UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
1335 East-West Highway
Silver Spring, MD 20910
THE DIRECTOR

JAN 2 1991

50-272/311/354

Mr. Steven A. Varga, Director
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation
United States Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Varga:

This responds to your correspondence to Richard Roe, Regional Director of the National Marine Fisheries Service (NMFS), submitting your Biological Assessment of the impacts of the Salem and Hope Creek Nuclear Generating Stations on the Kemp's ridley (Lepidochelys kempi) and loggerhead (Caretta caretta) sea turtles. This Biological Assessment was submitted in response to our request for a reinitiation of Endangered Species Act (ESA) Section 7 Consultation to evaluate the effect of impingement of sea turtles at the Salem Generating Station.

Based on our review of your Biological Assessment, and other available scientific information, we have prepared a Biological Opinion which concludes that the continued operation of these generating stations is not likely to jeopardize the continued existence of any endangered or threatened species under our jurisdiction. However, the operation of these generating stations may affect these species. Therefore, NMFS has developed reasonable and prudent measures and conservation recommendations to reduce the incidental take of sea turtles, which are contained in the Biological Opinion.

Finally, I would like to clear up a misconception on your part concerning the responsibilities of the Nuclear Regulatory Commission (NRC) in the Section 7 consultation process. It is the responsibility of the NRC to ensure licensee compliance with the requirements contained in the Incidental Take Statement of the Biological Opinion. This responsibility is based on your role as the Federal agency licensing the operation of these facilities. The process detailing the need and responsibilities for Federal agency consultation under Section 7 of the ESA are detailed at 50 CFR Part 402.

Sincerely,

William W. Fox, Jr.

Enclosure

ENDANGERED SPECIES ACT

SECTION 7 CONSULTATION

BIOLOGICAL OPINION

Agency: Nuclear Regulatory Commission

Activity: Reinitiation of a consultation in accordance with Section 7 (a) of the Endangered Species Act regarding continued operation of the Salem and Hope Creek Nuclear Generating Stations on the eastern shore of the Delaware River in New Jersey.

Consultation Conducted By: National Marine Fisheries Service
Northeast Regional Office

Date Issued: JAN 2 1991

Background:

A formal consultation in accordance with Section 7(a) of the Endangered Species Act was conducted by the National Marine Fisheries Service (NMFS) with the Nuclear Regulatory Commission (NRC) in 1979 to study the impingement of shortnose sturgeon at the Salem and Hope Creek Nuclear Generating Stations in Lower Alloways Creek Township, Salem County, New Jersey. The Environmental Protection Agency (EPA) joined the consultation process in 1980. The final Biological Opinion, issued in April of 1980, concluded that operation of these plants would not jeopardize the continued existence of shortnose sturgeon.

Since 1980, impingements of sea turtles at the Salem Nuclear Generating Station have been noted by the Public Service Electric and Gas Company (PSE&G) and reported to the NMFS according to reporting procedures established through an informal Section 7 (a) consultation conducted between the PSE&G, NRC, NMFS, and EPA during October 1981. The NMFS Northeast Regional Office sent a letter, dated August 19, 1988, requesting reinitiation of the formal Section 7 consultation to evaluate the effects of these impingements on the species of sea turtles involved. A Biological Assessment was prepared by the PSE&G, reviewed by the NRC and received by the NMFS in July of 1989. The NRC, in a letter dated June 18, 1990, requested concurrence with the assessment that the continued operation of these generating stations will not jeopardize the continued existence of any species of sea turtles.

Proposed Activities:

This consultation addresses the potential impact of the continued operation of the Salem and Hope Creek Generating Stations to a revised list of species. The operating conditions of these Nuclear Generating Stations has not changed significantly since the most recent informal Section 7 Consultation.

Listed Species Likely to Occur in the Project Area:

Listed species under the jurisdiction of the NMFS that may occur in the Delaware Bay area and may be affected by the proposed activities include;

THREATENED -

Loggerhead turtle (Caretta caretta)	All continental shelf waters and large bays from VA to MA in summer (June through November).

ENDANGERED -

Green turtle (Chelonia mydas)	Occasionally found in nearshore waters from MA to VA from June through October.
Leatherback turtle (Dermochelys coriacea)	ME to VA pelagically in large open bays from June through November.
Kemp's ridley turtle (Lepidochelys kempi)	Inshore bay and estuarine habitat, north to MA from July through October.
Shortnose sturgeon (Acipenser brevirostrum)	Lower reaches of major river systems.

Additional Biology and Distribution of the Species:

Loggerhead turtle (Caretta caretta)

The loggerhead turtle is the most abundant species of sea turtle occurring in U.S. waters. Aerial surveys indicate that loggerheads occur pelagically, but are most common in waters less than 50 m in depth (Shoop et al. 1981; Fritts et al. 1983). They are known to inhabit coastal areas as juveniles and adults and often enter bays, lagoons and estuaries (Ernst and Barbour 1972). Their primary food sources are benthic invertebrates including mollusks, crustaceans and sponges (Mortimer 1982). Although they are known to eat fish, clams, oysters, sponges, and jellyfish, the loggerhead's preferred prey in Atlantic embayments appear to be various species of crabs (Morreale, pers comm. 1990. Musick et al. 1987).

Loggerhead populations are under stress due to incidental captures in fisheries, pollution and marine habitat degradation, development of nesting beaches and other sources of man-induced and natural mortality. Crouse et al. (1987) published information indicating that the stability of loggerhead populations may be more sensitive to changes in the status of subadults than in other developmental stages. Stranding data indicate that the majority of loggerheads found off of the Northeast U.S. are subadults. Cumulative stresses on the animals in this area, then, may be impeding the recovery of this population.

Green turtle (Chelonia mydas)

Green turtle populations in the U.S. are listed as endangered if they are from the Florida breeding population and threatened if they belong to other populations. The Northeast Region considers them to be endangered unless the natal beach of the turtle is known.

Green turtles are more tropical in distribution than loggerheads and are generally found in waters between the northern and southern 20°C isotherms (Hirth 1971). Green turtle nesting in the U.S. occurs mainly on the Atlantic coast of Florida (Ehrhart 1979). More extensive nesting occurs on more southern beaches of the western Atlantic.

Green turtles are herbivorous as juveniles and adults, feeding mainly on Cymodocea, Thalassia, Zostera, Sagittaria, and Vallisneria (Babcock 1937; Underwood 1951; Carr 1954,1952; Neill 1958; Mexico 1966). Known feeding habitats in the U.S. include shallow lagoons and embayments in Florida. Similar inshore feeding areas may also occur, to a lesser extent, elsewhere along the Atlantic coast. Green turtles are occasionally encountered in pound nets as far north as the Long Island Sound in New York and strandings of green turtles have been reported as far north as Massachusetts.

Green turtles are subject to the same threats mentioned above for loggerheads.

Leatherback turtle (Dermochelys coriacea)

The leatherback turtle is found throughout the Atlantic, Pacific, Caribbean and Gulf of Mexico (Ernst and Barbour 1972). It nests on tropical beaches and migrates to temperate waters, north to Nova Scotia in the Western Atlantic, feeding primarily on jellyfish (Rebel 1974). While they are pelagically distributed throughout most of their range, leatherbacks have been observed inshore among northern species of jellyfish (Shoop et al. 1981). These observations are supported by stranding data, which document relatively few strandings of leatherbacks south of New Jersey (NMFS-SEFC STSSN database). They have been observed in embayments in the Northeast (Lazell, 1980), but are rarely seen in the Delaware Bay (Schoelkopf, pers comm 1990).

Kemp's ridley turtle (Lepidochelys kempi)

The Kemp's ridley is probably the most severely endangered species of sea turtle in the world. The only major nesting beach for ridleys is a single stretch of beach near Rancho Nuevo, Tamaulipas, Mexico (Carr 1963: Hildebrand 1963). Virtually the entire world population of adult females nests annually in this single location (Pritchard 1969). The total number of adults in 1988 was estimated to be 1,580 to 1,750 individuals (Marquez, 1990).

While adult Kemp's ridleys may occur almost exclusively in the Gulf of Mexico, a significant number of hatchlings may be transported north along the Atlantic coast of the U.S. Pritchard and Marquez (1973) speculate that these young turtles feed and grow rapidly during passive transportation until they are large enough to actively swim into embayments as far north as New England. These embayments apparently serve as important foraging habitats for single year classes of ridleys. Morreale et al. (1989) reported increases in weight of over 500 grams per month for juvenile ridleys tracked in the Long Island Sound. Reported prey includes benthic crustaceans (such as Polyonchus, Hepatus, Callinectes, Panopeus, Ovalipes, Calappa, Portunus, Araneus) fish (Lutjanus, Leiostomus) and mollusks (Noculana, Corbula, Mulinia, Nassarius) (Dobie et al. 1961; Pritchard and Marquez 1973). All of these genera are common along the eastern coast of the United States.

