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The Kemp's Ridley Sea Turtle Head Start Research Project: An Annual Report for Fiscal Year 1986

BY

Charles W. Caillouet, Jr., Clark T. Fontaine, Theodore D. Williams, Sharon A. Manzella, Kathy L. W. Indelicato, Marcel J. Duronslet, Dickie B. Revera, Andre M. Landry, Jr. and Pamela J. Howes

U. S. DEPARTMENT OF COMMERCE
Malcolm Baldrige, Secretary
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INTRODUCTION

Kemp's ridley sea turtle (Lepidochelys kempi), the most endangered of the sea turtles, is facing extinction. In 1986, fewer than 600 nested at the principal nesting beach near the village of Rancho Nuevo, Tamaulipas State, Mexico, bordering the western Gulf of Mexico (Jack Woody, U.S. Fish and Wildlife Service, Albuquerque, NM, personal communication, September 1986). In June 1947, as many as 40,000 nested there in a single day (Hildebrand 1963). Since 1978, an international program has been aimed at restoring the Kemp's ridley sea turtle population (Klima and McVey 1981). Among its goals is head starting the turtles to establish a new nesting colony at the Padre Island National Seashore near Corpus Christi, TX.

Head starting has several phases, including incubating, "imprinting" and hatching the eggs, "imprinting" the hatchlings, rearing the hatchlings in captivity for one year or less, and tagging and releasing the turtles into the wild (Klima and McVey 1981; Mrosovsky 1983; Caillouet 1984; Fontaine et al. 1985). Head starting increases survival during the critical first year of life. The working hypothesis of the Kemp's ridley head start research project is that eggs and hatchlings become imprinted to their natal surroundings in such a way that the adults return to copulate and nest at the same location (Owens, Grassman and Hendrickson 1982).

Each year, biologists of the Instituto Nacional de la Pesca (INP) of Mexico, the U.S. Fish and Wildlife Service (FWS), and Gladys Porter Zoo collect eggs in plastic bags as females lay them at Rancho Nuevo, and transfer them to polystyrene foam boxes containing sand from the Padre Island beach. The boxed eggs are transferred by aircraft to the National Park Service's (NPS) Padre Island National Seashore. There they are incubated in a hatchery under the surveillance of NPS personnel. Upon emergence, hatchlings are taken to the Padre Island beach and allowed to crawl down it into the surf where they are scooped up in dip nets and placed in boxes. Hatchlings are then transferred to the National Marine Fisheries Service (NMFS), Southeast Fisheries Center (SEFC), Galveston Laboratory in Galveston, TX. After captive-rearing for 1 year or less,

survivors in good health and condition are tagged and released into the Gulf of Mexico.

ACCOMPLISMENTS

So far, 10,792 head started Kemp's ridleys, representing year-classes 1978-1985, have been tagged and released into the Gulf of Mexico (Table 1). Most of these were "imprinted" as eggs and hatchlings to Padre Island, but some were "imprinted" to Rancho Nuevo (Klima and McVey 1981; Owens et al. 1982; Caillouet 1984; Fontaine and Caillouet 1985; Fontaine et al. 1985). Growth, migration and survival of head started, tagged and released turtles have been determined from reports of their recapture or stranding[1/].

Head starting also has provided tagged Kemp's ridleys for a captive stock, in part to develop captive propagation as a "safety net" for the species (Caillouet 1984). Out of 264 captive-reared and tagged Kemp's ridleys distributed among the Cayman Turtle Farm (1983), Ltd., and marine aquaria (Table 2), 111 ranging in age from 2 to 8 years old were alive as of 11 September 1986. An inventory of the captive-reared stock is being maintained (Caillouet and Revera 1985). An unknown number of wild-caught Kemp's ridleys also is being maintained in captivity at various locations and it would be useful to have them added to an inventory. Out of 10 turtles of the 1985 year-class retained in captivity, two were incurably ill (dislocated shoulders and bone degeneration; one has since died) and eight are being retained for studies of PIT (passive inductive transponder) tag retention.

[1/] Fontaine, C. T., R. M. Harris, W. J. Browning and T. D. Williams. Observations on distribution, growth and survival of captive-reared, tagged and released Kemp's ridley sea turtles (Lepidochelys kempi) from year-classes 1978-1983. Manuscript submitted for publication in the Proceedings of the First International Symposium on Kemp's Ridley Sea Turtle Biology, Conservation and Management, National Marine Fisheries Service, Southeast Fisheries Center, Galveston Laboratory and Texas A&M University at Galveston, Department of Marine Biology, Galveston, TX, October 1985.

In May 1984, two Galveston-reared Kemp's ridleys that had been transferred to the Cayman Turtle Farm nested there (Wood and Wood 1984). They were only 5 years old at the time. Only three eggs hatched, indicating that they had been fertilized by captive-reared males, but the hatchlings did not survive. Obviously, successful copulation had taken place in captivity. In spring-summer 1985, matings and crawls were observed in the Kemp's ridleys at the farm, but no known nestings took place (James Wood, personal communication, August 1985). The diet was changed to a high-protein trout chow. In spring 1986, a number of nests were laid by Kemp's ridleys at the farm, and viable hatchlings were produced; as of 11 September 1986, fewer than 40 of these hatchlings remained alive (James Wood, personal communication, September 1986). This successful hatch was a major break-through in captive propagation.

In October 1986, the international, interagency Kemp's ridley working group met in Sante Fe, NM, and reassessed its policies concerning the captive stock and captive propagation experiments. An earlier decision to conduct captive propagation experiments at Cayman Farm had been formalized in a Memorandum of Understanding, dated 18 December 1984, among FWS, NMFS and Cayman Farm. Agreement as to specific objectives and work to be conducted was achieved on 20 September 1985. This was reinforced at the interagency meeting in October 1986.

The original intent of distributing head started Kemp's ridleys among marine aquaria was to develop a captive stock to provide a "safety net" for the species through captive propagation (Caillouet 1984). It was not possible to visit every facility before turtles were transferred, so we relied on information provided by each organization and by our contacts who were knowledgeable of the facilities and were able to advise us. According to Edward Klima (personal communication, February 1987), another perhaps more important rationale exists for maintaining a captive stock, that being "super head starting" or the eventual release of Kemp's ridleys older than one

year of age. It is not known what size or age are optimum for the release of head started Kemp's ridleys that would provide maximum survival potential (ibid).

There have been a number of problems associated with maintaining the captive stock of Kemp's ridley at some locations:

(1) failure to maintain seawater quality and sufficient space for the turtles, resulting in transfer of the turtles to another facility.

(2) improper diet dominated by oily fish, leading to fatty degeneration of the liver, or in the worst case, steatitis, eventually leading to death,

(3) injuries caused by bites by other sea turtles, both interspecific and intraspecific, and

(4) death caused by injuries from bites from larger turtles (e.g., loggerheads, *Caretta caretta*).

Organizations that received head started Kemp's ridleys agreed to abide by written guidelines regarding their care and husbandry, as well as timely reporting requirements, so that the well being of the turtles could be assured. Though most complied, some did not, and remedial actions were taken. However, in some cases, turtle mortalities occurred before the remedies could be implemented. Nevertheless, useful information has been gained from monitoring the captive stock that would not have been available had such a stock not been developed and maintained. The main rationale for distributing the captive stock among numerous facilities rather than few was related to the risks of losing all of the turtles through an epidemic. For example, an epidemic at one facility could kill all or most of the

turtles at that facility, but would not affect turtles at other facilities. Also, such distribution provided opportunities for more individuals to gain experience with Kemp's ridley care and husbandry, as well educating public viewers of the need for sea turtle conservation.

Currently, the Kemp's ridley working group views the Cayman Turtle Farm's experiment in captive propagation of Kemp's ridleys as the only viable experiment of this kind on that species (Edward Klima, personal communication, February 1987). The rest of the captive stock distributed among facilities in the U.S. is available for various potential uses, among which are "super head starting", and replacements to losses from the Cayman Turtle Farm brood stock (ibid.). Plans are underway to release six "super head started" Kemp's ridleys in the Gulf of Mexico off south Texas in June 1987, and to track them by radio and sonic methods (ibid.). Tag-retention studies also are underway, using turtles in the captive stock.

A few head started Kemp's ridleys have been held longer than 1 year at the Galveston Laboratory then released (Fontaine et al. 1985). Others that were stunted, otherwise abnormal, incurably sick, or permanently handicapped by injuries were used in research, transferred to other organizations, agencies or investigators, or euthanized.

Gonads and kidneys are routinely excised from Kemp's ridleys that die during head starting. Such specimens have been examined by Dr. David Owens and others at the Department of Biology, Texas A&M University, College Station, TX, under contract with the NPS to determine their sex (Wibbels et al. 1985). This provides NPS with information necessary to determine the relationship between incubation temperature and sex ratio in Kemp's ridley.

Preserved specimens of Kemp's ridley tissues have been transferred to Dr. Elliott Jacobson, University of Florida, Gainesville, FL, for research on Kemp's ridley pathology. Approximately 700 carcasses of Kemp's ridleys that died during head starting were sent to Dr. John Frazier, Smithsonian Institution, Washington, D.C., and have been

archived by the Curator of Reptiles, FWS, National Museum of Natural History, Washington, D.C.

The Galveston Laboratory participates in the Sea Turtle Stranding and Salvage Network, and a few live-stranded sea turtles, including Kemp's ridleys as well as other species, have been rehabilitated, held temporarily for exhibit at the head start facilities and later tagged and released. Sea turtles of various species found dead on beaches along the upper Texas coast have been transferred to the Texas A&M University (TAMU) Department of Biology, to the Texas Veterinary Medical Diagnostic Laboratory System at College Station, or to the Texas A&M University at Galveston (TAMUG), Department of Marine Biology, for necropsy and biological measurements or observations. Some of the carcasses are being prepared by TAMUG for transfer to the scientific collection at the TAMU Department of Wildlife and Fisheries Sciences at College Station.

FACILITIES AND OPERATIONS

The head start research facilities have been described by Fontaine et al. (1985). They include two quonset huts that house 15 fiberglass raceways, each filled with seawater. In the past, each raceway contained yellow plastic buckets in which the turtles were reared in isolation from each other, one turtle per bucket. This prevented their biting and injuring one another (Klima and McVey 1981). Bottoms of the buckets were perforated to allow exchange of seawater and liberation of turtle excrement and uneaten food.

In addition to the standard bucket-rearing technique, we have begun comparing plastic milk cartons to the buckets as rearing containers. These cartons, made of yellow plastic, are fastened together with plastic bolts and nuts in units of 10 cartons (2 x 5), and their walls are lined with rigid, white plastic sheathing 3.2 mm thick. The cartons, 30.5 cm wide, 35.6 cm long and 24.1 cm deep, provide the turtles with more space for movement and exercise.

A new quonset hut, designed by Architect George Ling of the architectural firm of Melton and Henry, Houston, TX, in consultation with the head start staff, is being constructed. The materials and construction are being funded by HEART (Help Endangered Animals - Ridley Turtles), a Houston-based conservation organization, and others. Dimensions of the new quonset hut are 29.3 x 9.1 m. It has a concrete floor, and will be equipped with a grill-covered drain trough and improved plumbing and wiring as compared to the old quonset huts.

Seawater for the raceways is obtained from the surf zone of the Gulf of Mexico by suction-pumping through well-points buried in the sand below the water (Fontaine et al. 1985). After particulates are allowed to settle in a concrete sump, the sea water is pumped into two redwood reservoirs. Both by gravity flow and by pumping, the seawater is transferred to fiberglass reservoirs near the quonset huts.

Raceways are drained, flushed by hosing with fresh (tap) water, and refilled with clean seawater thrice each week (Fontaine et al. 1985). Once each week, all raceways are scrubbed with brushes, after being drained, to remove attached algae, uneaten food and excrement.

1985 YEAR-CLASS

Hatchlings Received

Between 9 July and 7 August 1985, 1,692 "imprinted" Kemp's ridley sea turtle hatchlings representing 21 clutches were transferred from the NPS' Padre Island National Seashore to the head start research facilities at the Galveston Laboratory (Caillouet et al. 1986b). Of these, 1,684 were received alive and 8 were dead on arrival. The incubating, hatching, "imprinting," packing and transporting operations were carried out by Robert King (NPS) and his staff at the National Seashore (King et al. 1985).

Clutches 1-20 were collected at the Rancho Nuevo beach, in the usual manner, from females identified by flipper tag numbers (see Caillouet et al. 1986b, Table 22). Clutch 21 was obtained from a nesting on 13 June

1985 at the National Seashore. The female that laid clutch 21 was seen only by a beachgoer who exercised good judgement by not disturbing it. After marking the nest site, the observer reported the nesting to NPS personnel who collected and incubated the eggs. We do not know, however, whether or not the nester was a head started Kemp's ridley.

Distribution of Hatchlings Among the Raceways

As the clutches of hatchlings of the 1985 year-class were received, they were assigned more or less sequentially to the raceways from east to west (see Caillouet et al. 1986b, Appendix Table 4). Hatchlings from clutch 21 were placed in standing basins (see Fontaine et al. 1985).

Schedule for Weighing and Measuring Turtles

All hatchlings of the 1985 year-class were weighed (see Caillouet et al. 1986b, Table 15) and measured (carapace length and width) at the National Seashore by NPS personnel between 8 July and 7 August 1985. Thereafter, at the Galveston Laboratory, random samples of turtles (30 per raceway) were taken for weighings at approximately 28-day intervals and before the releases (Table 3).

Foods and Feeding

The foods and feeding methods used in head starting Kemp's ridleys have been elaborated by Fontaine et al. (1985) and Caillouet et al.[2/] The food used in head starting the 1985 year-class was a dry, floating, pelleted, diet manufactured by Purina, Richland, IN. It is the same diet used for rearing green sea turtles (*Chelonia mydas*) at the Cayman Turtle Farm (1983), Ltd. (James Wood, personal communication, August 1984).

[2/] Caillouet, Charles W., Jr., Dennis B. Koi, Clark T. Fontaine, Theodore D. Williams, William J. Browning and Richard M. Harris. 1986. Growth and survival of Kemp's ridley sea turtle, *Lepidochelys kempi*, in captivity. NOAA Technical Memorandum NMFS-SEFC-186, in press.

