

Fred A. Johnson and Kees Koffijberg, 2021, Biased monitoring data and an info-gap model for regulating the offtake of greylag geese in Europe, *Wildlife Biology*, Open Access, Volume 2021, Issue 11, January 2021, Article number wlb.00803

Abstract The problem we address is motivated by the desire to regulate the size of the NW/SW European population of greylag geese *Anser anser* to meet a number of management objectives, including providing sustainable harvests and minimizing agricultural impacts and conflicts. Using simple models of population dynamics along with observed allometric relationships in birds, we have concluded that reported estimates of greylag goose population size and/or offtake at the flyway level are likely biased, perhaps severely so. Recognizing that resources are limited, we suggest that the most pressing need may be to investigate and strengthen monitoring protocols for offtake. We also describe a simple information-gap ('info-gap') decision model that could allow decision makers to make informed choices about changes in offtake until such time that more reliable monitoring information is available for greylag geese. With the info-gap decision model we were compelled to use a management criterion based on the growth rate of the flyway-wide population because true levels of abundance and offtake are unknown. Moreover, we emphasize that in the face of deep uncertainty about greylag goose abundance and offtake, decisions concerning management of the population carry a high risk of failing to meet conservation objectives, whatever they may be. While the info-gap analysis suggests an increase of offtake beyond the nominal level of 450 000 reported in the International Single Species Management Plan may be necessary to stabilize the population, we do not know the current level of offtake (i.e. whether it has recently changed from that last reported). Moreover, recent counts conducted by the range states and the International Waterbird Census suggest that the winter flyway population may no longer be increasing. For these reasons, management implications of the info-gap analysis must be viewed with caution.

Keywords Allometric methods; Bias; Greylag goose; Info-gap decision model; Monitoring; Offtake; Population growth; Reproduction; Survival.