



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

AUG 04 1992

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

Dear Mr. Varga:

The Biological Opinion which concludes the reinitiated consultation begun in August 1991 pursuant to Section 7 of the Endangered Species Act of 1973, as amended, is enclosed. During the summer of 1991, 21 loggerhead, 1 Kemp's ridley, and 1 green sea turtle were incidentally captured at the Salem Circulating Generating System intake structure, exceeding the take allowed by the Incidental Take Statement issued in 1991. Requirements of the Take Statement were met, however, resulting in zero mortalities due to plant activities.

The attached Biological Opinion concluded that, due to the success of the monitoring program initiated to fulfill the incidental take requirements, continued operation of the Salem and Hope Creek Nuclear Generating Stations will not jeopardize the continued existence of endangered species of sea turtles or shortnose sturgeon. An annual incidental take allowance of 30 loggerhead turtles with up to 5 mortalities; 5 green turtles with up to 2 mortalities, and 5 Kemp's ridley sea turtles with up to 1 mortality is issued with this Biological Opinion. Sea turtles that are obviously dead prior to impingement will not be counted against this allowance.

Sincerely,

William W. Fox, Jr.
 William W. Fox, Jr.

Enclosure

THE ASSISTANT ADMINISTRATOR
 FOR FISHERIES



Endangered Species Act
Section 7 Consultation - Biological Opinion

Agency: Nuclear Regulatory Commission

Activity Considered: 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 Region

Date Issued: 8-4-92

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 Biological Opinion, issued in April 1980, concluded that operation of these plants would not jeopardize the continued existence of shortnose sturgeon.

Incidental captures of sea turtles at the Salem Nuclear Generating Station Circulating Water System (CWS) intake trash bars were documented by the Public Service Electric and Gas Company (PSE&G) and reported to NMFS according to reporting procedures established through an informal section 7(a) consultation conducted between PSE&G, NRC, NMFS, and the Environmental Protection Agency during October 1981. Consultation was reinitiated on August 19, 1988, to evaluate the affects of these takes on the species of sea turtles involved. A Biological Assessment was prepared by PSE&G and reviewed by NRC and received by NMFS in July 1989. On January 2, 1991, NMFS issued a Biological Opinion which found that the continued operation of the Salem and Hope Creek stations would affect sea turtles, but would not jeopardize the continued existence of any populations of threatened or endangered turtles. An incidental take statement was issued which allowed the take of 5 Kemp's ridley (Lepidochelys kempi) and 5 green sea turtles (Chelonia mydas) per year with up to 2 mortalities; 10 loggerhead sea turtles (Caretta caretta) with up to 5 mortalities and

2 shortnose sturgeon. This take level was authorized if associated monitoring and resuscitation procedures were followed.

Between June 5, 1991, and September 16, 1991, 25 sea turtles were recovered from the Salem plant CWS intake trash bars, including 23 loggerhead (21 individuals and 2 recaptures), 1 green and 1 Kemp's ridley sea turtle. One loggerhead turtle was recovered dead and 2 of the loggerhead turtles were recaptured. Additionally, 3 shortnose sturgeon were recovered dead between October 22 and November 6, 1991. Consultation was reinitiated in the summer of 1991 and PSE&G staff were asked to evaluate possible causes of the increase in take levels, especially to assess the possibility that changes in plant activities caused the increase in takes of listed species. This Biological Opinion considers the summary report submitted by PSE&G on January 31, 1992, as well as additional sources of new information.

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 stations have not changed since the issuance of the last Biological Opinion on January 2, 1991.

Listed Species Likely to Occur in the Project Area

Project activities are known to affect endangered green turtles, Kemp's ridleys and shortnose sturgeon and threatened loggerhead turtles. The previous Biological Opinions (NMFS, 1991, 1980) contained a complete description of species under the jurisdiction of the NMFS that may occur in the Delaware Bay area.

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 a peninsula created from a natural sand bar in the early 1900s by the U.S. 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.



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Assessment of Impacts

The Biological Opinion issued on January 2, 1991, contains a full assessment of impacts of the Salem and Hope Creek Generating Stations on endangered species occurring in the Delaware River off Artificial Island. This assessment considers past Opinions (NMFS 1991, 1980), incident reports submitted by PSE&G as required by the incidental take statement and the summary report submitted to NMFS on January 31, 1992.

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 takes documented at that site since operations began in February of 1986. Consideration of the continued operation of this station will be included in the conclusion and the incidental take statement.

Environmental Sampling and Observations

Three loggerhead turtles and one green turtle have been encountered in trawl surveys conducted during station-related environmental sampling between 1979 and 1991 (Table 1). Bottom trawls, midwater trawls, and surface trawls were conducted for 10 to 15 minute intervals and all of these turtles were released unharmed. One shortnose sturgeon was also taken during station-related sampling. Any takes that occur during station-related sampling will be considered and included within the incidental take statement.

In addition to direct takes, between 1979 and 1991 one decomposed loggerhead turtle was discovered at the Salem Generating Station discharge structure; one dead loggerhead turtle was seen floating and one loggerhead turtle was found dead on a beach on Artificial Island.

Salem Generating Station CWS

There have been a total of 70 incidental captures of sea turtles at the Salem Generating Station CWS intake trash bars between 1979 and October 1991 (Tables 2, 3, and 4). These include 1 green turtle, 19 Kemp's ridley, and 50 loggerhead turtles. Additionally, 6 shortnose sturgeon have been taken lethally at the intake structure (Table 5).

Green turtles

Green turtles occur regularly, though in low numbers, in the embayments of the Atlantic coast from Florida through Cape Cod, Massachusetts. Only two green turtles have been documented in association with PSE&G plant activities. A green turtle was taken at Salem Nuclear Generating Station CWS (SNGS CWS) intake trash bars and released alive in September 1991, and one was reported taken in a bottom trawl in 1980 and released alive. The identification of the first recorded take cannot be verified as no photographs were archived. Additionally, a sea turtle identified as a Kemp's ridley taken at SNGS CWS intake structure in 1984 had measurements consistent with those of a green turtle, but no photographs exist and this identification cannot be verified.

