Why does so much of nature rely on sex for reproduction?

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A photo of the lake that is home to the population of snails that the researchers studied. Lake Alexandrina is a natural lake and waterfowl preserve in the Mackenzie Basin of New Zealand's South Island. Credit: Evolution Letters

Why is sex so popular among plants and animals, and why isn't asexual reproduction, or cloning, a more common reproductive strategy?

Researchers recently tested a theory developed in the 1970s by John Maynard Smith suggesting that sex is a more costly reproductive strategy than asexual reproduction. Mathematically, he showed that asexual females make more grandchildren than sexual females. For sexual females, approximately half their offspring must be sons, and those sons can't physically bear grandchildren. Asexual females don't make sons, so they make twice as many daughters as sexual females. Maynard Smith called this cost of sex the "two-fold cost of males." Therefore, asexual lineages should increase in frequency every generation and outcompete sexual lineages, driving them extinct.

In this latest research, investigators studied the snail Potamopyrgus antipodarum, which has two kinds of females: one is asexual and the other is sexual and produces both sons and daughters. Asexual females coexist with sexual females in lakes and streams in New Zealand. When they collected snails from a lake where asexual and sexual females coexist and allowed them to reproduce in big outdoor tanks, they found that asexual females increased in frequency from parents to offspring, and this increase was consistent with a two-fold cost of sex.

"Our findings mean that Maynard Smith's theory does apply to this complex natural system, and sexual females do pay at least a two-fold cost of sex," said Dr. Amanda Gibson, lead author of the *Evolution Letters* study. "This study provides the first direct estimate of the cost of sex, and the results validate Maynard Smith's foundational theory in evolutionary biology. Our experimental confirmation of the two-fold cost of sex also justifies a continued hunt for the selective forces that favor sex, because sex is indeed costly in P. antipodarum."

More information: Amanda K. Gibson et al, The two-fold cost of sex:

Experimental evidence from a natural system, *Evolution Letters* (2017). DOI: 10.1002/evl3.1