

PADRE ISLAND NATIONAL SEASHORE
KEMP'S RIDLEY SEA TURTLE PROJECT
1993 REPORT

BY:

DONNA J. SHAVER
DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
PADRE ISLAND NATIONAL SEASHORE
9405 S. PADRE ISLAND DRIVE
CORPUS CHRISTI, TEXAS 78418-5597

ABSTRACT

Patrols for nesting sea turtles and related public education efforts continued at Padre Island National Seashore (PAIS) during 1993. From April through mid-September, PAIS employees and volunteers spent 2,528 hours patrolling a total of 29,434 km of beachfront.

One set of loggerhead turtle (*Caretta caretta*) tracks was found at PAIS during 1993. These were the only confirmed sea turtle tracks found on PAIS beaches (and the entire Texas coast) this year. Although the tracks were quite visible, no eggs were located and the nesting emergence was apparently a false crawl. One possible nesting emergence by a Kemp's ridley turtle (*Lepidochelys kempii*) was reported at Padre Island during 1993. However, upon investigation by PAIS patrollers, the report could not be substantiated.

Thirteen sea turtle hatchlings were found stranded along Padre and Mustang Islands from 29 June through 28 October, including two Kemp's ridley, one loggerhead, and 10 hawksbill (*Eretmochelys imbricata*) turtles. The loggerhead and one of the Kemp's ridley hatchlings may have emerged from South Texas nests. Three of the hawksbill hatchlings were found dead and the 10 other stranded hatchlings were found alive.

Four injured, live hatchlings (including one *L. kempii*, one *C. caretta*, and two *E. imbricata*) were brought to the PAIS sea turtle hatchling rehabilitation facility for stabilization and care. The Kemp's ridley hatchling survived and was released into the Gulf of Mexico after two months of rehabilitation at PAIS. One hawksbill succumbed in less than 24 hours, the other hawksbill in 12 days, and the loggerhead in eight days. Six live hatchlings were transported to the University of Texas Marine Sciences Institute (UTMSI) for rehabilitation. The *L. kempii* and one of the *E. imbricata* are still being held at UTMSI for rehabilitation (as of 8 November 1993); four of the *E. imbricata* died within a few days after arrival at that facility.

BACKGROUND

During each summer, from 1978 to 1988, approximately 2,000 Kemp's ridley turtle (*Lepidochelys kempi*) eggs were shipped to Padre Island National Seashore (PAIS) from Rancho Nuevo, Mexico in an experimental attempt to establish a secondary breeding colony of this species through imprinting. Of the 22,507 eggs received, 17,358 (77.1%) hatched and 15,875 hatchlings were shipped to the National Marine Fisheries Service Laboratory for head starting (Shaver, 1989b, 1992a). Overall, 13,454 yearlings were released into the Gulf of Mexico after 9 to 11 months of head starting. To date, no turtles experimentally imprinted to Padre Island have been confirmed nesting at PAIS or any other nesting beach. However, it is unknown how many have survived after release and none may have attained adulthood yet.

Transfer of Kemp's ridley eggs to PAIS from Rancho Nuevo, Mexico was terminated after the 1988 incubation season. Now the primary objective of the PAIS Kemp's ridley project is to identify whether Kemp's ridleys return to nest at PAIS (Shaver, 1989a). Also significant in our efforts is the location and protection of all sea turtle nests and stranded hatchlings from local beaches. Public education programs, beach patrols, and protection and monitoring of nesting sea turtles, nests, and stranded hatchlings will be continued at the park for the foreseeable future. This report summarizes these efforts during 1993.

BEACH PATROLS

Management of the Padre Island National Seashore nesting beach, including beach patrols of the area, is listed as a priority 2 recovery task item in the Kemp's Ridley Sea Turtle Recovery Plan (U.S. Fish and Wildlife Service and National Marine Fisheries Service, 1992). As a result, seasonal beach patrols for nesting sea turtles, tracks, nests, and hatchlings began at PAIS in 1986 and have continued through 1993. From April through mid-September 1993, two patrols were conducted during most weekdays, one heading north from the Ranger Station and one heading south. Northern patrols usually covered the area from the Ranger

Station to the Nueces/Kleberg County line and back, twice daily. Of the 70 km included in the northern patrols, 38 km were north of the PAIS northern boundary. The southern patrol route encompassed the area from the Ranger Station to the Mansfield Channel and back, approximately 193 km.

Complete coverage of the entire patrol area on all days of the patrol season (April through mid-September) was not possible due to vehicle speed and personnel time limitations. It was necessary to concentrate efforts in areas, and at times, when they would be most effective. Weekend patrols were not conducted due to the high likelihood that beach visitors would detect and report turtle sightings. Although complete northern patrols were conducted during most weekdays, only the northernmost 64 km of the southern area could usually be patrolled. Four of the southern patrols involved overnight camping at the 64 km marker. Camping trips increased the number of days that park personnel could be present on the beach, increased patrol efficiency, and reduced mechanical wear of patrol vehicles.

Additionally, areas and dates of coverage were based upon historical trends of nesting and hatchling stranding dates and locations. Most sea turtle tracks and nests found along the Texas coast during the last 10 years were located between the 27 and 72 km markers on PAIS, from mid-April and mid-July (Table 1).

However, Kemp's ridley turtles have been documented nesting in Rancho Nuevo, Mexico from April through August. Most stranded hatchlings were found on North Padre Island, north of the PAIS 27 km marker, and Mustang Island, from July through mid-September. Hence, during September 1993, patrol efforts were concentrated north of the 27 km marker, in an attempt to locate stranded hatchlings rather than nesting turtles.

Resources Management Division staff continued to conduct an intensive study of marine debris at PAIS during 1993. Division employees travelled to specific study sites each day during the patrol season. Most sites were located between Closed Beach and South Beach 10.4 km marker. Employees were observant for sea turtle

sightings during their travel to and from the Marine Debris Survey sites. Hence, the time and distance of travel for this study were included in summary statistics for 1993 beach patrol efforts. For the 1993 patrol season, a total of 7,101 km of beachfront was traversed during north patrols, 17,283 km during south patrols, and 5,050 km during marine debris survey patrols (Fig. 1).

Patrol speeds varied during the season. Patrols exclusively for nesting turtles, tracks, and nests (April through June) were conducted at speeds of 16-26 km/hr, whereas patrols exclusively for stranded hatchlings (September) were conducted at speeds of 16 km/hr or less.

Three types of vehicles were used for patrolling during 1993 (Fig. 2). During previous patrol seasons, four-wheel drive trucks (4X4) were used more than any other type of patrol vehicle. However, the suitability of these vehicles for patrols is limited because they: 1) have a reduced field of observation and are ineffective for sighting small turtles and faint sea turtle tracks; 2) are subject to relatively high levels of mechanical failure; and, 3) require two people to be present in order to conduct patrols (one driver and one observer). During 1993, 1,902 km of beachfront was patrolled using 4x4 vehicles, in sharp contrast to the 12,141 km logged using these vehicles in 1992. During 1993, 4x4 trucks were used primarily for: 1) support of beach patrol camping trips; 2) marine debris surveys; and 3) opportunistic patrols conducted while en route to other locations.

Beginning in 1992, all-terrain 4-wheel cycles (ATVs) were extensively utilized for patrolling at PAIS. During 1993, ATVs were used to patrol 21,506 km of beachfront and logged more patrol distance than any other vehicle type. Contrastingly, only 5,643 km were patrolled via ATVs during 1992. ATVs were considered the preferred vehicles for patrols because they: 1) have excellent vantage for sighting sea turtle hatchlings, tracks, and nesting turtles; 2) can be operated by one individual; and, 3) can be operated at varying speeds and for varying distances, depending upon conditions.