Kemp's ridley turtles

Nineteen Kemp's ridley turtles have been reported impinged at SNGS CWS intake trash bars since 1979 (Table 3). Annual takes ranged from 0 to 6 Kemp's ridley turtles. Nine of these turtles were recovered dead or died shortly after discovery, with an average of .7 observed mortalities per year (range 0 to 2) observed in association with the SNGS CWS intake structure. One of the dead Kemp's ridley turtles was decomposed upon recovery and two had been hit by a boat. The average annual mortality of Kemp's ridley turtles due to plant activities, then, is more accurately approximately .5 lethal takes per year.

Loggerhead turtles

A total of 50 loggerhead turtles were encountered in association with SNGS CWS intake trash bars between 1979 and 1991 (Table 4). Zero to 23 loggerhead turtles (21 individuals and 2 recaptures) were taken each year with an average of 4 turtles per year. Prior to 1991, the eight loggerhead turtles taken in 1988 represented the largest number of loggerhead turtles taken in 1 year. Twenty were dead when discovered or died shortly after recovery. This represents an average of 1.7 lethal takes per year (range 0 to 6), however six of the dead loggerhead turtles were decomposed upon discovery and four were reported as boat hits, so the actual lethal take level due to plant activities may be as low as .8 per year. Two of the loggerhead turtles taken in 1991 were captured twice. One turtle taken on July 9, 1991, was recaptured on August 24, 1991. It had gained 2.7 kg (6 lbs) and grown 3 cm in the 39 days between captures. A loggerhead turtle taken July 11, 1991, was recaptured August 7, 1991. This turtle had gained 1.5 kg (5 lbs) pounds and grown 2 cm in the 27 days

between takes. The average weight gain between captures for these two animals was 1.9 kg per 30 days (range 1.9 to 2. kgs/30 days). This is higher than weight gains recorded for loggerhead turtle summer recaptures in a mark/recapture project conducted in Long Island Sound, a known developmental habitat (Morreale and Standora 1991, 1990, 1989). Apparently, the habitat occupied by the turtles between captures was favorable and the initial capture did not cause irreparable harm to these loggerhead turtles.

Prior to 1991, sea turtle incidental captures ranged from 0 to 10 turtles per year, with a mean of 4 turtles per year. Staff of PSE&G were asked to investigate possible causes of the 25 takes in 1991. Operation of SNGS had not changed, indicating the increase was due to higher numbers of sea turtles in the upper Delaware Bay. Salinity and temperature measurements were compared from 1986 through 1991, and while 1991 levels were slightly higher, the differences were consistent with short-term seasonal deviations and was not felt to be significant. Interviews with fishermen revealed no significant changes in the abundance of blue crabs, one of the available prey items in the Delaware Bay. While 1991 seems to be an anomalous year for sea turtle takes, the general upward trend observed at the Salem plant (Figure 1) is consistent with observations of sea turtle occurrence in the Long Island Sound and Chesapeake Bay.

The percentage of sea turtles which have been recovered and released alive at the SNGS CWS intake trash bars has increased with the increase in incidental capture rates (Figure 1). Release rates range from 0 percent (1982, 1983, 1986) to 96 percent in 1991. Since 1991, inspections of the trash racks have been conducted every 2 hours during the season that turtles are known to occur in the Northeast embayments. The increase in the percentage of sea turtles successfully released in 1991 is probably the result in this increase in monitoring.

Documented sizes of the sea turtles impinged at SNGS indicate all of the sea turtles reported were juveniles. All dead turtles for which sex was identified were reported as females, except for one male loggerhead turtle; however, identification of the sex of immature turtles is very difficult without training by a qualified herpetologist. Misidentification of the sex of juvenile Kemp's ridley turtles occurred in the Long Island Sound during a large cold-stunning mortality in the winter of 1985-86. The fairly undifferentiated gonads were determined to be ovaries.

Observations after training and experience gained since that time revealed a sex ratio more typical of that seen elsewhere. Accurate identification of the sex of dead sea turtles should be ascertained.

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

There are a number of possible reasons for the incidental capture of sea turtles at the SGNS. The design velocity of 1 to 1.7 feet per second, is significantly less than 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 than those encountered at the SNGS CWS intake structure (Morreale, pers. comm. 1990).

Passive drifting and the resultant susceptibility to impingement may occur at night, when sea turtles are less active. Prior to 1991, when monitoring was intermittent, documented discovery times did not show a clear temporal pattern of takes, and while many of the noted times coincided with shift changes, early morning recoveries were no more common than turtle recoveries at other times of the day.

It is possible that SGNS attracts sea turtles to the area of the CWS intake trash bars. Information on stomach contents of incidentally captured sea turtles recovered at this site indicate that many were actively feeding on blue crabs and other common prey species prior to their death. No quantitative diet study has been conducted and species listed on necropsy reports include only those most easily identified. The warm water discharge upstream of CWS may increase the distribution of prey species to the area, and dead fish and other material dumped from the trash racks may provide food for the turtles or scavenging prey species. The water depth in this area is 7.6 to 9 meters, which is the typical feeding depth for Kemp's ridley turtles in Long Island Sound waters (Morreale, pers comm 1990). A review of benthic survey data may identify prey density and distribution at various sites in the Bay and clarify the potential for attractions of invertebrates to this site.

Little is known about the distribution of sea turtles in the Delaware Bay. Aerial surveys flown by the Virginia Institute of Marine Science in July of 1983 and 1984 resulted in only one sea turtle sighting. Bellmund *et. al.* (1987) concluded that turtle densities in the lower Delaware Bay were low. 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 the Chesapeake Bay and Long Island Sound. Information on turtle distribution throughout Delaware Bay is needed before the degree of attraction of SGNS 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 3°C, is common in Atlantic embayments (Meylan 1986; Ehrhart 1983). In New York waters, this occurs around mid-November (STSSN database, NMFS-SEFC). No incidental captures of sea turtles have been reported at SGNS later than September, indicating that sea turtles leave this site before cold-stunning would occur. The thermal plume studies described in the Biological Assessment do not contribute to this finding. These studies appear to be based on a 2-day overflight in June of 1982. No information is supplied for other seasons or other operating conditions.

Shortnose sturgeon

Eight shortnose sturgeon have been recovered in association with plant activities since 1978 (Table 5). Two of these sturgeon were taken in gillnet and bottom trawl gear off Artificial Island. The other six were recovered dead or died shortly after discovery. Three of the documented takes occurred in a 2-week period in 1991. Gillnet fishing activity was seen offshore of the plant at this time. Fishermen indicated they were catching increased numbers of sturgeon; however, it was impossible to determine whether the impingements at the plant were due to previous takes in nearby gillnets.

