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Adult pair of Hermann's tortoises with a 1-foot (30-centimeter) ruler for scale.

featured species

Hermann's tortoise, *Testudo hermanni*

Hermann's Tortoise: History and Care

text and photographs by Ralph Hoekstra

My interest in tortoises began in 1975 when our pastor gave me a tortoise his children found walking down their street. His children wanted to keep it, but it was eating the plants in their mother's vegetable garden. I volunteered to take the tortoise off of their hands and thus began my 35-plus years with tortoises. I took the tortoise to a California Turtle & Tortoise Club/Orange County Chapter show to get it identified. I was told it was not a desert tortoise (*Gopherus agassizii*), but that it was definitely a female Hermann's tortoise (*Testudo hermanni*). We named her "Shelley."

Shelley shared our backyard for a short time with two desert tortoises that were found walking on nearby streets by neighbors. Shelley did not want to share her territory and neither did one of the desert tortoises, a female. Both claimed my yard as their territory. They charged at each other intending to ram their opponent. Just before they collided, each would pull her head back into her shell. Both desert tortoises found new homes. Note: this is a common mistake made by many new tortoise keepers. Tortoises so distinctly different should never be kept together.

Range Description

This species occurs in Mediterranean Europe, from coastal

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Fig. 1. Shelley with the two desert tortoises.

northeastern Spain, through southeastern France, Mallorca (Spain), Menorca (Spain), Corsica (France), Sardinia (including Asinara Island) and Sicily (Italy), the coastal plains of peninsular Italy, coastal Croatia, coastal Bosnia-Herzegovina, coastal Montenegro, central and southern Serbia, inland to southwestern Romania, much of Bulgaria, Macedonia, nearly all of Albania, the Greek mainland plus islands from Corfu to Zakynthos, and European Turkey. Records from Cyprus are likely to be in error (van Dijk, P.P., Corti, C., Mellado, V.P. & Cheylan, M. 2004).

Testudo hermanni Subspecies

Gmelin first described the Hermann's Tortoise in 1789. The sci entific name of this species is *Testudo hermanni*.[1]

[1] The tortoise we now recognize as *Testudo hermanni* was first described by J. F. Gmelin in 1789 within the 13th edition of the Systema Naturae (Amphibia et Pisces).

In 1976 Shelley would have been identified as *Testudo hermanni hermanni* and could trace her heritage to the eastern population of Hermann tortoises and more specifically to Bulgaria. In 1976 the western subspecies was identified as *T. hermanni robertmertensii*.

The French, or Western race of Hermann's tortoise was known as *Testudo hermanni robertmertensi* Wermuth 1952. Work by Roger Bour (1987) has demonstrated that these attributions are erroneous, and that the nominotypical species is actually that of southern France, previously referred to *T. h. robertmertensi*.

Two subspecies are currently recognized, *T. h. hermanni* and *T. h. boettgeri* (includes *hercegovinensis*).[2]

Physical Differences between the Subspecies

Both subspecies have the horned-tipped tail and most Hermann's tortoises have a split caudal scute, the scute above their tail. Hermann's tortoises are found in the collections of many tortoise enthusiasts. Most of these pet tortoises are from the eastern range of their distribution. However, occasionally there are some in their collections from the western range, the *T. h. hermanni*.

[2] Highfield, A.C. Notes on the Systematics and Ecology of *Testudo hermanni* Gmelin 1789.

Testudo hermanni hermanni

Fig. 2. Carapace view of two *Testudo hermanni hermanni*.

A distinctive characteristic found on *T. h. hermanni* are the pairs of dark bands found on their plastrons. Nearly all of the scutes on their plastron will be black.

Fig. 3. Plastron view of two *Testudo hermanni hermanni*.

T. h. hermanni can also be found in Italy, and individuals from this group

are also found in the pet trade. Their adult size is identical to the French cousins; the main difference is that their carapace colorization is not as intense. [3]

Testudo hermanni boettgeri

Plastron view of a large pair of *Testudo hermanni boettgeri*. The carapace view of these tortoises is on page 1.

The eastern subspecies has been given the nomenclature *T. h. boettgeri*. They are separated without subspecies separation into two families, based on size and appearance. The larger of the two groups are commonly referred to as "Bulgarian Giants." They are called "giants" because they can achieve a carapace length of 14 inches (357 millimeters). "Shelley" was 11 inches (280 millimeters).

These groups of Hermann's tortoises are those most commonly held by tortoise enthusiasts. I have had both of these groups in my collection.

Husbandry

Shelley succumbed to pneumonia in 1984 as a result of a freak rainstorm that dropped 10 inches (25 centimeters) of rain in three hours. I found her stretched full length against a planter in 10 inches of water. She was in this position for hours, and, sadly, I didn't bring her in for medical care.

In 1990 I was able to acquire more Hermann's tortoises. I also obtained enough knowledge to adequately care for their needs.

Hermann's tortoises can live outdoors year-round where I live in Southern California. They will need a dry place to sleep, preferably in a heated, predator-proof house.

Their pen should be as escape-proof as possible with low-growing shrubbery for hiding and to get out of the sun for managing their body temperatures.

They require access to water for drinking, soaking, and elimination of urates, the semi-solid, white substance excreted from the cloaca.

Tortoises are 'programmed' not to use water in the bladder to eliminate these urates unless replenishment is available. Depriving the tortoise of water will result in urates being accumulated, often to dangerous levels. [4]

A common question we hear is this: "Can I keep other tortoise species with my Hermann's tortoise?" Keepers of Mediterranean tortoises, including myself, have kept the Marginated tortoise (*T. marginata*) with Hermann's tortoises with no ill effects.

Mrs. Lillian Greene, a long-time legend in Southern California tortoise lore, kept all of her species in separate pens with the lone exception of Hermann's and Marginated tortoises. They were kept in the same pen for many years. I remember one spunky, small male Hermann's tortoise almost acting as a referee for a Marginated tortoise male-to-male combat.

Tortoises of the *Testudo graeca* complex (Greek tortoises) should never be kept with Hermann's tortoises, or for that matter, with any other species of tortoises.

The males of the *T. graeca* complex have an insatiable desire to ram other tortoises using their gutteral (i.e., gular) scutes. The shells of Hermann's tortoises cannot withstand this onslaught.

