

body (e.g., dead frog with puncture wound consistent with a turtle bite), feet, and thighs, as well as missing toes and facial injuries (e.g., live frog missing the right side of its upper jaw).

In southeastern Arizona, stock tanks and other bodies of water decrease considerably in size during the hot, dry period from May to early July. This decrease in habitat size, for two largely aquatic species, may allow for higher rates of successful *K. sonoriense* predation attempts and for these events to potentially have a greater effect on the local *R. chiricahuensis* population at a given site. During our ca. 2-h survey, we observed >50 adult and juvenile *K. sonoriense* in the stock tank, many of which were sitting in submerged vegetation along the shore. Taking into consideration the stock tank's small size during the dry season (50 × 35 m; <50% of its mean size outside of the dry season), the density of mud turtles was notable. Given that 25% of the frogs we captured had survived presumed mud turtle predation attempts, and another two were likely killed by mud turtles, the site appears to have high predation rates by mud turtles on *R. chiricahuensis*. Based on the location of the turtles, and the frog injuries we observed, it appears that *K. sonoriense* may attack frogs as they sit near or along the shoreline. In addition to direct predation, injured frogs that escape may have wounds to which they succumb later and would likely be consumed by scavenging *K. sonoriense*. Our observations suggest that under the appropriate circumstances, e.g., abundant localized prey, *K. sonoriense* might act like a sit-and-wait predator, rather than an active searcher as described by Hulse (1974, *op. cit.*).

The *R. chiricahuensis* captured during this survey tested positive for *Batrachochytrium dendrobatidis* (*Bd*). In southeastern Arizona, die-offs from *Bd* usually occur in juveniles and adults in the cooler months (Sredl et al. 2003. Nongame and Endangered Wildlife Program Technical Report 208. Arizona Game and Fish Department), but tadpoles can persist at a site overwinter. Chytridiomycosis from *Bd* can have the effect of creating a uniform age structure in *R. chiricahuensis* at a site; post-metamorphic individuals appear following adult die-offs in the winter. Given the combination of disease and heavy predation at this site, long-term persistence of *R. chiricahuensis* may be difficult. Beyond the scope of this single site, there are other stock tanks across southeastern Arizona that sustain high densities of mud turtles, particularly when they shrink in size during the dry season. The heavy predation that mud turtles may have on the local populations of *R. chiricahuensis* may be wider reaching than originally realized, especially when paired with negative effects from chytridiomycosis. Without management options for mitigating *Bd*, wildlife managers should consider avoiding sites like this with high density of *K. sonoriense* when identifying locations for *R. chiricahuensis* translocations and other recovery work.

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LEPIDOCHELYS KEMPPII (Kemp's Ridley Sea Turtle). LIFE HISTORY. *Lepidochelys kempii* is listed as a critically endangered species and is distributed in the Gulf of Mexico (GoM) and North Atlantic Ocean (National Marine Fisheries Service et al. 2011. Bi-national Recovery Plan for the Kemp's Ridley Sea Turtle, Second Revision. Silver Spring, Maryland. 177 pp.; <https://www.iucnredlist.org/species/11533/142050590>; 30 Oct 2019).

Lepidochelys kempii nesting primarily occurs along the western GoM from Texas, USA to Veracruz, Mexico, but infrequent nesting has been documented in other USA locations along the northern and eastern GoM, the southeast Atlantic coast, and in New York (Shaver 2005. Chelonian Conserv. Biol. 4:846–859; Shaver et al. 2016. Gulf Mex. Sci. 33:158–178; Rafferty et al. 2019. Herpetol. Rev. 50:355). Upon emergence, *L. kempii* hatchlings from gulf coast beaches enter the GoM, disperse offshore, migrate in ocean currents for their first few years of life via drifting and oriented-swimming behaviors, and then recruit to neritic habitats extending from Texas to Massachusetts, USA (Collard and Ogren 1990. Bull. Mar. Sci. 47:233–243; Morreale and Standora 2005. Chelonian Conserv. Biol. 4:872–882; Putman and Mansfield 2016. Cur. Biol. 25:1–7). At maturity, female *L. kempii* return to their natal beaches to nest (Lohmann et al. 2013. In Wyneken et al. [eds.], The Biology of Sea Turtles Volume III, pp. 59–77. CRC Press, Boca Raton, Florida), and 95% of the time *L. kempii* repeatedly nest on the same or nearby beaches (Shaver et al. 2016, *op. cit.*).