All of the shortnose sturgeon recovered in conjunction with plant activities were adults. Shortnose sturgeon reach maturity at 450-500 mm (Dadswell *et. al.* 1934). Dadswell *et. al.* (1984) lists documented takes of sturgeon in the vicinity of Artificial Island, including the five taken between 1978 and 1981. While additional records exist for nearby waters and the Delaware Bay, the primary habitat for sturgeon in the Delaware River system is considered to be between Trenton and Florence, where a recent estimate of 6,000 to 14,000 adult shortnose sturgeon were

calculated (Hastings *et. al.*, 1987). The authors of that report, however, felt the existing range could be limited by poor summer water quality downstream of Florence, near Philadelphia. The increase in shortnose sturgeon impingements at Artificial Island in 1991 may be indicative of increased numbers of sturgeon in the Delaware or improved water quality. Shortnose sturgeon encountered in the fall and early winter months may be travelling downstream to deep saline waters typical of their wintering area in other river systems (Dadswell *et al*, 1984).

Cumulative Effects

Cumulative impacts from unrelated, non-federal actions occurring in the Delaware Bay may affect protected species and their habitats. The Marine Mammal Stranding Center in Brigantine, New Jersey, reports an increase in the number of turtles hit by boats in New Jersey inshore waters. Sea Turtle Stranding and Salvage Network (STSSN) data show that turtles found in other northeast embayments die of various natural causes, including cold stunning, and 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 STSSN is unknown.

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 SGNS, NMFS concludes that the 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) No impingements have been recorded at the Hope Creek Nuclear Generating Station.
- (2) Only 1 of the 25 turtle takes documented in 1991 was recovered dead. The necropsy report indicates that it may have been dead for 24-48 hours prior to impingement on the SGNS CWS intake structure. The low level of mortality was probably the result of the monitoring requirement implemented in 1991. Prior to 1991, 25 percent to 100 percent of all sea turtles taken were dead or died shortly after recovery. The maximum number of observed lethal takes documented annually since 1979, are two ridley (average = .7) and six loggerhead sea turtles (average = 1.6). The mortality of any Kemp's ridley

turtle is significant, but mortalities of less than two juvenile Kemp's ridley turtles per year is conservative and consistent with takes allowed in similar operations.

- (3) The continued operation of the Hope Creek and SGNS at existing levels is not expected to change the observed mortality levels.
- (4) New information resulting from the mark recapture study and proposed diet and telemetry studies will allow us to further assess and closely monitor impacts of the SGNS on sea turtles and their habitat and contribute to our knowledge of sea turtles in the Delaware estuarine system.

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 January 1992

DATE	SPECIES	STATUS	COMMENTS
23 Aug 1979	<u>C. caretta</u>	Live/Released	Caught in bottom trawl
11 Aug 1980 02 Sep 1980	<u>C. mydas</u> <u>C. caretta</u>	Live/Released Live/Released	Caught in bottom trawl Caught in bottom trawl
30 Jun 1981	<u>C. caretta</u>	Dead	Seen floating
02 Jul 1984	<u>C. caretta</u>	Dead	Caught in trawl, decomposed
15 Jun 1987 14 Oct 1987	<u>C. caretta</u> <u>C. caretta</u>	Live/Released Dead on beach	Caught in bottom trawl Decomposed

TABLE 2 Chelonia mydas Impingements
Salem Nuclear Generating Station Circulating Water System
1979 through January 1992

DATE	STATUS	COMMENTS
16 Sep 1991	Live/Released	Released in Delaware River

TABLE 3 Lepidochelys kempii Incidental Captures
Salem Nuclear Generating Station Circulating Water System
1979 through January 1992

DATE	STATUS	COMMENTS
11 Aug 1980	Live/Released	Released in Delaware Bay
23 Sep 1981	Dead	Apparent boat hit
13 Jul 1983	Dead	
29 Aug 1984	Live/Released	Possible green turtle, released in Delaware Bay
11 Jun 1985 24 Jun 1985	Live/Released Dead	
05 Jul 1986	Dead	Decomposed
24 Sep 1987 24 Sep 1987 29 Sep 1987	Live/Died Dead Live/Released	To Florida for release
05 Jul 1988 27 Jul 1988	Live/Released Dead	Released off Brigantine
05 Aug 1989 06 Aug 1989 08 Aug 1989 30 Aug 1989 06 Sep 1989 23 Sep 1989	Live/Released Live/Died Live/Released Live/Released Dead Live/Released	Released in Delaware Bay Released in Delaware Bay Released in Delaware Bay Released in Delaware Bay
27 Jun 1991	Live/Released	Released in Delaware River

TOTAL: 19 TAKES; 10 LIVE/RELEASED, 9 DEAD

TABLE 4: Caretta caretta Incidental Captures
Salem Nuclear Generating Station
1979 through January 1992

DATE	STATUS	COMMENTS
11 Jul 1980	Dead	Apparent boat hit
03 Sep 1981 08 Sep 1981 14 Sep 1981	Live/Released Dead Dead	Decomposed
10 Jul 1982	Dead	Decomposed
11 Jul 1983 19 Jul 1983	Dead Dead	Decomposed Decomposed
03 Jul 1984	Dead	Apparent boat hit
08 Jun 1985 15 Jul 1985 05 Aug 1985 07 Aug 1985 10 Aug 1985 30 Sep 1985	Dead Dead Dead Dead Live/Released Dead	Apparent boat hit Dead 'one day' Apparent boat hit
14 Jul 1987 16 Jul 1987 20 Jul 1987	Live/Released Live/Released Live/Released	
05 Jul 1988 09 Jul 1988 12 Jul 1988 12 Jul 1988 12 Jul 1988 12 Jul 1988 15 Jul 1988 15 Jul 1988	Live/Released Live/Released Dead Dead Dead Dead Dead Dead	Released off Brigantine Released off Brigantine Apparent boat hit Decomposed

TABLE 4 (continued): Caretta caretta Incidental Captures
 Salem Nuclear Generating Station
 1979 through January 1992

