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Analytical and numerical study of a diffusive predator-prey model incorporating an Allee effect

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In this study, we propose a diffusive predator-prey model incorporating an Allee effect for both: the predator and the prey. In more detail, the studied system of two non-linear partial differential equations represents variations of the population densities of the predator and the prey in the space and in the time due to a slow random diffusion process and local growth rates induced by an Allee effect and predator-prey interactions. An exact traveling wave solution of the proposed system is found applying the Simple Equations Method (SEsM). We simulate numerically the obtained analytical solution and show how the predator and the prey density waves can vary in its profile depending on the strength of the Allee effect.

Keywords: diffusive predator-prey model, Allee effect, exact analytical solution, numerical simulations