pivotal achievement, underscoring the urgent need to combat wildlife crime and restore Madagascar's unique natural heritage.

Marc Dupuis-Desormeaux, President & CEO of Turtle Survival Alliance, emphasized the significance of the operation, stating, "The return of these tortoises to Madagascar represents a powerful victory in the global fight against wildlife trafficking. It demonstrates what is possible when nations and organizations come together with a shared commitment to safeguarding the natural heritage of our planet. Turtle Survival Alliance is honored to play a role in ensuring these animals are not only rescued from the black market trade but also given the opportunity to return to their native habitat."

A wild spider tortoise, *Pyxis arachnoides*, photographed in Madagascar. **Photo © 2023 by Fabrice Prugnaud**

The 912 repatriated tortoises were part of a record-breaking seizure of 1,117 turtles and 48 lemurs in Chumphon, Thailand, in May of this year, in what has been called the "Game Over" case. The operation led to the dismantling of a transnational trafficking network, with six arrests in Thailand and nine in Madagascar, and highlighted the role of corruption and organized crime in the exploitation of Madagascar's biodiversity. This landmark case reflects the Malagasy government's zero-tolerance policy on wildlife trafficking and its commitment to recovering its nation's natural wealth seized abroad.

"The return of these animals to their native habitats is a significant step in ensuring the survival of these critically endangered tortoises," said Andrew Walde, Senior Director of Conservation and Science, Turtle Survival Alliance. "It is a reminder of the immense challenges we face in combating wildlife trafficking, but also of the power of partnerships and science-based conservation to make a tangible difference."

Following their arrival in Madagascar, the tortoises have been placed under the Turtle Survival Alliance's care in a specialized quarantine facility, built specifically to address the uniqueness of this confiscation, in the capital city of Antananarivo, where they will undergo comprehensive health assessments. By the end of 2024, all Radiated Tortoises will be transferred to the Berenty Private Reserve in the Anosy Region, a protected habitat that already hosts tortoises from a similar confiscation and return case from Comoros in September of this year. The Spider Tortoises will be relocated to the Eden Botanical Garden, a private reserve in the Atsimo-Andrefana Region, where plans are

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underway for their eventual release back into the wild. Turtle Survival Alliance will continue to support these facilities to ensure the survival and integration of these species in their native ecosystems.

Hery Razafimamonjiraibe, Country Director, Turtle Survival Alliance Madagascar, added, "These animals' journey from victims of illegal trade from our country to ambassadors for conservation highlights the importance of protecting species at every stage—from enforcement to rehabilitation to rewilding. As we prepare these tortoises for their next chapter, we remain focused on creating sustainable solutions for species recovery and combating the root causes of wildlife trafficking."

The Radiated Tortoise, once one of the world's most abundant tortoise species, and the Spider Tortoise, have faced rapid population declines due to poaching for the pet, food, and bushmeat trades, habitat destruction, and the erosion of cultural taboos that traditionally protected them, with estimated population declines greater than 75%. With more than 50% of the world's turtle and tortoise species threatened with extinction, the return of these individuals to their native habitat marks a critical step in the fight against biodiversity loss.

A radiated tortoise, *Astrochelys radiata*, photographed in habitat in Madagascar. **Photo © 2023 by Atilla Steiner**

The success of this operation underscores the importance of international collaboration in addressing the complex nature of wildlife crime. From dismantling trafficking networks to ensuring the safe return and rehabilitation of seized wildlife, this effort involved a coalition of governments, law enforcement agencies, and conservation organizations, including INTERPOL, UNODC, and CITES. Turtle Survival Alliance commends the Malagasy and Thai authorities for their leadership in this case, as well as the support provided by United for Wildlife, *La Fondation pour les Aires Protégées et la Biodiversité de Madagascar*, and the airline carriers Qatar Airways and Airlink for facilitating the safe transport of these animals.

