

Foraging in risk-homogeneous landscapes – a spatial model for pest species distribution and damage in agriculture?

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Behaviour is shaped by evolution to maximise fitness by balancing gains and risks. Decision making models in biology, psychology or economy have investigated choices among options which differ in gain/risk. A foraging animal has to trade off food and safety, according to its biological state.

In some landscape these compromises are difficult, because predation risk is uniformly distributed in space. Agricultural landscapes, especially in large scale monocropping, are homogeneous in structure. Depending on the movement scale of species using landscapes, fields or parts of fields, individuals may perceive such structures as uniform in risk and gain. Adequate predictions for the emerging foraging patterns in risk-uniformity, especially under an overall, high risk, are missing.

Based on the existing models on local decision making in risk-heterogeneity we test predictions extrapolated to a landscape level with uniform risk distribution, comparing among independent high-risk landscapes and low-risk landscapes (Figure 1A) We provide experimental support for our hypotheses, investigating the foraging behaviour of voles in artificial landscapes (Figure 1B). In high risk uniform landscapes animals invested their foraging time in fewer options and accepted lower total returns, i.e. reduced foraging efficiency (Figure 1C), compared to their behaviour in low risk-uniform landscapes (Eccard and Liesenjohann, 2008; Eccard et al., 2008, Liesenjohann and Eccard, 2008)

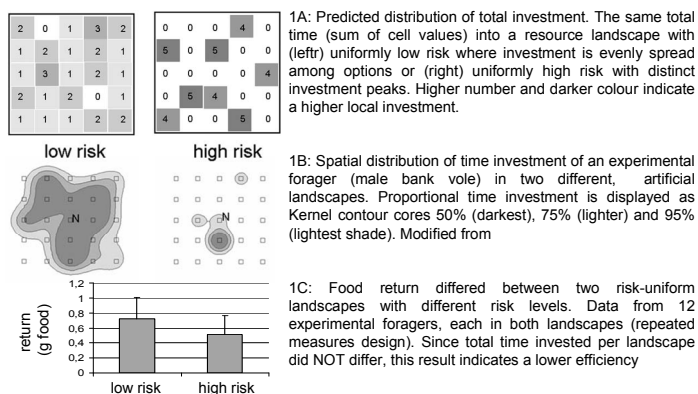


Fig. 1 Hypotheses and results for a foraging experiment in experimental, risk-homogeneous landscapes (Eccard and Liesenjohann, 2008)

Agricultural landscapes differ in field size and farming practice and some provide animals with risk-uniformity on a large scale. We suggest, that risk-uniformity affects the species distribution in such landscapes and also the distribution of damage by foraging animals in agricultural landscapes.

References

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