California Turtle & Tortoise Club

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Olive ridley turtle, *Leipdochlys olivacea,* photographed after laying her eggs. Photo © 2004 by Brad Flickinger. Source: Creative Commons; license CC-BY-SA 2.0.

featured species

Olive Ridley Sea Turtle, *Lepidochelys olivacea* (Eschscholtz 1829)

The Pacific Ridley Turtle by M. A. Cohen

Johann Friedrich von Eschscholtz, a German physician and naturalist, officially described the olive ridley sea turtle in 1829. Some attribute the common name "ridley turtle" to English naturalist Henry Nicholas Ridley (1855-1956) after his report of sighting the species in Brazil, but evidence supporting this claim is scant; others think it more likely that the term "ridley" may be related to the word "riddle."

The generic scientific name (*Lepidochelys*) of the olive ridley consists of two Greek root words, *lepido-*, meaning a scale, and *chelys-*, meaning a turtle, while the specific name (*olivacea*) derives from the Latin root word *oliva-*, meaning olive or olive-green, referring to the general coloration of the species' carapace.

According to researchers' estimates, approximately 800,000 female olive ridley turtles annually nest on beaches throughout the tropical and subtropical portions of their range ("Olive Ridley Turtle (*Lepidochelys olivacea*)"). Despite its relative abundance, in several parts of its range extensive exploitation of the olive ridley turtle for its eggs, oil, meat, shell, and skin continues, the result of which is plunging population numbers in those regions of overexploitation. In the judgement of some biologists, olive ridley populations have fallen to 50% of the levels recorded in the 1960s. See the sections on "Threats" and "Conservation" for additional information.

Identification

Belonging to the Cheloniidae, the chelonian family of sea turtles, the olive ridley turtle, *Lepidochelys olivacea*, is the smallest and most abundant of the living marine turtles. While individuals inhabiting the Pacific Ocean are generally larger than those in the Atlantic, olive ridleys in the Atlantic are usually darker in color than those in the Pacific. In the eastern Pacific, the carapace of the species is

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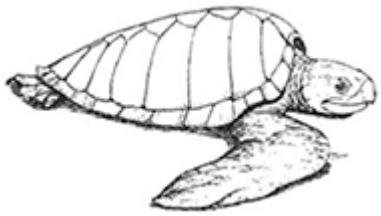

California Turtle & Tortoise Club: a Society Dedicated to Turtle & Tortoise Preservation, Conservation and Education Since 1964. Promoting and Facilitating the Care, Rescue and Adoption of Native and Nonnative Turtles and Tortoises.

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noticeably domed when compared to the Atlantic individuals ("Olive Ridley Sea Turtle," n.d.).

The olive ridley turtle has five or more vertebral scutes running down the center of its carapace, and five to nine pleural scutes on either side of its vertebrals. At 22 to 31 inches (55 to 80 centimeters) in length, the olive ridley's carapace is roughly heart-shaped and olive- to gray-green to brownish-gray in coloration.

Greenish-white to greenish-yellow in color, the species' plastron has no hinge. The skin of the olive ridley turtle is olive-colored on the top side and a lighter color on the underside.

While the male *L. olivacea* is larger than the female, the female is heavier than her male counterpart. With a longer, thicker tail that the female, the male has a tail extends well beyond the rear marginals of his carapace, and his plastron is noticeably concave toward the rear. The female olive ridley turtle has a considerably smaller tail than the male, and her plastron is flat (Ernst & Lovich, 2009).

While there is a possibility that the eastern Pacific and southern Atlantic populations are distinct, biologists do not currently recognize any subspecies of the olive ridley turtle ("Lepidochelys olivacea," 1997).

Range and Habitat

While biologists characterize *L. olivacea* as pelagic [1], most of the scientific studies of the species have been conducted within approximately 10 miles (16 kilometers) of mainland and island shores.

The extensive circumtropical range of the olive ridley turtle includes the tropical seas of the Pacific and Indian Oceans off the coasts of Arabia, India, Japan, southern Africa, Australia, New Zealand, and the island chains of Micronesia. The only tropical sea it does not ordinarily inhabit is the Gulf of Mexico (Abreu-Grobois & Plotkin, 2008).

The species also inhabits the seas of the southern Atlantic Ocean off the coast of western Africa, the South American coastal waters of Brazil, French Guiana, Guyana, Surinam, and Venezuela. In the eastern Pacific Ocean, the species lives off the coasts of Chile, the Galápagos Islands, the Gulf of California, and the Pacific Coast of North America.

L. olivacea inhabits warm, shallow coastal waters between reefs and shorelines, as well as bays, estuaries, and lagoons adjacent to the shorelines, feeding and breeding in these ecosystems. When it migrates into the pelagic zone, the olive ridley feeds on deep-water invertebrates in the open ocean.

pelagic: relating to or living in the open ocean

Feeding

Omnivorous, with a tendency to carnivory, *L. olivacea* consumes various marine invertebrates such as crabs, jellyfish, rock lobsters, mollusks such as snails, sea urchins, shrimp, and tunicates such as sea squirts and salps. The species also preys on fish, eats fish eggs, and periodically feeds on algae and seaweed.

Besides feeding in the shallow waters near shore, *L. olivacea* will also dive as deep as 500 feet (152 meters) in the open ocean to feed on invertebrates that live in the depths of the sea (known to oceanographers as the benthic zone).

Olive ridley turtle hatchling. Photo © 2014 by Pawar Pooja. Source: Creative Commons; license: CC BY-SA 4.0.

Following deep dives to feed in the cold waters of the benthic zone, the olive ridley turtle will often bask, floating on the warmer surface of the ocean to facilitate its digestion and stimulate its metabolism (Ernst & Lovich, 2009).

Reproduction

As a species, *L. olivacea* reaches reproductive maturity between 7 and 16 years, depending on geographical location and gender. While some mating may occur in the open ocean at various times of the year, most courtship and mating activities take place in the shallow waters offshore, after which female

olive ridleys come ashore to nest (Ernst & Lovich, 2009).

