

State-space modeling indicates rapid invasion of an alien shrub in coastal dunes

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Background

Changes in climate and land use affect terrestrial ecosystems. One key component are altered successional pathways including establishment of invasive plant species.

Invasion by alien plants has negative effects, for example in European dunes, where Japanese Rosa (*Rosa rugosa*) is reducing local biodiversity. Monitoring local spread of this species depends on long-term data with sufficient spatial resolution.

Methods

Bayesian state-space models are a new method for monitoring invasive plants based on unbalanced permanent-plot data. The method allows separation of process and sampling variance, thus enabling ecological predictions with a known degree of uncertainty. The method is applied for *R. rugosa* in Danish fixed dunes (Fig. 1).

Results

The probability of observing *R. rugosa* increased significantly from 0.18 to 0.28 during the period 2004–2007 (Figs. 1,2). The species was found in all Danish coastal regions, albeit slightly less common in northern Denmark.

Damgaard, C., Nygaard, B., Ejrnæs, R. & Kollmann, J. (in press) State-space modelling indicates rapid invasion of an alien shrub in coastal dunes. *Journal of Coastal Research*. DOI: 10.2112/JCOASTRES-D-09-00132.1.

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Kollmann, J., Jørgensen, R.H., Roelsgaard, J. & Skov-Petersen, H. (2009) Establishment and clonal spread of the alien shrub *Rosa rugosa* in coastal dunes – A method for reconstructing and predicting invasion patterns. *Landscape and Urban Planning*, 93, 194–200.

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Fig. 1. Map of the 40 monitoring sites in coastal sites of Denmark situated in fixed dunes with herbaceous vegetation (EU habitat code 2130). In 14 sites, the invasive shrub *Rosa rugosa* was recorded in at least one of the sample plots during the 4-year period; in the remaining sites the plant was not recorded.

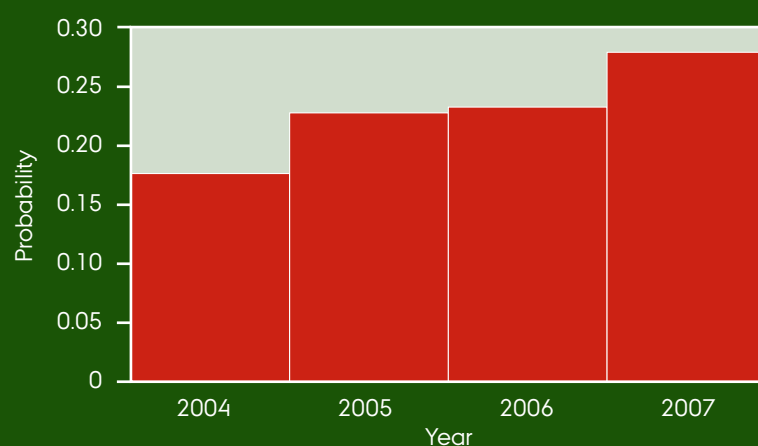


Fig. 2. Mean probabilities of observing *Rosa rugosa* in 574 plots sampled in coastal dunes in Denmark 2004–2007.

Conclusions

Bayesian models are promising for monitoring and predicting plant invasions using presence-absence data.

Further studies are needed to identify the factors causing spread of *R. rugosa*.