The turtles were fed twice daily. Initially, the hatchlings received a daily ration approximately 5% of their arithmetic average weight. Feeding rates were adjusted downward gradually as the turtles increased in size, based on a percentage of the geometric mean weight of combined samples of turtles weighed at 28-day intervals. Under this method of feeding, once the weight of food per turtle was calculated, the food was distributed to each turtle by volumetric measure based on weight:volume ratio for the food. The feeding experiment planned for the 1985 year-class was a "uniformity trial," so all turtles received the same amount of food daily for most of the rearing period. Also for the most part, all turtles in a given raceway were treated similarly with regard to feeding, cleaning of the raceways, and seawater management.

The planned feeding levels had to be altered from time to time, because day to day conditions in the raceways were affected by temperature, the amount of uneaten food, and the amount of turtle excrement which altered seawater quality. In some cases, feeding had to be stopped for a day or two to allow the turtles to recover from bloating caused by overfeeding. The turtles were fed twice per day; once in the morning and once in the afternoon. The daily ration was divided into two equal portions for twice daily feeding. For example, when the daily feeding level was 5% of average body weight, the daily ration of food was divided into two equal portions, each representing 2.5% of average body weight.

Statistical Analyses

Rectilinear regression[2/] was used to determine rates of growth in weight (W, in g) of the turtles during the uniformity trial, separately and independently by raceway and by clutch, as follows (Table 4):

$$\widehat{\ln W} = \ln a + bT^{1/2} + \ln d, \qquad (1)$$

where W = weight in g,

T = age in days,

ln a = intercept,

b = weight increase index (i.e., growth rate index), and

ln d = residual (i.e., deviation from regression).

The uniformity trial began with the weighing on 29 August 1985 and was terminated after the weighing on 13 March 1986. The experiment was terminated because some turtles had become too large to retain in buckets, so they were transferred to larger containers (plastic buckets) in raceways 4 and 5. Growth rate indices showed little variation among raceways (including standing basins) or among clutches (Table 4).

Table 5 gives the geometric mean weights at each weighing, by clutch and by raceway. Faster-growing (larger) turtles had to be given more food than the slower-growing turtles, after the uniformity trial was terminated, and feeding levels were adjusted accordingly. Additional food further enhanced the growth of the faster-growing turtles (Table 5).

Continued Feeding After the Uniformity Trial

After the uniformity trial ended, the turtles in different raceways were fed twice-daily at feeding rates depending upon their geometric mean weight by raceway. By 20 March 1986, the turtles that had outgrown their buckets were transferred to larger containers.

Health Care

Health care for the turtles consisted of prophylactic and therapeutic measures developed from previous research and experience[3/] (Clary and Leong 1984; Fontaine et al. 1985).

[3/] Leong, J. K., D. L. Smith, D. B. Revera, J. C. Clary III, D. H. Lewis, J. L. Scott and A. R. DiNuzzo. Health care and diseases of captive-reared loggerhead and Kemp's ridley sea turtles. Manuscript submitted for publication in the Proceedings of the First International Symposium on Kemp's Ridley Sea Turtle Biology, Conservation and Management, National Marine Fisheries Service, Southeast Fisheries Center, Galveston Laboratory and Texas A&M University at Galveston, Department of Marine Biology, Galveston, TX, October 1985.

Environmental Variables

During head starting of the 1985 year-class of Kemp's ridley, seawater temperature and salinity usually were monitored daily in raceways 1, 6, 10, 11 and 15, beginning 8 August 1985 and ending 21 April 1986. Daily monitoring of pH in the same raceways was done between 5 November 1985 and 21 April 1986. These measurements served as general guides to environmental conditions in the raceways. Raceway means of seawater temperature (for 242 days of measurements) ranged from 25.3°C to 26.6°C. The residual variance (over days) for seawater temperature was 1.5°C. The heating of the air in the quonset huts with forced-air heaters and the incoming seawater with immersion heaters during winter obviously stabilized the temperature in the raceways quite well as compared to previous years. Raceway means of seawater salinity ranged from 28.0 ppt to 28.2 ppt (for 242 days of measurements). The residual variance (over days) for salinity was 21.4 ppt, indicating considerable variation during head starting. Raceway means for seawater pH ranged from 6.6 to 6.8 (for 161 days of observations), with a variance (over days) of 4.00 pH, indicating wide variation in pH during head starting.

Morphometric Studies

Every two weeks during head starting, Dr. Andre Landry, Jr., Associate Professor, and his student assistants, Department of Marine Biology, Texas A&M University at Galveston (TAMUG), TX, took a variety of morphometric measurements on a group of 100 Kemp's ridleys selected from the 1985 year-class (see Caillouet et al. 1986b, Table 17). One purpose was to determine whether or not the two sexes could be distinguished by morphometric analysis. Sex is to be determined by histological techniques in any animals that died during head starting or by future examination of typical secondary sexual characteristics and sex hormone titers in living animals transferred to other facilities and held in captivity beyond one year of age. These animals also were studied to evaluate effects of clutches and feeding rates on morphometry. Of the 100 turtles, 57 (Table 6) were held beyond the time of the releases in April and May 1986. Of the 57, 47 were

released offshore of Galveston on 23 September 1986, two were incurably ill with dislocated shoulders and bone degeneration (one of these later died), and eight containing PIT tags were held until their transfer to Marineland, St. Augustine, FL, on January 1987.

Tags and Tagging

Tags were applied to all Kemp's ridleys of 1985 year-class that were healthy (Table 7). Types of tags included: inconel flipper tags, living-tags, internal, binary-coded, magnetic tags, and PIT tags. Inconel flipper tags were applied to the trailing edge of the right front flipper. The flipper tag code series included NNX001-NNX999 and NNY001-NNY564. Living tags were applied to right costal scute 5, and binary-coded, magnetic tags were inserted into the distal end of the left front flipper. PIT tags were applied to 8 sea turtles of the year-class on 1 July and 7 November 1986.

Living-tags on carapace scutes distinguish year-classes of head started Kemp's ridleys from one another (Caillouet et al. 1986a). The scutes proposed for year-classes 1985-1995 by Caillouet et al. (ibid.) were selected to minimize the use of the same scute for more than one year-class. Reuse of a given scute will not occur until right costal scute 4 is used on the 1990 year-class. The FWS, P. O. Box 1306, Albuquerque, NM 87103, coordinates the use of living-tags by sea turtle investigators (Bowman 1983).

Anyone encountering a tagged or marked Kemp's ridley should contact the NMFS, SEFC, Miami Laboratory, 75 Virginia Beach Drive, Miami, FL 33149 (Commercial telephone no. 305-361-4488, -4225, or -4487), or Galveston Laboratory, 4700 Avenue U, Galveston, TX 77550 (commercial telephone no. 409-766-3523, -3517, -3507, -3525). The location of the tag or mark, and details concerning the carapace length (straight line) and weight of the turtle, location, date and method of recapture, sighting or stranding also should be reported to NMFS.

Relocation for Super Head Starting, Captive Propagation or Cooperative Research

At the meeting of the international Kemp's ridley sea turtle working group in Galveston, TX, on 30 September and 1 October 1985, it was agreed that none of the 1985 year-class would be relocated to cooperating organizations for super head starting or captive propagation experiments. Later it was agreed that the 57 turtles (52 held at the head start facility to allow opportunities for further morphometric studies by Dr. Andre Landry and his assistants, and 5 transferred to Dr. Ron Malone, Department of Civil Engineering at Louisiana State University in Baton Rouge, LA, for studies of recycled seawater systems) would be held back temporarily (Table 6). In addition, it was decided at the working group meeting in Sante Fe, NM, on 9-10 October 1986 that the eight PIT-tagged turtles of the 1985 year-class would be held indefinitely in captivity.

Releases

On 22 April 1986, 519 multi-tagged Kemp's ridleys of the 1985 year-class were packed into wax-coated, corrogated cardboard boxes and transported by truck to the Texas Parks and Wildlife Department (TPWD) dock at Rockport, TX. TPWD provided the research boat ARANSAS BAY for the release. Of the 519 turtles released, 49 were released in Port Bay, 22 in Italian Bend, and 448 in Copano Bay, near Corpus Christi (Table 8). Port Bay and Italian Bend have a maximum depth near 5 ft. In the nearshore area of Copano Bay where the ridleys were released, water depth was 5-7 ft. The three release areas are part of a State shrimp nursery zone that was closed to commercial shrimping. According to TPWD Biologist Ed Hegen, these areas harbor an abundance of blue crabs (*Callinectes sapidus*), which are favored natural foods of Kemp's ridley, as well as shrimp (*Penaeus* spp.). Surface water temperature was 24°C at the time of the release.

All turtles were alive and appeared to be in good condition at the time of the release. In most cases, the turtles floated on the surface for a long time, rather than diving immediately upon contacting the water as has been observed in previous releases. However, none were observed on the

surface when the area was patrolled following completion of the release.

On 6 May 1986, 961 multi-tagged ridleys of the 1985 year-class and one of the 1984 year-class were packed in boxes as usual and transported by truck to the dock at the U.S. Coast Guard Station near Corpus Christi. Included among the 1985 year-class turtles were 63 head started survivors from the Padre Island nesting that occurred in June 1985. This group was dubbed the "Texas Sesquicentennial Kemp's Ridley Sea Turtles", and one individual was given the name "Lone Star" by Mrs. Carole Allen, Chairwoman of HEART, who had the honor or releasing it. The turtles were transferred to the U.S. Coast Guard Cutter POINT BAKER and thence to the release site in the Gulf of Mexico about 6-8 nautical miles off Mustang Island (Table 8).

The one individual from the 1984 year-class that was released on 6 May 1986 had been released before in the Gulf of Mexico off Padre Island on 23 May 1985 and had been found severely injured and stranded on the beach at Crystal Beach, TX, 15 days later. Its wounds were sutured and treated by Dr. Joseph Flanigan of the Houston Zoo, and its healing and rehabilitation had continued under the care of the head start staff at Galveston. During an open house sponsored by HEART in February 1986, Weis Middle School, of Galveston's Independent School District, held a "name the turtle" contest for this turtle. Rhys Todia of Houston, TX, won the contest with his entry "Traveler." Sharon Manzella of the head start staff had the honor of releasing Traveler.

Upon release, most of the turtles dived after contacting the water. This diving behavior, contrary to the floating behavior of turtles released inshore, may have been related to the rough sea surface conditions (2-3 m swells) during the offshore release.

Corpus Christi television news teams from Channel 3 (an ABC affiliate) and Channel 10 (a CBS affiliate) were on board the Coast Guard cutter during the offshore release. They aired their coverage on the evening newscasts of 6 May and on the morning newscasts the next day. The Channel 3 report was picked up by CNN television and aired nationwide on 7 and 8 May.

Kevin Moran of the Houston Chronicle and a reporter from the Corpus Christi Caller, also on board the Coast Guard cutter, released their reports on 7 May. A U.S. Navy reporter/photographer and free lance photographers/divers Stephan Myers and J. Frank Blagg photographed the offshore release.

On 23 September 1986, 54 multi-tagged ridleys of the 1985 year-class and two rehabilitated sea turtles ("Oiliver," a Kemp's ridley, and "Sam", a green sea turtle, both of which had been found live-stranded) were released from the Texas A&M University R/V ROAMIN' EMPIRE into the Gulf of Mexico about 43 nautical mi SSE of Galveston. Water depth was near 33 m. On the same day, "Bolivar" (the rehabilitated hawksbill that had been found live-stranded) was released from the ROAMIN' EMPIRE into the Gulf of Mexico near a Buccaneer Oil Field platform about 32 nautical miles SE of Galveston.

1986 YEAR-CLASS

Between 6-26 July 1986, 1,759 "imprinted" Kemp's ridley hatchlings of the 1986 year-class were received from the NPS's Padre Island National Seashore (Table 9). None were dead on arrival (Table 10). These hatchlings were from 22 clutches, all of which came from eggs collected in the usual manner at the Rancho Nuevo beach. Though there were reports of several crawls and one nest excavation by Kemp's ridley at the National Seashore in 1986, egg laying was not reported (Shaver et al. 1986).

The eggs of the 1986 year-class were incubated at the National Seashore at warmer temperatures than in previous years (Shaver et al. 1986). Sex in Kemp's ridley appears to be influenced by incubation temperature, as it is in other sea turtle species (Wibbels et al. 1985); thus, the proportion of females should be higher in the 1986 year-class than in previous year-classes.

Tables 11 and 12 give the origin, identification number and history of each clutch. The hatchlings were "imprinted," weighed (Table 13) and measured (carapace length and width) at the National Seashore by NPS per-

sonnel (Shaver et al. 1986). The actual and proposed dates and sample sizes for weighings of Kemp's ridleys of the 1986 year-class are given in Table 14.

Appendix Table 1 shows the distribution of clutches among the raceways as of 12 September 1986, following reallocation from their initial sequential allocation among the raceways.

Comparison of Rearing Containers

Among the major objectives of head starting is the production of yearlings that are in as good health and physical condition as possible, to enhance their survival in the wild. The turtles of the 1985 year-class grew so fast that some of them outgrew their plastic buckets before the first release. We suspect that this was due both to improved food quality and better control of seawater temperature during winter months. Regardless, the buckets are not large enough to hold fast-growing ridleys for one year. For this reason, buckets of the type used since 1978 as standard rearing containers are being compared with larger, plastic milk cartons which provide the turtles more room for movement and exercise.

Fewer yellow plastic cartons than buckets can be placed in a raceway. A raceway can hold 8 assembled units (2 x 5) of cartons, or 80 cartons arrayed in 5 columns and 16 rows. The standard configuration of buckets in a raceway is 108 buckets arrayed in 6 columns and 18 rows. Cartons have the added advantage that each can be temporarily partitioned into two compartments with a sheet of the same rigid plastic inserted diagonally. Therefore, two hatchlings can be placed in each partitioned carton and left there until one must be transferred to another container and the partition removed to allow more room for the remaining turtle. Thus, a raceway can hold 160 hatchlings in such partitioned cartons, as a convenience, until it becomes necessary to redistribute half of the turtles.