The laying of eggs, termed oviposition, occurs one to three times a season, usually twice during a given season and often at two-week intervals. The olive ridley female conceals her nest by performing a unique behavior described by Dr. James Spotila as "bouncing on the sand, pounding it flat and hard with her plastron. Propped up on her front flippers and hind legs, she alternatively bounces her plastron side to side in a little dance that seals the site where she has just deposited her offspring" (Spotila, 2004).

Ranging in size from 30 to 182 eggs, the average clutch size of by the olive ridley is 106 eggs. The influence of the mechanism of temperature-dependent sex determination (TSD) means that the internal temperature at which the olive ridley eggs incubate determines the sexes of the hatchlings. At incubation temperatures of 82°F (28°C) or less, nests produce only male hatchlings will, while at temperatures of 31°C or higher, only females emerge. The intermediate temperatures of 84 to 86°F (29 to 30°C) yield a mixture of male and female young (Ernst & Lovich, 2009).

Infestation of olive ridley eggs by fly and beetle larvae takes a significant toll on embryos as the turtles develop prior to hatching. After an incubation period of 50 to 58 days, dependent to some extent on the temperature of the sand, hatchlings emerge from their nest, usually simultaneously, and crawl to the sea. Many predators, including seabirds, domestic and feral dogs, and wild pigs await the emergence of the hatchlings, taking a heavy toll on the next generation ("Olive Ridley Sea Turtle," n.d.).

The mass emergence of scores of olive ridleys hatchlings serves as part of a general survival strategy known as "predator swamping." Animals preying on the emerging hatchlings are overwhelmed by the sheer number of young and cannot possibly consume all of them. This tactic ensures that some hatchlings will succeed in reaching the sea in an attempt to perpetuate their species.

An olive ridley *arribada* occurring on the beach at Oaxaca, Mexico. In Spanish, the species is called *la tortuga golfina*. Photo © 2012 by Eder Omar Campos González. Source: Creative Commons; license CC-BY-SA-3.0.

La Arribada

Translating from Spanish to English as "arrival," the term *arribada* refers to a mass-nesting event in which a large group of female marine turtles simultaneously arrives at a beach or shoreline, commencing nesting activities including nest excavation, egg-laying, and nest concealment. Olive ridley turtles and Kemp's ridley turtles (*Lepidochelys kempii*) are the only marine species in which scientists have observed mass-nesting events, although both species also engage in solitary nesting.

Despite the extensive range of the species, the *arribada* phenomenon occurs only on a few beaches in the Indian and eastern Pacific Oceans in the countries of Mexico, Nicaragua, Costa Rica, Panama, and India. The largest documented *arribadas* appear to occur in Orissa, India, yielding as many as 398,000 eggs ("Olive Ridley Sea Turtle," n.d.). Some biologists note that the largest *arribada* rookery is located in Escobilla, Mexico (Abreu & Plotkin, 2008). Biologists have recorded the solitary nesting of the olive ridley females in some 40 countries within the its range ("Olive Ridley Turtle (*Lepidochelys olivacea*)," n.d.).

While it is a dramatic event, the *arribada* is not well-understood regarding its triggering mechanisms. According to biologists' theories, among the triggers that may precipitate an *arribada* are offshore winds, lunar cycles, and pheromonal patterns of the female turtles ("Olive Ridley Turtle (*Lepidochelys olivacea*)," n.d.).

Often comprising tens of thousands of individuals, an *arribada* that occurs over a three-day period may yield as many as 5.5 million eggs (Spotila, 2004). So many turtles may seek nesting sites that those nesting later during the event may excavate nests laid earlier in the *arribada*.

Threats

The International Union for the Conservation of Nature (IUCN) Red List identifies four primary categories of threats to *L. olivacea*: targeted exploitation, bycatch in fisheries, habitat impacts, and disease and predation (Abreu-Grobois & Plotkin, 2008). Throughout the olive ridley's range, the species suffers population declines because of these threats, further examination of which follows.

Targeted exploitation

Targeted for their eggs, meat, and skin, olive ridley turtles are unsustainably exploited worldwide for personal and commercial uses. Despite varying local, national, and international regulations, enforcement of laws is often either insufficient or nonexistent.

Bycatch in fisheries

According to Abreu-Grobois and Plotkin, "incidental capture of Olive Ridleys occurs worldwide in trawl fisheries, longline fisheries, purse seines, gill net and other net fisheries and hook and line fisheries." When global statistics are combined, these fisheries account for—conservatively—tens of thousands of olive ridley deaths annually.

Habitat impacts

Degradation, destruction and loss of nesting beaches result from various factors, including development of tourist facilities and growing coastal populations in local communities. This development brings changes to nesting beaches such as increased light pollution and alteration of the thermal profile of the beaches.

Global climate change brings the threat of a skewing of the sex ratios of sea turtle populations as all sea turtles

are subject to the influence of incubation temperature on embryo development (temperature-dependent sex determination) (Abreu-Grobois & Plotkin, 2008).

Disease and predation

In some nesting *L. olivacea* females Costa Rica and Mexico, the herpes virus fibropapilloma is present, although the disease is more widespread in green turtles (*Chelonia mydas*). The current article discusses predation in the "Reproduction" section.

Conservation

Listings as Endangered in the IUCN Red List and as a CITES I species provide the basis for several other international, national, and local programs that attempt to legally protect the species as populations continue to decline. Law enforcement efforts vary from effective to lacking and might best be described as "patchy." Enforcement of existing regulations and increased mitigation measures for coastal portions of the species' range need implementation on order to aid olive ridley turtle recovery (Abreu & Plotkin, 2008). **Ω**

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Postage stamp featuring the olive ridley turtle issued by the government of the Republic of Indonesia in 2010. Public domain.

