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Home's Hinge-back Tortoise, *Kinixys homeana*, photographed in Kakum National Park in the West African nation of Ghana. Photo © 2017 by Charles J. Sharp from Sharp Photography, sharpphotography.co.uk

featured species

Home's Hinge-back Tortoise, *Kinixys homeana* (Bell, 1827)

A West African Rainforest Tortoise by M. A. Cohen

Members of the genus *Kinixys* are the only tortoises that possess flexible hinge-like structures on their carapaces. They are known as hinge-back tortoises. This hinge enables the tortoise to enclose its vulnerable rear limbs and tail between its carapace and plastron. When the tortoise also retracts its head deep into its carapace and folds its large-scaled forelegs in front of its head, it is well-protected from predators.

British naturalist, dental surgeon, and author Thomas Bell (1792-1880) formally described the genus *Kinixys* in 1827. The name *Kinixys* derives from the Greek word root *kine*, which translates as moveable.

The species name *homeana* honors Sir Everard Home (1756-1832), an English naturalist and physician who was also a prolific author of papers on human and animal anatomy (Beolens et al., 2011).

K. homeana belongs to the Testudinidae, the chelonian family that includes carnivorous freshwater turtles and herbivorous or omnivorous terrestrial tortoises.

The common name hinge-back sometimes appears in the literature without hyphenation as

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Home's hinge-back tortoise in a defensive posture photographed in Togo, West Africa. Its most distinctive characteristic is the sharply angled downward slope of the rear carapace as shown on the left of the image. Photo © 2016 by Justin Miller

hingeback. There are no recognized subspecies of Home's hinge-back tortoise. No significant geographic variations in appearance exist.

The Home's hinge-back tortoise is not well-studied because it is wary and difficult to find within its range.

K. homeana is sympatric with another hinge-back species, *K. erosa*, commonly named the serrated hinge-back or Schweigger's tortoise. The term sympatric indicates that the geographic ranges of two species overlap.

Description

K. homeana is a small to medium-sized tortoise with a carapace length from 5.5 to 11.5 inches (15 to 30 centimeters). While the female is larger than the male, the male has a longer, thicker tail and a concave plastron (Home's Hinge-back Tortoise, 2019).

The scutes of the carapace are tan and brown, and the front of the shell tilts downward toward the head. The rear of the carapace distinguishes the Home's hinge-back from other hinge-backs because it angles sharply downward toward the marginal scutes. The rear marginal scutes are serrated and curve upward.

The location of the hinge on the carapace is "between the 4th and 5th costals and the 7th and 8th peripherals, allowing the posterior portion of the carapace to be lowered over the hindquarters" (Farkas & Sátorhelyi, 2006).* See the image on page 4 for a photograph of the carapace.

The plastron of *K. homeana* is yellow, and there is a dark patch in the center of each plastral scute. Its head, limbs, and tail are brown to yellow, and each forefoot has five claws.

Range and Habitat

K. homeana occurs in the southern coastal rainforest regions along the Gulf of Guinea in West Africa. The tortoise inhabits lowland equatorial forest zones in Liberia, Ivory Coast, Ghana, Togo, Benin, Nigeria, Cameroon, Equatorial Guinea, and the western Central African Republic. A disjunct population also report-

* Editor's note: the carapace hinge is located between the 4th and 5th costal **scutes** and the 7th and 8th peripheral (marginal) **scutes**.

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edly occurs in eastern Congo Kinshasa. More research is necessary to verify the extent of its range (Luiselli and Diagne, 2013; Home's hinge-back tortoise, 2019).

The habitat of *K. homeana* is the humid evergreen and semi-deciduous tropical and subtropical rainforests near the Gulf of Guinea in the eastern Atlantic Ocean. Described as "elusive," the species occupies lowland swamp forests and stream-side ecosystems with dense, sheltering foliage that provide protective cover from high equatorial temperatures and predators.

The tortoise requires "closed forest canopy and shady microhabitats to avoid overheating, and shows behavioral thermoregulation in its avoidance of overheating...allowing only short periods of exposure to the sun during movements between sunlit and shaded areas" (Luiselli and Diagne, 2013).

The treatment by the local human communities within their range determines the habitats occupied by *K. homeana*. Some local peoples hunt the species for subsistence, prompting the tortoise to select the most dense, impenetrable habitats available to evade hunters. Other local peoples worship the species as a holy animal enabling the tortoise to live in more diverse habitats, including dense forests, sparse brush, swampland forests, and even cocoa and coffee plantations (Luiselli et al., 2019).

Home's hinge-back tortoise photographed in habitat in Ghana in West Africa. **Photo © 2008 by Ben P**

Activities

K. homeana is typically active at dawn and dusk, foraging and seeking mates when the weather is comparatively cool. The term crepuscular describes this twilight activity when the dim light protects the tortoise from predation. Some researchers describe the activity pattern of the tortoise as diurnal (active during daytime and inactive at night). During the heat of midday, the tortoise retreats into deep shade.

