



UNITED STATES
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D.C. 20555-0001

April 8, 1999

Mr. John Paul Cowan
Vice President, Nuclear Operations
Florida Power Corporation
ATTN: Manager, Nuclear Licensing (SA2A)
Crystal River Energy Complex
15760 W. Power Line Street
Crystal River, Florida 34428-6708

SUBJECT: DRAFT BIOLOGICAL OPINION REGARDING IMPACT TO SEA TURTLES AT
THE CRYSTAL RIVER ENERGY COMPLEX (TAC NO. MA1706)

Dear Mr. Cowan:

By letter dated October 1, 1998, Florida Power Corporation (FPC) provided the U.S. Nuclear Regulatory Commission (NRC) a Biological Assessment (BA) of the impact on endangered sea turtles of operation of the Crystal River Energy Complex. The BA was prepared to support a Section 7 consultation under the Endangered Species Act. By letter dated October 14, 1998, the NRC provided the BA and our recommendation to the National Marine Fisheries Service (NMFS).

The NRC has received from NMFS a draft Biological Opinion (BO). The BO is enclosed for FPC review and comment. Please note that the document is no longer exempt from Freedom of Information Act requests, and comments on the draft BO are required to be in writing and sent to the NRC. The NRC will forward your comments along with ours to the NMFS. Due to the NMFS schedule for issuance of the final BO, we request you provide comments within 30 working days of receipt of this letter.

Please contact me at (301) 415-1495 or Ms. Cynthia Sochor at (301) 415-2462 if you have any questions regarding this matter.

Sincerely,

A handwritten signature in black ink, appearing to read "L. A. Wiens".

Leonard A. Wiens, Senior Project Manager, Section 2
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-302

Enclosure: As stated

cc w/encl: See next page

Mr. John Paul Cowan
Florida Power Corporation

CRYSTAL RIVER UNIT NO. 3

cc:

Mr. R. Alexander Glenn
Corporate Counsel
Florida Power Corporation
MAC-A5A
P.O. Box 14042
St. Petersburg, Florida 33733-4042

Ms. Sherry L. Bernhoft, Director
Nuclear Regulatory Affairs (SA2A)
Florida Power Corporation
Crystal River Energy Complex
15760 W. Power Line Street
Crystal River, Florida 34428-6708

Mr. Charles G. Pardee, Director
Nuclear Plant Operations (NA2C)
Florida Power Corporation
Crystal River Energy Complex
15760 W. Power Line Street
Crystal River, Florida 34428-6708

Senior Resident Inspector
Crystal River Unit 3
U.S. Nuclear Regulatory Commission
6745 N. Tallahassee Road
Crystal River, Florida 34428

Mr. Michael A. Schoppman
Framatome Technologies Inc.
1700 Rockville Pike, Suite 525
Rockville, Maryland 20852

Mr. Gregory H. Halnon
Director, Quality Programs (SA2C)
Florida Power Corporation
Crystal River Energy Complex
15760 W. Power Line Street
Crystal River, Florida 34428-6708

Mr. William A. Passetti, Chief
Department of Health
Bureau of Radiation Control
2020 Capital Circle, SE, Bin #C21
Tallahassee, Florida 32399-1741

Attorney General
Department of Legal Affairs
The Capitol
Tallahassee, Florida 32304

Mr. Joe Myers, Director
Division of Emergency Preparedness
Department of Community Affairs
2740 Centerview Drive
Tallahassee, Florida 32399-2100

Chairman
Board of County Commissioners
Citrus County
110 North Apopka Avenue
Inverness, Florida 34450-4245

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Original signed by:

Leonard A. Wiens, Senior Project Manager, Section 2
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

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Docket Nos. 50-302

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**Endangered Species Act - Section 7 Consultation
DRAFT
Biological Opinion**

Agency: United States Nuclear Regulator Commission

Activity: Cooling water intake system at the Crystal River Energy Complex

Consultation Conducted By: National Marine Fisheries Service, Southeast Region

I. History of the Consultation

This consultation was initiated by the Nuclear Regulatory Commission (NRC) by a letter dated October 14, 1998, with an attached biological assessment (BA); received by the National Marine Fisheries Service (NMFS), Southeast Regional Office (SERO), Protected Resources Division on October 22, 1998. The BA analyzes the effects of the cooling water system on species of sea turtles protected by the Endangered Species Act (ESA), at the Crystal River Energy Complex (CREC). This biological opinion is based on information provided in the biological assessment; various telephone conversations and a May 13, 1998 meeting involving NMFS SERO, Florida Power Corporation (FPC), and NRC staff; an April 23, 1998 site visit by Mr. David Bernhart and Ms. Colleen Coogan of the SERO; a March 24, 1999 site visit by Mr. Bob Hoffman of the SERO; and other sources of information. A complete administrative record of this consultation is on file at the NMFS Southeast Regional Office.

II. Description of the Proposed Action

Action Area

The CREC is located on an approximate 5,000 acre site near the Gulf of Mexico in Citrus County, Florida. The Complex is approximately 7.5 miles northwest of the city of Crystal River, within the coastal salt marsh area of west central Florida. The action area consists of 3 of the 5 power plants that make up CREC, the 2.8 mile discharge canal, intake canal, and intake structures, which includes the bar racks, traveling screens, and sea water pump components. The intake canal is a dredged canal approximately 14 miles long with an average depth of 20 feet. The canal is bordered on both sides by land beginning from the plant site and extending 3 miles to the west. The canal then extends westward an additional 11 miles out into the Gulf of Mexico.

The Proposed Action

The CREC contains five separate power plants. Unit 1 is an approximately 400MW electric (MWe) coal-fueled plant. Unit 2 is an approximately 500 MWe coal-fueled plant. Unit 3 is an approximately 890 MWe pressurized water, nuclear-fueled plant. Units 4 and 5 are two coal-fueled plants at approximately 640 MWe each.