Diet

Hermann's tortoises are largely herbivores and will eat grasses, leaves, fruits and flowers. Bermuda grass seems to be their preference. Grape leaves are devoured. Pink, double hibiscus flowers are their favorite. This diet can be supplemented with high quality greens, such as endive, escarole, dandelions and mustard greens. They are fond of cooked

An enclosure housing Hermann's tortoises (*Testudo hermanni*) and Marginated tortoises (*T.marginata*) featuring numerous hiding places and plenty of plant cover.

[3] Personal observation of an individual purchased from a breeder.

[4] Highfield, A.C. Tortoises: Do They Need to Drink?

and sliced orange yams. Servings of fruit such as loquats or cantaloupe are eaten with enthusiasm.

Breeding and Mating

Plastron view of two recently hatched Hermann's tortoises with a U.S. quarter for scale.

Mating activity is the heaviest in April and May and will continue throughout their active months. It may be necessary to separate the females during their nesting period that begins in June and July. Courtship tends to be vigorous and intense, and females may end up with bite marks. These wounds should be dealt with as soon as possible. Open wounds are an invitation for houseflies to deposit eggs that can form into maggots in a very short time.

Females prefer to nest on mounds of root-free, fairly loose soil amended with sand. Their nests will be about as deep as their rear legs can excavate the nest site. A typical clutch would be 3 to 8 eggs. Clutch size will increase as females grow older.

Eggs should be artificially incubated. Eggs should be carefully removed from the nest site and marked with a soft lead pencil and kept with the marked side up during incubation. I incubated Hermann's tortoise eggs in a plastic tub in vermiculite moistened 50/50 by weight with water, at 87 to 88°F (30°C). If the eggs are fertile, after a week to 10 days, you will see a circle under the mark on the shell. Hatching, starting with pipping, can occur any where from 68 to 90 days.

Long-time Turtle and Tortoise Care Society member Betty Caldarelli had a friend who was seeking qualified buyers for the progeny produced by her pair of Hermann's tortoises. I purchased a two-year-old female and a one-year-old male. I kept them in the same pen for a year. I learned the hard way when Hermann's tortoises achieve adulthood. The pair had mated and produced a clutch of two live babies. Sadly, one drowned in a water dish and the other died trying to get out of the nest.

Tortoises are particularly long-lived animals, which are generally presumed to live as long as 70–100 years. This estimate is, of course, dependent on many factors. According to the web site Shelled Warriors (**www.shelled-warriors.co.uk/**), the longest-lived living Hermann's tortoise of today is named Little Foot. Owned by a Miss S. Emiliou in the UK, the tortoise is said to be 118 years old as of 2009 (source: TrekNature web site **www.treknature.com**).

Care of Hatchlings

I place the eggs on damp paper towels in a plastic tub after they start to pip. I then put the tub back into the incubator until they are out of the eggshell. They will still have an egg sac, so I again place them back into the tub and on a clean, dampened paper towel. They will stay like this in the incubator until the egg sac is fully absorbed. In the meantime I get a terrarium set up for them. Their new home will be a terrarium with a substrate of 50/50 peat moss and ground coconut fiber (coir).

After a few days I start feeding the hatchlings high quality greens and *Opuntia* cactus. About 2 or 3 times a week their food is sprinkled with reptile vitamins and calcium. They will need regular soakings and be kept warm. I tried to keep a temperature gradient with a drop of 10° F from one end of the enclosure to the other. On warm days I would bring them outdoors in a protected environment to give them shade and safety from birds. I once had a one-year old *T. h. hermanni* killed by a large crow.

Habitat

All tortoises will do better in captive conditions if they have an interesting pen. This will involve making mounds, adding rocks and shrubs for providing places to hide.

I thought I had a large male that escaped from his pen until I noticed him completely buried in a nesting mound except for his head.

Hibernation/Brumation

Mammals hibernate and tortoises brumate. The term "brumation" refers to the period of winter dormancy observed in many reptiles.

A terrarium set up to house hatchling and juvenile tortoises, including such accessories as a heat lamp, UV fluorescent fixture, hide boxes, shallow water dish, etc.

Hermann's tortoises will start to slow down in late fall or early winter. In Southern California it really never gets as cold as it does in their home range, so their period of brumation is not predictable. Mine would just go in their home and burrow down in the substrate until they decided they had had enough.

A fellow tortoise enthusiast here in Southern California put his

The large male tortoise I thought had escaped from his pen until I spotted him hiding in a nesting mound with only his head visible.

There is also an attempt – so far unsuccessful – to move the Hermann's tortoises into a new species entitled *Eurotestudo*. Another unsuccessful endeavor involves a move to grant separate species designation to *T. h. boettgeri*. Even if these attempts are successful, it will not change how we care for our Hermann's tortoises. ☯

Ralph Hoekstra has kept tortoises for over 45 years, having kept most of the species that are (or were) available in the pet trade. He is a past president of the Turtle and Tortoise Care Society (Long Beach) of the California Turtle & Tortoise Club.

Testudo collection on a rigid brumation schedule. He would hold back on their food for about 3 weeks beginning in October. He would then collect them and place them in containers in a refrigerator set for around 45°F (8°C). He kept the door ajar for air exchange. He would take them out of the refrigerator in late March or early April. He did this for years with no adverse effect. In fact, this "forced" brumation has a positive effect on tortoise physiology.

The Tortoise Trust has completed research in this area. They noted an increased level of liver disease and decline in fertility in tortoises that are not allowed to brumate long-term. Their conclusion is that only sick, fragile and very underweight tortoises should be kept "awake" (not allowed to brumate).

I totally agree with Michael J. Connor when he said this about Hermann's tortoises in an article he wrote for the CTTC *Tortuga Gazette*: "In my experience, Hermann's are among the bright stars as far as turtle intelligence is concerned. Captives quickly become very tame, and often show distinct individual characteristics and behavior patterns. My adults, some of which are free to wander about my backyard, often follow me when I am out gardening or doing yard work, just in case I should happen to have a treat for them or should happen to uncover a tasty slug or snail."

Conclusion

Both Hermann's tortoise subspecies will do well in captivity outdoors here in Southern California providing that their basic needs are met. They should be provided with a secure enclosure, safe from predators –namely raccoons. Their house should have a means to secure the door. Access to water is a must. Mounds of dirt for nesting and burrowing are a requirement, as are low-growing shrubs for hiding and to get out of the sun for body temperature regulating. Under these conditions, provided you have males and females, you should be rewarded with fertile eggs for incubation.

A nesting Hermann's tortoise; she laid a total of four eggs.

