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CALIFORNIA TURTLE & TORTOISE CLUB

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A gopher tortoise (*Gopherus polyphemus*), an ecosystem engineer within the territories it inhabits, photographed at the entrance to a burrow in Florida. Photo © 2018 by Bill Pranty

featured species **Gopher Tortoise (*Gopherus polyphemus*) and Mojave Desert Tortoise (*G. agassizii*)**

Gopherus Tortoises as Ecosystem Engineers by M. A. Cohen

What is a Keystone Species?

In architecture, a **keystone** is a wedge-shaped section of stone at the apex of a masonry arch. The placement of the keystone locks into place the other stones comprising the archway. Metaphorically, a keystone is something that all associated things depend on for support.

In 1969, the ecologist Robert Paine first introduced the phrase **keystone species** to describe an organism that plays a vital role in its ecosystem. Keystone species include life forms as diverse as bacteria, fungi, animals, and plants.

Keystone species are so critical to the functioning of an ecosystem that "if a keystone [species] is removed, it sets off a chain of events that turns the structure and biodiversity of its habitat into something very different" (Denchak, 2019). A keystone species is critical to the functioning of a given ecosystem. Without its keystone species, an ecosystem's biodiversity is dramatically reduced and may cease to exist.

Ecologists have identified five general categories of keystone species. The following list notes the types of keystone species with

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a few examples of each:

- **Predators**: lions, owls, sea otters, wolves;
- **Prey:** ants, krill, lemmings, rabbits;
- **Ecosystem engineers:** beavers, corals, elephants, tortoises;
- **Mutualists:** bats, bees, hummingbirds, and the plants they pollinate;
- **Plants:** goldenrod, kelp, mangrove trees, saguaro cactus (Denchak, 2019).

What is an Ecosystem Engineer?

Since 1994, the term **ecosystem engineer** has engendered controversy among ecologists, but is often encountered in the literature.

The following definition aptly characterizes this phrase. "Ecosystem engineers are species that disproportionately modify their environment in a significant way by creating, maintaining, or modifying habitat conditions in a manner that benefits other members of that biological community" (Provencio, 2021).

Many animal species worldwide can be described as ecosystem engineers, including diverse life forms such as bees, earthworms, termites, beavers, woodpeckers, elephants, and corals.

Biologists also consider some plant species, such as sargassum (brown micro-algae) and kelp (large brown algae), to be ecosystem engineers. Rafts of sargassum and kelp forests provide benefits such as shelter and food resources for many other forms of sea life.

What is Commensalism?

Commensalism is a form of **symbiosis** (interaction) and describes a relationship between two organisms in which one benefits from the association while the other derives neither benefit nor harm. The term comprises two Latin word roots, *com-,* meaning with or together, and *mensa-,* which means a table.

The word **commensal** describes the organism that benefits from the association characterized in the previous paragraph. The organism that derives neither benefit nor harm is called the **host**. When an organism entirely relies on the burrow for its food and shelter, it is termed an **obligate commensal**.

The current article will focus on two *Gopherus* tortoise species, the gopher tortoise (*G. polyphemus*) and the Mojave desert tortoise (*G. agassizii*). Scientists widely acknowledge these species as ecosystem engineers for their significant contributions to the ecosystems they inhabit.

These two tortoises are the hosts in the symbiotic relationships formed with their commensals, which include invertebrates, birds, reptiles, and mammals.

Studies of *G. polyphemus* and *G. agassizii* reveal that, between the two species, hundreds of commensals utilize the tortoises' burrows. Some commensals use the tortoises' burrows only occasionally; these are called accidental or casual commensals. Others are characterized as obligate commensals and live their entire lives within the burrow.

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The Gopher Tortoise

The gopher tortoise, one of the six species of fossorial (burrowing) tortoises in the North American genus *Gopherus*, is the only tortoise native to the southeastern United States and occurs in Alabama, Florida, Georgia, Louisiana, Mississippi, and South Carolina. Most publicly available information regarding the gopher tortoise pertains to its occurrence in Florida.

The Gopher Tortoise Council characterizes the habitat of *G. polyphemus* as "longleaf pine sandhills, xeric oak hammocks, scrub, pine flatwoods, dry prairies, and coastal dunes" ... and "man-made environments such as pastures, old fields, and grassy roadsides."