"Mules", small all-terrain vehicles obtained from military surplus property, were utilized for 6,025 km of patrolling during 1993, compared to 2,326 km during 1992. Although these vehicles provided excellent vantage for observations, they were limited to slower speeds and shorter distances. Mules were used primarily by volunteers, within the relatively short northern patrol route. The shade structure and additional seat installed on each mule allowed more comfortable transportation of the volunteers.

Similar amounts of time were spent patrolling during 1991 (2,355 hours) (Shaver, 1991), 1992 (2,243 hours) (Shaver, 1992b), and 1993 (2,527 hours). However, the total distance patrolled during 1993 (29,434 km) was appreciably higher than during 1992 (20,110 km) and 1991 (13,703 km). The expanded use of ATVs was probably the most significant factor leading to the increase in distance patrolled during 1992 and 1993. Two people were needed to conduct all patrols using four-wheel drive vehicles and most patrols using mules, with one individual operating the motor vehicle and the other scanning the beach for pertinent sightings. However, ATV patrols were conducted by one person and hence were less labor-intensive. Also, ATVs and mules were used to locate stranded hatchlings during 1992 and 1993, replacing slow walking patrols used for this purpose during 1990 and 1991.

A large work force was necessary to conduct patrols because of the extensive area (125 km linear distance) and lengthy season (5.5 months) of coverage. Due to extremely rigorous beach conditions, each individual was limited to no more than 2-3 patrol days/week. Additionally, at least one of the individuals conducting each patrol had to be intensively trained in patrol protocol and data collection methodology. To amass a sufficient contingent of people, several members of the park staff and volunteers participated in patrols again this year (Fig. 3).

Although Maintenance Division and Ranger Division employees traversed long distances of beachfront during the course of their duties, their vehicle types (large

sedans and 4-wheel drive trucks) and high speeds (typically in excess of 40 km/hr) prohibited them from being able to observe sea turtles or tracks. Thus, only two short patrols conducted by Ranger Division employees via ATVs qualified for inclusion in PAIS 1993 beach patrol efforts.

Park employees patrolled a total of 1,306 hours during 1993, as compared to 1,344 hours during 1992. All members of the Resources Management and Ranger Divisions were trained to conduct patrols and respond to turtle sightings. Nearly all 10 members of the Resources Management Division actively participated in beach patrols. This year, resources managers patrolled a total of 1,296 hours and rangers a total of 10 hours.

Volunteers participated in patrols again this year and 16 donated a total of 1,222 hours during this effort. Four intensively trained volunteers were allowed to conduct patrols without park staff members and contributed 92% of the total volunteer hours. In comparison, volunteers donated 899 hours during 1992 beach patrols, with four volunteers contributing 94% of the total volunteer hours.

STAFF AND VISITOR EDUCATION

The Kemp's Ridley Sea Turtle Recovery Plan lists addressing education/awareness and long-term education needs as a priority 2 recovery task item, with the National Park Service being one of the responsible agencies (U.S. Fish and Wildlife Service and National Marine Fisheries Service, 1992). Accordingly, efforts to educate the park staff and public about the Kemp's ridley project continued this year. Since PAIS is 105 km long and extensive areas are often devoid of park personnel, it is imperative that park employees and visitors assist with detection and reporting of turtle sightings. Therefore, great emphasis was placed on alerting them of the potential for nesting Kemp's ridleys and urging them to look for nesting turtles, tracks, and stranded hatchlings.

All park employees were shown photographs of sea turtle tracks and instructed to report all sightings. All were trained to collect pertinent information from visitors so that their sightings could be located and investigated further.

A variety of methods were used to educate park visitors about the possibility of sighting nesting turtles and stranded hatchlings. Posters, detailing the need to report sea turtle nestings and tracks, were displayed at PAIS and other local parks and establishments. Additional posters, alerting visitors about the possibility of encountering stranded hatchlings, were distributed at a number of locations within the park. Beach signs, alerting visitors to report live sea turtle sightings immediately, were posted at the park. A display and video tape about the Kemp's ridley project were available at the PAIS Visitor Center. Magnetic signs, stating that vehicles were conducting turtle patrols and that all live sea turtle sightings should be reported, were affixed to four-wheel drive trucks that were used to conduct patrols.

SEA TURTLE TRACKS AND NESTS

The only set of sea turtle tracks that was documented for the Texas coast in 1993 was found at PAIS. A Resources Management Division employee conducting a beach patrol via ATV located the loggerhead (*Caretta caretta*) turtle tracks at the PAIS 43.7 km marker on 16 June 1993. The tracks were 93 cm wide with alternating flipper impressions. The tracks extended approximately 6 m from the high tide line to the berm, paralleled the berm in a northerly direction for 6 m, crossed over the berm to a 2.4 m diameter area of disturbed sand, and extended 8 m from the disturbed area to the high tide line. Although coyote (*Canis latrans*) tracks were found at the eastern and western portions of the disturbed area, no signs of egg predation (ie. broken eggs or excavated nest cavity) were noted.

Five members of the Resources Management Division examined the crawl site and spent two hours excavating the entire disturbed area to a depth of 45 cm. However, no nesting cavities or eggs were located and hence this emergence was

deemed a false crawl. Materials were placed at the disturbed area so that the site could be investigated at the projected hatching time. However, extremely high tides during 19-20 June inundated the area, removed the markers, and eroded large quantities of sand from the berm. If a nest had been constructed at that location, it is likely that the high tides destroyed it and swept the eggs into the Gulf of Mexico. Due to this massive beach erosion, no investigation of the area was made at the projected hatching period.

There was one additional report of a sea turtle emergence on Padre Island this year. A fisherman reported observing a sea turtle emerge from the surf at 0600 h on 4 June 1993, approximately 0.8 km south of Bob Hall Pier. He stated that several fishermen observed the turtle and waved their arms in excitement, consequently frightening the turtle back into the water. The fisherman reported the observation to a passing beach patroller at 1400 h. The patroller immediately investigated the observation site. Unfortunately, during the intervening time between the sighting and investigation, the tide had risen and obliterated any possible evidence of the false crawl. The report could not be substantiated because of a lack of photographs or tracks. However, the report was deemed to be credible because: 1) the fisherman stated that he previously worked for the Texas Parks and Wildlife Department and was familiar with sea turtle characteristics and habits; 2) the description of a round turtle was an accurate representation of a Kemp's ridley; 3) Kemp's ridley nesting activity had been documented in that vicinity previously (Table 1); 4) the time reported for this sighting (0600 h) was consistent with peak nesting hours reported for Kemp's ridley turtles at Rancho Nuevo, Mexico (0600-1800 h); 5) the date reported for this sighting (4 June) was consistent with peak nesting activity for Kemp's ridleys at Rancho Nuevo, Mexico (last week of May to first week of June); and, 6) the windy weather conditions during the previous evening and morning of the observation were consistent with the tendency of Kemp's ridleys to nest on windy days.