The intake structures of the power plants are concrete structures with bar racks, traveling screens, and seawater pump components. Surface water trash barriers are deployed in front of the bar racks to collect large floating debris. Water is drawn from the intake canal through the bar racks, through the traveling screens, into the pumps and flows through the plants condensers and auxiliary systems. The water is then discharged through an outfall into the discharge canal. The discharge canal directs to water back to the Gulf of Mexico.

The intake bar racks prevent trash and large debris carried by the seawater from entering the intake structure. The seawater must pass through the bar racks which are made of steel bars spaced on 4 inch centers. The bar racks extend from well above the water line to the concrete base at the bottom of the intake canal. Debris and marine life smaller than the bar rack openings pass through the bar racks. The traveling screens effectively remove this floating or suspended debris from the intake water. Intake water passes through these screens, which suspend debris and solid materials onto the screens. The screens are conveyed upwards to an overlapping water spray system which washes these materials off the screens and into a debris trough. The traveling screen system is operated approximately three times a day.

Each of the three plants that use seawater to cool, have four large circulating pumps used to draw seawater into the plant. The water is then pumped through the condensers and out to the discharge canal. On units 1 and 2, the total design flow is 638,000 gallons per minute (g.p.m). Unit 3 design flow is 680,000 g.p.m. In addition, unit 3 has a low flow nuclear services water pumping system with a normal flow rate of approximately 10,000 g.p.m. Under emergency conditions, additional pumps would increase this flow up to approximately 20,000 g.p.m. From the discharge of the pumps the water flows to the main condensers; and for unit 3, an additional flow path exists for the nuclear services and decay heat cooling water heat exchangers. After the seawater passes through the tubes of the condenser and/or heat exchangers, the seawater is transported in underground pipes to the discharge canal. The discharge canal directs the water back to the Gulf of Mexico.

The bar racks are inspected 24 hours a day during times of high turtle concentrations in the intake canal (February through May) and once every two hours during other times of the year. If a turtle is stranded on the bar racks it is immediately recovered with dip nets. Healthy turtles are placed in a holding tank at the CREC Mariculture Center, where Mariculture Center Staff members determine the proper disposition of the turtle, in conjunction with Florida Department of Environmental Protection (FDEP) personnel. Non-healthy turtles are also taken to the Mariculture Center with disposition to be determined by FDEP. Dead turtles are sent to the Mariculture Center and picked up by FDEP.

III. Status of Listed Species and Critical Habitat

The following listed species under the jurisdiction of NMFS are known to occur in the Gulf of Mexico:

Endangered

Green sea turtle	<i>Chelonia mydas</i>
Leatherback sea turtle	<i>Dermochelys coriacea</i>
Hawksbill sea turtle	<i>Eretmochelys imbricata</i>
Kemp's ridley sea turtle	<i>Lepidochelys kempii</i>

Sperm whales (*Physeter macrocephalus*), occur in the Gulf of Mexico but are rare in state waters. Other endangered whales, including North Atlantic right whales (*Eubalaena glacialis*) and humpback whales (*Megaptera novaengliae*), have been observed occasionally in the Gulf of Mexico. The individuals observed have likely been inexperienced juveniles straying from the normal range of these stocks. NMFS does not believe that there are resident stocks of these species in the Gulf of Mexico, and these species are not likely to be adversely affected by projects in the Gulf.

Green turtles in U.S. waters are listed as threatened except for the Florida breeding population which is listed as endangered. Due to the inability to distinguish between these populations away from the nesting beach, green turtles are considered endangered wherever they occur in U.S. waters.

Threatened

Loggerhead sea turtle
Gulf Sturgeon

Caretta caretta
Acipenser oxyrinchus desotoi

No critical habitat for listed species under the jurisdiction of NMFS has been designated in the Gulf of Mexico.

Biology and Distribution

Sea Turtles

Five species of sea turtles occur in Gulf of Mexico waters. Kemp's ridley and loggerhead turtles are the most common turtle species found in the Gulf as evidenced by strandings. However leatherbacks are not uncommon and hawksbill and green turtles occur regularly within stranding and incidental capture records. Historical accounts of the occurrence of sea turtles in Texas, Louisiana and Florida waters are consistent with current observations, although fluctuations in populations are apparent (Fuller, 1978, Cox and Mauermann, 1978, and Fuller and Tappan, 1986). Commercial fisheries remain the major known direct cause of sea turtle takes.

Green turtle (*Chelonia mydas*)

Green turtles are distributed circumglobally, mainly in waters between the northern and southern 20°C isotherms (Hirth, 1971). Green turtles were traditionally highly prized for their flesh, fat, eggs, and shell, and fisheries in the United States and throughout the Caribbean are largely to blame for the decline of the species.

In the western Atlantic, several major nesting assemblages have been identified and studied (Peters, 1954; Carr and Ogren, 1960; Parsons, 1962; Pritchard, 1969; Carr *et al.*, 1978). In the continental United States, green turtle nesting occurs on the Atlantic Coast of Florida (Ehrhart, 1979). Occasional nesting has been documented along the Gulf Coast of Florida, at Southwest Florida beaches, as well as the beaches of the Eglin Air Force Base on the Florida Panhandle (Meylan *et al.*, 1995). Most documented green turtle nesting activity occurs on Florida index beaches, which were established to standardize data collection methods and effort on key nesting beaches. The pattern of green turtle nesting shows biennial peaks in abundance, with

a generally positive trend during the six years of regular monitoring since establishment of the index beaches in 1989 and for which data have been published, perhaps due to increased protective legislation throughout the Caribbean (Meylan *et al.*, 1995).

While nesting activity is obviously important in identifying population trends and distribution, the major portion of a green turtle's life is spent on the foraging grounds. Green turtles are herbivores, and appear to prefer marine grasses and algae in shallow bays, lagoons and reefs (Rebel, 1974). Some of the principal feeding pastures in the Gulf of Mexico include inshore south Texas waters, the upper west coast of Florida and the northwestern coast of the Yucatan Peninsula. Additional important foraging areas in the western Atlantic include the Indian River Lagoon System in Florida, Florida Bay, the Culebra archipelago and other Puerto Rico coastal waters, the south coast of Cuba, the Mosquito coast of Nicaragua, the Caribbean coast of Panama, and scattered areas along Colombia and Brazil (Hirth, 1971). The preferred food sources in these areas are *Cymodocea*, *Thalassia*, *Zostera*, *Sagittaria*, and *Vallisneria* (Babcock 1937; Underwood, 1951; Carr, 1952; 1954).