Home's hinge-back is most active during the wet months (April to October in Nigeria). The species is comparatively inactive during the dry months (November to March in Nigeria) exception for reproductive-age, nesting females (Luiselli and Diagne, 2013).

Mating occurs with the onset of the seasonal rainfall. Females nest once or twice a year during the dry season, laying two to four eggs per clutch in the forest floor leaf litter or in an excavated nest. There is insufficient documentation of incubation times in wild populations.

During the wet season, flooding is likely in stream-side and swampland habitats, and tortoises may float on the floodwaters, thus dispersing into new areas within its range.

The Home's hinge-back forages in the shade and basks in partial sunlight rather than full sun (Home's hinge-back tortoise, 2019).

Diet

Home's hinge-back has a more carnivorous diet than most members of the tortoise family. Being an omnivore, *K. homeana* consumes a diverse selection of foods, including mushrooms, aquatic and terrestrial worms, mollusks such as slugs and snails, small amphibians, fish, insects, plant matter, seeds, and carrion.

Threats and Conservation

Threats to *K. homeana* are many and varied. Populations are in decline throughout their historical range because of habitat degradation and destruction. The species requires a specialized ecosystem that includes high humidity and a closed forest canopy. Much of this habitat loss is due to human activity (anthropogenic).

Development for residential and agricultural purposes causes substantial habitat loss, including housing for growing human populations and clearing of forests

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Home's hinge-back tortoise, *Kinixys homeana*, photographed in Togo in West Africa. Photo © 2019 by Eric

This is the *K. homeana* carapace as viewed from above. Notice the widened areas at the sides of the carapace toward the top of the image. These are the flexible hinges that are located near the rear of the carapace.

for cattle grazing. Harvesting the species for subsistence, traditional medicine, and the international pet trade is responsible for decreasing tortoise populations.

In 2019, the IUCN Red List of Threatened Species classified *K. homeana* as critically endangered, meaning it is perilously close to extinction in the wild. In 1977, CITES added Home's hinge-back tortoise to Appendix II with all other members of the Testudinidae (Luiselli et al., 2019).

Togo and Nigeria have enacted some legal protections for Home's hinge-back tortoise, but enforcement is lacking.

References

Farkas, B., & Sátorhelyi, T. (2006). (PDF) Captive propagation of Kinixys homeana Bell, 1827. Edition Chimaira. https://www.academia.edu/796838/Captive_propagation_of_Kinixys_homeana_Bell_1827

Home's hinge-back tortoise . (2019). Smithsonian's National Zoo. https://nationalzoo.si.edu/animals/homes-hinge-back-tortoise

Luiselli, L. and Diagne, T. (2013.) Kinixys homeana Bell 1827–Home's Hinge-Back Tortoise. *In:* Rhodin, A.G.J., Pritchard, P.C.H., van Dijk, P.P., Saumure, R.A., Buhlmann, K.A., Iverson, J.B., and Mittermeier, R.A. (Eds.). Conservation Biology of Freshwater Turtles and Tortoises: A Compilation Project of the IUCN/SSC Tortoise and Freshwater Turtle Specialist Group. Chelonian Research Monographs No. 5, pp. 070.1–070.10, doi:10.3854/crm.5.070.homeana.v1.2013, http://www.iucn-tftsg.org/cbftt/

Luiselli, L., Agyekumhene, A., Akani, G.C., Allman, P., Diagne, T., Eniang, E.A., Mifsud, D.A., Petrozzi, F. & Segniagbeto, G.H. (2021). Kinixys homeana. The IUCN Red List of Threatened Species 2021: e.T11003A18341580. https://dx.doi.org/10.2305/IUCN.UK.2021-2.RLTS.T11003A18341580.en.

Monitoring of Critically Endangered Geometric Tortoise by Kallyn Gunkel and Martine Jordaan

21 September 2023—The geometric tortoise (*Psammobates geometricus*), classified as Critically Endangered, ranks among the top 25 most imperilled tortoises and turtles globally. Its future remains uncertain, with an estimated wild population of fewer than 3,000. This species is highly specialised in its habitat requirements, historically found in the low-lying renosterveld shrublands of the Swartland, Upper Breede River Valley, and Ceres Valley [regions in South Africa]. The geometric tortoise endures as a fragmented population within its historical range, facing severe threats primarily due to habitat destruction and fragmentation. Over 90% of its original habitat has been irrevocably converted for agriculture, while remaining habitats face ongoing threats from human settlement, invasive alien plants, predators (including invasive feral pigs), overgrazing by domestic livestock, droughts, and wildfires, seriously imperilling its survival.

