Queen signalling in Social Wasps

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Do queens of social Vespidae use cuticular hydrocarbons (CHCs) to signal their fertility and regulate reproductive division of labour?

The degree of worker policing depends on the species-average colony kin structure. Workers thus police according to their own fitness interests, not the queen’s.

Queen CHC profile (PC1) corresponds well with ovary development, colony stage, % reproductive workers, and % worker-produced males.

Queen-characteristic CHCs are by and large conserved between social Vespid species, consistent with slow rates of evolution and thus arguing against queen-worker arms races over reproduction.

These data are consistent with the hypothesis that queens of social Vespidae reliably signal their fertility and workers respond according to their own fitness interests.

The data argue against queen control over reproduction and queen-worker arms races.

Queen-signalling frequency (% of colonies)
Worker worker interactions (% of colonies)
Effective queen-marking frequency (% of colonies)
Average colony size in terms of workers (% of colonies)
Queen policing present?
Effective policing defined as (1 - worker policing rate) ≥ 0.25
Efficiency of policing*
Efficiency of policing**
Expected ESS % RW in queenright colonies
Expected ESS % RW in queenless colonies

Vespid wasps, and are typically characterised by linear and 3-methyl alkanes.

Queen CHC profiles are separated from those of sterile workers in two species of Vespine wasps, and are typically characterised by linear and 3-methyl alkanes.

Treatment with synthetic queen-characteristic CHCs reduces worker ovary development, so these compounds indeed function as queen pheromones.

References:
Butts et al. 1991, Comp Biochem Physiol
Van Oystaeyen et al. 2014, Science 287: 287