DATE	STATUS	COMMENTS
01 Jul 1989	Live/Released	Released off Brigantine
25 Jul 1989	Live/Released	Released off Brigantine
05 Jun 1991	Live/Released	Released in Delaware River
11 Jun 1991	Live/Released	Released in Delaware River
15 Jun 1991	Live/Released	Released off Brigantine
23 Jun 1991	Live/Released	Released in Delaware River
24 Jun 1991	Dead	Decomposed
27 Jun 1991	Live/Released	Released in Delaware River
01 Jul 1991	Live/Released	Released off Brigantine
03 Jul 1991	Live/Released	Released in Delaware River
04 Jul 1991	Live/Released	Released in Delaware River
07 Jul 1991	Live/Released	Released in Delaware River
09 Jul 1991†	Live/Released	Released in Delaware River
09 Jul 1991	Live/Released	Released off Brigantine
11 Jul 1991*	Live/Released	Released in Delaware River
20 Jul 1991	Live/Released	Released in Delaware River
23 Jul 1991	Live/Released	Released in Delaware River
25 Jul 1991	Live/Released	Released in Delaware River
01 Aug 1991	Live/Released	Released in Delaware River
01 Aug 1991	Live/Released	Released in Delaware River
07 Aug 1991*	Recapture, Live/Released	Released in Delaware River
24 Aug 1991†	Recapture, Live/Released	Released in Delaware River
08 Sep 1991	Live/Released	Released in Delaware River
09 Sep 1991	Live/Released	Released in Delaware River
10 Sep 1991	Live/Released	Released in Delaware River

TOTAL: 50 TAKES; 31 LIVE/RELEASED, 19 DEAD

TABLE 5: Acipenser brevirostrum Encounters
 Associated with the Salem and Hope Creek Nuclear Generating Station Activities
 1978 through January 1992

DATE	SIZE	COMMENTS
12 Jan 1978	Fork length = 545 mm	SNGS CWS intake trash bars, decomposed
26 Jun 1978	Fork length = 625 mm	SNIS CWS intake trash bars, alive/died
24 Apr 1979 27 Jul 1979	Total length = 991 mm Total length = 862 mm	Gillnetted off Art. Island Bottom trawl off Artificial Island
01 May 1981	Fork length = 648 mm	SNGS CWS intake trash bars "dead fish" seen floating on previous day
22 Oct 1991	Total length = 782 mm Fork length = 720 mm	SNGS CWS intake trash bars Gillnetting observed off Artificial Island
28 Oct 1991	Total length = 802 mm Fork length = 743 mm	SNGS CWS intake trash bars Gillnetting observed off Artificial Island
06 Nov 1991	Total length = 802 mm Fork length = 668 mm	SNGS CWS intake trash bars alive/died

References

- Crouse, D. T., L. B. Crowder and H. Caswell. 1987. A stage-based model for loggerhead sea turtles and implications for conservation. *Ecology* 68(5): 1412-1423.
- Bellmund, S.a., J.A. Musick, R.C.Klinger, R.A.Byles, J.A.Keinath, and D.E. Barnard. 1987. Ecology of Sea Turtles in Virginia. Special Scientific Report no. 119, NMFS Contract # NABOFAC-00004.
- Dadswell, M.J., B. D. Taubert, T. S. Squires, D. Marchette and J. Buckley. 1984. Synopsis of biological data on shortnose sturgeon, Acipenser brevirostrum Lesueur 1818. FAO Fisheries Synopsis no. 140. NOAA Tech Report NMFS 14, U.S. Dept. of Commerce, 3300 Whitehaven St., Washington, DC.
- Ehrhart, L. M. 1983. Marine turtles of the Indian River lagoon system. 1983 Florida Sci. 46(3/4): 337-346. 1983.
- Hastings, R. W., J. C. O'Herron II, D. Schick, M. A. Lazzari. 1987. Occurrence and distribution of shortnose sturgeon, Acipenser brevirostum, in the upper tidal Delaware River. *Estuaries*, Vol. 10(4): 337-341.
- Meylan, A. B. 1986. Riddle of the ridleys. *Natural History Magazine*, Amer. Mus. Nat. Hist. 11/86: 90-96.
- Morreale, S. J. 1990. Personal Communication. Okeanos Ocean Research Foundation, Sea Turtle. Hampton Bays, New York.
- Morr , S.J. and E. A. Standora. 1988, 1989, 1990, 1991. Occurrence, movement and behavior of the Kemp's ridley and other sea turtles in New York waters. Annual reports to the New York State Department of Environmental Conservation Return a Gift to Wildlife Program.
- National Marine Fisheries Service, 1991. Endangered Species Act Section 7 Consultation regarding the continued operation of the Salem and Hope Creek Nuclear Generating Stations. January 2, 1991
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Incidental Take Statement

Section 7(b)(4) of the Endangered Species Act (ESA) provides for the issuance of an incidental take statement on the agency action if the biological opinion concludes that the action is not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of critical habitat. In such a situation, the National Marine Fisheries Service (NMFS) will issue an incidental take statement specifying the impact of any incidental taking of endangered or threatened species, providing for reasonable and prudent measures that are necessary to minimize impacts, and setting forth the terms and conditions with which the action agency must comply in order to implement the reasonable and prudent measures. Incidental takings resulting from the agency action, including incidental takings caused by activities authorized by the agency, are authorized under the incidental take statement only if those takings are in compliance with the specified terms and conditions.

The 1980 Biological Opinion on the impact of the Salem Nuclear Generating Station (SNWS) 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. In the 1990 Biological Opinion, shortnose sturgeon takes were set at two per year due to the lack of reports in intervening years. Since new information indicates the sturgeon population may be increasing in the Delaware River and 3 sturgeon were taken in 1991, NMFS has set a cumulative incidental take level for shortnose sturgeon at 10 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 five Kemp's ridley turtles and five green turtles per year with up to two mortalities, and 30 loggerhead turtles with up to five mortalities is allowed provided the following reasonable and prudent measures are met:

- (1) Comatose sea turtles should be resuscitated according to the procedures described in Appendix I. These procedures should be posted in appropriate areas such as the fish pool buildings and the circulating water system operator's office.
- (2) In 1991, inspections of the SNWS Circulating Water System (CWS) intake trash bars were required every 2 hours from

June 1 to September 30. This should be continued. Documentation specified in the 1991 Biological Opinion should be sent to the Northeast Region, NMFS, within 30 days of any incidental take.

