

in depth and contained no eggs or eggshells (Fig. 2). Species was determined to be *C. caretta* based on the track characteristics, and the site was considered a non-nesting emergence.

Later, on 10 June at 2100 h, park visitors witnessed a large turtle with algae on its carapace emerge from the GoM near the 7.1 km (4.4 mile) PAIS marker. The turtle soon returned to the water after a vehicle passed by. The next day, at 0730 h, PAIS biologists investigated the inbound and outbound tracks left by the turtle at the 7.1 km site (Fig. 3). The tracks were deep and alternating, and like the non-nesting emergence site at the 53.1 km marker, measured 80 cm in width. Species was determined to be *C. caretta* and after thorough investigation of potential nest area, the site was considered another non-nesting emergence.

On 29 August, a *C. caretta* nest site was discovered after hatchling emergence by park visitors at the PAIS 3.1 km (1.92 mile) marker. The nest was positioned at the base of the foredunes, ca. 5 cm below the surface of the sand, and 45.7 m inland from the surf line. PAIS biologists responded to the visitor report and located 83 pipped eggshells and 10 hatchling carcasses in the nest chamber. The carcasses were desiccated, indicating they had been in the chamber for an extended period prior to discovery (Fig. 4). Though they were severely decomposed, 9 of the 10 hatchlings appeared to have carapace deformities. When considering the decomposition level of the carcasses, this nest likely hatched during the week of 12 August. No embryos were present in the eggshell remains and no additional hatchlings were documented near the nest site.

Based on the rarity of *C. caretta* nesting at the time, we believe this nest was likely from the turtle observed on 10 June. If estimating an incubation period of ca. 60–65 d, this nest could have been constructed the same week that the non-nesting emergences were documented. The area where the nest was located was patrolled daily during the week of 10 June, however PAIS personnel likely did not locate the tracks associated with this nest site due to the frequent vehicular and visitor traffic in this area of the park, which likely obscured any evidence of recent sea turtle activity. This is the first confirmed record of *C. caretta* nesting on North Padre Island and at PAIS, and the fourth confirmed *C. caretta* nest on the Texas coast.

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CARETTA CARETTA (Loggerhead Sea Turtle). REPRODUCTION.

Caretta caretta primarily nests on the eastern USA coast, however sparse nesting has also been recorded on the northern and western Gulf of Mexico (GoM) coasts (National Marine Fisheries Service [NMFS] and U.S. Fish and Wildlife Service [USFWS]. 2008. Recovery Plan for the Northwest Atlantic Population of the Loggerhead Sea Turtle (*Caretta caretta*), Second Revision. 325 pp.; Shamblyn et al. 2017. Mar. Biol. 164:138; Shaver et al. 2020. Front. Mar. Sci. 7:673). The first observations of *C. caretta* nesting in Texas were documented on South Padre Island in the 1970s (Hildebrand 1981. In Bjorndal [ed.], Biology and Conservation of Sea Turtles, pp. 447–453. Smithsonian Institution Press, Washington, D.C.; Hildebrand, pers. comm.). Herein, we report the first confirmed *C. caretta* nest in Texas since the 1970s (ca. 9 years), and the first *C. caretta* nest documented on Mustang Island, Texas.

At 2300 h on 25 June 1988, members of the public observed a *C. caretta* nesting 1.2 km south of Access Road 1 on Mustang Island. Though they did not measure the turtle, the observers did notice that this female did not have metal flipper tags. The *C. caretta* reentered the water after nesting. The next day,



FIG. 1. Hatchlings released from the first *Caretta caretta* nest documented on Mustang Island, Texas, USA.

the observers reported their finding to Tony Amos with the Animal Rehabilitation Keep, who contacted National Park Service biologists at Padre Island National Seashore (PAIS). PAIS biologists investigated the nest site at 0900 h on 26 June and located a nest chamber at the base of the foredunes, approximately 37 m inland from the surf line. The nest chamber contained 113 eggs, with the top layer of eggs measuring 18 cm from the sand surface. The nest chamber was 50 cm in depth. The disturbed sand and vegetation around the nest chamber indicated that the *C. caretta* had faced directly inland as she deposited the clutch.

The *C. caretta* clutch could not be incubated in situ due to its location in an area illuminated by artificial lighting from condominiums and subject to beach cleaning, horse traffic, human foot traffic, and vehicle use. The eggs were collected and relocated for protective incubation at the indoor PAIS Incubation Facility. Sixty-nine percent (78/113) of the eggs hatched after 47 d of incubation. The hatchlings were retained in darkened, sand-lined containers until they entered a period of hyperactivity (frenzy). The hatchlings non-uniformly entered their frenzy on 13, 15, and 17 August; two, four, and six days after hatching was first detected. Frenzying hatchlings were returned to the original nest site on Mustang Island for release into the GoM, however due to the artificial lighting in the area, hatchlings became disoriented during release (Fig. 1). During two subsequent releases with Kemp's Ridley Sea Turtle (*Lepidochelys kempi*) hatchlings in 1995, hatchlings had become disoriented by artificial lights. Subsequently, all hatchlings from sea turtle nests laid on Mustang Island and translocated to the PAIS Incubation Facility for protected care, have been released on North Padre Island at PAIS where there is no beach development (Shaver et al. 2020, *op. cit.*).