Experiment Comparing Buckets and Cartons

Raceways 3-8 in the east quonset hut were selected for a currently ongoing experiment whose objective is to compare buckets and cartons as rearing containers for Kemp's ridley. The raceways were grouped into two blocks (replications) of three raceways each in a randomized complete block design to test three treatments (Table 15):

Treatment A - 54 buckets and 40 cartons.

Treatment B - 80 cartons

Treatment C - 108 buckets

Treatment C is considered a control, as it represents the previous standard method using 108 buckets per raceway. Comparisons between the two types of rearing containers will be made using growth rate, survival and rate of increase in biomass as response variables.

Caillouet et al.[2/] suggested that the increase in biomass of turtles in a raceway might reduce survival as the turtles grow beyond a certain size during head starting. They believed that the biomass effect on survival was elicited through short term (between seawater replacements) degradation in seawater quality as affected by decomposition of sea turtle excrement and uneaten food. The quantities of excretory products and uneaten food increase with size of the turtle. In our experiment, initial stocking density determined initial biomass, and we expect carry-over of this initial density effect throughout the experiment. For this reason, we included Treatment A containing half the number of buckets of Treatment C and half the number of cartons of Treatment B. Thus, the initial density of turtles per raceway differs in Treatments A, B and C (94, 80, and 108, respectively), with consequent differences in initial biomass. Any differences that may be detected among the three treatments in our experiment could be due in part to the initial and subsequent differences in biomass. For raceways 4 and 6 containing Treatment A, the locations of the groups of buckets and cartons were randomized between south and north halves of each raceway (Table 15), but the buckets were placed together as a group in the raceway as were the cartons.

Assignment of clutches to raceways representing treatment-block com-

binations was random with the proviso that some siblings from each selected clutch occurred in all three treatments within a given block (Table 15). Also, assignment of numbers of turtles from a given clutch to buckets or cartons in the three raceways within a block was approximately proportional to clutch size (see Table 9) and number of rearing containers (by type) per raceway (Table 15). As a consequence, there were more members of a given clutch in treatment C than in treatment A, and more in treatment A than in treatment B. The assumptions underlying this assignment procedure were (1) that larger clutches are healthier and more vigorous, perhaps coming from larger females and more successful hatches, and (2) that such clutches should be more heavily represented in the experiment than smaller clutches.

Clutches assigned to Blocks 1 and 2 were not the same, so any difference that might result between blocks could be due in part to clutch differences as well as raceway location or microenvironmental effects (i.e., clutch and block effects are confounded). In other words, the assignment of different clutches to the two blocks created a restriction error which will be attached to the mean square for blocks in the analysis of variance (ANOVA). However, our interest is in testing treatment effects, not block or clutch effects, and the restriction error will not affect the test of significance of the treatment effects.

The experiment began on 7 August 1986, on the day that hatchlings from the selected clutches were transferred from their initial (temporary) locations to their reassigned locations within the experimental design (Appendix Table 1).

Raceways 1, 2, and 9-15 were not used in the experiment. Raceway 14 was used in part to supply turtles for an experiment on speed, stamina and physical fitness as related to bucket vs carton rearing methods, currently being conducted by Erich Stabenau, a graduate student in the Department of Marine Biology, Texas A&M University at Galveston.

SEA TURTLE REHABILITATION

Several sea turtles were rehabilitated at the Galveston Laboratory after having been found stranded on beaches. During rehabilitation they were fed varying amounts of penaeid shrimp "tails" daily, and blue crab (Callinectes sapidus), squid and fish several times weekly, until released.

"Traveller", the head started Kemp's ridley of the 1984 year-class found stranded on the Bolivar Peninsula beach in May 1985, 15 days after its release off Padre Island, was rehabilitated. Traveller was released again into the Gulf of Mexico on 6 May 1986, 6-8 nautical mi off Padre Island.

"Oiliver", the wild Kemp's ridley found stranded and heavily coated with oil on West Beach of Galveston Island on 5 August 1984 (Caillouet et al. 1986b), was rehabilitated then released on 23 September 1986 about 43 nautical mi SSE of Galveston. It appeared to be 1 year old when originally found, considering its size in relation to head started yearlings. Table 16 gives the weights, measurements, flipper tag number and other information concerning Oiliver by date.

"Bolivar", the hawksbill sea turtle (Eretmochelys imbricata) found stranded and tangled in sargassum weed high on the beach 5 mi east of the Bolivar ferry landing on 26 September 1984 (Caillouet et al. 1986b), was rehabilitated and released again into the Gulf of Mexico on 23 September 1986 near a Buccaneer Oil Field platform. Table 17 gives weights, measurements, flipper tag number and other information concerning Bolivar by date. Bolivar grew more slowly than Oiliver under similar conditions (Tables 16 and 17). Bolivar was found alive on the west Galveston beach 6 days after its release, and is again being maintained at the Galveston Laboratory.

"Hopalong", the injured Kemp's ridley hatchling received from Sea-Arama Marineworld on 24 August 1985, was rehabilitated at the Galveston Laboratory, but remains handicapped. Its right front and rear flippers apparently had been bitten off. Table 18 gives its weights, measurements and other information by date. Hopalong was transferred to Ila Loetscher, Sea Turtle Inc., South Padre Island, TX, on 25 September 1986.

SEA TURTLE STRANDING AND SALVAGE NETWORK

In Fiscal Year 1986, we expanded our participation in the Marine Mammal and Sea Turtle Stranding and Salvage Network. We documented the strandings of 23 sea turtles on the upper Texas Coast in fall 1985. As of 16 December 1986, 167 sea turtles had been found on the upper Texas Coast in 1986, and 100 sea turtles had been found on the coast of southwest Louisiana in 1986. Kemp's ridley represented 66% of the strandings in 1986. It is essential that the cause(s) of sea turtle strandings be documented so that the associated mortalities can be eliminated. We are working closely with FWS, TAMUG, and McNeese State University, Lake Charles, LA, toward this end. For example, Dr. Andre Landry and his students at the Department of Marine Biology, TAMUG, are conducting necropsies on carcasses of stranded turtles to obtain information on probable cause of death, sex, and food habits, and to obtain bones for age-growth studies.

OLIVE RIDLEYS

The 20 olive ridley (*L. olivacea*) hatchlings received from Ross Witham, Florida Department of Natural Resources, Jensen Beach, FL on 1 October 1985 were head started by the same methods used for Kemp's ridleys of the 1985 year-class, but showed very limited growth (Table 19). On 4 April 1986, the 13 survivors were transferred to Miami Seaquarium.

SUMMARY OF KEMP'S RIDLEY SEA TURTLE RELEASES AND RECOVERIES

Table 8 summarizes the release sites, dates of releases, numbers released and flipper tag series used for releases of head started Kemp's ridleys of the 1978-1985 year-classes.

Of the 10,792 tagged Kemp's ridleys released, 492 had been recovered as of 30 September 1986 (Table 20). Most of these were from the 1982 year-class in which a number of turtles were oiled and washed ashore at Padre Island shortly after their release about 4 nautical mi offshore. The least

recoveries have been from the 1983 year-class from which the smallest number (190) of any year-class was released. We received only 250 hatchlings from the 1983 year-class (Table 1) due to a poor hatch. Many of the 67 recaptures of the 1985 year-class were caught within the bays in which they were released, or in adjacent bays, shortly after the release.

Most of the recoveries have been in Texas (Table 21) because most of the turtles have been released along the coast of Texas (Table 8). Louisiana and Florida are second and third in recoveries, followed by North Carolina and South Carolina, respectively. Recoveries have been reported as for away as France and Morocco.

Of the recoveries for which an oceanside vs bayside recovery location was reported, 52% were from oceanside and 48% from bayside (Table 21). This confirms that Kemp's ridleys occur in estuarine as well as oceanic waters.

In most cases (26%), the method of recovery has not been reported (Table 22). Three methods dominated the reported recoveries: stranded dead (23.8%), shrimp trawl (22.6%) and stranded alive (18.9%). Of the shrimper-caught recoveries (Table 23), most were reported from Texas (49.6%) and Louisiana (27.0%). NMFS, the shrimp industry and conservation organizations have participated in several mediation meetings in an attempt to solve the problem of sea turtle by-catch in shrimpers' trawls.

Table 24 shows the condition of the tagged sea turtles at the time of their recovery. More than half of the turtles are recovered alive and are re-released into the environment.

CHANGES IN DIVISION STAFF

Pamela Howes joined the staff in July 1986 and resigned in January 1987. Deborah Tarver resigned in April 1986 and David Forcucci resigned in May 1986. Zoula Zein-Eldin was reassigned to work with Dr. Roger Zimmerman of the Fishery Ecology Division. The current permanent staff of the Life Studies Division working on sea turtles includes:

Charles Caillouet
Marcel Duronslet
Clark Fontaine
Sharon Manzella
Dickie Revera
Ted Williams

The current temporary staff of the division working on sea turtles includes:

Kathy Indelicato
Andre Landry (Faculty appointment, Associate Professor, Department of Marine Biology, Texas A&M University at Galveston)
Erich Stabenau (a TAMUG graduate student conducting exercise physiology research on Kemp's ridley and a NMFS part-time employee assisting in the Sea Turtle Stranding and Salvage Network)
John Stacy (a graduate student at McNeese State University, Lake Charles, LA, and NMFS part-time employee assisting in the Sea Turtle Stranding and Salvage Network)

PUBLICATIONS AND REPORTS IN FISCAL YEAR 1986

Caillouet, C. W., Jr. 1986. Aren't sea turtles excellent fishes? Letters to the Editor, Fisheries 11(1):65.

Caillouet, C. W., Jr. and M. J. Duronslet. 1985. Guest editorial--Sea turtle sex ratios and incubation temperature: are we on the right track? Marine Turtle Newsletter (35):14-16.

Caillouet, C. W., Jr., C. T. Fontaine, S. A. Manzella, T. D. Williams and D. B. Revera. 1986. Scutes reserved for living tags. Marine Turtle Newsletter (36):5-6.

Caillouet, C. W., Jr., C. T. Fontaine, T. D. Williams, S. A. Manzella, D. B. Koi, K. L. W. Indelicato, M. G. Tyree, J. K. Leong, M. J. Duronslet and K. T. Marvin. 1986. The Kemp's ridley sea turtle head start research project: an annual report for fiscal year 1985. NOAA Tech. Memo. NMFS-SEFC-174, ii plus 37 p., 29 tables, 1 figure, and 5 appendices.

ACKNOWLEDGEMENTS

The success of head starting depends upon the cooperation, assistance and contributions of many agencies, organizations and individuals. This work was conducted under INP Permit No. 301271 and 150486-333-01-0750 (and Mexican Diplomatic Notes No. 174 and 30132, respectively), FWS Endangered and Threatened Species Permits No. PRT-676379 and PRT-689914, CITES permit No. US-707274, TPWD Scientific Permit No. SP073-2, and FDNR Permit No. TP-015. Dr. Edward Klima, Fred Berry and Walter Nelson provided administrative guidance and support throughout the year.

The Kemp's ridley eggs from year-classes 1985 and 1986 were made available to the NPS through the efforts of Rene Marquez M. (INP, Mexico), Jack Woody (FWS, Albuquerque, NM), Pat Burchfield (Gladys Porter Zoo, Brownsville, Texas), and their staffs. The efforts of Dr. Milford Fletcher (NPS, Santa Fe, NM), Bill Lukens, Robert King, Donna Shaver and staff (NPS, Corpus Christi, Texas) in incubation, hatching and "imprinting" phases were appreciated.

HEART (Help Endangered Animals - Ridley Turtles), chaired by Mrs. Carole Allen, is a non-profit, special committee of the Piney Woods Wildlife Society of North Harris County College, Houston, TX. HEART provided the food for the 1985 and 1986 year-classes, and continued to lend the Galveston Laboratory an electronic balance for weighing turtles. HEART received donations totaling $26,950 during fiscal year 1986 in support of Kemp's ridley research and conservation. Included among the donors were Exxon Company, Earl Burke (Pel-Tex Oil Company), and the general public. Additional funds were pledged for construction of a new Kemp's ridley

rearing facility.

We thank TPWD for providing the ARANSAS BAY for the inshore release in April 1986, and Ed Hegen, Page Campbell, Domingo Sanchez and Doug Parker of TPWD, Pam Plotkin of NPS, Dr. Thomas Bright, Sea Grant Director, Texas A&M University, and his family, and David Forcucci, former member of the Galveston Laboratory staff, for their assistance in the release.

We thank Dr. Robert Jones, Director, University of Texas, Marine Science Institute, Port Aransas, TX, who provided the R/V LONGHORN for the offshore release in May 1986. The assistance of Dr. Anthony Amos, LONGHORN Captain Don Gibson and his crew, and Carole Allen and Donna Shaefer of HEART in the release also is appreciated.

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We are grateful to Dr. Joseph Flannigan, Houston Zoo, for his assistance in rehabilitation of Kemp's ridleys and studies of their diseases, and to Dr. David Owens and his students for collaboration in sex determination and in studies of reproductive physiology in Kemp's ridley.

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We thank Ross Witham, FDNR, Jensen Beach, FL, for providing olive ridley sea turtles for head start experimentation, and John Kerivan and his staff at Sea-Arama Marineworld, Galveston, TX, for their cooperation, both by rehabilitating sea turtles and by maintaining captive-reared Kemp's ridleys as potential breeders. The efforts of the several universities, organizations and agencies in holding captive-reared Kemp's ridleys older

than 1 year are greatly appreciated.

Mr. William Schaaf, Southeast Packing Company, Galveston, TX, provided temporary frozen storage for sea turtle food when our freezers were inoperable. Ms. Dorothy Rilat, Curl's Bait Center, Texas City, TX, donated frozen shrimp to feed the larger sea turtles at the laboratory.

News media coverage has helped generate greater public awareness of and interest in the head start project and the plight of Kemp's ridley.

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Table 1. Summary of "imprinted" Kemp's ridley sea turtle hatchlings received, and captive-reared survivors tagged and released or relocated, by year-class[a].

