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Horned beetles can have big weapons or big testes, not both. (O Helm & DJ Emlen)

Horny beetles have tiny testes: study

By Judy Skatsoo for ABC Science Online

Scientists have found beetles with the biggest horns have the smallest

testes, showing that in evolutionary terms you cannot have it all.

They say their finding is clear evidence of an evolutionary trade-off between the ability to fight off sexual competitors and reproductive potency.

Professor Leigh Simmons, of the University of Western Australia, and US researcher Professor Douglas Emlen have studied beetles of the genus *Onthophagus*, dung beetles known for the size and variety of their horns.

"What we did was test a fundamental assumption underlying evolution... that males face a trade-off between competing for access to lots of females and investment in gaining fertilisation with those females," Professor Simmons said.

"They need to have big horns to win fights and get females and they need to have big testes in order to win in sperm competition.

"But they can't do both, so species which invest very heavily in their horns tend to invest less in their testes."

He says the study also demonstrates the theory of sperm competition, which occurs when females mate with more than one partner.

According to the theory, male rivalry continues after mates have been found because sperm from different males compete to fertilise an egg.

The researchers have published their findings online today in the *Proceedings of the National Academy of Sciences*.

Manipulating horns

Professor Simmons tested the theory by cauterising the area of the developing beetle pupa, where the horns would grow, destroying cells and preventing horn growth.

He found that if horn development was inhibited, the pupa

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compensated by developing larger testes.

The principle is known as a resource allocation trade-off.

"They got a fixed amount of resources to allocate to various structures, to their legs, their wings, their horns and to their testes and other important organs," Professor Simmons said.

"If [the developing beetle] doesn't produce horns, those males then produce bigger testes because they have resources that weren't used for horn growth."

Other animals

Professor Simmons says the principle of resource allocation has been demonstrated in other animal studies.

For example, there is some evidence bats trade the size of their testes for brain power.

A recent study also showed that stalk-eyed flies, in which eye-span width is a measure of sexual desirability, trade testes size for the width of their eyes.

"There have been suggestions of a trade-off between gaining mates and gaining fertilisation, but our study is probably one of the most conclusive studies to date to have demonstrated this," Professor Simmons said.

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