The species requires well-drained sandy soils for digging

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its extensive burrows, abundant herbaceous plants and grasses for food, and open areas for basking and nesting (Gopher Tortoise Council, n.d.).

The Gopher Tortoise Burrow

For the last 60 million years, *G. polyphemus* has been creating burrows that provide a weather-stable microhabitat for itself and an estimated 350 to 400 commensals. The burrow also shelters the tortoise and its commensals from predators and wildfires. Scientists studying the tortoise find that it spends at least 80% of its life in its burrow (Tower, 2022).

The gopher tortoise "is one of the best examples of how a single species can create habitat for many other species and drive evolution to a point where many species would go extinct without tortoises present" (Chandler, 2018).

The entrance to its burrow is shaped like a half-moon and mimics the shape (and size) of the tortoise's carapace. The loose soil from the excavation that collects outside the burrow entrance is called the apron.

The average gopher tortoise burrow measures 15 feet (5 meters) long and may be up to 40 feet (12 meters) long. It is 7 feet (2 meters) deep and up to 10 feet (3 meters) deep (Life History, n.d.). The burrow typically has several side pathways branching off the main tunnel.

The specific commensals found in a burrow will vary depending on the habitat in which the tortoise occurs. For example, there will be some variation between the commensals in Louisiana and those in Florida because of differences in the diversity of the local fauna.

The following list comprises research conducted by Amanda Hipps in pursuit of a master's degree from Florida Atlantic University. While it details the species identified in Hipps's study sites in southeastern Florida, the list represents the commensals present in gopher tortoise burrows throughout the tortoise's range.

Gopher tortoise photographed in Florida grazing on grasses which make up the majority of its diet. Photo © 2021 by evangrimes

♦ Mammals

Bobcat
Lynx rufus
Coyote
Canis latrans
Opossum
Didephis marsupialus
Raccoon
Procyon lotor
Eastern spotted skunk
Spilogale putorius
Eastern mole
Scalopus aquaticus
Eastern gray squirrel
Sciurus carolinensis
Florida mouse
Podomys floridanus
Hispid gray rat
Sigmodon hispidus
Eastern cottontail
Sylvilagus floridanus
Marsh rabbit
Sylvilagus palustris
Nine-banded armadillo
Dasypus novemcinctus

♦ Birds

Northern cardinal
Cardinalis cardinalis
Blue jay
Cyanocitta cristata
Gray catbird
Dumetella carolinensis
Northern mockingbird
Mimus polyglottos
Brown thrasher
Toxostoma rufum
Ovenbird
Seiurus aurocapillus
Carolina wren
Thryothorus ludovicianus
House wren
Troglodytes aedon

♦ Amphibians

Greenhouse frog
Eleutherodactylus planirostris
Southern toad
Anaxyrus terrestris
Oak toad
Anaxyrus quercicus
Gopher frog
Lithobates capito

♦ Reptiles

Cuban brown anole
Anolis sagrei
Northern curlytail lizard
Leiocephalus carinatus armouri
Florida scrub lizard
Sceloporus woodi
Six-lined racerunner
Aspidoscelis sexlineata sexlineata
Black racer
Coluber constrictor priapus
Eastern coachwhip
Masticophis flagellum flagellum

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Corn snake
Pantherophis guttatus
Garter snake
Thamnophis sirtalis sirtalis
Eastern diamondback rattlesnake
Crotalus adamanteus
Florida box turtle
Terrapene carolina bauri

♦ Invertebrates

Note: Ants, beetles, butterflies and moths, crickets, flies, mites, snails, spiders, ticks, wasps, and other invertebrates are, by far, the most numerous commensals of gopher tortoises in terms of the quantity and variety of species.

