Biodiversity in poplar plantations in the Picardie region of France

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Inventoried poplar plantations exhibited surprising diversity of ground beetles, birds and vegetation.

AFOCEL/A. BERTHELOT

Chrysocarabus auronitens, ***a ground beetle frequent in broad-leaved forest and poplar plantations***

Biodiversity inventories carried out in 2003 in 16 poplar plantations of various ages and locations in the Picardie region of northern France revealed impressive species richness. High species diversity was found in all three components measured: ground beetles, birds and vegetation.

The inventory found 71 species of ground beetles under poplar. Alluvial sites were the richest in ground beetle species. The populations of ground beetles seemed to be structured according to soil moisture, vegetation cover and, to a lesser extent, soil pH. When some of the poplar plantations were compared with neighbouring environments, species richness in poplar stands was found to be higher than that in broad-leaved forests and equivalent to that in cereal fields. The Shannon index (accounting for both abundance and evenness of the species) and equitability index (species distribution) were higher for poplar plantations and broad-leaved forest. Ground beetle populations in cereal fields were uneven. The poplar plantations seemed able to accommodate species of open environments and forest species in balanced proportions (Table 1).

The study found 45 species of birds. For bird communities, poplar stands located on alluvial sites had higher species richness and diversity than those located on the plateaus. Species richness and diversity decreased with plantation age and canopy closure (Table 2). The avifauna was primarily made up of ubiquitous species of closed forest environments (Figure 1). Species of open forest environments were more frequent in young poplar plantations without understorey. There seemed to be no specific avifauna for poplar stands, except for *Oriolus oriolus,* which was very frequently observed.

Herbaceous species totalled 198. Plant

TABLE 1. Species richness, Shannon index and equitability index of ground beetles in poplar plantations

Indicator	Poplar plantations (7)	Broad-leaved forest (6)	Cereal fields (5)
Species richness	16.30	8.50	16.80
Shannon index	2.76	2.67	1.73
Equitability index	0.11	0.16	0.02

TABLE 2. Species richness and Shannon index of birds in poplar plantations

Site	Species richness	Shannon index
Alluvial site	18.87	2.756
Plateau	15.75	2.550
Young stands (10–15 years)	17.70	2.668
Mature stands (>25 years)	16.67	2.629
With understorey	17.25	2.645
Without understorey	17.37	2.661

