

WOODPECKERS AS ECOSYSTEM ENGINEERS: A NEW UNDERSTANDING OF THE BIOCENOTIC ROLE

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Abstract. The modern gap paradigm describes the sustainability of forest communities as a dynamic process. This is a balance between the formation of "windows" or "breakthroughs" of the forest canopy and the restoration of its elements during the population life of trees and shrubs. The spatial structure of forest communities consists of a set of disturbances that are at different stages of "overgrowth" (this is the so-called mosaic-cyclic concept of ecosystem organization). By developing both concepts, we reconstruct the role of woodpeckers in these dynamics, depending on the types of forest biomes and their disturbance degree. We have shown that: the biocenotic role of woodpeckers cannot be reduced to the commonly mentioned "suppliers of hollows" and "forest orderlies". Both roles are derivatives of the participation of these birds in the reproduction of the mosaic structure of the forest canopy, with the architecture of the crowns characteristic of a given biome and the composition of edificator trees of the 1st tier (vertical and horizontal complexity dimensions of the organization of the forest canopy). Thanks to this, woodpeckers participate in the "after-death of a tree": the density of hollows of different areas and depths, left over from the foraging of different species of woodpeckers, maintains the rate of decomposition of dead wood, optimal for a given forest cenosis. And vice versa: the stability of woodpecker habitat in a given area depends on the abundance of dead wood, especially for specialized species – white-backed *Dendrocopos leucotos*, three-toed *Picoides tridactylus*, middle *D. medius*, or their American analogues – *P. arcticus*, *P. tridactylus dorsalis*, *P. t. bacatus*, *D. albarvatus*. This biocenotic role to be fulfilled needs the entire biodiversity of woodpeckers, not just individual species. The greater is the number of woodpecker species living in one territory, the more complex is the organization of the forest canopy reproduced by their activities. Therefore, woodpecker biodiversity increases with increasing naturalness of the forest, and in different types of forest biomes – from boreal forests to tropical rainforests. Woodpeckers act in conjunction with wood-destroying fungi, transferring them when chiseling. And vice versa: woodpeckers use wood destruction caused by fungi as signals to "start" nest building or select a feeding method adequate for a given substrate. The defeat of the trunk by bacterial and/or fungal infection, ranging from softening to the formation of cavities, is in many ways a condition for the successful implementation of both. The indicator role of woodpeckers (the biodiversity of the group as a whole and the presence of individual species, especially specialized ones) in forest biogeocenoses is discussed. Violations of this role are shown in connection with urbanization, which "frees" certain species of woodpeckers (even specialized ones) from the biocenotic restrictions set by A-C).

Keywords: woodpeckers, ecosystem ecology, population ecology, life strategies, territoriality, feeding behaviour, nest building, nest web, key species, gap-paradigm

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