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How Many Insects Does It Take to Make a Swarm?

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Aggregations of social animals, such as flocks of birds, schools of fish, or swarms of insects, are beautiful, natural examples of self-organized behavior far from equilibrium. They tend to display a range of emergent properties, from enhanced sensing to the rapid propagation of information throughout the aggregate. Many classes of models have been proposed to describe these systems, including agent-based models that specify explicit social forces between individuals and continuum models that abstract the interactions between individuals into some smooth advecting velocity field. Assessing these various modeling approaches requires comparison with empirical data. We will discuss measurements of laboratory mating swarms of the non-biting midge Chironomus riparius in the context of model assessment. In particular, we focus on the question of the small-number limit: how large must the population be before collective properties emerge?