U. S. Coast Guard Airlifts Ridley Turtles in Need

According to the NOAA Fisheries' Greater Atlantic Region website, "the term 'cold stunning' refers to the hypothermic reaction that occurs when sea turtles are exposed to prolonged cold water temperatures. Initial symptoms include a decreased heart rate, decreased circulation, and lethargy, followed by shock, pneumonia and possibly death."

Cold stunning occurs on both the East and West Coasts of the United States, typically between October and December, when sea turtles foraging in northerly waters fail to migrate south to warmer waters. The ocean drops rapidly with increasingly cold weather, and the sea turtles are unable to escape the falling temperatures.

The endangered olive ridley sea turtle, nicknamed Solstice, sits in her crate during transport from Newport, OR to San Diego, CA Feb. 24, 2015. The turtle was found in Washington in December [2014] suffering from hypothermia, dehydration and other minor injuries, and a Coast Guard Air Station Sacramento, California, HC-130 crew transported the turtle. U.S. Coast Guard photo by Petty Officer 2nd Class Rob Simpson. Unit: U.S. Coast Guard District 11 PADET San Diego. Public domain.

Quincy, MA—Staff and volunteers from the New England Aquarium give fluids to an endangered Kemp's Ridley sea turtle to keep him hydrated for transport from Massachusetts to Florida while at the Animal Care Center in Quincy, Mass., Sun. Dec. 12, 2010. Twenty sea turtles that were rescued within the past six weeks around Cape Cod, Mass., were flown from Hanscom Air Force Base in Lincoln, Mass., to Orlando, Fla., by a Mobile, Ala.-based Coast Guard HC-144A Ocean Sentry aircrew where they will continue to be rehabilitated by Sea World before being potentially released back into the wild. Coast Guard photo by Petty Officer 3rd Class Connie Terrell. Unit: U.S. Coast Guard District 1. Public domain.

The U. S. Coast Guard assists in the rescue of dozens of sea turtles suffering from this life-threatening condition each year. By providing air transport to warm regions such as southern California and Florida, the Coast Guard facilitates treatment of the ailing sea turtles at rehabilitation facilities specializing in marine turtle medicine. Successful treatment of these sea turtles results in their release into the wild.

Lincoln, MA—Coast Guard petty officers Stephen Perusin and Andrew Anderson, from Aviation Training Center Mobile, Ala., secure 20 endangered Kemp's Ridley sea turtles for a flight from Hanscom Air Force Base in Lincoln, Mass., to Orlando, Fla., Sun. Dec. 12, 2010. Once in Orlando, Sea World staff will continue to rehabilitate the 20 sea turtles and potentially release them back into the wild. Coast Guard photo by Petty Officer 3rd Class Connie Terrell. Unit: U.S. Coast Guard District 1. Public domain.

In Memory of Ward

by Howard Suer, CTTC Valley Chapter

About 4 years ago, I received a call from Karen Berry, Adoption Team Leader for our Tortoise Club chapter, who asked if I would foster a desert tortoise. His owner of 40 years had died. The woman's best friend, Sondra, wanted to adopt him, but her yard was not properly fenced, and did not pass our inspection.

Karen explained that it would only be for a short time, until she could provide a safe home for "Ward".

I said "Sure," thinking it would only be for a few weeks or so.

Ward the desert tortoise. Photo by the author.

A few days later, Ward arrived. He was a big healthy-looking guy. His hopeful, adoptive owner, Sondra, came with him. I looked Ward in the eye, and there was an immediate bonding. We liked one another. I made a delicious-looking salad for him of diced Romaine lettuce and kale, dusted with a topping of calcium and tortoise vitamins. Ward apparently had other things on his mind as he walked right over his salad on an inspection tour of his new temporary home.

While wandering around the grassy front yard, he discovered "Wendy," my female desert tortoise. He immediately started bobbing his head for her. I smiled and said, "It's okay Ward. I was the same way when I was your age." Alas, poor Ward was not allowed to indulge his attraction to her.

By the third day, I was concerned that Ward had shown no interest in any of the food I offered him. I called Sondra and asked what her friend had fed him. She replied, "only canned corn." I bought a can of Green Giant corn niblets, and watched Ward gobble them up. This was not a good diet for a desert tortoise, and I gradually weaned him from the corn to a more nutritious diet.

Over the months that followed, Ward and I bonded. When I entered the front yard, he made a bee-line for me. I fell in love with that guy.

Meanwhile, every week, Sondra came to visit Ward, until one day, practically in tears, she said, "I could never give him a home like this. Would you like to keep him?" Those words were music to my ears.

About a week after I officially adopted Ward, he started acting lethargic. He stopped eating, and would just mope. We went to visit Dr. Geoff Stein at McClave Animal Hospital who gave him a thorough physical exam. An x-ray showed a bladder-stone, larger than a baseball. We scheduled his surgery for the following week.

Ward came through the surgery very well. Aside from a huge section of his plastron that had to be removed to access his bladder, then replaced and covered with fiberglass and epoxy, he was just fine. Dr. Stein explained that it would take about two years for the plastron to heal. Ward would then have this wonderful scar to boast about to his friends.

During the years that followed, Ward made lots of friends. Neighborhood kids would come to visit him. They would bring other friends and family members. Ward was somewhat of a celebrity in the neighborhood.

Last Monday, June 12th, Ward was lethargic. He was not interested in his food, and did not move from one spot. It had been a hot day, so I tried hydrating him in a shallow tub of cool water. We made an appointment to see Dr. Stein on Wednesday. Ward had pneumonia. Dr. Stein said that he thought Ward was about 80 years old (which is about the lifespan of a desert tortoise).

He told me that Ward was very sick, and didn't look like he would make it. I asked, "Can we try?" Dr. Stein gave Ward two injections into the muscles of his front legs. I left with prescription drugs which I was to administer the same way every three days. Thursday, I filled the syringe with his medication. When I went to get Ward.....he was dead.

Ward will always have a place in my heart, and this short story is to share the memory of a wonderful pet who asked very little and gave a lot of pleasure. **Ω**

The *Tortuga Gazette* offers condolences to Howard Suer for his loss and special thanks for sharing his heartfelt tribute to his desert tortoise Ward.

