

Northern Atlantic Oscillation effects on the temporal and spatial dynamics of green spruce aphid populations in the UK

Silverio Saldaña, Mauricio Lima, Sergio Estay

Summary

1

The role of climate variability in determining the spatial and temporal patterns of numerical fluctuations is a central problem in ecology. The influence of the North Atlantic Oscillation (NAO) index on the population dynamics and spatial synchrony of the green spruce aphid *Elatobium abietinum* across the UK was shown.

2

Fifteen overlapping time series within the UK were analysed; we used nonparametric models for determining the feedback nonlinear structure and the climatic effects. The spatial synchrony of these populations and the relationship between synchrony and NAO was estimated.

3

From the 15 time series across the UK, 11 showed positive and significant NAO effects. In most of the cases the NAO effects were nonlinear showing strong negative effects of low values. The NAO variation improve the explained variance of the first-order feedback models in 14.5%; ranging from 0% to 48%. All data showed strong-nonlinear (concave) feedback structure. In most of the localities the explained variance by the first-order feedback was about 50–60%.

4

The spatial synchrony of the per capita growth rates and residuals is high across long distances for those populations affected by NAO. The correlation function predicts a spatial scale of synchrony of about 350–400 km for NAO influenced populations.

5

We think that simple population theoretical models describing the link between NAO fluctuations and green spruce aphid dynamics may be fundamental for predicting and simulating the consequences of different climatic scenarios of the future.

