Androgenetic species of clam utilizes rare gene capture

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Corbicula fluminea. Image credit: USGS

(PhysOrg.com) -- In a new study published in the *Proceedings of the National Academy of Sciences*, biologist David Hillis from the University of Texas shows how the freshwater Corbicula clam utilizes rare gene capture to avoid the accumulation of mutations in their androgenetic lines.

The Corbicula clam is a freshwater species of clams that originated in China and Taiwan but can now be found all over the world. The clams utilize asexual reproduction known as androgensis where the offspring are essentially clones of the male parent. Asexual reproduction lacks

genetic recombination and can eventually lead to mutations and possible lineage extinction. This new study reveals that the Corbicula clam may have just found a way to avoid this mutation issue.

Hillis and his team looked at the genomes of 19 Corbicula species found throughout the world (both sexual and asexual) and found groups of genes which belonged to one species would show up in another one. This would not occur if the asexual species were strict with their cloning. Hillis found that these clams were essentially using the eggs of other species and occasionally capturing the maternal nuclear DNA in order to replenish the clone's lineage and avoid lineage mutations.

The Corbicula clam is also known for its sudden population increases and has become a pest in many areas of the world. Hillis now plans to look at if there is a connection between the population booms and this rare gene capture event.

More information: Rare gene capture in predominantly androgenetic species, *PNAS*, Published online before print May 23, 2011, doi: 10.1073/pnas.1106742108

Abstract
The long-term persistence of completely asexual species is unexpected. Although asexuality has short-term evolutionary advantages, a lack of genetic recombination leads to the accumulation over time of deleterious mutations. The loss of individual fitness as a result of accumulated deleterious mutations is expected to lead to reduced population fitness and possible lineage extinction. Persistent lineages of asexual, all-female clones (parthenogenetic and gynogenetic species) avoid the negative effects of asexual reproduction through the production of rare males, or otherwise exhibit some degree of genetic recombination. Another form of asexuality, known as androgenesis, results in offspring that are clones of the male parent. Several species of the Asian clam genus Corbicula

reproduce via androgenesis. We compared gene trees of mitochondrial and nuclear loci from multiple sexual and androgenetic species across the global distribution of Corbicula to test the hypothesis of long-term clonality of the androgenetic species. Our results indicate that low levels of genetic capture of maternal nuclear DNA from other species occur within otherwise androgenetic lineages of Corbicula. The rare capture of genetic material from other species may allow androgenetic lineages of Corbicula to mitigate the effects of deleterious mutation accumulation and increase potentially adaptive variation. Models comparing the relative advantages and disadvantages of sexual and asexual reproduction should consider the possibility of rare genetic recombination, because such events seem to be nearly ubiquitous among otherwise asexual species.