This historic repatriation highlights Madagascar's determination to safeguard its exceptional biodiversity, which represents 5% of the planet's species and includes some of the world's most iconic, endemic, and imperiled wildlife. Turtle Survival Alliance is dedicated to its mission of protecting turtles and tortoises from extinction in Madagascar and 16 other countries. This is achieved through a comprehensive approach that includes species- and country-specific conservation initiatives, along with numerous management practices aimed at improving the long-term survival of these ancient animals. Ω

New Meeting Location for the CTTC Kern County Chapter

The Kern County Chapter of CTTC, which is based in Bakersfield, CA has a new meeting place. Kern County is now meeting here:

Bakersfield College SouthWest
9400 Camino Media
Bakersfield, CA 93311
Room #214.

Meetings continue to take place on **the second Monday of the month at 6:30** PM. You do not need to be a member of the Kern County Chapter to attend or participate in meetings.

A seven-day-old Radiated Tortoise photographed at the Vakona forest lodge, Andasibe, Madagascar. **Photo © 2014 by Philstone**

Virginia Petition Seeks to Protect Diamondback Terrapins From Drowning in Crab Traps—Center for Biological Diversity press release

Ft. Monroe, Virginia—12 February 2025—Conservation groups today filed a petition asking the Virginia Marine Resources Commission to adopt regulations that would protect diamondback terrapins (*Malaclemys terrapin*) from drowning in blue crab pots.

Diamondback terrapin. Photo by George L. Heinrich. Used with permission.

Diamondback terrapins, found along the Atlantic and Gulf coasts from Massachusetts to Texas, are the only turtles in the world that live exclusively in coastal estuaries. These estuaries are also home to blue crabs, which are trapped in crab pots. Crab pots trap and drown imperiled diamondback terrapins, who have suffered population declines of 75% across most of their range in the past 50 years.

"Diamondback terrapins are drowning in blue crab pots every day, even though there's a simple, low cost way to prevent this ongoing tragedy, so we need action," said Tara Zuardo, a senior wildlife advocate at the Center for Biological Diversity. "It's time for Virginia to follow other states and take basic steps to require that crab traps don't kill even more of these imperiled turtles."

Today's petition, filed by the Center for Biological Diversity, Virginia Herpetological Society, Wild Virginia and biologist Willem M. Roosenburg, Ph.D., asked the state to require bycatch reduction devices on all licensed recreational and commercial blue crab pots in near-shore waters where terrapins are frequently found. When installed on crab pot entrance funnels, these small and inexpensive devices prevent most terrapins from entering the pot, while having little to no effect on crab haul.

Experts agree that blue crab pots pose the greatest threat to diamondback terrapins, with 60,000 to 80,000 killed in active and abandoned crab traps each year. Baited blue crab pots are known to trap and drown terrapins, while fleets of traps are capable of steadily killing turtles until a population cannot sustain itself. Abandoned or lost traps — called ghost pots — can capture terrapins by the dozen.

New York and New Jersey already require bycatch reduction devices on recreational and commercial pots. Delaware, Florida, and Maryland require the devices on recreational pots.

Under state law, the commission must respond to the petition in the Virginia Register of Regulations within 14 days.

In September 2024 the Center for Biological Diversity and 20 partner organizations petitioned NOAA Fisheries to protect diamondback terrapins as endangered under the Endangered Species Act.

Background

Diamondback terrapins are known for their stunning diamond-patterned shells and speckled skin. Spending most of their lives in nearshore habitat, they live in coastal marshes, tidal creeks, mangroves, and other estuarine habitats, where they primarily feed on snails, clams, mussels and small crabs. Terrapins are potentially a keystone species in salt marshes and mangroves, helping to maintain the health of those ecosystems. Ω

"What you do makes a difference, and you have to decide what kind of difference you want to make."