To support the conservation of the geometric tortoise, CapeNature conducts annual monitoring at various sites, including Voëlvlei and Briers Louw Nature Reserves. This year, monitoring was conducted over three days at both reserves, resulting in the observation of 11 geometric tortoises, including juveniles. The team also recorded angulate tortoises (*Chersina angulata*) and speckled padlopers (*Homopus areolatus*). This comprehensive documentation of tortoise species presence and abundance contributes to our understanding of community dynamics.

During the survey, the team also encountered ten mole snakes (*Pseudaspis cana*) at Briers Louw Nature Reserve. This unexpected discovery could be attributed to recent heavy rainfall, which may have temporarily flooded their burrows, prompting them to surface, making them more visible.

—CapeNature news release

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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

Galápagos Conservancy News

Living Life Fully in Retirement — An Update on Diego

What's Diego Up to Now? story and photographs by the Galápagos Conservancy

Diego at the Fausto Llerena Breeding Center on Santa Cruz Island, with Washington Tapia before his release in 2020. © Andrés Cruz/Galápagos Conservancy.

Among the longest-running and most important conservation efforts in Galápagos is Iniciativa Galápagos—a collaborative effort between Galápagos Conservancy and the Galápagos National Park—whose focus has been rewilding giant tortoises across the archipelago. One achievement in particular stands out: the restoration of the Española Giant Tortoise (*Chelonoidis hoodensis*). This Critically Endangered species went from just 15 individuals in the 1960s to the current number of several thousand. And we have one special individual to thank for his contribution to this amazing comeback—Diego, the father of hundreds of tortoises!

In late 2020, we announced that after more than 80 years away from his home, Diego was able to return to his birthplace to start his retirement. His homecoming to Española Island was well- deserved, as his reproductive contributions played a key role in saving his entire species, serving as father and grandfather of perhaps one-third of the 3,000 or so Española tortoises now in existence.

Though he is getting up there in years, even for a tortoise, he is still quite an active traveler—moving vigorously around his small home range of cactus trees over the last several months. He has a small GPS tracker on his shell, enabling us to keep an eye on him from afar, following his movements five times per day. A regular stop on his meandering circuit is a solitary *Opuntia* cactus tree, beneath which Diego can wait for days during the dry season until gravity has its way and a cactus pad drops to the ground, where he can fetch it for a meal. When it rains, a rare event, he ventures out to search for new grass growth for a few weeks, then retreats back to the shade of his cactus trees for the rest of the year.

Diego's active lifestyle and limited range seem to imply that he is pleased with his retirement and content to live out his days in his small part of his home island. We are all so happy that Diego is doing well and will forever be thankful for his contribution to the recovery of Española Giant Tortoises in Galápagos.

Originally published in the Galápagos Conservancy biannual magazine the *Galápagos Post* Summer 2023 issue and reprinted with the kind permission of the Galápagos Conservancy Media Department.

▲ The red pin shows one of Diego's positions recorded on Isla Española.

▼ Diego's movements are being tracked by GPS.

Therapy Tortoise Day at the Ridgecrest Regional Hospital

Story by Ridgecrest Chapter President Robert Parker with photographs by the Ridgecrest Hospital Staff

I gave a presentation to our local Rotary Club about our chapter of the California Turtle and Tortoise Club. Tera Moorehead was present and contacted me later on about bringing tortoises to the hospital for a special time. Tera is the Director of Community Outreach, Wellness, and Philanthropy at the Ridgecrest Regional Hospital. She explained that they usually have Therapy Dogs but for this event wanted me to bring "Therapy Tortoises" for the hospital employees to enjoy.

Sue and Bob Parker loaded up an adult female desert tortoise, a juvenile desert tortoise, two hatchlings, and our leopard tortoise who is maybe 8 or 9 inches (20 or 23 centimeters) in length. I brought some portable fencing for them, although the leopard pretty much roamed free.

Bob Parker's leopard tortoise.

▲ Hospital administrators and staff members enjoying the "therapy tortoises." ▶

Facebook, and I'm sharing them with CTTC for this article. The staff enjoyed holding them, little ones and the adult as well, and there were even a few hugs for the tortoises. The photos were taken by the staff and show the joy they had with the tortoises.

A hospital staff member (left) and Bob Parker (right) admire Bob's leopard tortoise.

Ms. Moorehead had advertised this event as a Surprise Pet appearance, and she said everyone was excited to see what the surprise was. We had a beautiful day under the trees in front of the hospital, so many visitors to the hospital were also treated to these "Therapy Tortoises." The staff of the hospital were kind enough to post the photos on

Many thanks to Robert Parker, founding member and president of the CTTC Ridgecrest chapter, for providing this article for publication.

the Turtle's Garden
planting for chelonians
by M A Cohen

Mirabilis laevis
Desert Wishbone Bush

A lavender-flowering variety of the wishbone bush, also known as California Four o'clock, *Mirabilis laevis var. crassifolia*. Photo © 2017 by John Doyen

The desert wishbone bush is a member of the Four O'clock family, the Nyctaginaceae. This family of plants derives its common name from its daily blooming cycle. Four o'clock flowers open in the late afternoon, typically around 4:00 PM, and remain open until the next mid-morning, usually closing around 10:00 AM.

