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Gopherus polyphemus, the gopher tortoise, photographed in the Guana Tolomato Matanzas Reserve, Florida. Photo © 2008 by Craig O'Neal

featured species **Gopher Tortoise, *Gopherus polyphemus***

Gopher tortoises are getting depressed - and it may be our fault

By Betsy Calvert

Let's say you lived on the same street for 40 years. You never left home, and lived a busy, routine life, eating plants, digging long tunnels, and keeping track of your neighbors.

You were looking forward to another 50–60 years of this — well, maybe you can't think of the future — but you had no reason to expect a change.

Then, suddenly, a backhoe shows up and a nice biology undergraduate pulls you out and puts you in the back of a truck. A few weeks later, they put you down on a strange piece of ground and say, "This is your new home. Start digging."

The story doesn't end here, tortoise researchers are saying.

To continue, some of your friends and relations cooperate, but you refuse. All you want to do is go back home. You spend your days roaming the surface of the land, looking for a way out, only to run up against fences. You can't bring yourself to eat or drink or dig a burrow. If the coyotes don't find you first, you gradually waste away, and then you die.

It's a grim story, but an important one to pay attention to, say reptile experts. They believe it is an explanation for the loss of about 13% of gopher tortoises on a 40–acre experimental relocation plot in the Panhandle.

"They're not eating, that's the main thing. For whatever reason, they're just kind of shutting down," said Matt Aresco, director of the 54,000–acre Nokuse Plantation in the Florida Panhandle.

CONTENTS

Gopher Tortoises are Getting Depressed, and It Might be our Fault by Betsy Calvert	1
In Memoriam: Wes Shipway by Don Williams	4
Adoption in the Time of Coronavirus by Karen Berry	6
Mike's Turtle Net Picks by Michael J. Connor, Ph.D.	7
The Turtle's Garden: Petunia, *Petunia* x *hybrida*	8
Scientists Develop New Way to Identify Sex of Sea Turtle Hatchlings	10
Research Identifies 515 Vertebrate Species on the Brink of Extinction	11
Isolated Female Burmese Roofed Turtle Surprises Conservationists by Laying Fertile Eggs	12
Study Evaluates Stress Level of Rehabilitated Sea Turtles During Transport	13
California Agency: Protection for Leatherback Sea Turtles may be needed	14
2020 CTTC Directory	15

Aresco is a scientist who, along with the staff at Nokuse, has been studying the survival rates of tortoises relocated due to development. Nokuse has been receiving these animals for the past 12 years as part of the state's species protection requirements. What they are finding is both good and bad news.

Gopher tortoise dining on *Opuntia* cactus in Smyrna Dunes Park, New Smyrna Beach, Florida. **Photo © 2010 by Andrea Westmoreland**.

For the bad news, they have come up with a possible strategy, if not a solution.

It used to be legal to outright kill tortoises.

In the early days of development, gopher tortoises and all other species were collateral damage. Not until the U.S. Endangered Species Act of 1973 were governments forced to pay attention to species threatened with extinction.

Florida came up with a plan for tortoises, which it turns out provide habitat for countless other animals with their burrows. The plan was that developers should dig up tortoises on their site and move them to a suitable location. If that was too much of a hassle, however, developers were allowed to continue to do what they had always done — bury the tortoises alive or kill them with heavy machinery.

For this choice, they had to pay a fee.

In 2007, relocating tortoises became mandatory, but landowners were allowed to apply for one last "incidental take" or the bury-them-alive permit. The state issued thousands of permits in those last days before the new regulations took effect. These were projects that were not even likely to happen, but developers grabbed the permits, because they had no expiration date.

Today, Nokuse tries to take in as many tortoises as they can that still live on land with an incidental take permit. Those relocations are done by volunteers, Aresco said. Otherwise, relocation can cost $13,000 to $15,000 a tortoise. That's a cost that developers now shoulder.

It was alert reader Carol McCoy of Englewood who told the *Sun* about the tortoise research in Nokuse. That research showed that while

Response from Florida Fish and Wildlife Commission

The Florida Fish and Wildlife Commission determines stocking rates for tortoise preserves based on the size of the area as well as the food available for tortoises. That ends up being two to four tortoises per acre, said FWC spokesperson Melody Kilborn.

Asked if too many tortoises were dying on preserves, Kilborn said in a statement: "Large scale mortality events documented on permitted recipient sites are rare. The FWC strives to minimize risk of mortality on permitted recipient sites by requiring protocols that reduce stress and potential spread of disease."

Of Aresco's proposal to reduce density to reduce mortality, Kilborn wrote: "FWC reviews relevant research in gopher tortoise conservation and takes new findings into consideration when revising and implementing the Gopher Tortoise Permitting Guidelines and the Gopher Tortoise Management Plan. We will consider this data in relation to mortality reports received, as well as the findings from other research that address the issue of gopher tortoise mortality post-relocation."

Gopher tortoise, *Gopherus polyphemus*, photographed in Green Swamp in central Florida. **Photo © 2008 by Tom Friedel.**

the relocating tortoises is necessary, it is not necessarily happy.

"When I relocated to Florida, the first local I met was the gopher tortoise living next to my pool," she said. "I named it Cecil."

"People relocate to Florida for nature and wildlife viewing opportunities," she said. "If suitable tortoise habitat is paved over and a species we claim to protect goes functionally extinct, Florida will be just another warm place."

Southwest Florida tortoises are huge, Aresco said, perhaps because they have a shorter winter dormant period.

The alarm was sounded after Aresco's research showed that in some of the early enclosures of Nokuse, the mortality of adults was alarmingly high over a seven-year period. Researchers set about evaluating causes of death.

The wasting away was much bigger a problem than predation, which is limited by electric fencing. They found no communicable disease. Food was plentiful.

They connected this finding with their own observations of what tortoises do when they are brought to the preserve. They wander above ground for days, weeks, failing to burrow — which would protect them from predators. They wander to the fencing, trying to get out.

Basically, they seem depressed.

"They're just not happy," he said, adding there needs to be more research on tortoise social behavior.

What can be done about "depressed" tortoises?