- (3) Dip nets, baskets, and other equipment should be used whenever possible to remove smaller sea turtles from the SNGS CWS intake structure to reduce trauma caused by the existing cleaning mechanism.
- (4) SNGS CWS intake trash bars should be cleaned daily from June 1 to September 30.
- (5) Live sea turtles should be inspected for signs of illness or injury. Any ill or injured turtle should be given appropriate medical attention and should not be released until its condition has improved.
- (6) Live turtles that exhibit no signs of illness or injury should be tagged and released. Tagging forms should be completed and forwarded to the Southeast Fisheries Science Center, NMFS, at the address on the tagging form.
- (7) Dead sea turtles should be necropsied by qualified personnel. Identification of sex should be determined and stomach contents should be identified to determine whether waste products from SNGS CWS trash racks are attracting sea turtles. Necropsy reports should be submitted to NMFS when completed.
- (6) An annual review of incident reports should be conducted to identify trends in sea turtle and shortnose sturgeon takes.

Conservation Recommendations

The following conservation recommendations are suggested:

- (1) In conjunction with NMFS, continue to develop a research program to determine whether the Salem Plant provides features attractive to sea turtles. This program should investigate habitat use, diet, and local and long-term movements. Use of existing mark/recapture and telemetry methods should be considered.
- (2) Historical benthic survey data should be reviewed to identify prey density and distribution at various sites in the Delaware Bay and clarify the potential for attractions of invertebrates to this site.
- (3) Conduct distribution surveys for sea turtles in the Bay.
- (4) Meet with NMFS annually to review incidental takes, and 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.

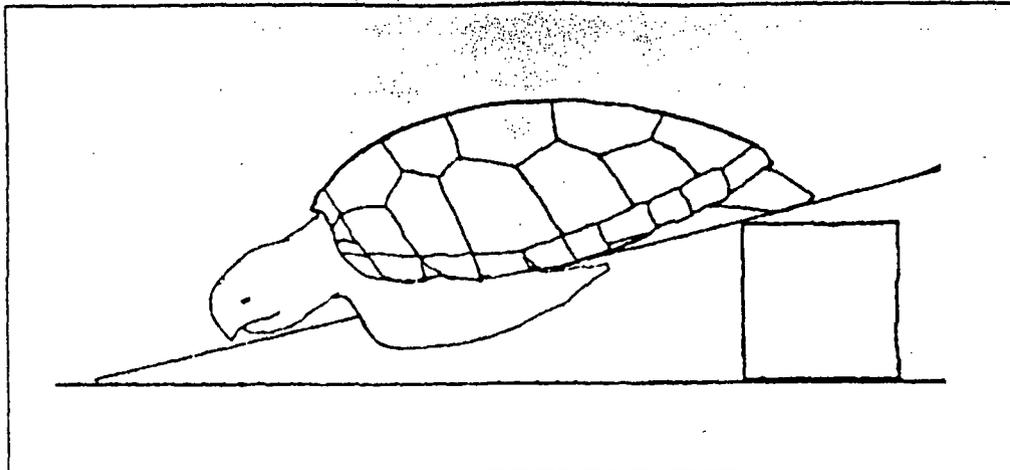
Adult male sea turtles of all species other than leatherbacks have claws on their foreflippers. Keep clear of slashing foreflippers.

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 6 hours) move the turtle to a warmer area.

If possible, place the animal in a few inches of water that is warmer than 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.

Assessment of Impacts

The Biological Opinion issued on January 2, 1991, contains a full assessment of impacts of the Salem and Hope Creek Generating Stations on endangered species occurring in the Delaware River off Artificial Island. This assessment considers past Opinions (NMFS 1991, 1980), incident reports submitted by PSE&G as required by the incidental take statement and the summary report submitted to NMFS on January 31, 1992.

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 takes documented at that site since operations began in February of 1986. Consideration of the continued operation of this station will be included in the conclusion and the incidental take statement.

Environmental Sampling and Observations

Three loggerhead turtles and one green turtle have been encountered in trawl surveys conducted during station-related environmental sampling between 1979 and 1991 (Table 1). Bottom trawls, midwater trawls, and surface trawls were conducted for 10 to 15 minute intervals and all of these turtles were released unharmed. One shortnose sturgeon was also taken during station-related sampling. Any takes that occur during station-related sampling will be considered and included within the incidental take statement.

In addition to direct takes, between 1979 and 1991 one decomposed loggerhead turtle was discovered at the Salem Generating Station discharge structure; one dead loggerhead turtle was seen floating and one loggerhead turtle was found dead on a beach on Artificial Island.

Salem Generating Station CWS

There have been a total of 70 incidental captures of sea turtles at the Salem Generating Station CWS intake trash bars between 1979 and October 1991 (Tables 2, 3, and 4). These include 1 green turtle, 19 Kemp's ridley, and 50 loggerhead turtles. Additionally, 6 shortnose sturgeon have been taken lethally at the intake structure (Table 5).

Green turtles

Green turtles occur regularly, though in low numbers, in the embayments of the Atlantic coast from Florida through Cape Cod, Massachusetts. Only two green turtles have been documented in association with PSE&G plant activities. A green turtle was taken at Salem Nuclear Generating Station CWS (SNGS CWS) intake trash bars and released alive in September 1991, and one was reported taken in a bottom trawl in 1980 and released alive. The identification of the first recorded take cannot be verified as no photographs were archived. Additionally, a sea turtle identified as a Kemp's ridley taken at SNGS CWS intake structure in 1984 had measurements consistent with those of a green turtle, but no photographs exist and this identification cannot be verified.

Kemp's ridley turtles

Nineteen Kemp's ridley turtles have been reported impinged at SNGS CWS intake trash bars since 1979 (Table 3). Annual takes ranged from 0 to 6 Kemp's ridley turtles. Nine of these turtles were recovered dead or died shortly after discovery, with an average of .7 observed mortalities per year (range 0 to 2) observed in association with the SNGS CWS intake structure. One of the dead Kemp's ridley turtles was decomposed upon recovery and two had been hit by a boat. The average annual mortality of Kemp's ridley turtles due to plant activities, then, is more accurately approximately .5 lethal takes per year.