EGG INCUBATION

No nests were located along the Texas coast and hence none were transferred to the PAIS incubation facility this year. Also, although several clutches of Kemp's ridley eggs laid in captivity at Sea World of Texas (San Antonio, Texas) and were transferred to PAIS for incubation during past years (Shaver, 1992b), no eggs were transferred during 1993. Sea World officials examined large follicles in the captive turtles using ultrasound and determined that the eggs possessed no bi-polarity, indicating that they were infertile (Violetta, pers. comm). As a result, it was deemed inappropriate to transfer the eggs to PAIS for incubation. Most Kemp's ridley eggs laid in captivity in Texas and transferred to PAIS for incubation have been found to be infertile (Shaver, 1992b). However, during 1992, PAIS incubated the first clutch of Kemp's ridley eggs that was laid in captivity in Texas that successfully hatched (Shaver, 1992b). Eight of the 76 eggs hatched (11%) and seven viable hatchlings were released into the Gulf of Mexico from this clutch.

HATCHLING STRANDINGS

Because of the large number of hatchlings that were found stranded on North Padre and Mustang Islands in 1990 (Shaver, 1990), PAIS expended considerable effort to detect stranded hatchlings since that time. Thirteen sea turtle hatchlings were found stranded along Mustang and North Padre Islands from 29 June through 28 October 1993. Among the 13 were two Kemp's ridley, one loggerhead, and 10 hawksbill hatchlings (Fig. 4). The number of hatchlings found stranded on South Texas beaches since 1980 has varied greatly between years (Fig. 4). As during 1990 and 1992, most of the hatchlings were located by pedestrians in heavily visited beach areas (Shaver, 1990, 1992b).

Stranding locations and dates were noted for each hatchling and all were measured for straight-line carapace length (SLCL), straight-line carapace width (SLCW), curved carapace length (CCL), curved carapace width (CCW), and weight (Table 2). To access possible age and origin of the hatchlings, each was examined for the presence of an umbilical scar, egg tooth, internal yolk and gut contents (if

dead), wounds, and epizoans (Table 2). Additionally, hatchlings that were found dead or died during rehabilitation at PAIS were necropsied in an attempt to determine cause of death and remove gonads for histological sex determination. Gonads were shipped to Dr. Robinson (Texas A&M University, Veterinary Diagnostic Laboratory), who determined gender of the dead hatchlings (Table 2).

All three of the *E. imbricata* hatchlings that were dead when located on Padre Island were necropsied at PAIS (Table 2). Due to the decomposed condition of the first carcass (EI-93-02), it was impossible to retrieve gut contents or remove gonads for histological sex determination (Table 2). However, gut contents and gonads were removed from the second (EI-93-03) and third (EI-93-04) carcasses.

The 10 hatchlings that were found alive were transported to two local rehabilitation facilities (Table 2). Four of the turtles (including one *L. kempii*, one *C. caretta*, and two *E. imbricata*) were taken to the facility at PAIS. The Kemp's ridley (LK-93-01) survived and was released into the Gulf of Mexico. One hawksbill (EI-93-01) succumbed in less than 24 hours after arrival at the PAIS facility, the other hawksbill (EI-93-05) in 12 days, and the loggerhead (CC-93-01) in eight days (see PAIS Hatchling Rehabilitation Facility). The other *L. kempii* and five *E. imbricata* were brought to the University of Texas Marine Sciences Institute (UTMSI), Port Aransas, Texas for rehabilitation. The *L. kempii* (LK-93-A) and one of the *E. imbricata* (EI-93-C) are being held for prolonged rehabilitation. The other four *E. imbricata* (EI-93-A, EI-93-B, EI-93-D, EI-93-E) died within a few days after arrival at UTMSI.

The loggerhead and the smallest Kemp's ridley hatchling may have emerged from South Texas nests. Both individuals were the size of newly hatched turtles (<20 g) (Shaver et al., 1986, 1987, 1988; Shaver, 1991, 1992b), possessed a prominent umbilical scar, and possessed an egg tooth (Table 5). However, both may have been in the water for several days prior to stranding since they possessed epizoans and wounds and passed fecal materials that indicated offshore

feeding. The origin of the 11 remaining stranded hatchlings is more difficult to ascertain since these turtles were larger than newly emerged hatchlings.

PAIS HATCHLING SEA TURTLE REHABILITATION FACILITY

More hatchlings stranded during the summer of 1990 than during any summer from 1980-1989 (Fig. 4). Forty of the 53 hatchlings found in 1990 were alive. Most were injured and in need of immediate care and stabilization. Unfortunately, there was no suitable local facility available where the hatchlings could be taken for rehabilitation.

It was feared that similarly high numbers of hatchlings might strand during successive summers. The park staff and Kemp's Ridley Sea Turtle Working Group concluded that improved, local rehabilitation efforts must be undertaken in the future to ensure the survival of these stranded hatchlings. In May, 1991, EXXON Corporation, USA donated \$30,000 to PAIS for the construction of a hatchling rehabilitation facility at the park. Specific plans for the facility were formulated after consultation with individuals from the U.S. Fish and Wildlife Service and National Marine Fisheries Service who had expertise in the care, maintenance, and rehabilitation of sea turtles. The rehabilitation facility was designed to hold up to 70 hatchlings, each in an individual 75.6 liter aquarium, in sterilized water. The building was not completed in time for the 1991 and 1992 stranding seasons and hence a temporary facility was established for use during those years. However, the permanent facility was completed and fully operational for the 1993 season.

Holding conditions, practices, and techniques were similar to those utilized during 1991 and 1992. Each holding container was filled with Gulf of Mexico water that had been pumped through a series of filters and an ultraviolet sterilizer to remove inert elements, particles, bacteria, protozoa, and fungi. Each aquarium had an individual, external, biological filter and an under-gravel filter. Water quality was monitored at least once a week. Injured turtles were transferred to different tanks when necessary to ensure high water quality, important in recuperation of ill turtles

(Leong et al., 1989). Additional water was added to the tanks when necessary. During 1993, lids were placed on all aquariums that did not contain turtles, in order to reduce evaporation of water.

Four live hatchlings were placed into the PAIS facility from July to October, 1993. Each was fed small pieces of shrimp and squid and provided a nutritional supplement that contained vitamins, trace elements, and amino acids. Attempts were made to feed turtles using as little human contact as possible. Each individual was first offered food items that were placed into the tank and allowed to sink. Those turtles that could not catch the falling food were next given pieces placed within a ladle. As during 1992, all turtles that were unable to feed using the first two methods, were offered small food items that were held in front of them within soft forceps.

As recommended for hatchling Kemp's ridley sea turtles (Fontaine et al., 1989), each hatchling held at the PAIS facility was fed approximately 5% of their body weight each day. SLCL, SLCW, CCL, CCW, and weight were measured weekly. All size and weight measurements were made by the author to avoid individual differences in measurement technique, a major source of error in growth data (Bjorndal and Bolten, 1988; Boulon and Frazer, 1990). Hatchling health was closely monitored. Veterinary care was provided by Dr. Mike Hughes, who has previous experience in treating sea turtles.

All of the hatchlings that were placed into the PAIS rehabilitation facility were injured when found. Injuries to the Kemp's ridley (LK-93-01) included: 1) absence of the distal one-third of the left rear flipper; 2) presence of two puncture wounds; and, 3) listing to the right side. The deepest puncture wound was located on the second right costal scute and the other, more superficial wound, was located on the plastron, immediately beneath the first wound. After only two weeks of care the flipper and plastron wounds healed and the turtle was extremely vigorous. However, after one month the carapace wound had not healed and the turtle

continued to tilt to the right. As prescribed by Dr. Hughes, sulfamylon cream was applied to the wound. Three days later Dr. Hughes applied an acrylic resin plug to the wound and prescribed a series of three amikacin (anti-biotic) injections. Tilting was immediately eliminated and the turtle continued to be active.