"Imprinted" Hatchlings Received					Tagged Turtles[b]					
Year-	Inclusive	"Imprinting"	No.		Relocated[c]		Released		Recovered	
class	dates	location	Alive	Dead	No.	%	No.	%	No.	%
1978	6 July-3 August	PINS[d]	1,854	1	41	2	1,267	68	50	4
	11 August	RN[e]	1,226	0	1	<1	752	61	25	3
			3,080	1	42		2,019	65	75	4
1979	26 June-23 July	PINS	1,656	2	66	4	1,279	77	21	2
		RN	187	1	100	53	66	87	0	0
			1,843	3	166	9	1,345	73	21	2
1980	24 June-14 July	PINS	1,608	4	0		1,526	95	81	5
	7 July	RN	207	3	0		197	95	5	3
			1,815	7	0		1,723	95	86	5
1981	24 July-22 August	PINS	1,864	1	0		1,639	88	53	3
1982	6 July-16 August	PINS	1,524	0	28	2	1,325	87	157	12
1983	8 July-12 August	PINS	230		2	<1	172	75	10	6
	8 July	RN	20		0		18	90	1	6
			250	0	2	<1	190	76	11	6
1984	24 July-27 July	PINS	1,441	106	61	4	1,017	71	22	2
1985	9 July-7 August	PINS	1,684	8	12[f]	1	1,534	91	67	4
1986	6 July-26 July	PINS	1,759	0						
1978-1985		PINS	13,620	122	210	2	9,759	72	461	5
1978-1985		RN	1,640	4	101	6	1,033	63	31	3
Total			15,260	126	311	2	10,792[f]	71	492	4

[a]As of 30 September 1986.

Table 1 continued.

b/ Allocation of data between PINS and RN "imprinting" categories may be incorrect for year-classes 1978-1980, and should be considered only an approximation.

c/ Most transferred to other locations for extended head starting and breeding experiments; also includes some abnormal individuals transferred to other investigators.

d/ Padre Island National Seashore.

e/ Rancho Nuevo.

f/ One of these turtles is incurably ill (exhibits bone degeneration in the shoulders), and eight others that are tagged with PIT tags are being held at the Galveston Laboratory until they are transferred to to Marineland in St. Augustine, FL.

Table 2. Head started Kemp's ridley sea turtles relocated to the Cayman Turtle Farm (1983), Ltd. and marine aquaria for captive breeding, by year-class.

Year-class[a]	Recipient organization	Clutch identification no.[b]	Flipper-tag code[c]	Living-tag scute code[d]	Internal, binary-coded magnetic tag: Tag code	Internal, binary-coded magnetic tag: Tag location[e]	Sex[f]	Relocation Date	Other identifying characteristics
1978	Sea-Arama Marine World, Galveston, TX	Unknown	2520 (NNA269)	None	None		F	Feb. 1980	Right front flipper missing
			2514 (NNA240)	"	"		M	"	
			2512 (NNA230)	"	"		F	"	
		"	2511 (NNA262)	"	"		F*	"	
			2510 (NNA243)	"	"		M	"	
		"	2509 (J0051)	"	"		F	"	
			2508 (NNA270)	"	"		F	"	
		"	2507 (J0089)	"	"		M	"	
1978	Miami Seaquarium Miami, FL	Unknown	NNK015 (unaccounted for)	NS-5	No		M	22 Feb 79	
		"	NNK021 (died 8 July 1986)	No	No		M	"	
		"	NNK003 (died 1 July 1986)	No	No		M	"	
		"	NNK017 (NNK001) (died 19 June 1986)	RCS-3	No		M	"	
		"	J1939 (died 1 July 1986)	No	No		M	"	
		"	AAL008 (NNR464)	LCS-3	No		F	"	
1979	Miami Seaquarium, Miami, FL	"	No Tag (unknown)	None	"		M	17 Sept. 1979	Right front flipper missing & notch on right edge of carapace

Table 2. continued.

Year-class[a]	Recipient organization	Clutch identification no.[b]	Flipper-tag code[c]	Living-tag scute code[d]	Internal, binary-coded magnetic tag: Tag code	Internal, binary-coded magnetic tag: Tag location[e]	Sex[f]	Relocation Date	Other identifying characteristics
1979	Cayman Turtle Farm (1983), Ltd., Grand Cayman, BWI	Unknown	1325 (NNA301)	None	"		M	4 July 1980	
		"	1330 (NNA302)	"	"		M	"	
		"	1320 (NNA305)	"	"		M	"	
		"	1332 (NNA312)	"	"		M	"	
		"	1323 (NNA317)	"	"		?	"	
		"	1353 (unknown)	None	None		F	"	
		"	1349 (NNA373)	"	"		F	"	
		"	1354 (unknown)	"	"		?	"	
		"	1355 (NNA380)	"	"		F	"	
		"	1331 (NNA383)	"	"		M	"	
		"	1322 (NNA386)	"	"		M	"	
		"	1345 (NNA387)	"	"		M	"	
		"	1356 (unknown)	"	"		M	"	
		"	1341 (NNA392)	"	"		M	"	
		"	1352 (NNA393)	"	"		M	"	
		"	1348 (NNA394)	"	"		M	"	
		"	1326 (NNA397)	"	"		M	"	
		"	1324 (NNA319)	"	"		F	"	
		"	1335 (NNA320)	"	"		F	"	
		"	1318 (NNA322)	"	"		F	"	
		"	1344 (unknown)	"	"		F	"	
		"	1327 (NNA326)	"	"		M	"	
		"	1336 (NNA331)	"	"		F**	"	
		"	1358 (NNA332)	"	"		M	"	
		"	1359 (NNA347)	"	"		F**	"	
		"	1360 (NNA349)	"	"		M	"	
		"	1339 (NNA350)	"	"		F	"	
		"	1357 (NNA353)	"	"		M	"	
		"	1338 (NNA357)	"	"		M	"	
		"	1329 (NNA361)	"	"		F	"	
		"	1346 (NNA365)	"	"		M	"	
		"	1337 (NNA367)	"	"		M	"	
		"	1347 (NNA368)	"	"		M	"	
		"	1342 (NNA371)[g]	"	"		F	"	

Table 2. continued.

Year-class[a]	Recipient organization	Clutch identification no.[b]	Flipper-tag code[c]	Living-tag scute code[d]	Internal, binary-coded magnetic tag: Tag code	Internal, binary-coded magnetic tag: Tag location[e]	Sex[f]	Relocation Date	Other identifying characteristics
1982	Clearwater Marine Science Center, Clearwater, FL	9	NNM107	None	D_1-2; D_2-20	RFF	?	9 Nov. 1983	
		12	NNM251	"	" -33	RFF	M	"	
		9	NNM154/NNM155	"	" -21	"	F	"	
		12	NNK710/NNK711	"	" -32	"	F	"	
		10	NNM330	LC-3	" -34	"	?	"	
1982	Gulfarium, Fort Walton, Beach, FL	4	NNL485	None	" -2	"	M	26 Jan. 1984	
		3	NNL298	"	" -8	"	F	"	
		4	NNL476	"	" -4	"	F	"	
		20	NNQ318	"	" -9	"	M	"	
1982[h]	Cayman Turtle Farm (1983), Ltd., Grand Cayman, BWI	6	No tag (NNK009)	"	" -68	"	F	16 Jan. 1986	
		19	NNM576	"	" -42		M	"	
		8	NNK008	"	" -40	"	M	"	
		7	No tag (NNM010)	LC-3	" -64	"	M	"	
		11	No tag (NNK011)	None	" -41	"	F	"	
1982	Marine Life Park, Inc., Gulfport, MS	5	NNL666	"	" -1	"	M	6 Feb. 1984	
		15	NNM703	LC-3	" -18	"	M	"	
		16	No Tag (NNM790)	"	" -17	"	M	"	
		18	No tag (NNM872)	LC-3	" -10	"	M	"	Notch on right rear of carapace
		17	No tag (NNM835)	None	" -16	"	M	"	

Table 2. continued.

Year-class[a]	Recipient organization	Clutch identification no.[b]	Flipper-tag code[c]	Living-tag scute code[d]	Internal, binary-coded magnetic tag: Tag code	Internal, binary-coded magnetic tag: Tag location[e]	Sex[f]	Relocation Date	Other identifying characteristics
1982[i]	Theater of the Sea, Islamorada, FL	5	NNL683	None	D_1-2; D_2-69	RFF	M	16 Apr. 1985	
		10	NNK012	LC-3	" -36	"	F	"	
		8	NNM375	LC-3	" -37	"	M	"	
		7	No tag (NNM024)	None	" -65	"	M	"	
		6	NNK027	"	" -66	"	F	"	
1984	Bass Pro Shops, Springfield, MO	4	NNT100	LC-5	D_1-2; D_2-72	"	?	17 July 1985	
		"	NNT110	"	" "	"	"	"	
		"	NNT111	"	" "	"	"	"	
		"	NNT114	"	" "	"	"	"	
		"	NNT176	"	" "	"	"	"	
1984	Dallas Aquarium, Dallas, TX	17	NNV016	"	" "	RFF, RRF	"	28 June 1985	
		"	NNV019	"	" "	"	"	"	
		"	NNT996[j]	"	" "	"	"	31 July 1986	
		"	NNT998[j]	"	" "	"	"	"	
		"	NNV020[j]	"	" "	"	"	"	
1984	Marineland, Inc., St. Augustine, FL	10	NNT118	"	" "	RFF	"	2 July 1985	
		"	NNT121	"	" "	"	"	"	
		"	NNT123	"	" "	"	"	"	
		"	NNT131	"	" "	"	"	"	
		"	NNT164	"	" "	"	"	"	
							"	"	
1984	New England Aquarium, Boston, MA	16	NNT043	"	" "	"	"	"	
		"	NNT045	"	" "	"	"	"	
		"	NNT052	"	" "	"	"	"	
		"	NNT059	"	" "	"	"	"	

Table 2. continued.

Year-class[a]	Recipient organization	Clutch identification no.[b]	Flipper-tag code[c]	Living-tag scute code[d]	Internal, binary-coded magnetic tag: Tag code	Internal, binary-coded magnetic tag: Tag location[e]	Sex[f]	Relocation Date	Other identifying characteristics
1984	North Carolina Marine Resources Center, Kure Beach, NC	8	NNT069	LC-5	D_1-2; D_2-72	RFF	?	30 July 1985	
		"	NNT070	"	"	"	"	"	
		"	NNT078	"	"	"	"	"	
1984	Pan American University, South Padre Island, TX	17	NNV004	"	"	RFF, LFF, RRF, LRF	"	1 Aug. 1985	
		"	NNV006	"	"	"	"	"	
1984	Sea-Arama Marineworld, Galveston, TX	"	NNV003	"	"	LFF, RFF, RRF	"	30 Sept. 1985	
		"	NNV011	"	"	"	"	"	
		"	NNV014	"	"	"	"	"	
1984	Sea Turtle, Inc., South Padre Island, TX	9	NNT004 (died 26 Sept 1986)	"	"	RFF	"	1 Aug. 1985	
		"	NNT087 (died June 1986)	"	"	"	"	"	
		"	NNT097*	"	"	"	"	"	
1984	Sea World of Florida, Orlando, FL	2	NNT136	"	"	"	"	2 July 1985	
		"	NNT140	"	"	"	"	"	
		"	NNT142 (died 13 July 1985)	"	"	"	"	"	
		"	NNT147	"	"	"	"	"	
		"	NNT155	"	"	"	"	"	
1984	Cayman Turtle Farm (1983), Ltd., Grand Cayman, BWI	13	NNT196	"	"	RFF, LFF	"	16 Jan. 1986	
		"	NNT244	"	"	"	"	"	
		"	NNT245	"	"	"	"	"	

*Transferred to NMFS Galveston on 25 September 1986.

Table 2. continued.

Year-class[a]	Recipient organization	Clutch identification no.[b]	Flipper-tag code[c]	Living-tag scute code[d]	Internal, binary-coded magnetic tag: Tag code	Internal, binary-coded magnetic tag: Tag location[e]	Sex[f]	Relocation Date	Other identifying characteristics
1984	Cayman Turtle Farm (1983), Ltd., Grand Cayman, BWI	13	NNT251	LC-5	D_1-D2; D_2-72	RFF, LFF	?	16 Jan. 1986	
		"	NNT253	"	"	"	"	"	
		11	NNT207	"	"	"	"	"	
		"	NNT227	"	"	"	"	"	
		"	NNT233	"	"	"	"	"	
		"	NNT238	"	"	"	"	"	
		"	NNT254	"	"	"	"	"	
		"	NNT257	"	"	"	"	"	
		"	NNT259	"	"	"	"	"	
		"	NNT260	"	"	"	"	"	
		"	NNT262	"	"	"	"	"	
		"	NNT290	"	"	"	"	"	

[a] With the exception of turtles of the 1979 year-class sent to Cayman Turtle Farm, all turtles were "imprinted" at the Padre Island National Seashore. The 1979 year-class turtles sent to Cayman Turtle Farm were "imprinted" at Rancho Nuevo, Mexico.

[b] Numbers preceeded by 3 letters represent monel flipper-tags applied by NMFS. Clutch identification for 1978 and 1979 year-classes is unavailable. Clutch identification numbers for subsequent years were assigned to clutches by NPS at Padre Island National Seashore and were used by the NMFS SEFC Galveston Laboratory.