The Crouse et al. 1987 paper mentioned above illustrating the importance of subadults to the stability of loggerhead populations may have important implications for Kemp's ridleys. The vast majority of ridleys identified along the Atlantic Coast of the U.S. have been juveniles and subadults. Sources of

mortality in this area include incidental take in fishing gear, pollution and marine habitat degradation, and other man-induced and natural causes. Loss of animals in the Atlantic, then, may be impeding the recovery of this population.

Shortnose sturgeon (Acipenser brevirostrum)

Shortnose sturgeon occur in many rivers, estuaries, and occasionally at sea along the east coast of North America from the Saint John River, New Brunswick, Canada (Leim and Day 1959), to the Indian River, Florida (Evermann and Bean 1898). This anadromous species migrates upriver to spawn in the spring and returns downstream in the fall (Dadswell et al. 1984). In the Delaware River system, shortnose sturgeon are found from Salem (north of Artificial Island) north to Lambertville (Hastings et al. 1987). Spawning apparently occurs north of Trenton. Larval shortnose sturgeon are believed to drift down river and settle near Duck Island (Hastings 1983). The April 1980 Biological Opinion given by the NMFS regarding potential impacts of the Generating Stations to shortnose sturgeon stated that the NMFS agreed with the NRC/EPA assessment that entrainable size shortnose sturgeon were not present in the Artificial Island area. No information to the contrary has been collected since that time.

Project Area:

The Salem and Hope Creek Generating Stations are located on the southern end of Artificial Island, New Jersey, on the eastern shore of the Delaware River Estuary, about 30 miles south of Philadelphia. Artificial Island is actually a peninsula created from a natural sand bar in the early 1900's by the Army Corps of Engineers. The tidal river in this area narrows upstream of Artificial Island and turns nearly 60 degrees. Most of the river in this area is less than 18 feet deep. Deeper parts include the navigation channel that extends from the mouth of the bay to Trenton, New Jersey and has depths of up to 40 feet near Artificial Island.

Maintenance dredging of the navigation channel occurs periodically. No bucket dredging is allowed from March through June. There are no seasonal restrictions for hydraulic dredging. Sea turtles should be able to avoid dredge activity in this area, and turbidity caused by hydraulic dredging is low and should not disrupt prey species in the area.

Assessment of Impacts:

This assessment is based on a review of the Biological Assessment prepared by the PSE&G in June 1989 and other pertinent information submitted by the NRC and the PSE&G.

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Maintenance dredging of the navigation channel occurs periodically. No bucket dredging is allowed from March through June. There are no seasonal restrictions for hydraulic dredging. Sea turtles should be able to avoid dredge activity in this area, and turbidity caused by hydraulic dredging is low and should not disrupt prey species in the area.

Assessment of Impacts:

This assessment is based on a review of the Biological Assessment prepared by the PSE&G in June 1989 and other pertinent information submitted by the NRC and the PSE&G.

Hope Creek Generating Station

Continued operation of the Hope Creek Generating Station is not expected to impact sea turtles. There have been no sea turtle impingements documented at that site since it began operating in February of 1986. Although consideration of the operation of this station will be included in the incidental take statement, we feel that continued operation of this Station is not likely to adversely affect any listed species.

Environmental Sampling, Incidental Catch

Three loggerhead turtles and one green turtle have been encountered in trawl surveys conducted during Station-related environmental sampling (see Table 1). Bottom trawls, midwater trawls and surface trawls were conducted for 10 to 15 minute intervals, insufficient time to cause the mortality of a turtle. All of the turtles captured during sampling were released unharmed. One shortnose sturgeon was also taken during Station-related sampling. This sampling procedure is not likely to adversely affect any listed species. Any takes that occur during station related sampling will be considered and included within the incidental take statement.

Salem Generating Station Circulating Water System

There have been 42 impingements of sea turtles at the Salem Generating Station Circulating Water System (CWS) intake screen between 1979 and October, 1990. These include 15 Kemp's ridley and 27 loggerhead turtles (see Tables 2 and 3).

Although we believe that the best scientific and commercial data available was used in the Biological Assessment, some of the observations are not sufficiently conservative in their acknowledgement of the significance of each "take" of listed species. Assessments of the number of turtles taken do not include live turtles that were apparently dead before their impingement. Live turtles should be considered potential mortalities, and therefore included for the determination of gross estimates. The possibility that the Salem Generating Station is attracting turtles to the area is sufficient to include turtles that have been dead for some time before impingement in these assessments of take. Comparison of these numbers to total population sizes is not possible due to the tentative nature of existing population estimates.

Re-evaluation of the occurrences of impingement of Kemp's ridleys between 1979 and October, 1990, indicates that a total of fifteen ridleys have been taken in association with the operations of the Salem Generating Station in twelve years (Table 2). Zero to three ridleys were taken per year (Figure 1), with a mean of

1.25. Eight of these ridleys were dead upon discovery or died of injuries related to the impingement, ranging from zero to two per year with a mean of .7 mortalities per year.

A total of twenty-seven loggerheads were encountered in association with the Salem Generating Station intake structure between 1979 and 1990 (Table 3) and five loggerheads were encountered during activities associated with the Station (Table 1). Zero to eight loggerheads were taken each year (Figure 1), with a mean of 2.6 turtles per year. Twenty-one of these turtles were dead upon discovery, ranging from zero to six per year and with a mean of 1.75 mortalities per year.

The fluctuation seen in number of sea turtle encounters per year (Figure 1) is consistent with observations of sea turtle distribution in the inshore waters and bays of the Atlantic. Impingements and other encounters have been documented and submitted to the NMFS since 1979 and have ranged from zero (1990) to ten (1988) takes per year with a mean of 4.

All of the sea turtles reported were juvenile or subadults according to their documented sizes. All dead turtles that were necropsied were reported as females, except for one male loggerhead. Identification of the sex of immature turtles is very difficult without training by a qualified turtle anatomist and it is probable some of these results are incorrect. Misidentification of the sex of juvenile Kemp's ridleys occurred in the Long Island Sound during a large cold-stunning mortality in the winter 1985-86. The fairly undifferentiated gonads were determined to be ovaries. Observations after training and experience gained since that time reveal a sex ratio more consistent with that seen elsewhere (Morreale, pers comm. 1990). The loss of female sea turtles of any age group is disturbing, though, and should not be downplayed.

Crouse et al. (1987) indicated that the stability of loggerhead populations may be more sensitive to changes in the status of subadults than in other developmental stages. It is generally believed that similar results will be found when the model is applied to the Kemp's ridley population. Cumulative stresses on the subadult sea turtles in the Atlantic, then, may be impeding the recovery of this population.

There are a number of possible reasons for sea turtle impingement at the Salem Generating Station. The design velocity for water approaching the CWS intake averages 1 foot per second. The distance from the intake cells for which this velocity is estimated is not given, but if the design velocity in the water line is 1.7 ft per second (about one knot), this should be the velocity at the face of the intake. Information on changes in production rates and corresponding changes in actual intake

velocity was not given in the Biological Assessment. The design velocity, though, is significantly less then the velocity of local currents within the estuary that may reach speeds of 3.3 to 4.3 feet per second. Sea turtles tracked in the Long Island Sound area seem to take advantage of currents when traveling, but have been observed swimming against currents stronger then these (Morreale, pers. comm. 1990).

Passive drifting and the resultant susceptibility to impingement may occur at night, when sea turtles are less active, but this is not supported by the reported times of discovery of impinged turtles. While many of these times coincide with shift changes, early morning recoveries were no more common than turtle recoveries at other times of the day.

It is possible that the Salem Generating Station attracts sea turtles to the area of the CWS intake screen. Information on stomach contents of impinged sea turtles recovered at this site indicate that many were actively feeding on blue crabs and other common prey species prior to their death. The warm water discharge upstream of the CWS may increase the distribution of prey species to the area. The water depth in this area is 7.6 to 9 meters. Work conducted in the Long Island Sound indicates that Kemp's ridleys commonly feed at about 8 meters. Dead fish and other material dumped from the Station's trash racks could also provide food for the turtles, or attract scavenging prey species. Benthic surveys establishing prey density and distribution at various sites in the bay may clarify the existence of attractions for invertebrates to this site.