After nearly two months of care, the Kemp's ridley hatchling increased in SLCL approximately 25 mm (Fig. 5) and nearly quadrupled in weight (Fig. 6). SLCL (y , measured in mm) was positively correlated with the number of days that the hatchling was held (x) ($y = 0.53x + 47.59$, $r^2 = 0.99$, $n = 11$) (Fig. 5). Also, a positive relationship was found between weight (y , measured in g) and the number of days that the hatchling was held (x) ($y = 0.94x + 18.44$, $r^2 = 0.98$, $n = 11$) (Fig. 6). Similar levels of significance were found for exponential equations fitted to the SLCL and weight growth data.

The USFWS was consulted to gain approval on a release location and date. To avoid habituation to humans the hatchling was released as soon it was judged to be healthy. Using a vessel donated by Deep Sea Headquarters, Port Aransas, Texas, the turtle was taken approximately 8 km offshore from Port Aransas, Texas and released into the Gulf of Mexico on 23 September 1993. During release, the hatchling swam vigorously and headed directly east.

The first hawksbill found alive (EI-93-01) had small portions of both rear flippers missing, had a puncture wound through the left side of the third vertebral scute, and listed to the left side. The turtle succumbed within 24 hours, prior to receiving veterinary care. Upon necropsy it was found that the left lung was punctured and contained a large quantity of blood. The stomach was bloated with gas and no internal yolk was noted.

The stranded loggerhead hatchling (CC-93-01) was extremely emaciated, weak, and covered in hydroids when it arrived at the PAIS facility. SLCL and weight measurements for this turtle were smaller than those recorded for virtually all *C.*

caretta hatched at the PAIS incubation facility (Shaver et al., 1988; Shaver, 1992b). Sulfamylon cream was applied to a puncture wound that was located on the right side of the fifth vertebral scute and the turtle was given small amounts of glucose. The turtle was held in a recuperation tub containing 1 cm of sterilized seawater rather than a tank because it was extremely weak and tilted to the right. Dr. Hughes prescribed a series of three amikacin injections and provided an injection of dextrose and fluid. The hatchling passed fecal material, containing primarily insect parts, and was fed small amounts of shrimp. Unfortunately, it never gained strength, decreased 2 g in weight, and succumbed after eight days of care. Dr. Hughes performed a necropsy and could find no conclusive cause of death. No internal yolk was found during necropsy.

The second hawksbill found alive (EI-93-05) was extremely weak and had a small indentation on the periphery of left marginal scutes 6 and 7 when it arrived at the PAIS rehabilitation facility on 23 October 1993. While being held in an aquarium, the turtle tilted to the right side, lowered both front flippers, and partially closed both eyes. The turtle was transferred to a recuperation tub containing 1 cm of sterilized water on 26 October. Dr. Hughes prescribed a series of three amikacin and vitamin injections. The hatchling was fed glucose, vitamin supplements, and small amounts of shrimp. On three occasions it passed fecal material containing primarily *Sargassum* sp. and insect parts. Although the turtle ceased tilting, it never gained strength, lost nearly 10 g in weight, and succumbed on 4 November. A necropsy revealed no conclusive cause of death. No internal yolk was found during the necropsy.

FUTURE PLANS

Public education programs, beach patrols, and protection and monitoring of nesting sea turtles and nests will be continued at the park during 1994. Attempts will be made to continue volunteer participation in this project. ATVs will continue to be the preferred patrol vehicle. Operation of the PAIS sea turtle egg incubation and hatchling rehabilitation facilities will be continued.

ACKNOWLEDGEMENTS

Gratitude must be extended to Dr. Samuel Kunkle (Chief Scientist, Southwest Regional Office, National Park Service) for continued support of the Kemp's Ridley Sea Turtle Restoration and Enhancement Project at Padre Island National Seashore. Without the assistance and support of PAIS managers Butch Farabee (Superintendent), and John Miller (Chief, Resources Management), continued involvement in this project could not have occurred. Sean Baker, Darrell Echols, Paul Eubank, Hillary Loring, Rick Martinez, Charles McCarley, Bruce Sternberg, Roddy Wilder, and other PAIS staff members who conducted patrols must be recognized for their efforts. Four volunteers, Joy Bernard, Leo Bernard, Chris Feit, and Wynne Roberson, are gratefully acknowledged for their contributions to the patrol program this year. Twelve other volunteers also assisted with patrols.

Gratitude must be extended to Tony Amos and Andrea Wickum Rowe (UTMSI) and to a number of beach visitors who assisted with detection, protection, and documentation of the stranded hatchlings. EXXON Corporation must be gratefully acknowledged for their very generous donation in support of a sea turtle hatchling rehabilitation facility at PAIS. Numerous PAIS employees assisted with the construction and operation of the rehabilitation facility. Volunteers Joy and Leo Bernard provided food and care to the rehabilitating hatchlings during a number of weekends. Dr. Mike Hughes voluntarily provided veterinary care to the rehabilitating hatchlings. Bob Tyler, Deep Sea Headquarters, and Hugh Ivey, owner of the Misfit, must be thanked for donating use of a vessel to release of the rehabilitated Kemp's ridley hatchling.

LITERATURE CITED

Bjorndal, K.A., and A.B. Bolten. 1988. Growth rates of immature green turtles, *Chelonia mydas*, on feeding grounds in the southern Bahamas. *Copeia* 1988(3):555-564.

Boulon, R.H., and N.B. Frazer. 1990. Growth of wild juvenile Caribbean green turtles, *Chelonia mydas*. *J. Herpetol.* 24(4):441-445.

Fontaine, C.T., T.D. Williams, S.A. Manzella, and C.W. Caillouet, Jr. 1989. Kemp's ridley sea turtle head start operations of the NMFS SEFC Galveston Laboratory. In: Proceedings from the First International Symposium on Kemp's Ridley Sea Turtle Biology, Conservation and Management, Oct. 1-4, 1985, Galveston, Texas, p. 96-110. C.W. Caillouet, Jr. and A.M. Landry, Jr. (eds.). Texas Sea Grant Publication TAMU-SG-89-105.

Leong, J.K., D.L. Smith, D.B. Revera, Lt. J.C. Clary III, D.H. Lewis, J.L. Scott, and A.R. DiNuzzo. 1989. Health care and diseases of captive-reared loggerhead and Kemp's ridley sea turtles. In: Proceedings from the First International Symposium on Kemp's Ridley Sea Turtle Biology, Conservation and Management, Oct. 1-4, 1985, Galveston, Texas, p. 178-201. C.W. Caillouet, Jr. and A.M. Landry, Jr. (eds.). Texas Sea Grant Publication TAMU-SG-89-105.

Shaver, D.J. 1989a. Padre Island National Seashore Kemp's Ridley Sea Turtle Project 1989 report. National Park Service, Dept. of the Interior. 4 pp.

_____. 1989b. Results from eleven years of incubating Kemp's ridley sea turtle eggs at Padre Island National Seashore. In: Proceedings of the Ninth Annual Workshop on Sea Turtle Conservation and Biology, February 7-11, Jekyll Island, Georgia, p. 163-165. S.A. Eckert, K.L. Eckert and T.H. Richardson (eds.). NOAA Technical Memorandum NMFS-SEFC-232.

_____. 1990. Padre Island National Seashore Kemp's Ridley Sea Turtle Project 1990 Report. National Park Service, Department of the Interior. 19 pp.

