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US Nuclear Regulatory Commission
(by cert. mail RRR #7099 3400 0001 9404 8796)
Document Control Desk – NRC
Washington, DC 20555

Dear Sirs,

Subject: OYSTER CREEK GENERATING STATION (OCGS)
DOCKET 50-219
SUPPLEMENT TO OCGS SEA TURTLE BIOLOGICAL ASSESSMENT

Reference: C. Mantzaris (NMFS) letter to E. Adensam (USNRC) dated October 6, 2000

The enclosed information is provided as requested in the referenced letter as a supplement to the previously submitted Sea Turtle Biological Assessment (BA) for the Oyster Creek Generating Station. As indicated in the referenced letter, this information was specifically requested by NMFS before Section 7 formal consultation can proceed. Additional information was requested regarding six bullet items in the referenced letter. In the enclosed information, those six bullet items are printed as numbered questions in boldface type and responses to each question have been provided.

Thank you very much for your assistance in this matter. If you have any questions or require additional information, please do not hesitate to contact Mr. Malcolm Browne of our Radwaste/Environmental Department at (609) 971-4124.

Very truly yours,

James J. Vouglitois
Supervisor Radwaste/Environmental
Oyster Creek Generating Station

JJV/MEB/pk
Enclosures

Enclosure

US Nuclear Regulatory Commission
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RESPONSES TO NMFS SEA TURTLE INFORMATION REQUESTS

(1) Q. Provide specifics on turtles taken August 3, August 28 & September 18, 2000.

A. See Sea Turtle Incidental Capture Reports 2000-3, 2000-4 & 2000-5 (enclosed) for specific information regarding the three incidental captures which have occurred at Oyster Creek since July 2000. Please note that all three of these sea turtles were captured alive and transported to the Marine Mammal Stranding Center (MMS) in Brigantine, NJ. Also please note that all of these turtles were subsequently taken to warmer southerly locations in North Carolina for release rather than being released locally, in order to minimize the possibility of cold-shock after release.

(2) Q. Provide possible reasons for the increase in turtle takes in 2000. Given that there have been large numbers of turtles taken in 2000 as compared to other years, what additional measures would help reduce the numbers of turtles incidentally taken at the OCGS?

A. The frequency of sea turtle takes at the OCGS appears to be unrelated to the mode of operation of the plant, but more likely related to physical and biological factors in Barnegat Bay and, more importantly, along the seasonal migration path that brings the turtles to Barnegat Bay. Nuclear power plants such as Oyster Creek are "baseload" plants, meaning that they are designed to be operated continuously at 100% power for as much time as possible (other than refueling and maintenance outages). While operating at 100% power, Oyster Creek typically utilizes four circulating water pumps at its circulating water intake and two dilution pumps at its dilution intake. Although this basic mode of operation has remained unchanged since Oyster Creek began operating in 1969, no sea turtles were incidentally captured at the facility until 1992. Since 1992, the number of turtles incidentally captured during any single year has averaged slightly less than two, and has ranged from zero to five turtles per year. Five turtles were captured during 2000, slightly higher than the previous maximum of four during 1994.

There are several possible reasons why the number of sea turtle incidental captures which have occurred during 2000 is slightly greater than the previous annual maximum. Barnegat Inlet, the only tidal inlet in the vicinity of Oyster Creek which provides access to Barnegat Bay from the Atlantic Ocean, was deepened during dredging operations in the early 1990's. Completion of the Barnegat Inlet dredging operation resulted in an increase in the tidal prism, or volume of water entering and exiting the inlet on a single tidal cycle, as well as a slightly greater tidal range at Oyster Creek. The deepening of Barnegat Inlet and associated waterway channels was completed immediately prior to 1992, when incidental captures of sea turtles began to occur at Oyster Creek, and may partially explain the occurrence of the turtles. However, the annual abundance of sea turtles in this vicinity appears to be highly variable, unpredictable, and unrelated to the mode of operation of the OCGS.