The following list is a typical sampling of invertebrate commensals. A comprehensive, 15-page list of these commensals is available on the Florida Fish and Wildlife Conservation Commission's website: https://myfwc.com/media/ruzghbfd/gtinvertebrates.pdf

Ashmead's Long-legged Ant
Aphaenogaster ashmeadi
Rainbow Scarab Beetle
Phanaeus igneus
Camel Cricket
Ceuthophilus divergens
Gopher Tortoise Burrow Fly
Eutrichota gopheri
Tropical Rat Mite
Ornithonyssus bacoti
Gulf Coast Tick
Amblyomma maculatum
Tubeworm Moth
Acrolophus spp.
Pirate Wolf Spider
Pirata spiniger
Square-headed Wasp
Liris spp.
Ridge Scrubsnail
Praticolella bakeri

Seed Dispersal

Gopher tortoises are herbivores and spend considerable time above ground foraging for their preferred food plants.

As the seeds of these plants transit through the digestive system of the tortoise, their seed coats break down during digestion. Then, when the tortoise deposits droppings during its travels through its range, the seed components plus digested nutrients (i.e., fertilizer) positively contribute to the plant diversity of the ecosystem the tortoise inhabits.

A Mojave desert tortoise photographed in a burrow in the Joshua Tree National Park in Riverside County, California. Public domain.

Plant species native to Florida that provide good forage for *G. polyphemus* include the following: dwarf huckleberry (*Gaylussacia dumosa*), saw palmetto (*Serenoa repens*), summer grape (*Vitis aestivalis*), gopher apple (*Licania michauxii*), pineland daisy (*Chaptalia tomentosa*), verbena (*Verbena* spp.), woodland sedge, (*Carex* spp.), and nutrush (*Scleria* spp.).

An extensive list of Florida's "gopher-tortoise friendly plants" is available on the **Florida Fish and Wildlife Conservation Commission website**.

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The Mojave Desert Tortoise

Gopherus agassizii, the Mojave or Agassizi's desert tortoise, is native to the southwestern United States in Arizona, California, Nevada, and Utah. Ecologists consider the Mojave desert tortoise to be an ecosystem engineer because it can create a beneficial burrow microhabitat for itself and its commensals. The tortoise benefits its ecosystem by distributing seeds throughout its territory.

The species inhabits ecosystems within the Mojave and Colorado-Sonoran Deserts. Mojave desert tortoise habitats include plant communities such as creosote-bursage scrub, creosote-blackbrush scrub, alkali scrub, cactus scrub, shadscale scrub, and Joshua tree woodlands (Grover & DeFalco, 1995).

The Desert Tortoise Burrow

It is impossible to overstate the burrow's importance to the Mojave desert tortoise; without its burrow, the desert tortoise could not survive the harsh, unforgiving environment in which it currently lives.

Scientists believe that desert tortoises became a species at least 10.5 million years ago during the Miocene epoch (Taxonomy & History, n.d.). The Miocene was a geological epoch from 23 to 5.3 million years ago. What is now

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the Mojave ***desert*** was a grassland during the mid-Miocene.

The Pleistocene Epoch, known as the Ice Age, occurred 2.58 million to 11,700 years ago with alternating glacial and interglacial periods. During the last glacial period, ± 20,000 years ago, research indicates there was 40% more precipitation, and temperatures were 6°C (43°F) cooler in the area now called the Mojave!

When the glaciers began to retreat some 12,000 to 10,000 years ago, gradual warming and drying began and continue into the present. Through the ages, the climate has become increasingly more severe, a fact aggravated by the effects of climate change (MacKay, 2019).

Through intensive studies of the species, biologists estimate that *G. agassizii* spends at least 90% of its life in the protection of its burrow. The burrow microhabitat's stable temperature and humidity provide a refuge from the heat and cold weather hazards at the desert surface and protect the burrow occupants from the threats of wildfires and predators.

An excavated Mojave desert tortoise burrow typically extends downward 3 to 4 feet (1 to 1.3 meters) from ground level at an estimated 45-degree angle. The tortoise may also dig a den or cave into the bank of a dry wash that extends 8 to 30 feet (2.9 to 4 meters) horizontally (Desert Tortoise, n.d.).

The burrow of *G. agassizii* provides shelter and food resources for various commensals that share the safety of the burrow with the tortoise. The following list of desert tortoise commensals, compiled by Mark Grover and Lesley DeFalco and published in 1995, utilizes research conducted from 1948 to 1980.