_____. 1991. Padre Island National Seashore Kemp's Ridley Sea Turtle Project 1991 Report. National Park Service, Department of the Interior. 39 pp.

_____. 1992a. Kemp's Ridley Research Continues. *Park Science* 12(4):26-27.

_____. 1992b. Padre Island National Seashore Kemp's Ridley Sea Turtle Project 1992 Report. National Park Service, Department of the Interior. 35 pp.

_____, E. Cheeseman, K. Brennan, N. Karraker, and J. Bjork. 1987. Padre Island National Seashore 1987 Report: Kemp's Ridley Sea Turtle Restoration and Enhancement Project, Incubation and Imprinting Phase. National Park Service, Department of the Interior. 142 pp.

_____, _____, S. Chacon, and J. Bjork. 1988. Padre Island National Seashore 1988 Report: Kemp's Ridley Sea Turtle Restoration and Enhancement Project, Incubation and Imprinting Phase. National Park Service, Department of the Interior. 51 pp.

_____, P. Plotkin, A. Neville, and K. Brennan. 1986. Padre Island National Seashore 1986 report: Kemp's Ridley Sea Turtle Restoration and Enhancement Project, Incubation and Imprinting Phase. National Park Service, Department of the Interior. 135 pp.

U.S. Fish and Wildlife Service and National Marine Fisheries Service. 1992. Recovery Plan for the Kemp's Ridley Sea Turtle (*Lepidochelys kempi*). National Marine Fisheries Service, St. Petersburg, Florida. 40 pp.

Table 1. Documented sea turtle nestings on Texas beaches from 1979 through 1993.
PAIS = Padre Island National Seashore, Padre Island, PBP = Padre Balli Park,
Padre Island, SPI = South Padre Island, and MI = Mustang Island.

Species	Number of eggs	Lay date	Nesting location	Incubation location and method	Percent hatch
Loggerhead	84	15 June 1979	SPI	SPI, nest site	1
Kemp's ridley	67	17 June 1979	PAIS	PAIS, styrofoam box	97
Kemp's ridley	113	30 April 1980	PBP	PAIS, styrofoam box	55
Kemp's ridley	115	22 May 1980	PAIS	PAIS, nest site	2
Kemp's ridley	97	13 June 1985	PAIS	PAIS, styrofoam box	72
Green	2	13 July 1987	PAIS	PAIS, styrofoam box	50
Kemp's ridley	104	27 April 1988	MI	PAIS, styrofoam box	91
Loggerhead	113	26 June 1988	MI	PAIS, styrofoam box	69
Loggerhead	83	11 June 1990	PAIS	PAIS, nest site	100 ¹
Kemp's ridley	107	29 April 1991	PAIS	PAIS, styrofoam box	94
Loggerhead	91	25 June 1992	PAIS	PAIS, styrofoam box	93 ²
Loggerhead	130	6 July 1992	PAIS	PAIS, styrofoam box	45

¹ Nest not detected until after hatching; lay date projected based upon a 60 day incubation period and nest detection two weeks after hatching; number of eggs and hatching rate estimated from examination of egg shells.

² Totals based upon 91 eggs recovered for styrofoam box incubation and do not include 5-7 broken eggs found at the top of the nest

Table 2. Sea turtle hatchlings stranded on Padre and Mustang Islands from 29 June - 28 October 1993.

I.D. #	Species	SLCL (cm)	SLCW (cm)	CCL (cm)	CCW (cm)	Weight (g)	Stranding location	Stranding date	Condition Facility ¹	Fate ²	Sex ³	Comments ⁴
LK-A	Lk	5.1	4.7	5.9	6.4	23	MI, Port Aransas Co. Park	29 June	live UTRF	H	U	wf
LK-01	Lk	4.8	4.5	5.1	5.2	19	PI, 2.5 km S. of Bob Hall Pier	29 July	live PAISRF	R 23 Sept.	U	et, us, ep, wf
EI-01	Ei	6.8	5.3	7.2	6.8	45	PI, Padre Balli Park	14 Aug.	live PAISRF	died 15 Aug.	F	ep, wf
EI-02	Ei	6.8	5.5	6.9	5.9	24	PI, J.P. Luby Beach	19 Aug.	dead	-	U	ep, wf
EI-A	Ei	6.3	5.1	7.0	6.4	23	MI, Port Aransas County Park	3 Sept.	live UTRF	died 4 Sept.	F	y, ep, wh
EI-B	Ei	6.9	5.6	7.4	7.0	35	MI, Port Aransas County Park	4 Sept.	live UTRF	died 6 Sept.	F	ep, wh
CC-01	Cc	4.3	3.6	4.5	4.4	15	PI, 0.5 km N. of Bob Hall Pier	10 Sept.	live PAISRF	died 18 Sept.	U	et, us, ep, wf
EI-03	Ei	8.6	7.2	9.0	8.0	78	PAIS, 0.2 km S. of N. Boundary	21 Sept.	dead	-	U	ep, wh
EI-04	Ei	9.9	7.8	10.5	9.6	99	PI, 1.6 km S. of Bob Hall Pier	24 Sept.	dead	-	F	ep, wf
EI-C	Ei	8.9	7.0	9.3	8.3	95	MI, Sandpiper Condominium	14 Sept.	live UTRF	H	U	wf
EI-D	Ei	7.4	6.0	7.8	7.6	50	MI, 1.6 km S. of Access Rd. # 1	17 Oct.	live UTRF	died 18 Oct.	F	ep, wf
EI-05	Ei	8.1	6.4	8.4	8.0	68	PAIS, 5.6 km marker	23 Oct.	live PAISRF	died 4 Nov.	F	ep
EI-E	Ei	8.5	6.6	8.9	8.7	80	MI, unknown loc. left at Vis. Ctr.	28 Oct.	live UTRF	died 7 Nov.	F	ep, wh

¹ PAISRF = Padre Island National Seashore rehabilitation facility,
UTRF = University of Texas Marine Sciences Institute rehabilitation facility

² R = released 8 km offshore from Port Aransas, Texas, H = still being held for rehabilitation as of 6 December 1993

³ M = male, F = female, U = unknown

⁴ y = internal yolk, et = egg tooth, us = umbilical scar, ep = epizoan, wf = fresh external wounds, wh = healed external wounds

