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**STUDY TITLE:** Abundance and Distribution of Sea Turtles off North Carolina

**REPORT TITLE:** Abundance and Distribution of Sea Turtles off North Carolina, Final Report

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KEY WORDS: Mid-Atlantic; South Atlantic; Sea turtles; Caretta; Lepidochelys kempji; Dermochelys coriacea; loggerhead turtle; Kemp's ridley turtle; leatherback turtle; satellite telemetry; aerial survey; distribution; movements; migration; behavior; population; density; protected species.

**BACKGROUND:** Juvenile and adult sea turtles inhabit the coastal areas of the mid-Atlantic, where petroleum exploration may occur. This exploration may impact sea turtles, yet little is known of the occurrences of turtles there. Satellite telemetry and aerial surveys were used to describe the occurrence and movements of sea turtles in the coastal area near Cape Hatteras.

**OBJECTIVES:** the objectives of this study were to:

1. Analyze and/or summarize existing aerial survey, satellite telemetry, and stranding data;
2. Conduct additional aerial surveys near Cape Hatteras; and
3. Track Kemp's ridley turtles utilizing satellite telemetry.

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These data were used to define the migration and temporal and spacial distribution and abundance of sea turtles in the area to determine habitat usage and number of turtles which utilize the area.

**DESCRIPTION:** Existing aerial survey data from 1985 - 1989, stranding data, and data from 9 satellite tracked loggerhead turtle were analyzed or summarized. Aerial surveys from 1985 - 1989 were performed offshore from Cape Henry, Virginia to Cape Hatteras, North Carolina up to 28 km offshore. In addition, aerial surveys and Kemp's ridley satellite tracking data were collected specifically for this report.

From 1991 - 1992, 10 aerial surveys were flown from 75 km north to 75 km south of Cape Hatteras. This area was divided into three zones; from 75.0 km to 18.5 km north of Cape Hatteras (northern zone), from 18.5 km north to 18.5 km south of Cape Hatteras (middle zone), and from 18.5 km to 75.0 km south of Cape Hatteras (southern zone). All surveys were flown to 27.8 km offshore.

Seven Kemp's ridley turtles were equipped with satellite transmitters and released from Virginia Beach. Turtles were tracked via the Argos system until transmissions ceased.

**SIGNIFICANT CONCLUSIONS:** We estimate up to 4,500 loggerhead and 500 Kemp's ridley sea turtles migrate from the south around Cape Hatteras during May to northern summer feeding areas. They return in fall to the south of Cape Hatteras, rounding the Cape during October and November. This movement is probably mediated by water temperature. Kemp's ridleys, as well as some loggerheads appear to overwinter as far south as Florida, while some loggerheads either become pelagic in the North Atlantic or stay along the outer shelf over live bottom under the Gulf Stream off North Carolina.

**STUDY RESULTS:** Density estimates of surfaced loggerheads in the 1985-1989 study ranged from 0 (December) to 0.372 (early May) turtles km<sup>-2</sup>. In the 1991-1992 study, density estimates of loggerheads at the surface north of Cape Hatteras ranged from 0 (in January, early April, June, August and September) to 0.314 turtles km<sup>-2</sup> (in early July). Density ranged from 0 (in January and early April) to 0.314 turtles km<sup>-2</sup> (in early July) for the northern zone, from 0 (in June) to 0.187 turtles km<sup>-2</sup> (in early April) in the middle zone, and from 0 (August, June and September) to 0.179 turtles km<sup>-2</sup> (early April) in the southern zone. Diving data from three satellite telemetered loggerheads showed that the turtles migrating south along the North Carolina coast stayed at the surface 10.6% of the time, providing an adjustment factor of 9.4 to compensate for turtles not observed below the surface, yielding population density estimates up to 2.952 turtles km<sup>-2</sup>.

The ratio of stranded ridleys to loggerheads ranged up to 0.2500, providing population estimates up to 0.738 ridleys km<sup>-2</sup>. However, during some years the flounder trawl fishery interacts with turtles migrating south in the autumn, and incurs high mortality on sea turtles. Because Kemp's ridley is a summer estuary inhabitant, we feel that the ratio for this time (0.1095) is most representative for calculating standing stock of ridleys from stranding

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ratios. This provides population estimates for ridleys up to 493.72 turtles in the northern zone, up to 171.69 turtles in the middle zone, and 224.10 turtles in the southern zone.

Few leatherback turtles were observed, and surface density estimates ranged up to 0.070 turtles km<sup>-2</sup>, when they were observed. No dive data is available for leatherbacks off North Carolina's coast. A leatherback turtle tracked in the Caribbean off St. Croix Island was at the surface 13.1% of the time, yielding an adjustment factor of 7.6, providing density estimates up to 0.532 turtles km<sup>-2</sup>.

Data from aerial surveys and satellite telemetry show that turtles migrate from waters north of Cape Hatteras in the autumn, rounding Cape Hatteras during October and November. Once south of Hatteras, telemetered turtles either became pelagic in deep offshore waters (two loggerheads), traveled nearshore to Florida (two loggerheads and two ridleys), overwintered off North Carolina in the west side of the Gulf Stream (three loggerheads), travelled north and entered Chesapeake Bay (one ridley), or ceased to transmit shortly after rounding the Cape (with the exception of one that ceased in Pamlico Sound). One loggerhead which overwintered off Cape Canaveral, Florida, and three which overwintered off North Carolina just over the continental shelf between Cape Fear and Cape Lookout (2) or just south of Cape Hatteras (1) returned to the Chesapeake Bay the following spring, rounding Cape Hatteras during May. This movement was supported by aerial surveys.

**STUDY PRODUCT(S):** Keinath, J.A., J.A. Musick, and D.E. Barnard. 1994. Abundance and Movements of Sea Turtles off North Carolina. Final report for the Minerals Management Service Atlantic OCS Region, Herndon, VA.

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