Green turtles were once abundant enough in the shallow bays and lagoons of the Gulf to support a commercial fishery, which landed over one million pounds of green turtle in 1890 (Doughty, 1984). Doughty (1984) reported the decline in the turtle fishery throughout the Gulf of Mexico by 1902. Currently, green turtles are uncommon in offshore waters of the northern Gulf, but abundant in some inshore embayments. Shaver (1994) live-captured a number of green turtles in channels entering into Laguna Madre, in South Texas. She noted the abundance of green turtle strandings in Laguna Madre inshore waters and opined that the turtles may establish residency in the inshore foraging habitats as juveniles. Algae along the jetties at entrances to the inshore waters of South Texas was thought to be important to green turtles associated with a radio-telemetry project (Renaud *et al.*, 1995). Transmitter-equipped turtles remained near jetties for most of the tracking period. This project was restricted to late summer months, and therefore may reflect seasonal influences. Coyne (1994) observed increased movements of green turtles during warm water months.

Hawksbill turtle (*Eretmochelys imbricata*)

The hawksbill turtle is relatively uncommon in the waters of the continental United States, preferring coral reefs, such as those found in the Caribbean and Central America. Hawksbills feed primarily on a wide variety of sponges but also consume bryozoans, coelenterates, and mollusks. Nesting areas in the western North Atlantic include Puerto Rico and the Virgin Islands. There are accounts of hawksbills on the reefs of south Florida, and a surprising number of small hawksbills are encountered in Texas. Most of the Texas records are probably in the 1-2 year class range. Many of the individuals captured or stranded are unhealthy or injured (Hildebrand, 1983). The lack of sponge-covered reefs and the cold winters in the northern Gulf of Mexico probably prevent hawksbills from establishing a strong presence in this area.

Leatherback turtle (*Dermochelys coriacea*)

The Recovery Plan for Leatherback Turtles (*Dermochelys coriacea*) contains a description of the natural history and taxonomy of this species (USFWS and NMFS, 1992). Leatherbacks are widely distributed throughout the oceans of the world, and are found throughout waters of the Atlantic, Pacific, Caribbean, and the Gulf of Mexico (Ernst and Barbour, 1972). Leatherbacks are predominantly distributed pelagically, feeding primarily on jellyfish such as *Stomolophus*, *Chryaora*, and *Aurelia* (Rebel, 1974). They may come

into shallow waters if there is an abundance of jellyfish nearshore. Leary (1957) reported a large group of up to 100 leatherbacks just offshore of Port Aransas, Texas associated with a dense aggregation of *Stomolophus*.

The status of the leatherback population is the most difficult to assess since major nesting beaches occur over broad areas within tropical waters outside the United States. The primary leatherback nesting beaches occur in French Guiana and Suriname in the western Atlantic and in Mexico in the eastern Pacific. Although increased observer effort on some nesting beaches has resulted in increased reports of leatherback nesting, declines in nest abundance have been reported from the beaches of greatest nesting densities. At Mexiquillo, Michoacan, Mexico, Sarti *et al.* (1996) reported an average annual decline in leatherback nesting of about 23% between 1984 and 1996. The total number of females nesting on the Pacific coast of Mexico during the 1995-1996 season was estimated at fewer than 1000. The major western Atlantic nesting area for leatherbacks is located in the Suriname-French Guiana trans-boundary region. Chevalier and Girondot (1998) report that combined nesting in the two countries has been declining since 1992. Some nesting occurs on Florida's east coast, although nests are likely under-reported because surveys are not conducted during the entire period that leatherbacks may nest. In the eastern Caribbean, nesting occurs primarily in the Dominican Republic, the Virgin Islands, and on islands near Puerto Rico. Sandy Point, on the western edge of St. Croix, Virgin Islands, has been designated by the U.S. Fish and Wildlife Service (USFWS) as critical habitat for nesting leatherback turtles. Anecdotal information suggests nesting has declined at Caribbean beaches over the last several decades (NMFS and USFWS, 1995).

Kemp's Ridley (*Lepidochelys kempii*)

Of the seven extant species of sea turtles of the world, the Kemp's ridley has declined to the lowest population level. The Recovery Plan for the Kemp's Ridley Sea Turtle (*Lepidochelys kempii*) (USFWS and NMFS, 1992b) contains a description of the natural history, taxonomy, and distribution of the Kemp's or Atlantic ridley turtle. Kemp's ridleys nest in daytime aggregations known as arribadas, primarily at Rancho Nuevo, a stretch of beach in Mexico. Most of the population of adult females nest in this single locality (Pritchard, 1969). When nesting aggregations at Rancho Nuevo were discovered in 1947, adult female populations were estimated to be in excess of 40,000 individuals (Hildebrand, 1963). By the early 1970s, the world population estimate of mature female Kemp's ridleys had been reduced to 2,500-5,000 individuals. The population declined further through the mid 1980s. Recent observations of increased nesting, discussed below, suggest that the decline in the ridley population has stopped, and there is cautious optimism that the population is now increasing.

The nearshore waters of the Gulf of Mexico are believed to provide important developmental habitat for juvenile Kemp's ridley and loggerhead sea turtles. Ogren (1988) suggests that the Gulf Coast, from Port Aransas, Texas, through Cedar Key, Florida, represents the primary habitat for subadult ridleys in the northern Gulf of Mexico. Stomach contents of Kemp's ridleys along the lower Texas coast had a predominance of nearshore crabs and mollusks, as well as fish, shrimp and other foods considered to be shrimp fishery discards (Shaver, 1991). Analyses of stomach contents from sea turtles stranded on upper Texas beaches apparently suggest similar nearshore foraging behavior (Plotkin, pers comm).