The Nokuse team has one strategy that they have implemented already. It will take some years to find out if it works. They have limited the number of tortoises to 1.5 per acre in each relocation site. That's dramatically lower than the state limit of up to 4 per acre. They picked that number, because that is the typical density in a natural site, and also, because the newer Nokuse sites with that density have much lower mortality.

Not everyone agrees.

Local environmental consultant Ian Vincent, whose firm handles 12% of the state's tortoise permits, said lowering the density would endanger tortoises rather than save them.

Of the thousands of tortoises Vincent has handled, none seem stressed when they are removed.

"I've never had any one show any sign of stress when we're holding it," he said, of the days or weeks they may hold on to tortoises before the recipient site is ready.

Vincent has a degree in resource conservation and management along with 23 years experience relocating tortoises. He acknowledged, however, that he has not been to a recipient site.

"They're pretty adaptable animals," he said.

Aresco agreed tortoises are adapting to more crowded settings over the decades as their habitat dwindles.

"They can probably hang on, on a lot of un-managed sites for a long time," he said.

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Thanks to Abigail DeSesa for providing the link to this article.

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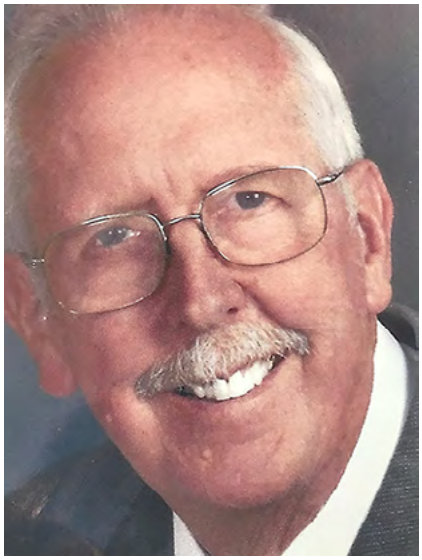
Nokuse Plantation and its eccentric founder

Nokuse Plantation (pronounced no goo see) is a 54,000-acre nature preserve in the Florida Panhandle. It is the result of land purchases made by a Floridian named Marion Clifton Davis, who once described himself to National Public Radio as spending most of his life politically to the right of Attila the Hun. He grew up poor in Northwestern Florida, but earned a law degree. Starting out as a gambler, he later made a fortune in shrewd real estate and mineral deals. He described a conversion to environmentalism in mid-life. He bought undeveloped land and established Nokuse to bring back the Florida landscape, where timber companies had long since removed the pine forests. In 2015, he was diagnosed with lung cancer and when it advanced, he took his own life, the *Tampa Bay Times* reported. He left his family in charge of the foundation that owns Nokuse. It has become a prime re-location site for the thousands of gopher tortoises threatened by rapid development. It includes a $12 million environmental education center named for biologist E.O. Wilson.

Hatchling gopher tortoise, *Gopherus polyphemus*. Photo by Chris Potin, Mississippi Army National Guard. Public domain.

In Memoriam
Wes Shipway

Tribute by Don Williams, Chair of the CTTC Executive Board and President of the CTTC Santa Barbara-Ventura Chapter with remembrances by other chapter members



Portrait photograph courtesy of the Shipway family.

The Santa Barbara / Ventura Chapter of CTTC sadly announces the passing of Wes Shipway, Adoptions Chair on June 9, 2020.

He will be sorely missed by family and friends but will always be remembered as one of our chapters great assets in helping tortoises and turtles.

HISTORY

Wes became involved with turtles and tortoises in the early 80's with the Turtle and Tortoise Club of Santa Barbara (officially named by "founders" Joan and Tim Terrio @ 1988).

Attendance was about 20 at each meeting, including Tim and Joan Terrio, Jeannie Vaughan, Dave and Marie Friend, Vel Muscat and fellow turtle and tortoise lovers.

Wes held various positions in the group, including treasurer, but his main focus was always adoptions, a position in which he would serve for many years until his death.

The Turtle & Tortoise Club of Santa Barbara joined CTTC in 1992, and they officially changed their name to Santa Barbara / Ventura Chapter of CTTC in 1994.

Since I first met Wes in about 2002, he, Dave and Maree Friend, and Colin and Debi Hawkes were the main driving forces in setting up arrangements for our exhibits at the Ventura County Fair that started the last weekend in July of each year.

Somehow these folks even managed to get me to come over from Bakersfield during the early 2000's, while I was an officer of the Kern Chapter, to help at the Fair each year until I moved here in 2014!! To the best of older members' recollections, we have been doing the Ventura County Fair for some 25 years now.

Wes had skills that were invaluable in the design and construction of our exhibit cases as well as our display photo boards of various species of turtles and tortoises and various banners and signage. These visual displays enhanced our exhibits at the Ventura County Fair as well as our exhibits for the annual World Turtle Day at the Ventura County Museum.

MEMORIES

"Wes was best known to me personally as the man who could never say "no" to a request to help a turtle or tortoise, picking up a sulcata and two red-eared sliders two weeks before his passing on June 9th, even though he was still recovering from a hospitalization in May and a small stroke!!" (Myself)

"Wes always reminded me of Marlin Perkins from Mutual of Omaha's *Wild Kingdom* in his turtle club shirt. He loved talking turtle at the Ventura County Fair every year. He was always kind to us. The last time I saw him, I showed him how to use his [phone's] voice-to-text feature instead of typing. This made him so happy because he had a hard time typing on his phone." (Debi)

"Wes always brought gingerbread cookies and Coke to our early meetings at the church in Carpinteria, always making sure we knew that he baked them himself. I brought our main course and the others brought side dishes." (Maree and Dave)

"I met Wes in the 1980s at the church in Carpinteria at the meeting. He was kind, friendly and just loved turtles and tortoises, and he quickly got me into desert tortoises, of which I have 3." (Vel)

Wes Shipway educating the public at the Ventura County Fair. Photograph by Debi Nowak-Hawkes.

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Adoption in the Time of Coronavirus

Story and photo by Karen Berry, Valley Chapter

Long lines at grocery and other stores. A run on toilet paper, paper towels, any kind of hand sanitizer, and antibacterial soap or wipes. People everywhere wearing masks and gloves, and practicing what, for many, was a new concept known as "social distancing". Shortages of pasta, rice, quick fix meals, and in some areas, fresh produce and meat. Limits on how many items of a particular food or product you could buy.

