

## Brief report

# The ranging behaviour and habitat selection by three Hawfinches *Coccothraustes coccothraustes* in late winter in Scotland

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The detected ranges (mean convex polygons) of two male radio-tagged Hawfinches in March 2007 were 34.9 and 1.2 km<sup>2</sup>, however that of the latter male was likely to be an underestimate because of its relatively infrequent detection. Constant monitoring of a female tagged in February 2008 indicated a range of 1.4 km<sup>2</sup>. Tree species used in daytime were Oak (an average 39% of radio locations for the three birds), Yew (32%), Sitka Spruce (17%), Lime (10%), Sycamore (1%) and Fir (<1%). Sitka Spruce and Cypress were used as roost sites. Although there are apparent differences between the sexes (greater ranging distances by the males and greater preference for Yews by the female), the small sample size of tagged birds limits making any generalisations for the species.

## 1. Introduction

This paper describes the ranging behaviour and habitat choices of three individual Hawfinches *Coccothraustes coccothraustes* that were radio-tagged in Scotland in late winter; as far as we are aware, the first study of Hawfinches using radio-telemetry. The Hawfinch breeds across the Palaearctic where it breeds predominantly in broad-leaved woodland, especially mixed oak *Quercus* spp. and Hornbeam *Caprinus betulus*, in the temperate and Mediterranean zones (Cramp & Perrins 1994). Scotland is at both the western and northern periphery of its range where it has only been present in relatively small numbers at a few apparently isolated sites (Zonfrillo 2007). In Britain, the

breeding population is believed to have declined markedly within the last two decades of the 20<sup>th</sup> Century (Langston *et al.* 2002) and is currently 'red-listed' as of high conservation concern (Eaton *et al.* 2009). Causes of population decline in Britain and elsewhere are poorly known but the predation of nests by Grey Squirrels *Sciurus carolinensis* and corvids has been suggested as a possible factor (Bijlsma 1998, Hewson *et al.* 2004, Fuller *et al.* 2005). However, the year-round ecology of Hawfinches has been little studied especially in recent decades and so other potential causes for a decline may not have been identified. Although little is known about changes in the availability of large seeds, a principal food source of Hawfinches (Mountford 1957), within wood-

land and in the wider landscape (Fuller *et al.* 2005), the availability of seeds in late winter may be a limiting resource for seed-eating birds within agricultural landscapes (Siriwardena *et al.* 2008). This study provides initial quantitative data on the ranging behaviour and foraging choices of Hawfinches at the edge of their range and at a potentially important time of year.

## 2. Material and methods

Three Hawfinches were caught and fitted with tail-mounted (glued and tied to the base of the two central tail feathers) 1 g PIP radio transmitters in the grounds of Scone Palace, near Perth, Scotland (56° 25' N, 3° 26' W). Two males were tagged on 20 March 2007 and a female on 24 February 2008. The capture site was mature broad-leaf and mixed policy woodland that forms an 'informal' part (*ca.* 16 ha in area) of the ornamental parkland which is the grounds of the palace at about 35 m above mean sea level. The principal habitats and land uses of the surrounding area were a mosaic of mixed farmland (arable, pasture and soft fruit), broad-leaf woodland (both semi-natural and policy), coniferous plantations and urban areas (towns and villages). The grounds of Scone Palace were, at the time of the study and to our best knowledge, the only site in Scotland where Hawfinches occur regularly. Small numbers breed within the palace grounds (2–4 nests are found annually, though more may be present), and up to *ca.* 70 birds have been recorded in winter (mid-December to early April) when birds form flocks of varying sizes and their behaviour includes courtship displays (as described by Mountford 1957) as well as feeding (N. Morrison, unpubl. data).

