

Prey capture performance in hatchlings of two sibling *Harmonia* ladybird species in relation to maternal investment through sibling cannibalism

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Background

We are interested in food range evolution and species coexistence in predatory ladybirds.

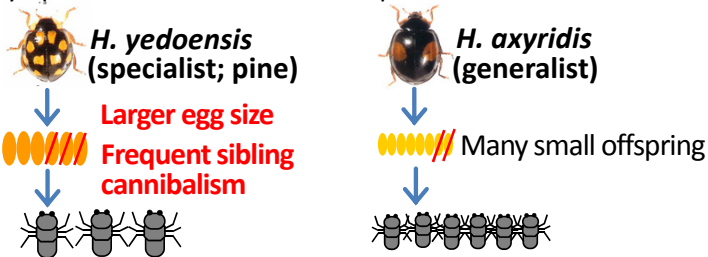
- 1) Why are some species specialists, and others generalists?
- 2) What are behavioral mechanisms in food specificity?

We focused on **the amount of maternal investment** because

- 1) it is important for offspring survival in insects
- 2) it reflects the quality of food sources.

Materials

Harmonia yedoensis and *H. axyridis* are sibling species with sympatric distributions in central Japan.



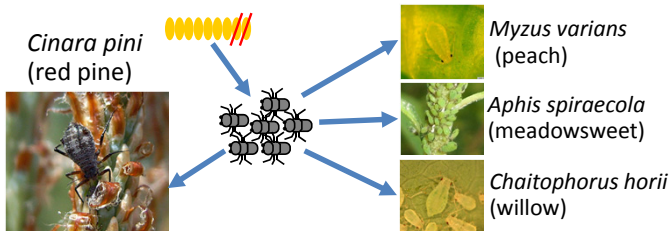
The amount of maternal investment is greater in *H. yedoensis* than in *H. axyridis* (Osawa & Ohashi 2008)

How does maternal investment affect prey capture performance in these two ladybird species?

Methods

Experiment 1

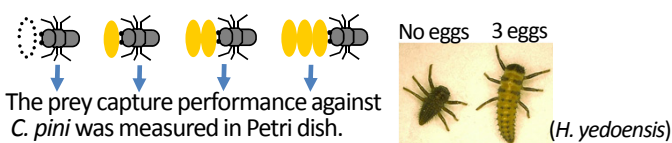
We examined the prey capture performance of hatchlings against four aphid species including the giant pine aphid.



H. yedoensis is an oligophagous predator that preys only on *C. pini*. Note that *C. pini* has very long legs and walks very fast.

Experiment 2

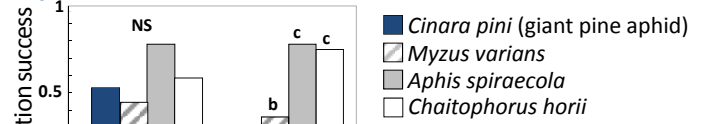
We manipulated the number of eggs consumed to evaluate the causal relationship between the amount of maternal investment and the prey capture performance of the hatchlings.



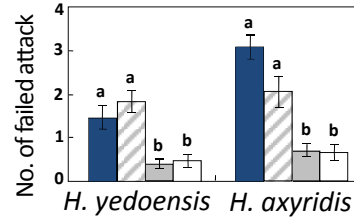
The prey capture performance against *C. pini* was measured in Petri dish.

Results

Experiment 1

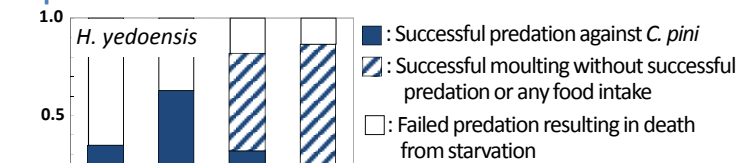


H. yedoensis predation against *C. pini* was moderately successful, whereas *H. axyridis* predation against this species was highly unsuccessful. GLMM with Tukey's HSD test ($N = 36$, $p < 0.05$)

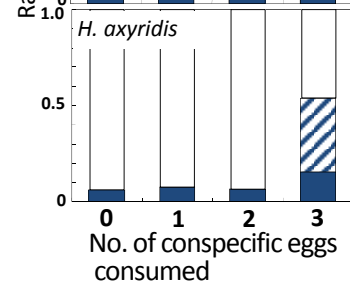


C. pini was a very elusive prey even for *H. yedoensis* hatchlings. GLMM with Tukey's HSD test ($p < 0.05$)

Experiment 2



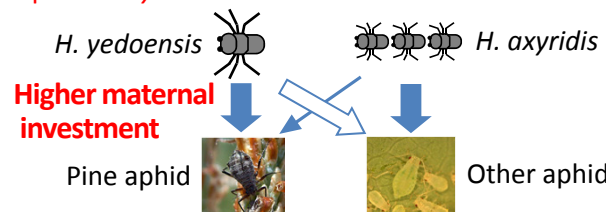
H. yedoensis hatchlings that consumed a conspecific egg improved their prey capture performance. (Extended Fisher's exact test, $p < 0.05$)



By contrast, in *H. axyridis* the provision of conspecific eggs did not enhance predation success and predation success was quite low.

Conclusions

Maternal investment through intense sibling cannibalism is apparently necessary for the specialization to the giant pine aphid in *H. yedoensis*.



Why is the prey type of *H. yedoensis* restricted to a highly elusive prey for ladybird hatchlings, sacrificing larger clutch size?

We suggest that negative interactions between closely related species determine their habitat types and food sources.