Mathematical Biology Seminar

Monday, September 12, 2022

3 pm MDT - 657 CAB

Join Zoom Meeting

https://ualberta-ca.zoom.us/j/98497695684?pwd=SG5pcUVRS0xucW5xd0xBTm1VVCtEUT09

Meeting ID: 984 9769 5684
Passcode: 32123

Pijush Panday
Postdoctoral Fellow
University of Alberta

Modelling fear effect in predator-prey interaction and investigating its role on the stability and dynamical properties of the system.

In this talk, I will present some mathematical models to investigate the impact of predation fear-induced indirect effects in different predator-prey systems and address relevant questions related to the stability and dynamical properties of the systems. First, I will present a model where we incorporate the impact of cascading effect of fear of predators of higher levels on lower trophic levels in tri-trophic food chain model. We showed fear that can stabilize the chaotic system via period-halving bifurcation. The robustness of the stabilizing role of fear parameter is also verified. Next, I will talk about a model where we incorporated the effect of fear of multiple predators on their prey and investigate how fear from predator of different level in food-chain model impact the dynamics of the model. We found that fear can stabilize the predator-prey system by excluding chaotic oscillation and also can change the stability properties of the limit cycle. To incorporate both the cost and benefit of anti-predator behavior of prey due to fear and also to include the varying anti-predator responses among different aged prey we developed a stage-structure predator-prey model. We showed how our fear-induced stage-structure model showed complex dynamics in different bi-parametric planes and different types of bistability. At last, I will take about a delayed predator-prey model by incorporating the delayed cost of fear of predators in the growth rate of prey population. We showed that with increasing the value of delay, the model switches its dynamics multiple times between stable focus and limit cycle oscillations and for large value of delay system ultimately shows chaotic behavior.

COLLABORATIVE MATHEMATICAL BIOLOGY GROUP

MATHEMATICAL & STATISTICAL SCIENCES
UNIVERSITY OF ALBERTA