Afterword

There is an ongoing attempt to add another subspecies to the Hermann's tortoise species, *T. h. hercegovinensis*. This proposed inclusion into the *T. hermanni* species is based upon differences in the pectoral and femoral scutes on the plastrons of Hermann's tortoises identified as *T. h. boettgeri*.

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Originally published in the *Tortuga Gazette* 48(6), November/December 2012.

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**

Phantasticus Lives!
In the find of the century, biologists found a female Fernandina giant tortoise, *Chelonoidis phantasticus*, living in one of the isolated patches of vegetation that has survived lava flows from La Cumbre volcano.

Videos
- **The capture showing her native habitat**
- **In captivity on Isabela**

What the Tortoise Taught Us
New insulin delivery system was inspired by a leopard tortoise!!!!

Desert Tortoise Head-starting Strategies
Biologists examine the trade-offs of rearing tortoises indoors, outdoors and after direct release. Indoor-reared tortoises grow faster than direct-released and outdoor-reared tortoises but have softer shells and lower weights.

Sulawesi Forest Turtle
Take a video walk through the Sulawesi Forest Turtle habitat at the Riverbank Zoo.

Temples Are Key Refugia for Assam's Turtles
Head-started black, Indian, and peacock softshell turtles from temple ponds in Assam and Bangladesh are re-populating the wild.

New Asian Softshell
A new species of softshell turtle, *Pelodiscus variegatus*, from north-central Vietnam and Hainan Island, China.
Read the research paper

Chasing Yangtze River Giant Softshells
Brent Crane searches for the two *Rafetus swinhoei* known to be left in the wild.

Painted Turtle Navigation
Some turtles use magnetic fields to find their way around; painted turtles rely on their memories!

South Australian Turtles Face Trouble
Drought, invasive species, and habitat destruction are taking a toll on South Australia's remarkable turtles.
The full report is available

Global Conservation Status of Turtles and Tortoises
An international team of scientists reviews and analyses the conservation status of all 360 currently recognized species of living and recently extinct turtles and tortoises.

SWOT Report
The fourteenth State of the World's Sea Turtles report.

Indian Ocean Turtle Newsletter
Latest issue available for free download.

African Sea Turtle News
African Sea Turtle Newsletter #10 now available.

Leg Tumor in Fossil Turtle Relative
A specimen of the Chihuahua-sized, *Pappochelys rosinae*, a shell-less turtle relative that lived 240-million-years ago was afflicted with a type of bone cancer similar to osteosarcoma found in humans.

Linda Cayot Retires
Giant tortoise biologist Linda Cayot has retired after 38 years with the Galapagos Conservancy.

Bob Thomas Retires
Longtime enthusiast Bob Thomas has retired and handed over his Arroyo Grande Turtle and Tortoise Sanctuary to new owners.

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Galápagos Conservancy News

155 Captive-Reared Tortoises Released on Santa Fe Island

28 February 2019—A group of 155 juvenile Española tortoises (*Chelonoidis hoodensis*) were recently released on Santa Fe Island as part of ongoing efforts to restore its ecosystem. The original Santa Fe tortoise species went extinct more than 150 years ago, so the island is being repopulated with a tortoise species similar to the original Santa Fe tortoise.

Jorge Carrión, director of the Galápagos National Park Directorate (GNPD), commented: "All the released tortoises have an intra-dermal identification microchip to facilitate their monitoring in the future. The tortoise is the largest herbivore of the Archipelago, and its release on Santa Fe aims to fulfill its role as 'ecosystem engineer' and contributes to the dispersal of species such as *Opuntia* cactus."

Prior to their transfer from the Fausto Llerena Breeding Center on Santa Cruz to Santa Fe, rangers ensured the tortoises complied with rigorous quarantine processes. Upon the landing in the bay on Santa Fe, 11 park rangers and four scientists unloaded the tortoises from the boat and carried them to the release area on the island.

The recovery plan for Santa Fe includes the annual release of juvenile tortoises to Santa Fe until 2026. GC's Wacho Tapia, Director of the Giant Tortoise Restoration Initiative, explained, "The first tortoises released in 2015 are currently between 10 and 12 years old so they are expected to start reproducing in the next five to seven years." The new inhabitants of Santa Fe add to the 394 that have been released in the past four years since this program began. ☯

— Galápagos Conservancy press release

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An Introduction to the Ingestion of Stones, Bones, Fossils and Soil by Turtles by M. A. Cohen

While firsthand observations of this phenomenon are rare, the ingestion of external mineral sources such as stones, bones, fossils, and soil by various turtle species has been documented through field research, scat analysis, and radiography.

Some turtle keepers may be unfamiliar with the behavior described in this article, and some may think this article refers to bladder stones, with which many tortoise keepers are familiar. To avoid ambiguity, it is necessary to clarify the concepts.

Bladder stones, known to science as uroliths, are formed internally and are composed of urates, i.e., uric acid waste products. While the exact cause of bladder stones is unknown, two factors—dehydration and too much protein in the diet—are suspected as contributing to the formation of the uroliths.

The focus of this article is external mineral sources found in the environment and ingested by the animals. In a subsequent section of this article, instances of this behavior from the research of the scientific community will be briefly described.

Terminology

geophagia (also known as geophagy): ingestion of soil substrates, often those rich in clay or limestone. Geophagy occurs in humans and other animals, and reasons for this practice vary by species.

lithophagia (a.k.a. lithophagy): ingestion of small stones to aid digestion, among other probable reasons.

osteophagia (a.k.a. osteophagy): ingestion of bones and bone fragments for purposes of mineral supplementation. Osteophagy provides additional calcium, phosphorus, and other minerals to an herbivore whose diet is typically low in these essential minerals.

Ingestion of soil (geophagy)

Geophagy is a behavior known in humans and other animals. As a traditional cultural practice, humans consume soils for various reasons. Pregnant women in some developing countries believe nutrient-rich soils are beneficial to their pregnancies, some religious observances include the ingestion of soils, and, in areas of extreme poverty, residents may consume soils to supplement a meager diet.

Researchers documenting the ingestion of soils in turtle species surmise that this behavior is primarily for mineral supplementation. Analysis of clay soils consumed by pregnant women in Africa reveals that these soils contain nutrients critical to bone formation (Rosenberg, 2018). Turtles may swallow coarse soils such as sand for the same reasons they ingest small stones, i.e., for grinding tough foods, for controlling internal parasites, and as a source of minerals.

Ingestion of stones (lithophagy)

Generally accepted is the fact that the herbivore diet comprises vegetation and seeds that are difficult to digest because herbivores typically lack grinding teeth. The ingestion of small stones that are retained within the digestive tract assists in the breakdown of the tough cell walls of certain foods, rendering the nutrients within the foods available to the animal.