Sounds like scenes from an apocalyptic blockbuster sci-fi movie, right..? The only thing missing is Charlton Heston yelling, "You gotta tell 'em....Soylent Green is people....!"

Nightmare...? It was, and still is, very real. The Covid-19 pandemic that started in China and spread around the world, killed close to a half million people (as of the writing of this article). The pandemic hit economies hard, including ours, and, in just a few short weeks, put millions of people out of work and introduced us to "safer at home" orders.

For many, it was like "house arrest" without the ankle monitor. A large number of employers required employees to work from home, which became more difficult with schools closed. Parents were trying to work AND keep on top of their children's activities, too.

"Adventures in Senior Shopping Hours" could have been a new reality show as a lot of us, at the grocery and other stores, were close to being "carded" to verify our age, while standing in the line that time forgot. As if gray hair and having trouble walking weren't proof enough.

But there was also a bright spot amid all the chaos. We've all heard "be careful what you wish for".

After a winter of no incoming adoption applications, our chapter caught a big break. A kind supporter of the Valley chapter placed an ad in one of the local papers, which produced a remarkable number of applications, that also coincided with "safer/stay at home" orders.

Valley chapter adoption team member Jennifer Edward (left) conducting a yard consultation with potential adopters and Rudy the desert tortoise.

Hmmm, how to get the adopters in process, stay safe doing it, and be able to handle the big work load with new team members who weren't able to get training over the winter. Embracing a philosophy from the military, to "improvise, adapt, and overcome", we developed a process that easily allowed for the safety of both the adoption team members doing the yard consultations and the adopters.

We developed a simple plan, where the team member would call the adopter upon arrival, and be let in to the back yard via a side gate. Team members would wear masks, and we would ask all adopters to do the same, since the public can only obtain non-medical masks that keep us from contaminating others, not those for protecting ourselves, and part of the team was over 65. In the back yard, it would be easy for everyone to maintain that six-foot "social distancing". We would encourage the adopters to take notes, if they wished.

The team member conducting the consultation would then write up a short report at home for the adopter, noting what modifications or repairs were needed before their tortoise arrived, and the report would be emailed to them.

March was fairly soggy, and a lot of yards were more suitable for mud wrestling than evaluation as a tortoise habitat. The last portion of the month, and the first part of April, were spent contacting the adopters, talking about the kind of tortoise they wanted to adopt, answering questions they had about the process, and doing all the preliminary "virtual" work on the applications. Mid-April, we started making appointments, to start in May, for in-person yard consultations. The consultations themselves were successful, the adopters were very willing to wear masks during our visits, and tortoises have been — and continue to be — placed in new homes.

There are still some lingering effects of the pandemic, which has been tapering down, but there is still anxiety that it isn't really over, and may return in the fall. Some of us may still be experiencing some feelings of isolation from having to stay mostly inside, or anxiety about our employment situation. We haven't been able to meet in person, and shows and other chapter events have been canceled. Some chapters have done virtual

meetings to try and bridge the gap of not being able to spend time together.

But being the troupers that Americans are, we manage to find different ways to cope. I have, and many of you have likely received some hilarious cartoons and memes from friends and relatives. Humor is a great way to relieve the stress of any situation, and a laugh here and there can go a long way to making sure we don't lose sight of that light at the end of the tunnel.

These are certainly still trying times, and we will weather them by staying positive and taking good care of ourselves, in addition to our physical safety measures in public.

Tortoises and turtles have been known to help people to stay calm, and you can feel yourself relax if you are spending time with them. Take advantage of that, with no "social distancing" needed. Please do all you can to stay safe, and we'll see you on the other side of this health emergency. 🐢

"Look closely at nature. Every species is a masterpiece, exquisitely adapted to the particular environment in which it has survived. Who are we to destroy or even diminish biodiversity?"

— Edward Osborne Wilson (b. 1929)
American biologist

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**

Turtles and Tortoises Are in Trouble
Important review paper from the world's leading turtle and tortoise biologists.

Diego Returns to Española
As announced earlier in the year, Diego the famous saddle-backed tortoise from Española (Hood Island) has now been returned to his natal home

Sonoyta Mud Turtle Critical Habitat
The U.S. Fish and Wildlife Service announced the final critical habitat designation for the endangered Sonoyta mud turtle that only occurs in the U.S. by the administration's proposed border wall.

'Extinct' Turtle Crushed by Train
Article highlights conservation needs for the formerly locally-extirpated black soft-shell in Baneshwar, India.

Giant Amazon River Turtles Hatch at Trinidad and Tobago Zoo
A 100 year old giant Amazon River turtle at the Emperor Valley Zoo nested during the Covid-19 shutdown and 18 hatchlings emerged.

64,000 Green Sea Turtles at the Raine Island Rookery
Drone-recorded video used to estimate the massive green sea turtle population in the rookery at Raine Island on the Great Barrier Reef.

California Considers Leatherback Sea Turtle Protection
California Department of Fish and Wildlife has recommended that Pacific leatherback sea turtles move toward protection under the state's Endangered Species Act.

Relatively Fewer Male Sea Turtles in Florida
Climate change is skewing the female to male ratio among Florida's sea turtles. But does it matter?.

Sea Turtles Stressed During Transport
New study proves sea turtles experience major stress during transport to release locations.

Sea Turtle Week
The second week of June was Sea Turtle Week.

Latest African Sea Turtle Newsletter
African Sea Turtle Newsletter issue 13 now available.

10th Century Monumental Turtle
Archaeologists have uncovered a huge, meter-long carved stone turtle at the famed Angkor Wat temple complex in Cambodia.

Chelonian Longevity
Why do some turtles live so long?

Planet of the Humans
After much politicking, Michael Moore's documentary was taken down but after a brief stint on Vimeo it was eventually reposted on YouTube. The controversy helped ensure that it has now had over 8.6 million views !