There are currently five recognized varieties of *Mirabilis laevis*:

- *Mirabilis laevis var. cedrosensis,* California Four O'clock (CA),
- *Mirabilis laevis var. crassifolia*, California Four O'clock (CA),
- *Mirabilis laevis var. laevis,* Desert Wishbone-bush (CA),
- *Mirabilis laevis var. retrorsa*, Wishbone-bush (AZ, CA, NV, OR, UT), and
- *Mirabilis laevis var. villosa*, Wishbone-bush (AZ, CA, NV) [Sturla, n.d.].

Leaves and forked branches of *M. laevis* photo- graphed on Santa Cruz Island, one of the Channel Islands off the California coast. Photo © 2014 by Steve Matson

Description

The desert wishbone bush is a low, spreading perennial or subshrub that typically grows 6 to 18 inches (15 to 46 centimeters) tall but may reach 24+ inches (60+ centimeters). It may spread as much as 8+ feet (2.4+ meters).

The young plant is herbaceous (lacking woody tissue) but develops lignified (rigid) tissue at its base as it matures.

The stems and leaves of *M. laevis* are medium green to gray-green and covered with minute, soft hairs. The common name wishbone bush derives from its forked branches that resemble poultry wishbones. Its leaves are thick, cordate (heart-shaped), and about 1.5 inches (3.8 centimeters) long (The American Southwest, n.d.).

The wishbone bush typically loses some foliage following its spring bloom period and is stress-deciduous during drought conditions. It is also seasonally deciduous, losing all its leaves when the weather becomes too hot and dry. Fall and winter rains promote the formation of buds for new leaves and flowers.

Appearing from December through June (and possibly longer in parts of its range), the flower colors of *M. laevis* vary from white to pale pink to shades of lavender, magenta, and purple.

The blossoms of *M. laevis* are unusual in that they lack petals. What appear to be ten petals are five two-part sepals, the flower parts that usually enclose the

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petals. These colorful sepals comprise flowers that are 1 inch (2.54 centimeters) in diameter with yellow-orange stamens (Baumann, 2020).

Range and Habitat

M. laevis is endemic to North America and is primarily distributed throughout the western United States from southeast Oregon south through California, Nevada, Utah, and Arizona. It is also native to Baja California and the northwestern Sonora Desert in Mexico.

There is substantial variation in the habitats occupied by *M. laevis*. In California, the species prefers rocky slopes up to an elevation of 7,000 feet (2,134 meters) in canyons, chaparral, coastal sage scrub, foothill woodlands, and the western Mojave desert (The American Southwest, n.d.; Mirabilis Laevis, n.d.).

Cultivation

Providing for its basic needs enables the desert wishbone bush to grow well. Good drainage is required, as is ample sunlight. The species grows best in full sun, although it will tolerate some shade.

The desert wishbone bush tolerates a variety of soil textures (clay, loam, and sandy) as long as the drainage is sufficient.

M. laevis requires regular watering during the first season of growth, after which its water requirements are minimal.

A summer shearing will keep the plant more compact because it grows thin and rangy as the weather becomes hotter and drier.

White-flowered *Mirabilis laevis var. villosa* photographed in Arizona. **Photo © 2023 by Eric Hough**

Flowering occurs in winter and spring. As mentioned, flowers of *M. laevis* open in late afternoon and close by mid-morning. Flowers remain open overnight when pollination occurs. Night-flying moths and other insects are the primary pollinators, and diurnal insects and hummingbirds act as secondary pollinators (Wishbone Bush, n.d.).

A DTRNA Study

In 2014, W. Bryan Jennings and Kristin H. Berry published a bite-count study concerning the selective foraging ecology of the Mojave desert tortoise (*Gopherus agassizii*) at the Desert Tortoise Research Natural Area (DTRNA) in the western Mojave Desert. The study itself occurred during 1992 following an El Niño rainfall event.

The study divided the tortoises' spring feeding season into three phenological* periods. The researchers recorded facts about the annual and perennial plants on which the tortoises fed during the spring, including the abundance (number of individual plants) in the study site at the DTRNA.

During each phenological period, the herbaceous perennial desert wishbone bush comprised a small percentage of the total plants on which the desert tortoises fed, but accounted for a comparatively large number of the total bites taken.

The researchers commented, "On finding a single *M. laevis*, tortoises typically took hundreds of bites from each plant before moving on..." Overall, the desert wishbone bush was the second most-consumed plant in the study (Jennings and Berry, 2014).

