

Rural Ohio has an all-female society of salamanders

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"Polyploid" salamanders are all-female. They reproduce by cloning themselves. Photo: Robert Denton, The Ohio State University

In fiction and myths throughout the ages, there have been plenty of examples of all-female societies. The ancient Greeks spoke of a civilization of warrior women, where no men were allowed. The traveler John Mandeville wrote of a place whose female rulers "never would suffer man to dwell amongst them." Wonder Woman, the comic-book heroine, came from a ladies-only utopia called Paradise Island.

Those places might have been imaginary, but there is at least one all-female society in the real world. It is in a wetland in rural Ohio, and it's full of salamanders.

"They're pretty incredible," said Robert Denton, a biologist at Ohio State who studies the unusual group of salamander species. These creatures can reproduce by themselves, with no need for males.

These Amazing Salamanders

They do so by cloning - making copies of themselves rather than mating with partners. Cloning has a major downside, though. When animals reproduce by copying themselves, their genes do not mix, and genetic diversity usually helps species to stay healthy and adapt to their environments.

To keep their gene pool varied, the salamanders sometimes "steal" sperm left behind on trees and leaves by male salamanders of other species. This lets them pass at least one new gene to their offspring without males.

Moreover, these amazing salamanders have extra genes that make it easier for them to thrive without reproducing sexually. Most animals get two sets of genes, one from each parent. Only passing on a single set of genes would normally put a species at a disadvantage, but these salamanders can have between two and five times the normal amount of genetic material. Even though their offspring only receive genes from a single parent, mothers have enough genes to pass on to keep the species thriving.

Animals with more than two sets of chromosomes (structures containing genes) are called "polyploid." Denton said polyploid salamanders have been around for about 6 million years. That is far longer than most other species that reproduce by cloning. Since such animals tend to have a less varied gene pool, they have more trouble adapting when living conditions change. As a result, they usually become extinct relatively quickly.

Quite A Tale

The all-female salamanders found in the wetlands of Ohio, however, are an exception to the rule. They seem to be better off than other salamanders in some respects. In a new study just published in the Journal of Zoology, Denton and his coworkers reported that the all-female salamanders they studied could regrow lost tails 36 percent faster than other species.

If you are living in an Ohio swamp, it seems, you might be better off without men.

The study was conceived by Monica Saccucci, who is currently a medical student at the University of Cincinnati in Ohio. When she came up with the idea to study the all-female salamanders, she was still a college student working in the same lab as Denton.

First, Saccucci went into the wetlands near Ohio State to collect eggs from both polyploid and ordinary salamanders. Once they hatched and reached adulthood, she cut off 40 percent of each salamander's tail to see how fast it would grow back.

Look At Those Polyploids Go

The fact that salamanders can regrow their tails at all is somewhat remarkable, but the polyploid salamanders could do so with impressive speed. Within 10 weeks, they had new, full-length tails. Their sexually reproducing cousins, on the other hand, were not finished growing new tails for another five weeks.

The findings made sense to Denton. Polyploid animals simply have more of the equipment necessary to build back what they have lost, he explained.

"More genomes means more genes, which produce more RNA, which make proteins," he said. "That causes a much faster pipeline to producing more tissue."

Staying Alive

Being able to quickly regrow lost limbs gives these salamanders a big evolutionary advantage. Salamanders' tails serve more than mere decorative purposes: In the water, tails help them to swim, and on land they can use their tails to distract predators. Being able to regrow tails quickly, in the event their tails get snapped off by a predator, for example, makes it more likely that the all-female salamanders will stay alive to reproduce.

"They get injured a lot," Saccucci said in a news release. "If you can't heal and grow back, you're dead."

Quiz

1 Finish the following statement.

The central idea of the article is MOST developed by

- (A) highlighting the features of common salamander habitats.
- (B) describing how polyploid salamanders reproduce and survive.
- (C) comparing how long it takes for salamanders' tails to regenerate.
- (D) identifying basic needs of both male and female salamanders.

2 Which two of the following sentences from the article include the MOST central ideas of the article?

1. *These creatures can reproduce by themselves, with no need for males.*
2. *To keep their gene pool varied, the salamanders sometimes "steal" sperm left behind on trees and leaves by male salamanders of other species.*
3. *Polyploid animals simply have more of the equipment necessary to build back what they have lost, he explained.*
4. *Salamanders' tails serve more than mere decorative purposes: In the water, tails help them to swim, and on land they can use their tails to distract predators.*

- (A) 1 and 4
- (B) 2 and 3
- (C) 1 and 3
- (D) 2 and 4

3 Which of the following describes Robert Denton's opinion of polyploid salamanders?

- (A) He thinks they are complicated, because their genetics allow for more than two chromosome sets.
- (B) He thinks they are segregated, because ordinary salamanders have a lower survival rate.
- (C) He thinks they are endangered, because they have lived on the earth for 6 million years.
- (D) He thinks they are extraordinary, because males are unnecessary for reproduction.

4 Monica Saccucci's research on salamanders led to which of the following conclusions?

- (A) Salamanders use their tails to help them swim, and to also distract predators.
- (B) Polyploid salamanders take less time to grow back their tails than ordinary salamanders.
- (C) Polyploid salamanders have between two and five times the typical amount of genetic material.
- (D) Ordinary salamanders mate with a partner, and pass down two sets of genes to offspring.