Research being conducted by Texas A&M University has resulted in the intentional live-capture of 100's of Kemp's ridleys at Sabine Pass and the entrance to Galveston Bay. Between 1989 and 1993, 50 of the Kemp's

ridleys captured were tracked by biologists with the NMFS Galveston Laboratory using satellite and radio telemetry. The tracking study was designed to characterize sea turtle habitat and to identify small- and large-scale migration patterns. Preliminary analysis of the data collected during these studies suggests that subadult Kemp's ridleys stay in shallow, warm, nearshore waters in the northern Gulf of Mexico until cooling waters force them offshore or south along the Florida coast (Renaud, NMFS Galveston Laboratory, pers. comm.).

In recent years, unprecedented numbers of Kemp's ridley carcasses have been reported from Texas and Louisiana beaches during periods of high levels of shrimping effort. NMFS established a team of population biologists, sea turtle scientists and managers, known as the Expert Working Group (EWG) to conduct a status assessment of sea turtle populations. Analyses conducted by the group have indicated that the Kemp's ridley population is in the early stages of recovery; however, strandings in some years have increased at rates higher than the rate of increase in the Kemp's population (Expert Working Group, June 1996). While many of the stranded turtles observed in recent years in Texas and Louisiana are believed to have been incidentally taken in the shrimp fishery, other sources of mortality exist in these waters. These stranding events illustrate the vulnerability of Kemp's ridley and loggerhead turtles to the impacts of human activities in nearshore Gulf of Mexico waters.

The EWG focused on determining population estimates for Kemp's ridley and loggerhead sea turtles, the species of greatest concern in the Gulf of Mexico due to high historical incidental take levels in the shrimp fishery. Internal reports submitted by the EWG, entitled "Kemp's ridley (*Lepidochelys kempii*) Sea Turtle Status Report" dated June 28, 1996 and the "Status of the Loggerhead Turtle Population (*Caretta caretta*) in the Western North Atlantic" dated July 1, 1996, were submitted in early July of 1996.

The EWG developed a population model to evaluate trends in the Kemp's ridley population through the application of empirical data and life history parameter estimates chosen by the EWG. Model results identified three trends in benthic immature Kemp's ridleys. Benthic immatures are those turtles that are not yet reproductively mature but have recruited to feed in the nearshore benthic environment, where they are available to nearshore mortality sources that often result in strandings. Benthic immature ridleys are estimated to be 2-9 years of age and 20-60 cm in length. Increased production of hatchlings from the nesting beach beginning in 1966 resulted in an increase in benthic ridleys that leveled off in the late 1970s. A second period of increase followed by leveling occurred between 1978 and 1989 as hatchling production was further enhanced by the cooperative program between the USFWS and Mexico's Instituto Nacional de Pesca (INP) to increase the nest protection and relocation program in 1978. A third period of steady increase, which has not leveled off to date, has occurred since 1990 and appears to be due to the greatly increased hatchling production and an apparent increase in survival rates of immature turtles beginning in 1990 due, in part, to the introduction of TEDs.

The EWG was unable to estimate the total population size and current mortality rates for the Kemp's ridley population. However, they listed a number of preliminary conclusions. They indicated that the Kemp's ridley population appears to be in the early stage of exponential expansion. Over the period 1987 to 1995, the rate of increase in the annual number of nests accelerated in a trend that would continue with enhanced hatchling production and the use of turtle excluder devices. Nesting data indicated that the number of adults declined from a population that produced 6,000 nests in 1966 to a population that produced 924 nests in 1978 and a low of 702 nests in 1985. This trajectory of adult abundance tracks trends in nest abundance from an estimate

of 9,600 in 1966 to 1,050 in 1985. The EWG estimated that in 1995 there were 3000 adult ridleys. The increased recruitment of new adults is illustrated in the proportion of neophyte, or first time nesters, which has increased from 6% to 28% from 1981 to 1989 and from 23% to 41% from 1990 to 1994. The EWG's population model projected that Kemp's ridleys could reach the intermediate recovery goal identified in the Recovery Plan, of 10,000 nesters by the year 2020 if the assumptions of age to sexual maturity and age specific survivorship rates plugged into their model are correct. They determined that the data they reviewed suggested that adult Kemp's ridley turtles were restricted somewhat to the Gulf of Mexico in shallow near shore waters, and benthic immature turtles of 20-60 cm straight line carapace length are found in nearshore coastal waters including estuaries of the Gulf of Mexico and the Atlantic.

The EWG identified an average Kemp's ridley population growth rate of 13% per year between 1991 and 1995. Total nest numbers have continued to increase. However, the 1996 and 1997 nest numbers reflected a slower rate of growth, while the increase in the 1998 nesting level has been much higher. The population growth rate does not appear as steady as originally forecasted by the EWG, but annual fluctuations, due in part to irregular interesting periods, are normal for other sea turtle populations.

The area surveyed for ridley nests in Mexico was expanded in 1990 due to destruction of the primary nesting beach by Hurricane Gilbert. The EWG assumed that the increased nesting observed particularly since 1990 was a true increase, rather than the result of expanded beach coverage. Because systematic surveys of the adjacent beaches were not conducted prior to 1990, there is no way to determine what proportion of the nesting increase documented since that time is due to the increased survey effort rather than an expanding ridley nesting range. As noted by the EWG, trends in Kemp's ridley nesting even on the Rancho Nuevo beaches alone suggest that recovery of this population has begun but continued caution is necessary to ensure recovery and to meet the goals identified in the Kemp's ridley Recovery Plan.

Loggerhead Sea Turtles (*Caretta caretta*)

The threatened loggerhead is the most abundant species of sea turtle occurring in U.S. waters. The nearshore waters of the Gulf of Mexico are believed to provide important developmental habitat for juvenile loggerheads. Studies conducted on loggerheads stranded on the lower Texas coast (south of Matagorda Island) have indicated that stranded individuals were feeding in nearshore waters shortly before their death (Plotkin *et al.*, 1993).