[c] Tag codes or explanations to the left represent current tag status. Tag codes in parentheses to the right represent the previous monel flipper tags that most recently have been either lost or removed. Turtles that have lost all tags are indicated as "No tag" followed by the previous tag code in parentheses if known. Untagged animals are scheduled for re-tagging with flipper tags. Tag codes separated by a slash (/) represent double-tagged turtles (i.e., on both front flippers). Sea-Arama Marineworld turtles of the 1978 year-class are tagged with orange plastic tags. All 1979 year-class turtles at Cayman Turtle Farm were doubled-tagged with medium rototags (plastic) on 14 May 1984. At that time, all but seven still had original monel tags in place; during the period 14 May 1984 to 1 September 1985, three of the seven died.

d/Miami Seaquarium turtles of the 1978 year-class were living-tagged in studies by Drs. John & Lupe Hendrickson in June 1980 and June 1981, under contract with the NMFS SEFC. All costal scutes and the 5th neural scute (N-5) were used in the studies. All 1982 year-class turtles that were "living-tagged" were tagged on left costal scute 3 (LC-3). All 1984 year-class turtles were tagged on left costal scute 5 (LC-5).

e/Manufactured by Northwest Marine Technology Inc., Shaw Island, Washington. Tags were inserted subcutaneously in the dorsal aspect of a front flipper near the distal end of the humerus, and centered in the dorsal aspect of a rear flipper. Letters identify flipper(s) used: RFF = right front flipper; LFF = left front flipper; RRF = right rear flipper; LRF = left rear flipper.

f/Sex of 1978 and 1979 year-classes at Sea-Arama Marineworld and Miami Seaquarium was determined by an external, secondary sex characteristic (tail length), and by testosterone levels in blood samples taken by Dr. David Owens, TAMU. Sex of 1979 year-class turtles at Cayman Turtle Farm was obtained from a report from the farm dated 14 May 1984. Sex of all 1982 year-class turtles is predicted sex, based on testosterone levels from blood samples taken by Dr. Owens on 10 July 1984. In this column, a single asterisk (*) indicates that the sex was verified by Dr. Owens by laparoscopic examination. Double asterisks (**) in this column indicate that the turtle nested during May 1984. A question mark (?) in this column indicates that sex has not been determined.

g/This turtle escaped between 14 May 1984 and 1 September 1985.

h/These five turtles were transferred to Cayman Turtle Farm (1983), Ltd. from Key West Municipal Aquarium, Key West FL, on 16 January 1986. These five turtles had been at Key West Municipal Aquarium since 9 November 1983. One was dead on arrival at the Cayman Turtle Farm, but its identity has not been reported to NMFS.

i/These five turtles had been at Turtle Kraals, Key West, FL since 9 November 1983.

j/These three turtles were returned to the NMFS Facility, Galveston, Texas on 31 July 1986.

Table 3. Dates for weighings of combined samples of Kemp's ridley sea turtles of the 1985 year-class.

Weighing sequence	Date	Combined samples, total no. weighed
1 (hatchlings)	8 July-7 August 1985[a]	1,692
2	29 August	505
3	26 September	"
4	24 October	"
5	21 November	"
6	19 December	"
7	16 January 1986	504
8	13 February	"
9	13 March	"
10	17-19 April	519[b]
11	29-30 April & 3 May	961[c]
12	21 September	54[d]

[a] Data from King et al. (1985; Table 5).
[b] Turtles released on 22 April 1986.
[c] Turtles released on 6 May 1986.
[d] Turtles released on 23 September 1986.

Table 4. Rectilinear regressions of the natural logarithm of weight (lnW; W in g) on the square root of age ($T^{1/2}$; T in days) for Kemp's ridley sea turtles of the 1985 year-class, by raceway and clutch, in the uniformity trial.

Raceway	n	slope[a/], b	Intercept, lna	Variance[b/], $s^2_{dev.}$	Coefficient of determination, r^2
1	292	0.367	1.034	0.0390	0.96
2	241	0.357	1.224	0.0171	0.98
3	245	0.361	1.058	0.0446	0.95
4	239	0.366	1.149	0.0198	0.98
5	235	0.356	1.103	0.0735	0.93
6	306	0.348	1.349	0.0233	0.98
7	260	0.359	1.193	0.0295	0.97
8	238	0.369	0.997	0.0520	0.96
9	238	0.363	1.024	0.0493	0.95
10	240	0.352	1.253	0.0671	0.94
11	231	0.357	1.105	0.0412	0.96
12	205	0.362	1.138	0.0358	0.97
13	219	0.334	1.482	0.0460	0.96
14	423	0.353	1.325	0.0818	0.93
15	227	0.351	1.058	0.1586	0.88
SB[c/]	198	0.330	1.438	0.0761	0.93
1	200	0.374	0.949	0.0170	0.98
2	200	0.356	1.185	0.0525	0.95
3	200	0.353	1.306	0.0110	0.99
4	40	0.356	1.382	0.0111	0.99
5	200	0.350	1.287	0.0291	0.97
6	200	0.363	0.993	0.0425	0.96
7	200	0.365	1.185	0.0141	0.99
8	200	0.357	1.072	0.0770	0.92
9	200	0.351	1.293	0.0254	0.97
10	200	0.358	1.198	0.0348	0.97
11	200	0.370	0.984	0.0511	0.96
12	200	0.364	0.987	0.0416	0.96
13	200	0.349	1.333	0.0361	0.97
14	200	0.363	1.082	0.0718	0.94
15	200	0.359	1.055	0.0401	0.96
16	200	0.359	1.203	0.0326	0.97
17	200	0.322	1.601	0.0510	0.95
18	199	0.376	1.031	0.1192	0.92
19	200	0.339	1.594	0.0195	0.98
20	200	0.351	0.999	0.1454	0.89
21	198	0.331	1.438	0.0761	0.93
Combined[d/]	4,037	0.355	1.197	0.0597	0.95

[a/] Weight increase index.
[b/] Variance of deviations from regression.
[c/] Standing basins.
[d/] All raceways, including standing basins, and clutches combined.

Table 5. Geometric mean weights (g) of Kemp's ridley sea turtles of the 1985 year-class, by raceway and clutch, at intervals during head starting.

	Weighing sequence[a]											
Raceway[b]	1[c]	2	3	4	5	6	7	8	9	10	11	12
1	15.6(505)	49.6(34)	82.9(35)	132.3(35)	205.9(34)	317.9(38)	516.2(37)	733.5(37)	977.7(42)	1,279.7(104)		
2	" "	55.3(34)	90.9(33)	139.2(30)	205.3(30)	352.1(30)	541.7(31)	746.1(29)	1,024.7(24)	1,345.9(101)	1,255.6(1)	3,000.0(2)
3	" "	47.8(29)	77.0(26)	127.3(34)	184.0(35)	292.9(29)	494.3(29)	689.2(30)	879.7(33)	1,288.7(30)	1,176.2(71)	
4	" "	53.4(31)	90.5(32)	139.7(28)	225.8(27)	361.4(30)	579.6(30)	755.7(33)	1,063.2(28)	1,404.7(71)	1,334.5(18)	3,614.4(13)
5	" "	47.5(28)	77.3(27)	122.9(30)	181.5(33)	281.4(30)	443.6(30)	676.6(27)	878.2(29)	1,222.8(18)	1,323.7(69)	3,220.6(15)
6	" "	52.8(40)	90.1(41)	139.6(38)	217.2(36)	330.5(39)	508.2(38)	702.5(39)	973.3(33)	1,293.2(91)		3,544.1(12)
7	" "	49.5(31)	86.3(33)	127.5(32)	196.9(33)	321.0(28)	506.8(33)	708.6(30)	973.6(41)	1,255.7(92)		3,431.4(10)
8	" "	39.2(31)	64.4(31)	105.7(29)	142.3(28)	236.8(32)	472.1(29)	668.4(31)	895.1(29)	1,332.0(12)	1,316.6(84)	
9	" "	37.8(27)	61.9(27)	98.0(28)	138.8(35)	235.5(32)	400.3(27)	608.3(31)	857.9(31)		1,228.0(100)	
10	" "	40.4(30)	66.9(30)	105.9(35)	159.9(26)	233.9(30)	456.8(34)	609.0(30)	865.6(25)		1,246.9(100)	
11	" "	35.5(30)	59.0(30)	99.0(29)	136.2(30)	240.4(28)	383.9(28)	577.7(27)	801.8(29)		1,120.3(102)	
12	" "	34.4(25)	59.9(24)	100.9(24)	154.8(21)	280.0(24)	412.4(28)	616.6(30)	806.0(29)		1,148.7(103)	
13	" "	36.1(29)	63.1(29)	99.0(27)	148.5(28)	237.4(29)	374.6(28)	566.2(22)	745.3(27)		1,093.9(102)	
14	" "	31.0(53)	58.5(53)	98.9(53)	138.0(57)	238.9(53)	405.5(49)	601.2(56)	833.2(49)		1,134.3(100)	
15	" "	24.4(28)	41.4(29)	64.2(28)	93.6(27)	153.0(28)	272.3(29)	483.9(28)	648.4(30)		991.9(48)	1,810.0(1)
SB[d]	15.3(25)	29.7(25)	56.0(25)	80.0(25)	115.6(25)	190.2(25)	328.5(24)	478.8(24)	691.1(25)		1,096.5(63)	2,453.0(1)

Table 5. continued.

Clutch[e]	1	2	3	4	5	6	7	8	9	10	11	12
1	13.5	48.1	80.5	130.1	202.1	330.0	547.3	729.1	981.5	1,255.0(64)		
2	17.7	53.6	87.4	136.3	198.6	308.3	489.5	752.3	987.0	1,342.0(88)	1,225.6(1)	3,000.0(2)
3	17.8	56.8	95.6	144.5	222.2	367.2	560.6	746.1	1,004.7	1,316.7(83)		
4	15.3	54.8	95.2	150.3	237.7	380.6	582.1	787.3	1,075.8	1,320.8(5)		
5	16.3	53.6	89.1	131.6	198.6	323.3	494.1	697.2	976.1	1,267.7(59)	1,398.0(1)	3,684.7(11)
6	16.2	45.9	71.8	120.8	171.7	278.3	474.7	664.3	852.7		1,194.4(82)	
7	15.6	54.8	95.1	143.1	231.7	378.3	597.2	782.6	1,071.0	1,407.0(68)		3,614.4(13)
8	15.2	46.5	76.5	122.8	179.2	272.6	430.7	671.0	878.4	1,327.2(4)	1,326.1(75)	3,220.6(15)
9	16.1	51.5	86.9	135.1	203.6	319.5	519.9	686.6	940.0	1,284.3(75)		2,310.0(1)
10	14.7	47.8	88.7	126.9	198.2	306.9	500.3	719.3	974.0	1,263.2(73)		3,431.4(10)
11	16.1	38.3	61.7	103.5	140.2	234.4	465.0	650.2	890.0		1,319.1(73)	
12	14.5	37.1	60.0	94.9	133.4	213.2	394.4	598.1	856.5		1,227.8(92)	
13	17.3	41.9	71.2	115.1	159.3	275.6	446.3	643.7	862.1		1,245.7(85)	
14	16.2	36.9	59.6	97.0	149.1	226.9	460.2	593.6	857.8		1,219.2(77)	
15	14.9	34.0	58.5	97.9	136.7	242.6	363.1	585.1	772.8		1,107.0(100)	
16	15.2	34.9	61.9	100.8	156.4	270.5	422.4	613.5	835.5		1,157.8(99)	
17	16.8	36.7	62.0	98.6	136.9	220.9	357.4	506.0	707.9		1,023.9(88)	
18	12.8	26.6	52.8	90.1	126.2	234.8	394.1	645.5	866.9		1,218.6(26)	
19	18.1	35.8	65.0	112.6	161.8	264.8	439.3	626.1	830.4		1,184.0(62)	
20	13.1	23.1	38.6	59.3	88.4	140.8	250.6	468.2	615.6		935.8(37)	1,810.0(1)
21	15.3	29.7	56.0	80.0	115.6	190.2	328.5	478.8	691.1		1,096.5(63)	2,453.0(1)

[a] See Table 3 for dates of weighings and numbers of turtles weighed.
[b] Sample size (n = no. turtles weighed) is shown in parentheses following each mean weight.
[c] Except for the turtles in the standing basins, we used the geometric mean for the combined samples to represent each raceway.
[d] These turtles were held in the standing basins, and all were in clutch 21.
[e] Sample size (n = no. turtles weighed) was 25 except for clutch 4 in which n = 5, and for weighings 10, 11 and 12.

Table 6. Bucket identification codes[a], clutch identification numbers[b] and inconel tag numbers for the 57 Kemp's ridley sea turtles of the 1985 year-class held beyond the release dates in April and May 1986 for continued study[c].

Raceway 4		Raceway 5		Raceway 6		Raceway 7	
Clutch 7		Clutch 8		Clutch 5		Clutch 10	
D6	NNX375	A5	NNX470	A3	NNX524	F5	NNX794
E1	NNX012	B6	NNX474	A6	NNX578	F6	NNX795
F5	NNX380	C4	NNX475	B1	NNX525	G5	NNX797
H1	NNX021	D6	NNX480	C1	NNX528	H2	NNX651
H6	NNX387	E2	NNX429	D3	NNX533	I6	NNX679
I2	NNX025	H1	NNX437	D6	NNX587	J2	NNX657
I6	NNX390	H3	NNX439	E2	NNX535	K6	NNX685
J6	NNX393	I2	NNX441	E6	NNX590	L4	NNX686
K5	NNX395	I5	NNX494	F1	NNX537	N2	NNX669
L5	NNX398	K1	NNX446	G1	NNX540	N6	NNX694
M5	NNX401	K5	NNX500	G3	NNX542	O2	NNX672
O5	NNX407	N2	NNX456	I3	NNX548	P5	NNX699
O6	NNX408	N5	NNX509	J2	NNX550	Q6	NNX702
P5	NNX409	A1	NNX417				
P6	NNX410	B1	NNX420				
		C1	NNX423				

[a] The letter designates the bucket row and the number the bucket column.

[b] Used by the NPS at the Padre Island National Seashore.

[c] 52 were used for morphometric studies conducted by Dr. Andre Landry and assistants, Department of Marine Biology, Texas A&M University at Galveston, Galveston, TX, and 5 were used by Dr. Ron Malone, Department of Civil Engineering, Louisiana State University, Baton Rouge, LA, for studies to develop recirculating seawater systems.

Table 7. Schedule of tagging the 1985 year-class of Kemp's ridley sea turtles.