It is likely that the local variability of sea turtle abundance is also related to biological factors including the abundance of organisms on which sea turtles prefer to feed, such as blue crabs, horseshoe crabs, and calico crabs. Physical factors, such as an oceanic front and/or an

oceanic gyre occurring unusually close to Barnegat Inlet, may also play a part in the prevalence of sea turtles near Oyster Creek because oceanic fronts have been shown to be used as a migratory and forage habitat by sea turtles (Polovina et al, 2000). Experience has also shown that the passage of a severe storm or pressure system near Barnegat Inlet can cause major increases in winds, waves, tides and tidal prism in shallow estuarine waters such as Barnegat Bay which could in turn increase the likelihood of slowly swimming organisms such as sea turtles occurring in the estuary. Likewise, several consecutive days of persistent high winds from the same direction can strongly affect tides and tidal prism locally.

Many years of environmental sampling conducted near Oyster Creek have repeatedly demonstrated that the abundance of various marine organisms can vary considerably from year to year, often by orders of magnitude. This is particularly true for seasonal migrants, whose abundance in Barnegat Bay is highly dependent upon physical and biological factors along the migratory route. Therefore, the increase in sea turtle incidental captures at Oyster Creek from a previous maximum of four per year to five during the current year is not considered particularly significant. The ultimate goal of the considerable effort being put forward at Oyster Creek for the protection of sea turtles is to protect the turtles that do arrive at the plant, and to release as many turtles as possible to safety. It is therefore considered more significant that four out of the five turtles incidentally captured this year were released alive and well, to the Atlantic Ocean in locations free from potential cold-shock, due to the efforts of Oyster Creek personnel. In view of this high degree of success of the Oyster Creek sea turtle protection program, it is not considered necessary to implement any additional measures or changes to the program at this time.

(3) Q. Discuss potential theories as to why more turtles in the past six years have been captured at the dilution water system in comparison to the circulating water system. Based on the information submitted, only two out of twelve turtles were taken at the circulating water system (the turtle taken on September 18, 2000 was not included in these results, as the final incident report with the location of take has not yet been received).

A. As indicated in Section 4.1.2.1.2 of the Oyster Creek Biological Assessment, a floating debris/ice barrier has been designed and installed at OCGS upstream of the circulating water system (CWS) and dilution water system (DWS) intake structures. This barrier was designed to divert floating debris such as wood, eelgrass or ice away from the CWS intake and towards the DWS intake. The primary function of the barrier is to prevent excessive amounts of debris or ice from accumulating on the CWS traveling screens or trash bars. The orientation of the barrier causes water near the surface of the intake canal and flowing towards the OCGS intakes to be diverted towards the right at the barrier (i.e., away from the CWS intake). The floating barrier is constructed of wood and extends about 60 cm (2 ft) below the surface from just upstream of the CWS intake to just upstream of the DWS intake (see Biological Assessment Figure 4-2). Therefore, a sea turtle which happened to be near the surface of the OCGS intake canal when approaching the floating barrier may be diverted towards the DWS intake unless it dove into deeper water and turned left towards the CWS intake.

Eighteen incidental captures of sea turtles have occurred at OCGS since 1992 and of these, eleven (61%) have occurred at the DWS intake and seven (39%) at the CWS intake. During normal operation of OCGS at 100% power, typically two dilution water pumps withdraw

a total of 1968 m³/min from the intake canal and four circulating water pumps withdraw a total of an additional 1740 m³/min. The cross sectional area of the DWS intake is smaller than that of the CWS intake, resulting in a higher average through-screen velocity at the DWS than at the CWS intake. The DWS pumps typically withdraw about 53% of the water pumped from the intake canal and the CWS pumps withdraw about 47%, which fairly closely reflects the percentages of incidental captures which have occurred at the respective intakes. The reason why a greater percentage of incidental captures have occurred at the DWS intake in recent years (i.e., 10 of 13 turtles or 77% since 1994) is unknown. There has been no operational or mechanical change at either intake since that time which would explain an increased proportion of takes at the DWS intake. Rather, the reason may be due to physical and behavioral characteristics of the turtles incidentally captured at OCGS. Five of the eight loggerhead turtles incidentally captured at OCGS have been retrieved from the CWS intake, but only two of the eight Kemp's ridleys and neither of the two green turtles were retrieved from the CWS intake. The eight loggerhead turtles incidentally captured at OCGS had an average carapace length of 47.9 cm (18.9 in) SCL. By comparison, the eight Kemp's ridley turtles and two green turtles incidentally captured had average carapace lengths of only 30.1 cm (11.9 in) and 28.1 cm (11.1 in) SCL, respectively. The generally larger size of the loggerhead turtles is probably associated with a stronger swimming ability and may allow loggerheads to selectively move towards the CWS rather than the DWS. The greater likelihood of loggerheads to occur at the CWS intake may also have been a result of actively pursuing preferred food organisms such as blue crabs or horseshoe crabs, which are probably more prevalent near the CWS intake.

