



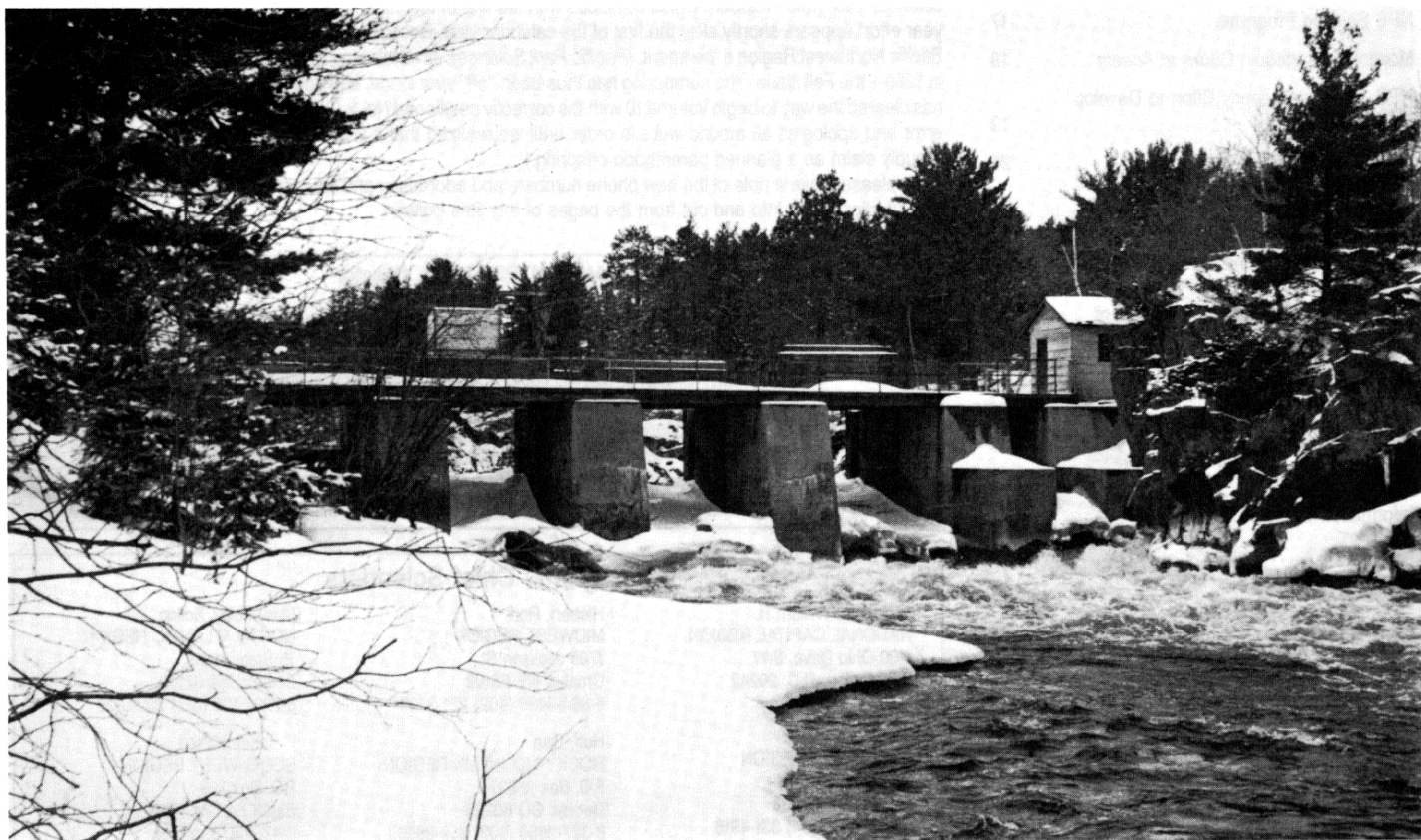
PARK SCIENCE

A RESOURCE MANAGEMENT BULLETIN

NATIONAL PARK SERVICE
U.S. DEPARTMENT OF THE INTERIOR

VOLUME 10 – NUMBER 1

WINTER 1990



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For Science, Charles Stone of Hawaii Volcanoes National Park

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Kemp's Ridley Project at Padre Island Enters a New Phase

By Donna J. Shaver

For the last decade the annual arrival of endangered Kemp's ridley sea turtle (*Lepidochelys kempi*) eggs from Rancho Nuevo, Mexico was anxiously awaited at Padre Island National Seashore (PAIS). Eggs were sent to the park each summer from 1978-1988, in an international multi-agency attempt to establish a secondary breeding colony of this species through imprinting. This experiment, originally scheduled to be conducted for 10 years, is now undergoing changes and entering a new phase. Eggs will no longer be sent to the park from Mexico. Attention will now focus on continuing public education about sea turtles, patrolling the beaches for nesting turtles and protecting any nests found.

