IDENTIFICATION OF A SOCIAL TIPPING POINT IN A COLONIAL BIRD SUBPOPULATION USING NONLINEAR DYNAMICAL SYSTEMS

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How populations respond to both abiotic and biotic perturbations is a crucial issue in ecological systems, especially for social species. Combining mathematical modelling an artificial intelligence to population data of the Audouin's gull over 40 years [1–4] we have found feedbacks in dispersal after a cumulative perturbation driven by the presence of predators causing a population collapse. The collapse is well described by a non-linear function mimicking social copying, whereby dispersal made by a few individuals induces others to leave the patch in a behavioral cascade for decision-making to disperse. Our approach has allowed us to quantify the dispersal response in a metapopulation patch, identifying a social tipping point involving the acceleration of dispersal at a critical population size. In providing the first evidence of copying for the emergence of feedbacks in dispersal in a social organism, our results suggest a broader impact of self-organized collective dispersal in complex population dynamics.

References

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