Desert scenic. USFWS photo. Public domain.

Lachryphagy: Butterflies Sipping Turtle Tears by M. A. Cohen

Two Julia Butterflies (*Dryas iulia*) drinking the tears of [unidentified] turtles in Ecuador. The turtles placidly permit the butterflies to sip from their eyes as they bask on a log. This "tear-feeding" is a phenomenon known as lachryphagy. Photo © 2012 by amalavida.tv (flickr). Source: Creative Commons, license: CC BY-SA 2.0. This photograph, captured in western Ecuador, was awarded Picture of the Year in 2014 by Wikimedia Commons.

Lachryphagy (pronounced LACK-rih-fah-gee), a term derived from the Latin root word *lachr-*, meaning tears, and the Greek root word *phag-*, meaning to eat, describes an activity occasionally seen and photographed by humans. Tear-feeding and the related behavior mud-puddling appear to be strategies through which some insects obtain salts, protein, and other micronutrients.

Flower nectar, the staple food of many butterflies and other insects, is low in salts and protein, which are chemical compounds vital to the insects' metabolic and reproductive processes. Mud-puddling, or simply puddling, is a behavior observed mainly in butterflies, when the insects visit a moist area, such as a mud puddle, lake shore, and the like, to drink droplets of water containing dissolved essential micronutrients.

Scientists have observed butterflies, moths, and bees engaging in tear-feeding on birds, mammals such as cattle and humans, and reptiles in various parts of the world, including Asia and Central and South America. In the reptile category, caimans, crocodiles, and turtles are the animals commonly targeted by the tear-feeding insects, and the reptiles generally cooperate with the insects' lachryphagous behavior.

Mostly, caimans seem oblivious to tear-feeding by all types of insects. Conversely, while basking, river turtles calmly accept tear-feeding by butterflies, but, when bees are buzzing around their eyes, the turtles seem nervous. Researchers have observed the turtles shaking their heads to discourage the bees and even diving to the water to rid themselves of the nuisance (Sirucek, 2014).

Carlos de la Rosa of La Selva Biological Station near San Pedro, Costa Rica routinely observes reptiles, including spectacled caimans (*Caiman crocodilus*), American crocodiles (*Crocodylus acutus*), Nicaraguan sliders (*Trachemys emolli*) and black river turtles (*Rhinoclemmys funerea*) being visited while basking on or near the shores of the Puerto Viejo River in northern Costa Rica by insects for tear-feeding (de la Rosa, 2014).

The photographic evidence of lachryphagy notwithstanding, this phenomenon has not been extensively studied scientifically, and the purpose of tear-feeding is poorly understood. Lachryphagy is a short-lived activity lasting maybe 15 minutes at most, making it difficult for scientists to research and thoroughly document the phenomenon. Furthermore, computer modeling is not particularly useful as a tool for analyzing tear-feeding. Instead, old-fashioned natural history such as field research is likely to be a more productive technique for determining the function of tear-feeding in the lives of the animals involved and in the environment as a whole (Sirucek, 2014). **Ω**

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Julia (*Dryas iulia titio*) butterflies feeding on the tears of Yellow-spotted river turtles (*Podocnemis unifilis*), as photographed on the Cristalino River, Southern Amazon, Brazil. Photo © 2015 by Charlesjsharp from Sharp Photography. Source: Creative Commons; license: CC-BY-SA-4.0.

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.**

Rio Grande Cooters in New Mexico
This story on captive and wild Rio Grande cooters has some great photographs.

Annotated Checklist of Turtles of the World
The eighth edition of the IUCN's Turtles of the World: Annotated Checklist and Atlas of Taxonomy, Synonymy, Distribution, and Conservation Status now available as a free download.

Turtle Evolution Overview
Darren Naish blogs the "World of Turtle Evolution".

Good Vibrations
There was lots of media coverage of biologists using vibrators to sex chicken turtles in the field.

You might enjoy watching **Donald McKnight's presentation of his work (includes a link to his research paper).**

A Connecticut Box Turtle (1)
A lucky encounter allows a Last Green Valley ranger to strike seeing an eastern box turtle from his bucket list!

A Connecticut Box Turtle (2)
Every now and then an eastern box turtle visits a Connecticut couple living in its habitat.

Studying Ornate Box Turtles in Iowa
Cornell College field studies of ornate box turtles. Make sure to scroll down and watch the video!

Canada's Turtles Face Many Threats

- **Ontario's turtles are in a "State of Emergency".**
- **Abandoned red-eared sliders are impacting Vancouver's painted turtles.**
- **Despite having "toppled" a major wind turbine project, roads threaten Ontario's Blanding's turtles.**

"Invasive Grasses Choking Desert Tortoise"
USFWS news release on weedy grasses invading desert tortoise habitat. Sadly, it makes no mention that they still permit the BLM to authorize commercial cattle grazing–which spreads these exotic grasses–on large swathes of their critical habitat.

Cadiz Mojave Desert Water Mining Project
Senator Feinstein urges the State Legislature to pass the California Desert Protection Act, to block the Cadiz water mining project that will dehydrate the eastern Mojave tortoise habitats.

Feds Sued for Back-tracking on Protections for California's Sea Turtles
Oceana has filed suit against the Trump Administration's rollback of restrictions that would limit the number of sea turtles and other wildlife trapped in swordfish gill nets off California's coast.

Number of Kemp's Ridley Nests in Texas Breaks Record
352 Kemp's Ridley sea turtle nests have been found on Texas beaches so far this year. The story includes a video clip of hatchlings being released.

Green Sea Turtle Skin Grown in Laboratory
USGS scientists have successfully cultured skin from green sea turtles. This is a major advance in the fight against fibropapillomatosis, the virus-caused skin cancer that impacts green sea turtles around the globe.

Sea Turtle Research
Special issue of the Latin American Journal for Aquatic Research includes 10 peer reviewed articles on sea turtles, all with access.