The Kemp's ridley is the most endangered and restricted sea turtle species. Virtually the entire population nests on a single 14 mile stretch of beach near the village of Rancho Nuevo, Tamaulipas, Mexico. It is estimated that 40,000 females nested in a daytime aggregation (arribada) filmed there in 1947. By 1966, when biologists finally learned the location of the nesting beach and began protection, only 3,000 to 5,000 females nested in the largest arribadas. Despite conservation efforts, probably fewer than 700 females nested there during the entire 1989 nesting season. Causes for this sharp decline include the harvest of adults for meat and leather and of eggs for use as a supposed aphrodisiac. Incidental capture of these turtles in fishing and shrimp trawls is also thought to have reduced their numbers.

Project Background

In 1978, the Kemp's Ridley Sea Turtle Restoration and Enhancement Project was undertaken by the Instituto Nacional de Pesca de Mexico, U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries (NMFS), National Park Service (NPS) and Texas Parks and Wildlife Department in accordance with Section II of the Endangered Species Act. One of the goals of the project was to establish a secondary breeding population of this species at Padre Island. Padre Island NS was chosen because the species had been known to nest there historically and because the NPS would be able to provide some protection in the event that a new breeding population became established.

Each summer, from 1978-1988, about 2,000 eggs (20 clutches) were collected at Rancho Nuevo as they were laid, placed in styrofoam boxes containing Padre Island sand and transported via aircraft to the national seashore. The styrofoam boxes were placed in an outdoor predator-proof, screen enclosed incubation shed. The overall hatching rate of the 22,507 eggs sent to Padre Island during the 11 years was 77.1 percent (Table 1). Yearly hatching rates ranged from 12.1-91.6 percent (Table 1).

Hatchlings were released on the beach at Padre Island and allowed to crawl down the beach, enter the surf and swim approximately 10 yards where they were recaptured using aquarium dip nets. A total of 278 hatchlings (1.7 percent) escaped in the surf during release and 381 hatchlings (2.2 percent) died at Padre Island either prior to or after release (Table 1).

From 1978 through 1988, 15,875 recaptured hatchlings were transported to the NMFS laboratory in Galveston, Texas for one year of "head starting" (Table 1). This time in captivity allowed them to grow to a size large enough to avoid most predators and to be tagged for future recognition. Overall, approximately 80 percent of the hatchlings survived head starting. Most of



One of the Kemp's ridley hatchlings released at Padre Island NS beach every summer from 1978 through 1988.

these head started turtles (approximately 12,000) were released offshore from Padre Island.

Research

A number of parameters were monitored on eggs and hatchlings at PAIS. Data were collected on incubation temperatures, sex ratios, embryonic mortalities and hatchling lengths and weights to evaluate incubation conditions and clutch and year class viability to improve management techniques. Much of the data had never been amassed for this species and had significant management implications and applications at the park and Rancho Nuevo. In fact, park employees traveled to Rancho Nuevo to train new beach workers on techniques we developed to monitor and modify incubation temperatures and to examine unhatched eggs.

Research at the park elucidated the importance of temperatures of incubating Kemp's ridley eggs. Incubation temperatures were found to affect sex ratio, with higher temperatures producing more females (Shaver et al. 1988), and embryonic survivorship, with excessively high, low and fluctuating temperatures reducing survivorship (Shaver in press, Shaver and Chaney in press). The matching of clutch incubation temperatures and sex ratios for several year classes of eggs allowed us to further define the incubation temperatures at which the eggs should be maintained (Shaver et al. 1988). During the later project years, techniques were developed to alter incubation temperatures so that a 1:1 sex ratio or slightly more females were produced. Although slightly more males were produced during early project years, slightly more females were produced during later project years (Shaver et al. 1988) and collectively a 1:1 sex ratio was attained. Incubation durations and percent females were correlated to derive an equation that could be used to predict percent females for a particular clutch when given its incubation duration (Shaver in press).