Raceway	Bucket row (letter) and column (no.)	Clutch	Tagging date: Internal tag[a]	Tagging date: Flipper tag[b]	Tagging date: Living-tag[c]
1	A1-G6	1	9 Apr. 1986	12 Feb. 1986	11 Mar. 1986
	H1-H3	1	"	"	"
	I1-I3	1	"	"	"
	J1-J3	1	"	"	"
	K1-K3	1	"	"	"
	L1	1	"	"	"
	H4-H6	1	"	"	12 Mar.
	I4-I6	1	"	"	"
	J4-J6	1	"	"	"
	K4-K6	1	"	"	"
	L2-L3	2	"	"	11 Mar.
	M1-M3	2	"	"	"
	M4-M6	2	"	"	12 Mar.
	N1-Q6	2	"	"	"
	R1-R6	2	"	13 Feb.	"
2	A1-I4	2	"	"	"
	I5-M3	3	"	"	"
	N1-N3	3	"	"	"
	O1-O3	3	"	"	"
	R1-R3	3	"	"	"
	Q1-Q3	3	"	"	"
	R1-R3	3	"	"	"
	M4-M6	3	"	"	13 Mar.
	N4-N6	3	"	"	"
	O4-O6	3	"	"	"
	R4-R6	3	"	"	"
	Q4-Q6	3	"	"	"
	R4-R6	3	"	"	"
3	A1-F1	3	10 Apr.	"	"
	F2-R6	6	"	"	"
4	A1-A3	6	"	10 Feb.	14 Mar.
	B1-B3	6	"	"	"
	C1-C2	6	"	"	"
	A4-A6	6	"	14 Feb.	"
	B4-B4	6	"	"	"
	C3	7	"	10 Feb.	"
	D1-D3	7	"	"	"
	E1-E3	7	"	"	"
	F1-F3	7	"	"	"
	G1-G3	7	"	"	"
	H1-H3	7	"	"	"
	I1-I3	7	"	"	"

Table 7. continued.

Raceway	Bucket row (letter) and column (no.)	Clutch	Tagging date: Internal tag[a]	Flipper tag[b]	Living-tag[c]
4	J1-J3	7	10 Apr. 1986	10 Feb. 1986	14 Mar. 1986
	K1-K3	7	"	"	"
	L1-L3	7	"	"	"
	M1-M3	7	"	"	"
	N1-N3	7	"	"	"
	O1-O3	7	"	"	"
	P1-P3	7	"	"	"
	Q1-Q2	7	"	"	"
	C4-C6	7	"	14 Feb.	"
	D4-D6	7	"	"	"
	E4-E6	7	"	"	"
	F4-F6	7	"	"	"
	G4-G6	7	"	"	"
	H4-H6	7	"	"	"
	I4-I6	7	"	"	"
	K4-J6	7	"	"	"
	L4-L6	7	"	"	"
	M4-M6	7	"	"	"
	N4-N6	7	"	"	"
	O4-O6	7	"	"	"
	P4-P6	7	"	"	"
	Q3	8	"	10 Feb.	"
	R1-R3	8	"	"	"
	Q4-Q6	8	"	14 Feb.	"
	R4-R6	8	"	"	"
5	A1-A3	8	15 Apr.	"	"
	B1-B3	8	"	"	"
	C1-C3	8	"	"	"
	D1-D3	8	"	"	"
	E1-E3	8	"	"	"
	F1-F3	8	"	"	"
	G1-G3	8	"	"	"
	H1-H3	8	"	"	"
	I1-I3	8	"	"	"
	J1-J3	8	"	"	"
	K1-K3	8	"	"	"
	L1-L3	8	"	"	"
	M1-M3	8	"	"	"
	N1-N3	8	"	"	"
	O1-O3	8	"	"	"
	A4-A6	8	"	"	"
	B4-B6	8	"	"	"
	C4-C6	8	"	"	"
	D4-D6	8	"	"	"
	E4-E6	8	"	"	"
	F4-F6	8	"	"	"
	G4-G6	8	"	"	"

Table 7. continued.

Raceway	Bucket row (letter) and column (no.)	Clutch	Tagging date: Internal tag[a]	Tagging date: Flipper tag[b]	Tagging date: Living-tag[c]
5	G4-G6	8	15 Apr. 1986	14 Feb. 1986	14 Mar. 1986
	H4-H6	8	"	"	"
	I4-I6	8	"	"	"
	J4-J6	8	"	"	"
	K4-K6	8	"	"	"
	L4-L6	8	"	"	"
	M4-M6	8	"	"	"
	O4	8	"	"	"
	O5-O6	5	10 Apr.	"	17 Mar.
	P1-P3	5	"	"	14 Mar.
	Q1-O3	5	"	"	"
	R1-R3	5	"	"	"
	P4-P6	5	"	"	"
	Q4-Q6	5	"	"	"
	R4-R6	5	"	"	"
6	A1-J2	5	"	"	17 Mar.
	J3-K1	4	"	"	"
	K2-R6	9	"	"	"
7	A1-F1	9	11 Apr.	"	18 Mar.
	F2-R6	10	"	"	"
8	A1-C2	10	"	18 Feb.	19 Mar.
	C3	11	15 Apr.	"	"
	D1-D3	11	"	"	"
	E1-E3	11	"	"	"
	F1-F3	11	"	"	"
	G1-G3	11	"	"	"
	H1-H3	11	"	"	"
	I1-I3	11	"	"	"
	J1-J3	11	"	"	"
	K1-K3	11	"	"	"
	L1-L3	11	"	"	"
	M1-M3	11	"	"	"
	N1-N3	11	"	"	"
	O1-O3	11	"	"	"
	P1-P3	11	"	"	"
	C4-C6	11	16 Apr.	"	"
	D4-D6	11	"	"	"
	E4-E6	11	"	"	"
	F4-F6	11	"	"	"
	G4-G6	11	"	"	"
	H4-H6	11	"	"	"
	I4-I6	11	"	"	"
	J4-J6	11	"	"	"

Table 7. continued.

Raceway	Bucket row (letter) and column (no.)	Clutch	Tagging date: Internal tag[a]	Flipper tag[b]	Living-tag[c]
8	K4-K6	11	16 Apr. 1986	18 Feb. 1986	20 Mar. 1986
	L4-L6	11	"	"	"
	M4-M6	11	"	"	"
	N4-N6	11	"	"	"
	O4-O6	11	"	"	"
	P4-P6	11	"	"	"
	Q1-Q3	12	15 Apr.	"	19 Mar.
	R1-R3	12	"	"	"
	Q4-Q6	12	16 Apr.	"	20 Mar.
	R4-R6	12	"	"	"
9	A1-A3	12	"	"	19 Mar.
	B1-B3	12	"	"	"
	C1-C3	12	"	"	"
	D1-D3	12	"	"	"
	E1-E3	12	"	"	"
	F1-F3	12	"	"	"
	G1-G3	12	"	"	"
	H1-H3	12	"	"	"
	I1-I3	12	"	"	"
	J1-J3	12	"	"	"
	K1-K3	12	"	"	"
	L1-L3	12	"	"	"
	M1-M3	12	"	"	"
	N1-N3	12	"	"	"
	O1-O3	12	"	"	"
	A4-A6	12	"	"	20 Mar.
	B4-B6	12	"	"	"
	C4-C6	12	"	"	"
	D4-D6	12	"	"	"
	E4-E6	12	"	"	"
	F4-F6	12	"	"	"
	G4-G6	12	"	"	"
	H4-H6	12	"	"	"
	I4-I6	12	"	"	"
	J4-J6	12	"	"	"
	K4-K6	12	"	"	"
	L4-L6	12	"	"	"
	M4-M6	12	"	"	"
	N4-N6	12	"	"	"
	O4	12	"	"	"
	O5-O6	13	"	"	"
	P1-P3	13	"	"	19 Mar.
	Q1-Q3	13	"	"	"
	R1-R3	13	"	"	"
	P4-P6	13	"	"	20 Mar.
	Q4-Q6	13	"	"	"
	R4-R6	13	"	"	"

Table 7. continued.

Raceway	Bucket row (letter) and column (no.)	Clutch	Tagging date: Internal tag[a]	Tagging date: Flipper tag[b]	Tagging date: Living-tag[c]
10	A1-L3	13	16 Apr. 1986	18 Feb. 1986	26 Mar. 1986
	L4-R6	14	"	"	"
11	A1-A3	14	27 Apr.	19 Feb.	"
	B1-B3	14	"	"	"
	C1-C3	14	"	"	"
	D1-D3	14	"	"	"
	A4-A6	14	"	"	27 Mar.
	B4-B6	14	"	"	"
	C4-C6	14	"	"	"
	D4-D6	14	"	20 Feb.	"
	E1-E3	14	"	"	26 Mar.
	F1-F3	14	"	"	"
	G1-G3	14	"	"	"
	H1-H3	14	"	"	"
	E4-E6	14	"	"	27 Mar.
	F4-F6	14	"	"	"
	G4-G6	14	"	"	"
	H4-H6	14	"	"	"
	I1-I3	15	"	"	26 Mar.
	J1-J3	15	"	"	"
	K1-K3	15	"	"	"
	L1-L3	15	"	"	"
	M1-M3	15	"	"	"
	N1-N3	15	"	"	"
	O1-O3	15	"	"	"
	P1-P3	15	"	"	"
	Q1-Q3	15	"	"	"
	R1-R3	15	"	"	"
	I4-I6	15	"	"	27 Mar.
	J4-J6	15	"	"	"
	K4-K6	15	"	"	"
	L4-L6	15	"	"	"
	M4-M6	15	"	"	"
	N4-N6	15	"	"	"
	O4-O6	15	"	"	"
	P4-P6	15	"	"	"
	Q4-Q6	15	"	"	"
	R4-R6	15	"	"	"
12	A1-H2	15	28 Apr.	21 Feb.	"
	H3-R6	16	"	"	"

Table 7. continued

Raceway	(letter) and column (no.)	Clutch	Tagging date		
			Internal tag[a]	Flipper tag[b]	Living-tag[c]
13	A1-B6	16	28 Apr. 1986	24 Feb. 1986	27 Mar. 1986
	C1-C3	16	"	"	"
	D1-D3	16	"	"	"
	E1-E3	16	"	"	"
	F1-F3	16	"	"	"
	G1-G3	16	"	"	"
	H1-H3	17	"	"	"
	I1-I3	17	"	"	"
	J1-J3	17	"	"	"
	K1-K3	17	"	"	"
	L1-L3	17	"	"	28 Mar.
	M1-M3	17	"	"	"
	N1-N3	17	"	"	"
	O1-O3	17	"	"	"
	P1-P3	17	"	"	"
	Q1-Q3	17	"	"	"
	R1-R3	17	"	"	"
	G4-G6	17	"	"	29 Mar.
	H4-H6	17	"	"	"
	I4-I6	17	"	"	"
	J4-J6	17	"	"	"
	K4-K6	17	"	"	"
	L4-L6	17	"	"	"
	M4-M6	17	"	"	"
	N4-N6	17	"	"	"
	O4-O6	17	"	"	"
	P4-P6	17	"	"	"
	Q4-Q6	17	"	"	"
	R4-R6	17	"	"	"
14	A1-D6	17	29 Apr.	25 Feb.	2 Apr.
	E1-F6	18	"	"	"
	G1-G3	18	"	"	"
	H1-H3	18	"	"	"
	I1-I3	18	"	"	"
	J1-J2	18	"	"	"
	J3	19	"	"	"
	G4-G6	18	"	"	1 Apr.
	H4-H6	18	"	"	"
	I4-I6	18	"	"	"
	J4-J6	19	"	"	"
	K1-R6	19	"	"	"

Table 7. continued.

Raceway	Bucket row (letter) and column (no.)	Clutch	Tagging date: Internal tag[a]	Tagging date: Flipper tag[b]	Tagging date: Living-tag[c]
15	A1-A3	19	29 Apr. 1986	25 Feb. 1986	2 Apr. 1986
	B1-B3	19	"	"	"
	A4-A6	19	"	"	3 Apr.
	B4-B6	19	"	"	"
	C1-C3	20	"	"	2 Apr.
	M1-M2	20	"	"	"
	N1-N2	20	"	"	"
	C4-C6	20	"	"	3 Apr.
	D4-D6	20	"	"	"
	E4-E6	20	"	"	"
	F4-F6	20	"	"	"
	G4-G6	20	"	"	"
	H4-H6	20	"	"	"
	I4-I6	20	"	"	"
	J4-J6	20	"	"	"
	K4-K6	20	"	"	"
	L4-L6	20	"	"	"
	PINS (all survivors)	21	30 Apr.	25 Feb.	16 Apr.

[a] Binary-coded, magnetic metal tag inserted into the left front flipper.

[b] Inconel tag inserted into the right front flipper.

[c] Applied to right costal scute 5.

[d] This clutch was reared in standing basins.

Table 8. Summary of head started Kemp's ridley sea turtle release sites, dates of releases, numbers of turtles released, and flipper tag series used, by year-classes.

Year-class	"Imprinting" location[a]	Release site	Release date	No. released	Flipper tag series[b]
1978	PINS	Sandy Key, FL	22 Feb. 1979	135	G----
	PINS	East Cape, FL[c]	"	52	G----
	PINS	East Cape, FL	28 Feb. 1979	1	13582
	PINS	East Cape, FL	"	166	G----
	PINS	Sandy Key, FL	5 Mar. 1979	172	G----
	RN	Homosassa, FL	8 May 1979	751	G----, F----
	PINS	Homosassa, FL[c]	"	628	G----, F----
	PINS	Padre Island, TX	7 July 1979	112	G----, F----
	RN	Padre Island, TX	"	1	G0985
	PINS	Homosassa, FL	3 June 1980	1	NNA260
1979	PINS	Homosassa, FL (offshore)[c]	"	665	NNN---
	RN	Homosassa, FL (nearshore)	5 June 1980	66	NNA---
	PINS	Homosassa, FL (nearshore)[c]	"	608	NNN---, NNA---
	PINS	Padre Island, TX	2 June 1981	5	K----
	PINS	Galveston, TX	28 Sept. 1981	1	J0096
1980	PINS	Padre Island, TX	2 June 1981	1,426	NNB---, K----
	PINS	Padre Island, TX	"	100	8001-8100 (inconel)
	RN	Campeche, MX	3 Mar. 1981	197	NNB---, K----
1981	PINS	Padre Island, TX	2 June 1982	1,521	NNG---, NNH---
	PINS	Sabine Pass, TX	14 July 1982	118	NNG---, NNH---
1982	PINS	Padre & Mustang Islands, TX	7 June 1983	1,159	NNL---, NNM---
	PINS	Nueces Bay, TX	"	96	NNL---, NNM---
	PINS	Sabine Pass, TX	15 July 1983	69	NNL---, NNM---
	PINS	Mustang Island, TX	5 June 1983	1	NNM428
1983	PINS	Mustang Island, TX	"	172	NNQ---
	RN	Mustang Island, TX	"	18	NNQ---
1984	PINS	Padre & Mustang Islands, TX	21 May 1985	1,017	NNT---, NNV---

Table 8. continued

Year-class	"Imprinting" location[a]	Release site	Release date	No. released	Flipper tag series[b]
1985[d]	PINS	Copano Bay, TX	22 April 1986	448	NNX---, NNY---
	PINS	Italian Bend, TX	"	22	NNX---, NNY---
	PINS	Port Bay, TX	"	49	NNX---, NNY---
	PINS	Padre Island, TX	6 May 1986	961	NNX---, NNY---
	PINS	Galveston Island, TX	23 Sept. 1986	54	NNX---,
Total				10,792	

[a] PINS = Padre Island National Seashore;
RN = at Rancho Nuevo.