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CTTC Meetings and Programs

Cen-Val: 14 September; 12 October

Chino Valley: 15 September; 20 October

Foothill: 22 September; 27 October

High Desert: 11 September; 9 October

Inland Empire: 1 September; 6 October

Kern County: 11 September; 9 October

Low Desert: 2 October

Orange County: 8 September; 13 October

Ridgecrest: 11 September; 9 October

Santa Barbara-Ventura: Contact the chapter for meeting information.

Santa Clarita: 16 September

Silicon Valley: 15 September; 20 October

TOOSLO (San Luis Obispo): 13 September; 11 October

TTCS (Long Beach): 15 September – Show and Tell; 20 October

Valley: 15 September; 20 October

Executive Board: 14 October. Meetings are held at the Los Angeles County Arboretum, Arcadia, CA.

Check your Chapter web site for the latest program information. Programs may be scheduled after the newsletter is published.

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"... the current position of the California Department of Fish and Wildlife is that it is illegal to breed captive [desert] tortoises."

[The Desert Tortoise Council's *Answering Questions* e-publication is currently offline in revision.]

"CTTC will not place desert tortoises (*Gopherus agassizii*) in situations where captive breeding may occur. CTTC works with California Department of Fish and Wildlife (CDFW) to place desert tortoises. Both CDFW and CTTC discourage the captive breeding of desert tortoises."

– tortoise.org/cttc/adoption.html

Reptile skin grown in lab for first time, helps study endangered turtle disease

by Tina Weatherby Carvalho, University of Hawaii School of Ocean and Earth Science and Technology — *University of Hawaii press release*

Scientists, including Tina Weatherby with the University of Hawai'i at Mānoa (UHM) School of Ocean and Earth Science and Technology (SOEST), published a study wherein they reconstructed the skin of endangered green turtles, marking the first time that reptile skin was successfully engineered in a laboratory. In turn, the scientists were able to grow a tumor-associated virus to better understand certain tumor diseases.

In an international collaboration led by the U.S. Geological Survey, scientists engineered turtle skin in order to grow a virus called chelonid herpesvirus 5 or ChHV5. ChHV5 is associated with fibropapillomatosis, known as FP, a tumor disease affecting green turtles worldwide but particularly those in Hawai'i, Florida and Brazil. FP in turtles causes disfiguring tumors on the skin, eyes and mouth as well as internal tumors. The virus also harms turtles' immune systems, leading to secondary infections, emaciation and often death.

Examining how ChHV5 grows in turtle skin brings researchers closer to fighting viral diseases that threaten imperiled species.

"Fibropapillomatosis is the most common infectious disease affecting endangered green turtles," said Thierry Work, a USGS scientist and the lead author of the study. "Our findings provide a significant advancement in studying FP, and may eventually help scientists better understand other herpes virus-induced tumor diseases, including those of humans."

Scientists used cells from tumors and normal skin from turtles to reconstruct the complex three-dimensional structure of turtle skin, allowing growth of ChHV5 in the lab. In order to observe virus replication in unprecedented detail, Weatherby, a research associate at the UHM SOEST Pacific Biosciences Research Center, precisely cut ultrathin slices of the skin to a thickness of about 60 to 80 nanometers or about one thousandths of the thickness of a hair. Viewing these slices through a transmission electron microscope, the only one of its kind in the state used for biological studies, revealed bizarre systems such as sun-shaped virus replication centers where the viruses form within cells.

Although the existence of ChHV5 has been known for more than 20 years, the inability to grow the virus in the laboratory hampered understanding of how it causes tumors and the development of blood tests to detect the virus.

"Examining viruses within the complex three-dimensional structure of engineered skin is exciting, because virus replication in such a system is likely much closer to reality than traditional laboratory techniques," Work said. "This method could be a powerful tool for answering broader questions about virus-induced tumors in reptiles and herpes virus replication in general."

The U.S Endangered Species Act and International Union for the Conservation of Nature list sea turtles as threatened or endangered throughout their range. Aside from disease, threats to green turtles include loss of nesting habitat, nest destruction and bycatch in commercial fisheries.

The USGS partnered with the University of Hawai'i, the National Oceanic and Atmospheric Administration and the University of Zurich on the new study. **Ω**

This Hawaiian green turtle is severely afflicted with fibropapillomatosis [appearing as cauliflower-like tumors]. The mouth tumors, which are unique to Hawaiian greens, can also occur inside the mouth and throat, impairing breathing and eating. The eye tumors impair vision and can blind the turtle. The large tumors around the flippers can impair swimming. Although FP tumors are benign, they can easily be a significant factor in a turtle's death.
Photo © 1992 by Peter Bennett & Ursula Keuper-Bennett. Photographed at about 15 meters [49 feet] depth and approximately 300 meters [984 feet] from shore at Honokowai, West Maui, Hawaii.
Source: Creative Commons; license: CC-BY-3.0.

Talking Turtles II: WCS Discovers More Turtles that Talk

Pig–nosed turtles of Australia and New Guinea vocalize while feeding, basking, and nesting

New York, New York—June 26, 2017— Scientists from the Wildlife Conservation Society (WCS) and other groups have found that the pig-nosed turtle (*Carettochelys insculpta*) has joined a select group of chatty chelonians that can vocalize. The researchers recorded 182 calls from seven individuals in the wild and in a private breeding facility and found that the turtles communicate with each other while feeding, basking, and nesting.

The researchers published their study in the journal *Copeia*. Authors include Camila Ferrara, Aquatic Turtle Specialist for WCS; Richard Vogt of the *Instituto Nacional de Pequisas da Amazônia*; Carla Eisemberg of Charles Darwin University; and J. Sean Doody of the University of Tennessee.

Until recently, scientists believed that most freshwater turtles did not have complex social interactions or postnatal parental care.

The pig-nosed turtle, also called the Fly River turtle, is found in Australia, New Guinea, and Indonesia. It is classified as Vulnerable by IUCN due to the illegal wildlife trade and habitat loss.