According to Esque and Peters (1994), other theories of stone ingestion include the following: the presence of stones helps to control intestinal parasites, to neutralize toxic properties of plants, and to maintain of a healthy intestinal pH (acidity/alkalinity balance). Turtles possibly absorb essential minerals such as calcium and phosphorus from the swallowed stones.

Gastroliths

Composed of the Greek root words *gastro-* , meaning stomach, and *-lith*, meaning stone, the term "gastrolith" is generally defined as a stone retained within the gastrointestinal tract to aid in the digestion of tough foods.

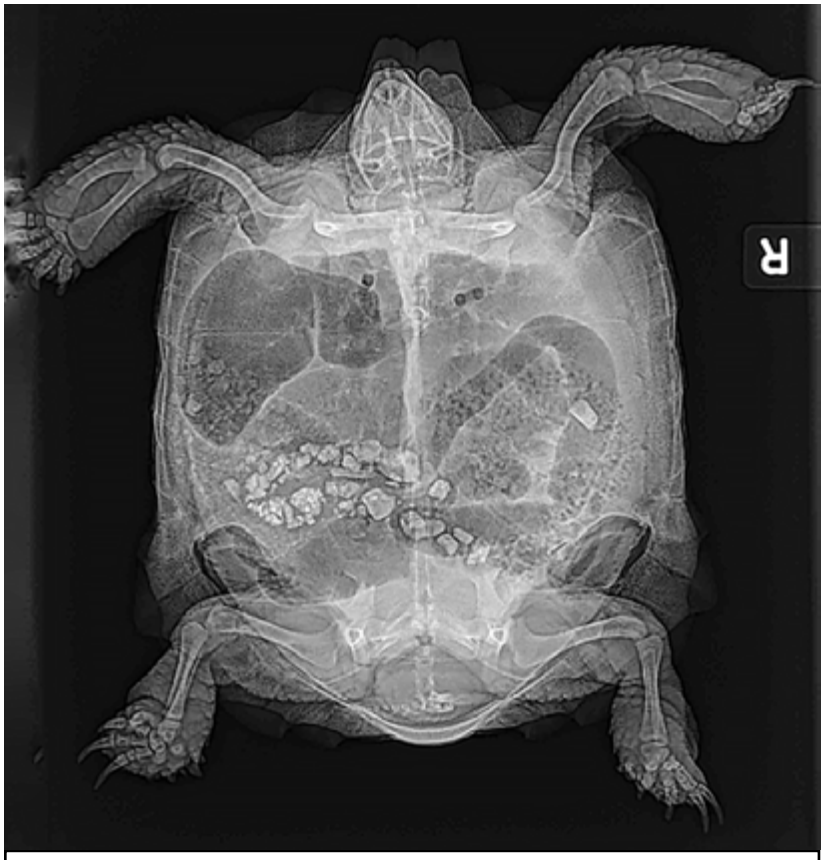
Researchers document that some birds, fish, and reptiles swallow small stones to aid digestion. Researchers also document the ingestion of gastroliths by amphibians and crocodilians, theorizing that, in these cases, the practice serves to control the animals' buoyancy.

Gastroliths, also known as stomach stones or gizzard stones, help to grind tough food items like fibrous vegetation and the hard shells of seeds for herbivores that lack grinding teeth. Scientists have recorded the sizes of gastroliths ranging from sand particles to cobblestones depending on the size of the animal ingesting the gastrolith.

Ingestion of bones and fossils (osteophagy)

Calcium, a vitally important mineral to turtle species, is essential for normal skeletal and shell development. Turtles have exceptionally high calcium requirements because of the amount of bone tissue in their bodies. Female turtles of reproductive age require additional calcium during egg development because both the egg yolk and the egg shell are calcium-rich materials (Yost et al., n.d.).

Osteophagy is the most frequently observed of the three ingestion



X-ray of a large male desert tortoise, *Gopherus agassizii*, that swallowed numerous small rocks. The tortoise was turned in to the CTTC Valley chapter by a private party, who had fed the tortoise a diet of kale, radicchio, and Mazuri pellets. The private party kept the tortoise in an enclosure on a substrate of coconut fiber, which the tortoise had apparently been eating.

When the tortoise presented to the veterinarian, it was neither eating nor passing feces. Dr. Kenneth Coscarelli of the **Newbury Park Veterinary Clinic** ordered a diagnostic x-ray, and, following evaluation, recommended a treatment regimen. The treatment included the prescribed medications cisipride and metaclopramide, both of which are used to assist in emptying the stomach and assisting in intestinal motility, plus soaks in warm water.

The diet of the tortoise was also modified the include a chopped salad of organic dandelion greens, a very small amount of organic kale, with some organic iceberg for extra water. To increase the fiber, a small amount of soaked Mazuri pellets made into mush or soaked Bermuda grass hay pellet mush was mixed in with the greens.

By the end of the first week of treatment, four small rocks were passed. It took about two months total to get the rocks completely out.

As of mid-February 2019, this tortoise is in foster care awaiting adoption.

Radiography by Newbury Park Veterinary Clinic; the image is reprinted with permission from the Clinic.

behaviors in turtles, and is observed in both wild and captive individuals. Turtles ingest small bones, bone fragments and fossilized bone to supplement their mineral needs. Bones and fossils are rich sources of minerals, not only calcium and phosphorus, but also trace minerals including magnesium, manganese, potassium, selenium, boron, copper, zinc, and many others.

Instances of geophagy, lithophagy, and osteophagy in turtles

Box turtle

Keepers of North American box turtles, *Terrapene* species, have observed osteophagy in their pets (Naish, 2014). Consuming bone fragments and gnawing on larger bones supplement the omnivorous diet of the box turtle with added calcium, phosphorus, and other minerals.

Desert tortoise

Mineral ingestion behavior by the desert tortoise (*Gopherus agassizii*) is well-documented. Esque and Peters (1994) cite instances of mineral ingestion in wild desert tortoises, surmising that this behavior compensates for mineral deficiencies in desert soils and desert plants.

While all desert tortoises require mineral macronutrients and micronutrients for optimal health, it is the young tortoises and the gravid females that have the greatest need for supplemental minerals. Young tortoises need these nutrients for skeletal and shell development, and gravid females require added nutrients for egg development.