A beach temperature profile study was undertaken to determine temperatures at which Kemp's ridley eggs would incubate if laid in Padre Island sand and to predict seasonal trends in sex ratios. Temperatures from three sites on Padre Island were compared with temperatures from Rancho Nuevo. It was found that

Rancho Nuevo and Padre Island sand temperatures were comparable during the summer months of heaviest nesting activity and egg incubation (Shaver et al. 1988). Clutches undergoing their middle third of incubation (when sex is determined) early in the nesting season at Padre Island or Rancho Nuevo should produce primarily males, later portion of the season primarily females, and middle of the season a mixture.

Unhatched eggs were examined to quantify fertility rates and embryological stages of development at time of death. By staging embryos obtained from these eggs, we could estimate time of death and relate it to the sequence of activities involved in the Restoration and Enhancement Program. Excessive sand moisture and/or fungal contamination led to the high early staged mortality in the 1983 year class. Also, high and excessively fluctuating temperatures led to relatively high late staged embryonic mortality in a number of clutches in the 1985 and 1987 year classes (Shaver in press, Shaver and Chaney in press). These findings were incorporated into the development of techniques to modify incubation temperatures so that they would not reach injurious levels. The techniques were employed during the 1988 Kemp's ridley incubation season and the hatching success of the 1988 year class (91.6 percent) was the highest of all project years (Table 1).

Beach Patrols and Nestings

The age at which Kemp's ridleys mature is unknown, but estimates range from 8 to 15 years. Since females from the early project years may begin returning to Padre Island to nest, systematic beach patrols for nesting turtles and tracks, initiated in 1986, were continued during 1987, 1988 and 1989. Patrols were made during daylight hours in an attempt to detect daytime nesting Kemp's ridley turtles. It was also hoped that nesting by sea turtles not a part of this project (including Kemp's ridleys, loggerheads and greens) would also be detected during these patrols.

Patrols were conducted from the ranger station to the Mansfield Channel and back, covered a distance of about 120 miles and required at least eight hours. Three to four patrols were made each week from mid-April through August in order to encompass the entire Kemp's ridley nesting and incubation season and much of the green and loggerhead nesting seasons. Although most patrols were done in a four-wheel drive truck, a Coast Guard Auxiliary airplane and a National Guard "hummer" (a military all-terrain vehicle) were used to conduct patrols once a week during the later part of the 1989 patrol season.

Although a number of tracks, nesting turtles and nests have been found on the Texas coast during the past 11 years, no confirmed head-started *L. kempi* have nested on Padre Island to date. However, it is unknown how many have survived after release or whether any have attained adulthood. Many reports and sightings of nesting turtles and tracks have failed to yield nests. However, eight sea turtle nests found during patrols or reported by visitors were documented on Texas beaches from 1979 through 1989 (Table 2). Five Kemp's ridley, two loggerhead and the first green turtle nest confirmed on the Texas coast (Shaver 1989) were found. Four of the eight confirmed nests were constructed on the national seashore. Three of these were relocated in styrofoam boxes to the park incubation facility because they were located in areas where they might have been destroyed. Eggs from three of the four nests that were constructed outside the sea-



Beach patrols for nesting sea turtles are conducted from mid-April through August at Padre Island NS. It is hoped that Kemp's ridley turtles soon will return to nest there.

Table 1. General results of 1978-1988 Kemp's ridley incubation and imprinting at Padre Island National Seashore.

Year	Number clutches from Rancho Nuevo	Number eggs from Rancho Nuevo	Number (percent) eggs hatched	Number (percent) hatchlings died at Padre Island	Number (percent) hatchlings lost during release	Number hatchlings to Galveston	Mean incubation period (days)
1978	17	2,191	1,931 (88.1)	64 (3.3)	19 (1.0)	1,848	51.5
1979	20	2,053	1,769 (85.7)	15 (0.9)	93 (5.3)	1,661	52.0
1980	32	2,976	2,502 (84.1)	14 (0.6)	65 (2.6) ^a	1,611	50.5
1981	23	2,279	1,898 (83.3)	11 (0.6)	19 (0.8)	1,868	48.3
1982	20	2,017	1,563 (77.6)	5 (0.3)	34 (2.2)	1,524	51.0
1983	18	2,006	242 (12.1)	10 (4.1)	2 (0.8)	230	52.0 ^b
1984	19	1,976	1,792 (90.7)	239 (13.3)	9 (0.5)	1,544	51.1
1985	20	1,978	1,664 (84.1)	13 (0.8)	25 (1.5)	1,623 ^c	48.8
1986	22	2,011	1,776 (88.3)	1 (0.1)	16 (0.9)	1,759	46.7
1987	20	2,001	1,288 (64.3)	5 (0.4)	1 (0.1)	1,282	47.6
1988	10	1,019	933 (91.6)	4 (0.4)	4 (0.4)	925	46.9
Total	221	22,507	17,358 (77.1)	381 (2.2)	287 (1.7)	15,875	49.7

^aCalculated excluding 810 hatchlings from 11 clutches intentionally released into the Gulf of Mexico.