CTTC's Turtle And Tortoise Listserve
CTTC's Turtle and Tortoise list has now moved to io.groups. If you want to talk with other turtle and tortoise fans in a friendly atmosphere just send an email to: **<CTTC-TurtleAndTortoise-list+subscribe@groups.io>**

CTTC on Facebook
For breaking news updates visit and "like" us on Facebook!

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

Petunia hybrida
Petunia

A Daddy® series *Petunia hybrida* blossom with lavender petals and a purple throat and veining. Public domain.

Comprising some 20 species, the genus *Petunia* is native to South America. While most species of *Petunia* are comparatively rare, *P. hybrida*, also known as *P. atkinsiana*, is a very popular annual in gardens worldwide.

P. hybrida is sometimes written as *Petunia* x *hybrida* because it is not a single species. Instead, plant breeders successfully combined South American species of petunias to develop the cultivars (cultivated varieties) commonly planted in today's modern gardens.

Members of the Solanaceae, also known as the nightshade family, petunias belong to a diverse group that includes food crops, spices, medicinal plants, and garden ornamentals.

Discovery of the species that are the ancestors of today's petunias took place in Argentina in the mid-1700's and early 1800's (Esbenshades). The original species from which modern petunias were bred are thought to be *P. axillaris* and *P. violacea*. The genus name *Petunia* is based on the name of the French botanist Petun, who successfully bred the first garden petunias in the 1850's (Kessler, Jr. 1999).

Since their introduction into ornamental horticulture, petunias have become one of the most popular and widely used bedding and border plants in the world. Their popularity stems from their ease of culture, their blossoms' glorious array of colors and forms, and their adaptability to a variety of garden applications.

Description

While it is a short-lived, tender perennial in the mildest climates, *P. hybrida* is typically grown as an annual. In horticulture the term "tender" describes a plant that will not tolerate frost.

Extreme heat will also kill off *P hybrida*. In the hottest, most arid locations, the species will perform best as a winter and spring annual.

Petunia blossoms, shaped like trumpets' bells, appear in late spring, blooming profusely throughout summer until the first frost. Some varieties feature a sweet fragrance. Petunia foliage is broad, thick, fuzzy, and rather sticky to the touch.

Two basic horticultural types of *P. hybrida* are widely available as both seeds and nursery starts.

Grandifloras

As the term implies, grandiflora petunias are large-flowered, typically ranging from 3 to 4.75 inches (7.6 to 12.1 centimeters) across. Being susceptible to rain damage, these varieties perform best when grown in containers and hanging baskets where they can be grown with some protection from pounding rainstorms.

Multifloras

Comparatively smaller in size but flowering in more profusion, multiflora varieties are excellent choices for colorful bedding and border plantings because they are not as prone to damage from wet weather as the grandifloras.

The heights of petunia cultivars (cultivated varieties) vary considerably, depending on the type. The seed packet or the nursery tag should provide some information as to the mature height of the plant being purchased. Grandifloras are typically 12 to 15 inches (30 to 38 centimeters) at maturity and are likely to require some sort of support to remain upright.

Wave petunia blossoms with bi-colored petals. Wave petunias are named for their ruffled edges. Photo © 2005 by Fanghong.

Multifloras are generally more compact and mounding in their growth habits. Ground cover trailing types are available that grow to only 6 inches (15 centimeters) and some may spread as much as 6 feet (2 meters).

The terms "grandiflora" and "multiflora" are less applicable currently than in the past. The reason for this is the fact that plant breeders, through their hybridizing efforts, have blurred the lines between the

Doubled-flowered pink *Petunia hybrida* blossom. Photo © 2007 by Betty.

two basic types. The most reliable information on growth habit and mature height and spread will be found in seed catalog descriptions, on seed packets, and on nursery labels.

Cultivation

P. hybrida can be grown from seed or from nursery starts. Growing from seed requires advance planning. Start seeds indoors 8 to 10 weeks before the last frost date, and only plant in the landscape when all danger of frost is passed. Plant out in the garden when the seedlings have three true leaves. Once plants are established, pinch back halfway to encourage compact growth (Brenzel, ed., 2012; Fell, 1983).

The same concept applies to nursery starts. Plant in the landscape, and await establishment, pinching newly established plants back halfway for stronger, more compact growth.

Petunias are comparatively easy to grow, provided the proper garden conditions and cultivation practices are present. In most areas, plants require full sun for the best growth and blooming. The species will tolerate partial shade, but less flowering will result (Badgett).

The ideal garden soil in which to grow petunias is a well-drained, sandy loam rich in organic matter (humus). *P. hybrida* requires consistent irrigation and regular fertilization for best performance. Weekly deep watering should suffice unless there is a prolonged drought. Feed monthly with a complete fertilizer, a product containing nitrogen, phosphorus, and potassium.

Deadheading, the removal of spent flowers, will encourage the formation of more flowers. Because seed formation will slow or stop flowering altogether, deadhead down to the base of the spent flower to make sure the seeds are removed (Badgett).

Once the main blooming period is over, cut lanky petunias halfway back to promote healthy new growth (Brenzel, ed., 2012).

P. hybrida grows well in containers, hanging baskets, and window boxes. Because containers dry out more rapidly than the soil in the garden, apply water more often to containerized plants, perhaps as often as daily in hot weather.

Petunia flowers are widely available in colors ranging from pure white to both vibrant and pastel colors, and in solids as well as bi-colors. Photo © 2008 by Jay Dugger

Pests and Diseases

While the species is comparatively resistant to pests and diseases, some can be problematic. Pests include aphids, geranium budworm caterpillars, leaf miners, mites, and snails and slugs. Diseases include mosaic viruses, and fungal diseases such as powdery mildew and root, stem, and crown rot (Growing Petunias: How to Plant, Grow and Care for Petunias; Brenzel, ed., 2012; Waterworth).

The "Big Three" Plant Nutrients

Nitrogen (N): promotes the development of healthy leaves and stems (vegetative growth)

Phosphorus (P): promotes the development of flowers and fruits in angiosperms (flowering plants); supports the immune systems of plants

Potassium (K): promotes the development of a strong root system

Edibility

P. hybrida blossoms have edible petals that have been described as having a mild, spicy, slightly sweet flavor. These petals are eaten raw in salads and used as garnishes on other foods in human cuisine.

