

# Dispersal distance and burial mode of acorns in Eurasian Jays *Garrulus glandarius* in European temperate forests

Przemysław KUREK<sup>1</sup>, Dorota DOBROWOLSKA<sup>2</sup> & Blanka WIATROWSKA<sup>3</sup>

<sup>1</sup>Department of Plant Ecology and Environmental Sciences, Adam Mickiewicz University, Umultowska 89, 61–614 Poznań, POLAND, e-mail: przkur1@amu.edu.pl

<sup>2</sup>Department of Forest Ecology, Forest Research Institute, Braci Leśnej 3, 05–090 Sękocin Stary, POLAND

<sup>3</sup>Department of Forest Botany, Poznań University of Life Sciences, Wojska Polskiego 71D, 60–625 Poznań, POLAND

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**Abstract.** Dispersal distance and burial mode of acorns are two of the most important characteristics in renewal processes of oaks that result from the food hoarding ecology of the Eurasian Jay *Garrulus glandarius*. To obtain the dispersal distance and to locate precisely the caches with scattered acorns we used radio-tracked transmitters with flexible 13 cm long sticking out antennae injected into drilled acorns. From mid-September to mid-October acorns of Pedunculate Oak *Quercus robur* with transmitters were mixed with untagged acorns and exhibited on five feeders distributed from each other at a distance of at least 1.3 km (max. 3.8). We obtained information on 121 tagged acorns scattered by Jays in two consecutive years (2014 — 42 records, 2015 — 79 records). For both seasons, mean dispersal distance was 115.7 metres (SE = 9.2). The maximum detected distance was 456 m, the minimum was 3 m. Most of the acorns (52.6%) were deposited by Jays up to 100 m from the source. Dispersal distance differed significantly between the two years of research and between feeders. Mean dispersal distance was much higher in 2014 (166 m, N = 42) than in 2015 (86 m, N = 72) and differed between seasons while the seed crop was similar and low. Only four acorns (3.5%) were found on the litter with no signs of hiding, which suggests accidental loss during transport (dyszoochory). Most of the cached acorns (44.6%) were deposited in the Scots Pine *Pinus sylvestris* litter or moss cushions no deeper than 0.5 cm. The additional covering of caches with pieces of bark or leaves were noted accidentally in nine cases (9.8%).

**Key words:** Eurasian Jay, oak, acorn, dispersal distance, zoochory

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## INTRODUCTION

There is a simple reason why animals carry seeds from the source: the risk of loss of scattered seeds decreases inversely with the distance from the cache to the source area, where other granivores forage more intensively (Vander Wall 1990). It is very difficult to assess the dispersal distance in the case of birds. In several reports concerning this characteristic, we can recognize many different methods implemented to give precise information about how far seeds are transported. Most authors obtain such information by direct observations of birds (Sutter & Amann 1953, Kollmann & Schill 1996, Gómez 2003), marking birds with colour (Darley-Hill & Johnson 1981) or using any kind of markers built in the seeds (Kollmann & Schill 1996). Such mixed or intermediate laborious methods were not able to give particular information without any defects — over- or underestimating the dispersal distance. However, now new

solutions are available, such as the application of telemetry technology in research (Pons & Pausas 2007, Morán-López et al. 2015, Castro et al. 2017). Using small transmitters in our research allowed us to track the fate of acorns dispersed by Jays, precisely assess cache localization and describe the environmental conditions of seed burial without any disturbance of birds by the observer.

Dispersal distance and burial mode of acorns seem to be crucial factors shaping oak communities that result from the food hoarding ecology of the Eurasian Jay *Garrulus glandarius*. Oaks benefit from Jays' long-distance dispersal, in some events reaching up to 1000 m (Gómez 2003). Vander Wall (1990) suggested that Eurasian Jays and Blue Jays, *Cyanocitta cristata*, routinely carry acorns and other nuts for 4 or 5 km to storage sites, although these distances are often much shorter (Chettleburgh 1952, Darley-Hill & Johnson 1981). Clark's Nutcrackers *Nucifraga columbiana*, from western North America may carry pine seeds up