The movements of radio-tagged Hawfinches were monitored using a hand-held receiver and a three-element Yagi antenna. Monitoring protocols aimed to assess (i) the proportion of time that individuals spent within the 16 ha capture site; (ii) how far Hawfinches ranged from that site; and (iii) the species of trees that were selected by the radio-tagged birds. Radio-tagged birds were monitored from one hour before daylight through to one hour after dark and where possible their locations were recorded every 20–60 minutes. Some additional opportunistic checks were made to detect move-

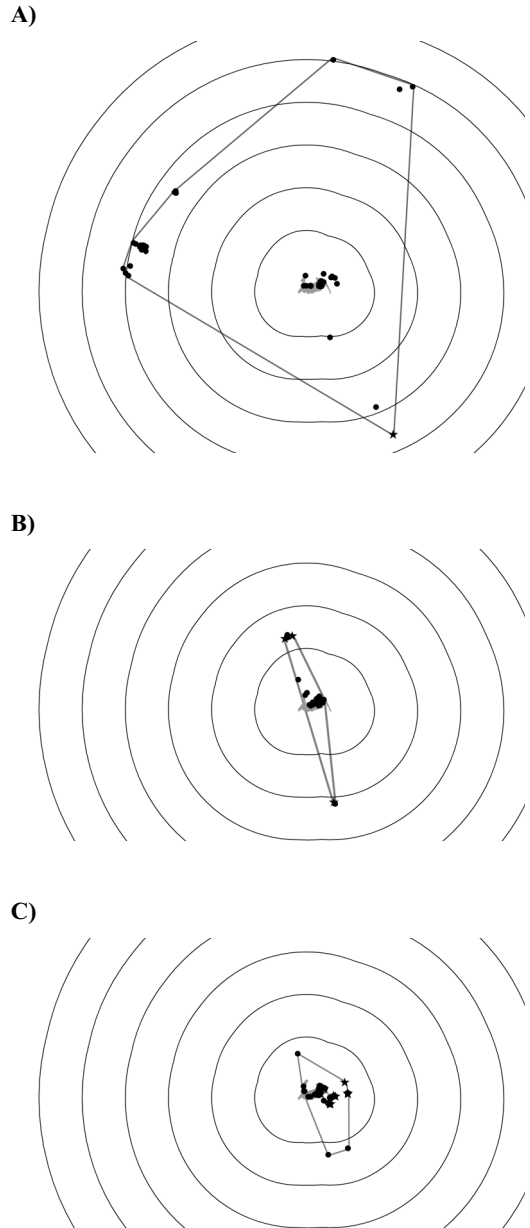


Fig. 1. Radio locations of two tagged male Hawfinches (A & B) and a female tagged Hawfinch (C). Stars represent roost sites and the polygons are the MCPs fitted around all of each individual's radio locations. The concentric rings represent successive 1-km distance bands from the core area of the palace grounds which are shown centrally.

ments during the hours of darkness. In the field, radio-tagged birds could be reliably detected at up to 1 km distance.

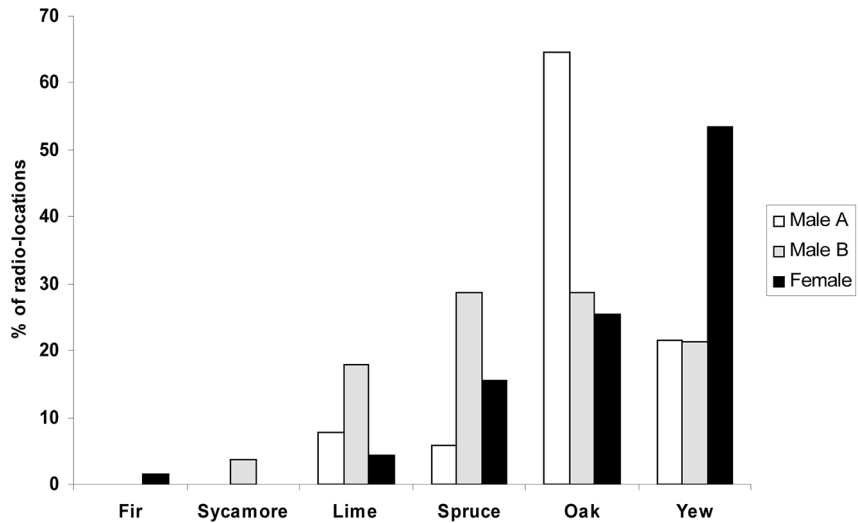


Fig. 2. Tree species selected by three radio-tagged Hawfinches in day time in late winter in Scotland.