The EWG identified four nesting subpopulations of loggerheads in the western North Atlantic based on mitochondrial DNA evidence. These include: (1) the Northern subpopulation producing approximately 6,200 nests/year from North Carolina to Northeast Florida; (2) the South Florida subpopulation occurring from just north of Cape Canaveral on the east coast of Florida and extending up to Naples on the west coast and producing approximately 64,000 nests/year; (3) the Florida Panhandle subpopulation, occurring at Eglin Air Force Base and the beaches near Panama City and producing approximately 450 nests/year; and (4) the Yucatan subpopulation occurring on the northern and eastern Yucatan Peninsula in Mexico and producing approximately 1,500-2,000 nests/year.

Genetic analyses of benthic immature loggerheads collected from Atlantic foraging grounds identify a mix of the east coast subpopulations that is disproportionate to the number of hatchlings produced in these nesting assemblages. Although the northern nesting subpopulation produces only approximately 9% of the

loggerhead nests, loggerheads on foraging grounds from the Chesapeake Bay to Georgia are nearly equally divided in origin between the two subpopulations (Sears, 1994; Sears *et al.*, 1995; Norrgard, 1995). Of equal interest, 57% of the immature loggerheads sampled in the Mediterranean were from the South Florida subpopulation, while only 43% were from the local Mediterranean nesting beaches (Laurent *et al.*, 1993; Bowen, 1995). Genetic work has not yet been done on nesting or foraging loggerheads in the Gulf of Mexico.

The EWG considered nesting data collected from index nesting beaches to index the population size of loggerheads and to consider trends in the size of the population. They constructed total estimates by considering a ratio between nesting data (and associated estimated number of adult females and therefore adults in nearshore waters), proportion of adults represented in the strandings, and in one method, aerial survey estimates. These two methods indicated that for the 1989-1995 period, there were averages of 224,321 or 234,355 benthic loggerheads, respectively. The EWG listed the methods and assumptions in their report, and suggested that these numbers are likely underestimates. Aerial survey results suggest that loggerheads in U.S. waters are distributed in the following proportions: 54% in the Southeast U.S. Atlantic, 29% in the northeast U.S. Atlantic, 12% in the eastern Gulf of Mexico, and 5% in the western Gulf of Mexico.

The EWG considered long-term index nesting beach datasets when available to identify trends in the loggerhead population. Overall, they determined that trends could be identified for two loggerhead subpopulations. The Northern subpopulation appears to be stabilizing after a period of decline; the South Florida subpopulation appears to have shown significant increases over the last 25 years suggesting the population is recovering, although the trend could not be detected over the most recent 7 years of nesting. An increase in the numbers of adult loggerheads has been reported in recent years in Florida waters without a concomitant increase in benthic immatures. These data may forecast limited recruitment to south Florida nesting beaches in the future. Since loggerheads take approximately 20-30 years to mature, the effects of decline in immature loggerheads might not be apparent on nesting beaches for decades. Therefore the EWG cautions against considering trends in nesting too optimistically.

Briefly, the EWG made a number of conclusions regarding the loggerhead population. They concluded that four distinct nesting populations exist based on genetic evidence, although separate management is not possible because of insufficient information on the in-water distribution of each subpopulation. They concluded that the recovery goal of more than 12,800 nests for the Northern subpopulation was not likely to be met. Currently, nests number about 6,200 and no perceptible increase has been documented. The recovery goal or "measurable increases" for the South Florida subpopulation (south of Canaveral and including Southwest Florida) appears to have been met, and this population appears to be stable or increasing. However, index nesting surveys have been done for too short a time, therefore it is difficult to evaluate trends throughout the region. Recovery rates for the entire subpopulation cannot be determined with certainty at this time. However, caution is warranted because, although nesting activity has been increasing, catches of benthic immature turtles at the St. Lucie Nuclear Power Plant intake canal, which acts as a passive turtle collector on Florida's east coast, have not been increasing. The EWG recommended establishing index nest survey areas in the Gulf of Mexico to monitor those populations, which do not currently have recovery goals assigned to them.

Fish

Gulf Sturgeon (*Acipenser oxyrinchus desotoi*)

Detailed information regarding the life history, abundance and distribution of Gulf sturgeon can be found in the Gulf Sturgeon Recovery/Management Plan (FWS and GSMFC, 1995). Gulf sturgeon were listed as threatened in 1991, and are under the joint jurisdiction of the Fish and Wildlife Service and NMFS. Historically, Gulf sturgeon occurred in most major rivers between the Mississippi and the Suwannee, and in marine waters from the Mississippi to Florida Bay. While little is known about the abundance of Gulf sturgeon through most of its range, estimates exist for the Suwannee and Apalachicola rivers. The FWS (1990, 1991, 1992 in FWS & GSMFC, 1995) reported an average of 115 individuals larger than 45 cm total length over-summering in the Apalachicola River below Jim Woodruff Lock and Dam. For the Suwannee River, population size estimates ranging from 2,250 to 3,300 individuals have been made (Carr and Rago, unpublished data in FWS & GSMFC, 1995).

There is sparse information available regarding the distribution of Gulf sturgeon in the marine environment. A few takes incidental to commercial and recreational fishing have been documented offshore of Louisiana, in the Mississippi Sound and Biloxi Bay, Pensacola Bay, Apalachicola Bay, Tampa Bay and Charlotte Harbor. Although biotelemetry studies geared toward identifying the movements of sturgeon once they have entered marine waters have been conducted, little information has been developed yet. Gulf sturgeon likely leave riverine waters in the late fall to early winter to forage in the marine or estuarine environment for benthic invertebrates over mud and sand bottoms and seagrass communities, and return to the rivers in the spring.

Directed and incidental take in fisheries and habitat loss have been identified as the major threats to the recovery of Gulf sturgeon.