(4) Q. Update the necropsy results for the turtles previously captured. Please provide details on the necropsy results and probable cause of death for the Kemp's ridley taken on July 1, 1994; the Kemp's ridley taken on July 12, 1994; and the green taken on October 23, 1999. Furthermore, if necropsies were performed on the Kemp's ridley taken on September 4, 1997, and the Kemp's ridley taken on July 12, 2000, please provide details from these analyses as well.

A. The first sea turtle incidentally captured at OCGS on which a necropsy was performed was a Kemp's ridley captured October 17, 1993. The specimen (which had a carapace length of 26.0 cm (10.2 in) SCL and weighed 3.0 kg (6.6 lb)) was sent to Dr. Steve Morreale of Cornell University, a renowned sea turtle expert. A copy of the necropsy report for that turtle is enclosed. Dr. Morreale made the following comments in that report:

Comments: The overall condition of this turtle was one of an otherwise healthy young Kemp's ridley, typical of the many that I have examined in northeastern waters. The lack of food in the gut is typical of the sea turtles that I have seen at this time of year and is indicative of a behavioral change prior to migrating southward. The lack of any obvious trauma would tend to implicate drowning as the cause of death to this animal. The lack of fluid in the lungs is not necessarily contradictory to this conclusion. It is my opinion that sea turtles suffocate underwater rather than inhaling water. The superficial scrapes on the plastron and neck were very fresh and probably occurred on the intake grates. However, I

could not tell whether these occurred prior to or after death. The only potentially contradictory evidence of this turtle having died as a result of impingement was the condition of the specimen. From the information given to me about the timing of death, the water temperature, and the subsequent handling of the carcass, I expected to observe slightly less decomposition. The moderate levels of decomposition of liver and gonad tissues are usually more representative of a turtle that has been dead for one to two days at those temperatures.

A necropsy of the loggerhead sea turtle incidentally captured at OCGS on July 6, 1994 was performed by Bob Schoelkopf, director of the Marine Mammal Stranding Center (MMSC) in Brigantine, NJ. A copy of the MMSC stranding report for that turtle is enclosed. This turtle was a juvenile loggerhead with a carapace length of 61.4 cm (24.2 in) SCL which weighed 40.4 kg (89.1 lb). There were at least three deep scars in the carapace which appeared to be boat propeller wounds. These wounds were not fresh because blue mussels were attached and growing in the scars. There were also several notches in the outer edge of the carapace up to 6.3 cm (2.5 in) wide which were also not fresh wounds based on the presence of scar tissue surrounding them. Schoelkopf attributed the largest notch to a bacterial infection. Portions of the carapace were deteriorated due to fungal growth. All four appendages were deteriorated, possibly due to bacterial infection.

Schoelkopf concluded that the turtle did not die at the OCGS intake and did not suffocate. The turtle's lungs appeared to be in good condition. It had been dead for 1 to 2 days prior to the incidental capture. He concluded that the turtle had died of a long-term illness.

Necropsy results for several additional turtles sent from OCGS to Cornell University, including those listed in the 10/06/2000 letter from NMFS to the USNRC, have not been received despite numerous requests from AmerGen by email, telephone, and letter. Carrie McDaniel of NMFS has indicated that she will contact Dr. Morreale to obtain as much information as possible about the condition and possible cause of death of those turtles.

(5) Q. Update the sea turtle stranding data discussed in the BA. Specifically, data in Table 5-2 and Figure 5-5 only extend to 1994, while Figure 5-6 only presents data from 1977 to 1984. The New Jersey annual strandings in Table 5-1 range from 1977 to 2000, but are current stranding numbers available for the other figures and tables? If so, these data should be included in the BA.

