Male snails babysit for other dads

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Males of the whelk *Solenoptera macrospira* provide all parental care, carrying egg capsules on their back -- even though most of the offspring are not theirs. Male, left; female on the right. Credit: Peter Marko

(Phys.org)—Pity the male of the marine whelk, *Solenosteira macrospira*. He does all the work of raising the young, from egg-laying to hatching—even though few of the baby snails are his own.

The surprising new finding by researchers at the University of California, Davis, puts *S. macrospira* in a small club of reproductive outliers characterized by male-only child care. Throw in extensive promiscuity and sibling cannibalism, and the species has one of the most extreme life histories in the animal kingdom.

The family secrets of the snail, which lives in tidal mudflats off Baja

California, are reported online in a study in the journal Ecology Letters.

In the study, UC Davis researchers report that, on average, only one in four of the hundreds of eggs that a male *S. macrospira* carries around on his back belong to him. Some carry the offspring of as many as 25 other males.

Such extreme cases provide the raw material on which natural selection can work and shed light on more "mainstream" species, said study author Rick Grosberg, a professor of evolution and ecology at UC Davis.

"It opens our eyes to viewing other kinds of behavior not as weird or harmful but as normal," he said.

The snails were first described in an amateur shell-collectors newsletter, The Festivus, in 1973. Grosberg started studying the animals in 1994, when he brought some back from a collecting trip and realized that only male snails had egg capsules on their shells.

When the snails mate, the female glues capsules containing hundreds of eggs each to the male's shell.

The male's shell likely acts as a substitute rock, since the snails' habitat offers few surfaces on which to glue eggs, said co-author Stephanie Kamel, a postdoctoral researcher in Grosberg's lab.

Moving in and out with the tide on dad's (or stepdad's) back also protects the egg capsules from the extremes of heat and drying they might face if left on a stationary rock.

A male's shell may become covered in dozens of capsules, each containing up to 250 eggs. As the eggs hatch, a process that takes about a month, some of the baby snails devour the rest of their littermates.

Typically only a handful of hatchlings survives the fratricide to emerge from a capsule and crawl away.

Kamel carried out DNA analysis of brood capsules to determine the eggs' parentage. On average, she found that the male snails had sired just 24 percent of the offspring on their backs. Many had sired far less.

"The promiscuity in the female snails is extraordinary," Kamel said, noting that some females mate with as many as a dozen different males.

Why do they do it? Typically in the animal kingdom, females invest more resources in an egg than a male does in a sperm, so mothers have a stronger interest in providing parental care. Males may mate with multiple partners to increase their chances of siring offspring, but typically make less investment in caring for those young. When dads do get involved, it's nearly always because they are assured that all or most of the offspring are their own. Male sea horses, for example, carry developing young in a pouch—but all are their own genetic offspring.

One explanation could be that caring for the kids just doesn't cost the male snails much. But by tethering individual snails to a post sunk in the sand, Grosberg was able to follow them over time and show that the capsules do impose a significant burden, reflected in weight loss.

It may be that carrying the egg capsules simply represents the best of limited options for the males, Grosberg said, since it's impossible for them to mate without the female attaching an egg capsule to their backs.

Or carrying egg capsules may be a way for a male to show a female that he's good parent material.

"If he wants to get any action, he has to pay the price," Grosberg said.

Grosberg is fascinated by the conflicts that occur between parents, between siblings, and between parents and offspring as they each try to get resources and maximize their success in breeding. You can see these conflicts and rivalries all the way from simple animals to humans, he notes.

"Everything that intrigues me about family life happens in these snails," he said.

At the same time, no animal has gone as far as humans in evolving increasing cooperation between relatives, tribes and larger and larger (and less closely related) groups over time.

"We're good at seeing other forms of reward," Grosberg said.

Provided by UC Davis

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