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Free boundary problems and competing systems with many species

Abstract: We prove some uniqueness and convergence results for a competing system and its singular limit, and an interior measure estimate of the free boundary for the singular limit, and prove S. Terracini's conjecture. We obtain that the solution of Lotka-Volterra competing species system with strong competition, converges to a stationary point under some natural conditions, which implies that there is no periodic solutions. We also establish the limit system for the Gross-Pitaevskii equations when the segregation phenomenon appears, and shows this limit is the one arising from the competing systems. (joint with E. N. Dancer, Kelei Wang)