Through their field studies in the Mojave Desert, Esque and Peters (1994) found that desert tortoises ingested only *white* stones, not gray, tan, or other colors. In the Mojave, white stones are largely formed of caliche, also known as calcite, which is primarily composed of calcium carbonate.

Desert tortoises have been known to mine caliche soils for ingestion purposes. Researchers R. W. Marlow and K. Tollestrup observed female tortoises scraping away the topsoil to reach the caliche subsoil, as documented in a paper published in 1982. Subsequent research revealed that local desert tortoises routinely visit caliche mines for purposes of mineral supplementation.

Osteophagy in desert tortoises has been observed in both wild animals and captives. Tortoises ingest small whole bones from carrion and gnaw on weathered bones and even on the shells and bones of dead

tortoises found in the wild (Esque and Peters, 1994).

Galápagos tortoise

In her Ph.D. thesis, Dr. Linda Cayot (1987) refers to the scat analysis of Galápagos tortoise fecal material and the finding that those analyses reveal the presence of soil particles and gravel in the scat of tortoises in an earlier study.

Studies by Yost et al. (n.d.) indicate that the tortoises inhabiting the oldest, lowest-elevation Galápagos islands are generally the saddle-backed varieties that are usually smaller in overall size and have thinner shells than their larger, higher-domed counterparts from islands with more humid highland habitats.

Depletion of calcium and other vital nutrients in the soils on the older Galápagos Islands account for the fact that the saddle-backed tortoises are smaller overall. Soils in the humid highlands are more nutritionally complete, therefore, the tortoises in the humid highlands grow larger because of their nutritionally superior foods (Yost et al., n.d.).

Gopher tortoise

Native to the southeastern United States, gopher tortoises, *Gopherus polyphemus,* are herbivores. Moore and Dornberg (2014) conducted studies of the species, concentrating on female gopher tortoises. The scientists used field observation, scat photography, analysis of scat samples, and radiography in their research.

Analysis of the gopher tortoise x-rays revealed that 85% of gravid females had stones, bones, bone fragments, or seashells in their digestive tracts, while only 5% of non-gravid females contained such items.

These findings led Moore and Dornberg to conclude that the gravid females engaged in lithophagy and osteophagy to overcome mineral deficiencies in their diet during the formation of their eggs. As mentioned, egg yolks and egg shells are largely composed of calcium, phosphorus, and other minerals.

Close-up of the stones that passed through the digestive tract of the desert tortoise in the x-ray image on page 9. Photo by Karen Berry.

Hermann's tortoise

Documenting scavenging behavior by Hermann's Tortoise (*Testudo hermanni*) in Serbia, Nikolić et al. (2016) note that, while the species is widely regarded as primarily herbivorous, its diet also includes "mushrooms, soil, sand, pebbles, and animal matter," a fact confirmed by several researchers. Scientists confirm that Hermann's tortoise also periodically ingests soil—geophagy—for mineral supplementation.

T. hermanni also feeds on mammal feces, apparently for the bone fragments and hair it contains, as well as on carrion. Such "sporadical carnivorous behavior" is considered to be relic, and it requires additional investigation to better understand the ecological requirements of the species (Nikolić et al. 2016).

Radiated tortoise

While the radiated tortoise (*Geochelone* [= *Astrochelys*] *radiata*) is primarily herbivorous in its dietary choices, the species is an "opportunistic" omnivore, ingesting various types of animal matter for mineral supplementation (Leuteritz 2003).

During his studies of the feeding behavior of the radiated tortoise in southwestern Madagascar, Thomas Leuteritz (2003) recorded the ingestion of fish and mammal bones and bone fragments, snail shells, mammal hair, dried mammal and reptile carcasses, as well as mammal, reptile, and bird feces. His study also documented the ingestion of charcoal and sand by the species.

Mentioned in this study of radiated tortoise behavior is the fact that the leopard tortoise (*Geochelone* [=*Stigmochelys*] *pardalis*) also engages in osteophagy, according to a 1992 paper by S. J. Milton published in the *South African Journal of Zoology*.

Red-footed tortoise

An omnivorous forest tortoise endemic to northern South America, the red-footed tortoise (*Chelonoidis carbonaria*) consumes more fruit than any other single food item. Like many other tortoise species, however, the red-footed tortoise is an opportunistic feeder.

Wang et al. (2011) conducted studies of the species in the Pantanal, an enormous wetland region in Brazil. Their research confirms that, in addition to fruit, flowers, and leaves, the species also ingests a variety of other items, including invertebrates such as ants, snails, and termites, vertebrate carrion such as bones, egg shells, feathers, scales, and skin, fungi such as mushrooms and toadstools, and soils.

Following scat analysis of samples from both male and female red-footed tortoises, Wang et.al. (2011) identified vertebrate carrion in 25% of the females' scat though it was only 12.5% of their total intake. One might conclude that females ingesting such mineral-rich items as bones and egg shells could be related to reproduction, specifically to the development of egg yolks and egg shells.

Researchers also observed red-footed tortoises ingesting sand

during their foraging activities and identified sand in scat analyses. Sand could aid in the digestion of tough foods, and might be a source of minerals for the tortoises. ☯

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Meetings and Programs

Click on your Chapter's website link for the latest program information. Programs may be scheduled after newsletter publication.

Chino Valley
15 March; 19 April

Foothill
22 March; 26 April

High Desert
11 March; 8 April

Inland Empire
1 March; 5 April

Kern County
11 March; 8 April

Low Desert
1 April

Orange County
8 March; 12 April

Ridgecrest
11 March; 8 April

Santa Barbara-Ventura
Contact the chapter for meeting information.

Santa Clarita
16 March – Regina Conroy on "Wildlife and You"

TOOSLO (San Luis Obispo)
19 March; 16 April

TTCS (Long Beach)
15 March; 19 April

Valley
15 March; 19 April

Executive Board
13 April. Meetings take place at the Los Angeles County Arboretum in Arcadia, CA.

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The female park rangers protecting turtles from traffickers in Nicaragua by Monica Pelliccia

posted on **Mongabay** on 21 December 2018

- The female park rangers in Nicaragua's San Juan del Sur area patrol the beaches against the theft of eggs from endangered sea turtles that nest there.
- Species like the leatherback turtle have dwindled to less than 3 percent of their population in the eastern Pacific in the last three generations.
- In Nicaragua, an estimated more than 6,000 dozen turtle eggs are sold every month, with restaurants by the coast offering them in dishes as part of their menus.
- The NGO that hires the rangers say they manage to preserve 90 percent of turtle nests on the beaches they patrol, compared to 40 percent on government-patrolled beaches.

