

Scientists: Hammerhead has 'virgin birth' in zoo's shark tank

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A hammerhead shark captured in Florida Bay gave birth without sex, according to scientists who said they used genetic analysis to account for the mysterious appearance of a pup in a tank of female sharks.

The research was to be published today in the British journal *Biology Letters*.

The phenomenon, known among biologists as a "virgin birth," had been observed before among some snakes, lizards and birds, but never a shark, the scientists say.

The issue arose in late 2001 at a zoo in Omaha, Neb., when a worker noticed a baby shark swimming in a tank that contained only females. The three female bonnetheads, a small species of hammerhead, had been caught as juveniles. Three years later, the pup appeared.

The zoo's scientists advanced possible explanations -- someone dropped the baby shark in the tank as a hoax; a different fish species in the tank somehow fertilized the female; or one of the females had stored sperm from a previous encounter with a male.

But in the article, a team of scientists from Nova Southeastern University, the University of Miami, Queen's University Belfast and the Henry Doorly Zoo of Omaha report that a genetic analysis proved the pup was the offspring of one of the females only and contained no paternal genetic material.

"It now appears that at least some female sharks can switch from a sexual to a non-sexual mode of reproduction in the absence of males," said Mahmood Shivji, a biologist at Nova's Guy Harvey Research Institute, and one of the study's authors.

Robert Hueter, director of the Center for Shark Research at Mote Marine Laboratory in Sarasota, who was not involved in the study, said the research "looks solid."

"When the initial reports of this came out, we were all thinking this has got to be a case of sperm storage," said Hueter. "One is still skeptical until you look at the genetic evidence, which is the strength of this paper."

The pup lasted only a few hours before something killed it, possibly a stingray.

"I have it in a jar, actually," said Ed Louis, conservation geneticist at the zoo. "Looks like it got a good bite mark across the head."

The zoo sent tissue samples to Shivji, whose expertise in shark DNA has helped prosecutors convict people for illegally catching great white sharks. He and graduate student Demian Chapman helped analyze the pup's genes.

Aside from the presence of stingrays in the tank, the young pup would have had a disadvantage rooted in its unusual birth. Produced through a process called parthenogenesis, the shark grew from an unfertilized egg. Such eggs normally contain only half the mother's genes, in anticipation of receiving a set of genes from the father. But in this case, no paternal genes arrived, so the pup contained half the genetic material of a normal shark.



A hammerhead shark caught in Florida Bay gave birth to this pup without sex, the first such case established among sharks and rays. Nova Southeastern University biologist Mahmood Shivji analyzed the pup's genes and established that they contain no paternal DNA, only DNA from a female shark.

(Photo courtesy Lee Simmons)

In their paper, the scientists say this reduction in genetic material could spell bad news for the future of sharks. As the number of sharks are depleted by overfishing, more females could fail to find mates, making virgin births more common.

"The offspring have very, very low levels of genetic diversity," Shivji said.

A broad gene pool is the key to a species' ability to adapt to changing conditions. "That's what allows organisms to adapt," he said.

But Hueter said the authors exaggerated the potential consequences for shark conservation, saying this sort of birth would be far too rare to pose much danger of reducing any species' genetic diversity.

"I think this is going to manifest itself in a closed aquarium situation," he said. "Although shark numbers are depleted in many parts of the world, I don't think we're at that point. I think it would be extremely rare in the wild."