♦ Mammals

Antelope ground squirrel
Ammospermophilus leucurus
Blacktail jackrabbit
Lepus californicus
Canyon mouse
Peromyscus crinitus
Desert cottontail
Sylvilagus auduboni
Desert woodrat
Neotoma lepida
House cat
Felis domesticus
Kangaroo rat
Dipodomys merriami
Kit fox
Vulpes macrotis
Pocket mouse
Perognathus spp.
Spotted skunk
Spilogale gracilis
White-footed mouse
Peromyscus spp.

♦ Birds

Burrowing owl
Athene cunicularia
Gambel's quail
Callipepla gambelii
Poorwill
Phalaenoptilus nutstallii
Roadrunner
Geococcyx californianus

♦ Reptiles

Banded gecko
Coleonyx variegatus
Coachwhip
Masticophis flagellum
Desert iguana
Dipsosaurus dorsalis
Desert spiny lizard
Sceloporus magister
Gopher snake
Pituophis melanoleucus
Mojave green rattlesnake
Crotalus scutulatus
Sidewinder
Crotalus cerastes
Spotted night snake
Hypsiglena torquata
Western rattlesnake
Crotalus viridis
Western whiptail
Cnemidophorus tigris

♦ Invertebrates

Antlion larva
Myrmeleontidae spp.
Blackwidow spider
Lactrodectus mactans
Ground beetle
Tenebrionidae spp.
Roaches
Orthoptera spp.
Scorpion
Centruroides spp.
Silverfish
Thysanura spp.
Tarantula
Aphonopelma spp.
Ticks
Acarina, Ornithodoros parkeri

Research on the Mojave desert tortoise conducted since 1980 identified two additional commensals, *Eremophila alpestris,* a bird with the common name the Horned Lark, and *Gambelia wislizenii*, a lizard known as the Long-nosed Leopard Lizard (Walde et al., 2009; Walde et al., 2015).

Mojave desert tortoise resting among desert dandelion (*Malacothrix glabrata*) blossoms in San Bernardino county, CA. **Photo © 2020 by Juergen Schrenk**

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Studies currently document many additional commensals of the Mojave desert tortoise, and the results will likely be published shortly.

Seed Dispersal

G. agassizii performs another valuable service within its ecosystem: it distributes of the seeds of food plants during its travels in its range. The Mojave desert tortoise is an herbivore that feeds on many species of grasses, shrubs, annuals, and perennials.

A Mojave desert tortoise photographed in Joshua Tree National Park in California sporting "green lipstick" from foraging for fresh plants. **Photo © 2017 by Joe Zarki**

In a paper published in 2015, Jennings and Berry documented the selectivity of Mojave desert tortoises in their food choices and their tracking of the flowering cycles of their favorite food plants.

The site of the study by Jennings and Berry was the Desert Tortoise Research Natural Area (DTRNA) in eastern Kern County, California, during the spring following an El Niño winter of copious rainfall.

The DTRNA is "home to at least 126 annual plant species, making this one of the most species-rich sites known in the Mojave Desert," most of which flower from February through June. At least 57 perennial plants occur in the DTRNA (Jennings & Berry, 2015).

By distributing the seeds of their favored food plants within their habitat, Mojave desert tortoises, like the gopher tortoises, contribute to the quality of the plant materials available within their ecosystem. Invasive, nonnative, wildfire-promoting plant species with limited nutritional value are becoming a problem in Mojave desert tortoise habitats. Because of this incursion, replenishment of high-quality, nutritious food plants is vital to the health of populations of tortoises in the wild.

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Upcoming issues of this newsletter will feature other tortoise species that are also considered ecosystem engineers. Ω

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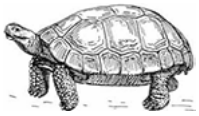

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A CRITICALLY ENDANGERED TORTOISE ENJOYS ZOO MED GRASSLAND TORTOISE FOOD

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

60th Anniversary Shellebration and Shellebrate we did!

Story by Heather Ponek, President of the CTTC Kern County Chapter, Bakersfield, CA and CTTC Executive Board Secretary

Event Chair Heather Ponek welcomes guests to the CTTC 60th Anniversary Celebration.