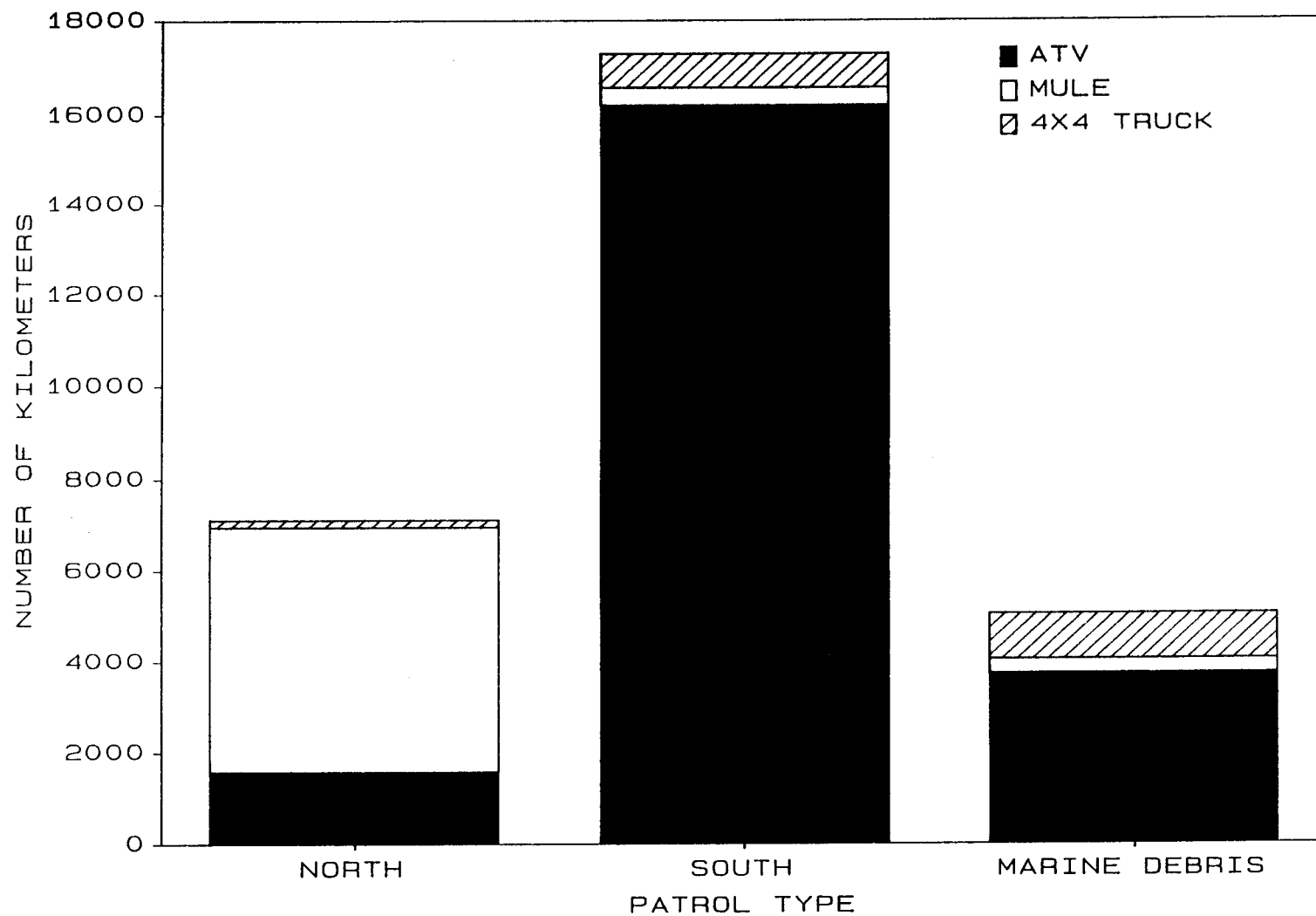


Fig. 1. Number of kilometers patrolled during various types of patrols conducted from April through mid-September, 1993.

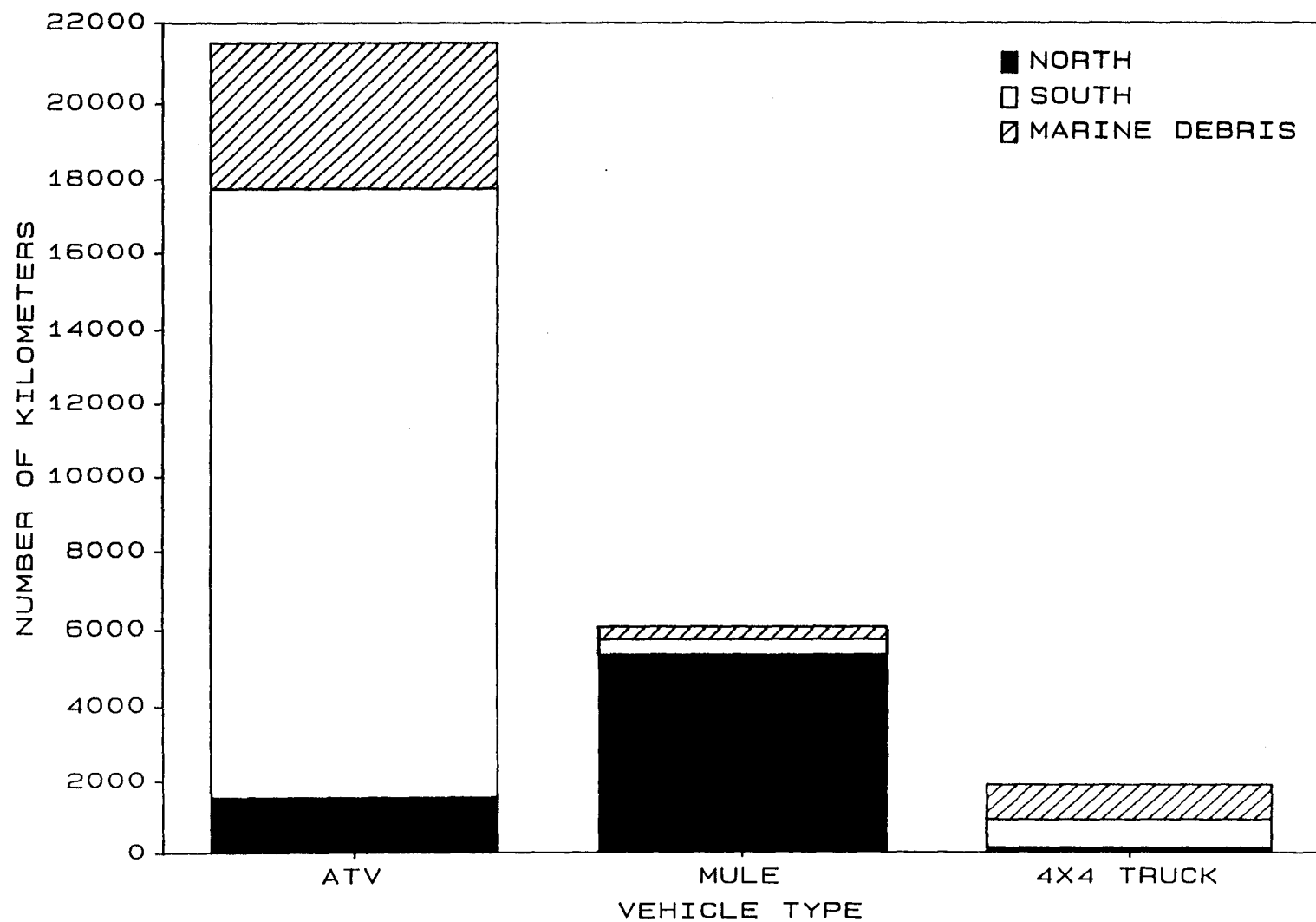


Fig. 2. Number of kilometers patrolled using various types of vehicles from April through mid-September, 1993.