—Dr. Jane Goodall (b. 1934), English primatologist

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A CRITICALLY ENDANGERED TORTOISE ENJOYS ZOO MED GRASSLAND TORTOISE FOOD

The Radiated Tortoise *(Astrochelys radiata)* is the 6th rarest tortoise in the world, and the heroes at Turtle Survival Alliance (TSA) are fighting for its future. As a non-profit, the TSA relies on support from the community. Zoo Med has pledged to donate pallets of their Natural Grassland Tortoise Food to TSA's Madagascar location 3 times a year. This food prevents shell and spinal growth deformities by matching the nutrient profile and high fiber content of a wild tortoise diet.

Join Zoo Med in supporting the TSA's conservation efforts; visit their website to learn more and how to contribute: turtlesurvival.org

TSA
turtle survival alliance

Saguaro Struggles: A Desert Icon Feels the Heat

Climate change, drought, and fires — all caused or worsened by human activity — are rewriting the future of ancient Sonoran saguaros

By Karen Mockler as published in *The Revelator*

Ask a roomful of kids to draw a desert and odds are good that most of their drawings will include a saguaro cactus, waving two friendly (albeit prickly) arms.

Despite the endearing ubiquity of that image, it's not a sight you'll actually see in most of the planet's 71 deserts. In fact, the only home to the tree-like saguaro (*Carnegiea gigantea*) is the Sonoran Desert, which stretches across southeast California, the southern half of Arizona, and the northwest states of Mexico.

"Saguaros are such an icon of this area, of the Southwest in general," says Beth Hudick, interpretation, education, and outreach manager at Saguaro National Park in southern Arizona. "If you close your eyes and picture a cactus, it's a saguaro."

The Sonoran Desert is no stranger to heat, but as climate change makes heatwaves more frequent, intense, and long-lasting, the resilience of this desert's most beloved plant is being tested.

Tucson is the cactus's stronghold, bookended by Saguaro National Park on both its east and west edges, but a 2018 study by the National Park Service rated the park as one of those put at greatest risk by climate change. The city, meanwhile, smashed heat records this past summer, including the longest number of consecutive days in the triple digits.

Even plants native to this desert feel the heat: In the past few years many saguaros have lost arms, toppled over, or burned.

Although it's unlikely these iconic cacti are headed for extinction anytime soon, they're in decline. And these newly harsh conditions have people wondering what the species' survival will look like.

From Baby Boom to Bust

Let's start with the good news: Saguaros are not endangered. Not in the short term, at least. They can live 200 years, and they had a baby boom in the 1980s, according to Hudick, so the current population of saguaros in the park is "quite healthy."

Saguaros' most famous characteristics help protect them. Pleats in their trunk and arms allow them to grow pleasantly plump after heavy rains. Columns of spines shade them and shield them.

But it takes time to build up those defenses.

Hence, the bad news: Establishment of new saguaros has nearly ceased. A study published by the National Park Service in 2018 found that since the early 1990s, the number of young saguaros in this and two other parks in the region has been disturbingly low — mainly due to a decline in precipitation coupled with higher temperatures.

The Sonoran Desert has two rainy seasons — in the winter, when the gentle rains come, and in the late summer when the dramatic monsoons arrive. Arizona has been in a long-term drought since 1994, so it's seen less of both.

Without sufficient moisture a seed might still germinate, but not be able to establish itself.

The young saguaros that do pop up face a tough beginning. Seedlings grow very slowly at first — only an inch or so annually during their first handful of years. It may be 70 years before they sprout arms and 150 before they reach their full height of 40-50 feet, with some rising higher.

"They're so vulnerable when they're little," Hudick says, "because they can't absorb a lot of water. That's why it takes them so many years to get to the size that you can actually see and notice. [Park] visitors will not notice saguaros that are less than ten years old."

People still look for them, though. The Park Service and hundreds of citizen scientists and saguaro enthusiasts conduct a census every decade to monitor the health of the plants over time.

The results of the most recent survey, published in that 2018 study, showcased just how few new saguaros are surviving. Of the nearly 10,000 saguaros surveyed, teams located just 70 young plants under 4 inches tall or less than 11–15 years old.

"It's not a die-off," Hudick reiterates. "It's a reduction in recruitment. That is the concerning thing."