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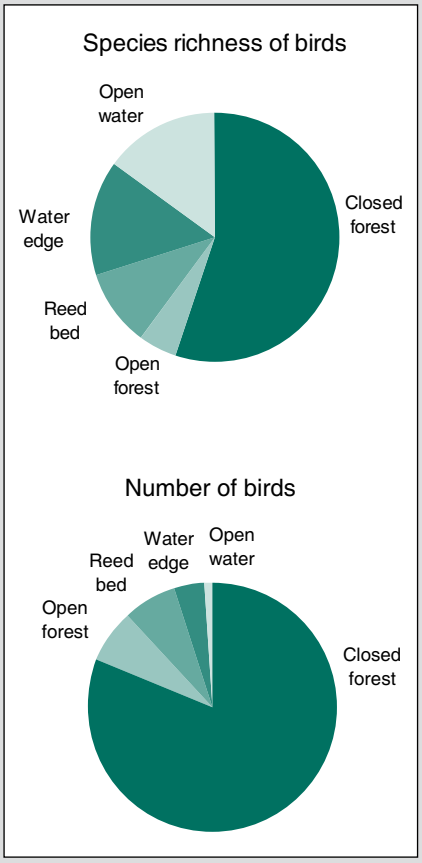
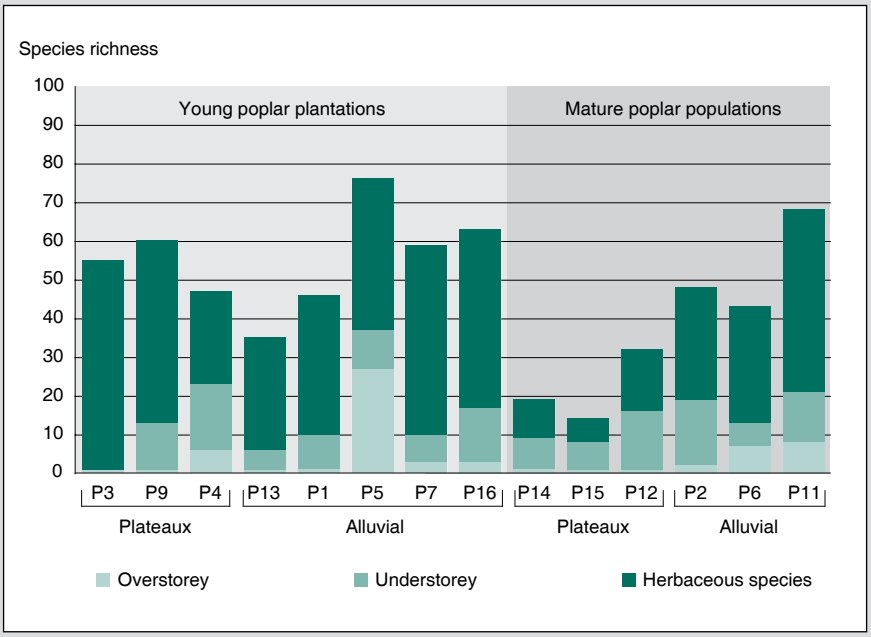
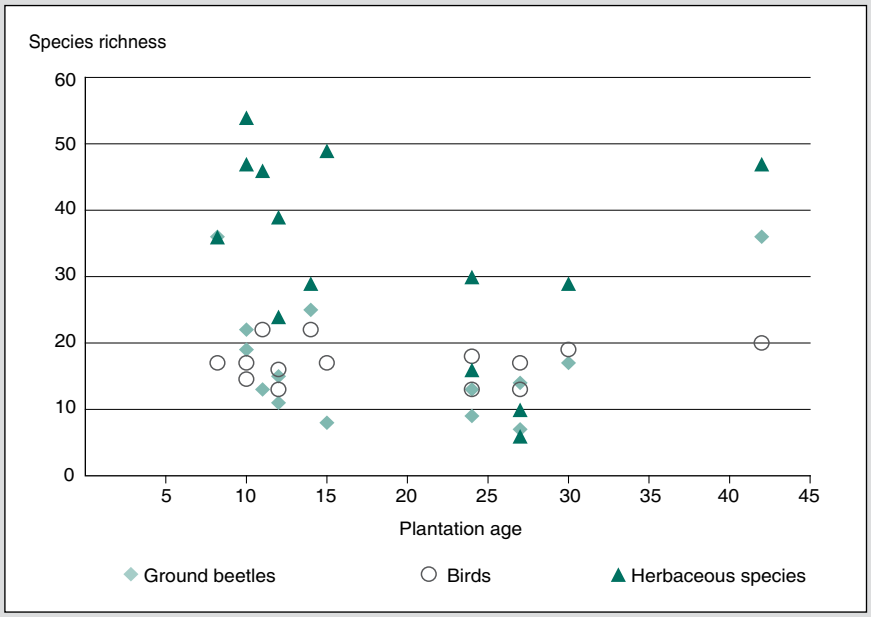
1
Distribution of species and number of birds in poplar plantations



2
Species richness of vegetation in poplar plantations



3
Species richness versus age of poplar plantations for ground beetles, birds and vegetation



communities were diversified in spite of the homogeneity of the overstorey. The variety of sites, soils and previous vegetation could explain this diversity. Herbaceous species richness was higher in young poplar stands and lower in mature stands, especially on plateaus (Figure 2). The high species richness could be due to the suitable conditions of alluvial soils on which poplars are cultivated, including water and nutrient availability. Tending operations (disking or mowing) appeared to support species diversity but to reduce the natural coherence of the plant communities; i.e. they allowed the presence of some annual species that would have been eliminated naturally by competition. Increases in available resources (light, water, nitrogen) benefited not only the cultivated poplars, but also sometimes the heliophilous species that were competing strongly with other herbaceous species (for example *Rubus* spp. on plateaus).

In summary, the species richness of poplar plantations in the Picardie region varied according to sites but was overall high for the three components examined. The age of the stands seemed to influence species richness for ground beetles and vegetation (but not for birds) (Figure 3); it tended to be higher in young stands and to decline in mature stands, but it appeared to increase again if the poplars were not harvested. ◆