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Dictatorship and Not Voluntary Altruism Characterizes Insect Colonies

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Worker Females are forbidden to reproduce

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A new research made on social insects revealed that their cast organized colonies' organization, with non reproductive workers, are not based on some kind of a voluntary altruism, as previously thought, but coercion, a more complex and darker reality.

Bees, ants, wasps, and termites colonies rely on worker females that get and share food with their nest-mates and raise the colonies' young, which are in fact their sisters and brothers, as the queen is the mother of all individuals in the colony.

Even if workers do possess ovaries, researchers thought that they chose freely a self-denying behavior, helping their queen mother to raise offspring as a more efficient method of propagating their own genes.

Well, it seems that in fact, what's inside an insect colony is more like a miniature dictatorship: outside the queen's chamber, reproduction is forbidden, and unauthorized eggs are destroyed.

"It's kind of a police state" said Tom Wenseleers of the Catholic University of Leuven in Belgium.

Since 1989, when Francis Ratnieks of the University of Sheffield in England found that honeybee workers eat each others' eggs, egg-killing was seen in many other social insects.

This behavior varies greatly amongst species.

In Asian paper wasp (photo), the queen personally assumes the killing and eating eggs laid by working daughters while in honeybee and other species, loyal workers execute this role.

The reproductive physiologies also differ greatly amongst the colonial insects: more than 30 % of Asian paper wasp workers (that's one in three) lay eggs but less than one honeybee in a thousand will do it (which means less than 0.1 %).

In Asian paper wasp colonies, most of the eggs laid by workers survive, while in a honeybee hive, almost none will do it. This behavior may sketch an evolutionary pattern about how social character evolved in insects.

"Egg-killing helps to retain the reproductive monopoly of the queen," Wenseleers said.

"If there is a very high probability of [workers' eggs] being killed," he said, "then there's not much point in them laying the eggs in the first place."

The effect is that insect colonies tend towards a zero-offspring policy.

"That manipulation explains why most honeybee workers essentially abandon any design on bearing offspring", Wenseleers says.

"Their seeming altruism is not really voluntary."

Moreover, the finding contradicts the theory of altruism, which stipulates that more closely related workers would be more cooperative as they favor the propagation of their kin.

"We actually find the reverse," Wenseleers said.

"The less closely related, the more cooperative they are."

Asian paper wasp workers share 75 % of their genes with each colony member, but their colonial reproductive behavior, as seen, is

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less altruistic than in honeybee, where colony members share only about 30 % of the genome.

Thus, insect "altruism" is not based on family ties, but on social coercion.

"Some individuals are manipulating the options that other individuals have," commented David Queller, an evolutionary biologist at Rice University in Houston.

"For workers deprived of the chance to reproduce, helping their mother and sisters is their best shot at perpetuating their genes," he says.

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