Saturday, a Spring Day with the possibility of light showers: April 13, 2024. Twelve California Turtle & Tortoise Club Chapters gathered in Norwalk, California, 123 of us altogether, all with the love of turtles and tortoises and supporting each other in the care and conservation of these wonderful creatures in common.

I want to FIRST thank our fabulous Anniversary Celebration Committee that worked for over a year after first signing up two years prior to put on this event: Ginny Doepping, Bob Hazard, Yolanda Keh, Gerald Rezes, Linda Grunnet, John Kim, and Jeanette Lea

As you can imagine, a great deal of planning went into this event: everything from securing a venue and developing a budget to the registration process, speakers, program, music, gift bags, raffle, flowers, plaques, photo booth, video, event T-shirts and great food!

The officers of the CTTC Santa Barbara-Ventura chapter: Wendy Dasgupta (vice-president), Christina Vanarelli (president), Sue Alvarez (membership/treasurer), and Chuck Alvarez (recording secretary).

Members of Kern County CTTC: Tim Brennan, Heather Ponek, Cindy Hedrick, Jill Brennan, Kamryn Jones, Madellyn Walker, Jolene Jones, and Raeyana Ross.

Upon entering the celebration venue, we received a branded jute swag bag full of unique gifts: a 3D printed turtle, handmade soaps in the shape of a turtle, a 60th Anniversary lapel pin, a branded notepad, pen and flashlight, a beautiful bag of dried flower Turtle Food from Kapidolo Farms, and a jar of Grassland Tortoise Food from ZooMed. Rainforest Flora donated raffle flora and the gift orchids, and we thank them for their generosity.

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Representatives of desert tortoise conservation organizations with their affiliations: Roger Dale (Desert Tortoise Preserve Committee), Jun Lee (Desert Tortoise Preserve Committee), Ed LaRue (Desert Tortoise Council); Joe Probst (Desert Tortoise Council), and Ron Berger (Desert Tortoise Conservancy).

We thank ALL the members who support the Club. The represented chapters at the 60th Anniversary Special thanks to all members who support the Club. Chapters represented at the 60th Anniversary Celebration included Care Society Chapter—Long Beach; Chino Valley Chapter—Chino; Foothill Chapter—Pasadena; High Desert Chapter—Victorville; Inland Empire Chapter—Redlands; Kern County Chapter—Bakersfield; Low Desert Chapter—Palm Desert; Orange County Chapter—Santa Ana; Ridgecrest Chapter; Santa Barbara/Ventura Chapter; Santa Clarita Chapter—Castaic; TOOSLO Chapter—San Luis Obispo; Valley Chapter-Woodland Hills.

Helen Cain and friends. Helen (second from the left) has attended the 30th, 40th, 50th, and 60th Celebrations!

The room was encircled with beautiful gift bags and raffle gifts with "Turtle" as the motif. Our buffet lunch theme was a Gourmet Tour of Italy.

Speaker Michael Tuma.

Our first speaker, Michael Tuma, reviewed the six species of North American gopher tortoises and described new research on the Bolson tortoise. Who knew how beautiful these tortoises are? We did — that's who! From their beautiful eyes to their shells, their evolutionary history is fascinating.

We learned the importance of the tortoise burrow – soil aeration, seed dispersion, home for insects, snakes, burrowing owls, frogs and more. Without these burrows, species could not survive the desert heat.

From the peril of the ravens to habitat loss, this fascinating *Gopherus* species endures. I loved the video

Speaker Robert Hazard.

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Event attendees and their chapter affiliations. Back row: Mike Ponek (Kern), Heather Ponek (Kern), Bob Parker (Ridgecrest), Montynne Yates (Ridgecrest), Bob Hazard (Valley), and unidentified lady. Front row: Sue Parker (Ridgecrest) and Lynda Pasco (Valley).

of the Bolson Tortoise sprinting and sliding into its burrow.

We videotaped the Shellebration and will hopefully show an edited version at our next CTTC Executive Board meeting on July 13th for delegates and guests!

Following our first speaker, we had a drawing for raffle goodies. I want to thank everyone for all the time and effort put into the Chapter gift baskets! Just picking out the color for the T-shirts, with Chapters all over California, was a challenge. We did it and they came out great!