Analysis of the Species Likely to be Affected

Of the above listed species occurring in the eastern Gulf of Mexico, NMFS believes that the five species of sea turtle are likely to be adversely affected by the proposed action. NMFS believes that the Gulf sturgeon and listed species of large whales are not likely to be adversely affected by the proposed action. Although the Gulf sturgeon's migratory habits are not well known, NMFS believes it is unlikely that Gulf sturgeon will stray from mud and sand bottom marine foraging areas in the Gulf to enter the rocky bottomed intake canal of the CREC and be affected by the cooling water intake system. Species of large whales are not likely to occur in the inshore shallow waters by the intake canal. The remainder of the analysis in this biological opinion will focus on the five species of sea turtles.

IV. Environmental Baseline

Status of the Species Within the Action Area

The five species of sea turtles that occur in the action area are all highly migratory. The offshore waters of the eastern Gulf may be used by these species as post-hatchling developmental habitat, foraging habitat, or migratory pathways. NMFS believes that no individual members of any of the species are likely to be year-round residents of the action area. Individual animals will make migrations into nearshore waters as well as

other areas of the Gulf of Mexico, Caribbean Sea, and North Atlantic Ocean. Therefore, the range-wide status of the species, given in Section II above, most appropriately reflects the species status within the action area.

Factors Affecting the Species Within the Action Area

The offshore waters of the eastern Gulf of Mexico remain relatively free of human activities that impact listed species of sea turtles. The only Federal action in the action area impacting these species, whose effects have been previously considered in a biological opinion, is the pelagic fishery for swordfish, tuna, and shark. As discussed above, however, sea turtles are not strict residents of the action area and may be affected by human activities throughout their migratory range. Therefore, this section will discuss the impacts of Federal actions on sea turtles throughout the Gulf of Mexico and western North Atlantic.

Federally-regulated commercial fishing operations represent the major human source of sea turtle injury and mortality in U.S. waters. Shrimp trawlers in the southeastern U.S. are required to use TEDs, which reduce a trawler's capture rate by 97%. Even so, NMFS estimated that 4,100 turtles may be captured annually by shrimp trawling, including 650 leatherbacks that cannot be released through TEDs, 1,700 turtles taken in try nets, and 1,750 turtles that fail to escape through the TED (NMFS, 1998). Henwood and Stuntz (1987) reported that the mortality rate for trawl-caught turtles ranged between 21% and 38%, although Magnuson *et al.* (1990) suggested Henwood and Stuntz's estimates were very conservative and likely an underestimate of the true mortality rate. The mid-Atlantic and Northeast fishery for summer flounder, scup, and black sea bass uses otter trawl gear that also captures turtles. Summer flounder trawlers fishing south of Cape Henry, Virginia (south of Oregon Inlet, North Carolina from January 15 to March 15) are required to use TEDs. Participants in this fishery who use a type of trawl known as a flynet, however, are not required to use TEDs, as TEDs for flynets have not been researched and NMFS is collecting further observer information on turtle bycatch by flynet vessels. The estimated, observed annual take rates for turtles in this multispecies fishery is 15 loggerheads and 3 leatherbacks, hawksbills, greens, or Kemp's ridley, in combination (NMFS, 1996a). The pelagic fishery for swordfish, tuna, and shark, which is prosecuted over large areas of the northwestern Atlantic and the Gulf of Mexico, including the action area, also has a fairly large bycatch of sea turtles. NMFS (1997b) estimated that the longline component of this fishery would annually take, through hooking or entanglement, 690 leatherbacks, 1,541 loggerheads, 46 green, and 23 Kemp's ridley turtles, with a projected mortality rate of 30%. In the driftnet component of the fishery, estimated annual levels of injury or mortality are 40 leatherbacks, 58 loggerheads, 4 Kemp's ridleys, 4 greens, and 2 hawksbills.

Military activities, including vessel operations and ordnance detonation, also affect listed species of sea turtles. U.S. Navy aerial bombing training in the ocean off the southeast U.S. coast, involving drops of live ordnance (500 and 1,000-lb bombs) is estimated to injure or kill, annually, 84 loggerheads, 12 leatherbacks, and 12 greens or Kemp's ridley, in combination (NMFS, 1997a). The U.S. Navy will also conduct ship-shock testing for the new SEAWOLF submarine off the Atlantic coast of Florida, using 5 submerged detonations of 10,000 lb explosive charges. This testing is estimated to injure or kill 50 loggerheads, 6 leatherbacks, and 4 hawksbills, greens, or Kemp's ridleys, in combination (NMFS, 1996b). The U.S. Coast Guard's operation of their boats and cutters, meanwhile, is estimated to take no more than one individual turtle - of any species - per year (NMFS, 1995). Formal consultation on Coast Guard or Navy activities in the Gulf of Mexico has not been conducted.

The construction and maintenance of Federal navigation channels has also been identified as a source of turtle mortality. Hopper dredges, which are frequently used in ocean bar channels and sometimes in harbor channels and offshore borrow areas, move relatively rapidly and can entrain and kill sea turtles, presumably as the drag arm of the moving dredge overtakes the slower moving turtle. Along the Atlantic Coast of the southeastern United States, NMFS estimates that annual, observed injury or mortality of sea turtles from hopper dredging may reach 35 loggerheads, 7 greens, 7 Kemp's ridleys, and 2 hawksbills (NMFS, 1997c). Along the north and west coasts of the Gulf of Mexico, channel maintenance dredging using a hopper dredge may injure or kill 30 loggerhead, 8 green, 14 Kemp's ridley, and 2 hawksbill sea turtles annually (NMFS, 1997d).

Sea turtles entering coastal or inshore areas have been affected by entrainment in the cooling-water systems of electrical generating plants. At the St. Lucie nuclear power plant at Hutchinson Island, Florida, large numbers of green and loggerhead turtles have been captured in the seawater intake canal in the past several years. Annual capture levels from 1994-1997 have ranged from almost 200 to almost 700 green turtles and from about 150 to over 350 loggerheads. Almost all of the turtles are caught and released alive; NMFS estimates the survival rate at 98.5% or greater (1997e). Other power plants in south Florida, west Florida, and North Carolina have also reported low levels of sea turtle entrainment, but formal consultation on these plants' operations has not been completed.