Park rangers Yajaira Vargas and Karen Lacayo in the El Ostional nursery where they work daily. Image by Monica Pelliccia.

The sign near the nursery door reads as follows: "*En esta playa anidan tortugas marinas. Mantenla limpia.*" This sign translates as "Sea turtles nest on this beach. Keep it clean."

The lights draw uncertain lines under the blanket of stars that joins the sea to the sky at El Ostional Beach in southern Nicaragua, 30 kilometers (19 miles) from the border with Costa Rica. The silence of the darkness is interrupted by the noise of waves crashing on the shore and the clicks of flashlights turning off and on again a few meters apart, like lonely fireflies.

The flickering flashlights belong to *hueveros*, turtle egg traffickers who scour the beaches of La Flor Wildlife Refuge, a marine conservation area, every night.

"Tonight, there are quite a few *hueveros* because an olive ridley sea turtle laid its eggs yesterday," says Yajaira Vargas, a park ranger at El Ostional. "They usually nest during the waning moon."

Vargas, 30, is one of the five women who work as park rangers for the NGO Paso Pacífico, which promotes biodiversity conservation initiatives in Nicaragua. The organization started hiring women as park rangers in 2009, and more women have joined their ranks since then.

An olive ridley turtle heads back to sea after nesting at an undisclosed location. Photo © 2004 by Brad Flickinger. Source Wikimedia Commons; license CC-BY-2.0.

Sea turtles return to the place where they were born to reproduce. They follow routes that are known to the rangers, and to the egg traffickers. El Ostional is one of many nesting spots along Nicaragua's Pacific coast.

A few kilometers from El Ostional sits La Flor Beach, one of seven mass nesting sites for sea turtles in the world. Thousands arrive here between July and December every year to lay their eggs. In a single week, 70,000 turtles might cram onto the sand, according to Liza González, the head of Paso Pacífico.

It's an attraction for tourists and residents, and the eggs are a treasure for those who take and sell them illegally.

"There is egg theft on all the beaches," González says, adding that, in places without park rangers, traffickers snatch nearly all of the eggs.

"On mass nesting beaches controlled by the Ministry of Environment and Natural Resources, the looting is estimated at 40 percent," González says. "We succeed in protecting more than 90 percent of nests in the spots where our rangers work."

Following the moon

The previous night, Vargas saw an olive ridley sea turtle (*Lepidochelys olivacea*) emerge from the water and walk around on the sand until it

found a hidden spot to lay its eggs. It used its flippers to dig a hole around 50 centimeters (20 inches) deep, and then it stayed there for another 40 minutes laying 70 eggs, one after another.

Once the work was finished, the turtle covered the hole and went back to the ocean. It will never meet its hatchlings, who will be born after 45 days. At that point, they'll have a gauntlet to run, as they try to avoid predators that hunt them from the air, such as cormorants and seagulls, as well as those in the sea, like white sharks and killer whales.

Vargas always pays attention to the sea, even when she isn't working. She studies the phases of the moon to understand the life cycle of turtles, a rhythm she learned about during her two years as a night ranger with her colleague, Karen Lacayo.

Vargas says she loves her job. She has imparted her passion to the other members of her family, especially to her oldest daughter, 6-year-old Shanti Sofía.

"If we want to tease her, we tell her we'll be eating turtle eggs," Vargas says as she pulls her hair up to reveal her turtle-shaped earrings. "My daughter says that eggs need to hatch [on the beach], not in the mouth."

Shanti Sofía is a junior ranger, and like most of the children who attend the communal school, she's involved in the educational programs organized by Paso Pacífico.

Although nighttime is when the action takes place, the female rangers only work the daytime shift. Still, their strategy is the same.

"When we see a *huevero*, we go to him and try to convince him that if he keeps stealing eggs, his children won't ever see a turtle because they'll be extinct," Vargas says during a patrol on El Ostional.

"Many *hueveros* tell me that they would like to give me their loot, but they need it because it's their only source of income. They don't have any other options. That's why we try to exchange the eggs for money, incentives or vouchers that they can use to buy food in the grocery store."

Yajaira Vargas, a park ranger at El Ostional Beach in Nicaragua, patrolling the beaches of La Flor Wildlife Refuge on the lookout for sea turtles. Image by Monica Pelliccia.

Four endangered species

Twice a month, Vargas and fellow ranger Lacayo take a boat out to monitor the turtle populations in the marine protected area. All of the area's sea turtle species are classified as vulnerable, endangered or critically endangered on the International Union for the Conservation of Nature's Red List. The most frequently encountered is the olive ridley turtle, whose population has been nearly halved in the last three generations. The other local species are even more threatened. Numbers of the green turtle (*Chelonia mydas*), which can weigh up to 300 kilograms (660 pounds), are down by more than 60 percent in the last three generations, and the hawksbill turtle (*Eretmochelys imbricata*) is almost extinct, having lost 80 percent of its population in the last three generations.

Green turtle (*Chelonia mydas*) grazing on seagrass. Photo © 2013 by P. Lindgren. Source: Wikimedia Commons; license CC BY-SA 3.0.

Leatherback turtles (*Dermochelys coriacea*), however, have seen some of the biggest declines in the eastern Pacific: Their population is now less than 3 percent of what it was three generations ago, according to the "State of the World's Sea Turtles" (SWOT) report that focuses on the problem in South America. The main threats to turtles identified in the study include incidental capture in deep-sea fishing equipment, egg theft, and the construction of hotels and other buildings near their nesting sites, which complicates the laying of eggs due to light pollution and human presence.

Turtle eggs are a valuable commodity, especially between December and July every year, when the mass arrivals of sea turtles are still a few months away. Only occasionally will a turtle leave the ocean to lay eggs during this time.

To improve their success rate, people who steal eggs go waist-deep into the water, catch the turtles and haul them up onto the beach, carrying up to three at a time in their arms. Then they watch them while they lay their eggs, sometimes even placing a bag under the turtle so they catch every single egg.

Over the next few days, they'll sell the eggs for $1.50 or $2 a dozen. An estimated 6,250 dozen eggs are sold every month in Nicaragua, valuing the trade at up to $13,000, according to a 2012 report by Fauna & Flora International. Most of the people interviewed for the report said they had eaten turtle eggs because it's a typical food in Central America. It's also thought to be healthy and have aphrodisiac powers.