According to Kate P. on the website delishably.com, the nutritional values present in petunia flowers include vitamin A, vitamin C, iron, and calcium.

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Scientists Develop New Way to Identify the Sex of Sea Turtle Hatchlings

Published on the website **Vet Candy**

04 May 2020 — Unlike humans, sea turtles and other reptiles like crocodiles do not have sex chromosomes. Their sex is defined during development by the incubation environment. In sea turtles, sex is determined by the nest's temperature: warmer temperatures produce females and cooler temperatures produce males. It is especially challenging to identify the sex of hatchling sea turtles because they lack external sexual organs and heteromorphic sex chromosomes – no X or Y. To date, there are a limited number of ways to reliably identify sex in turtle hatchlings. With the rapid increase of global temperatures, there is an urgent need to clearly assess sex ratios in these imperiled animals.

Researchers from Florida Atlantic University's Charles E. Schmidt College of Science have developed a first-of-its-kind technique that is minimally invasive and greatly enhances the ability to measure neonate turtle sex ratios at population levels across nesting sites worldwide. They used this technique to identify sex in neonates of two turtle species: a freshwater turtle (*Trachemys scripta*) and a marine turtle (*Caretta caretta*) using analysis of small blood samples. This is the first time that differences in sex-specific protein expression patterns have been identified in blood samples of hatchlings with temperature-dependent sex determination. This research is a crucial step in assessing the impact of climate change on imperiled turtle species.

For the study, published in Scientific Reports, researchers used an immunoassay approach to test samples for the presence of several proteins known to play an important role in sex differentiation. Results of the study showed that anti-müllerian hormone (AMH) can reliably be detected in blood samples from neonate male turtles but not females and can be used as a sex-specific marker.

Hatchling loggerhead turtle, *Caretta caretta*, walking through a tidepool on Blackbeard Island, Georgia, on its way to the open ocean. Photo by Becky White, USFWS. Public domain.

Researchers verified the sex of the turtles using histology or laparoscopy, which revealed that the new method they developed is 100 percent reliable for identifying sex in both the freshwater turtle and the loggerhead sea turtle in 1– to 2–day-old hatchlings and was 90 percent reliable for identifying sex in 83– to 177–day-old (120 - 160g) loggerhead juveniles.

"The challenges inherent in the methods that are currently being used to identify the sex of neonate turtles with temperature-dependent sex determination is what inspired us to look for an alternative approach," said Jeanette Wyneken, Ph.D., co-author and a professor of biological sciences in FAU's Charles E. Schmidt College of Science. "Results from our study provide the field of reptile conservation, and in particular, turtle conservation and management, with a valuable new tool that can be used to accurately assess the sex ratios of hatchlings."

In comparison to the current molecular methods for sex identification in turtles with temperature-dependent sex differentiation, the approach developed by FAU researchers using blood samples via western blot analysis is quick, minimally invasive (requires a very small volume of blood), and the hatchling turtle can then be released immediately.

"Information from our study should enable other scientists and managers to precisely monitor changes in sex ratios that might arise as a consequence of changes in temperature over time," said Boris Tezak, Ph.D., senior author who conducted the research as part of his Ph.D. studies at FAU and is now a post-doctoral researcher at Duke University Medical Center. "It also will help them to estimate how climate change will affect future generations of hatchlings, and allow for expedited evaluation of management strategies used to help recover imperiled sea turtles and other reptile species with temperature-dependent sex determination."

Identifying natural turtle hatchling sex ratios at nesting sites is challenging for a variety of reasons, spanning morphological limitations to ethical issues to a lack of understanding of the mechanisms that actually direct embryonic sexual differentiation. Generally, turtles are characterized by being long-lived and late-maturing, so they are not sexually dimorphic until approaching sexual maturity - marine turtle species often take more than 25 years to become sexually mature.

"Due to the difficulties associated with readily identifying hatchling sex, most large-scale studies investigating turtle hatchling sex ratios rely on proxies to infer sex ratios indirectly such as nest temperatures, air temperatures or nest incubation durations," said Itzel Sifuentes-Romero, Ph.D., co-author,

a post-doctoral fellow of biological sciences in FAU's Charles E. Schmidt College of Science, and a post-doctoral fellow of FAU's Brain Institute (I-Brain). "However, these alternatives often fail to match the primary sex ratios from natural turtle nests or rookeries. We believe that the novel technique we have developed will allow for more accurate estimates of hatchling sex ratios at a population level and on a global scale."

Reprinted with permission from the Vet Candy staff.

Northern river terrapin, *Batagur baska*, a critically endangered freshwater turtle native to Asia. **Photo © 2004 by Animoy**

Eastern Santa Cruz Giant Tortoise, *Chelonoidis donfaustoi*, a critically endangered tortoise from Santa Cruz, Galápagos. **Photo © 2014 by aposematic herpetologist**

Male Yunnan box turtle, *Cuora yunnanensis*, a critically endangered Asian box turtle. **Photo © 2007 by Ting Zhou / Torsten Blanck**

Research from the IUCN Red List and Birdlife International Identifies 515 Vertebrate Species on the Brink of Extinction

In a posting on **Mongabay.com** dated 9 June 2020, author Liz Kimbrough references a new research article from the *Proceedings of the National Academy of Sciences* (PNAS) that discusses the possible extinction of 515 vertebrate species worldwide, including mammals, birds, reptiles, and amphibians, based on the low numbers of individuals remaining in the wild.

The **PNAS article**, published on 1 June 2020, is entitled "Vertebrates on the brink as indicators of biological annihilation and the sixth mass extinction." It is a scientific report focusing on the likelihood of species extinction and its consequences for human populations.

In Liz Kimbrough's posting, entitled "Less than a thousand remain: New list of animals on the brink of extinction," she makes the following observation: "Previous major extinctions, like the one that wiped out the dinosaurs, were caused by catastrophes such as volcanic eruptions, depletion of oxygen, and asteroid impact. Each of these events wiped out an estimated 70 to 90% of life on Earth at the time."

