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# Using simulation to infer key parameters of the black rat colonization in Senegal during the elapsed century

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## Abstract

The twentieth century was the seat of the black rat expansion in Senegal via commercial transport, beginning with its propagation along the colonial posts until his appearance at the southeastern edge and through its presence in groundnut trade economic areas.

The analysis of a colonization process of this national and secular magnitude by a commensal species implies integrated consideration of bio-ecological and socio-economic factors. These evolve in close dependancies due the historic and systemic dimension of the phenomenon.

On the other hand, such a reconstruction is complicated by the difficulty to quantify key parameters determining the observed phenomenon. Among them, the chance of boarding rodents in various vehicles is a critical unknown.

It is proposed in this study to estimate, at least in terms of order of magnitude, the value of this key parameter by inference from a model of the colonization process. Within an individual based simulator, we reconstituted the geographical and historical features of trade development (roads, traffic, vehicle parks, and urban populations) as well as the boarding process and demographics of the rodent studied. Using sensitivity analysis, the various determinants of the dynamics of colonization were varied. Then, by comparing the patterns produced with in situ observations of the black rat distribution, we inferred the best values for the unknown parameter.

The values obtained are discussed as well as the weight of other key factors involved in the colonization dynamics such as the required level of the rodents' source (primarily city of Dakar) and their implantation conditions.

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**Keywords:** black rat, Senegal, modelling, parameter estimation, invasion, transportation