* **phenology:** the study of cyclic and seasonal occurrences, especially in relation to climate and plant and animal life.

References

Baumann, L. (2020). Plant of the Month - Wishbone Bush. Santa Monica Mountains Trails Council. https://www.smmtc.org/plantofthemonth/Wishbone_Bush.php

Jennings, W. B., & Berry, K. H. (2015). Desert Tortoises (Gopherus agassizii) Are Selective Herbivores that Track the Flowering Phenology of Their Preferred Food Plants. PLOS ONE, 1, e0116716. https://doi.org/10.1371/journal.pone.0116716

Mirabilis laevis. (n.d.). Calflora. https://www.calflora.org/app/taxon?crn=10129

Sturla, E. (n.d.). Mirabilis laevis, Desert Wishbone-bush, Southwest Desert Flora. Southwest Desert Flora. https://southwestdesertflora.com/Website-Folders/All_Species/Nyctaginaceae/Mirabilis%20laevis,%20Desert%20Wishbone-bush.html

The American Southwest. (n.d.). Desert Wishbone Bush, Mirabilis Laevis. National Parks and National Monuments of the American Southwest and West. https://www.americansouthwest.net/plants/wildflowers/mirabilis-laevis.html

Wishbone Bush. (n.d.). Nature Collective. https://naturecollective.org/plant-guide/details/wishbone-bush/

Mike's Turtle Net Picks by Michael J. Connor, Ph.D.

A varied selection of recent articles, stories and sites on the Web that some of you may find as interesting as I did. This list is also posted at tortoise.org/turtlenetpicks/turtlenetpicks.html

Feds Sued Over Impact of Vehicle Routes to Desert Tortoise in California

A federal judge heard arguments in a 2021 lawsuit over whether the BLM is violating the Endangered Species Act because of its roads in the West Mojave Desert.

Feds Sued Over Ongoing Impacts to Desert Tortoise Habitat in Nevada

BLM and USFS sued for failing to protect desert tortoise critical habitat in Southern Nevada from cattle and large-scale solar developments.

Rewilding Bolson's Tortoise in New Mexico

There was massive media coverage of the release of an additional 20 Bolson's tortoise (*Gopherus flavomarginatus*) into a 16.5-acre pen on Ted Turner's Armendaris Ranch.

Rewilding Hermann's Tortoise in Gibraltar

Gibraltar kicks off its rewilding program by releasing three male and three female Hermann's tortoises (*Testudo hermanni*) into the wild.

400 Tortoises Rescued From Greece Fires

Some 400 tortoises were rescued from blaze sites following this summer's massive wildfires in Greece.

Zoo Hatches McCord's Box Turtle

Sedgwick County Zoo hatched its first McCord's Box Turtle, a species not seen in the wild since 2010.

Western Pond Turtles Proposed For ESA Listing

On October 3 the US Fish and Wildlife Service proposed threatened status for the Northwestern Pond Turtle and Southwestern Pond Turtle. The comment period closes December 3.

Ottawa's Blanding's Turtles Declining

Blanding's turtles at risk of extinction in western Ottawa due to urban sprawl and inadequate mitigation measures.
Watch the CBC Video.

Southern River Terrapin Conservation

Southern river terrapin (*Batagur affinis*) conservation in peninsular Malaysia.

Sea Turtle Stamps

Coming in 2024, postage stamps showing each of the 6 sea turtles found in US waters.

Los Angeles Green Sea Turtles

NPR podcast featuring the green sea turtle population in the mouth of the San Gabriel River near Seal Beach.

Sea Turtles Increasing in the Gulf of Mexico

Forty years of monitoring show increasing loggerhead and green sea turtle abundance in the Gulf of Mexico.

Saving Kemp's Ridley in Texas

Things not so good for Kemp's ridley sea turtle; what does it take to save our smallest sea turtle?

Some Cool Chelonian Science

Testosterone identifies hatchling sex for desert tortoises (*Gopherus agassizii*).

The first high-quality chromosome-level genome of Hawksbill (*Eretmochelys imbricata*).

Bone samples from a Miocene (6 million years old) fossil *Lepidochelys* sea turtle may still contain DNA!

Freshwater turtle rock art and archaeological sites in Australia: a glimpse into Aboriginal use of chelonians.

CTTC's Turtle and Tortoise Listserve

To engage with other turtle and tortoise fans in a friendly atmosphere join CTTC's Turtle and Tortoise list or send an email to: <CTTC-TurtleAndTortoise-list+subscribe@groups.io>.

CTTC On Facebook

For breaking news updates follow CTTC on Facebook!

"Nature is slow but sure; she works no faster than need be; she is the tortoise that wins the race by her perseverance."