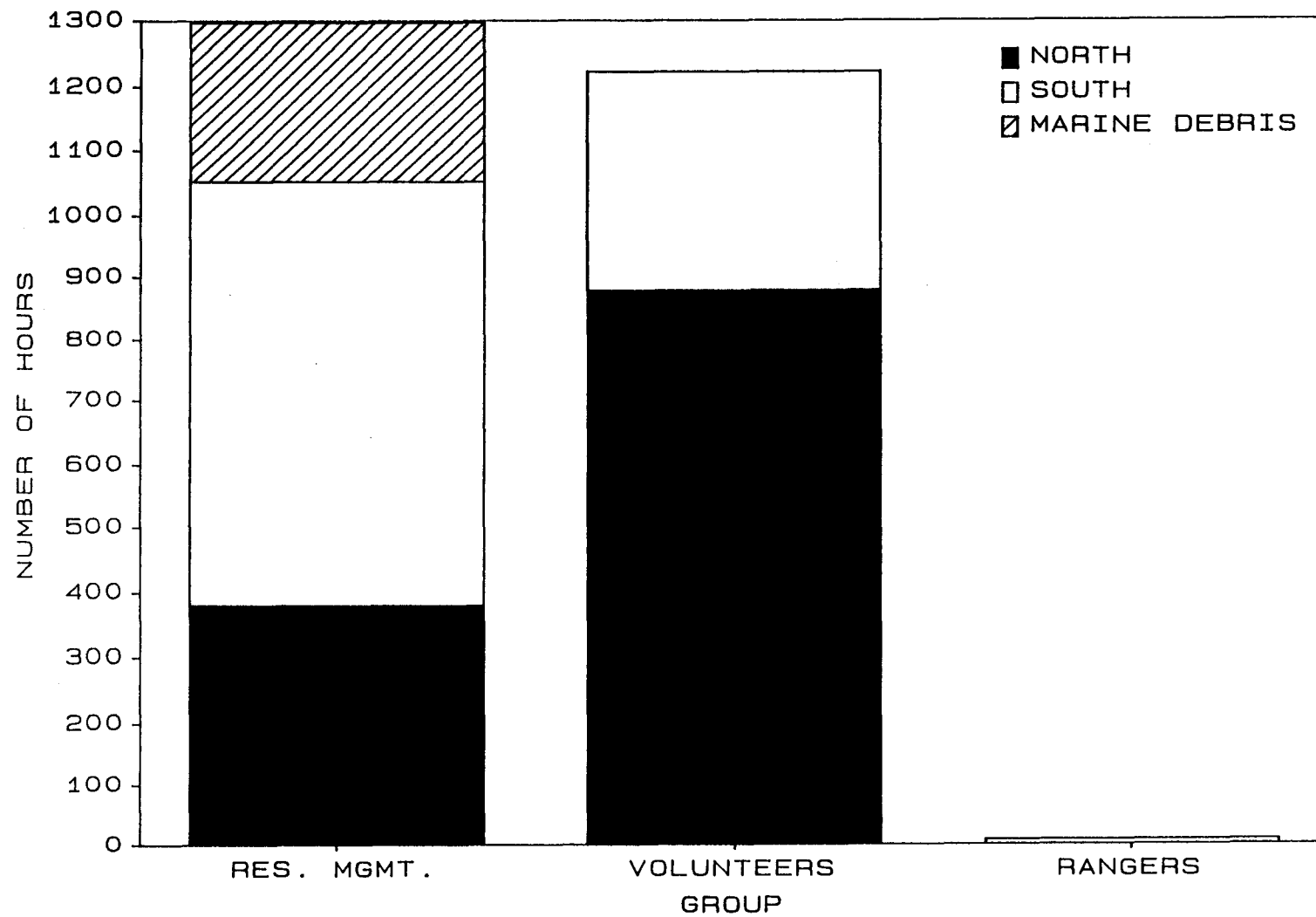


Fig. 3. Number of hours that various groups spent conducting patrols from April through mid-September, 1993.

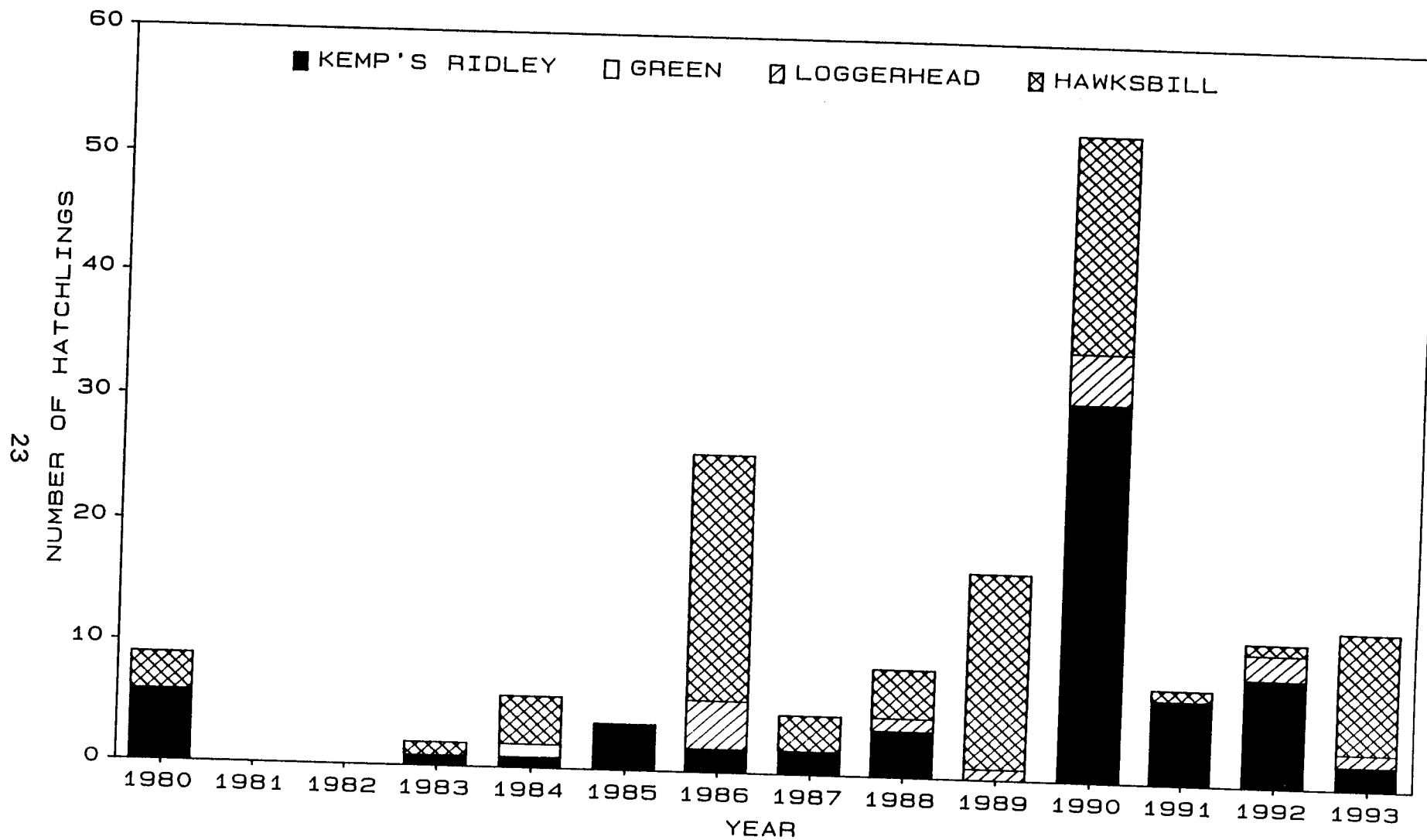


Fig. 4. Sea turtle hatchlings and post-hatchlings stranded on North Padre and Mustang Islands from 1980-1993.