A. Several requests for the information necessary to update the Tables and Figures mentioned have been addressed by AmerGen to Ms. Wendy Teas of the NMFS Southeast Region, who is the database coordinator for the sea turtle strandings database for the East Coast. To date, no response has been received from Ms. Teas. However, Carrie McDaniel of NMFS Northeast Region has indicated that she will initiate a request for this data and provide it to AmerGen for update of the BA. Ms. McDaniel has recently provided AmerGen with some updated information from the NMFS Strandings database from which the enclosed updated version of Table 5-2 was prepared. Please note that the information provided was insufficient to prepare an updated version of Figure 5-6 (New Jersey sea turtle strandings by county).

However, the existing Figure 5-6 illustrates that moderate numbers of sea turtle strandings tend to occur in Ocean County, New Jersey relative to other New Jersey counties located along the Atlantic coast. It is believed that the general trends illustrated in Figure 5-6 have continued, although Schoelkopf (Personal communication, 1999) reported that unusually high numbers of sea turtle strandings had occurred in the Sandy Hook vicinity (Monmouth County) during the late 1990's.

An updated version of Figure 5-5 (enclosed) which illustrates the number of Kemp's ridley nests at Rancho Nuevo before and after implementation of TED regulations has been prepared based on data from Marquez et al., 1999. The recent data indicates that although the number of nests remained below 1000 during the entire decade of the 1980's, Kemp's ridley nesting at Rancho Nuevo has gradually increased during the 1990's subsequent to implementation of TED regulations and active conservation programs in the United States and Mexico. The number of nests has remained above 1000 since 1994 and reached a peak of 2409 nests in 1998.

(6) Q. Update the data in Section 5.0, Information on Sea Turtle Species. If updated population estimates and stranding numbers for each species are available, please incorporate these current numbers into the BA. Additionally, updated strandings and incidental captures in the periodic trawl and seine sampling in Barnegat Bay are necessary to provide a complete picture of sea turtles in the project area.

A. Because accurate population estimates for wide ranging turtle species are difficult to obtain, many researchers consider trends in the number of nests to be a useful proxy to reflect overall population trends of these species. Marquez et al, 1999 noted a mean annual increase in nesting at Rancho Nuevo between 1988 and 1998 of 8%. They indicated that this gradual increase in nesting numbers "...that appears to have begun in the early 1990's is likely to be the result of a combination of a number of activities. These may include an increase in recruitment to the population as a result of beach and nest protection at Rancho Nuevo and neighboring camps and the introduction of Turtle Excluder Devices".

Researchers also sometimes use strandings data trends as a proxy for trends in sea turtle populations. The sea turtle strandings information requested from Ms. Teas may be useful as a reflection of population trends of the species which have been incidentally captured at OCGS.

Although seining and trawling has been conducted at a much lower frequency in the vicinity of OCGS in recent years than in past years, there still have been no incidental captures of sea turtles during these activities.

REFERENCES

- Marquez, R., J. Diaz, M. Sanchez, P. Burchfield, A. Leo, M. Carrasco, J. Pena, C. Jimenez and R. Bravo. 1999. Results of the Kemp's Ridley Nesting Beach Conservation Efforts in Mexico. *Marine Turtle Newsletter* 85: 2-4
- Polovina, J.J., D.R. Kobayashi, D.M. Ellis, M.P. Seki, and G.H. Balazs. 2000. Turtles on the edge: Movement of loggerhead turtles (*Caretta caretta*) along oceanic fronts in the central North Pacific, 1997-1998. *Fish. Oceanogr.*, 9: 71-82.
- Schoelkopf, R. 1999. Personal communication. Marine Mammal Stranding Center, Brigantine, NJ.

OYSTER CREEK GENERATING STATION

Sea Turtle Incidental Capture Report 2000-3

August 3, 2000

At approximately 1525 hours on Thursday August 3, 2000, an Oyster Creek Generating Station (OCGS) operator performing a routine inspection of the dilution trash racks noticed a live sea turtle in Bay # 4 of the dilution intake structure. The turtle was carefully removed as quickly as possible and found to be alive, moving about normally and with no apparent injury. OCGS Environmental Affairs personnel who took custody of the turtle confirmed it to be a juvenile Atlantic green sea turtle (*Chelonia mydas*). The water temperature at the time of the incidental capture was approximately 83.9 F (28.8 C) and OCGS was in operation at full power with four circulating water pumps and two dilution pumps in operation. Although it is impossible to say precisely how long the turtle had been on the intake structure prior to removal, the dilution trash racks had been mechanically cleaned earlier the same day.