She contrasts historical extinctions with our present predicament: "Our current extinction crisis is caused by humans, driven by activities such as habitat destruction, habitat fragmentation, poaching, illegal trade, overharvesting, the introduction of non-native and domesticated species into the wild, pathogens, pollution, and climate disruption."

Interested readers can access both reports by clicking on the links in paragraphs 1 and 2 of this article.

Species of Turtle with Less Than 1,000 Individuals Remaining in the Wild

International Union for the Conservation of Nature Red List Statistics as of 2019

Scientific Name	Common Name	IUCN Red List Category
Batagur baska	Northern River Terrapin	Critically endangered
Batagur kachuga	Redcrowned Roofed Turtle	Critically endangered
Batagur trivittata	Burmese Roofed Turtle	Critically endangered
Chelonoidis donfaustoi	Eastern Santa Cruz Giant Tortoise	Critically endangered
Chelonoidis duncanensis	Pinzón Giant Tortoise	Critically endangered
Chelonoidis guntheri	Sierra Negra Giant Tortoise	Vulnerable
Chelonoidis hoodensis	Española Giant Tortoise	Critically endangered
Chelonoidis microphyes	Volcán Darwin Giant Tortoise	Endangered
Chelonoidis phantasticus	Fernandina Giant Tortoise	Critically endangered
Cuora yunnanensis	Yunnan Box Turtle	Critically endangered
Mesoclemmys hogei	Hoge's Sidenecked Turtle	Critically endangered
Psammobates geometricus	Geometric Tortoise	Critically endangered

Isolated Female Burmese Roofed Turtle Surprises Conservationists by Laying Fertile Eggs

Conservationists attribute success to captive breeding and release of 20 young males in Myanmar's Chindwin River — Wildlife Conservation Society news release

Yangon, Myanmar—22 May 2020 Conservationists from the Wildlife Conservation Society (WCS) and Turtle Survival Alliance (TSA) in Myanmar have announced that this year for the first time, an isolated female Burmese roofed turtle living far upstream on the Chindwin River who has never been known to produce fertile eggs, deposited a clutch of 19 eggs, 14 of which hatched earlier this month.

The Burmese Roofed Turtle (*Batagur trivittata*) is considered one of the world's most endangered turtles with fewer than five breeding females (number of males unknown) now surviving in the wild.

Conservationist attribute this change of fortune to a group of 20 captive-reared young males released into the river in late 2018. These offspring on the Chindwin River are of inestimable genetic worth. They will eventually be incorporated into our captive breeding program to stave off the long-term genetic deterioration of the population through inbreeding.

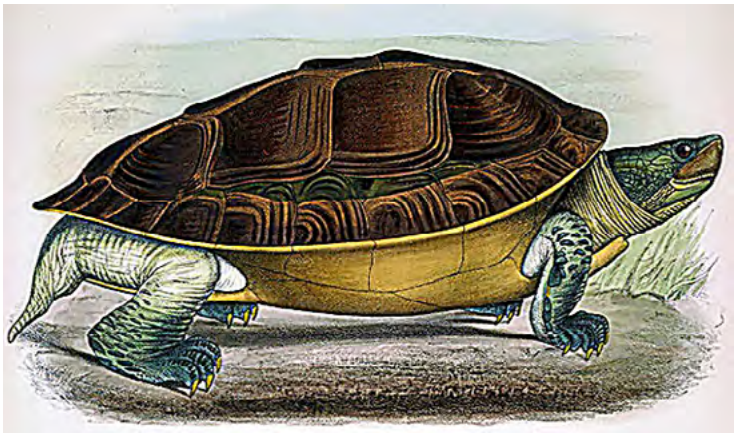
Additional news about the captive population concerns a new breeding group of Burmese Roofed Turtles established in April 2019 at the Yangon Zoo with turtles initially hatched and reared at the Mandalay Zoo. Conservationists assumed these turtles were much too young to reproduce and hence, did not expect them to begin nesting for several more years. However, less than a year after the turtles were transferred to Yangon, the females began laying eggs in an artificial sand island in their spacious outdoor enclosure. To date four eggs have hatched (more are expected) making this the first time Burmese Roofed Turtles born in captivity have successfully nested.

Carapace view of a Burmese roofed turtle hatchling. Photo from Steven Sauter, WCS.

Once abundant in the larger rivers of Myanmar, Burmese Roofed Turtles were driven to near-extinction by a combination of unsustainable egg harvesting, accidental drowning in fishing gear, gold dredging, and destruction of critical sandbanks nesting habitat. By the late 1990s, the Burmese Roofed Turtle was feared extinct until two small populations (one of which has since gone extinct) were "rediscovered" in the early 2000s.

An aggressive conservation program launched in 2007 by the Myanmar Forest Department in collaboration with the Wildlife Conservation Society and Turtle Survival Alliance has now pulled the Burmese Roofed Turtle back from the brink of extinction.

Every year in February and March eggs laid by the few remaining wild females are collected from sandbanks along the Chindwin River in northern Myanmar. They are incubated at a remote riverside village until they hatch in May and June, and then the offspring are reared for 5–6 years in captivity before returning them to the river. Captive-breeding groups have also been established at several zoos and wildlife sanctuaries in Myanmar to produce additional hatchling turtles for eventual release.



Female Burmese roofed turtle (*Batagur trivittata*). Rendering by Philbert Charles Berjeau dated 1878. Public domain.

Study Evaluates Stress Level of Rehabilitated Sea Turtles during Transport

— New England Aquarium news release

16 June 2020—Boston, Massachusetts—A new study co-authored by six scientists with the New England Aquarium has found that rehabilitated Kemp's ridley and loggerhead sea turtles experience a substantial stress response when transported to release locations in the southern United States but that the turtles remained physically stable and ready for release.

Kemp's ridley turtle, *Ledpidochelys kempii*, on his way home after being released from a cold-stun rehab center. Photo credit: NER Sea Turtle Stranding Network. Public domain.

