

Whale sharks may produce many litters from one mating, paternity test shows

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Whale shark. UIC researcher Jennifer Schmidt, associate professor of biological sciences, studies the large mammals. Image: Jennifer Schmidt

How do female whale sharks meet their perfect mates and go on to produce offspring? While little is known about the reproductive behavior of these ocean-roaming giants, a newly published analysis led by University of Illinois at Chicago biologist Jennifer Schmidt reveals new details about the mating habits of this elusive, difficult-to-study fish.

Schmidt, a UIC associate professor of biological sciences, determined paternity of 29 [frozen embryos](#) saved from a female [whale shark](#) caught off the coast of Taiwan in 1995. The embryos, studied in collaboration with Professor Shoou-Jeng Joung at the National Taiwan Ocean University, are extremely rare.

The pregnant shark carried a surprisingly large number of embryos -- 304 -- still in the uterus and representing a spectrum of age and development stages ranging from being still egg-encased to developed, near-term animals.

Schmidt and her colleagues spent several years developing DNA [genetic markers](#) to study whale sharks, initially for population genetics, but in this study the tool was used to determine paternity.

Shark reproduction is still an emerging science, but what is known suggests that most broods are sired by more than one male. That is not what Schmidt found with this particular female whale shark.

"These differently aged embryos -- itself unusual across [animal species](#) -- had the same father," Schmidt said. "We have to be very cautious in drawing conclusions from a single litter, but the data suggest female whale sharks store sperm after a single mating event, and subsequently fertilize their own eggs as they are produced."

If the finding can be supported from analysis of other whale shark litters, Schmidt said, "it would suggest that there is no whale shark breeding ground where large numbers of animals meet to mate, but rather that mating occurs as an isolated event."

Follow-up studies may be serendipity. International protocols protect whale sharks from capture, few are housed in aquariums, and those that are are usually less than 25 years old and not yet sexually mature. Scientists typically study whale sharks at seasonal feeding grounds, but those animals are usually juveniles not mature enough to breed. Rarely are adult females observed in the wild.

"Protections for whale sharks have increased in many parts of the world, yet shark numbers seem to be declining, and the average size is getting

smaller," said Mark Meekan, principal research scientist with the Australian Institute of Marine Sciences.

"This is a classic sign of overfishing, where larger, more valuable animals are selectively removed," he said. "Targeted fishing of breeding-age animals in a late-maturing species can be devastating for its survival."

More information: The findings are reported in the journal *Endangered Species Research*, published online Aug. 4.

Provided by University of Illinois at Chicago

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