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Neuroanatomical correlations to social organization and foraging habits in bees

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Among Hymenoptera, many ecologically successful species evolved a eusocial lifestyle. Several studies emphasize that eusocial honeybees and ants possess a complex brain including a high number of functional units (glomeruli) in the antennal lobe and large mushroom body calyces. Brain complexity may have evolved as the result of eusociality or in response to other selective pressures and therefore be a precondition for the evolution of eusociality. We analyzed the antennal lobe structure in selected wild-bee species and correlated the results with both social lifestyle and foraging habits. We investigated halictid bee species (Halictidae) with different grades of sociality, but polylectic foraging habit and different solitary polylectic and oligolectic bee genera (*Osmia*, *Hylaeus* and others). In halictid bees, we found no significant differences between solitary and eusocial species in terms of number of glomeruli within the same genus. In all investigated solitary bee genera, we found a large interspecies variance in glomerular numbers, correlated to floral preference. Specialized (oligolectic) species showed a significantly lower glomerular number than bee species which forage at a broad range of flower species. Additionally, we also investigated other neuroanatomical traits like main neuropile volume and synaptic density in higher integration centers. Our results give first hints that a complex olfactory system is not the result of eusocial lifestyle in Hymenoptera. Furthermore, the results indicate that the floral preference seems to have a larger impact on the complexity of the antennal lobe structure than social lifestyle. Chemical analyzes of host-plant odors and behavioral tests will be next steps to understand the large impact of floral preference on the complexity of the olfactory system in bees. Funding: DFG KE-1701 1/1.