Invasives and Fire

A drought-stressed landscape is

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also more susceptible to invasive species. The archenemy of the Sonoran Desert is buffelgrass (*Cenchrus ciliaris*), which covers the ground and crowds out places where saguaro seedlings and other native plants would start life.

Buffelgrass also introduces another threat: fire.

Native to much of Africa and southern Asia, buffelgrass grows in savanna grasslands with sparse trees, where it adapted to survive frequent fires.

The Sonoran Desert's flora evolved for heat, not flame. Historically, natural fires only burned here once every 250 years, and when they did, they didn't get far. That changed with buffelgrass, which turns flammable as it dries out, producing twice the fuel of native vegetation.

"This is not a fire-dependent ecosystem," Hudick says. "The desert isn't meant to have widespread fires like prairies or forests. And when we have those fires that are carried by buffelgrass, then we see the death of the large saguaros."

Introduced to the Southwest in the 1930s, buffelgrass has spread most swiftly in the past quarter-century. By 2010 buffelgrass infestations were expanding roughly 35% per year. Now, thanks to thick invasions of grass, fires here burn hotter, faster, and over larger areas.

Besides saguaros, these fires also kill other iconic but slow-moving species, including desert tortoises and Gila monsters.

And thanks to climate change, the fire season has also grown longer.

A statuesque Saguaro growing wild in Arizona, USA. **Photo © 2024 by adriennefriend**

Unlike excess heat and meager rain — factors hard to control — buffelgrass can at least be managed, Hudick says. Staff and dedicated volunteers go out each year to pull buffelgrass during a narrow window of time before it sets seed.

Meanwhile, a new and dangerous invasive has arrived on the scene. The cheerful yellow ball-shaped blooms of stinknet (*Oncosiphon pilulifer*) produce thousands of seeds and can quickly smother a landscape and outcompete native wildflowers. It, too, is highly flammable.

Cactus Dominoes

When Hudick and I spoke outside the East Park's visitor center, it was a lovely 70-degree day in December under a cloudless blue sky — no rain coming anytime soon. (Indeed, December 2024 turned out to be Tucson's driest and warmest December on record.)

Here the Rincon Mountains rise to our east. On every side of the city, it's these unfurling foothills that saguaros seem to love best. Some stands are so dense they're called cactus forests.

"Saguaros really are a keystone species in this ecosystem, culturally and ecologically," Hudick says. "A lot of animals rely on the saguaro."

Animals such as doves, bats, javelina, and foxes depend on saguaros for their fruit, while pack rats and jackrabbits eat their moist flesh. Gila woodpeckers and gilded flickers make nest holes in the trunks and large arms. Other birds occupy abandoned holes or build nests in the crook of a raised arm, while raptors perch on tall saguaros to spot prey.

"If the saguaro were to disappear from the landscape, I think we would see largescale change ecologically — it'd change the way the whole desert community looked," Hudick says. "People are not necessarily going to see that in their lifetime, because the changes are happening slowly. It might be 50 or 60 years before we see those larger saguaros die off and nothing coming in to replace them."

The Saguaro Way of Life

An hour west, another group is keeping a watchful eye on the saguaro. The Tohono O'odham, or Desert People, have lived in southern Arizona for more than 5,000 years. The saguaro

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appears in one of their creation stories — their name for the cacti is haha:sañ (pronounced "ha-ha-shawn").

"The saguaro is an ancestor to us," explains Jacelle Ramon-Sauberan, a member of the Tohono O'odham Nation, an instructor of language and culture at Tohono O'odham Community College, and as of 2024, the first Tohono O'odham board member of Friends of Saguaro National Park. "In the stories that we tell in the winter months, the story of how the saguaro came to be is a story that is told every year."

In the creation story, a mother is obsessed with playing toka, a traditional field hockey game, and often neglects her young son. One day the child is so hungry and lonely that he goes in search of her, only to be laughed at by others and sent back home by his mother. In despair he sinks into ground, weeping, and rises later as a saguaro, a plant that has fed Ramon-Sauberan's people "since time immemorial," she says.

