ADDITIONAL MATERIALS AND METHODS

Supplementary feeding.

The tree species present in our woodlands were predominantly sycamore (*Acer pseudoplatanus*), beech (*Fagus sylvatica*) and oak (*Quercus robur*), Sites were paired according to location, woodland composition, woodland shape/size, amount and type of understorey vegetation and other common features such public access, proximity to human settlement, game shooting and surrounding habitat. For example, sites of long narrow woodland with similar tree species, vegetation and levels of public access, and therefore accompanying paths, roads and disturbance, were matched together. All sites were at least 3.5km apart to ensure that birds at unfed sites did not have access to the supplementary food at fed sites. Birds were colour-ringed at both fed and unfed sites throughout the winter. No marked birds, either fed or unfed, were observed to move between sites in either winter or spring and no birds were caught in mist nets at more than one site.

The feeders used had highly effective squirrel guards so use by non-target animals was minimal and only small passerines were ever observed eating from the feeders. Over 320kg of peanuts were consumed overall, with an average of 66kg per site across the four months. Marked birds caught at feeders during winter (November-February) showed that individuals were utilising the food throughout the winter period and that individuals were remaining in the area to breed the following spring. It is possible some breeding birds in the supplemented sites may not have been present to use the feeders over the winter period, having only moved into the site in spring once they had been removed. However, the result of any unfed birds moving into the sites from unsupplemented neighbouring areas is likely to reduce our ability to detect any effects of provisioning and lead to a more conservative assessment of the full effect. The reverse is also possible that birds with access to feeders in gardens and parks moved into unfed sites during the breeding season, but this is also likely to reduce our ability to detect differences between treatments and again lead to a more conservative measure of the treatment effect.

Feeding in this study was restricted to the winter period only and stopped at least 6 weeks prior to the first recorded laying date. Other studies examining the impact of supplemental feeding on breeding success have also supplemented in the months prior to breeding (e.g. Jansson 1981), but have also continued to provision into the breeding period. While others have limited feeding to immediately prior to the breeding period, for example one once initial signs of breeding have already been observed.

Breeding success. The breeding success of blue tits was monitored in the spring following the cessation of supplementary feeding (2006). In order to examine the importance of treatment effects relative to between-site variation, nest boxes were also monitored the following year (2007) for occupancy and lay date only. In the second year none of the ten sites received any feeding treatment.

Second brooding is rare in these blue tit populations and no second broods were included in the analysis. Laying dates were back calculated on the assumption that one egg is laid per day (Lambrechts 2004) and all nests were found prior to clutch completion. To minimise disturbance following calculation of the final brood size and chick measurements, nests were left undisturbed and then re-checked around the predicted fledging date. At the end of the breeding season all nest boxes were searched for unhatched eggs and dead chicks in order to calculate fledging success rates (defined as the percentage of brood successfully fledging the nest) (Svensson 1995). Cases of whole or partial nest predation, which could be inaccurately recorded as fledging, could normally be detected through signs at the nestbox (disturbance of nest material, box lid forced open, remains of chicks etc.). However, predation was not found to be a major cause of mortality at any of the sites (Northern Ireland has no woodpeckers, no weasels *Mustela nivalis*, and a restricted small mammal fauna). Individual measurements of all chicks within a brood were also recorded when they were approximately 9-12 days old. Weights were taken to the nearest 0.1g using a Pesola spring balance and tarsus minimum length (Redfern 2001) were taken using callipers to the nearest 0.1mm.

Sample sizes were higher for fed sites as supplementary food was found to lead to a greater number of birds breeding in the nest-boxes. There were 42 broods in fed sites compared to 28 in unfed sites. However, the median number of broods in the two treatments was not significantly different (Mann-Whitney U, $P = 0.222$). It was also not consistent across all site pairs, in two of the five pairs there were more broods at unfed sites compared to fed sites. There was also no correlation between any of the breeding parameters measured and the density of birds using the nest-boxes (Pearson Correlation (2-tailed): lay date $r = -0.451$, $P = 0.190$, clutch size $r = 0.054$, $P = 0.883$, brood size $r = 0.136$, $P = 0.707$, number fledged $r = 0.011$, $P = 0.976$).

