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Short reference: Kuijper et al. (2010)

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Abstract

Fluctuating ungulate density shapes tree recruitment in natural stands of the Białowieża Primeval Forest, Poland

Dries P. J. Kuijper, Bogumiła Jedrzejewska, Bogdan Brzeziecki, Marcin Churski, Włodzimierz Jedrzejewski & Henryk Żybura

Abstract:

Question: What are the main driving factors in 70 years of natural dynamics in tree recruitment in the Białowieża National Park?

Location: Białowieża National Park, Poland, is one of the least disturbed temperate, lowland forest systems in Europe.

Methods: We tested whether fluctuations in large herbivore populations, changes in climate and openness of the forest explained compositional dynamics. Tree recruitment (to size class DBH>5 cm) was measured on permanent transects (in total, 14.9 ha) six times between 1936-2002. These data were related to existing data on ungulate density, climatic parameters and estimates of forest openness collected during the same period.

Results: Total recruitment of all tree species combined was negatively correlated with total ungulate density and red deer density. The variation in response between species was related to the preferences of herbivores; the more preferred forage species (especially *Carpinus betulus*) were positively and the less

preferred species negatively related to herbivore density. Total tree recruitment rates were not related to climatic parameters and openness of the forest. Only *Alnus glutinosa* recruitment was significantly related to climatic parameters, and *Ulmus glabra* related to forest openness, but there were no predictable patterns in recruitment among species in relation to these factors.

Conclusions: The present study indicated that changes in large herbivore density have played an important role in driving patterns in tree recruitment and species composition during the last 70 years in Białowieża National Park. In contrast to other studies, increasing herbivore numbers were associated with higher recruitment of preferred and browsing-tolerant species. Periodical crashes in ungulate numbers, whether human-induced or caused by natural factors, may offer windows of opportunity for regeneration of a range of tree species and facilitate more diverse and dynamic forest development.

Notes

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Tartalom:

Introduction

Methods

Description of study site

Measuring recruitment of trees

Long-term changes in ungulate populations

Selection of tree species by browsing ungulates

Meteorological data and tree species response to climate

Statistical analyses and hypotheses testing

Results

Patterns of tree recruitment rate

Tree recruitment rates in relation to ungulate density, climate and forest openness

Tree recruitment rates in relation to ranking of species

Discussion

Herbivory as a driving factor

Positive feedback of ungulate browsing?

Climate changes and forest openness had less influence on tree recruitment

Other possible driving factors

Conclusion

Acknowledgements

References

Supporting information

Browsing impact; European bison; Red deer; Roe deer; Temperate deciduous forest; Topdown effects; mouse

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