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Effects of a barrier zone on invasion of a population with a strong Allee effect

We consider integro-difference and reaction-diffusion models to study the effects of a barrier zone on invasion of a population with a strong Allee effect. It is assumed that inside the barrier zone a certain proportion of the population is killed. We provide a formula for the critical width L* of barrier zone. We show that when a barrier zone is set properly at the front of a population, if the width of barrier zone is bigger than L* then the barrier zone can stop the population invasion, and if the width of barrier zone is less than L* then the population crosses the barrier zone and eventually occupies the entire space. The results are proven by establishing the existence and attractivity of three types of equilibrium solutions. The mathematical proofs involve phase plane analysis and comparison.