

## Twenty years of marine turtle nesting at the Archie Carr National Wildlife Refuge, Florida, USA

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The 21 km coastline in south Brevard County, Florida supports more loggerhead and green turtle nesting than any comparable beach in the United States, and leatherback nesting has risen markedly since 1996. Nesting surveys, tagging and morphometric data collection have been constant since 1982. During this time, there have been more than 4,700 loggerhead encounters, about 1,600 Florida green turtle encounters and 23 leatherback encounters. The Refuge concept was based on loggerhead

and Florida green turtle nest production during the 1980s. Since that time, loggerhead nesting has increased by 33%, Florida green turtle nesting has increased by 294%, and leatherback nesting has increased by about 170%. Tag returns and satellite tracking data indicate that turtles utilizing the Carr Refuge are migrating from the nearby Atlantic, the Gulf of Mexico, Cuba, and the Bahamas. Research in the Carr Refuge has ranged from simple nesting surveys to satellite telemetry.

## Estimates of survival probabilities for immature green turtles in the southern Bahamas

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Capture-recapture data for a population of immature green turtles at Inagua, Bahamas, collected over 22 years (1978 - 1999) were evaluated. The Cormack-Jolly-Seber approach (using the program MARK) was used to model recapture probabilities and annual survival probabilities. We evaluated temporal and size-class-specific demographic effects on both survival and recapture estimation as well as the possible transient behavior of the immature green turtles. Transience was evaluated using pro-

gram TMSURVIV. The model with the best fit had size-class-specific and time-dependent survival probabilities but size-class-independent and time-dependent recapture probabilities. Estimates of annual survival probabilities are presented. We discuss the caution required in interpreting these data, because our estimates of apparent survival confound mortality with emigration. Meta-population studies are needed to distinguish between mortality and emigration.

## Survival rate estimates in sea turtles with variable inter-nesting intervals: new statistical modeling of capture-recapture data

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One of the main objectives of tagging programs should be to provide estimates of demographic parameters, such as survival rates. To date, this has not been adequately achieved for marine turtles due to the lack of available models that take into account variable inter-nesting intervals. Indeed, in the case of marine turtles, the capture probability of an individual is dependent on

its past history. To correct for this problem, we have developed a new demographic model in which the inter-nesting intervals are now an output, in addition to survival rates and capture probabilities. The benefits of this new method relative to increased knowledge of sea turtle biology will be presented.

## Changes in relative abundance and population structure of immature marine turtles in the Indian River Lagoon, Florida over the past 20 years

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The Indian River Lagoon system serves as a developmental habitat for juvenile green turtles and sub-adult loggerheads. The capture of 574 loggerheads and 1508 green turtles over the last 20 years of an ongoing study has provided an index of relative abundance and an understanding of population structure for these aggregations. During the first two years of this study, the ratio of loggerhead captures to green turtle captures was 3:1. During the intervening years this has reversed, so that the ratio

is now 1:4. While the relative abundance and mean standard carapace length of green turtles has increased significantly, this has not been the case for loggerheads. The results of this study to date suggest that conservation efforts over the past two decades may be paying off, but this optimism is tempered by the high prevalence of fibropapillomatosis in this green turtle population.