Fuller, R.J. & Gill, R.M.A. 2010. *BOU Proceedings – The Impacts of Non-native Species.*
http://www.bou.org.uk/bouproc-net/non-natives/fuller-gill20100531.pdf

This paper forms part of the proceedings from the BOU conference ***The Impacts of Non-native Species.***
Other papers from these proceedings can be viewed at www.BOUPROC.net.

SHORT COMMUNICATION

The spread of non-native Muntjac and Fallow Deer: a problem for lowland woodland birds?

ROBERT J. FULLER[1]* & ROBIN M.A. GILL[2]

[1] British Trust for Ornithology, The Nunnery, Thetford, Norfolk IP24 2PU, UK

[2] Ecology Division, Forest Research, Alice Holt Lodge, Surrey GU10 4LH, UK

* Email: rob.fuller@bto.org

Concern has been growing about the potentially far-reaching effects on woodland biodiversity of the ongoing large increases in abundance and distribution of deer in Britain (Fuller & Gill 2001). Within woodland, increasing deer activity generally results in reduction of low vegetation (e.g. McShea & Rappole 2000, Gill 2006, Gill & Fuller 2007). The predominant implication for avian habitat quality is the loss of physical vegetation structures that provide nest sites, feeding sites and shelter for understorey-dependent species (Fuller 2001). Other impacts may include enhanced predation, trampling and alteration of food supplies. Evidence that high deer densities can alter bird assemblages exists for North America (deCalesta 1994, McShea & Rappole 1997, 2000, Allombert *et al.* 2005), Japan (Hino 2000) and Europe (Gill & Fuller 2007, Holt *et al.* 2010). Increasing pressure from deer may be contributing to reduction in habitat quality for several species of woodland birds that have recently declined in Britain, including Common Nightingale *Luscinia megarhynchos*, Song Thrush *Turdus philomelos*, Garden Warbler *Sylvia borin*, Willow Warbler *Phylloscopus trochilus* and Eurasian Bullfinch *Pyrrhula pyrrhula* (Fuller *et al.* 2005).

Four deer species are widespread and increasing in lowland English woods: Red Deer *Cervus elaphus* and Roe Deer *Capreolus capreolus* are native, but Fallow Deer *Dama dama* and Reeves' Muntjac *Muntiacus reevesi* are non-native. This assemblage of native and non-native deer species is unique in Europe. Different combinations of deer species occur in different locations, though an increasing number of woods are becoming occupied by three or more species.

There has been little research on the comparative ecology of native and non-native deer, but there may be important differences in ecology with implications for habitat change (Dolman & Wäber 2008). Variations are evident between species in social behaviour, foraging strategy and feeding niche, patterns of habitat use and other traits (Harris & Yalden 2008). There is considerable overlap in these traits between species. Behavioural plasticity and inter-specific competition can modify the realised niches. Nonetheless, there is sufficient inter-specific variation in ecology and behaviour of deer species to result in differential impacts on vegetation structure and composition. For example, Muntjac tend to be solitary, occupy a lower foraging niche and are more tightly associated with woodland habitats than the other deer species. In contrast, Fallow and Red Deer are gregarious and mobile with the result that they may occur at very high local densities leading to rapid and large local impacts on habitat structure.

Climate change will probably give a further boost to populations of deer in Britain (Irvine *et al.* 2007). The native ranges of the introduced deer species all lie at lower latitudes, and it is likely that future climatic conditions will be especially advantageous to them. It is to be expected, therefore, that the coming decades will see intensified impacts of deer on woodland vegetation structures. The continued colonisation by Muntjac and Fallow Deer of woods that previously held just Roe Deer will undoubtedly greatly diminish the quantity and complexity of low

vegetation leading to reductions in habitat quality for bird species that depend on resources associated with these structures. On the other hand, bird species such as Wood Warbler *Phylloscopus sibilatrix* that prefer more open habitat structures could potentially benefit.

There is an urgent need for research on the implications of intensified deer browsing, not just for habitat quality of woodland birds, but on the wider impacts on biodiversity. This research needs to take account of both the effects of different deer densities and different assemblages of deer. Knowledge about the form of relationships between deer abundance and habitat quality for birds and other biodiversity is a serious knowledge gap that needs to be addressed if sound deer management plans are to be developed (Fuller & Gill 2001).

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