Sea turtles are vulnerable to blast injury and death from the use of underwater explosives. Klima *et al.* (1988) reported a dramatic elevation in the number of sea turtle strandings along the north Texas coast, coinciding with a large number of explosive removals of offshore oil platforms in the area. Since then, protective measures implemented by NMFS, the Corps of Engineers, and the Minerals Management Service, including required observers at explosive rig-removals, have been effective in minimizing the impacts of explosive rig-removals on sea turtles. From 1987 to 1997, a total of 1,013 platform removals took place with NMFS observers present. Sea turtles were observed at 112 of those sites, and two loggerhead turtles were recovered injured after blasting. Those animals were rehabilitated and released. In 1998, one loggerhead has been killed as a result of rig-removal blasting. Although some mortality may occur and go undetected, the overall number of turtles impacted by rig-removal actions has been very low since the adoption of protective measures.

V. Effects of the Action

Since units 1, 2, and 3 began commercial operation, marine turtles have occasionally been found in the intake canal. CREC records indicate that from 1994 to 1997, eight sea turtles were stranded on the unit 3 intake bar racks. CREC records for these years do not indicate species, time of year, size or disposition of the stranded turtles (dead or alive). Sea turtle monitoring activities at CREC have increased substantially since 1997 with the monitoring program implemented in March of 1998 and the implementation of the Sea Turtle Rescue Guidelines dated Sept 1998. The increased monitoring may increase take numbers as turtles that may have been missed in previous years are added into the take numbers for a given year.

The number of sea turtle sightings in the intake canal and strandings of the bar racks increased dramatically in 1998. The majority of these were Kemp's ridley sea turtles. In February 1998, 2 sea turtles were found stranded on the bar racks. These turtles were released alive. During March 1998 an additional 19 turtles were stranded on the unit 3 bar rack and released alive. Four mortalities were discovered floating in the

intake canal. CREC considers these four mortalities not causally related to plant operations since they were found upstream of the power plant intake structures. CREC considers it highly unlikely that a turtle mortality related to power plant operations could float against the incoming water current and by pass the surface trash boom structures.

In April, 1998 an additional 14 stranded sea turtles were released alive and 7 mortalities found. Four of these mortalities were found on the bar racks while the other 3 were found floating upstream of the intake structure. For the reasons described above CREC does not consider these three mortalities to be caused by plant operations. In May, 1998 a total of 4 sea turtles were stranded on the bar racks at unit 3 and released, 2 mortalities were recovered, one at unit 3 and the other was seen floating in the canal and finally recovered near the intakes for units 1 and 2. This mortality had evidence of a boat collision. During June and July no sea turtles were stranded at CREC. During August 1998, one live sub-adult green turtle was removed from the bar racks of units 1 and 2. This turtle was considered severely debilitated by fibropapillomatosis and was transferred, under the direction of the Florida Department of Environmental Protection (FDEP), to the Clearwater Marine Science Center for rehabilitation.

NMFS agrees with the BA that dead turtles floating in the canal are not causally related to plant operations for the reasons stated above. NMFS also believes that severely decomposed turtles found on the bar racks are also not causally related to plant operations as the bar racks are continually monitored on a daily basis for turtle strandings. Therefore dead sea turtles not considered causally related to plant operations and verified by the FDEP are not considered taken by CREC.

The records indicate that this activity has not taken many sea turtles for years up to 1998. For the four years from 1994 to 1997 the activities at CREC have taken an average of two sea turtles per year. Records for 1998 show a dramatic increase in the numbers of sea turtle strandings at CREC, especially for the months of February to May. In 1998 a total of 44 takes were attributed to plant operations 5 being lethal. Of these 37 of the turtles released alive were Kemp's ridley and all 5 lethal takes were also Kemp's ridley. All sea turtles stranded at CREC were sub-adults with carapace lengths ranging from 21 cm to 55 cm. There are no proven environmental factors that have caused this increase and population numbers are not monitored for this area so the increase could be from an increase in population or an increase in sub-adult turtles moving into this area from some other area (personal communication with Allen Foley, FDEP). According to CREC personnel there has been 4 Kemp's ridley sub-adult turtles released alive from the bar racks at unit 3, from January to March of 1999. Thus far this rate of take is less than this time in 1998, and is considered comparable to other years excluding 1998.

Based on this information and the fact that another anomalous year such as 1998 is possible, NMFS believes that the level of live take of sea turtles in BSEP's intake canal may reach 50 sea turtles rescued alive from the bar racks biannually and 5 lethal takes, biannually that are causally related to plant operations.

VI. Cumulative Effects

Cumulative effects are the effects of future state, local, or private activities that are reasonably certain to occur within the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA. Within the action area, major future developments in human activities, that are not

part of a Federal action, are not anticipated. Because the action area is entirely within the Exclusive Economic Zone, new activities such as natural resource extraction/harvest would be subject to Federal review and/or regulation. As discussed in Section III, however, listed species of turtles migrate throughout the Gulf of Mexico and may be affected during their life cycles by non-Federal activities outside the action area.

Throughout the coastal Gulf of Mexico, but particularly in Louisiana, the loss of thousands of acres of wetlands is occurring due to natural subsidence and erosion, as well as reduced sediment input from the Mississippi River. Impacts caused by residential, commercial, and agricultural developments appear to be the primary causes of wetland loss in Texas.

Oil spills from tankers transporting foreign oil, as well as the illegal discharge of oil and tar from vessels discharging bilge water will continue to affect water quality in the Gulf of Mexico. Cumulatively, these sources and natural oil seepage contribute most of the oil discharged into the Gulf of Mexico. Floating tar sampled during the 1970s, when bilge discharge was still legal, concluded that up to 60% of the pelagic tars sampled did not originate from the northern Gulf of Mexico coast.

Marine debris will likely persist in the action area in spite of MARPOL prohibitions. In Texas and Florida, approximately half of the stranded turtles examined have ingested marine debris (Plotkin and Amos, 1990 and Bolten and Bjorndal, 1991). Although fewer individuals are affected, entanglement in marine debris may contribute more frequently to the death of sea turtles.

