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Ihr Zeichen/Ihre Nachricht vom:

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Dear Prof. Storch,

Mgr. Štěpánka Kadochová has presented a highly interesting thesis on thermoregulation in nests of red wood ants of the *Formica rufa* group. Although the phenomenon of nest thermoregulation in wood ant nests is well known, the concrete mechanisms behind this process were still not well researched. The focus of the thesis was i) on the role of nest mounds as solar collectors and as hot-spots of microbial activity and ii) on behavioural patterns of the ants, sun-basking behavior in particular. The six major questions and hypotheses addressed by the thesis are very well presented and derived from the known literature. The scientific merit of the thesis lies in the systematic approach of testing the contribution of the potential mechanisms to thermoregulation and in providing a concise synthesis of the innovative findings. An additional merit lies in the experimental testing of sun-basking behavior and metabolic rates of ant individuals and in relating those findings to the trade-off between thermoregulation of the colony and survival of individual workers. The thesis is written in the form of a collection of papers. Two papers are published in peer-reviewed journals, one is under review in another peer-reviewed journal. In all three papers, the experimental design was appropriate, methods applied were well chosen and well executed. The results are well and clearly presented. The interpretation of the results is sound and the discussion sticks closely to the results and is not becoming speculative.

The quality of the documentation is high and the only minor flaws are spelling and grammar errors in the general introduction and conclusions.

To me, some open questions remain from the thesis which may require further thoughts:

- i) It is stated in the major findings that RWA nests rely primarily on inner heat sources. From reading the thesis I got the impression that a combination of thermoregulation strategies apply during different times of the year and stages of colony development. Here I would have expected a more elaborate finding.
- ii) It was observed, that not all worker ants participate in the sun basking. It was concluded that - because sun basking can be dangerous - that RWA workers who want to lay eggs should be selfish and therefore should avoid sunning. Is there an alternative explanation based on kinship-relationships in the polygynous colonies? Should there be differences in the contribution of workers to sun-basking behavior depending on whether the colony is monogynous or polygynous (due to differences in genetic relatedness)? In this context, I do not fully understand this conclusion: "The explanation might be in higher levels of genetic diversity in workers caused by multiple-queen colonies in RWA, which result in less polymorphic workers (Swchwander et al. 2005)."

- iii) It was found that morphological and physiological measurements did not reveal any difference between “sunners” and “non-sunners”. Were there any differences in coloration? Were sun-basking individuals darker than non-sun-basking ones?
- iv) Based on the finding that the metabolic rates of workers came back to normal two days after the sunning event, Martin’s theory (1980) that the sunning behaviour works as a metabolic trigger for catabolic lipid degradation was denied. How long would such a lipid degradation or increase of metabolic activity have to last according to Martin so that it could count as contribution to thermoregulation?
- v) Is there sun-basking behavior in other mound-building species such as *Lasius* and if not, why not?
- vi) Is there a trade-off between decomposition of nest material and microbial heating. Does the resin collected by RWA play a potential role in regulation of microbial activity in the nest material?
- vii) Are lipid reserves in worker ants still high enough in spring to allow a catabolic heating process?

I consider the thesis suitable for the defense and its quality fulfills the criteria necessary for obtaining a Ph.D. degree.

Yours sincerely,

Prof. Dr. Jens Dauber