Cover Letter

Rhino species populations are at a critical level due to the demand of rhino horn and the subsequent poaching. Wild life managers, who are in charge of the protected areas, attempt to secure the life of the animal using several devaluing approaches. The most common approach is dehorning. Nonetheless, dehorning does not always repel the poachers. In order for dehorning to be successful a poacher must choose to only kill rhinos with full horns, thus be a 'selective poacher'. Indiscriminate poachers also exist, which are poachers who choose to kill all rhinos they encounter.

In 2016, the interaction between a rhino manager and poachers was investigated for the first time using a game theoretic model [1]. In this manuscript, we explore the population dynamic effects associated to these interactions. More specifically, the interaction between poachers is investigated using evolutionary game theory. The game considered is not of a two player game anymore (manager and poacher) but now an infinite population of poachers is considered. The purpose of the work is to determine what circumstances would ensure that rhino dehorning is successful. This is explored using both analytical and numerical methods.

The findings confirm that behaving selectively will not persist, not even in a mixed population, using the fact that the only evolutionary stable strategy is the indiscriminate one. Meaning, that for any given starting population, the poachers would evolve to adopt an indiscriminate behaviour. However, our results reveal that it is possible for a population of selective poachers to exist, but for this to occur a disincentive must be applied to the utility of indiscriminate poachers. The disincentive factor can have several interpretations; such as engaging the rural communities that live with wildlife.

The insights gained from this manuscript contribute to ecological management through the understanding of poacher behaviour on a population dynamic level.

References

[1] T. E. Lee and D. L. Roberts. Devaluing rhino horns as a theoretical game. *Ecological Modelling*, 337:73 – 78, 2016.