Gonads were removed from 32 late-stage embryos to determine the approximate sex ratio of the clutch. Ninety-seven percent (31/32) of the hatchlings were identified as female. Sex could not be determined for one sampled hatchling. Excessive incubation temperatures likely led to the relatively high late-staged embryonic mortality in this clutch. Since 1988, *ex situ* sea turtle incubation procedures at PAIS have continued to be

improved and refined according to best scientific practices. Currently, the number of sea turtle eggs incubated per artificial nest is restricted according to the species and egg size to maximize hatchling success, and *C. caretta* clutches are split into multiple artificial nests containing no more than 60 eggs each (DJS, pers. obs.). This is the first confirmed record of *C. caretta* nesting on Mustang Island, and the third confirmed *C. caretta* nest on the Texas coast.

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CARETTA CARETTA (Loggerhead Sea Turtle). SOUTHERNMOST NESTING RECORD. The first two substantiated observations of *Caretta caretta* nesting in Texas, USA were not made until 1977 and 1979, on South Padre Island, though specific locations are not provided for these records. In these cases, species identification was accomplished via visual examination of hatchlings emerged from in situ nest sites, though hatching success was recorded to be low (ca. 1%) for at least one of the clutches (Hildebrand 1981. In Bjorndal [ed.], *Biology and Conservation of Sea Turtles*, pp. 447–453. Smithsonian Institution Press, Washington, D.C.; Hildebrand, pers. comm.).

Since the 1970s, *C. caretta* continue to nest in Texas from South Padre Island to the Texas/Louisiana border (Shaver et al. 2020. *Front. Mar. Sci.* 7:673). Despite this, *C. caretta* nesting has not been observed south of South Padre Island on Brazos Island (the southernmost island in Texas, USA), though frequent nesting by *Lepidochelys kempii* (Kemp's Ridley Sea Turtle) is documented there (Shaver et al. 2016. *Gulf Mex. Sci.* 33:158–178; Shaver et al. 2020. *Herpetol. Notes* 13:907–923). Herein, we report the first confirmed *C. caretta* nest documented on Brazos Island at Boca Chica Beach.

On 24 June 2022, at ca. 0926 h, inbound and outbound sea turtle tracks were documented near the 6-mile marker on Boca Chica Beach. The alternating tracks measured 75 cm in width and were estimated to be more than six hours old at time of discovery. A nest site was discovered low on the beach, in front of the embryonic dune line. The nest chamber contained 109 eggs, of which 5 were broken and 104 were relocated to a corral (i.e., an enclosed portion of the nesting beach) on South Padre Island for protected incubation. The clutch was split into two artificially constructed chambers within the corral (Chamber A contained 51 eggs; Chamber B contained 53 eggs), and buried at a depth of ca. 65 cm. A temperature data logger (Onset Computer Corporation, HOBO Pendant Temperature) was placed into the center of the egg mass within each chamber.

At 2049 h on 13 August 2022, the 51st day of incubation, 24 hatchlings emerged from Chamber B (Fig. 1). At 0051 h on 14 August 2022, 42 hatchlings emerged from Chamber A. Two additional hatchlings were excavated from Chamber B during inventory. Overall, 68 hatchlings from this nest were successfully released at four locations on South Padre Island and allowed to enter the Gulf of Mexico.

On 19 August 2022, PAIS biologists conducted an analysis of the excavated clutch contents (36 unhatched eggs). External and internal black mold and pink fungi were observed on and within most of the unhatched eggs. Six eggs were classified as apparently infertile (collapsed, non-white exterior, and no



FIG. 1. One of 68 hatchlings successfully released from the first *Caretta caretta* clutch located on Boca Chica Beach, Texas, USA. Hatchlings were released on South Padre Island, Texas, USA after protected incubation in an enclosed corral.

blood spot or embryo present). Four eggs were classified as fertile without embryo (white exterior, no blood spot or embryo present). Twenty-six fertile eggs contained dead embryos varying in developmental stage from 12–30 (Miller et al. 2017. *Chelonian Conserv. Biol.* 16:111–122).

Embryonic deaths occurred during the first- (developmental stages 6–21; N = 5), middle- (developmental stages 22–27; N = 15), and final- (developmental stages 28–31; N = 6) third of incubation, based on an incubation duration of 60 days (Miller et al. 2017, *op. cit.*). Embryos that died during the middle-third of incubation had a mean ($\pm$ SD) straight carapace width (SCW) of 17.4 ± 4.5 mm (N = 10); those that died during the final-third of incubation had a mean ($\pm$ SD) SCW of 24.5 ± 3.7 mm (N = 6).

Tissue samples collected from five embryos have been archived at the NOAA-Fisheries Marine Turtle Genetics Laboratory in La Jolla, California, USA. Gonad samples collected from six embryos were sent to the University of Alabama Birmingham in Birmingham, Alabama, USA for histological sex determination. This is the first confirmed record of *C. caretta* nesting on Boca Chica Beach and the southernmost *C. caretta* nest documented in Texas.

All activities (nest detection, relocation, monitoring, excavation, analysis, and photographs) were conducted under state (Texas Parks and Wildlife Department Scientific SPR-0190-122; SPR-0421-044) and federal (U.S. Fish and Wildlife Service Endangered Species TE840727-3; PER0013385) permits, with ethical approval from the Institutional Animal Care and Use Committee (IACUC) at the National Park Service (201909289).

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