New research on predator-prey relationships

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One of the reasons that prey species migrate is to avoid predators over long time scales, this ultimately has a powerful effect on the balance of predator and prey in a given ecosystem. This is especially the case if the

migration is seasonal and the predator lacks the capacity to migrate.

New work published in the *International Journal of Dynamical Systems and Differential Equations*, looks at how modeling predator-prey interactions in divided into hypothetical reserved and non-reserved areas—the reserved zone is the area to which the prey migrates and is inaccessible to predators—can improve our understanding of the biological phenomenon of migration. Moreover, the creation of artificial reserved zones could be useful in reducing the detrimental effects of climate change, exploitation, random harvesting, poaching, and pollution on prey species without having any significant negative impact on the predators. Prey and predator both deserve a chance at being part of a sustainable, biodiverse environment, after all.

"Several factors should be taken into account in the time of creating protected areas for a particular species, such as the number of individual of species to be protected, the carrying capacity of the reserved area, dynamics of the ecosystem supporting these species and many others," write Jyotirmoy Roy and Shariful Alam of the Indian Institute of Engineering Science and Technology in Howrah. The team's modeling show how migration into and out of the reserved zone has a powerful effect on the system dynamics, the changing predator-prey balance, in other words. However, the movement of prey from reserved to non-reserved zone has the greatest impact and if that movement falls below a particular threshold then the whole system becomes unstable. Conversely, if there is too great a migration back and forth then the concept of creating a reserved zone becomes meaningless as the prey are essentially perpetually in the purview of the predators.

The next step to modeling such systems will take seasonality into account to create a more realistic system that can be tested more rigourously.

More information: Jyotirmoy Roy et al. Analysis of migration pattern

of prey species with reserved zone, *International Journal of Dynamical Systems and Differential Equations* (2020). DOI: 10.1504/IJDSDE.2020.111480