[b] Monel tags, unless noted otherwise. Each dash represents a numerical digit from 0-9; actual numerical series are not given because they were mixed. Details concerning the numerical series can be obtained from the NMFS SEFC Galveston Laboratory, 4700 Avenue U, Galveston, TX 77550.

[c] This release included turtles also tagged with radio-transmitters (see Klima and McVey 1981; Wibbels 1984).

[d] Inconel tags were used on the 1985 year-class.

Table 9. Clutches of the 1986 year-class of "imprinted" Kemp's ridley sea turtle hatchlings received from the NPS from 6-26 July 1986.

Clutch identification no.	Counts of hatchlings by NMFS by date in July						
	6	8	11	16	24	26	Total
1	52	1					53
2		68	15				83
3		38	4				42
4	90						90
5	77	1[a]					78[a]
6		83					83
7	70						70
8		92	4				96
9	101	3	1				105
10	84	20	3				107
11	79						79
12		85	1				86
13	72						72
14				102			102
15				94			94
16					79	22	101
17					56		56
18					77		77
19					70		70
20					89		89
21					50		50
22					10	66	76
Totals	625	391	28	196	431	88	1,759

[a] The hatchling from clutch 5 received on 8 July was mixed with the shipment of clutch 6. It had been combined with clutch 6 on the Padre Island beach during imprinting, so it cannot be distinguished from other individuals in clutch 6.

Table 10. Summary of mortality in eight year-classes of "imprinted" Kemp's ridley sea turtle hatchlings during shipment to NMFS by NPS.

Year-class	Hatchlings Received				
	Alive		Dead on arrival		Total
	No.	%[a]	No.	%	No.
1978	3,080	99.97	1	0.03	3,081
1979	1,843	99.84	3	0.16	1,846
1980	1,815	99.62	7	0.38	1,822
1981	1,864	99.95	1	0.05	1,865
1982	1,524	100.00	0	0.00	1,524
1983	250	100.00	0	0.00	250
1984	1,441	93.15	106	6.85	1,547
1985	1,684	99.53	8	0.47	1,692
1986	1,759	100.00	0	0.00	1,759
Combined	15,260	99.18	126	0.82	15,386

[a] Percentages are based on the total numbers of hatchlings received by year-class.

Table 11. Adult female Kemp's ridley sea turtles and clutches of eggs from which hatchlings of the 1986 year-class were obtained for head starting at the Galveston Laboratory[a].

Flipper tag nos.[b]	Carapace length, cm	Clutch identification no.	Polystyrene box no.[c]	Date eggs laid	No. eggs[d]
T-00817	73.0	1	506	18 May	81
T-00608	75.0	2	507	18 "	98
T-00153	65.0	3	508	18 "	53
C-00153	71.0	4	509	18 "	97
T-00877	-	5	510	18 "	82
T-00881	73.0	6	511	18 "	94
T-00879	-	7	512	18 "	92
T-00688	70.0	8	513	18 "	109
T-00794	70.0	9	514	18 "	110
-	-	10	515	18 "	112
T-00732	67.0	11	516	18 "	89
T-00607	67.0	12	517	18 "	94
-	-	13	518	18 "	76
T-00795	69.0	14	551	27 "	110
T-00810	73.0	15	552	27 "	107
T-00896	-	16	663	5 June	128
T-00797	69.0	17	634	5 "	80
T-00690	66.0	18	635	5 "	92
T-00812	68.5	19	636	5 "	73
T-00793	68.0	20	637	5 "	102
T-00693	66.0	21	638	5 "	54
T-00065 & T-00624	65.0	22	657	5 "	78
Total					2,011

[a]Data provided by Donna Shaver, NPS.

[b]Used by INP at Rancho Nuevo.

[c]Used by INP, FWS and Gladys Porter Zoo at Rancho Nuevo.

[d]Number of eggs incubated in each polystyrene foam box at the Padre Island National Seashore. It can be equal to or less than the number laid, because not all eggs laid by clutch were transferred to a box in every case. For example, any that accidentally touched Rancho Nuevo sand were not put into a box containing Padre Island sand.

[e]No data.

Table 12. Clutch histories of the 1986 year-class of "imprinted" Kemp's ridley sea turtle hatchlings received from the NPS from 6-26 July 1986[a].

Clutch identification no.[b]	Dates: Hatched	Dates: "Imprinted"[c]	Incubation period, days
1	4 July	6-8 July	48
2	3 "	6-11 "	47
3	4 "	6-10 "	48
4	1 "	5-6 "	45
5	2 "	5 "	46
6	2 "	5-8 "	46
7	2 "	5 "	46
8	3 "	7-11 "	47
9	2 "	5-10 "	46
10	2 "	5-10 "	46
11	3 "	6 "	47
12	2 "	5-10 "	46
13	3 "	5-6 "	47
14	11 "	13-16 "	46
15	11 "	13-16 "	46
16	20 "	23-26 "	46
17	21 "	23-24 "	47
18	21 "	23 "	47
19	21 "	23-24 "	47
20	21 "	24 "	47
21	22 "	24 "	48
22	22 "	24-25 "	48
Combined	1-22 "	5-26 "	45-48

[a] Data provided by Donna Shaver, NPS. See Table 9 for counts of hatchlings received by clutch.

[b] See Table 11 for polystyrene box numbers used at the beach near Rancho Nuevo.

[c] On the beach and in the surf at the Padre Island National Seashore.

Table 13. Arithmetic mean weight (g), geometric mean weight and ranges in weight of "imprinted" Kemp's ridley sea turtle hatchlings of the 1986 year-class[a].

Clutch identification no.	Date weighed[a]	Age, days	No. hatchlings weighed	Arithmetic mean weight, g	Geometric mean weight, g	Range in weight, g
1	6-8 July	2-4	53	16.9	16.9	15.7-18.5
2	8-11 "	5-8	83	16.6	16.6	13.7-18.5
3	6-10 "	2-6	42	12.8	12.7	10.3-17.5
4	5-6 "	4-5	90	14.5	14.5	12.1-16.3
5	5 "	3	77	15.5	15.4	12.2-17.1
6	5-8 "	3-6	84[b]	15.4	15.4	13.9-16.5
7	5 "	3	70	16.2	16.2	14.6-17.5
8	7-11 "	4-8	96	15.3	15.3	14.2-16.6
9	5-10 "	3-8	105	14.3	14.3	12.4-16.8
10	5-10 "	3-8	107	14.6	14.6	13.0-16.8
11	6 "	3	79	16.6	16.6	13.7-18.0
12	5-10 "	3-8	86	16.9	16.9	14.9-17.9
13	5-6 "	2-3	72	17.8	17.8	16.2-19.4
14	13-16 "	2-5	102	16.3	16.3	14.8-17.4
15	13-16 "	2-5	94	18.6	18.6	16.8-20.4
16	23-26 "	3-6	101	18.1	18.1	16.6-19.8
17	23-24 "	2-3	56	17.5	17.5	13.1-19.5
18	23 "	2	77	16.4	16.4	14.7-17.8
19	23-24 "	2-3	70	16.7	16.7	14.4-18.9
20	24 "	3	89	17.8	17.8	16.0-19.2
21	24 "	2	50	14.8	14.8	12.0-16.7
22	24-25 "	2-3	76	17.5	17.5	12.1-19.4
Combined	5-26 July	2-8	1,759	16.3	16.2	10.3-20.4

[a]All weighed in July 1986. Data provided by Donna Shaver, NPS.

[b]One of these hatchlings was from clutch 5, and it got mixed with clutch 6 on the Padre Island beach during imprinting. See Table 9.

Table 14. Dates for weighings of combined samples of Kemp's ridley sea turtles of the 1986 year-class.

Sample weighing sequence	Date[a]	Combined samples, total no. weighed
1 (hatchlings)	July 1986	1,759
2	31 July	400
3	28 August	405
4	25 September	405
5	23 October	405
6	20 November	
7	18 December	
8	15 January 1987	
9	12 February	
10	12 March	
11	9 April	
12	7 May	
13	4 June	

[a]Dates after 23 October 1986 are proposed weighing dates.

[b]Data provided by Donna Shaver, NPS.

Table 15. Physical layout and assignment of Kemp's ridley sea turtle clutches within a randomized block design to compare buckets and cartons as rearing containers.

Block 1

Sequence of container and clutch[a]	Treatment C (Raceway 3) Container no. & type	Clutch identification no.	No. of turtles	Treatment A (Raceway 4) Container no. & type	Clutch identification no.	No. of turtles	Treatment B (Raceway 5) Container no. & type	Clutch identification no.	No. of turtles
1	36 buckets	10	36	13 cartons	10	13	27 cartons	10	27
2	18 "	13	18	10 "	4	10	20 "	6	20
3	27 "	6	27	7 "	13	7	20 "	4	20
4	27 "	4	27	10 "	6	10	13 "	13	13
5				14 buckets	4	14			
6				18 "	10	18			
7				8 "	13	8			
8				14 "	6	14			
Total	108 buckets		108	40 cartons 54 buckets		40 54	80 cartons		80

Block 2

Sequence of container and clutch[a]	Treatment A (Raceway 6) Container no. & type	Clutch identification no.	No. of turtles	Treatment B (Raceway 7) Container no. & type	Clutch identification no.	No. of turtles	Treatment C (Raceway 8) Container no. & type	Clutch identification no.	No. of turtles
1	10 cartons	8	10	20 cartons	8	20	36 buckets	9	36
2	10 "	12	10	27 "	9	27	27 "	12	27
3	13 "	9	13	20 "	12	20	27 "	8	27
4	7 "	5	7	13 "	5	13	18 "	5	18
5	18 buckets	9	18						
6	8 "	5	8						
7	14 "	12	14						
8	14 "	8	14						
Total	40 cartons 54 buckets		40 54	80 cartons		80	108 buckets		80

[a] This represents the sequence of placement of containers and clutches from south to north within a raceway.

Table 16. Weights and measurements of "Oiliver," a Kemp's ridley sea turtle found stranded and oiled on West Galveston beach on 5 August 1984 and rehabilitated.

Date	Weight, kg	Carapace length, cm[a]	Carapace width, cm[a]	Remarks
6 Aug. 1984	1.1	22.0	19.2	
5 Oct.				Tagged with monel flipper tag NNP930
3 Jan. 1985	2.3			
28 Feb.	2.6			
8 Mar.		26.7	25.4	
28 "	2.7			
25 Apr.	2.8			
14 May	3.5			
30 Aug.	5.3			
10 Oct.	6.5			
21 Nov.	7.2			
19 Dec.	7.9			
16 Jan. 1986	8.6			
13 Feb.	9.3			
13 Mar.	9.5			
5 Aug.				Tag NNP930 fell off
29 Aug.	11.4			
22 Sept.	12.7	44.5	42.0	Tagged with tag AAV502
23 Sept.				Released 43 miles SSE of Galveston, TX

[a]Straight line measure.

Table 17. Weights and measurements of "Bolivar," a hawksbill sea turtle, *Eretmochelys imbricata*, found on Bolivar Beach on 26 September 1984 and rehabilitated.

Date	Weight, kg	Carapace length, cm[a]	Carapace width, cm[a]	Remarks
26 Sept. 1984	0.9	19.0	14.2	
5 Oct.				Tagged with monel flipper tag NNP931
3 Jan. 1985	1.4			
28 Feb.	1.7			
19 Mar.		23.8	18.1	
28 "	1.9			
25 Apr.	2.1			
14 May	2.5			
30 Aug.	4.0			
10 Oct.	5.0			
21 Nov.	5.2			
19 Dec.	5.9			
16 Jan. 1986	6.3			
13 Feb.	6.8			
13 Mar.	7.0			
29 Aug.	9.1			
22 Sept.	10.1	43.3	33.3	Tagged with tag and AAV501
23 Sept.				Released near Buccaneer oil field 32 mi SE of Galveston, TX
29 Sept.	9.7	43.2	32.9	Found stranded alive on West Galveston Island. Currently being held at Galveston Laboratory

[a]Straight line measure.

Table 18. Weights of "Hopalong", a Kemp's ridley sea turtle hatchling found injured on the Bolivar penisula beach on 24 August 1985 and rehabilitated.

Date	Weight, g	Remarks
26 Aug. 1985	27.6	
23 Sept.	41.2	
24 Oct.	65.2	
21 Nov.	95.4	
19 Dec.	143.9	
16 Jan. 1986	205.3	
13 Feb.	362.3	
13 Mar.	590.9	
25 Sept.		Transferred to Ila Loetscher, Sea Turtle Inc.

Table 19. Growth in weight of head started olive ridley sea turtles (*Lepidochelys olivacea*) of the 1985 year-class received from Florida Department of Natural Resources[a].