The turtle measured 11.5 in (29.2 cm) carapace length straight line and weighed 7.6 lb (3.4 kg). Sex was not determined. No tags were present on the turtle when captured. The majority of the dorsal surface of the turtle was heavily encrusted with barnacles. Several marginal scutes on the posterior dorsal surface had a dull grayish coloration, which may be an indication of a fungal infection. USNRC and NMFS personnel were notified of the capture within 24 hours on August 4, 2000.

The turtle was transferred to the Marine Mammal Stranding Center in Brigantine, NJ on August 3, 2000, where it was examined and given initial care. It was transferred on September 7, 2000 to the Karen Beasley Sea Turtle Rescue and Rehabilitation Center in Topsail Island, NC for final care before release. It was released October 12, 2000 in the Atlantic Ocean off Topsail Beach, NC.

OYSTER CREEK GENERATING STATION

Sea Turtle Incidental Capture Report 2000-4

At approximately 0112 hours on Monday August 28, 2000, an Oyster Creek Generating Station (OCGS) operator performing a routine inspection of the dilution trash racks noticed a live sea turtle in Bay # 1 of the dilution intake structure. The turtle was carefully removed as quickly as possible and found to be alive, moving about normally and with no apparent injury. OCGS Environmental personnel who took custody of the turtle confirmed it to be a juvenile Kemp's ridley sea turtle (Lepidochelys kempii). The water temperature at the time of the incidental capture was approximately 79.8 F (26.5 C) and OCGS was in operation at 72% power with four circulating water pumps and two dilution pumps in operation. The turtle measured 10.3 in (26.2 cm) carapace length straight line and weighed 6.5 lb (2.9 kg). Sex was not determined. No tags were present on the turtle when captured. Although it is impossible to say precisely how long the turtle had been on the intake structure prior to removal, the dilution trash racks had been mechanically cleaned the previous day and inspected earlier the same night that the turtle was captured.

The turtle was taken to the Marine Mammal Stranding Center (MMSC) in Brigantine, NJ. At the MMSC, the turtle was examined, fed, tagged and given initial care. The turtle was transferred on September 7, 2000 to the Karen Beasley Sea Turtle Rescue and Rehabilitation Center in Topsail Island, NC, where it is receiving final care prior to being released to safety in offshore Atlantic Ocean waters. USNRC and NMFS personnel were notified of the capture within 24 hours on August 28, 2000.

OYSTER CREEK GENERATING STATION

Sea Turtle Incidental Capture Report 2000-5

At approximately 1310 hours on Monday September 18, 2000, an Oyster Creek Generating Station (OCGS) operator performing a routine inspection of the trash racks noticed a live sea turtle in Bay # 4 of the circulating water intake structure. The turtle was carefully removed as quickly as possible and found to be alive, moving about normally and with no apparent injury. OCGS Environmental personnel who took custody of the turtle confirmed it to be a subadult loggerhead sea turtle (Caretta caretta). The water temperature at the time of the incidental capture was approximately 68.8 F (20.4 C) and OCGS was in operation at full power with four circulating water pumps and two dilution pumps in operation. Although it is impossible to say precisely how long the turtle had been on the intake structure prior to removal, the circulating water trash racks had been cleaned the previous afternoon.

The turtle measured 22.5 in (57.2 cm) carapace length straight line and weighed 58.5 lb (26.5 kg). Sex was not determined. No tags were present on the turtle when captured. The majority of the dorsal surface of the turtle was heavily encrusted with barnacles. A few of the scutes on the posterior dorsal surface had partially peeled, which may have occurred when some barnacles scraped off of the turtle. USNRC and NMFS personnel were notified of the capture within 24 hours on September 18, 2000.