^bCalculated based only upon the 9 clutches that hatched.

^cCalculated excluding 69 hatchlings from a Padre Island natural nest head started at the Galveston NMFS laboratory.

Table 2. Documented sea turtle nestings on Texas beaches from 1979 through 1989. PAIS = Padre Island National Seashore, Padre Island, PBP = Padre Balli Park, Padre Island, SPI = South Padre Island and MI = Mustang Island.

Species	Number of eggs	Lay date	Nesting location	Incubation location and method	Percent hatch
Loggerhead	84	15 June 1979	SPI	SPI, nest site	1
Kemp's ridley	67	17 June 1979	PAIS	PAIS, styrofoam box	97
Kemp's ridley	113	30 April 1980	PBP	PAIS, styrofoam box	55
Kemp's ridley	115	22 May 1980	PAIS	PAIS, nest site	2
Kemp's ridley	97	13 June 1985	PAIS	PAIS, styrofoam box	72
Green	2	13 July 1987	PAIS	PAIS, styrofoam box	50
Kemp's ridley	104	27 April 1988	MI	PAIS, styrofoam box	91
Loggerhead	113	27 June 1988	MI	PAIS, styrofoam box	69

shore were also deemed to be threatened and were placed in styrofoam boxes and incubated at the PAIS facility (Table 2).

Because of our expertise, the park has taken the lead in sea turtle nest detection and protection for the Texas coast. The park recently prepared an action plan that details threats to nesting turtles, nests and hatchlings, measures that can be used to protect them and recommendations for dealing with eggs and hatchlings from nests laid on PAIS. The plan also outlines sug-

gested procedures that could be followed if nesting activity is found on other Texas beaches. Procedures recommended in the plan for dealing with nesting activity vary with different nesting levels. The basic recommendation is that sea turtle eggs should be left at the nest site (*in-situ*) if they can be protected from threats and that hatchlings should be released there. If few clutches are laid and cannot be protected *in-situ*, they will be incubated in styrofoam boxes at the park incubation facility. Larger numbers of nests that cannot

be protected *in-situ* will be placed into corrals where feasible and where trained personnel can monitor them.

Public Education

Efforts to educate the public about the Kemp's ridley project and sea turtle conservation began in 1978 and continued through 1989. Interpretive programs were given at most hatchling releases from 1978 through 1988. Also, handouts, posters and displays describing the project were made and the project was frequently covered by the media during all project years. Beginning in 1986, increased efforts were made to educate the public about the potential for nesting Kemp's ridley turtles and urge them to look for and report turtles and tracks. Since the national seashore is 65 miles long and extensive areas are often devoid of NPS personnel, it is imperative that park visitors assist with turtle detection and reporting. In 1989, magnetic signs alerting visitors to report all live sea turtle sightings were affixed to patrol vehicles. The signs elicited very positive responses from visitors and resulted in a number of reports of turtle sightings. Also, a video describing the Kemp's ridley project and what visitors should do if they see nesting turtles or tracks was shown continuously at the new park Visitor Center after its opening in July 1989.

Future Program Efforts

Pursuant to a decision made by the Kemp's Ridley Sea Turtle Working Group in 1987, no additional Kemp's ridley eggs will be transferred from Rancho Nuevo to Padre Island after 1988. Since the Kemp's ridley population is still declining at a rate of 3-4 percent per year, the group felt that additional emphasis should be placed on protecting the nesting turtles and nests in Mexico. Additionally, the Padre Island portion of the Restoration and Enhancement Program was originally designed to last only 10 years and that time was up. The PAIS sea turtle project will now focus on determining if Kemp's ridleys return to South Texas to nest and protecting, documenting and monitoring any nesting sea turtles and nests that are found. Central in our efforts will be the continuation of beach patrols and public education.

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