There are relatively few records of tag returns demonstrating the connectivity of foraging grounds for immature *L. kempii* in the northeastern GoM and the nesting beaches of adult females in the western GoM (National Marine Fisheries Service et al. 2011, *op. cit.*). Herein, we present the first record of a *L. kempii* tagged during an in-water study in western Florida, USA and subsequently observed nesting in Texas, USA. To the authors' knowledge, the 25.7-yr recapture interval is the longest documented for a *L. kempii* tagged during an in-water study of free-ranging marine turtles and subsequently observed on a nesting beach.

On 5 September 1992, a *L. kempii* measuring 45.5 cm standard straight-line carapace length (SSCL, measured from the nuchal notch to the posterior margin of the postcentral) was captured on Corrigan Reef, ca. 5 km E of the Cedar Keys, Florida, USA. The *L. kempii* was tagged on the trailing edge of both front flippers with a Jumbo Roto plastic tag (Dalton, Newark, England) and an Inconel metal tag (National Band and Tag Company, Newport, Kentucky, USA). A passive integrated transponder (PIT) tag (7F7D337879; Biomark, Boise, Idaho, USA) was inserted in the left front flipper. In addition to being part of an in-water, mark-recapture study (Schmid 1998. Fish. Bull. 96:589–602), the *L. kempii* was also part of a study on marine turtle stress and sex hormones (Gregory and Schmid 2001. Gen. Comp. Endocrinol. 124:66–74), which predicted this turtle to be female based on plasma testosterone concentration.

At 1355 h on 26 April 2011, staff from Padre Island National Seashore (PAIS) documented a nesting *L. kempii* near the 58.7 km beach marker in Kenedy County, Texas, USA. A PIT tag (7F7D337879) was present in the left front flipper, which was matched to her original tag application in 1992 near the Cedar Keys, Florida, USA. The *L. kempii* measured 64.0 cm SSCL, reflecting ca. 18.5 cm SSCL growth in ca. 19 yr. The female was observed nesting on six subsequent occasions in 2011 (N = 1), 2013 (N = 1), 2017 (N = 2), and 2018 (N = 2). Additionally, three nests located at PAIS in 2007 (N = 2) and 2013 (N = 1) were linked to this female based on genetic analysis of dead embryonic tissue samples. The *L. kempii* was not observed nesting at these three sites, but kinship analysis of the genetic data determined that the female observed and sampled in 2011 had laid these other nests (Frey et al. 2014. Endanger. Species Res. 23:63–71).

The 10 nests were documented along a 61.8-km stretch of PAIS during a ca. 11-yr period. The nests had a mean clutch

size of 91 eggs (range: 54–110 eggs) and a 90.4% mean hatching success. Prior to maturity, the *L. kempii* was predicted to be female, and confirmation of her nesting validates the use of plasma testosterone concentrations to predict sex in *L. kempii*. This record of a *L. kempii* tagged during an in-water study in Florida, USA and repeatedly observed nesting in Texas, USA provides the longest documented recapture interval (25.7 yr) for *L. kempii* and demonstrates the connectivity of foraging grounds in the eastern GoM and nesting beaches in the western GoM.

