

Changes in vegetation diversity in Dębowe Góry Nature Reserve – Impacts of the disintegration of thermophilous oak forest

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Thermophilous open oak woodlands represent valuable refuges for rare and protected species. These communities developed as a result of long-term human activities, including grazing, litter raking, and traditional forest management. Under such conditions, a specific type of vegetation evolved, combining characteristics of forests, woodlands, meadows, and pastures.

The Dębowe Góry Nature Reserve, located in the Łomża Forest District in north-eastern Poland, was established to protect a rare community of thermophilous open oak woodland with naturally occurring sessile oak. The vegetation of the reserve was first documented in 1993 by Prof. A.W. Sokołowski, who distinguished three plant associations: the thermophilous oak woodland *Potentillo albae-Quercetum*, the mixed deciduous forest *Melitti-Carpinetum*, and the mixed pine–oak forest *Pino-Quercetum*. At that time, the reserve’s flora was rich, comprising 200 vascular plant species, including numerous rare taxa. The present study aimed to assess vegetation changes in the reserve between 1993 and 2025.

Phytosociological data were collected in early spring and summer at the historical locations of Sokołowski’s relevés. The dataset was analysed using Principal Coordinates Analysis (PCoA) and classified using Ward’s hierarchical clustering method. Changes in alpha diversity were evaluated using the indices: Taxa S, Shannon H, and Pielou’s Evenness, whereas beta diversity was assessed using the Bray–Curtis and Jaccard similarity indices. The significance of changes in these indices was tested using the Wilcoxon test.

Five groups of relevés were distinguished within the study area: (1) *Tilio-Carpinetum*, (2) *Tilio-Carpinetum melittetosum*, (3) *Tilio-Carpinetum calamagrostietosum*, (4) *Calamagrostio-Quercetum*, and (5) *Potentillo albae-Quercetum*. The results indicate ongoing secondary succession and several directions of vegetation change. In particular, a progressive decline of thermophilous open oak woodland was observed. Changes in the reserve’s biodiversity are associated with the disappearance and decreasing abundance of valuable species. Consequently, the flora of the reserve is becoming impoverished, while increasing biotic differentiation of vegetation is occurring as a result of the disintegration of thermophilous oak forests. The transformation of *Potentillo albae-Quercetum* into *Calamagrostio-Quercetum* may also occur in north-eastern Poland.