Then came a talk by Ed LaRue from the Desert Tortoise Council. Since 1989 Ed has been involved with the desert tortoises. Along with his wife he founded; The Circle Mountain Biological Consultancy in 1994, with a focus on desert tortoise conservation. In his 45-foot Winnebago with a tortoise painted on the side he traveled the desert—everyone wanted to talk about their pet tortoise.

In 2023 alone, he drafted 92 letters advocating for measures to minimize impacts on the Mojave desert tortoise. Thank you, Ed, for all your work to upgrade the status of the Desert Tortoise.

We learned many ways to help through organizations like the Desert Tortoise Council, and how solar installations and cannabis cultivation are impacting the desert tortoise's habitat. He also thanked the CTTC for their donations over the years.

Speaker Ron Berger.

We then viewed an "In Memoriam" slide show honoring all those members who have passed over the last 10 years. We are grateful for all the memories.

Ron Berger is actively involved with multiple organizations, including the Desert Tortoise Preserve Committee for 12 years and now the Desert Tortoise Conservancy. He brought awareness to the desert tortoise—a new center called "The Tortoise" in Palm Springs is being created. This center sounds fantastic! I see a road trip in our future!

Heather Ponek's pet desert tortoise with one of the plaques presented to honorees at the 60th Anniversary Celebration.

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Look at all the great photos! Thank you, Art and Nothy Garcia, FOMOPartyBooth, from Foothill Chapter. Extra work went into customizing these photobooth frames especially for our club.

On the heels of our 60th Anniversary event, we got some great news. In March 2020, 49 pages were submitted to the California Fish and Wildlife Commission to uplist the Mojave desert tortoise from Threatened to Endangered. On 18 April 2024, after years of petitioning, the Mojave desert tortoise was officially designated as **ENDANGERED** under the California Endangered Species Act by a **unanimous** vote of the CA Fish and Wildlife Commission.

I am grateful and honored to have served as the 60th Anniversary Committee Chair. I have a notebook full of details and comments to pass on to the next Chair with best wishes for many, many more.

Heather Ponek, President KCTTC Bakersfield, CA and Executive Secretary CTTC Ω

Linda Grunnet, Orange County chapter vice-president and 60th Anniversary Committee member on the left of this photo, with Heather Ponek, chair of the 60th Anniversary Committee.

New research finds abnormal hormone levels in sea turtles affected by Deepwater Horizon oil spill

— Aquarium scientists used archived blood samples to develop hormone test

Boston, Massachusetts—1 May 2024—In a first-of-its-kind study, new research out of the New England Aquarium is revealing the potential hormone impacts on sea turtles affected by the 2010 Deepwater Horizon oil spill.

The Deepwater Horizon oil spill, the largest marine oil spill in history, is estimated to have exposed hundreds of thousands of sea turtles to oil in the Gulf of Mexico and killed up to 86,500 juvenile Kemp's ridley turtles, a critically endangered species. In the aftermath of the oil spill, 319 live sea turtles were recovered from the ocean and taken to rehabilitation facilities for medical assessment and treatment. Responders collected blood samples to assess the health of each turtle, and a portion of the blood was frozen for future studies.

In the last three years, scientists in the Anderson Cabot Center for Ocean Life at the New England Aquarium developed a novel test to analyze sea turtle blood for the hormone aldosterone. Using this test, along with tests previously developed at the Aquarium, the scientists evaluated the oiled turtles' blood for a suite of hormones. The results, published in the journal *Endangered Species Research*, showed that Kemp's ridley sea turtles had abnormally elevated concentrations of aldosterone and corticosterone (both produced by the adrenal gland) as well as thyroid hormone when they arrived for treatment, which can affect metabolism, electrolytes, and many other important processes.

"As we develop more and more tools to study the health status of endangered sea turtles, we learn more about the impact of various threats and how to better treat the affected animals. We can now use this test to study sea turtle health in other situations," said Dr. Charles Innis, a senior scientist and veterinarian at the Aquarium, who led the study. Dr. Innis was part of the veterinary team that responded to the 2010 oil spill, where he treated ailing sea turtles at the Audubon Nature Institute in New Orleans.