The hunters usually sell the eggs in the markets of the capital, Managua, or in the city of Masaya, close to the active volcano of the same name. When the turtle nesting season is in full swing, the markets are full of eggs. Vendors display them in their kiosks, and some restaurants along the coast in Managua and León offer dishes that contain turtle eggs.

Rangers Darling Delgado and Liessi Calero patrol Brasilon Beach in Nicaragua in April 2018. Image by Monica Pelliccia.

Mongabay Latam contacted Ronald Miranda Mejía, an official with the Ministry of Environment and Natural Resources in the Department of Rivas, to ask about turtle egg theft in the eastern Pacific. He hung up the phone after hearing the question.

Turtle egg consumption and theft is illegal under a 2005 law. Penalties range from jail time of two to four years and fines of up to $10,000. In practice, however, no one stays behind bars very long for these crimes, according to locals working with Paso Pacífico.

Despite the prohibition on the trade and the threat of extinction that turtles face, egg theft is a common practice on these beaches.

Relying on the Pacific

The ocean is at the center of life for Nicaraguans born and raised in the communities next to the turquoise waters of the Pacific, and turtles are an integral part of it. They're a national symbol, appearing on some of the country's banknotes.

Nicaragua is one of the worst-performing countries in the Americas on the United Nations' human development index. The country has been mired in a deep political crisis since late April 2018, leading to massive demonstrations by students unhappy with changes to social security and other reforms. The protesters have also complained about oppression in the streets and demanded the resignation of President Daniel Ortega. More than 250 people have died and 1,800 injured during the protests and subsequent crackdowns, as reported by the Inter-American Commission on Human Rights.

Amid this political strife and lack of employment opportunities, families in the region have had to rely on the sea for survival, even when that means trafficking turtle eggs. All of the female rangers know of neighbors, relatives and friends who steal turtle eggs. Many of the rangers themselves did the same in the past.

"My mother-in-law used to be a *huevera*. She started stealing eggs to settle debts she had contracted when she was sick," says Liessi Calero, a 29-year-old park ranger who has patrolled Brasilon Beach for two years. "The police arrested her when she was coming back by bus from taking eggs with other women, and she spent a month in prison. When she was released, she stopped doing it."

Every day at dawn, Calero and fellow ranger Darling Delgado put on their blue uniforms and go to work. They used to spend the day doing house chores and taking care of their families. Now they walk to the main street and wait to hitch a ride or take the first bus to Brasilon Beach, 7 kilometers (4.4 miles) from El Coco, where they live. El Coco is a village of 200 inhabitants on the road to touristy San Juan del Sur, a renowned surf mecca. It's also a place where the extraction of turtle eggs is a practice that goes back generations.

At 6:30 a.m., they arrive at Brasilon, a white-sand beach where pelicans soar above long waves beyond the break, ending their horizontal flight to dive into the water for fish. Calero and Delgado watch the beach to prevent the theft of the eggs laid by the turtles during the night.

"We start the day by revising the notes that the night rangers left for us, where we can see the turtles

Leatherback turtle (*Dermochelys coriacea*) nesting on a Caribbean Island. Photo by USFWS. Public domain.

The hawksbill sea turtle (*Eretmochelys imbricata*), famous for its colorful shell, is almost extinct. Its population has decreased by 80 percent in the last three generations. Photo by USFWS. Public domain.

that arrived during the previous night," Delgado says. "We locate the nests and move [the eggs from] the ones that could be in danger to the nursery under this tree. We tag each of the points where we bury the eggs to indicate the hatching date."

Each hatching is a big event for the rangers. For many, it's the best part of their job. Once the baby turtles hatch, the rangers, accompanied by their children, wait until the evening to release the baby turtles, when there are fewer hungry predators in the sky and the sea. They also clean up the plastic waste brought in by the tide because it makes nesting more complicated. The trash is yet another obstacle that the little turtles have to contend with in their struggle to survive.

"We are the only organization that employs women rangers in the country, which is rare throughout Latin America," Paso Pacífico's Liza González says. "They have shown clear leadership: They used to be housewives, and now they play a very important role for the livelihood of their families and for the conservation of the environment."

'I used to steal eggs. Now I'm a park ranger'

The sun is at its highest point above Brasilon Beach. It's 1 p.m., and Calero and Delgado must get back home and leave their spot to the evening park ranger, Félix Pedro Reyes, who will work until 6 a.m., checking each of the lights that appear on these beaches at night.

"I was born in a community of *hueveros*. I was raised in the Pacific Ocean. I've lived by the sea my entire life. The Pacific has always responded to all our needs," Reyes says. "I became a *huevero* at 9 years old with my group of friends. We used to sell the eggs to international traders. I was the leader of the gang. Back then, I didn't understand what I was doing."

For many years, Reyes used to go out to steal eggs every night. But a revolution engulfed Nicaragua in the late 1970s, and at 13 years old, Reyes went to fight with the insurgent Sandinista National Liberation Front. More than five years passed before he could return to his home and his ocean. By then, he was suffering from post-traumatic stress disorder, and it would be years before he could live a normal life again. Every night, he would hunt for turtle eggs the same way he now guards their nests.

"I used to take everything there was on these beaches, until one night, after stealing the eggs of five green turtles that had come to La Flor, I realized that people were doing the same on the neighboring beach," Reyes says. "I started thinking that we were exhausting our natural resources and that if we continued, the future generations wouldn't know about turtles."

Maura Antonia Martínez had a similar epiphany.

"When I was 18, I ate and stole eggs to help my family's economy. I didn't understand the damages we were inflicting upon our environment," Martínez says. "Now I have the chance to feel useful, not only at home. I work to achieve equality and take care of nature."

A single mother of 10 children, today she proudly sees herself as the head of her household, where some of her 28 grandchildren run and play.

"I'm the boss here!" says the 56-year-old one day after returning from her job at the nursery at El Coco Beach.

In the yard, one of her grandchildren is playing with another child, who is chasing a butterfly with a stick. When they see what's happening, her grandchildren tell Martinez that the child is hurting the butterfly. "He is the son of a *huevera*. I'm taking care of him because his mother is in San Jorge Prison. She was arrested for stealing eggs," Martínez says. "She is a single mother who has no one to care for her children."

Martínez approaches the boy and tries to explain to him how important it is to protect nature and to care for the Pacific Ocean, which is part of who they are. ☯

Originally published on **Mongabay** on 21 December 2018. Republished under the Creative Commons license CC-BY-NC-ND.

Author information: Monica Pelliccia is an Italian freelance multimedia journalist. She writes on environmental and social topics, such as biodiversity conservation, women's issues, climate change, indigenous people rights, food security and agroecology.