The tops of mature saguaros produce white blooms in late spring, pollinated in daylight by birds and bees, at night by bats and moths that all feed on the nectar. In summer those blooms produce red, juicy fruit. Using a pole fashioned from long saguaro ribs, her people harvest the fruit and turn the bright red pulp into jelly, syrup, and ceremonial wine.

But while the fruit provides nourishment and medicine, climate change has made the time of harvest less reliable.

"I know there have been saguaros that have produced and bloomed out of season," she says. "It's hot one day, it's cold another, what's going on? We don't have a word for climate change."

Ramon-Sauberan teaches a Tohono O'odham food systems class in which she starts out with the basics: What is climate change? What are we seeing now? What did we see in the past?

Her community on the reservation is discussing the same issue.

"We're all trying to figure this out as we go, whether you are a human being or a plant. We've gotta take a step back and realize everything on this earth has a spirit, going back to our traditional ways. What did we used to do? We used to sing to our crops and harvest, and we do have songs for the harvest." Ω

Originally published in *The Revelator*, 27 January 2025, and reprinted with a Creative Commons 4.0 International License.

Scientists Develop First Portable eDNA Test Which Is Able to Detect One of the Rarest of the Rare Wildlife Species, a Swinhoe's Softshell turtle, in a Massive Body of Water

With only two known to exist, the only hope for the long-term survival of this species is finding additional Swinhoe's softshell turtles to assist in breeding efforts—Wildlife Conservation Society news release

New York, New York—January 15, 2025—Scientists have developed and validated a first-of-its-kind, portable environmental DNA (eDNA) test to help detect the world's rarest turtle, the Swinhoe's softshell turtle (*Rafetus swinhoei*), which is teetering on the brink of extinction. Two of these turtles are currently known to exist, one wild animal in Vietnam (sex unknown) and one captive male in China (over 100 years old). Additional Swinhoe's softshell turtles need to be found in order to breed these turtles successfully in captivity and rescue this species.

This new test will help determine if others may still be living in unexplored and understudied lakes, reservoirs, and other large bodies of water. This test, currently being used in the field, can also be adapted to inform field surveys or help find other elusive and threatened species.

EDNA testing was first initiated by the Asian Turtle Program of Indo-Myanmar Conservation (ATP-IMC) in 2013. In collaboration with a laboratory at Washington State University, they obtained the first positive result for the Swinhoe's Softshell Turtle (*Rafetus swinhoei*, Softshell Turtle) DNA in a water sample collected from Xuan Khanh Lake, Son Tay District, Hanoi, Vietnam.

Tim McCormack, ATP-IMC Program Director said, "Our early data showed the feasibility that eDNA testing could be used to detect this turtle species in its natural environment. Although challenging in large lakes and bodies of water, we did have some success with this technique; importantly, this showed that eDNA could be a viable method in confirming additional Swinhoe's Softshell Turtles in the wild at other locations, with every individual important if this species is to survive."

The breakthrough portable DNA test was developed through a multi-year collaborative effort, started in 2016 by the WCS

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Zoological Health Program based at the Bronx Zoo, WCS Vietnam, in partnership with the ATP-IMC, and the Central Institute for Natural Resources and Environmental Studies (CRES) in Vietnam. The goal of the project was to develop a sensitive and specific portable eDNA water test to detect a known individual of Swinhoe's Softshell Turtle, confirmed through a previous capture and regular photographing of the individual living in Dong Mo Lake, a massive 3000 acre (1260 hectare) body of water located in the outskirts of Hanoi, the capital city of Vietnam.

Turtles shed their DNA into the environment through urine, feces, and skin cells, but DNA can degrade over time and be diluted in such large water bodies, presenting challenges when detecting in environments with very few individuals. The partners, as noted in a newly published scientific paper in *Environmental DNA*, explain how the new portable eDNA test kit was successfully applied to detect eDNA from the Swinhoe's softshell turtle in a massive body of water.

