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Guangyu Zhao* (gzz0021@auburn.edu), Department of Mathematics and Statistics, Auburn University, Auburn, AL 36849. *The role of the sanctuary in a periodic diffusive Leslie predator-prey model.*

This talk presents our recent study on a periodic diffusive Leslie predator-prey model in which a sanctuary Ω_0 is designated for the survival of prey. Much of our attention is focused on the impacts of Ω_0 on spatial dynamics of time-periodic coexistence states of the model. Our mathematical analysis shows that there is a critical patch size of Ω_0 which serves as a threshold and plays a crucial role in the development of spatial profiles of the predator and the prey. More precisely, the threshold is determined by the principal eigenvalue $\lambda_0(\Omega_0)$ of the eigenvalue problem $\partial_t w - \Delta w = \lambda a(t)w$ in $\mathbb{R} \times \Omega_0$ with $w(t + T, \cdot) = w(t, \cdot)$, and $w = 0$ in $\mathbb{R} \times \partial\Omega_0$, where $a(t)$ is periodic in t with period T satisfying $\int_0^T a(t)dt > 0$. When the environment outside Ω_0 favors the predator, the strong growth of the predator is able to push the prey out of the territory once shared by both species. Meanwhile, the prey can survive in Ω_0 provided that the size of Ω_0 is above the threshold. In case that the size of Ω_0 falls below the threshold, the prey population will continuously shrink as the growth rate of the predator increases. (Received January 26, 2019)