A juvenile Kemp's ridley turtle, *Lepidochelys kempii*, that was exposed to oil during the Deepwater Horizon disaster that began on 20 April 2010. Photograph by Brian Stacy. Used with permission.

In the aftermath of the Deepwater Horizon oil spill, with treatment, the turtles' hormone levels returned to normal over the course of one to two months. Post-rehabilitation, 99 percent of the treated turtles were released back into the ocean.

The hormone tests used in the study had not yet been validated for sea turtles at the time of the oil spill, highlighting the importance of preserving samples so that future technologies can be used to provide further insight into past events.

"This study would not have been possible if the team did not have the foresight in 2010 to archive these samples," Dr. Innis said.

The results of the study support previous research published in 2012 that analyzed blood data and found significant physiological impacts to sea turtles exposed to oil.

Kemp's ridley sea turtles are a critically endangered species, facing threats including fisheries interactions, climate change, ocean pollution, and degradation of their habitat. Adults of this species are primarily found in the Gulf of Mexico, nesting on beaches in Mexico and Texas. Rescue and rehabilitation efforts help to conserve this species. The New England Aquarium operates one of the largest sea turtle rescue and rehabilitation programs in the world at its Sea Turtle Hospital in Quincy, MA.

The study in *Endangered Species Research* was funded by the Morris Animal Foundation. Ω

—New England Aquarium press release

The New England Aquarium website is found at **https://www.neaq.org/**

California Turtle & Tortoise Club Directory 2024

Executive Board

Important note: *The Executive Board is strictly an administrative body for the corporate portion of CTTC and does not handle animals or adoptions.*

Postal mailing address: **P.O. Box 7300, Van Nuys, CA 91409-7300.**
Information: CTTCEBOfficers@tortoise.org
Chief executive officer: **John Kim**
Vice chief executive officer: **Robert Hazard**
Chief financial officer: **Virginia Doepping**
Secretary: **Heather Ponek**

Chino Valley Chapter

Postal mailing address: **P.O. Box 1753, Chino, CA 91708-1753.**
President: Lynda Misiak
Vice president: David Bowman
Secretary: Rachelle Buck
Adoptions: Jim Misiak
Meeting: In-person on the third Friday, 7:30 PM at Chino Girl Scout House, 5007 Center St., Chino, CA 91710.

Foothill Chapter

Postal mailing address: **P.O. Box 51002, Pasadena, CA 91115-1002.**
President: Joanna Bolt
Secretary: Mardy Graves
Treasurer/Membership: Jeanette Lea
Meeting: In-person meetings on the fourth Friday at 7:30 PM in the Palm Room, Los Angeles County Arboretum, 301 North Baldwin Ave., Arcadia, CA 91007.

High Desert Chapter

Postal mailing address: **P.O. Box 163, Victorville, CA 92392.**
President: Regene Fonville
Vice president: Dave Cheney
Secretary/Adoptions: Erica Schafer
Treasurer: Jose Zamudio
Meeting: In-person meetings on the second Monday at 6:00 PM at the Sterling Inn Regency Room, 17738 Francesca Road, Victorville, CA 92392.

Inland Empire Chapter

Postal mailing address: **P.O. Box 7205, Redlands, CA 92375.**
Information: CTTCIE@tortoise.org
President: **Gerald Rezes**
Vice president: **Richard Roosman**
Corresponding Secretary: **Amy Taylor**
Treasurer: **Walter Cook**
Meeting: Hybrid meetings take place virtually via Zoom plus in-person on the first Friday, 7:30 PM at "The Ark" Church of the Nazarenes in the Fellowship Hall in Young Hall, 1307 East Citrus Ave., Redlands, CA 92374.

Kern County Chapter

Postal mailing address: **P.O. Box 81772, Bakersfield, CA 93380-1772.**
information: KernCTTC@tortoise.org
President/membership: Heather Ponek
Vice president: Tim Brennan
Treasurer: Kathy Studer
Meeting: In-person meetings on the second Monday, 6:30 PM. Contact chapter for location information.

