Restoring a Gray Partridge (*Perdix perdix*) Population and the Future of Predation Control

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For the past quarter century, the author's partridge (*Perdix perdix*) population simulation model has been a useful guide, incorporating annual variation in chick survival rate, nesting habitat quality, nest predation, pesticides affecting the supply of insect food for the chicks and shooting. The 2 most important variables, density dependent nest predation and effect of insect food supply have been experimentally verified and all parts of the model have been extensively validated. However some very high densities achieved in northern France have not been fully explained. An ongoing conservation research project within the Sussex Downs Study (U.K.) area is described. The area is small (155 ha) but the numbers of partridges have increased ten-fold since 2003, with 57 per 100-ha in the autumn of 2005. Despite a very high density of pheasants no adverse effect of a caecal nematode (*Heterakis gallinarum*) has been detected. This project has been successful so far, but it has involved the removal of large numbers of meso-predators. Although legal, this predation control is unpopular and difficult. Moreover the smaller raptors are increasing and cannot be controlled. The question of whether the return of some top-predators could improve the situation for the partridge is explored by reference to experience in the USA and other countries. Few species have been studied more than the partridge yet, even more vigorous research will be necessary in future to meet the many challenges ahead.

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For the past quarter century a deterministic simulation model of gray partridge (*Perdix perdix*) population dynamics has been a useful guide to the management of gray partridge populations in the UK, incorporating the dynamic interplay between density, annual variation in chick survival rate, nesting habitat quality, nest predation, insect availability for chicks due to pesticide use, and shooting (Potts 1986). The 2 most important variables, density dependent nest predation and effect of insect food supply have been experimentally verified and all parts of the model have been thoroughly validated. Adapted to local conditions, the model has also been found useful in North Dakota (Carroll 1992) and elsewhere (e.g. Germany Pethig 1994), but in France different factors have clearly emerged. In the Beauce (SW Paris Basin) predation on adult partridges by the hen harrier (*Circus cyaneus*) has become increasingly important (Bro et al. 2006). Yet, paradoxically in May 2000, at a meeting of the organization La Chasse Verte, Gérard Pasquet reported all time record densities of 1 pair/ha in the NW Paris Basin, particularly on 2 farms owned by Jacques Hicter. For these farms the Potts model predicted pair densities and over-winter survival that were half the observed levels, whereas the remaining variables were well predicted. Although analyses are not yet concluded it is clear that the almost year-round provision of grain on these two farms is reducing dispersal rates and thus elevating local densities. Due to these drastically different findings, there was considered to be a clear need to test these conclusions in the United Kingdom.

Partly with this in mind, in 2003/2004 a major new wild partridge conservation management and research project was established privately within the Sussex Downs Study Area (see Potts 1986). The part of the area chosen for a feasibility study was initially

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small (145 ha of arable), and intensive management involved the implementation of beetle banks, unsprayed [CH2] headlands, strips of kale (*Brassica oleracea*), nest predator control, supplemental feeding, a zero rate of gray partridge shooting and no rearing and releasing of gamebirds. The rest of the study area which totals 6200 ha remained as a control. However in spring 2006 the feasibility study was extended by 120 ha of arable with a further extension of 365 ha in spring 2007 to bring the intensively managed area to 630 ha of arable. During 2003-2006, this management package resulted in an increase to 15 pairs per 100-ha compared to 1-2 pairs per 100-ha in the remaining part of the study area (acting as a control) and in the managed area pre-treatment. In the managed area the large increase has taken place despite a very high density of pheasants (*Phasianus colchicus*) mostly originating from neighboring properties and with red-legged partridges (*Alectoris rufa*) also present. The project is privately funded and detailed results will be made available as equilibrium levels are established.

This ongoing partridge management project has like the previous Salisbury Plain Project (Tapper et al. 1996) required the removal of large numbers of predators. Although legal in the UK and France, this predation control is expensive, and necessitates a large amount of physical work in often difficult conditions. Moreover several species, especially the smaller raptors are increasing and these cannot be controlled. The question whether the return of some top-predators such as the eagle owl (*Bubo bubo*) could improve the situation for the partridge has been explored (Potts 2007). For example in Schleswig Holstein in the absence of eagle owls it was found in one study that the northern goshawk (*Accipiter gentilis*) predated about 13% of adult female gray partridge per year. The eagle owl also takes many partridges; it is increasing virtually throughout Europe and thus may add to the predation pressure on the gray partridge. However calculations suggest that the additional predation on partridges by these owls is more than offset by its predation on partridge predators. Many questions remains unanswered but intra-guild predation like this may help to relieve the intense nest predation pressure that most partridge populations currently experience on farmland and more research here would clearly be valuable.

Few species have been studied more than the partridge, yet the continually evolving dynamic and complex interaction of gray partridges with their ecosystem demonstrate that even more vigorous research will be necessary in future to ensure the species has a satisfactory future.

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