Said WCS's Camila Ferrara, lead author of the study: "Understanding how turtles communicate is important to help to protect them. Noise pollution produced by ships, boats, jet skis, and other motorized watercraft may affect the reception of sound by turtles and potentially interfere with their communication."

In addition, Ferrara notes that current conservation strategies, which include isolating young individuals in captivity after hatching, might be negatively impacting important social interactions among females and hatchlings.

In 2014, WCS documented vocalization in giant South American river turtles In Brazil. Since the publication of those findings, managers now immediately release hatchlings instead of holding them for up to a month before releasing them into the wild as part of a head-starting program. **Ω**

—*Wildlife Conservation Society press release*

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

Gazania: *Gazania* species

Yellow blossoms of *Gazania rigens*, a species gazania native to South Africa. Photo © 2007 by Alvesgaspar. Source: Creative Commons; license: CC-BY-SA-3.0.

Treasure flower, a common name often applied to *Gazania,* originated because this plant is such a valuable asset in the garden. Many attributes recommend its inclusion in a variety of gardens, including drought tolerance once established, adaptability to many soil types, deer resistance, fire resistance, and tolerance of coastal conditions, heat, and wind.

A member of the large Asteraceae (Compositae) family, commonly known as the aster, daisy, or sunflower family, *Gazania* is one of some 2,000 genera worldwide comprising the Asteraceae. A term used as both a botanical and a common name, gazania was named in honor of the Greek humanist scholar Theodorus Gaza (c. 1398 – c. 1475), one of the leaders in the revival of learning that followed the Dark Ages.

Native to South Africa, *Gazania* species thrive in all Mediterranean regions of the world, including the Mediterranean Basin, much of California, portions of Australia, western Asia, and central Chile in South America, besides southern Africa. Sharing the common characteristics of warm, dry summers and mild, rainy winters, Mediterranean climates support a great array of plant species, both native and nonnative.

Identification

An evergreen perennial treated as an annual in colder climates, gazanias require full sun in order to produce an abundance of daisy flowers in a profusion of colors. In mild-winter areas, some flowering occurs throughout the year with the heaviest bloom in late spring through fall. In colder climates, flowering occurs during the warmest weather.

Measuring 3 to 4 inches (8 to 10 centimeters) in diameter, gazania blossoms provide a showy display throughout the warmest seasons of the year. While the species plant blooms in yellow and goldenrod, cultivars (hybrids) feature flower colors ranging from white to burgundy and include shades of pink, orange, bronze, and red as well as many bicolor and multi-color combinations. While a few hybrids bear flowers that open even in cloudy weather, most gazania flowers open with the sun and close at night, remaining closed on overcast days (Cathey, 1998).

The leaves of gazanias are lanceolate (lance-shaped) or lobed and include shades of green and silver-gray. Some hybrids bear leaves that are green with contrasting margins, and some bear leaves that are dark-green on top with gray undersides.

Whether the growth habit is clumping or trailing, *Gazania* grows approximately 6 to 10 inches (15 to 25 centimeters) tall with an equal or greater spread.

Growth habits

With both clumping and trailing growth habits, *Gazania* proves to be a versatile genus with a variety of uses in gardens. Whether in a container, in a rock garden, as a bedding plant, on a bank, and for many other garden situations, there is a gazania that will furnish an abundance of brightly colored flowers with a minimum of effort.

Gazania in full bloom at the Barcelona Botanical Garden in Barcelona, Spain. Photo © 2005 by Valerie & Agnès. Source: Creative Commons; license: CC BY-SA 3.0.

Clumping gazanias

The clumping growth habit forms a mound of leaves and flowers that generally grows 6 to 10 inches (15 to 25 centimeters) tall and 10 to 12 inches (25 to 30 inches) wide. Clumping gazanias perform well as bedding and border plantings, small-scale ground covers on comparatively level ground, container plantings, and as temporary fillers until newly-planted shrubs spread outward.

Trailing gazanias

The trailing growth habit features rapidly-spreading, vine-like stems growing to 18 inches (45 centimeters) or more in length. Well-suited for ground cover and bank plantings, trailing types are also suitable for hanging baskets and for growing atop walls to soften the architectural edges. If trailing stems grow beyond their allotted space, selective pruning will keep them in check.

Culture

For the successful culture of the *Gazania,* full sun is a necessity. Without sufficient sun, plants will grow excessively long stems (known in horticulture as leggy growth). Being adaptable to most soil types, gazanias will thrive as long as the soil drains well; the species will not succeed in a heavy, poorly drained soil.

Watering

Because the plant is a native of hot, dry South Africa, too much water applied too often may cause crown rot or stem rot. Avoid overwatering, the leading cause of death in gazanias. Instead, deep but infrequent watering will promote flower production and will improve appearance overall.

Fertilizing

When *Gazania* grows in the garden, supplemental fertilizer is not necessary. When growing in containers, apply fertilizer sparingly, as too much fertilizer will result in lush vegetative growth, but few flowers (Wolfe, n.d.) In spring, apply a single dose of sustained-release granular fertilizer, or apply a general-purpose liquid feed at four- to six-week intervals throughout the warm weather. When fertilizing gazanias, less is more.

Pruning

Dead-heading, the removal of spent flower heads, promotes flower production throughout the flowering seasons. In late winter or early spring, just prior to the push of new growth, careful removal of old growth will promote more compact structure to the plant when grown as a perennial.

Pests and diseases

Though gazanias are quite pest-resistant, mealybugs may attack, appearing as cottony or waxy tufts on the leaves and stems of the plant. Mealybugs are the sap-sucking pests underneath the cottony or waxy protective coating. Insecticidal soap combined with rubbing alcohol and water is an effective spray to treat a mealybug infestation. Combine a quart of rubbing alcohol, four tablespoons of insecticidal soap and one gallon of water. Spray on all surfaces of the plants every one to two days until there is no evidence of the mealybugs (Wolfe, n.d.).