Loggerhead turtles

A total of 50 loggerhead turtles were encountered in association with SNGS CWS intake trash bars between 1979 and 1991 (Table 4). Zero to 23 loggerhead turtles (21 individuals and 2 recaptures) were taken each year with an average of 4 turtles per year. Prior to 1991, the eight loggerhead turtles taken in 1988 represented the largest number of loggerhead turtles taken in 1 year. Twenty were dead when discovered or died shortly after recovery. This represents an average of 1.7 lethal takes per year (range 0 to 6), however six of the dead loggerhead turtles were decomposed upon discovery and four were reported as boat hits, so the actual lethal take level due to plant activities may be as low as .8 per year. Two of the loggerhead turtles taken in 1991 were captured twice. One turtle taken on July 9, 1991, was recaptured on August 24, 1991. It had gained 2.7 kg (6 lbs) and grown 3 cm in the 39 days between captures. A loggerhead turtle taken July 11, 1991, was recaptured August 7, 1991. This turtle had gained 1.5 kg (5 lbs) pounds and grown 2 cm in the 27 days

between takes. The average weight gain between captures for these two animals was 1.9 kg per 30 days (range 1.9 to 2. kgs/30 days). This is higher than weight gains recorded for loggerhead turtle summer recaptures in a mark/recapture project conducted in Long Island Sound, a known developmental habitat (Morreale and Standora 1991, 1990, 1989). Apparently, the habitat occupied by the turtles between captures was favorable and the initial capture did not cause irreparable harm to these loggerhead turtles.

Prior to 1991, sea turtle incidental captures ranged from 0 to 10 turtles per year, with a mean of 4 turtles per year. Staff of PSE&G were asked to investigate possible causes of the 25 takes in 1991. Operation of SNGS had not changed, indicating the increase was due to higher numbers of sea turtles in the upper Delaware Bay. Salinity and temperature measurements were compared from 1986 through 1991, and while 1991 levels were slightly higher, the differences were consistent with short-term seasonal deviations and was not felt to be significant. Interviews with fishermen revealed no significant changes in the abundance of blue crabs, one of the available prey items in the Delaware Bay. While 1991 seems to be an anomalous year for sea turtle takes, the general upward trend observed at the Salem plant (Figure 1) is consistent with observations of sea turtle occurrence in the Long Island Sound and Chesapeake Bay.

The percentage of sea turtles which have been recovered and released alive at the SNGS CWS intake trash bars has increased with the increase in incidental capture rates (Figure 1). Release rates range from 0 percent (1982, 1983, 1986) to 96 percent in 1991. Since 1991, inspections of the trash racks have been conducted every 2 hours during the season that turtles are known to occur in the Northeast embayments. The increase in the percentage of sea turtles successfully released in 1991 is probably the result in this increase in monitoring.

Documented sizes of the sea turtles impinged at SNGS indicate all of the sea turtles reported were juveniles. All dead turtles for which sex was identified were reported as females, except for one male loggerhead turtle; however, identification of the sex of immature turtles is very difficult without training by a qualified herpetologist. Misidentification of the sex of juvenile Kemp's ridley turtles occurred in the Long Island Sound during a large cold-stunning mortality in the winter of 1985-86. The fairly undifferentiated gonads were determined to be ovaries.

Observations after training and experience gained since that time revealed a sex ratio more typical of that seen elsewhere. Accurate identification of the sex of dead sea turtles should be ascertained.

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

There are a number of possible reasons for the incidental capture of sea turtles at the SGNS. The design velocity of 1 to 1.7 feet per second, is significantly less than 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 than those encountered at the SNGS CWS intake structure (Morreale, pers. comm. 1990).

Passive drifting and the resultant susceptibility to impingement may occur at night, when sea turtles are less active. Prior to 1991, when monitoring was intermittent, documented discovery times did not show a clear temporal pattern of takes, and while many of the noted times coincided with shift changes, early morning recoveries were no more common than turtle recoveries at other times of the day.

It is possible that SGNS attracts sea turtles to the area of the CWS intake trash bars. Information on stomach contents of incidentally captured sea turtles recovered at this site indicate that many were actively feeding on blue crabs and other common prey species prior to their death. No quantitative diet study has been conducted and species listed on necropsy reports include only those most easily identified. The warm water discharge upstream of CWS may increase the distribution of prey species to the area, and dead fish and other material dumped from the trash racks may provide food for the turtles or scavenging prey species. The water depth in this area is 7.6 to 9 meters, which is the typical feeding depth for Kemp's ridley turtles in Long Island Sound waters (Morreale, pers comm 1990). A review of benthic survey data may identify prey density and distribution at various sites in the Bay and clarify the potential for attractions of invertebrates to this site.

Little is known about the distribution of sea turtles in the Delaware Bay. Aerial surveys flown by the Virginia Institute of Marine Science in July of 1983 and 1984 resulted in only one sea turtle sighting. Bellmund et. al. (1987) concluded that turtle densities in the lower Delaware Bay were low. 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 the Chesapeake Bay and Long Island Sound. Information on turtle distribution throughout Delaware Bay is needed before the degree of attraction of SGNS 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 around mid-November (STSSN database, NMFS-SEFC). No incidental captures of sea turtles have been reported at SGNS later than September, indicating that sea turtles leave this site before cold-stunning would occur. The thermal plume studies described in the Biological Assessment do not contribute to this finding. These studies appear to be based on a 2-day overflight in June of 1982. No information is supplied for other seasons or other operating conditions.

Shortnose sturgeon

Eight shortnose sturgeon have been recovered in association with plant activities since 1978 (Table 5). Two of these sturgeon were taken in gillnet and bottom trawl gear off Artificial Island. The other six were recovered dead or died shortly after discovery. Three of the documented takes occurred in a 2-week period in 1991. Gillnet fishing activity was seen offshore of the plant at this time. Fishermen indicated they were catching increased numbers of sturgeon; however, it was impossible to determine whether the impingements at the plant were due to previous takes in nearby gillnets.

All of the shortnose sturgeon recovered in conjunction with plant activities were adults. Shortnose sturgeon reach maturity at 450-500 mm (Dadswell et. al. 1984). Dadswell et. al. (1984) lists documented takes of sturgeon in the vicinity of Artificial Island, including the five taken between 1978 and 1981. While additional records exist for nearby waters and the Delaware Bay, the primary habitat for sturgeon in the Delaware River system is considered to be between Trenton and Florence, where a recent estimate of 6,000 to 14,000 adult shortnose sturgeon were

calculated (Hastings et. al., 1987). The authors of that report, however, felt the existing range could be limited by poor summer water quality downstream of Florence, near Philadelphia. The increase in shortnose sturgeon impingements at Artificial Island in 1991 may be indicative of increased numbers of sturgeon in the Delaware or improved water quality. Shortnose sturgeon encountered in the fall and early winter months may be travelling downstream to deep saline waters typical of their wintering area in other river systems (Dadswell et al, 1984).