Every year, dozens and even hundreds of "cold-stunned" turtles are treated at the Aquarium's Quincy Animal Care Center for a variety of life-threatening medical conditions that result from weeks of hypothermia and the inability to feed during stranding season. Typically, the stranding season begins in early November and runs through early January when New England water temperatures quickly turn cold and the turtles get stuck on the north side of Cape Cod. The turtles are then rescued and rehabilitated for two to eight months. When the time comes to be released back into the wild, the turtles must enter the ocean at beaches with appropriate water temperatures, often requiring transportation to southeastern states by climate controlled SUV or van. These transports may take up to 24 hours, and can induce a stress response.

"As for humans, traveling many hours over long distances can be stressful for turtles. We wanted to characterize the degree of the stress response and document whether the turtles were still in good condition after such a long trip," said Dr. Charles Innis, Director of Animal Health at the New England Aquarium.

Until now, the full impact of the transport process was unclear. In this new study, led by Dr. Kathleen Hunt of George Mason University and published in the journal Integrated Organismal Biology, all turtles had stranded in a cold-stunned state along the shore of Cape Cod Bay between October and December of 2011–2017 and were rehabilitated at the Aquarium's Animal Care Center for six to eight months. During trips to release the turtles back into the wild, scientists studied the responses of Kemp's ridley and loggerhead turtles before and after vehicle transport for under six hours, 12 hours, 18 hours, and 24 hours, gathering blood samples.

The researchers found that transport induced a physiological stress response for both sea turtle species. The duration of those transports significantly affected the stress responses, with both species showing more pronounced changes on longer journeys. Importantly, despite the findings, both turtle species in the study remained in good clinical condition based on evaluation of vital signs and blood data, even after 24-hour transport. Nonetheless, the researchers suggest that minimizing transport time, when possible, may help to ensure that rehabilitated turtles are released into the ocean under the best possible conditions.

"Results of this study will be used to ensure that sea turtle transports are conducted under controlled environments and at safe durations," said Connie Merigo, Marine Animal Rescue Department Manager. "This study will be helpful to the global community of sea turtle rehabilitators, veterinarians, researchers and biologists."

Journal Reference:

C Innis, K McNally, J Wocial, L Lory, A Kennedy, D Davis, C Loren Buck, E A Burgess, C Merigo, K E Hunt. Effects of Ground Transport in Kemp's Ridley (*Lepidochelys kempii*) and Loggerhead (*Caretta caretta*) Turtles. Integrative Organismal Biology, 2020; 2 (1) DOI: 10.1093/iob/obaa012

What is Cold-Stunning?

Sea turtles are cold-blooded reptiles that depend on the temperature of their surroundings to maintain their body temperature. Sea turtles can normally control their body temperatures by moving between areas of water with different temperatures or basking in the sun at the water's surface or on the beach. However, when temperatures rapidly decline and sea turtles are cut off from moving to warmer waters, they can suffer from a form of hypothermia we call **cold stunning**.

Cold stunning can be fatal as sea turtles become lethargic, experiencing decreased circulation and slowing of other body functions. Cold-stunned sea turtles are more likely to be hit by boats, eaten by predators, become sick, or die as their bodies shut down. Sea turtles are especially susceptible to cold stunning if water temperatures fall below 50 degrees Fahrenheit (10 degrees Celsius) or if they remain in shallow-water areas that can become very cold as air temperatures drop. This makes strong cold snaps and unseasonably cooler weather serious business for sea turtles.

— Courtesy: NOAA Fisheries

California Agency: Protection for Leatherback Sea Turtles May Be Needed

— Prehistoric Reptiles Threatened by Fishing, Ship Strikes

Sacramento, California.— 18 June 2020 — The California Department of Fish and Wildlife recommended today that Pacific leatherback sea turtles move toward protection under the state's Endangered Species Act. The action came in response to a petition from the Center for Biological Diversity and Turtle Island Restoration Network (TIRN).

The Pacific leatherback population has declined by 90% over the past 40 years, mostly because longline and gillnet fishing for tuna and swordfish entangles and drowns these giant, ancient, soft-shelled turtles. Scientists predict that, without help, Pacific leatherbacks could be extinct in 20 years.

"Pacific leatherback sea turtles are moving a step closer to protection off California's coast," said Catherine Kilduff, a Center attorney. "Leatherback sea turtles have traveled across the Pacific for millions of years. We urge the state to finalize these protections quickly so the California Endangered Species Act can help prevent their extinction."

Protecting leatherbacks under the state's Endangered Species Act would make them a state conservation priority. The state law would also provide a backstop to potentially weakened protections for leatherbacks under the federal Endangered Species Act.

2010 Indonesian postage stamp depicting a leatherback sea turtle. Public domain.

"Declaring the Pacific leatherback endangered is sorely needed and the first step toward recovery of one of California's most giant, gentle and unique marine species," said Todd Steiner, a wildlife ecologist and executive director of Turtle Island Restoration Network.

Leatherback turtle nesting on Sandy Point National Wildlife Refuge, US Virgin Islands. Photo by Al Woodson, USFWS. Public domain.

"In order to give this amazing species a fighting chance at survival we must eliminate all threats from commercial fishing, pollution and climate change."

In August 2020 California's Fish and Game Commission is scheduled to decide whether to accept the department's recommendation and grant these imperiled turtles candidate status under state law. A candidate designation triggers a yearlong review of whether the species should be formally protected by the state; the species is legally protected during that review period.

Pacific leatherback sea turtles are highly endangered and listed under the federal Endangered Species Act. In 2016 the National Marine Fisheries Service identified leatherback sea turtles as one of eight species most at risk of extinction. The Service says reducing their entanglement in fishing gear is the top priority for ensuring their survival.

The Center and TIRN sued the Trump administration after a fishing permit issued last year exempted vessels from the federal ban on longline gear off California. Longlines stretch up to 60 miles, with thousands of baited hooks. A federal judge in Oakland ruled Dec. 20 [2019] that the federal government had failed to adequately consider impacts on leatherbacks when it revived longline fishing, blocking the permit.

— Center for Biological Diversity press release

The CTTC Orange County Chapter is happy to announce their 7th Annual Educational "Live Turtle and Tortoise Show"!

New changes, New look...Come join us!

Exhibitors, Animal Exhibits, Volunteers, and Vendors Wanted!

Everyone Welcome!

SAVE THE DATE... COME HELP US EDUCATE!!

