Cooperative pathogen defence in fungus-farming ambrosia beetles

Gemeinschaftliche Pathogenbekämpfung in Nestern von Pilze züchtenden Käfern

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Survival of highly-related members of social insect colonies strongly depends on their abilities to cope with pathogens. Not only are immune mechanisms within single individuals important, but also a wider so called social immune defense consisting of different behaviours which reduce pathogen abundance and hinders their spreading over the whole colony. This is especially important for fungus-growing social insects, because pathogenic fungi flourish in the humid nest environment and threaten the food fungi of the insects. Hence, advanced mechanisms to control such pathogens can be expected.

The fruit tree pinhole borer *Xyleborinus saxesenii* (Ratzeburg, 1837) ("der Kleine Holzbohrer") is a native fungus-farming ambrosia beetle living in facultatively eusocial societies with division of labour between adult and larval workers. It lives in large chambered colonies which are founded by a single female in the heart wood of weakened or freshly dead trees. Young females inbreed with their brothers and delay their dispersal to help raising their sisters by grooming them and attending for the fungus garden. We are able to manipulate laboratory reared colonies by injecting different pathogenic fungi and monitoring to which extend the colony is changing its overall social immune response.

We found that the colonies are capable to detect several pathogens and that they react by enhancing grooming frequencies and cannibalism of (presumable infected) larvae. Our results show that ambrosia beetles are in fact good study species to investigate the evolution of social immune responses in insect societies. Ambrosia beetles are a polyphyletic clade with a wide range of social organization patterns ranging from subsociality to eusociality, which repeatedly evolved in several separate lineages.

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