

## East versus West: Contrasts in phenological patterns?

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### Abstract

**Aim** To examine whether change in the timing of a large number of phenological events and their response to temperature differs between trophic levels during the period 1988-2008. **Location** In the vicinity of Kazan, Tatarstan Republic, Russia (55°45' N, 49°08' E). **Methods** Observations of the dates of first events of 22 plant phases, 8 insect phases, 3 herpetofauna phases and 26 migrant bird phases were examined using regression to assess changes over time and response to temperature. Differences between trophic levels were assessed using ANOVA. **Results** In comparison to studies from western Europe, relatively few phenological series (15) revealed a significant advance over time, but a much larger number (37), including all the herpetofauna and nearly all the plants, showed a response to temperature. Trends in birds were, on average, twice as great as those for plants, but plants had a significantly greater temperature response. Over the study period local temperatures had not risen significantly but some phenological change was still evident. **Main conclusions** Phenological change has been less marked in the eastern edge of Europe than in western and central Europe. This is compatible with a lack of significant local warming during the study period. A large number of species show strong responses to temperature so will be expected to advance if/when local temperatures do increase. In contrast to results from elsewhere in Europe, early events were not the most temperature responsive, suggesting local adaptation preventing precocious behaviour and the consequent dangers of sub-zero temperatures. © 2010 Blackwell Publishing Ltd.

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### Keywords

Eastern Europe, First appearance, First flowering date, First leafing date, Phenology, Russia, Tatarstan, Temperature response, Temporal trends