Coastal runoff and river discharges carry large volumes of petrochemical and other contaminants from agricultural activities, cities and industries into the Gulf of Mexico. The coastal waters of the Gulf of Mexico have more sites with high contaminant concentrations than other areas of the coastal United States, due to the large number of waste discharge point sources. Although these contaminant concentrations do not likely affect the more pelagic waters of the action area, the species of turtles analyzed in this biological opinion travel between nearshore and offshore habitats and may be exposed to and accumulate these contaminants during their life cycles.

State-regulated commercial and recreational fishing activities in the Gulf of Mexico waters take endangered species. These takes are not reported and are unauthorized. It is expected that states will continue to license/permit large vessel and thrill-craft operations which do not fall under the purview of a Federal agency and will issue regulations that will affect fishery activities. NMFS will continue to work with states to develop ESA Section 6 agreements and Section 10 permits to enhance programs to quantify and mitigate these takes. Increased recreational vessel activity in inshore waters of the Gulf of Mexico will likely increase the number of turtles taken by injury or mortality in vessel collisions. Recreational hook-and-line fisheries have been known to lethally take sea turtles, including Kemp's ridleys. In a study conducted by the NMFS Galveston Laboratory between 1993 through 1995, 170 ridleys were reported associated with recreational hook-and-line gear; including 18 dead stranded turtles, 51 rehabilitated turtles, 5 that died during rehabilitation, and 96 that were released by fishermen (Cannon and Flanagan, 1996). The Sea Turtle Stranding and Salvage Network (STSSN) also receives stranding reports that identify carcass anomalies that may be associated with the recreational fishery (entangled in line or net, fish line protruding, fish hook in mouth or digestive tract, fish line in digestive tract). The reports do not distinguish between commercial or recreational sources of gear, such as hook, net, and line, which may be used in both sectors. Cumulatively, fishery entanglement anomalies are noted in fewer than 4% of the stranded sea turtle carcasses reported

between 1990 and 1996, and some carcasses carry more than one anomaly (e.g., fishing line in digestive tract/fishing line protruding from mouth or cloaca), therefore summing these reports may result in some double counting.

VII. Conclusion

After reviewing the current status of the affected species of sea turtles, the environmental baseline for the action area, and the effects of the action, it is NMFS's biological opinion that the operation of the cooling water intake system of the Crystal River Energy Complex as outlined in the Nuclear Regulatory Commission's Biological Assessment, dated October 14, 1998, is not likely to jeopardize the continued existence of the loggerhead, leatherback, green, hawksbill, or Kemp's ridley sea turtles. No critical habitat has been designated for these species in the action area, therefore none will be affected. This conclusion is based on the action's effects on these species being limited to the direct take, through death or injury, of a small number of sub-adult and adult sea turtles per year.

VIII. Incidental Take Statement

Section 7 (b)(4) of the ESA requires that when a proposed agency action is found to be consistent with section 7(a)(2) of the ESA and the proposed action may incidentally take individuals of listed species, NMFS will issue a statement that specifies the impact of any incidental taking of endangered or threatened species. It also states that reasonable and prudent measures, and terms and conditions to implement the measures, shall be provided that are necessary to monitor and minimize such impacts. Only incidental taking resulting from the agency action as described in the proposed action of the biological opinion, including incidental takings caused by activities approved by the agency, and that comply with the specified reasonable and prudent measures and terms and conditions, are exempt from the takings prohibition of section 9(a), pursuant to section 7(o) of the ESA.

Section 7(a)(2) of the ESA specifies that each federal agency shall, in consultation with and with the assistance of the Secretary, insure that any action authorized, funded, or carried out by such is not likely to jeopardize the continued existence of any endangered or threatened species.

NMFS has estimated the impact of CREC's operation of its cooling water intake system on listed species of sea turtles (see Assessment of Impacts above). Based on this analysis, NMFS anticipates 50 sea turtles (of the five species analyzed in this BO) with 5 being lethal (lethal take being turtles mortalities considered causally related to plant operations and verified by the FDEP) could be incidentally taken biannually (annual records are from January 1- December 31 each year), as a result of this action. This level of take will not jeopardize the continued existence of these species.

The following reasonable and prudent measures and terms and conditions are specified as required by 50 CFR 402.14 (i)(1)(ii) and (iv) to monitor and minimize the impact of incidental takings associated with the operation of the water intake system at CREC.

Reasonable and Prudent Measures

1. CREC will have a plan to monitor sea turtle activities around the bar racks and a plan to rescue sea turtles stranded on the bar racks.
2. CREC will keep records of sea turtle strandings at the plants.

Terms and Conditions

3. Continue implementation of the procedures outlined in the Sea Turtle Rescue and Handling Guidelines for CREC dated September 9, 1998. All updates of the rescue plan will be reviewed by the FDEP and NMFS.
4. If any listed species are apparently injured or killed in the intake canal or the bar racks, a report, summarizing the incident, must be provided to the NMFS Southeast Regional Office's Chief of Protected Resources, within 30 days of the incident.
5. All sea turtle takings will be recorded by species, size and time of year taken. These records will be made available to NMFS Southeast Regional Office's Chief of Protect Resources 30 days after the start of each year or upon written request during other parts of the year.

IX. Conservation Recommendations

Pursuant to section 7(a)(1) of the ESA, the following conservation recommendations are made to assist BSEP in reducing/eliminating impacts to listed and proposed species and promoting their conservation and recovery.

1. CREC should conduct tissue sampling for the genetic identity of turtles interacting with plant cooling water intake systems.
2. CREC should set up a tagging program for released sea turtles in conjunction with FDEP.
3. CREC should continue working on a design for diversion structures, which would be used to keep sea turtles away from the bar racks.

X. Reinitiation of Consultation

Reinitiation of formal consultation is required if (1) the amount or extent of taking specified in the incidental take statement 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. In instances where the amount or extent of incidental take is exceeded, CREC must immediately request reinitiation of formal consultation.

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