— Henry David Thoreau (1817–1862), American naturalist and philosopher

18 May 2024: Orange County Chapter Annual Show ~ First Christian Church of Orange, 1133 East Walnut Avenue, Orange, CA 92867; 9 AM to 4 PM.

18 May 2024: Valley Chapter Annual Show ~ Woodland Hills Christian Church, 5920 Shoup Avenue, Woodland Hills, CA 91367; 11 AM to 4 PM.

CTTC Memberships and Renewals

Each chapter handles its own memberships.

There are three options for membership renewal:

1. Send a check to the postal mailing address of your chapter. On the last page of this newsletter, 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.

Classified Advertisements

Classified advertisements run for one issue at 5^{00} for up to four lines. Ads are accepted at the discretion of the Editor. Classified ads are available to members and subscribers only and are run as a service to our members. California Turtle & Tortoise Club is not responsible for merchandise placed for sale in the *Tortuga Gazette*.

Please make your check payable to the California Turtle & Tortoise Club.

Please send ad fee to: CTTC Tortuga Gazette, attn Treasurer, P. O. Box 7300, Van Nuys, CA 91409-7300. Mail fee with ad copy to the *Tortuga Gazette* mailing address; OR, mail fee to the postal address above, and email the ad copy to the Gazette Editor.

What is an iButton?

An iButton is basically a data logging and management device that comprises a silicon microchip enclosed in a stainless-steel can which acts as an "electronic communications interface." It is about the size of a button-cell battery, hence the name iButton (What Is an iButton Device? 2006).

The medical and food storage industries began using the iButton technology years ago. Research-based projects also use iButtons. These minute devices are durable, portable, and mountable. The devices can withstand temperature extremes while continuing to provide accurate readings.

The type of microchip in the iButton varies according to purpose of the technology. There are five general uses for iButtons, including:

- Address-specific devices for identification and access control;
- Memory devices storing routing and contents information for containers;
- Real-time clock devices maintain time information;
- Secure devices that store encrypted data; and
- Temperature and data logging devices having extended memory capacity for storing sensor-system data.

This last usage is the subject of the following article concerning a desert tortoise research project utilizing iButtons.

References

Rouse, M. (2015). What is an iButton? https://www.techopedia.com/definition/14945/ibutton

What Is an iButton Device? (2006). https://www.analog.com/en/technical-articles/what-is-an-ibutton-device.html

iButtons Help Gather Data in Desert Tortoise Temperature Studies

By Abhishyant Kidangoor as posted on Mongabay on 20 September 2023

- Researchers are using a button-shaped device to gather data about desert tortoises (*Gopherus agassizii*) and their habitats in the Mojave Desert in Southern California.
- Using iButtons, the researchers are trying to understand how hot the tortoises get, and the temperatures that they prefer in the burrows where they spend most of their time.
- Identifying the critically endangered species' temperature preferences is an urgent task: the tortoise faces threats to its survival from various quarters such as rising temperatures, habitat loss, and attacks by predators.
- With this research, scientists say they hope to find habitats that are safer and where the thermal conditions are suitable for the long-term survival of the tortoises.

A swanky iPhone or a sleek new iPad might sound like a perfect holiday gift for many. Tom Radzio feels the same joy when he retrieves an iButton and downloads data from it.

"It's like opening a Christmas present," Radzio, a researcher at the San Diego Zoo Wildlife Alliance, told Mongabay in a video interview.

The device he referred to isn't a fancy phone or a fitness tracker. Rather, it's a button-shaped device filled with sensors that have helped Radzio and his team study desert tortoises and their habitats. Since March this year, they've attached iButtons to 95 juvenile and 20 adult Mojave Desert tortoises (*Gopherus agassizii*), a critically endangered species native to the Mojave Desert in Southern California. The goal: find out how hot the animals are getting and understand the temperatures they've been living through. Each time he retrieves an iButton from a tortoise, Radzio said, he ends up with a treasure trove of information.

"You get to see what the animals have been doing," he said. "Did it come out of its burrow on a particular day? What kind of temperatures have they experienced?"

Getting answers to these questions is critical. Identifying the temperature and humidity at which tortoises are moving helps scientists determine the characteristics of their preferred habitats, and aids in their understanding of how global warming is impacting tortoises and the ecosystems they live in.

Mojave tortoises face an onslaught of threats to their survival. Extreme drought, rampant habitat loss spurred by urbanization, increasing attacks by predators, and getting hit by cars are all factors that have played a role in the steady decline of their population. Given their slow reproduction rate, and the long time it takes for the animals to reach maturity, conservationists say it's essential to gather more data on their habitats that can inform urgently needed conservation measures. The tortoises and their burrows also play a larger role in their ecosystem.

