Girl power: Female boa constrictor doesn't need a male

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New evidence shows that boa constrictors can reproduce without sex. But one boa constrictor had babies asexually and the old-fashioned way. Her sexually produced snake (left) is shown beside one of the asexually produced females (right).

In a finding that upends decades of scientific theory on reptile reproduction, researchers at North Carolina State University have discovered that female boa constrictors can squeeze out babies without mating.

More strikingly, the finding shows that the babies produced from this asexual reproduction have attributes previously believed to be impossible.

Large litters of all-female babies produced by the “super mom” boa constrictor show absolutely no male influence – no genetic fingerprint that a male was involved in the reproductive process. All the female babies also retained their mother’s rare recessive color mutation.

This is the first time asexual reproduction, known in the scientific world as parthenogenesis, has been attributed to boa constrictors, says Dr. Warren Booth, an NC State postdoctoral researcher in entomology and the lead author of a paper describing the study. He adds that the results may force scientists to re-examine reptile reproduction, especially among more primitive snake species like boa constrictors.

The study is published online in *Biology Letters*, a Royal Society journal.

Snake sex chromosomes are a bit different from those in mammals – male snakes' cells have two Z chromosomes, while female snakes' cells have a Z and a W chromosome. Yet in the study, all the female babies produced by asexual reproduction had WW chromosomes, a phenomenon Booth says had not been seen before and was believed to be impossible. Only through complex manipulation in lab settings could such WW females be produced – and even then only in fish and amphibians, Booth says.

Adding to the oddity is the fact that within two years, the same boa mother produced not one, but two different snake broods of all-female, WW-chromosome babies that had the mother's rare color mutation. One brood contained 12 babies and the second contained 10 babies. And it wasn't because she lacked options: Male snakes were present and courted the female before she gave birth to the rare babies. And the versatile super-mom had previously had babies the "old-fashioned way" by mating with a male well before her two asexual reproduction experiences.

Booth doubts that the rare births were caused by environmental changes. He notes that while environmental stresses have been associated with asexual reproduction in some fish and other animals, no changes occurred in the mother boa's environment or routine.

It's possible that this one snake is some sort of genetic freak of nature, but Booth says that asexual reproduction in snakes could be more common than people think.

"Reproducing both ways could be an evolutionary 'get-out-of-jail-free card' for snakes," Booth says. "If suitable males are absent, why waste those expensive eggs when you have the potential to put out some half-clones of yourself? Then, when a suitable mate is available, revert back to sexual reproduction."

A reptile keeper and snake breeder, Booth now owns one of the young females from the study. When the all-female snake babies reach sexual maturity in a few years, Booth will be interested to see if they mate with a male, produce babies without a mate, or – like their mother – do both. In any case, these WW-chromosomed females will continue their version of "girl power," as any baby they produce will also be female.

Drs. Coby Schal and Ed Vargo co-authored the paper. Co-author Sharon Moore raised the snakes in the study. Co-author and veterinarian Daniel Johnson provided surgical sex testing on the snakes. NC State's Department of Entomology is part of the university's College of Agriculture and Life Sciences.

More information: "Evidence for viable, non-clonal but fatherless Boa constrictors", Warren Booth, et al. The Boastore, Published: Online Nov. 3, 2010, in *Biololgy Letters*

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