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Date: December 6, 2006

## Why Do Some Queen Bees Eat Their Worker Bee's Eggs?

Worker bees, wasps, and ants are often considered neuter. But in many species they are females with ovaries, who although unable to mate, can lay unfertilized eggs which turn into males if reared. For some species, such as bumble bees, this is the source of many of the males in the species. But in others, like the honeybee, workers "police" each other -- killing eggs laid by workers or confronting egg-laying workers.

In 1964 the English biologist William Hamilton put forward his "relatedness hypothesis", a major landmark in kin selection theory. His hypothesis was that worker bees, wasps and ants do not reproduce because most workers are half sisters. Instead the workers favor the queen's male progeny, since she has mated with multiple males, ensuring variation in the species. According to this theory, a species where the mother queen mates with multiple males would have more worker policing. This theory is widespread and in animal behavior textbooks.



A new study from the American Naturalist finds that honeybee workers' sons are reared 100 times less in species with a queen mated to multiple males. (Photo courtesy of F. Ratnieks)

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However, Hamilton's relatedness hypothesis was challenged in 2004 by researchers from the University of Lausanne, Switzerland. They compared 50 species and found no evidence that multiple mating by the queen correlated with reduced rearing of workers' sons or greater worker reproductive policing. Were the textbooks wrong?

A new study appearing in the current issue of The American Naturalist strongly supports Hamilton's original theory. Tom Wenseleers and Francis Ratnieks (University of Sheffield) compared 90 species and found that workers' sons are reared 100 times less in species with a queen mated to multiple males. They also found worker policing by the queen, with the queen eating working-laid eggs, in all species with multiple-mated queens, but in only 20 percent with single-mated queens.

"It seems that the textbooks do not need rewriting," write the authors. "Kin selection theory is important when studying relatedness in social behavior. Social insects, with their great variation in kinship, have been a key test bed of the theory, and the theory has revolutionized our understanding of insect societies."

Founded in 1867, The American Naturalist is one of the world's most renowned, peer-reviewed publications in ecology, evolution, and population and integrative biology research. AN emphasizes sophisticated methodologies and innovative theoretical syntheses--all in an effort to advance the knowledge of organic evolution and other broad biological principles.

Wenseleers, Tom and Francis Ratnieks, "Comparative analysis of worker reproduction and policing in eusocial hymenoptera supports relatedness theory." The American Naturalist: November 2006.

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### Honeybee Gene Find Ends 150-year Search

(August 22, 2006) -- The genetic signal that makes a honeybee male or female has been identified by researchers in Germany, the U.S. and Norway. The finding, published in the August 22 issue of the

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