Low Desert Chapter

Postal mailing address: **P.O. Box 4156, Palm Desert, CA 92261.**
General Information: Tony Vaninetti
Secretary: Marlies Dietrich
Adoptions: Bill Powers
Meeting: Meetings to be announced.

Orange County Chapter

Postal mailing address: **P.O. Box 11124, Santa Ana, CA 92711.**
Information: OrangeCounty@tortoise.org
President: **John Kim**
Vice president/Membership: **Linda Grunnet**
Secretary: **Joyce Keyak**
Treasurer/membership: **Virginia Doepping**
Adoptions: Adoptions Questions
Meeting: In-person meetings on the first Friday of the every month at 7:30 PM at the First Christian Church of Orange, 1130 E. Walnut Ave., Orange, CA 92867.

Ridgecrest Chapter

Postal mailing address: **P.O. Box 1272, Ridgecrest, CA 93555.**
President: Robert Parker
Secretary: Sue Parker
Adoptions: Montynne Yates
Meeting: In-person meetings on the second Monday, 7:30 PM at the Maturango Museum, 100 E. Las Flores Ave., Ridgecrest, CA 93555. There are NO meetings in July or August.

Santa Barbara-Ventura Chapter

Postal mailing address: **P.O. Box 3086, Camarillo, CA 93011-3086.**
Information:SB.Ventura@tortoise.org
President: **Christina Vanarelli**
Vice president: **Wendy Dasgupta**
Treasurer/Membership: **Sue Alvarez**
Secretary: **Chuck Alvarez**
Meeting: Planned quarterly meetings in January, April, July, and October. Dates and locations to be announced.

Santa Clarita Chapter

Postal mailing address: **P.O. Box 4012, Castaic, CA 91310.**
General Information: Abigail DeSesa
President: **George Ordway**
Treasurer/membership/adoptions: Abigail DeSesa
Secretary: **Jennifer Fields**
Meeting: Meetings to be announced.

TOOSLO Chapter (website is down)

Postal mailing address: **P.O. Box 763, Grover Beach, CA 93483.**
Chapter Information: TOOSLO@tortoise.org
President: **Brandon Froelicher**
Vice president: **Emma White**
Treasurer: **Diane Olear**
Meeting: Activities are paused due to pandemic restrictions.

Turtle & Tortoise Care Society

Postal mailing address: **P.O. Box 15953, Long Beach, CA 90815.**
President: **Casey Quinn**
Vice president: John Kim
Secretary/Treasurer: **Yolanda Keh**
Adoptions: Adoptions Inquiries
Meeting: In-person meetings on the third Saturday, 7:30 PM at St. Gregory's Episcopal Church, 6201 E. Willow St., Long Beach, CA. 90815.

Valley Chapter

Postal mailing address: **P.O. Box 7364, Van Nuys, CA 91409-7364.**
President: Bob Hazard
Treasurer: Karen Berry
Adoptions: Valley Adoption Team
Meeting: Third Friday, 7:00 PM at Woodland Hills Christian Church, 5920 Shoup Ave., Woodland Hills 91367-3327. Virtual meetings via Zoom and/or in-person meetings until further notice.

Meeting Schedule: January/February 2024

Check your chapter website for program information.

Chino Valley
July 19; August 16

Foothill
July 26; August 23

High Desert
July 8; August 12

Inland Empire
July 5; August 2

Kern County
July 8; August 12

Low Desert
Meeting information to be announced.

Orange County
July 5; August 2

Ridgecrest
NO meetings in July or August

Santa Barbara-Ventura
Meeting information to be announced.

Santa Clarita
Meeting information to be announced.

TOOSLO (San Luis Obispo)
Contact the chapter for meeting information.

TTCS (Long Beach)
July 20; August 17

Valley
July 19; August 16

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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CTTC Memberships and Renewals

Each chapter handles its own memberships/renewals.

There are three options for membership renewal:

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

The California Turtle & Tortoise Club (CTTC) is a non-profit 501(c)(3) corporation. Contributions are tax deductible to the full extent of the law. Please pay by USA funds only (US bank check, money order, or International Postal Order).

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 to the right).

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

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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

Tortuga Gazette
California Turtle & Tortoise Club
P.O. Box 7300
Van Nuys, California 91409-7300

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