Cumulative Effects

Cumulative impacts from unrelated, non-federal actions occurring in the Delaware Bay may affect protected species and their habitats. The Marine Mammal Stranding Center in Brigantine, New Jersey, reports an increase in the number of turtles hit by boats in New Jersey inshore waters. Sea Turtle Stranding and Salvage Network (STSSN) data show that turtles found in other northeast embayments die of various natural causes, including cold stunning, and 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 STSSN is unknown.

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 SGNS, NMFS concludes that the 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) No impingements have been recorded at the Hope Creek Nuclear Generating Station.
- (2) Only 1 of the 25 turtle takes documented in 1991 was recovered dead. The necropsy report indicates that it may have been dead for 24-48 hours prior to impingement on the SGNS CWS intake structure. The low level of mortality was probably the result of the monitoring requirement implemented in 1991. Prior to 1991, 25 percent to 100 percent of all sea turtles taken were dead or died shortly after recovery. The maximum number of observed lethal takes documented annually since 1979, are two ridley (average = .7) and six loggerhead sea turtles (average = 1.6). The mortality of any Kemp's ridley

turtle is significant, but mortalities of less than two juvenile Kemp's ridley turtles per year is conservative and consistent with takes allowed in similar operations.

- (3) The continued operation of the Hope Creek and SGNS at existing levels is not expected to change the observed mortality levels.
- (4) New information resulting from the mark recapture study and proposed diet and telemetry studies will allow us to further assess and closely monitor impacts of the SGNS on sea turtles and their habitat and contribute to our knowledge of sea turtles in the Delaware estuarine system.

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 January 1992

DATE	SPECIES	STATUS	COMMENTS
23 Aug 1979	<u>C. caretta</u>	Live/Released	Caught in bottom trawl
11 Aug 1980 02 Sep 1980	<u>C. mydas</u> <u>C. caretta</u>	Live/Released Live/Released	Caught in bottom trawl Caught in bottom trawl
30 Jun 1981	<u>C. caretta</u>	Dead	Seen floating
02 Jul 1984	<u>C. caretta</u>	Dead	Caught in trawl, decomposed
15 Jun 1987 14 Oct 1987	<u>C. caretta</u> <u>C. caretta</u>	Live/Released Dead on beach	Caught in bottom trawl Decomposed

TABLE 2 Chelonia mydas Impingements
Salem Nuclear Generating Station Circulating Water System
1979 through January 1992

DATE	STATUS	COMMENTS
16 Sep 1991	Live/Released	Released in Delaware River

TABLE 3 Lepidochelys kempi Incidental Captures
Salem Nuclear Generating Station Circulating Water System
1979 through January 1992

DATE	STATUS	COMMENTS
11 Aug 1980	Live/Released	Released in Delaware Bay
23 Sep 1981	Dead	Apparent boat hit
13 Jul 1983	Dead	
29 Aug 1984	Live/Released	Possible green turtle, released in Delaware Bay
11 Jun 1985 24 Jun 1985	Live/Released Dead	
05 Jul 1986	Dead	Decomposed
24 Sep 1987 24 Sep 1987 29 Sep 1987	Live/Died Dead Live/Released	To Florida for release
05 Jul 1988 27 Jul 1988	Live/Released Dead	Released off Brigantine
05 Aug 1989 06 Aug 1989 08 Aug 1989 30 Aug 1989 06 Sep 1989 23 Sep 1989	Live/Released Live/Died Live/Released Live/Released Dead Live/Released	Released in Delaware Bay Released in Delaware Bay Released in Delaware Bay Released in Delaware Bay
27 Jun 1991	Live/Released	Released in Delaware River

TOTAL: 19 TAKES; 10 LIVE/RELEASED, 9 DEAD

TABLE 4: Caretta caretta Incidental Captures
Salem Nuclear Generating Station
1979 through January 1992

DATE	STATUS	COMMENTS
11 Jul 1980	Dead	Apparent boat hit
03 Sep 1981 08 Sep 1981 14 Sep 1981	Live/Released Dead Dead	Decomposed
10 Jul 1982	Dead	Decomposed
11 Jul 1983 19 Jul 1983	Dead Dead	Decomposed Decomposed
03 Jul 1984	Dead	Apparent boat hit
08 Jun 1985 15 Jul 1985 05 Aug 1985 07 Aug 1985 10 Aug 1985 30 Sep 1985	Dead Dead Dead Dead Live/Released Dead	Apparent boat hit Dead 'one day' Apparent boat hit
14 Jul 1987 16 Jul 1987 20 Jul 1987	Live/Released Live/Released Live/Released	
05 Jul 1988 09 Jul 1988 12 Jul 1988 12 Jul 1988 12 Jul 1988 12 Jul 1988 15 Jul 1988 15 Jul 1988	Live/Released Live/Released Dead Dead Dead Dead Dead Dead	Released off Brigantine Released off Brigantine Apparent boat hit Decomposed

TABLE 4 (continued): Caretta caretta Incidental Captures
Salem Nuclear Generating Station
1979 through January 1992

DATE	STATUS	COMMENTS
01 Jul 1989	Live/Released	Released off Brigantine
25 Jul 1989	Live/Released	Released off Brigantine
05 Jun 1991	Live/Released	Released in Delaware River
11 Jun 1991	Live/Released	Released in Delaware River
15 Jun 1991	Live/Released	Released off Brigantine
23 Jun 1991	Live/Released	Released in Delaware River
24 Jun 1991	Dead	Decomposed
27 Jun 1991	Live/Released	Released in Delaware River
01 Jul 1991	Live/Released	Released off Brigantine
03 Jul 1991	Live/Released	Released in Delaware River
04 Jul 1991	Live/Released	Released in Delaware River
07 Jul 1991	Live/Released	Released in Delaware River
09 Jul 1991+	Live/Released	Released in Delaware River
09 Jul 1991	Live/Released	Released off Brigantine
11 Jul 1991*	Live/Released	Released in Delaware River
20 Jul 1991	Live/Released	Released in Delaware River
23 Jul 1991	Live/Released	Released in Delaware River
25 Jul 1991	Live/Released	Released in Delaware River
01 Aug 1991	Live/Released	Released in Delaware River
01 Aug 1991	Live/Released	Released in Delaware River
07 Aug 1991*	Recapture, Live/Released	Released in Delaware River
24 Aug 1991+	Recapture, Live/Released	Released in Delaware River
08 Sep 1991	Live/Released	Released in Delaware River
09 Sep 1991	Live/Released	Released in Delaware River
10 Sep 1991	Live/Released	Released in Delaware River