- **NEW** Show Information...
- Date - **Saturday Aug. 29, 2020**
- Time - **10 a.m to 4 p.m.**
- Where - The La Habra Community Center
- 101 W. La Habra Blvd.
- City of La Habra, CA 90631
- Info - Orangecounty@tortoise.org

2020 California Turtle & Tortoise Club Directory

Executive Board
General Information:
CTTCEBOfficers@tortoise.org
Chair: **Don Williams**
Vice-chair: **Robyn Kohr**
Treasurer: **Javier Gonzalez**
Meeting: quarterly (January, April, July and October) at 10 AM at the Los Angeles County Arboretum, 301 No. Baldwin Avenue, Arcadia, CA 91007

Chino Valley Chapter
President: **Lynda Misiak**
Vice president: **David Bowman**
Secretary: **Rachelle Buck**
Adoptions: **Jim Misiak**
Meeting: Third Friday, 7:30 PM at Chino Girl Scout House, 5007 Center Street, Chino, CA 91710

Foothill Chapter
President: **Joanna Bolt**
Secretary: **Mardy Graves**
Treasurer/membership:
Jeanette Lea
Meeting: Fourth Friday, 7:30 PM at Los Angeles County Arboretum, 301 No. Baldwin Avenue, Arcadia, CA 91007

High Desert Chapter
President: **Regene Fonville**
Vice president: **Dave Zantiny**
Secretary: **Mary Dutro**
Treasurer: **Jose Zumudio**
Meeting: Second Monday, 7:00 PM at Sterling Inn Regency Room, 17738 Francesca Road, Victorville, CA 92395

Inland Empire Chapter
President: **Monica Dirac**
Vice president: **Richard Roosman**
Corresponding Secretary:
Amy Taylor
Treasurer: **Robyn Kohr**
Meeting: First Friday, 7:30 PM at "The Ark" Church of the Nazarenes in the Fellowship Hall in Young Hall, 1307 East Citrus Avenue, Redlands, CA 92374

Kern County Chapter
General Information:
TurtleTortoiseClubKern@gmail.com
President/membership:
Heather Ponek
Vice president: **Tim Brennan**
Secretary: **Lisa Marriott-Smith**
Treasurer: **Kathy Studer**
Adoptions:
Richard Marriott-Smith
Meeting: Second Monday, 6:30 PM at St. Philip of the Apostle Church, St. Ann's Room (east side of church), 7100 Stockdale Hwy (on the north side, between Ashe and Gosford), Bakersfield, CA 93309

Low Desert Chapter
General Information:
Tony Vaninetti
Secretary: **Marlies Dietrich**
Adoptions: **Bill Powers**
Meeting: First Monday of every even-numbered month 7:00 PM at The Living Desert Reserve, 47-900 Portola, Palm Desert, CA 92260-6156

Orange County Chapter
General Information:
orangecounty@tortoise.org
President: **Sharon Paquette**
Vice president: **John Kim**
Secretary: **Joyce Keyak**
Treasurer: **Traci Fields**
Adoptions Inquiry
Meeting: Second Friday, 7:30 PM at Grand Street Center (First Presbyterian Church), 146 N. Grand Street, Orange, CA 92866

Ridgecrest Chapter
President: **Robert Parker**
Vice president: **Sue Parker**
Adoptions: **Montynne Yates**
Meeting: Second Monday, 7:30 PM at Maturango Museum, 100 East Las Flores Ave., Ridgecrest, CA 93555

Santa Barbara-Ventura Chapter
President: **Don Williams**
Meeting: Contact the Chapter for meeting information.

Santa Clarita Chapter
President: **George Ordway**
Secretary: **Jennifer Fields**
Treasurer/membership/adoptions:
Abigail DeSesa
Meeting: Third Saturday of odd-numbered months at 6:30 PM at Valencia United Methodist Church, 25718 McBean Pkwy, Valencia, California 91355

TOOSLO (San Luis Obispo) Chapter
President: **Brandon Froelicher**
Vice president: **Brian Kusko**
Treasurer: **Diane O'Leary**
Meeting: Second Wednesday, 7:00 PM at Ludwick Community Center Meeting Room. 864 Santa Rosa St., San Luis Obispo, CA 93401

Turtle & Tortoise Care Society (Long Beach) Chapter
President: **Richard Roosman**
Vice president: **John Kim**
Treasurer: **John Wong**
Adoptions: **Casey Quinn**
Adoptions Inquiries
Meeting: Third Saturday, 7:30 PM at St. Gregory's Episcopal Church, 6201 East Willow Street, Long Beach, Ca. 90815

Valley Chapter
President: **Bob Hazard**
Treasurer: **Karen Berry**
Adoptions: **Valley Adoption Team**
Meeting: Third Friday, 7:30 PM at Woodland Hills Christian Church, 5920 Shoup Ave., Woodland Hills, CA 91367-3327

NOTE: The postal mailing addresses for each Chapter are listed on the last page of this newsletter.

Meetings and Programs

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

Chino Valley
17 July; 21 August

Foothill
24 July; 28 August

High Desert
13 July; 10 August

Inland Empire
3 July; 7 August

Kern County
13 July; 10 August

Low Desert
3 August

Orange County
10 July; 14 August

Ridgecrest
13 July; 10 August

Santa Barbara-Ventura
Contact the chapter for meeting information.

Santa Clarita
15 August

TOOSLO (San Luis Obispo)
21 July; 18 August

TTCS (Long Beach)
18 July; 15 August

Valley
17 July; 21 August

Long Live Science

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

Please send ad fee to: CTTC *Tortuga Gazette*, attn Treasurer, P. O. Box 7300, Van Nuys, CA 91409-7300.

Mail fee with ad copy to the *Tortuga Gazette* mailing address; OR, mail fee to the postal address above, and email the ad copy to the **Gazette Editor**.

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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 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}

CTTC Mailing Addresses

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

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

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

Inland Empire Chapter: P.O. Box 2371, San Bernardino, CA 92406-2371

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

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

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

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

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

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

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

Turtle & Tortoise Care Society Chapter: P O Box 15953, Long Beach, CA 90815

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

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