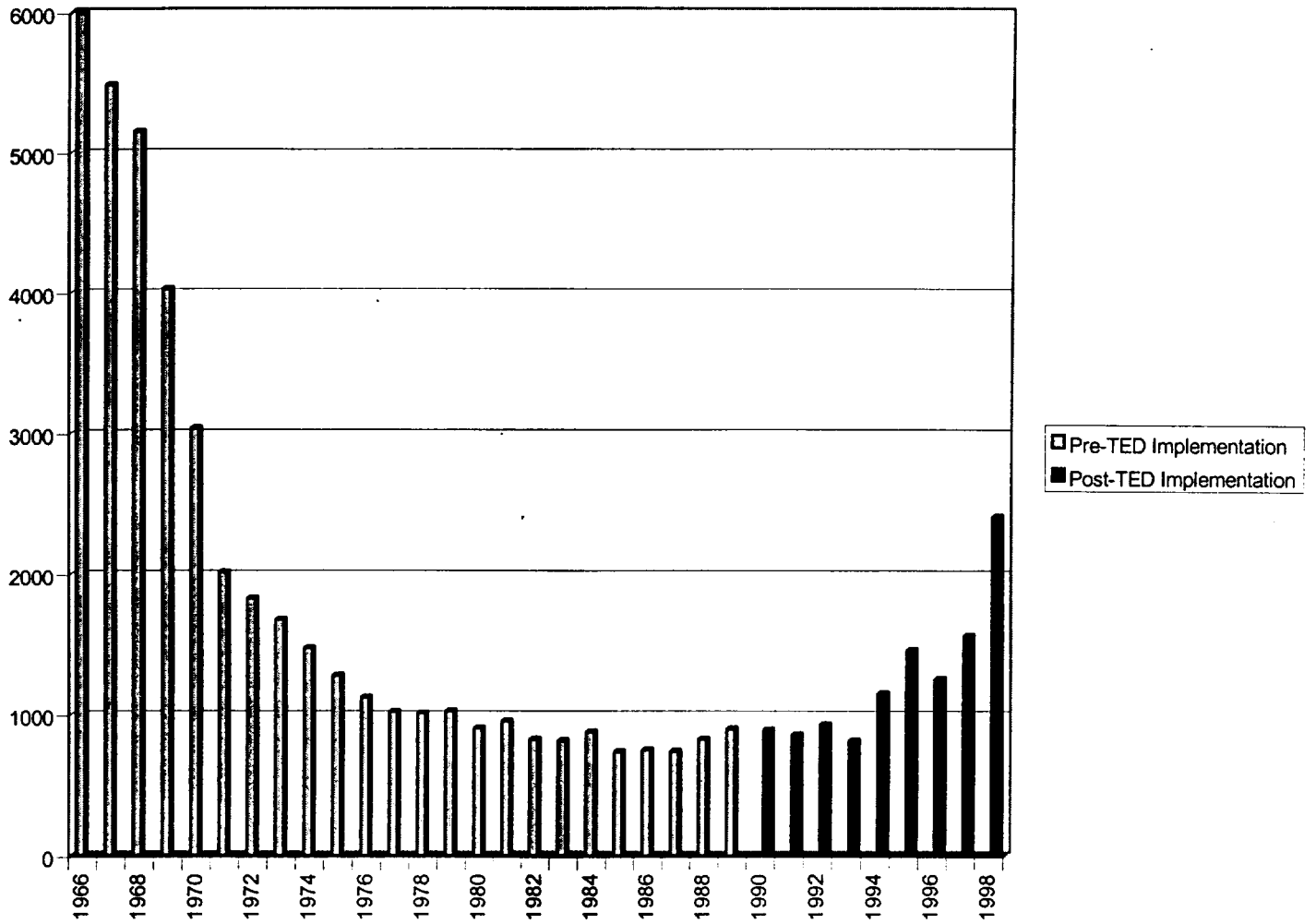
The turtle was taken to the Marine Mammal Stranding Center (MMSC) in Brigantine, NJ. At the MMSC, the turtle was examined, fed, and tagged. The turtle was taken during late September to a more southerly location in Nags Head, NC (where cold-stunning was less likely) and released into the Atlantic Ocean.