"Their burrows provide refugium for many species, now documented over 100," Radzio said. "Some of the species actually require tortoise burrows for part of their life cycle because the burrow provides a stable environment that is not as extreme as at the surface." However, accessing data on where the tortoises are isn't always easy. Desert tortoises spend most of their time in burrows or under rocks, in order to regulate their body temperature and minimize water loss. Since they live near the ground, the temperatures they experience are typically higher than the readings recorded by weather stations.

Juvenile desert tortoise fitted with an iButton on the rear carapace. The white dot is used to identify the tortoises with cameras above the study site. Image courtesy of the San Diego Zoo Wildlife Alliance.

article continues on page 13 ▶

It was to overcome this problem that Radzio started using iButtons — a device that has long been used for medical purposes and in the food-shipping industry. "You can program it to record temperature at preselected intervals, and some iButtons also record humidity," Radzio said. "We get a long time series of data on temperature and humidity in their environment — data which we cannot collect by hand at the same level of frequency and spatial extent."

So far, Radzio and his team have used the devices to sample the environment available to tortoises during two important, and vulnerable, life stages. One, to understand how juvenile tortoises are choosing habitats that help them conserve energy and water during hot and dry summer months. And second, to figure out if there's a pattern behind how the animals select their habitats for nesting.

"In the egg stage, temperature has really strong effects on development, sex ratio, size, and other attributes that can affect the animal's ability to persist," Radzio said.

Mojave Desert tortoises face threats to their survival from various quarters such as rising temperatures, habitat loss, and attacks by predators.

Since the research is still ongoing, Radzio said concrete patterns are yet to emerge from the preliminary data collected so far. Nonetheless, he said, there are certain trends that have caught his attention.

For example, Radzio's team lined 21 burrows with iButtons every 10 centimeters (4 inches). They found that the temperatures varied rapidly from one location in the burrow to another. "During spring, the temperature can be 43° Celsius [109.4° Fahrenheit] at the entrance in the middle of day, but deep inside, it's somewhere close to 26°C [78.8°F]," Radzio said.

Moreover, the team found that well-hydrated tortoises often pick spots in the burrow where the temperature hovers around 32°C (89.6°F). "The predictability with which the tortoises selected temperatures, it was almost like clockwork. It likely tells us something about their habitat needs," Radzio said.

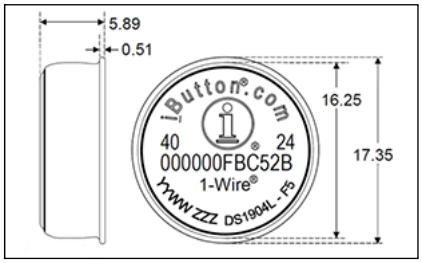
One of the big questions, Radzio said, is to find out how juveniles survive summers on limited energy and water reserves. Initial observations from his experiment suggest that they dig deeper, cooler burrows when temperatures increase, and often emerge from the burrows at night to experience cooler surface temperatures. "By simultaneously recording temperature and humidity experienced by tortoises during physiologically challenging summer months, iButtons can provide valuable insights into juvenile tortoise habitat requirements and potential responses to climate change," he said.

Radzio said these preliminary observations will be further validated as the team continues its research. Additionally, they're collaborating with researchers at the University of North Carolina at Chapel Hill to study the relationship between the thermal profiles of habitats and the animals' physiology.

"We will run controlled physiological experiments in the lab to measure metabolic rate and water loss rates in tortoises under a wide range of environmental conditions," Eric Riddell, an assistant professor in the biology department at UNC–Chapel Hill, told Mongabay in an email interview. "We will then incorporate this data into models which will simulate how organisms interact with the environment across realistic landscapes."

The final goal, he said, is to be able to get the model to predict when and where desert tortoises may experience conditions that threaten their survival. As the impacts of climate change worsen over the years, Riddell said he hopes this information will be used for conservation efforts to breed or translocate the animals to places that are predicted to be more suitable for them.

"Physiology gives us a direct window into the conditions necessary for survival," he said. "By coupling physiology with these complex simulations, we can give these animals the greatest chance of survival on our warming planet."



Side and top views of the metal case of an iButton that contains a silicon microchip. In this study, the iButtons on the tortoises' carapaces were surrounded by a protective plastic housing.

All measurements in the illustration are in millimeters. The outside diameter of the iButton, 17.35 millimeters, is 0.68 inch. Creative Commons image from Rev Space

Two West Coast Pond Turtles Proposed for Endangered Species Protections

Sacramento, California—29 September 20223—In response to a petition and lawsuit by the Center for Biological Diversity, the U.S. Fish and Wildlife Service today proposed to protect northwestern and southwestern pond turtles in California, Oregon and Washington as threatened species under the Endangered Species Act.

"Endangered Species Act protections are a much-needed lifeline for our dwindling native West Coast turtles," said Jeff Miller, a senior conservation advocate at the Center. "Pond turtles are crucial to healthy rivers and wetlands, and losing them would impoverish aquatic ecosystems."

