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Mobbing: a problem in flocking and deterrence M. ELIAS TOUSLEY, OWEN GLAZE, ANNA SCHALL, SUZANNE AMADOR KANE, Physics Dept., Haverford College — We present experimental and theoretical studies of one type of mobbing behavior in which swarms of prey animals (e.g., tree swallows) harass a predator (e.g., a red-tailed hawk). Empirical field data were collected for tree swallows mobbing a fixed model predator; previous studies have established that this experimental design provokes the same response as actual "perch-and-wait" predator behavior. We extended these earlier studies using stereometric video to record the three-dimensional trajectories of prey birds and mobbing cries; we also analyzed single-angle video data taken of crows mobbing red-tailed hawks in flight. Video recordings of red-tailed hawk flight were filmed and analyzed to establish the dynamics of potential predator attacks. The trajectory analysis employed particle-tracking methods and statistical analyses to understand and model the dynamical rules governing this behavior. Swarming behavior during mobbing exhibited a high degree of periodicity and coordination both for fixed predator and in-flight mobbing attacks. The trajectories of individual mobbing birds were analyzed as a random walk superimposed on an approximately elliptical flightpath. Computer simulation studies reproduce several aspects of this behavior, in particular explaining how the mobbing strategy employed by prey birds minimizes the risk of hawk predation while optimizing the frequency of harassing attacks.

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