Little is known about the distribution of sea turtles in the Delaware Bay. Few strandings are reported in the Bay, but more may occur unnoticed or unreported. The Bay provides habitat similar to that used by large numbers of turtles in Chesapeake Bay and Long Island Sound. Information on turtle distribution throughout Delaware Bay is needed before the degree of attraction of the Salem Station can be determined.

Concern that the warm-water discharge may keep sea turtles in the area until surrounding waters are too cold for their safe departure is not supported by any existing data. Cold-stunning, the comatose condition of sea turtles subjected to water temperatures lower than 8°C, is common in Atlantic embayments (Meylan 1986; Ehrhart 1983). In New York waters, this occurs sometime around mid November (STSSN database, NMFS-SEFC). No impingements at the Salem Generating Station have been reported later then September, indicating that sea turtles leave this area before cold-stunning would occur. The thermal plume studies described in the Biological Assessment do not affect this finding. These studies appear to be based on a two day overflight in June of 1982. No information is supplied for other seasons or other operating conditions.

Cumulative Effects:

Cumulative impacts from unrelated, non-federal actions occurring in the Delaware Bay may affect protected species and their habitats. The STSSN data show that turtles die of various natural causes, including cold stunning, as well as from other human activities, such as incidental capture in fisheries, ingestion of or entanglement in debris, boat hits, and degradation of nesting habitat. The cause of death of most turtles recovered by the STSSN is unknown.

Conclusion:

The continued operation of the Hope Creek Generating Station is not likely to affect any endangered or threatened species. The continued operation of the Salem Generating Station is not likely to jeopardize the continued existence of any listed species. The following factors form the basis for this conclusion:

Based upon our review of the information available on the biology and ecology of the endangered and threatened species in the North Atlantic affected by the continued operation of the Hope Creek and Salem Generating Stations, NMFS concludes that this continued operation of these stations are not likely to jeopardize the continued existence of the species listed above or result in destruction or adverse modification of their habitat. The following factors form the basis for this conclusion:

(1) The maximum observed annual mortality levels, documented since 1979, are two ridleys (mean = .7) and six loggerheads (mean = 1.75). The mortality of any Kemp's ridley is significant but mortalities of less than two juvenile ridleys per year is conservative and consistent with takes allowed in similar operations elsewhere.

(2) The continued operation of the Hope Creek and Salem Generating Stations at existing levels is not expected to increase the observed mortality levels.

(3) Increased monitoring of the intake screen and consistent use of resuscitation techniques may decrease the observed mortality level.

Reinitiation of Consultation:

Reinitiation of formal consultation is required if: (1) the amount or extent of taking specified in the incidental take statement (Attachment 1) is exceeded, (2) new information reveals effects of the action that may affect listed species or critical habitat (when designated) in a manner or to an extent not previously considered, (3) the identified action is subsequently modified in a manner that causes an effect to listed species or critical habitat that was not considered in the Biological Opinion, or (4) a new species is listed or critical habitat designated that may be affected by the identified action.

TABLE 1: Sea Turtle Incidents Related to
Salem Generating Station Activities
1979 Through September 1990

DATE	SPECIES	STATUS	COMMENTS
23 Aug 79	C. caretta	Live/Released	Caught during bottom trawl sampling
11 Aug 80	C. mydas	Live/Released	Caught during bottom trawl sampling
02 Sep 80	C. caretta	Live/Released	Caught during bottom trawl sampling
30 Jun 81	C. caretta	Dead	Seen floating
15 Jun 87	C. caretta	Live/Released	Caught during bottom trawl sampling
14 Oct 87	C. caretta	Dead on beach	Found on Artificial Island. Decomposed

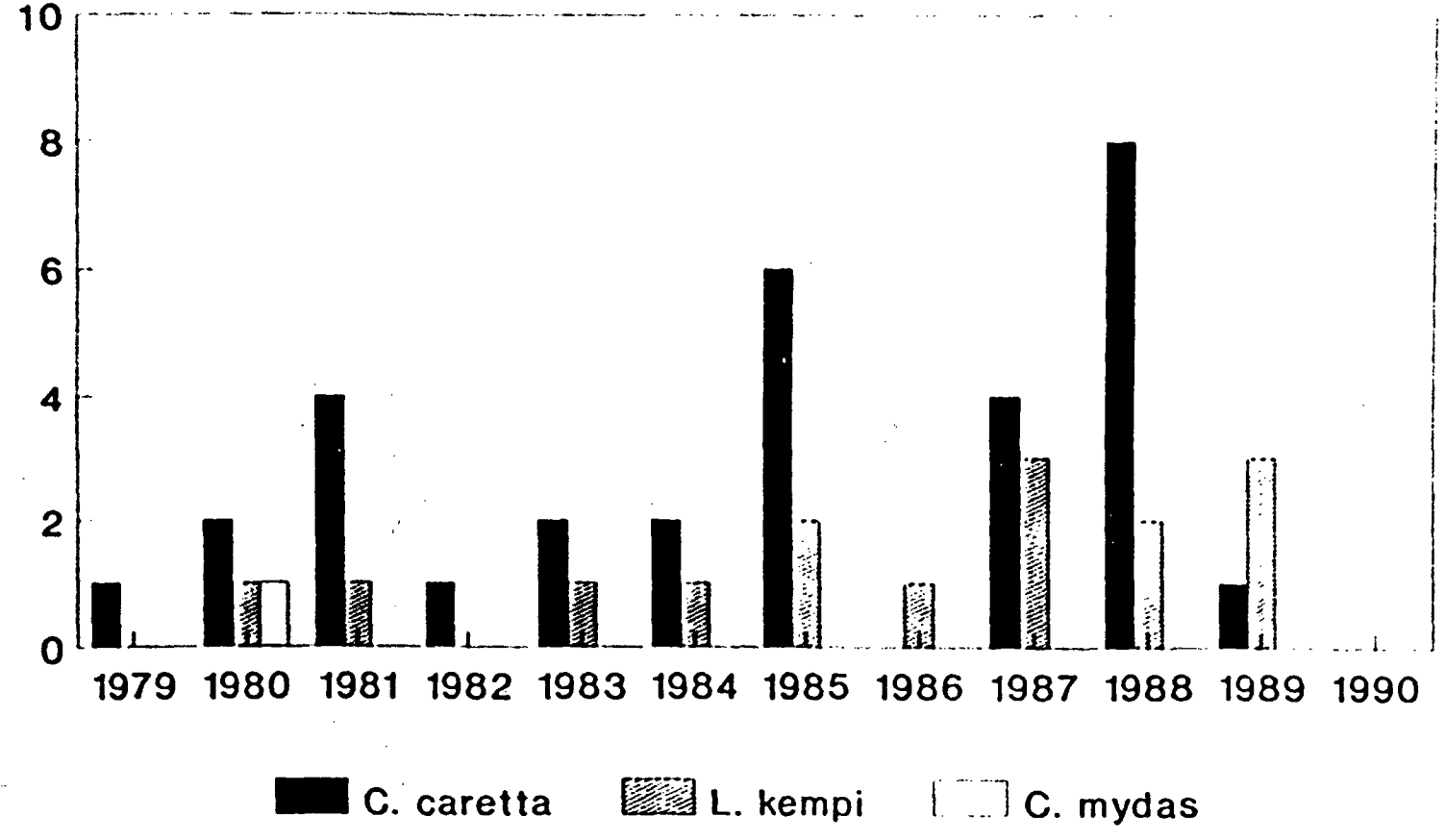
TABLE 2: *Lepidochelys kempi* Impingements
Salem Generating Station
1979 Through September 1990

DATE	STATUS	COMMENTS
11 Aug 80	Live/Released	
23 Sep 81	Dead	Apparent boat hit
13 Jul 83	Dead	Reported as female
29 Aug 84	Live/Released	Measurements indicate may be a Green turtle
11 Jun 85	Live/Released	
24 Jun 85	Dead	Reported as female
05 Jul 86	Dead	Decomposition reported
24 Sep 87	Live/Died	Reported as female
24 Sep 87	Dead	
29 Sep 87	Live/Released	To Florida for release
05 Jul 88	Live/Released	
27 Jul 88	Dead	Reported as female
30 Aug 89	Live/Released	
06 Sep 89	Dead	Reported as female
23 Sep 89	Live/Released	

TABLE 3: Caretta caretta Impingements
Salem Generating Station
1979 Through September 1990