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LEPIDOCHELYS KEMPII (Kemp's Ridley Sea Turtle). PREDATION. Large predator attacks on nesting *L. kempii* adults have been observed in Tamaulipas, Mexico (*Canis latrans*; J. Montañón, pers. comm.), but have not been documented in the United States. For other marine turtle species, *Canis aureus*, *C. familiaris*, *C. latrans*, *Crocodylus acutus*, and *Panthera onca* are known to attack and kill nesting females (Marquez-M. 1990. FAO Fisheries Synopsis 11:1–81; Peters et al. 1994. Herpetol. Rev. 25:120; Ortiz et al. 1997. Chelon. Conserv. Biol. 2:585–587; Drake et al. 2003. Chelon. Conserv. Biol. 4:675–678; Alfaro et al. 2016. Int. J. Conserv. Sci. 7:101–108; Margaritoulis et al. 2019. Mar. Turt. Newsl. 158:22–23).

Canis latrans have been reported as the main and most efficient predator on *L. kempii* eggs and hatchlings in Mexico (Hildebrand 1963. Ciencia 22:105–112; Pritchard and Marquez 1973. IUCN Monograph No 2: Marine Turtle Series, 30 pp.; Marquez-M. 1994. NOAA Technical Memorandum NMFS-SEFSC-343. 91 pp.). Anecdotally, *C. latrans* would arrive in packs to the primary *L. kempii* nesting beach at Rancho Nuevo, Mexico during an arribada and consume eggs, but were not observed harassing nesting *L. kempii* (Carr 1967. The Sea Turtle: So Excellent a Fish. University of Texas Press, Austin, Texas. 280 pp.). Recently, *C. latrans* abundance has decreased at the main *L. kempii* nesting beach and predator impact is low (Bevan et al. 2014. Herpetol. Conserv. Biol. 9:563–577). In the United States, *C. latrans* have been documented predating *L. kempii* nests on the Texas coast (National Marine Fisheries Service et al. 2011. Bimational Recovery Plan for the Kemp's Ridley Sea Turtle, Second Revision. Silver Spring, Maryland. 177 pp.). Here, we provide the first documented evidence of *C. latrans* predation on, and interaction with, nesting *L. kempii* in Texas, USA.

At 0735 h on 18 May 2011, staff from the National Park Service located inbound and outbound *L. kempii* tracks and an abandoned egg chamber near the 49 km beach marker at Padre Island National Seashore (PAIS), in Kenedy County, Texas, USA. The tracks measured 65 cm in width and were estimated to be less than one hour old. *Canis latrans* tracks were present at the site, located parallel to the *L. kempii* tracks and near the abandoned egg chamber. The *L. kempii* outbound track displayed numerous marks indicative of flipper swipes, indicating that the turtle was evading a predator. Approximately 2 h later, a *L. kempii* carcass (64.4 cm straight carapace length) was discovered 6.4 meters south of the abandoned nest site (Fig. 1). A passive integrated transponder tag (Biomark, Boise, Idaho, USA) and two

Inconel metal tags (National Band and Tag Company, Newport, Kentucky, USA) were present in the left front and rear flippers, which were matched to her original tag application during a nesting emergence on 28 April 2011 at 0955 h at PAIS, in Kleberg County, Texas.

The carcass had extensive injuries, indicative of those inflicted by *Canis*. Neck injuries were not characteristic of shark predation, commonly seen on sea turtle carcasses in Texas. Intestines were pulled from the body cavity, and there were no remnants of blood on the beach, indicating that the extensive injuries occurred in the surf. Necropsy analysis indicated damage to the trachea and esophagus. Only 35% of the gastrointestinal tract remained in the carcass, and the heart was normal, but drained of blood. PAIS staff removed 88 fertile eggs from the carcass at 0945 h for protective incubation in a polystyrene box. Sixty-three eggs hatched (71.6%) and 57 hatchlings emerged and were successfully released at PAIS after a 47-d incubation period. This is the first *L. kempii* documented as killed by *C. latrans* while nesting in the United States.

At 1209 h on 19 May 2017, NPS staff located a nesting *L. kempii* near the 39 km beach marker, in Kenedy County, Texas, USA. A *C. latrans* was observed lying on top of a foredune near



FIG. 1. Adult *Lepidochelys kempii* carcass documented on Padre Island National Seashore, Texas, USA with injuries indicative of a *Canis latrans* attack.