

Monogamous female sea turtles? Yes, thanks to sperm storage

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A baby loggerhead (*Caretta caretta*) sea turtle is "belly-up" in a nest on the beach in southwestern Florida. Credit: Florida Atlantic University

Like most other species, male sea turtles will mate with any female sea turtle they can. However, when it comes to female sea turtles and mate

selection, it's a little more complex. Sea turtles are known to have multiple mates, yet there is no consensus on why they do.

It is believed that female sea turtles may mate multiply to ensure fertilization, which will result in multiple [paternity](#) within their nests, providing "fertilization insurance," so to speak. However, researchers from Florida Atlantic University suggest that this fertilization insurance hypothesis might not be so compelling after all.

Findings from their study, published in the journal *Ecology and Evolution*, provide insights into the relative numbers of males present in the breeding population—such measures are hard to obtain because males never come ashore. Furthermore, because [conservation efforts](#) are often focused on protected nests and nesting beaches (ensuring protection of the genetic output of nesting females), this study helps to provide a rough measure of how many males' genes are effectively receiving protection as well.

For the study, researchers examined paternity patterns in a sample of nesting loggerhead (*Caretta caretta*) female sea turtles on Sanibel Island in southwestern Florida. Sea turtles lay several nests over the course of a nesting season. Sanibel Island is monitored by the Sanibel Captiva Conservation Foundation (SCCF) who determined that during the 2016 nesting season, 634 loggerhead nests were laid on the island. Over that nesting season, sea turtles that laid more than one nest at that beach and a subset of their hatchlings were assessed to find out how many fathers were represented in the clutches (the eggs in each [nest](#)). Researchers compared genotypes to examine 36 of their clutches to determine paternity patterns between subsequent clutches.



Baby loggerhead (*Caretta caretta*) sea turtles make their way along a Florida beach. Credit: Florida Atlantic University

Multiple mating can occur when the benefits of mating outweigh the costs, but if costs and benefits are equal, no pattern is expected. The researchers hypothesized that, if the benefits of mating outweigh the costs, females should mate multiply both early and throughout the breeding season.

Surprisingly, what researchers discovered is that most of these Sanibel Island female sea turtles were monogamous—75 percent of the females they analyzed had mated singly. No male was represented in more than one female's clutches.

"Female [sea turtles](#) have the remarkable ability to store sperm. The simplest explanation of these singly-fathered Sanibel Island nests is that the females successfully mated once and stored sufficient sperm to fertilize all the eggs in the multiple clutches we observed," said Jacob A. Lasala, Ph.D., senior author and a graduate of biological sciences who trained under Jeanette Wyneken, Ph.D., co-author and a professor of biological sciences, and Colin Hughes, Ph.D., co-author and an associate professor of biological sciences in FAU's Charles E. Schmidt College of Science. "Females likely mate at the beginning of the season and use stored sperm for multiple clutches."

In this population, males appear to complete their breeding season before all females complete nesting and depart for foraging grounds. Given the dispersion of loggerhead turtles and the lack of evidence of pair bonds, the researchers say that it is improbable that females who laid singly sired nests would seek out the same specific males to replenish their sperm storage between clutches.

"If females were mating with multiple males to increase opportunities for and benefits from males with some advantageous heritable traits, we would expect to see higher emergence success and/or larger and presumably, more robust hatchlings in multiple paternity clutches," said Wyneken. "There were no differences between primary versus secondary clutches or between single versus multiple paternity clutches."

The frequency of multiple paternity was 22 percent (eight of 36 nests), which is lower than previously reported for this nesting beach (67 percent, 34 of 51 nests). The researchers did not find any consistent pattern across the subsequent multiple paternity clutches, suggesting benefits to loggerhead females probably equals their costs. All clutches had male genotypes that persisted from the first clutch to subsequent clutches (including one of 50 days past the first observed [clutch](#)).

The four female loggerhead [turtles](#) in the study with new fathers in subsequent clutches were smaller and possibly younger than those that mated with one male. The researchers think it's possible that smaller females or those breeding for the first time may be unable to reject persistent or aggressive males and hence their nests would be prone to multiple paternity.

"If there is little benefit and little cost to multiple mating by females, it's reasonable to hypothesize that larger and more experienced females may be more effective in controlling their numbers of mates than smaller, neophyte nesters," said Lasala, who is currently a postdoctoral research fellow at Mote Marine Laboratory. "While loggerhead [females](#) may mate between nesting events, that behavior appears to be relatively rare."

More information: Jacob A. Lasala et al, Female loggerhead sea turtles (*Caretta caretta* L.) rarely remate during nesting season, *Ecology and Evolution* (2019). [DOI: 10.1002/ece3.5869](https://doi.org/10.1002/ece3.5869)

Provided by Florida Atlantic University

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