DATE	STATUS	COMMENTS
11 Jul 80	Dead	Apparent boat hit
03 Sep 81	Live/Released	
08 Sep 81	Dead	Reported as female
14 Sep 81	Dead	Decomposition reported
10 Jul 82	Dead	Decomposition reported
11 Jul 83	Dead	Decomposition reported
19 Jul 83	Dead	Decomposition reported
02 Jul 84	Dead	Decomposed. Impinged at discharge
03 Jul 84	Dead	Apparent boat hit
08 Jun 85	Dead	Reported as female. Apparent boat hit
15 Jul 85	Dead	Reported as female
05 Aug 85	Dead	Reported as female
07 Aug 85	Dead	Reported as female
10 Aug 85	Live/Released	
30 Sep 85	Live/Released	
14 Jul 87	Live/Released	
16 Jul 87	Live/Released	
20 Jul 87	Live/Released	
05 Jul 88	Live/Released	
09 Jul 88	Live/Released	
12 Jul 88	Dead	Reported as female. Apparent boat hit
12 Jul 88	Dead	Reported as female
12 Jul 88	Dead	Reported as female
12 Jul 88	Dead	Reported as female
15 Jul 88	Dead	Reported as female
15 Jul 88	Dead	Reported as male
01 Jul 89	Live/Released	

Sea Turtle Incidents, 1979-1990
Associated with Salem Generating Station



n = 47

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Attachment 1

Incidental Take Statement:

Section 7 (b)(4) of the ESA requires that when an agency action is found to comply with Section 7 (a)(2), NMFS will issue a statement specifying the impact of incidental taking of endangered species, provide reasonable and prudent measures necessary to minimize impacts, and set forth the terms and conditions with which the action agency must comply to implement the reasonable and prudent measures.

The 1980 Biological Opinion on the impact of the Salem Nuclear Generating Station and the Hope Creek Nuclear Generating Station on shortnose sturgeon theorized that potential take levels for shortnose sturgeon would be 0 to 11 takes per year. It was determined that this level would not jeopardize that population. Since no takes of shortnose sturgeon have been reported since that consultation, the NMFS has set a cumulative incidental take level for shortnose sturgeon at two takes per year provided the applicable reasonable and prudent measures listed below are met.

The significance of each Kemp's ridley and green turtle mortality was considered in determining an allowable incidental take. A take limit of 5 Kemp's ridleys and 5 green turtles per year with up to 2 mortalities (1 Kemp's ridley and 1 green), and 10 loggerheads with up to 5 mortalities is allowed provided the following reasonable and prudent measures are met:

1) Inspect the Salem Station water intake trash bars at least once every two hours from June 1 through September 30.

2) Inspect the Hope Creek intake screen once per day from June 1 to September 30.

3) Clean intake water trash bars at least twice per day at the Salem Station and once per day a Hope Creek from June 1 through September 30.

4) Make use of dip nets and other equipment whenever possible to remove smaller sea turtles from intake water trash racks to reduce trauma caused by the existing cleaning mechanism.

5) Implement the sea turtle resuscitation procedures for comatose turtles described in Appendix I. These procedures and related materials shall be posted in appropriate areas such as the fish pool buildings and the circulating water intake operators office.

(6) The monitoring and reporting system established in 1981 and modified in Appendix II should be continued. Information in Appendix III will assist in identification of species impinged. These reports should be sent to the NMFS, NER within 30 days of any incidental take.

Attachment 2

Conservation Recommendations:

The following conservation recommendations are suggested:

1) In conjunction with the NMFS, develop a program to determine the attraction factors of the Salem circulating water intake structure to sea turtles. This program should include distribution surveys for sea turtles in the Bay, stomach content analyses of all dead impinged turtles, and benthic surveys to provide information on prey distribution.

2) Examine the necessity for supplemental lighting for use during night inspections of water intake trash bars to assist in noting impinged sea turtles.

3) Examine the feasibility of modifying the current trash rack cleaning mechanism to reduce the trauma of removal to impinged sea turtles.

4) Examine the necessity of installing a barrier, to retain debris, and sea turtles, floating on the surface of the water intake channel to the Salem generating station

5) Meet with the NMFS annually to review incidental takes, assess the status of sea turtles in the Delaware Bay and to reconsider these recommendations accordingly.

Appendix I - **Handling and Resuscitation Procedures**

Handling:

Do not assume an inactive turtle is dead. Pressing the soft tissue around the nose of a sea turtle may result in an eye reflex in a comatose turtle. The onset of rigor mortis is often the only definite indication that a turtle is dead.

Keep clear of the head.

Adult male sea turtles of all species other than leatherbacks have claws on their foreflippers. Keep clear of slashing foreflippers.

Pick up sea turtles by the front and back of the top shell (carapace). Do not pick up sea turtles by flippers, the head or the tail.

Resuscitation Procedures:

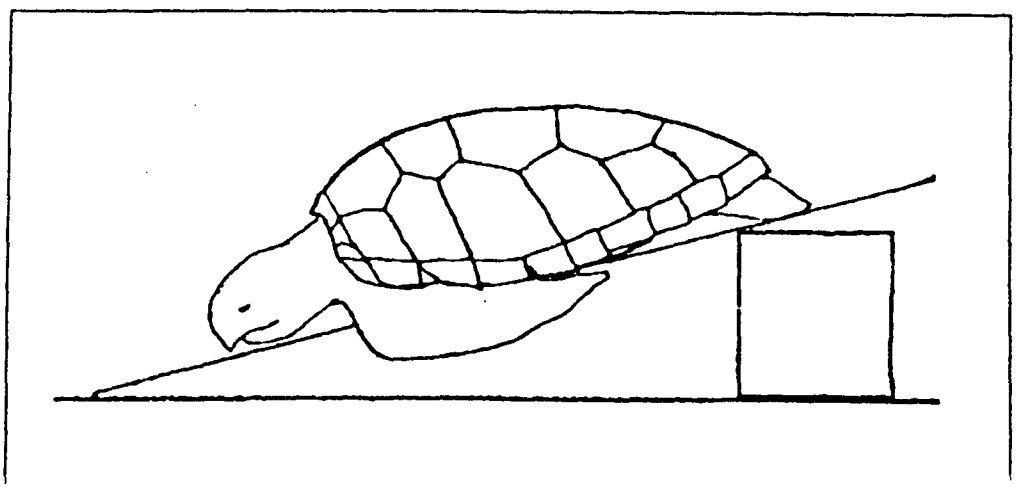
If a turtle appears to be comatose (unconscious), attempts should be made to revive it immediately. These procedures are designed to void the turtles' lungs of water by active pumping and passive drainage. Sea turtles have been known to revive up to 24 hours after these procedures have been followed:

1) Place the turtle on its back and gently pump the breastplate. This may stimulate the animal to breathe and allow water to drain.

2) Place the animal on its breastplate and raise the hindquarters. The degree of elevation depends on the size of the turtle; greater elevations are required for larger turtles.

4) Keep the turtle shaded and moist and observe for 24 hours.

5) When the turtle has revived, release in a manner that minimizes the chances of reimpingement.



Appendix I (cont.) - **Handling and Resuscitation Procedures**

Special Instructions for Cold-Stunned Turtles:

Comatose turtles found in water less than 10°C are probably "cold-stunned". This is most common in the fall and early winter. If a turtle appears to be cold-stunned, the following applies:

To increase blood flow, flap the flippers and rub the skin. Gradually, (over a period of six hours) move the turtle to a warmer area.

If possible, place the animal in a few inches of water that is warmer then the ocean. Do not cover the mouth or nostrils with water. It is not imperative that sea turtles be kept in water.

Dead sea turtles should be retained for necropsy.

