

# Wybiórczość siedliskowa i strategia użytkowania tokowisk przez samce dubelta *Gallinago media* w okresie lęgowym

Habitat selection and lek use strategy of breeding male Great Snipes *Gallinago media*

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The present thesis is based on the following papers:

1. Korniluk M., Białomyzy P., Grygoruk G., Kozub Ł., Sielezniew M., Świętochowski P., Tumiel T., Wereszczuk M., Chylarecki P. 2021. Habitat selection of foraging male Great Snipes on floodplain meadows: importance of proximity to the lek, vegetation cover and bare ground. *Ibis* 163: 486–506; DOI: 10.1111/ibi.12898
2. Korniluk M. & Chylarecki P. 2023. Intra-seasonal lek changes of Great Snipe males in the Northeast of Poland. *Acta Ornithologica* 58 (in press)
3. Korniluk M. & Chylarecki P. 2023. Factors influencing flight initiation distance in a cryptic bird species – the Great Snipe *Gallinago media* (*Manuscript*)

## Summary

Habitat loss caused by anthropogenic environmental transformation is considered as a major cause of bird extinction and their population declining trends in Europe and worldwide. One of the most endangered ecological groups in European birds species are the so-called meadow waders, which include the Lapwing, Black-tail Godwit, Eurasian Curlew and the Great Snipe. With the drainage of wetlands and the intensification of agriculture, their habitats have deteriorated considerably and their low reproductive success due to predation and agriculture practices on the breeding grounds does not allow to population recovery. As a result, they are among 20% of breeding bird species in the European Union countries classified as endangered. Given that breeding habitats of meadow waders are nowadays largely dependent on agricultural use, counteracting the declining trends of their populations nowadays mainly consists of implementing appropriate grassland management systems. Among the meadow waders breeding in Europe, one of the most threatened and yet least studied in terms of habitat preferences is the Great Snipe. Its lowland population, inhabiting eastern Europe, breeds in habitats dependent on agricultural use and remains far less studied than the Scandinavian one inhabiting mountain fens. The species is characterised by a rare mating system (lekking) in which males compete for access to females during clustered, nocturnal display. The ecology of the species is thus largely shaped by sexual selection acting in conjunction with classical natural selection factors. Research carried out as part of PhD dissertation was aimed to determine the habitat selection of male Great Snipe foraging between nocturnal display sessions on meadows and pastures located in river valleys in north-eastern Poland. Habitat preference was assessed at two spatial scales, and the results were also intended to find relationships between males' preferred habitat characteristics, including food resources, and agricultural use regime (**publication 1**). I also wanted to determine what role the need to minimise predation risk plays in the process of selecting foraging habitats and to what extent this may be at odds with selection pressures that reward efficient foraging for rapid recovery of energy reserves (**publication 3**). A separate aim of the study was also to determine whether and to what extent males Great Snipe may change leks during the breeding season, forcing conservation planning for the species on a scale far beyond the range of one breeding location (**publication 2**).

Between 2013 and 2020, during 7 research seasons, I tagged with telemetry transmitters a total of 124 male Great Snipe that were captured at 9 different leks in eastern Poland. The data obtained from the transmitters, as well as information on habitat characteristics collected in the field during 4 breeding seasons at male foraging sites in the vicinity of 6 leks, were analysed using statistical models (GLM, MARK) and GIS tools.

I found that the distribution of male foraging sites was clustered and not random (**publication 1**), with a significant proportion located at a distance of 500 m from the leks (**publication 1 and publication 2**). The apparent preference of males to forage closer to the leks (**publication 1**) could be driven by the need to conserve energy associated with moving between the leks and foraging grounds. This is consistent with results indicating that in locations farther away from the leks, males were less likely to flush, delaying flight decision in the face of predation risk (**publication 3**). Landscape elements such as trees, shrubs or proximity to forest or water elements had no influence on the choice of foraging sites for Great Snipe males. On the other hand, micro-scale habitat characteristics such as a significant amount of bare ground, medium density and height of vegetation, or high soil penetrability strongly determined the foraging sites of males (**publication 1**). These characteristics were most strongly influenced by two-cut and grazed meadows, where the probability of finding males was highest and where we found significantly more earthworms, compared to the other land use types. The probability of finding males assessed on a broader spatial scale was also highest at such sites. The process of habitat selection was shown to be to some extent an evolutionary trade-off, as the habitat characteristics strongly preferred by Great Snipe males at foraging sites were in some extent different from the habitat features providing the highest level of safety (**publication 1 and publication 3**). The research aiming to detect long-distance movements revealed that 75% of Great Snipe males changed their leks during the mating season (1 May - 15 June), visiting up to 9 different leks (**publication 2**). The average daily probability of changing the lek by a male was 0.12, with significant differences between survey years. Moving males made an average of 9 transits during the breeding season (up to a maximum of 43). Movements of up to 50 km predominated, with only about 10% of males visiting leks located more than 100 km from the sites where they were originally tagged (up to a maximum of 253 km). Movements were almost exclusively nocturnal, and in one of the three study years they increased as the breeding season progressed.

Strong correlation of the maximum distances of male movements between leks with the maximum foray, suggests that the long-distance, intra-seasonal dispersal of males was performed exclusively in order to join other leks. The prevalence of this behaviour indicates its major importance in the population and may be part of an alternative mating strategy to compensate for some males' low mating success.

The relatively intensively used grasslands preferred by male Great Snipes may be associated with a high risk of brood loss and lead to ecological trap, so patches of habitat mown later in the landscape should also be available to ensure breeding safety. Active protection aimed at maintaining a high quality habitat for the Great Snipe should therefore be a mosaic of land use, providing both habitat characteristics preferred by males for foraging and those providing suitable and safe breeding sites for females. In doing so, these activities should be prioritised in the vicinity to leks and encompass several leks in the landscape to ensure free movement of males and females between lekking sites. Such conservation measures should be implemented as a priority in areas closer to the leks. Habitat protection should also encompass larger sections of river valleys, covering at least several leks, to ensure regular movements of males and females dispersing between them.