Date weighed	Weight, g		
	Sample size	Geometric mean	Range
7 Oct. 1985	19	29.5	24.5-37.0
24 Oct.	19	36.4	26.7-45.9
21 Nov.	17	45.9	28.0-60.0
19 Dec.	15	64.0	44.7-86.9
16 Jan. 1986	15	86.7	58.7-131.8
13 Feb.	14	118.2	63.0-189.5
13 Mar.	13	181.6	73.2-285.0
2 Apr.	13	219.3	81.1-345.6

[a]Hatchlings were received from Ross Witham, FDNR, Jensen Beach, FL on 1 October 1985.

Table 20. Summary of recoveries of head started, tagged and released Kemp's ridley sea turtles by year-class.[a]

Year-class	No. of recoveries	Percent of total recoveries	Percent of total released by year-class
1978	75	15	4
1979	21	4	2
1980	86	17	5
1981	53	11	3
1982	157	32	12
1983	11	2	6
1984	22	4	2
1985	67	14	4
Total	492	99	4

[a]As of 30 September 1986.

Table 21. Summary of recoveries of head started, tagged and released Kemp's ridley sea turtles of the 1978-1985 year-classes, by nation, state and recovery zone (oceanside vs bayside).[a]

Nation/State	Oceanside	Bayside	Not reported	Total
Mexico	4	0	1	5
USA				
Texas	134	112	76	314
Louisiana	24	18	14	53
Mississippi	1	4	0	5
Alabama	3	0	1	4
Florida	20	17	12	49
Georgia	4	0	5	9
South Carolina	0	4	8	12
North Carolina	0	16	2	18
Virginia	0	1	1	2
Maryland	0	1	1	2
New Jersey	1	0	1	2
New York	0	1	1	2
France	1	0	0	1
Morocco	0	1	0	1
Not Reported	0	0	2	2
Total	192	175	125	492

[a]As of 30 September 1986.

Table 22. Summary of recoveries of head started, tagged and released Kemp's ridley sea turtles of the 1978-1985 year classes by method of recovery.[a]

Recovery method	No. of recoveries	Percent of recoveries
Not reported	129	26.2
Stranded dead	117	23.8
Shrimp trawl	111	22.6
Stranded alive	93	18.9
Hook and line	19	3.9
Gill net	13	2.6
Dip net	3	0.6
Cast net	2	0.4
Swimming	2	0.4
Butterfly net[b]	1	0.2
Beach seine	1	0.2
Crab pot	1	0.2
Total	492	100.0

[a]As of 30 September 1986.

[b]Wingnet used to catch shrimp.

Table 23. Summary of recoveries (by-catch) by shrimpers of head started, tagged and released Kemp's ridley sea turtles of the 1978-1985 year-class by nation/state.[a]

Nation/State[b]	Recoveries (by-catch) by shrimpers	Percent of recoveries by shrimpers
Mexico	4	3.6
USA		
Texas	55	49.6
Louisiana	30	27.0
Mississippi	1	0.9
Alabama	2	1.8
Florida	8	7.2
Georgia	3	2.7
South Carolina	4	3.6
North Carolina	2	1.8
Virginia	1	0.9
Not Reported	1	0.9
Total	111	100.0

[a]As of 30 September 1986. See Table 21.

[b]In which the turtles were recovered.

Table 24. Condition of head started, tagged and released Kemp's ridley sea turtles when recovered by year-class.[a]

Year-class	Alive, returned to the environment	Alive, rehabilitated, returned to the environment	Alive, attempted rehabilitation, later died	Dead	Unknown	Total
1978	60	3	1	7	4	75
1979	15	1	0	3	2	21
1980	47	1	2	16	20	86
1981	29	0	0	20	4	53
1982	91	6	3	49	8	157
1983	8	0	0	3	0	11
1984	12	0	0	10	0	22
1985	10	8	3	46	0	67
Total	272	19	9	154	38	492
Percent	55.3	3.9	1.8	31.3		
	59.2		33.1		7.7	

[a]As of September 30, 1986.

Appendix Table 1. Locations of 22 clutches of "imprinted" Kemp's ridley sea turtle hatchlings of the 1986 year-class, beginning 7 August 1986 at the start of the experiment comparing bucket and carton rearing methods (see Table 15) (numbers in the table are clutch identification numbers).

	Raceway 1[a]						Raceway 2						Raceway 3						Raceway 4[b]						Raceway 5[c]					
Column	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
ROW																														
A	1	1	1	1	1	1	2	2	2	2	2	2	10	10	10	10	10	10	10	10	10	10	10		10	10	10	10	10	
B	1	1	1	1	1	1	2	2	2	2	2	2	10	10	10	10	10	10	10	10	10	10	10		10	10	10	10	10	
C	1	1	1	1	1	1	2	2	2	3	3	3	10	10	10	10	10	10	10	10	10	4	4		10	10	10	10	10	
D	1	1	1	1	1	1	3	3	3	3	3	3	10	10	10	10	10	10	4	4	4	4	4		10	10	10	10	10	
E	1	1	1	1	1	1	3	3	3	3	3	3	10	10	10	10	10	10	4	4	4	13	13		10	10	10	10	10	
F	1	1	1	1	1	1	3	3	3	3	3	3	10	10	10	10	10	10	13	13	13	13	13		10	10	6	6	6	
G	1	1	1	1	1	1	3	3	3	3	3	3	13	13	13	13	13	13	6	6	6	6	6		6	6	6	6	6	
H	1	1	1	1	1	1	3	3	3	3	3	3	13	13	13	13	13	13	6	6	6	6	6		6	6	6	6	6	
I	1	1	1	1	1	2	3	3	3	3	3	3	13	13	13	13	13	13	4	4	4	4	4	4	6	6	6	6	6	
J	2	2	2	2	2	2	3	3	3	4	4	4	6	6	6	6	6	6	4	4	4	4	4	4	6	6	4	4	4	
K	2	2	2	2	2	2	4	4	4	4	4	4	6	6	6	6	6	6	4	4	10	10	10	10	4	4	4	4	4	
L	2	2	2	2	2	2	4	4	4	4	4	4	6	6	6	6	6	6	10	10	10	10	10	10	4	4	4	4	4	
M	2	2	2	2	2	2	4	4	4	4	5	5	6	6	6	6	6	6	10	10	10	10	10	10	4	4	4	4	4	
N	2	2	2	2	2	2	5	5	5	5	5	5	6	6	6	4	4	4	10	10	13	13	13	13	4	4	13	13	13	
O	2	2	2	2	2	2	5	5	5	5	5	5	4	4	4	4	4	4	13	13	13	13	6	6	13	13	13	13	13	
P	2	2	2	2	2	2	5	5	5	5	5	5	4	4	4	4	4	4	6	6	6	6	6	6	13	13	13	13	13	
Q	2	2	2	2	2	2	5	5	5	5	5	5	4	4	4	4	4	4	6	6	6	6	6	6						
R	2	2	2	2	2	2	5	5	5	5	7	7	4	4	4	4	4	4												
S	2	2	2	2	2	2	7	7	7	7	7	7																		
T	2	2	2	2	2	2	7	7	7	7	7	7																		

Appendix Table 1 (continued)

	Raceway 6						Raceway 7						Raceway 8						Raceway 9						Raceway 10					
Column / Row	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
A	8	8	8	8	8		8	8	8	8	8		9	9	9	9	9	9	7	7	7	7	7	7	11	11	11	11	11	11
B	8	8	8	8	8		8	8	8	8	8		9	9	9	9	9	9	7	7	7	7	7	7	11	11	11	11	11	11
C	12	12	12	12	12		8	8	8	8	8		9	9	9	9	9	9	7	7	7	7	7	7	11	11	11	11	11	11
D	12	12	12	12	12		8	8	8	8	8		9	9	9	9	9	9	7	7	7	7	7	7	11	11	11	11	11	11
E	9	9	9	9	9		9	9	9	9	9		9	9	9	9	9	9	7	7	7	7	7	7	11	11	11	11	11	11
F	9	9	9	9	9		9	9	9	9	9		9	9	9	9	9	9	7	7	7	7	7	7	11	11	11	11	11	11
G	9	9	9	5	5		9	9	9	9	9		12	12	12	12	12	12	7	7	7	7	7	7	11	11	11	11	11	11
H	5	5	5	5	5		9	9	9	9	9		12	12	12	12	12	12	7	7	7	7	7	7	11	11	11	11	11	11
I	9	9	9	9	9	9	9	9	9	9	9		12	12	12	12	12	12	7	7	7	8	8	8	11	11	11	11	11	11
J	9	9	9	9	9	9	9	9	12	12	12		12	12	12	12	12	12	8	8	8	8	8	8	11	11	11	11	11	11
K	9	9	9	9	9	9	12	12	12	12	12		12	12	12	8	8	8	8	8	8	8	8	8	11	11	11	11	11	11
L	5	5	5	5	5	5	12	12	12	12	12		8	8	8	8	8	8	8	8	8	8	8	8	11	11	11	11	11	11
M	5	5	12	12	12	12	12	12	12	12	12		8	8	8	8	8	8	8	8	8	8	9	9	11	11	11	11	11	11
N	12	12	12	12	12	12	12	12	5	5	5		8	8	8	8	8	8	9	9	9	9	9	9	11	12	12	12	12	12
O	12	12	12	12	8	8	5	5	5	5	5		8	8	8	8	8	8	9	9	9	6	6	6	12	12	12	12	12	12
P	8	8	8	8	8	8	5	5	5	5	5		5	5	5	5	5	5	6	6	6	6	6	6	12	12	12	12	7	7
Q	8	8	8	8	8	8							5	5	5	5	5	5	6	6	6	6	10	10	7	7	7	7	13	13
R													5	5	5	5	5	5	10	10	10	10	10	10	13	13	13	13	13	13
S																			10	10	10	10	10	13	13	13	13	13	13	13
T																			13	13	13	13	13	13	13	13	13	13	13	13

Appendix Table 1 (continued)

	Raceway 11[d]						Raceway 12[d]						Raceway 13[d]					
Column	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
Row																		
A	21	21	21	21/21	21/21		15/15	15/15	15/15	15/15	15/15		16/16	16/16	16/16	16/16	16/16	
B	21/21	21/21	21/21	21/21	21/21		15/15	15/15	15/15	15/15	15/15		16/16	16/16	16/16	16/16	16/16	
C	14/14	14/14	14/14	14/14	14/14		15/15	15/15	15/15	15/15	15/15		16/16	16/16	16/16	16/16	16/16	
D	14/14	14/14	14/14	14/14	14/14		15/15	15/15	15/15	15/15	15/15		16/16	16/16	16/16	16/16	16/16	
E	14/14	14/14	14/14	14/14	14/14		15/15	15/15	15/15	15/15	15/15		16/16	16/16	16/16	16/16	16/16	
F	14/14	14/14	14/14	14/14	14/14		15/15	15/15	15/15	15/15	15/15		16/16	16/16	16/16	16/16	16/16	
G	14/14	14/14	14/14	14/14	14/14		15/15	15/15	15/15	15/15	15/15		16/16	16/16	16/16	16/16	16/16	
H	14/14	14/14	14/14	14/14	14/14		15/15	15/15	21/21	16/16	16/16		16/16	16/16	16/16	17/17	17/17	
I	14	14	14	14	14	14	16/16	16/16	16/16	16/16	16/16		17/17	17/17	17/17	17/17	17/17	
J	14	14	14	14	14	14	16/16	16/16	16/16	22	22/22		17/17	17/17	17/17	17/17	17/17	
K	14	14	14	14	14	14	22/22	22/22	22/22	22/22	22/22		17/17	17/17	17/17	17/17	17/17	
L	14	14	14	14	14	14	22/22	22/22	22/22	22/22	22/22		17/17	17/17	17/17	17/17	17/17	
M	14	14	14	14	14	14	22/22	22/22	22/22	22/22	22/22		17/17	17/17	17/17	17/17	17/17	
N	14	14	14	14	14	14	22/22	22/22	22/22	22/22	22/22		17/17	22/22	22/22	22/22	22/22	
O	14	14	14	14	14	15	22/22	22/22	22/22	19/19	19/19		22/22	22/22	22/22	22/22	22/22	
P	15	15	15	15	15	15	19/19	19/19	19/19	19/19	19/19		22/22	22/22	22/22	22/22	22/22	
Q	15	15	15	15	15	15												
R	15	15	15	15	15	15												

Appendix Table 1 (continued)

	Raceway 14[d]						Raceway 15[d]					
Column	1	2	3	4	5	6	1	2	3	4	5	6
Row												
A	18	18	18	18	18		19/19	19/19	19/19	19/19	19/19	
B	18	18	18	18	18		19/19	19/19	19/19	19/19	19/19	
C	18	18	18	18	18		19/19	19/19	19/19	19/19	19/19	
D	18	18	18	18	18		19/19	19/19	19/19	19/19	19/19	
E	18	18	18	18	18		19/19	19/19	19	19/19	19/19	
F	18	18	18	18	18		19/19	19/19	19/19	20/20	20/20	
G	18	18	18	18	18		20/20	20/20	20/20	20/20	20/20	
H	18	18	18	18	18		20/20	20/20	20/20	20/20	20/20	
I	18	18	18	18	18	18	20/20	20/20	20/20	20/20	20/20	
J	18	18	18	18	18	18	20/20	20/20	20/20	20/20	20/20	
K	18	18	18	18	18	18	20/20	20/20	20/20	20/20	20/20	
L	18	18	18	18	18	18	20/20	20/20	20/20	20/20	20/20	
M	18	18	18	18	18	18	20/20	20/20	20/20	20/20	20/20	
N	18	18	21	21	21	18	20/20	20/20	20/20	20/20	20/20	
O	21	18	21	21	21	21	20/20	20/20	20	21/21	21/21	
P	21	21	21	21	21	18	21/21	21/21	21/21	21/21	21/21	
Q	18	21	21	21	21	19						
R												

a/ Raceways 1, 2, 3, 8, 9 and 10 contained all buckets.

b/ Raceways 4, 6 and 14 contained half cartons and half buckets.

c/ Raceways 5 and 7 contained only cartons.

d/ Raceways 11-15 contained only cartons. When two clutch numbers are separated by a slash, this indicates that the carton was partitioned and contained two turtles.