When planted properly, gazanias are disease-resistant. However, planting gazanias in too much shade and too close together often causes problems with powdery mildew. Planting gazanias in full sun 12 inches (30 centimeters) on center from each other will enable them to grow to their mature size without overcrowding (Wolfe, n.d.).

In addition, improper watering, including overhead watering near nightfall, may cause various fungal diseases such as leaf-spot disease, to attack gazanias. Prune infected plant parts and dispose of them in the trash, sterilizing tools with a diluted bleach solution after pruning infected plants (Wolfe, 2014).

Watering early in the day, so the plants dry off completely before the cooling of nightfall is an effective way to combat many fungal diseases in the garden.

Attracting pollinators and beneficial insects

Coupled with its many other garden benefits, gazania is very attractive to pollinators. According to the National American Pollinator Protection Campaign, pollination, absolutely vital to successful horticulture and agriculture, is "the transfer of pollen in and between flowers of the same species [which] leads to fertilization, and successful seed and fruit production for plants. Pollination ensures that a plant will produce full-bodied fruit and a full set of viable seeds" ("Pollination," n.d.).

Gazania cultivar 'Copper King' photographed at the Desert Demonstration Garden in Las Vegas, Nevada. Photo © 2004 by Stan Shebs. Source: Creative Commons; license: CC-BY-SA-3.0.

"Pollination occurs when pollen is moved within flowers or carried from flower to flower by pollinating animals such as birds, bees, bats, butterflies, moths, beetles, or other animals, or by the wind" ("Pollination," n.d.). *Gazania* blossoms attract major pollinators such as butterflies and bees, as both types of insects particularly like brightly-colored flowers.

Furthermore, gazanias attract ladybugs, (Coccinellidae family), which are major beneficial insects. Incidentally, insect scientists, called entomologists, prefer the term ladybird beetle or lady beetle, because the "ladybug" is not a true bug (Hemiptera), but rather a true beetle (Coleoptera). "Ladybug" larvae, and, to a lesser extent, adult ladybugs are voracious predators of soft-bodied insect pests, including aphids, mites, scale insects, and white flies (Hadley, 2017).

Edibility

Occasionally one reads statements such as "parts of the plant are poisonous if ingested" on some gardening websites ("Gazania, Treasure Flower," n.d.). However, none of these sites provide any specifics to support such generalizations.

Conversely, most online toxic plant databases, including the California Poison Control System website list *Gazania* as a safe, nontoxic species ("Know Your Plants!" n.d.). Many tortoise keepers report that their tortoises relish the gazania flowers. In 2012 the Khumbala Indigenous Garden, a database of indigenous South African flora, responded to a question posed about gazania toxicity as follows: "...I have found gazania on lists of nontoxic plants, (for humans and stock animals) as well as on a list of edible plants for medicinal uses. The leaves and flowers are eaten by tortoises. If you are still concerned, perhaps check with your vet" ("Gazania," n.d.). Gardeners also report that their local wild rabbits enjoy feasting on the gazanias planted in their gardens. **Ω**

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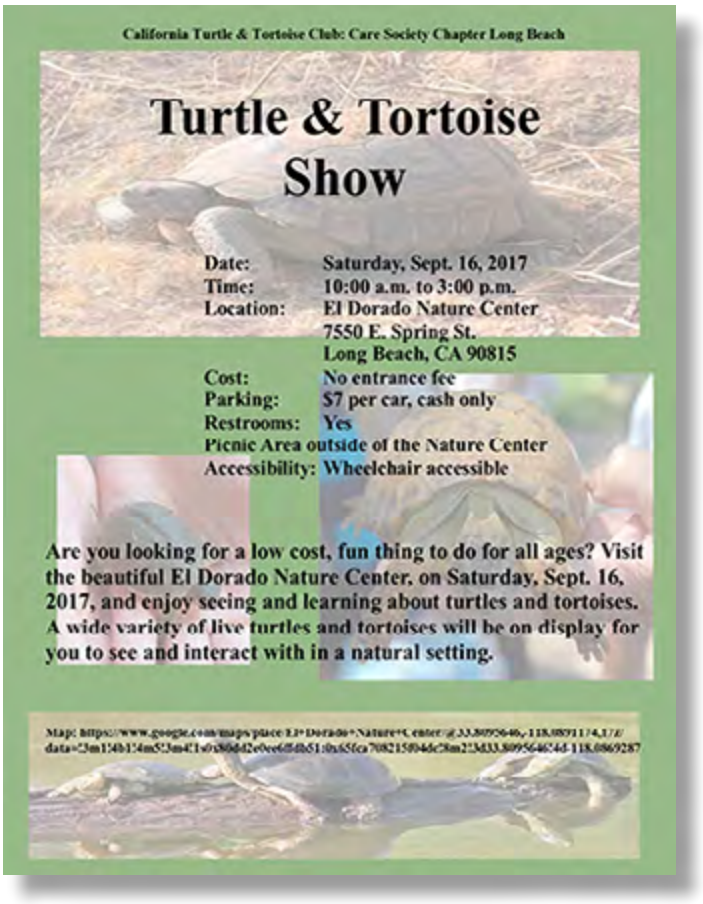

Radiated Tortoises For Sale

Hatched in November 2015 from different mothers. Growing nicely in my terrarium at 65% humidity. Eating twice a day on a diet of mixed greens, hibiscus and mulberry leaves. I call them "2-Dot" and "3-Dot."

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I can send more photos and other information if you are interested.

Contact Ralph Hoekstra at 714-962-0624 or rhoekstra@aol.com

Changes to the CA Department of Fish & Wildlife Desert Tortoise Permitting Process

State of California law requires that all *Gopherus* tortoises—desert tortoises (*G. agassizii*), Texas tortoises (*G. berlandieri*), and gopher tortoises (*G. polyphemus*), and any others—have a CA Department of Fish & Wildlife (CDFW) permit and license tag.