APPENDIX II - **Reporting Requirements**:

Photographs should be taken and the information requested below should be collected in association with all protected species (sea turtles and shortnose sturgeon) impingements. This documentation should be sent to the National Marine Fisheries Service, Habitat Conservation Branch
One Blackburn Drive, Gloucester, MA 01930-2298

Protected Species Impingements, Salem and Hope Creek Generating Stations

Observer's full name:_____

Reporters full name:_____

Species Identification (key attached):_____

Site of impingement: _____

Date and time impingement was observed:_____

Date and time animal was collected:_____

Tidal stage at time of observation:_____

Date and time of last observation of screen:_____

Water temperature at site and time of impingement:_____

Intake velocity at site and time of impingement (ft/sec):_____

Average percent of power generating capacity achieved per unit over the 48 hrs previous to impingement:_____

Condition of animal:_____

Sea Turtle Measurements (indicate cm or in):
Carapace length: Curved:_____Straight:_____

Carapace width: Curved:_____Straight:_____

Tag number and location, if tagged:_____

Remarks: _____

_____

_____

_____

Results of necropsy (include stomach contents): _____

_____

_____

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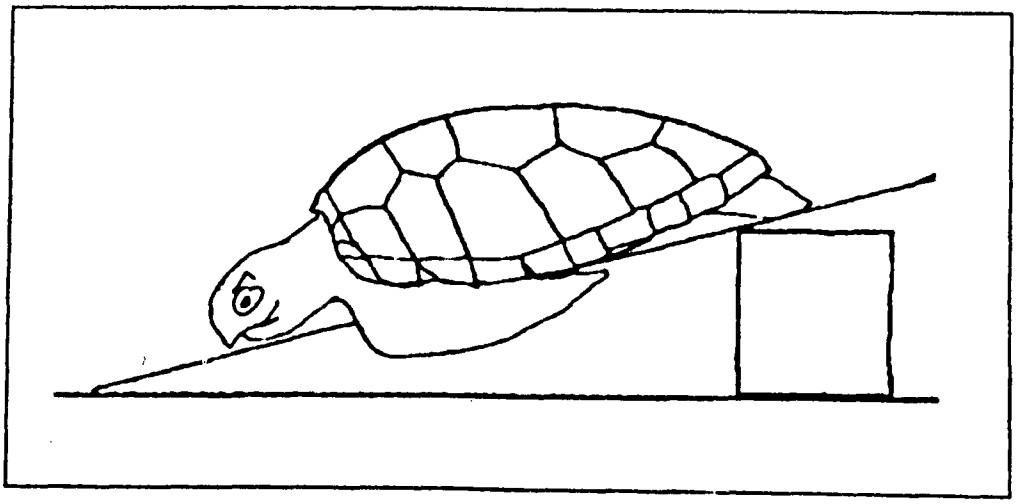
4) Keep the turtle shaded and moist and observe for 24 hours.

5) When the turtle has revived, release in a manner that minimizes the chances of reimpingement.



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Site of impingement: _____

Date and time impingement was observed:_____

Date and time animal was collected:_____

Tidal stage at time of observation:_____

Date and time of last observation of screen:_____

Water temperature at site and time of impingement:_____

Intake velocity at site and time of impingement (ft/sec):_____

Average percent of power generating capacity achieved per unit over the 48 hrs previous to impingement:_____

Condition of animal:_____

Sea Turtle Measurements (indicate cm or in):
Carapace length: Curved:_____Straight:_____

Carapace width: Curved:_____Straight:_____

Tag number and location, if tagged:_____

Remarks: _____

_____

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Results of necropsy (include stomach contents): _____

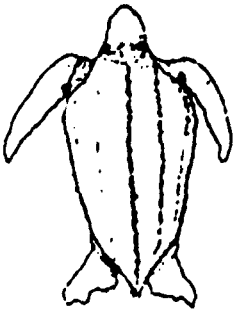
_____

_____

APPENDIX III **Identification Materials**

SEA TURTLES

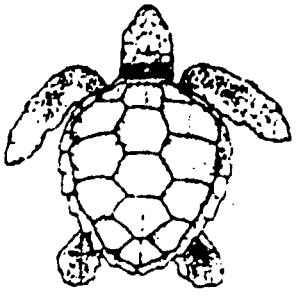
LBST



Leatherback -

Found in open water throughout the Northeast from spring through fall. Leathery shell with 5-7 ridges along the back. Largest sea turtle (4-6 feet) Dark green to black, may have white spots on flippers and underside.

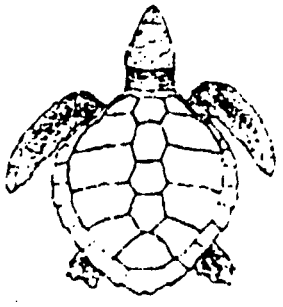
LGST



Loggerhead

Bony shell, reddish-brown in color. Mid-sized sea turtle (2-4 feet). Commonly seen from Cape Cod to Hatteras from spring through fall, especially in southern portion of range. Head large in relation to body.

RST



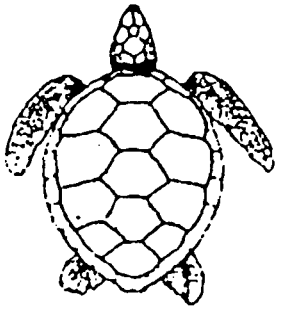
Kemp's ridley

Most often found in bays and coastal waters from Cape Cod to Hatteras from summer through fall. Offshore occurrence undetermined. Bony shell, olive green to grey in color. Smallest sea turtle in Northeast (9-24 inches). Width equal to or greater than length.

APPENDIX III (cont.) Identification Materials

SEA TURTLES

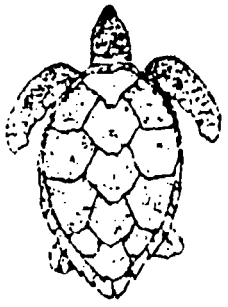
GST



Green turtle

Uncommon in the Northeast. Occur in bays and coastal waters from Cape Cod to Hatteras in summer. Bony shell, variably colored; usually dark brown with lighter stripes and spots. Small to mid-sized sea turtle (1-3 feet). Head small in comparison to body size.

HST

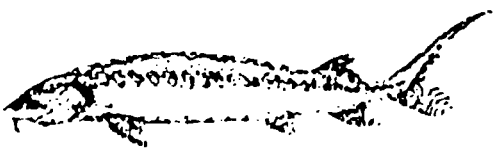


Hawksbill

Rarely seen in Northeast. Elongate bony shell with overlapping scales. Color variable, usually dark brown with yellow streaks and spots (tortoise-shell). Small to mid-sized sea turtle (1-3 feet). Head relatively small, neck long.

FISH

SNS



Shortnose sturgeon

Occur in the major river systems along the Atlantic seaboard. Found offshore only within a few miles of land. Shortnose have a wide mouth, short snout, and are brownish to black in color, with bony plates along the sides of the body Rarely reach 4 feet.

Hope Creek Generating Station

Continued operation of the Hope Creek Generating Station is not expected to impact sea turtles. There have been no sea turtle impingements documented at that site since it began operating in February of 1986. Although consideration of the operation of this station will be included in the incidental take statement, we feel that continued operation of this Station is not likely to adversely affect any listed species.

Environmental Sampling, Incidental Catch

Three loggerhead turtles and one green turtle have been encountered in trawl surveys conducted during Station-related environmental sampling (see Table 1). Bottom trawls, midwater trawls and surface trawls were conducted for 10 to 15 minute intervals, insufficient time to cause the mortality of a turtle. All of the turtles captured during sampling were released unharmed. One shortnose sturgeon was also taken during Station-related sampling. This sampling procedure is not likely to adversely affect any listed species. Any takes that occur during station related sampling will be considered and included within the incidental take statement.

Salem Generating Station Circulating Water System

There have been 42 impingements of sea turtles at the Salem Generating Station Circulating Water System (CWS) intake screen between 1979 and October, 1990. These include 15 Kemp's ridley and 27 loggerhead turtles (see Tables 2 and 3).

Although we believe that the best scientific and commercial data available was used in the Biological Assessment, some of the observations are not sufficiently conservative in their acknowledgement of the significance of each "take" of listed species. Assessments of the number of turtles taken do not include live turtles that were apparently dead before their impingement. Live turtles should be considered potential mortalities, and therefore included for the determination of gross estimates. The possibility that the Salem Generating Station is attracting turtles to the area is sufficient to include turtles that have been dead for some time before impingement in these assessments of take. Comparison of these numbers to total population sizes is not possible due to the tentative nature of existing population estimates.

Re-evaluation of the occurrences of impingement of Kemp's ridleys between 1979 and October, 1990, indicates that a total of fifteen ridleys have been taken in association with the operations of the Salem Generating Station in twelve years (Table 2). Zero to three ridleys were taken per year (Figure 1), with a mean of

1.25. Eight of these ridleys were dead upon discovery or died of injuries related to the impingement, ranging from zero to two per year with a mean of .7 mortalities per year.

A total of twenty-seven loggerheads were encountered in association with the Salem Generating Station intake structure between 1979 and 1990 (Table 3) and five loggerheads were encountered during activities associated with the Station (Table 1). Zero to eight loggerheads were taken each year (Figure 1), with a mean of 2.6 turtles per year. Twenty-one of these turtles were dead upon discovery, ranging from zero to six per year and with a mean of 1.75 mortalities per year.