The southwestern pond turtle (*Actinemys marmorata* subspecies *pallida*) lives in Southern California from Monterey County southward and into northern Baja California, Mexico. The northwestern pond turtle (*Actinemys marmorata* ssp. *marmorata*) is found in Washington, Oregon, and California north of the San Francisco Bay Area and in the Central Valley.

The name "pond turtle" is something of a misnomer because this species frequently lives in rivers. Pond turtles inhabit permanent and intermittent waters of rivers, creeks, small lakes and ponds, marshes, irrigation ditches and reservoirs. Turtles bask on land or near water on logs, branches or boulders. They require terrestrial habitat for nesting and overwintering, which is a form of hibernation. Pond turtles are highly opportunistic eaters and will consume almost anything they can catch and overpower.

Pond turtles are imperiled by habitat loss and fragmentation from urban development and agriculture, dam construction, disease, invasive species and climate change.

Basking Western Pond Turtle (*Actinemys marmorata*) photographed in California. **Photo @ 2009 by Yathin S Krishnappa**

A respiratory disease epidemic in Washington in 1990 left a total population of fewer than 100 pond turtles in the state, though there have been some reintroduction efforts. They have been nearly wiped out in lower Puget Sound, and only two populations remain in the Columbia River Gorge.

In the Willamette Valley in Oregon, pond turtles appear to have declined by 99%. In California's Central Valley, where most of their natural habitat has been eliminated, surveys detected turtles at only 15 of 55 sites, with sizable populations only at five sites. Pond turtle numbers are in precipitous decline in Southern California, with few stable, reproducing populations known between Los Angeles and the Mexican border.

At the state level, pond turtles are listed as endangered in Washington, sensitive/critical in Oregon, and a species of special concern in California. Although habitat destruction is one of the biggest threats to the turtle, none of these state laws provided effective habitat protection.

A 2014 genetic analysis of pond turtles along the West Coast determined they are two distinct species, each of which is more endangered than previously thought.

The Fish and Wildlife Service determined in 2015 that Endangered Species Act protection may be warranted for pond turtles, but the agency delayed protection.

Today's listing comes in response to a Center lawsuit seeking timely status evaluations and protection decisions for 241 plant and animal species thought to be trending toward extinction, including the northwestern and southwestern pond turtles. The Center and several renowned scientists and herpetologists petitioned to protect the pond turtles in 2012.

—Center for Biological Diversity press release

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On 29 September, the 60-day comment period began on the US Fish and Wildlife proposal to federally protect both the southwestern and northwestern pond turtle species under the Endangered Species Act. See **FWS Pond Turtle Listing Proposal** for more details.

Meeting Schedule: November/December 2023

Click on your Chapter's website link for the latest program information which is posted as it becomes available.

Chino: November 17; December-no meeting

Foothill: November 20; December 11

High Desert: November 13; December 11

Inland Empire: November 3; December 1

Kern County: November 13; December 11

Low Desert: Meetings to be announced.

Orange County: November 3; December 1

Ridgecrest: November 13; December 11

Santa Barbara-Ventura: Meetings to be announced.

Santa Clarita: Meetings to be announced.

TOOSLO (San Luis Obispo): Meetings to be announced.

TTCS (Long Beach): November 18; December 16

Valley: November 17; December 15

California Turtle & Tortoise Club: a Society Dedicated to Turtle & Tortoise Preservation, Conservation and Education since 1964. Promoting and Facilitating the Care, Rehoming, and Adoption of Native and Nonnative Turtles and Tortoises.

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Many members choose to join a nearby Chapter to participate in Chapter meetings and other activities. Print membership forms from the CTTC website.

Your Chapter and your renewal date (month/year) are displayed on your newsletter notification. Mail your new or renewal membership/subscription to the Chapter of your choice.

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CTTC Chapter Mailing Addresses

Chino Valley Chapter: P.O. Box 1753, Chino, CA 91708-1753

Foothill Chapter: P.O. Box 51002, Pasadena, CA 91115-1002

High Desert Chapter: P.O. Box 163, Victorville, CA 92393

Inland Empire Chapter: P.O. Box 7205, Redlands, CA 92375

Kern County Chapter: P.O. Box 81772, Bakersfield, CA 93380-1772

Low Desert Chapter: P.O. Box 4156, Palm Desert, CA 92261

Orange County Chapter: P.O. Box 11124, Santa Ana, CA 92711

Ridgecrest Chapter: P.O. Box 1272, Ridgecrest, CA 93555

Santa Barbara-Ventura Chapter: P.O. Box 3086, Camarillo, CA 93011-3086

Santa Clarita Chapter: P.O. Box 4012, Castaic, CA 91310

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

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

Valley Chapter: P.O. Box 7364, Van Nuys, CA 91409-7364

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California Turtle & Tortoise Club
P.O. Box 7300
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