TOTAL: 50 TAKES; 31 LIVE/RELEASED, 19 DEAD

TABLE 5: Acipenser brevirostrum Encounters
 Associated with the Salem and Hope Creek Nuclear Generating Station Activities
 1978 through January 1992

DATE	SIZE	COMMENTS
12 Jan 1978	Fork length = 545 mm	SNGS CWS intake trash bars, decomposed
26 Jun 1978	Fork length = 625 mm	SNI'S CWS intake trash bars, alive/died
24 Apr 1979 27 Jul 1979	Total length = 991 mm Total length = 862 mm	Gillnetted off Art. Island Bottom trawl off Artificial Island
01 May 1981	Fork length = 648 mm	SNGS CWS intake trash bars "dead fish" seen floating on previous day
22 Oct 1991	Total length = 782 mm Fork length = 720 mm	SNGS CWS intake trash bars Gillnetting observed off Artificial Island
28 Oct 1991	Total length = 802 mm Fork length = 743 mm	SNGS CWS intake trash bars Gillnetting observed off Artificial Island
06 Nov 1991	Total length = 802 mm Fork length = 668 mm	SNGS CWS intake trash bars alive/died

References

- Crouse, D. T., L. B. Crowder and H. Caswell. 1987. A stage-based model for loggerhead sea turtles and implications for conservation. *Ecology* 68(5): 1412-1423.
- Bellmund, S.a., J.A. Musick, R.C.Klinger, R.A.Byles, J.A.Keinath, and D.E. Barnard. 1987. Ecology of Sea Turtles in Virginia. Special Scientific Report no. 119, NMFS Contract # NA80FAC-00004.
- Dadswell, M.J., B. D. Taubert, T. S. Squires, D. Marchette and J. Buckley. 1984. Synopsis of biological data on shortnose sturgeon, Acipenser brevirostrum LeSueur 1818. FAO Fisheries Synopsis no. 140. NOAA Tech Report NMFS 14, U.S. Dept. of Commerce, 3300 Whitehaven St., Washington, DC.
- Ehrhart, L. M. 1983. Marine turtles of the Indian River lagoon system. 1983 Florida Sci. 46(3/4): 337-346. 1983.
- Hastings, R. W., J. C. O'Herron II, D. Schick, M. A. Lazzari. 1987. Occurrence and distribution of shortnose sturgeon, Acipenser brevirostum, in the upper tidal Delaware River. *Estuaries*, Vol. 10(4): 337-341.
- Meylan, A. B. 1986. Riddle of the ridleys. *Natural History Magazine*, Amer. Mus. Nat. Hist. 11/86: 90-96.
- Morreale, S. J. 1990. Personal Communication. Okeanos Ocean Research Foundation, Sea Turtle. Hampton Bays, New York.
- Morr , S.J. and E. A. Standora. 1988, 1989, 1990, 1991. Occurrence, movement and behavior of the Kemp's ridley and other sea turtles in New York waters. Annual reports to the New York State Department of Environmental Conservation Return a Gift to Wildlife Program.
- National Marine Fisheries Service, 1991. Endangered Species Act Section 7 Consultation regarding the continued operation of the Salem and Hope Creek Nuclear Generating Stations. January 2, 1991
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The significance of each Kemp's ridley and green turtle mortality was considered in determining an allowable incidental take. A take limit of five Kemp's ridley turtles and five green turtles per year with up to two mortalities, and 30 loggerhead turtles with up to five mortalities is allowed provided the following reasonable and prudent measures are met:

- (1) Comatose sea turtles should be resuscitated according to the procedures described in Appendix I. These procedures should be posted in appropriate areas such as the fish pool buildings and the circulating water system operator's office.
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June 1 to September 30. This should be continued. Documentation specified in the 1991 Biological Opinion should be sent to the Northeast Region, NMFS, within 30 days of any incidental take.

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- (4) SNGS CWS intake trash bars should be cleaned daily from June 1 to September 30.
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- (6) An annual review of incident reports should be conducted to identify trends in sea turtle and shortnose sturgeon takes.

Conservation Recommendations

The following conservation recommendations are suggested:

- (1) In conjunction with NMFS, continue to develop a research program to determine whether the Salem Plant provides features attractive to sea turtles. This program should investigate habitat use, diet, and local and long-term movements. Use of existing mark/recapture and telemetry methods should be considered.
- (2) Historical benthic survey data should be reviewed to identify prey density and distribution at various sites in the Delaware Bay and clarify the potential for attractions of invertebrates to this site.
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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.

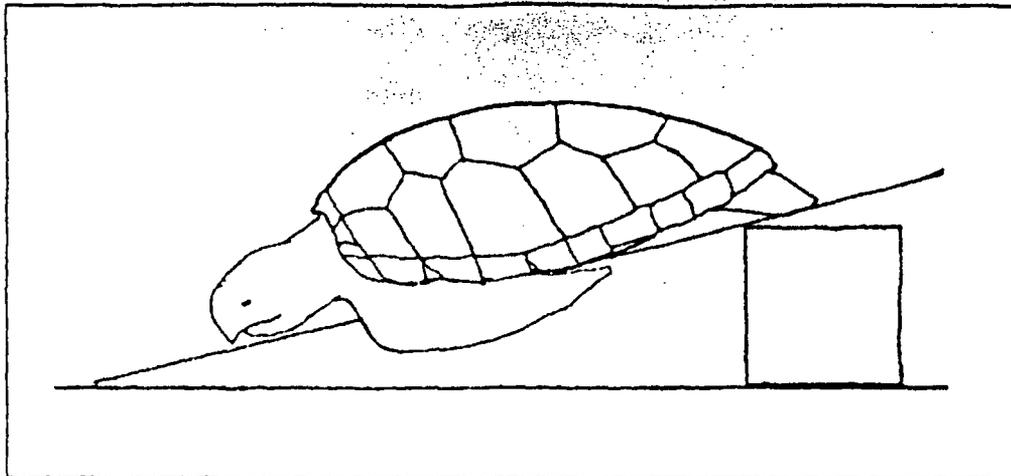
Adult male sea turtles of all species other than leatherbacks have claws on their foreflippers. Keep clear of slashing foreflippers.

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 6 hours) move the turtle to a warmer area.

If possible, place the animal in a few inches of water that is warmer than 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.