Statistical analysis. Prior to analysis all data were tested for departures from normality (Kolmogorov-Smirnov goodness of fit test) and homogeneity of variance (Levene's test). In order to control for any differences due to the age of chick at measurement, body weight was divided by tarsus length to provide a measurement of chick size. This measurement, comparing skeletal growth with weight, provides a relative index of body condition. This measurement was then log-transformed to normalize the distribution of data prior to parametric analysis. Fledging success data were unusually distributed with large proportion of 0 and 100% values due to complete nest failure or entire broods successfully fledging. Thus, these data were classified into five ranked categories, based on the % of chicks fledged: 0-19 %, 20-39 %, 40-59 %, 60-79 %, 80-100 %. Data were analysed using SPSS 14 and JMP version 3.2.6.

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Table 1. Energetic calculation showing the number of birds that could be potentially supported from commercial wild bird food sales in the UK

1) People in the UK buy 48,000,000 kg of bird food per year (BTO 2006)

2) Comprising 16,000,000 kg of peanuts, 10,000,000 kg of sunflower hearts, 20,000,000 kg of sunflower seeds and 2,000,000 kg of fat (BTO 2006)

3) Peanuts contain 5700 calories per kg, sunflower hearts contain 6100 calories per kg, sunflower seeds contain 5000 calories per kg and fat contains 8500 calories per kg (CJ Wildlife 2007)

4) The amount of energy available annually through commercial bird food is birds is therefore around 2.692×10^{11} calories

5) A great tit requires 23.28 calories per day (Nagy 2005), or 8496.69 calories per year

6) People in the UK provide enough food to feed 31,682,926 great tits for a year

Table 2. Summary for each of the breeding parameters (mean ± s.e) measured at the ten sites during the 2006 breeding season. The overall results for treatment groups (fed versus unfed) is also shown.

Site	Pair	Treatment	Sample size	Lay date (day of year)	Clutch size	Brood size	Number of chicks fledged
Ballywalter	1	Fed	13	119.3 (± 1.26)	7.3 (± 0.36)	5.5 (± 0.84)	4.3 (± 0.96)
Hillsborough	1	Unfed	11	119.1 (± 1.36)	8.0 (± 0.48)	7.6 (± 0.48)	3.8 (± 1.07)
Greyabbey	2	Fed	5	118.4 (± 1.78)	8.2 (± 8.20)	7.0 (± 0.45)	7.0 (± 0.45)
Mt Stewart	2	Unfed	7	119.4 (± 1.11)	7.1 (± 0.55)	6.1 (± 0.67)	4.9 (± 1.08)
Castle ward	3	Fed	6	118.8 (± 2.98)	7.6 (± 0.42)	7.3 (± 0.33)	5.5 (± 0.96)
Castlewellan	3	Unfed	4	121.3 (± 2.59)	7.7 (± 0.65)	7.3 (± 1.65)	5.5 (± 1.38)
Finnebrogue	4	Fed	9	114.9 (± 1.69)	8.0 (± 0.69)	7.0 (± 1.09)	5.8 (± 1.27)
Seaforde	4	Unfed	6	120.8 (± 2.02)	7.0 (± 0.45)	4.8 (± 1.54)	4.2 (± 1.40)
Montalto	5	Fed	12	117.5 (± 1.51)	6.8 (± 0.44)	6.4 (± 0.38)	6.1 (± 0.40)
Clandeboye	5	Unfed	3	127.5 (± 1.50)	7.5 (± 0.50)	7.5 (± 0.50)	4.0 (± 2.00)
Fed			**45**	**117.8 (± 0.78)**	**7.5 (± 0.23)**	**6.5 (± 0.35)**	**5.5 (± 0.42)**
Unfed			**31**	**120.3 (± 0.83)**	**7.4 (± 0.26)**	**6.4 (± 0.46)**	**4.1 (± 0.59)**

Table 3. 2006 breeding season model outputs for each of the dependent breeding parameters analysed in the GLMMs. Treatment was a binomial factor, fed or unfed. Pair a multi-level random factor for each of the five site pairs. Lay date a covariate to control for any change in the breeding parameters as a result of the earlier lay date in fed sites.

Dependent variable	Model	Parameter	Sum of Squares	F value	p
Lay date	Treatment + Pair	Treatment	125.11	4.93	0.03
		Pair	56.20	0.55	0.70
Clutch size	Treatment + Pair + Lay date	Treatment	<0.01	<0.01	0.98
		Pair	5.09	0.60	0.67
		Lay date	12.40	5.80	0.02
Brood size	Treatment + Pair + Lay date	Treatment	0.16	0.03	0.87
		Pair	3.37	0.14	0.97
		Lay date	10.85	1.74	0.19
Chick size	Treatment + Pair + Lay date	Treatment	<0.01	0.09	0.76
		Pair	0.58	2.57	0.06
		Lay date	3.49	16.32	<0.01