TABLE 5-2**SEASONAL OCCURRENCE OF SEA TURTLE
STRANDINGS IN NEW JERSEY COASTAL AND
ESTUARINE WATERS, 1980-1999 (NMFS, 2000).****MONTHLY DISTRIBUTION (*)**

MONTH	LOGGERHEAD	RIDLEY	LEATHERBACK	GREEN	UNKNOWN
January	1 (0)	1 (0)	4 (0)	0	0
February	0	1 (0)	2 (0)	0	0
March	0	0	0	0	1 (0)
April	0	0	1 (0)	0	0
May	0	0	2 (0)	0	0
June	53 (2)	1 (0)	5 (0)	0	2 (0)
July	101 (1)	5 (2)	15 (0)	1 (0)	7 (0)
August	130 (1)	8 (0)	42 (0)	0	6 (0)
September	149 (1)	10 (2)	71 (0)	0	6 (0)
October	75 (0)	3 (2)	52 (0)	1 (1)	0
November	8 (0)	1 (0)	16 (0)	3 (0)	0
December	1 (0)	1 (0)	2 (0)	0	0
TOTALS	518 (5)	31 (6)	212 (0)	5 (1)	22 (0)

Note: * Number of incidental captures at OCGS in parentheses.

Figure 5-5. Number of Kemp's Ridley Nests at Rancho Nuevo Before and After Implementation of TED Regulations in 1989 (After Marquez et al. 1999).



SEA TURTLE STRANDING AND SALVAGE NETWORK - STRANDING REPORT

PLEASE PRINT CLEARLY AND FILL IN ALL APPLICABLE BLANKS. Use codes below. Measurements may be straight line (caliper) and/or over the curve (tape measure). Measure length from the center of the nuchal notch to the tip of the most posterior marginal. Measure width at the widest point of carapace. CIRCLE THE UNITS USED. See diagram below. Please give a specific location description. INCLUDE LATITUDE AND LONGITUDE.

Observer's Full Name MARINE MAMMAL STRANDING CENTER Stranding Date 94 - 07 - 06
 Address / Affiliation Brigantine, N.J.
 Area Code / Phone Number 609-266-0538
 Species CC (Loggerhead) Turtle Number By Day 94-060
 Reliability of I.D.: (CIRCLE) Unsure Probable Positive Species Verified by State Coordinator? Yes ☒ No ☐
 Sex: (CIRCLE) Female Male Undetermined How was sex determined? Necropsy
 State NEW JERSEY County Ocean
 Location (be specific and include closest town) Oyster Creek Nuclear Power Plant.
Forked River
 Latitude 39 48' 52" Longitude 74 12' 05"
 Condition of Turtle (use codes) 1 Final Disposition of Turtle (use codes) 3
 Tag Number(s) (include tag return address and disposition of tag) NA

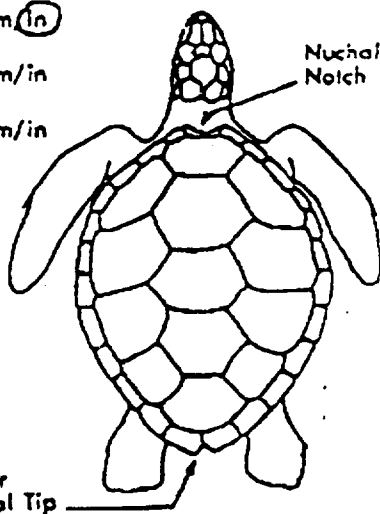
Remarks (note if turtle was involved with tar or oil, gear or debris entanglement, wounds or mutilations, propellor damage, papillomas, epizoa, etc.) continue on back if necessary

Carapace deteriorated due to fungal growth, All four appendages deteriorated
(possible bacterial infection) Photos taken, Stomach and esophogase contain
blue crabs, no tag scars, Field # 94-060

MEASUREMENTS: CIRCLE UNITS

Straight Length 24.5 cm in
 Straight Width 19.75 cm in
 Curved Length _____ cm/in
 Curved Width _____ cm/in

Mark wounds,
abnormalities,
and tag locations



CODES:

SPECIES:

CC = Loggerhead
 CM = Green
 DC = Leatherback
 EI = Hawksbill
 LX = Kemp's ridley
 UN = Unidentified

CONDITION OF TURTLE:

0 = Alive
 1 = Fresh dead
 2 = Moderately decomposed
 3 = Severely decomposed
 4 = Dried carcass
 5 = Skeleton, bones only

FINAL DISPOSITION OF TURTLE:

1 = Painted, left on beach
 2 = Buried: on beach / off beach
 3 = Salvaged specimen: all / part
 4 = Pulled up on beach or dune
 5 = Unpainted, left on beach
 6 = Alive, released
 7 = Alive, taken to a holding facility