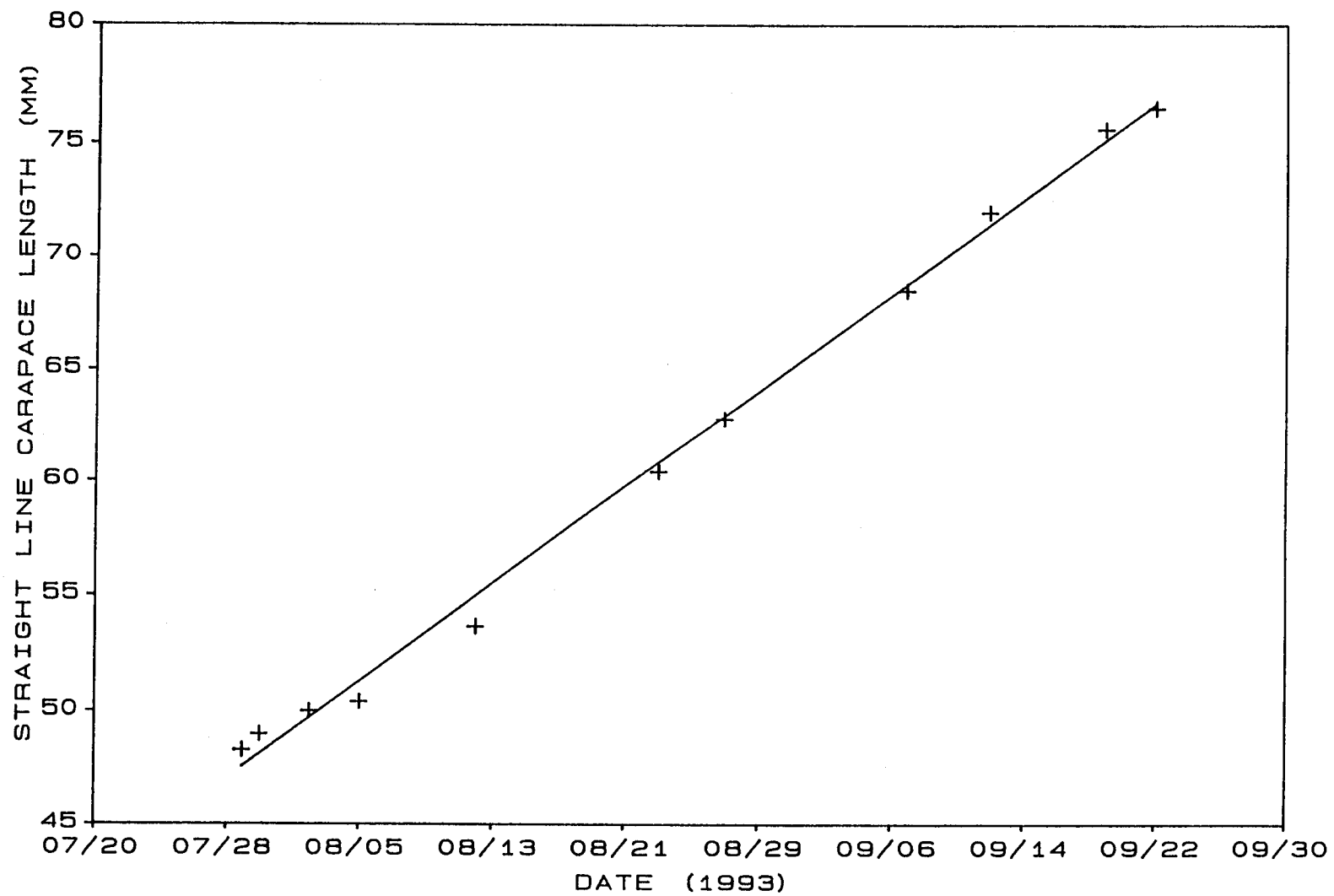


Fig. 5. Straight-line carapace lengths of Kemp's ridley turtle hatchling (LK-93-01) held at the Padre Island National Seashore rehabilitation facility during 1993.

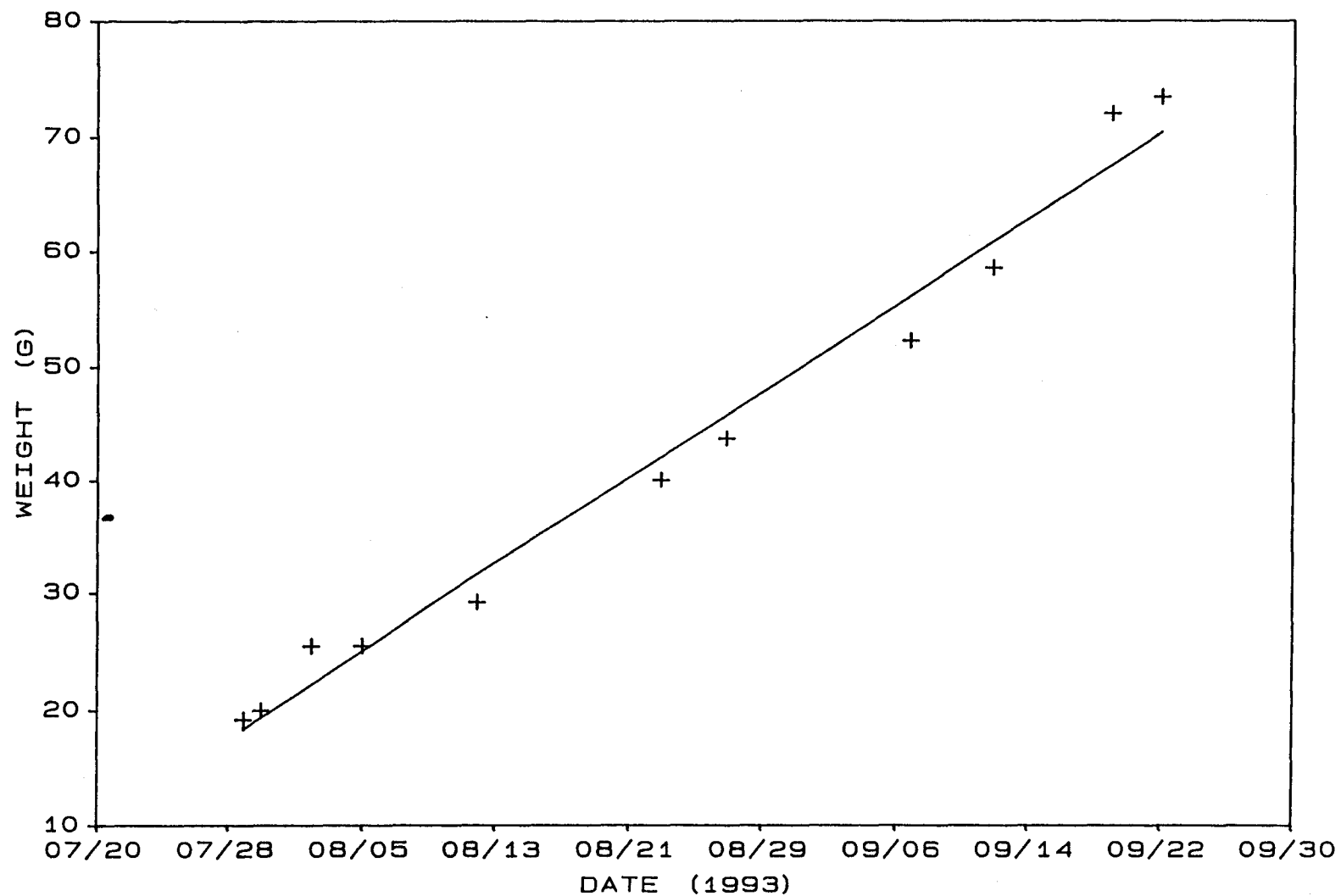


Fig. 6. Weights of the Kemp's ridley turtle hatchling (LK-93-01) held at the Padre Island National Seashore rehabilitation facility during 1993.