The portable kit uses qPCR technology, which stands for quantitative polymerase chain reaction, and is a technology used for detecting DNA of targeted species. eDNA methodology has been suggested to be one of the most cost-effective approaches to species detection for both enhancing and reducing the cost of traditional survey methods, with traditional methodologies particularly challenging for very rare species. However, most eDNA methods require transporting samples to specialized laboratories, leading to long lag periods between sample collection and result reporting.

Said Dr. Minh Le, Head of Department of Natural Resources and Conservation - CRES: "The portable eDNA test has allowed conservationists to be trained in and carry out the qPCR testing in real-time on the ground. This also bypasses the need to export the samples out of the region or country to specialized labs. This project has also enhanced our in-country lab capacity to undertake additional testing that is needed to confirm results."

Swinhoe's Softshell Turtle (*Rafetus swinhoei*). Image captured in May 2022 in Dong Mo Lake, Vietnam. ©WCS

As of 2024, with two known Swinhoe's softshell turtles, one (male) at the Suzhou Zoo in China and the other (sex unknown) in Xuan Khanh Lake, Vietnam, the only hope for the long-term survival of this species is finding additional, as yet undiscovered animals that have thus far eluded detection by traditional survey methods. Teams are continuing to use this new test in additional lakes in Vietnam to hopefully find other Swinhoe's softshell turtles. Previous attempts with artificial insemination several years ago with a captive male and female, both over 100 years old, at the Suzhou Zoo in China were unsuccessful, and the female at the zoo died in 2019.

Dr. Tracie Seimon, Director of the WCS Zoological Health Program's Molecular Laboratory and lead author of the paper, said: "This project proved that we could use eDNA to detect an extremely rare species in a very large lake, and demonstrates that portable eDNA testing can be applied as a conservation tool to help detect the rarest of the rare of species in a natural environment. This is truly groundbreaking for conservation research."

Said Thuy Hoang, Director of WCS Vietnam and a co-author of the Environmental DNA paper: "The goal of this study was to develop a test that conservationists can use to enhance our survey work by shortening the time needed to confirm the presence of a species at a site. In addition, we learned from our study that pooling multiple samples together from one habitat before testing is a cost-effective strategy to enable detection over a much larger area while using fewer tests. We plan to continue eDNA testing in our search for the Swinhoe's Softshell Turtles in other unexplored and understudied lakes with the hope of finding more individuals. By finding other individuals, we may succeed in our overall goal, which is to prevent the species from going extinct."

The authors emphasized in their report: "Using this test can expand the search for *R. swinhoei* in unexplored and understudied lakes, reservoirs and other bodies of water where this species may be present and could inform field surveys utilizing eDNA for other threatened species that are rare in nature." Ω

To read the published study about this portable eDNA test, click: **https://doi.org/10.1002/edn3.70011**

Meeting Schedule: March/April 2025

Check your chapter website for program information.

Chino Valley
March 21; April 18

Foothill
March 28; April 25

High Desert
March 10; April 14

Inland Empire
March 7; April 4

Kern County
March 10; April 14

Low Desert
Meeting information to be announced.

Orange County
March 7; April 4

Ridgecrest
March 10; April 14

Santa Barbara-Ventura
Meeting information to be announced.

Santa Clarita
Meeting information to be announced.

TOOSLO (San Luis Obispo)
March 25

TTCS (Long Beach)
March 15; April 19

Valley
March 21; April 18

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There are three options for membership renewal:

1. Send a check to the mailing address of your chapter. In the panel below, you will find the current membership fees and the mailing addresses for each chapter.
2. Renew your membership in person at your chapter's meeting.
3. Some chapters have PayPal accounts that enable their members to renew memberships online.

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TOOSLO Chapter: P.O. Box 763, Grover Beach, CA 93483

Turtle & Tortoise Care Society Chapter: PO Box 15952, Long Beach, CA 90815

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