



# continued research paper 2008-2013



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Symbiotic experiments of western honey  
bees with book scorpions (*Chelifer  
cancroides*).

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## 2 Preface

Following the state exam paper, in which fundamental findings regarding the behavior of book scorpions (*Chelifer cancroides*) were made, it was now time to co-house the bees with these "cleaning animals" again. Since book scorpions prefer small ridges and gabs to live in, the modern beehives needed to be modified accordingly, because they have smooth walls on the inside. What seemed to be fairly easy at first, turned out to be tricky over the years, because the pseudoscorpions did not settle and the beehives did not show any traces of the animals after the winter anymore. Due to this situation new approaches were chosen and entirely distinct beehives were developed. Amongst other things, it was observed that the book scorpions did not settle in Segeberger plastic containers made up of styrofoam, even though precisely this styrofoam container was chosen for nest building above average during the material trials in the terrarium. Therefore, new questions, approaches, and theories arose. Finally, the key to success were long term climate measures within the beehives. The measures unfolded that the humidity values within the styrofoam containers (during the winter months) were significantly higher compared to similar wooden containers. The problem could be solved using climate shrouds that divert humidity and are open to diffusion. Using this method, the containers used for the symbiosis were more and more adapted to the needs of the book scorpions until the settlement of the book scorpions was finally successful.

Additionally, questions regarding the practicability were addressed. How can bee keepers move the book scorpion quickly and easily from beehive to beehive, for example when new colonies were propagated or artificial swarms were generated? Suitable solutions are appropriate frames for pseudoscorpions, which could be present inside the terrarium already and a kind of mobile brooding closet. The bee keeper would only have to move it. Additionally, the upper beam of the frames, which are housing the combs, could have gab so that cleaning animals would have an appropriate hiding place available in direct proximity of the bees.

All of the chosen approaches, modifications, experiments, and analyses are subject of this work.