The fluctuation seen in number of sea turtle encounters per year (Figure 1) is consistent with observations of sea turtle distribution in the inshore waters and bays of the Atlantic. Impingements and other encounters have been documented and submitted to the NMFS since 1979 and have ranged from zero (1990) to ten (1988) takes per year with a mean of 4.

All of the sea turtles reported were juvenile or subadults according to their documented sizes. All dead turtles that were necropsied were reported as females, except for one male loggerhead. Identification of the sex of immature turtles is very difficult without training by a qualified turtle anatomist and it is probable some of these results are incorrect. Misidentification of the sex of juvenile Kemp's ridleys occurred in the Long Island Sound during a large cold-stunning mortality in the winter 1985-86. The fairly undifferentiated gonads were determined to be ovaries. Observations after training and experience gained since that time reveal a sex ratio more consistent with that seen elsewhere (Morreale, pers comm. 1990). The loss of female sea turtles of any age group is disturbing, though, and should not be downplayed.

Crouse et al. (1987) indicated that the stability of loggerhead populations may be more sensitive to changes in the status of subadults than in other developmental stages. It is generally believed that similar results will be found when the model is applied to the Kemp's ridley population. Cumulative stresses on the subadult sea turtles in the Atlantic, then, may be impeding the recovery of this population.

There are a number of possible reasons for sea turtle impingement at the Salem Generating Station. The design velocity for water approaching the CWS intake averages 1 foot per second. The distance from the intake cells for which this velocity is estimated is not given, but if the design velocity in the water line is 1.7 ft per second (about one knot), this should be the velocity at the face of the intake. Information on changes in production rates and corresponding changes in actual intake

velocity was not given in the Biological Assessment. The design velocity, though, is significantly less then the velocity of local currents within the estuary that may reach speeds of 3.3 to 4.3 feet per second. Sea turtles tracked in the Long Island Sound area seem to take advantage of currents when traveling, but have been observed swimming against currents stronger then these (Morreale, pers. comm. 1990).

Passive drifting and the resultant susceptibility to impingement may occur at night, when sea turtles are less active, but this is not supported by the reported times of discovery of impinged turtles. While many of these times coincide with shift changes, early morning recoveries were no more common than turtle recoveries at other times of the day.

It is possible that the Salem Generating Station attracts sea turtles to the area of the CWS intake screen. Information on stomach contents of impinged sea turtles recovered at this site indicate that many were actively feeding on blue crabs and other common prey species prior to their death. The warm water discharge upstream of the CWS may increase the distribution of prey species to the area. The water depth in this area is 7.6 to 9 meters. Work conducted in the Long Island Sound indicates that Kemp's ridleys commonly feed at about 8 meters. Dead fish and other material dumped from the Station's trash racks could also provide food for the turtles, or attract scavenging prey species. Benthic surveys establishing prey density and distribution at various sites in the bay may clarify the existence of attractions for invertebrates to this site.

Little is known about the distribution of sea turtles in the Delaware Bay. Few strandings are reported in the Bay, but more may occur unnoticed or unreported. The Bay provides habitat similar to that used by large numbers of turtles in Chesapeake Bay and Long Island Sound. Information on turtle distribution throughout Delaware Bay is needed before the degree of attraction of the Salem Station can be determined.

Concern that the warm-water discharge may keep sea turtles in the area until surrounding waters are too cold for their safe departure is not supported by any existing data. Cold-stunning, the comatose condition of sea turtles subjected to water temperatures lower than 8°C, is common in Atlantic embayments (Meylan 1986; Ehrhart 1983). In New York waters, this occurs sometime around mid November (STSSN database, NMFS-SEFC). No impingements at the Salem Generating Station have been reported later then September, indicating that sea turtles leave this area before cold-stunning would occur. The thermal plume studies described in the Biological Assessment do not affect this finding. These studies appear to be based on a two day overflight in June of 1982. No information is supplied for other seasons or other operating conditions.

Cumulative Effects:

Cumulative impacts from unrelated, non-federal actions occurring in the Delaware Bay may affect protected species and their habitats. The STSSN data show that turtles die of various natural causes, including cold stunning, as well as from other human activities, such as incidental capture in fisheries, ingestion of or entanglement in debris, boat hits, and degradation of nesting habitat. The cause of death of most turtles recovered by the STSSN is unknown.

Conclusion:

The continued operation of the Hope Creek Generating Station is not likely to affect any endangered or threatened species. The continued operation of the Salem Generating Station is not likely to jeopardize the continued existence of any listed species. The following factors form the basis for this conclusion:

Based upon our review of the information available on the biology and ecology of the endangered and threatened species in the North Atlantic affected by the continued operation of the Hope Creek and Salem Generating Stations, NMFS concludes that this continued operation of these stations are not likely to jeopardize the continued existence of the species listed above or result in destruction or adverse modification of their habitat. The following factors form the basis for this conclusion:

(1) The maximum observed annual mortality levels, documented since 1979, are two ridleys (mean = .7) and six loggerheads (mean = 1.75). The mortality of any Kemp's ridley is significant but mortalities of less than two juvenile ridleys per year is conservative and consistent with takes allowed in similar operations elsewhere.

(2) The continued operation of the Hope Creek and Salem Generating Stations at existing levels is not expected to increase the observed mortality levels.

(3) Increased monitoring of the intake screen and consistent use of resuscitation techniques may decrease the observed mortality level.

Reinitiation of Consultation:

Reinitiation of formal consultation is required if: (1) the amount or extent of taking specified in the incidental take statement (Attachment 1) is exceeded, (2) new information reveals effects of the action that may affect listed species or critical habitat (when designated) in a manner or to an extent not previously considered, (3) the identified action is subsequently modified in a manner that causes an effect to listed species or critical habitat that was not considered in the Biological Opinion, or (4) a new species is listed or critical habitat designated that may be affected by the identified action.

TABLE 1: Sea Turtle Incidents Related to
Salem Generating Station Activities
1979 Through September 1990

DATE	SPECIES	STATUS	COMMENTS
23 Aug 79	C. caretta	Live/Released	Caught during bottom trawl sampling
11 Aug 80	C. mydas	Live/Released	Caught during bottom trawl sampling
02 Sep 80	C. caretta	Live/Released	Caught during bottom trawl sampling
30 Jun 81	C. caretta	Dead	Seen floating
15 Jun 87	C. caretta	Live/Released	Caught during bottom trawl sampling
14 Oct 87	C. caretta	Dead on beach	Found on Artificial Island. Decomposed

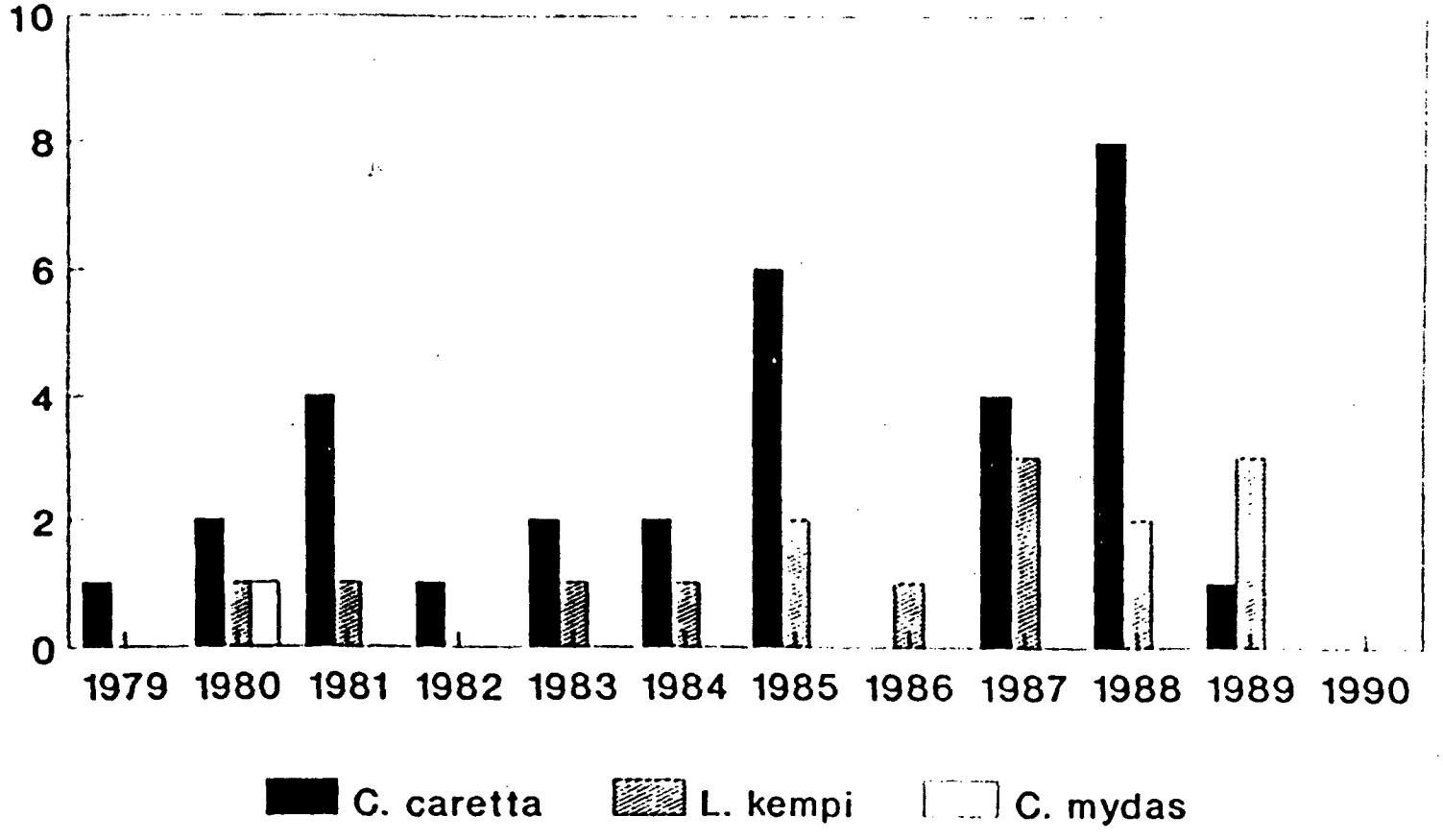
TABLE 2: *Lepidochelys kempi* Impingements
Salem Generating Station
1979 Through September 1990

