

Is every female equal?

Caste biasing in a primitively eusocial insect

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Introduction

The evolution of eusociality is a major transition in evolution. One defining feature is a division of labour, where some individuals have lifetime sterility (worker caste), whilst others remain reproductive (queen caste)^{1,2}.

Primitively eusocial insects, like *Polistes* paper wasps, represent the earliest stages of eusociality. Adults have behavioural not morphological castes and can switch roles as adults (totipotency).

Current literature suggests *Polistes* may not be as primitive as previously thought, with evidence of caste biasing early in development through mechanisms such as mechanical signalling³ and larval nutrition⁴.



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Fig. 1 *Polistes canadensis*

Here we examine individual caste variation in the wasp, *Polistes canadensis* (Fig. 1).

Investigating if females are bias towards particular caste roles as evidenced by diverging behavioural profiles.

Hypothesis

1) **Workers differ in their expression of dominance and maternal behaviour over time**

Is this behaviour fixed?

OR

Can individuals change their behaviour over time?

Methods and Materials

- Data collected April - August 2012 in Panama.
- 400 females on 9 nests were individually marked on emergence and monitored daily for 3 months.
- Behavioural observations were conducted every 3-4 days.
- Behaviours were categorised as Dominant, Maternal or Neutral (Fig. 2.).

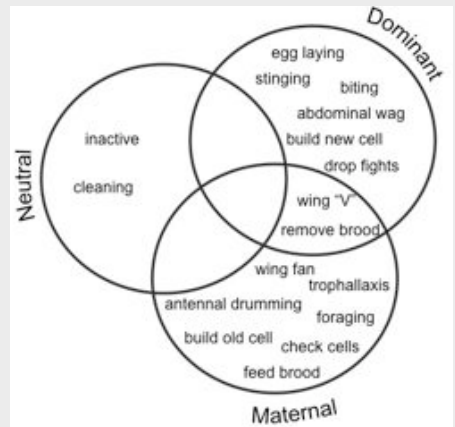
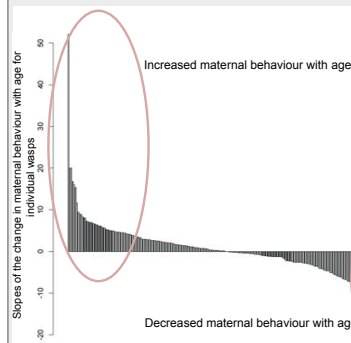


Fig. 2. Venn diagram of behaviours in *P.canadensis*

Results



Age has a significant effect on the expression of maternal behaviour
GLMM: $X^2 = 2233$, d.f. = 1 $P = <0.0001$

But the direction of this expression differs among individual wasps (e.g. Fig. 3.)

57% of wasps show a increase of maternal behaviour with age

15% of wasps show a decrease of maternal behaviour with age

Fig. 3. Differing patterns of the direction of maternal behaviour with age for individual wasps

Conclusions

- Females change their investment in indirect fitness with age.
- There maybe two different strategies:
 - 1) committed worker
 - 2) potential reproductive
- Not all females are equal

Future Work

Explain individual differences in maternal behaviour with age
Investigate 2nd hypothesis: “**females differ in totipotency, this is apparent during development**” by assessing:

- 1) Developmental periods of larvae and pupae
- 2) Differential expression of queen and worker genes of emerging wasps

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