Paso Pacífico, a conservation organization based in Nicaragua, characterizes its missions as follows: "Our mission is to restore and protect the Pacific Slope ecosystems of Mesoamerica. These habitats include the endangered dry tropical forest, mangrove wetlands, and eastern Pacific coral reefs ... Our innovative approach protects biodiversity where people already live. By working with local communities, landowners, and partner organizations, we restore and protect the habitats that form building blocks for wildlife corridors." For more information, visit the **Paso Pacífico website**.

CTTC Valley Chapter

Turtle & Tortoise Show

Saturday, May 18, 2019
11:00 AM ~ 4:00 PM
Woodland Hills Christian Church
5920 Shoup Avenue, Woodland Hills, CA 91367

For their service during the recent wildfires, Valley Chapter thanks our first responders with FREE admission.

- Live turtles and tortoises
- Information on adoptions, care and conservation
- Tortuga Gift Shop • Raffle
- "Ask the Vet" booth

Admission Fees

Adults	$3.00
Seniors 60+	2.00
Children 6+	2.00
Children under 5	FREE
First Responders	FREE
Active Military & Veterans	FREE

For more information, contact:
Show Chair: Karen Berry theflyingturtle1953@gmail.com
Co-Chair: Cristina Perovich cribetti@gmail.com

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CALIFORNIA TURTLE AND TORTOISE CLUB
WWW.TORTOISE.ORG

ADOPTION EVENT

Saturday, June 8, 2019
10:00 am to 3:00 pm

5007 Center Street, Chino 91710

The CALIFORNIA TURTLE AND TORTOISE CLUB is holding an adoption event to help place turtles and tortoises in approved homes.

Come and talk to our adoption chairs and find out what is required for you to adopt a turtle or tortoise.

No fee required for adoptions. Come and obtain information and required forms to adopt:

DESERT TORTOISE
BOX TURTLE
WATER TURTLE
RUSSIAN TORTOISE
SULCATA TORTOISE

For more information, please contact:

THE CHINO CHAPTER @ jlcalif2@aol.com
THE INLAND CHAPTER @ kttaylor@macdialup.com
THE ORANGE COUNTY CHAPTER @ adoptions.cttcoc@gmail.com
THE FOOTHILL CHAPTER

BACK BY POPULAR DEMAND!!

"LIVE TURTLE AND TORTOISE SHOW"

Returning to the La Habra Community Center

101 W. La Habra Blvd, La Habra, CA 90631

SUNDAY, AUGUST 25, 2019

"Save the Date"

Please join us for this

Fantastic, Fun & Educational Event

on Turtles and Tortoises!

This is open to ALL Chapters of the California Turtle and Tortoise Club (CTTC)

Members of the CTTC

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Vendors/Sellers of Turtle and Tortoise related items.

(Seller and Vendor space is "limited." Please sign up early!)

For further details & information please contact one of the following coordinators

Orange County Chapter – Sharon Paquette – turtlenutz@gmail.com

Chino Chapter – Lynda Misiak – jlcalif2@aol.com

Foothill Chapter Upcoming Events

Friday, April 26, 2019 at 7:00 PM: Annual Plant Auction
The plant auction is a chapter fundraising event. This and all our meetings are open to the public, with free parking, admission, and refreshments.

Plant auction donations include a wide variety of California natives, "tortoise friendly" plants, trees and aquatic plants provided by Steve List, local nurseries, water gardens, and members.

Friday, June 28, 2019 at 7:00 PM: Annual Health Clinic and Micro-Chipping plus Silent Auction
Health clinic includes de-worming and micro-chipping for turtles and tortoises.
De-worming fee: $10^{00}; micro-chipping fee: $20^{00}.
These services are provided by Dr. Dennis Fees of the Arcadia Small Animal Hospital. To participate and receive health services, one must be a member in good standing of the California Turtle & Tortoise Club.

Silent Auction: donations come from restaurants, businesses, stores, gift cards, and specially selected items.

Foothill Chapter meeting location: Los Angeles Arboretum (Palm Room), 301 North Baldwin Ave., Arcadia, CA 91007
Additional information: contact chapter president Robin Robb (951) 359-3003 or **sgrpilot@hotmail.com**

TOOSLO Chapter News

TOOSLO Chapter Changes Its Meeting Day and Location

CTTC's TOOSLO Chapter will change its meeting day and location beginning in March 2019.

The chapter will meet on the **third Tuesday** of each month beginning on **March 19, 2019**. As of this date, the new meeting location will be :

Ludwig Community Center
864 Santa Rosa Street
San Luis Obispo, CA 93401. ☯

Eastern box turtle, *Terrapene carolina carolina*. Public domain

Galápagos Conservancy News

Female Tortoise Found on Fernandina Island

19 February 2019—Galápagos Conservancy's Wacho Tapia, Director of the Giant Tortoise Restoration Initiative, discovered a female tortoise on Fernandina with the help of Galápagos National Park ranger Jeffreys Málaga on a recent expedition to the island. Fernandina tortoises (*Chelonoidis phantasticus*) were believed to be extinct for more than a century, making this a truly monumental find — and an emotional high point in Wacho's life's work:

"The conservation of Galápagos giant tortoises has been my world for 29 years, and I have been involved in many exciting events, including the discovery of a new species of tortoise. But this time, the emotion I feel is indescribable. To find a living tortoise on Fernandina Island is perhaps the most important find of the century. **The only live specimen of the species from Fernandina was found 112 years ago.** Now we just need to confirm the genetic origin of this female."

Park rangers Eduardo Vilema, Roberto Ballesteros, and Simon Villamar also participated in the expedition, which was funded by Animal Planet, and helped transfer the tortoise to the breeding center on Santa Cruz Island. Geneticists at Yale University will evaluate a blood sample to confirm her genetic origin, and another trip to Fernandina is planned for later this year to search for additional tortoises. If more tortoises are located, they will be brought into captivity with this female in hopes that they may breed and young can be reared — eventually to be returned to their native island. ☯

— Galápagos Conservancy press release

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Membership in the CTTC and subscriptions to the *Tortuga Gazette* are handled through the CTTC Chapters. The Chapters also manage membership renewals (see postal addresses below).

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.

Membership fees

- **Student membership** $15.00
- **Individual membership** $25.00
- **Family membership** $35.00
- **Life membership** $500.00

CTTC Mailing Addresses

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

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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 14222, San Luis Obispo, CA 93406

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

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

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