DATE	STATUS	COMMENTS
11 Aug 80	Live/Released	
23 Sep 81	Dead	Apparent boat hit
13 Jul 83	Dead	Reported as female
29 Aug 84	Live/Released	Measurements indicate may be a Green turtle
11 Jun 85	Live/Released	
24 Jun 85	Dead	Reported as female
05 Jul 86	Dead	Decomposition reported
24 Sep 87	Live/Died	Reported as female
24 Sep 87	Dead	
29 Sep 87	Live/Released	To Florida for release
05 Jul 88	Live/Released	
27 Jul 88	Dead	Reported as female
30 Aug 89	Live/Released	
06 Sep 89	Dead	Reported as female
23 Sep 89	Live/Released	

TABLE 3: Caretta caretta Impingements
Salem Generating Station
1979 Through September 1990

DATE	STATUS	COMMENTS
11 Jul 80	Dead	Apparent boat hit
03 Sep 81	Live/Released	
08 Sep 81	Dead	Reported as female
14 Sep 81	Dead	Decomposition reported
10 Jul 82	Dead	Decomposition reported
11 Jul 83	Dead	Decomposition reported
19 Jul 83	Dead	Decomposition reported
02 Jul 84	Dead	Decomposed. Impinged at discharge
03 Jul 84	Dead	Apparent boat hit
08 Jun 85	Dead	Reported as female. Apparent boat hit
15 Jul 85	Dead	Reported as female
05 Aug 85	Dead	Reported as female
07 Aug 85	Dead	Reported as female
10 Aug 85	Live/Released	
30 Sep 85	Live/Released	
14 Jul 87	Live/Released	
16 Jul 87	Live/Released	
20 Jul 87	Live/Released	
05 Jul 88	Live/Released	
09 Jul 88	Live/Released	
12 Jul 88	Dead	Reported as female. Apparent boat hit
12 Jul 88	Dead	Reported as female
12 Jul 88	Dead	Reported as female
12 Jul 88	Dead	Reported as female
15 Jul 88	Dead	Reported as female
15 Jul 88	Dead	Reported as male
01 Jul 89	Live/Released	

Sea Turtle Incidents, 1979-1990
Associated with Salem Generating Station



n = 47

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Attachment 1

Incidental Take Statement:

Section 7 (b)(4) of the ESA requires that when an agency action is found to comply with Section 7 (a)(2), NMFS will issue a statement specifying the impact of incidental taking of endangered species, provide reasonable and prudent measures necessary to minimize impacts, and set forth the terms and conditions with which the action agency must comply to implement the reasonable and prudent measures.

The 1980 Biological Opinion on the impact of the Salem Nuclear Generating Station and the Hope Creek Nuclear Generating Station on shortnose sturgeon theorized that potential take levels for shortnose sturgeon would be 0 to 11 takes per year. It was determined that this level would not jeopardize that population. Since no takes of shortnose sturgeon have been reported since that consultation, the NMFS has set a cumulative incidental take level for shortnose sturgeon at two takes per year provided the applicable reasonable and prudent measures listed below are met.

The significance of each Kemp's ridley and green turtle mortality was considered in determining an allowable incidental take. A take limit of 5 Kemp's ridleys and 5 green turtles per year with up to 2 mortalities (1 Kemp's ridley and 1 green), and 10 loggerheads with up to 5 mortalities is allowed provided the following reasonable and prudent measures are met:

1) Inspect the Salem Station water intake trash bars at least once every two hours from June 1 through September 30.

2) Inspect the Hope Creek intake screen once per day from June 1 to September 30.

3) Clean intake water trash bars at least twice per day at the Salem Station and once per day a Hope Creek from June 1 through September 30.

4) Make use of dip nets and other equipment whenever possible to remove smaller sea turtles from intake water trash racks to reduce trauma caused by the existing cleaning mechanism.

5) Implement the sea turtle resuscitation procedures for comatose turtles described in Appendix I. These procedures and related materials shall be posted in appropriate areas such as the fish pool buildings and the circulating water intake operators office.

(6) The monitoring and reporting system established in 1981 and modified in Appendix II should be continued. Information in Appendix III will assist in identification of species impinged. These reports should be sent to the NMFS, NER within 30 days of any incidental take.

Attachment 2

Conservation Recommendations:

The following conservation recommendations are suggested:

1) In conjunction with the NMFS, develop a program to determine the attraction factors of the Salem circulating water intake structure to sea turtles. This program should include distribution surveys for sea turtles in the Bay, stomach content analyses of all dead impinged turtles, and benthic surveys to provide information on prey distribution.

2) Examine the necessity for supplemental lighting for use during night inspections of water intake trash bars to assist in noting impinged sea turtles.

3) Examine the feasibility of modifying the current trash rack cleaning mechanism to reduce the trauma of removal to impinged sea turtles.

4) Examine the necessity of installing a barrier, to retain debris, and sea turtles, floating on the surface of the water intake channel to the Salem generating station

5) Meet with the NMFS annually to review incidental takes, assess the status of sea turtles in the Delaware Bay and to reconsider these recommendations accordingly.

Appendix I - **Handling and Resuscitation Procedures**

Handling:

Do not assume an inactive turtle is dead. Pressing the soft tissue around the nose of a sea turtle may result in an eye reflex in a comatose turtle. The onset of rigor mortis is often the only definite indication that a turtle is dead.

Keep clear of the head.

Adult male sea turtles of all species other than leatherbacks have claws on their foreflippers. Keep clear of slashing foreflippers.

Pick up sea turtles by the front and back of the top shell (carapace). Do not pick up sea turtles by flippers, the head or the tail.

Resuscitation Procedures:

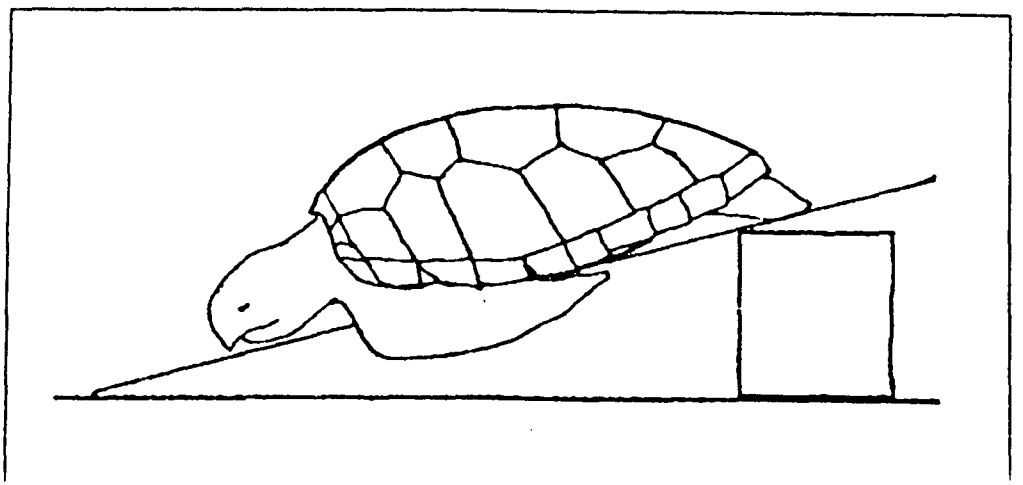
If a turtle appears to be comatose (unconscious), attempts should be made to revive it immediately. These procedures are designed to void the turtles' lungs of water by active pumping and passive drainage. Sea turtles have been known to revive up to 24 hours after these procedures have been followed:

1) Place the turtle on its back and gently pump the breastplate. This may stimulate the animal to breathe and allow water to drain.

