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# A SPATIAL MODEL OF THE EVOLUTION OF SOCIAL BEHAVIOUR

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Mathematical models have been widely and successfully applied in understanding the interplay of population structure and the evolution of social behavior. Here we ask whether helping and non-helping behaviour can co-exist in social groups, and importantly, what ecological factors affect this coexistence. We use two types of modelling techniques to examine this question. The first is an individual based model based on the lifecycle of social wasps and other colony founding species which compete for limited resource sites. The second is a discrete dynamical system derived from the individual based model through a mean field approximation. To incorporate spatial structure in the mean field model, the dynamical system is spatially extended to a coupled map lattice. Both techniques use simple ecological parameters, such as number of offspring, effect of division of labour and dispersal distance. Using these two techniques, we find that the spatial structure of populations is critically important in allowing helping behaviour to evolve. Our broad approach to investigating helping behaviour highlights the importance of spatial effects in the evolution of social behaviours.