

Presentation Summary: Altruism in Insect Societies: Voluntary or Enforced?

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- Eusocial insects cooperate to enhance the reproduction of a single female, the queen
- Hamilton's Rule was proposed to explain this level of cooperation
- Based on coefficients of relatedness between sisters and brothers in haplodiploid colonies, the level of cooperation present would not be expected based on Hamilton's rule alone.
- Queen and worker policing of worker laid eggs is an act of coercion which enforces altruism within a colony, it is characterized by the identification and killing of worker laid eggs.
- Due to lower coefficients of relatedness between certain individuals in a colony, we observe policing of eggs laid by workers.
- In a monandry system, female workers are expected to care for sons and nephews rather than brothers, per Hamilton's rule. This causes a conflict of reproduction between the queen her daughters.
- In a polyandry system, there is less relatedness between workers, so we can expect a high level of reproductive conflict between workers, which results in an increase in worker policing.
- Researchers have proposed that altruism is enforced and coercion is necessary for the evolution and maintenance of eusociality.
- Effectiveness of policing has been shown to have a correlation with a reduced proportion of reproductive workers.
- In 2004, Wenseleers *et al.* created a model to predict the proportion of egg laying workers based on the relatedness of individuals within a colony. The model assumes **no coercion** in the colony and **reproducing individuals do not work**.
- In the case of a large colony, the model can be simplified and shows a trend that as the number of queen **mates increases**, the **relatedness between sisters decrease**, and the **proportion of egg laying workers increases**.
- Using data of proportion of egg laying workers from queenless honeybee colonies, we observe a closely matched prediction based on the model (queenless bee colonies have a drastic reduction in egg policing.)
- We can observe coercion and enforced cooperation in other social systems, such as vertebrates including meercats, naked mole rats and even humans.

References:

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