2) Place the animal on its breastplate and raise the hindquarters. The degree of elevation depends on the size of the turtle; greater elevations are required for larger turtles.

4) Keep the turtle shaded and moist and observe for 24 hours.

5) When the turtle has revived, release in a manner that minimizes the chances of reimpingement.



Appendix I (cont.) - **Handling and Resuscitation Procedures**

Special Instructions for Cold-Stunned Turtles:

Comatose turtles found in water less than 10°C are probably "cold-stunned". This is most common in the fall and early winter. If a turtle appears to be cold-stunned, the following applies:

To increase blood flow, flap the flippers and rub the skin. Gradually, (over a period of six hours) move the turtle to a warmer area.

If possible, place the animal in a few inches of water that is warmer then the ocean. Do not cover the mouth or nostrils with water. It is not imperative that sea turtles be kept in water.

Dead sea turtles should be retained for necropsy.

APPENDIX II - **Reporting Requirements:**

Photographs should be taken and the information requested below should be collected in association with all protected species (sea turtles and shortnose sturgeon) impingements. This documentation should be sent to the National Marine Fisheries Service, Habitat Conservation Branch
One Blackburn Drive, Gloucester, MA 01930-2298

Protected Species Impingements, Salem and Hope Creek Generating Stations

Observer's full name:_____

Reporters full name:_____

Species Identification (key attached):_____

Site of impingement: _____

Date and time impingement was observed:_____

Date and time animal was collected:_____

Tidal stage at time of observation:_____

Date and time of last observation of screen:_____

Water temperature at site and time of impingement:_____

Intake velocity at site and time of impingement (ft/sec):_____

Average percent of power generating capacity achieved per unit over the 48 hrs previous to impingement:_____

Condition of animal:_____

Sea Turtle Measurements (indicate cm or in):
Carapace length: Curved:_____Straight:_____

Carapace width: Curved:_____Straight:_____

Tag number and location, if tagged:_____

Remarks: _____

_____

_____

_____

Results of necropsy (include stomach contents): _____

_____

_____

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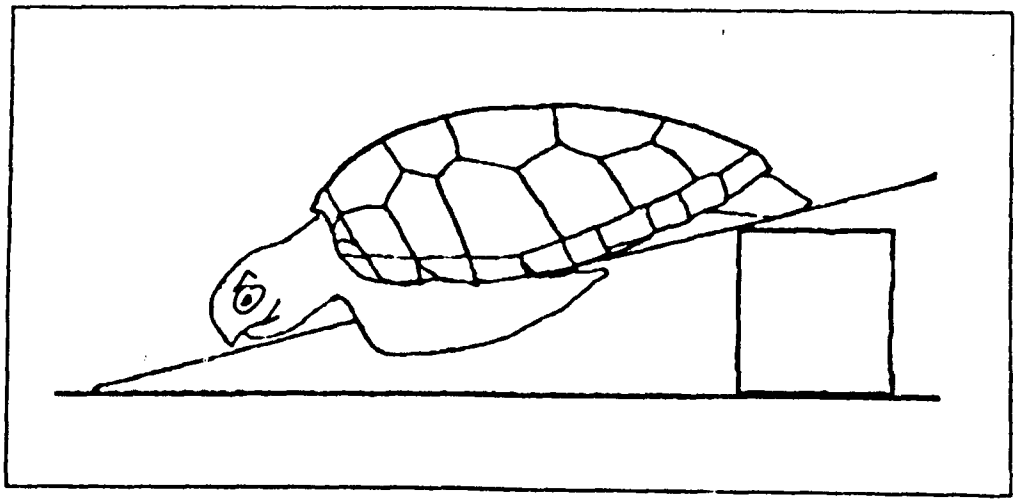

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Intake velocity at site and time of impingement (ft/sec): _____

Average percent of power generating capacity achieved per unit over the 48 hrs previous to impingement: _____

Condition of animal: _____

Sea Turtle Measurements (indicate cm or in):
Carapace length: Curved: _____ Straight: _____

Carapace width: Curved: _____ Straight: _____

Tag number and location, if tagged: _____

Remarks: _____

_____

_____

_____

Results of necropsy (include stomach contents): _____

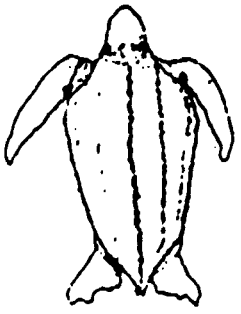
_____

_____

APPENDIX III **Identification Materials**

SEA TURTLES

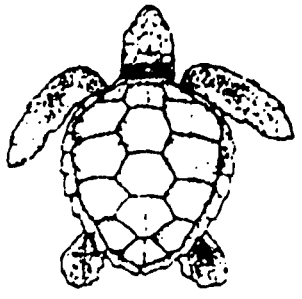
LBST



Leatherback -

Found in open water throughout the Northeast from spring through fall. Leathery shell with 5-7 ridges along the back. Largest sea turtle (4-6 feet) Dark green to black, may have white spots on flippers and underside.

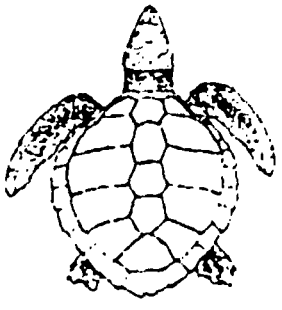
LGST



Loggerhead

Bony shell, reddish-brown in color. Mid-sized sea turtle (2-4 feet). Commonly seen from Cape Cod to Hatteras from spring through fall, especially in southern portion of range. Head large in relation to body.

RST



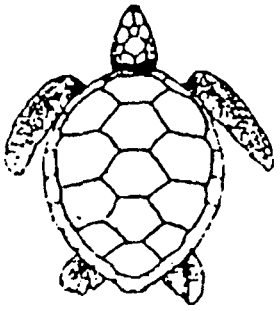
Kemp's ridley

Most often found in bays and coastal waters from Cape Cod to Hatteras from summer through fall. Offshore occurrence undetermined. Bony shell, olive green to grey in color. Smallest sea turtle in Northeast (9-24 inches). Width equal to or greater than length.

APPENDIX III (cont.) **Identification Materials**

SEA TURTLES

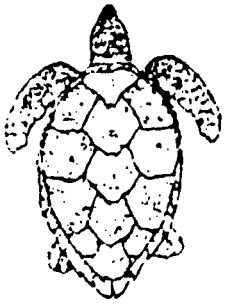
GST



Green turtle

Uncommon in the Northeast. Occur in bays and coastal waters from Cape Cod to Hatteras in summer. Bony shell, variably colored; usually dark brown with lighter stripes and spots. Small to mid-sized sea turtle (1-3 feet). Head small in comparison to body size.

HST

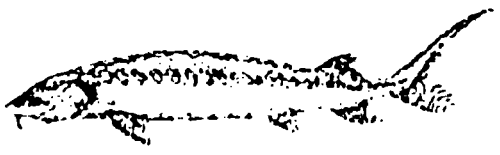


Hawksbill

Rarely seen in Northeast. Elongate bony shell with overlapping scales. Color variable, usually dark brown with yellow streaks and spots (tortoise-shell). Small to mid-sized sea turtle (1-3 feet). Head relatively small, neck long.

FISH

SNS



Shortnose sturgeon

Occur in the major river systems along the Atlantic seaboard. Found offshore only within a few miles of land. Shortnose have a wide mouth, short snout, and are brownish to black in color, with bony plates along the sides of the body Rarely reach 4 feet.