For decades, the CDFW has used a triplicate NCR form for its desert tortoise permit application form. Recently, changes to the procedure for obtaining a permit have been implemented. When the current supply of triplicate forms runs out, the NCR form will ***not*** be reprinted.

The **desert tortoise permit application form** will now be available as a PDF on the California Turtle & Tortoise Club (CTTC) website. The permit application consists of a fillable PDF that can either be completed online and downloaded for printing or downloaded, printed out and completed by hand (print legibly, please) or on a typewriter. This form is intended for those who already have a desert tortoise that needs a CDFW permit. Fill out all pages completely, sign and date the application, include a photograph of the tortoise and a stamped self-addressed envelope (both required), and mail the whole package to this address:

California Turtle & Tortoise Club
Chino Chapter
P. O. Box 1753
Chino, CA 91708-1753

Mr. Bates, a desert tortoise (*Gopherus agassizii*) belonging to CTTC member Serena Chow.

Aside from the stand-alone permit application form, CTTC has developed a **combined desert tortoise adoption and permit application form**, available as a PDF on the CTTC website for persons wanting to adopt a desert tortoise. This document consists of a two-page desert tortoise adoption application and the CDFW permit application. Fill out all pages completely, sign and date, and mail the whole package to your CTTC Chapter. If you don't know the Chapter mailing address, you will find it at the bottom of page 2 on the Adoption Application.

If you wish to adopt a type of turtle or tortoise other than a desert tortoise, please use this form: **Turtle/Tortoise Adoption Application**. Fill it out completely, sign and date it, and mail it to the nearest CTTC Chapter. **Ω**

Special thanks to Lynda Misiak for providing assistance and expertise during the preparation of this article.

Over 150 Asian Giant Softshell Turtles Return to the Wild — Local communities working to protect endangered species

Kratie, Cambodia—21 June 2017—WCS (Wildlife Conservation Society), in collaboration with Cambodia's Fisheries Administration (FiA) and the Turtle Survival Alliance (TSA), released 150 Endangered Asian giant softshell turtle (*Pelochelys cantorii*) hatchlings into their natural habitat along the Mekong River.

The hatchlings are part of a community protection program designed to increase the wild population of the species, and had been collected from nests that were guarded by local communities.

The Asian giant softshell turtle is listed on the IUCN Red List as globally Endangered. It was thought extinct in the Cambodian portion of the Mekong River until re-discovery in 2007 in a 48-kilometer (30-mile) stretch of the river between Kratie and Stung Treng Provinces.

"The purpose of this release is to increase the wild population of the Asian giant softshell turtle," said Mr. Sun Yoeung, WCS's Asian Giant Softshell Turtle Conservation Project Coordinator. "As the project pays local people as guardians and rangers, the release will also increase local incomes and encourage the support and involvement of local communities in conserving the species."

The release is part of a project that has been ongoing since 2007, formerly run by Conservation International (CI), and now by WCS in collaboration with the FiA and TSA. The community-based protection program encourages the participation of local communities living in Kratie and Stung Treng Provinces by hiring former nest collectors to search for and protect nests, instead of harvesting the eggs. Since 2007, 329 nests have been protected and 7,709 hatchlings released.

"Protection is needed to conserve the Asian giant softshell turtle from extinction," said Mr. Ouk Vibol, Director of Fisheries Conservation Department of Fisheries Administration. "Collection of eggs or adults for consumption or sale is illegal in Cambodia. Everyone can help conserve Asian giant softshell turtles by not buying or eating their meat or eggs."

WCS works to save turtles and tortoises around the world. In 2012, WCS launched an organization-wide program to revive some of the most endangered turtle and tortoise species. Efforts include breeding programs at WCS's zoos in New York, head start programs abroad, and working with governments and communities to save species on the brink of extinction.

Asian giant softshell turtle (*Pelochelys cantorii*). Photo © 2012 by Dementia. Source: Creative Commons; license: CC BY-SA 2.0.

Conservation of the Asian giant softshell turtle along the Mekong River would not be possible without the support of the Turtle Survival Alliance, Conservation International, and the Critical Ecosystem Partnership Fund (CEPF). The CEPF is a joint initiative of *l'Agence Française de Développement*, Conservation International, the European Union, the Global Environment Facility, the Government of Japan, the Macarthur Foundation, and the World Bank. A fundamental goal is to ensure civil society is engaged in biodiversity conservation. **Ω**

— Wildlife Conservation Society press release

Facts about the Asian Giant Softshell Turtle

Scientific name: *Pelochelys cantorii*

Common names: Asian giant softshell turtle, Cantor's giant softshell turtle, frog-faced softshell turtle

Range: Bangladesh, Burma (Myanmar), Cambodia, China, India, Indonesia, Laos, Malaysia, Papua New Guinea, Philippines, Thailand, Vietnam

Habitat: Lowland freshwater ecosystems such as lakes, rivers, estuaries, and seacoasts

Carapace length: One of the largest living softshell turtles growing up to 2 meters (6.6 feet) in length

Weight: Upwards of 100 kilograms (220 pounds)

Diet: Omnivorous but primarily carnivorous feeding on crustaceans, fish, molluscs, and plant matter

Feeding strategy: Ambush predator lying in wait in the soft river bottom mud with only its eyes and snout visible

Threats: Direct exploitation for food markets; habitat destruction of riverine and coastal ecosystems; commercial export for the pet trade

Conservation status: CITES Appendix II; Endangered (IUCN Red List)

References

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the *Tortuga Gazette*
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Featured Species
Olive Ridley Turtle
Lepidochelys olivacea

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Olive ridley turtle, *Lepidochelys olivacea* photographed at the Mazunte Aquarium in Oaxaca, Mexico.. Photo © 2011 by Theklan. Source: Creative Commons; license: CC-BY-SA-3.0.

"For most of the wild things on earth the future must depend upon the conscience of mankind."

— Archie Carr (1909-1987)
American herpetologist and conservationist