When monitoring birds away from the core area and if a bird could not be detected, systematic searches were made from a series of predetermined points ( $n = 58$ ) at distances of up to 6 km from the capture site. If a bird was detected, when possible, the signal was then followed to determine the bird's precise location. Our approach aimed to locate birds away from the capture site within the constraints of limited time (day length) and without undue bias associated by waiting for them to return to the area of their capture. Once located, tree species were identified, retrospectively in daylight in the case of some roost sites.

### 3. Results

#### 3.1. Ranging behaviour

Male 'A' was tracked for 19 days, which is about the expected life-time of the attached tag. Male 'B' was tracked for 10 days (unknown outcome of the tag or bird) and the female was tracked for 7 days, after which the transmitter became detached. Both males were within the palace grounds on 33% of the occasions for which they were searched within that area (out of totals of 159 and 84 systematic searches of that area during the times when their radios were known to be active). Male A was detected up to 5 km away from the palace grounds within broad areas to the north, west and south-east of that core area ( $n = 66$  locations; Fig. 1). The

area of a minimum convex polygon (MCP) fitted around those locations was 34.9 km<sup>2</sup> and the maximum distance between locations was 8.9 km. Male B was detected at distances of up to 2.2 km away from the core area with an MCP of 1.2 km<sup>2</sup> and maximum distance between locations of 4.1 km ( $n = 42$  locations; Fig. 1).

Although both males were detected at the palace grounds on the same proportion of systematic searches, and therefore it can be assumed that both individuals spent 67% of their time away from that area, the latter individual was detected less frequently, even when the lesser longevity of its tag is considered (3% of 152 systematic searches > 1 km from the palace grounds compared to 17% for Male A during the period for which both tags are known to have been active). Given the reliable detection radius of the tagged birds (*ca.* 1 km) and the extent of the area that was searched for them (*ca.* 125 km<sup>2</sup>), it remains possible that the bird was ranging within the same areas as the more frequently detected Male A but was simply not encountered during searches of the wider area. However, if it ranged even more widely, that would reduce the likelihood of its detection and therefore its apparent ranging behaviour as suggested by its recorded locations could be a serious underestimate.

In contrast to the males, the tagged female was detected the majority of times (96% of the 94 occasions) for which it was searched within the palace grounds. On the few occasions that it was not, it

was easily located at up to 1.4 km distance; the MCP encompassing its locations was 1.4 km<sup>2</sup> in area and the maximum distance between recorded locations was 2.5 km ( $n = 94$  locations; Fig. 1).

### 3.2. Habitat selection

All radio-locations were in woodland or else in large wooded gardens and parkland. Diurnal locations were sufficiently precise to identify individual tree species in 51 instances for Male A, 28 for Male B and 71 for the female. Oak *Quercus robur/petrea* was the most favoured tree species accounting for 39% of locations (an average of the proportions for the three individual birds), Yew *Taxus baccata* accounted for an average 32% of locations, Sitka Spruce *Picea sitchensis* 17%, Lime *Tilia* spp. 10%, Sycamore *Acer pseudoplatanus* 1% and Fir *Abies* spp. <1%. There was variation in the proportions between the individuals, however, most notably with the female having Yew as its most frequently used tree (56% of locations) compared to Oak for the males (65% and 29%) (Fig. 2).

Roost sites were found for Male A once (in Sitka Spruce), Male B on four nights (Sitka Spruce on 3 occasions and Yew once) and the female on seven nights (Sitka Spruce on 6 occasions and Cypress *Cupressus* spp. once). The Sitka Spruces used as roost sites were both within plantations where the trees were 25–30 years old (the two males on all occasions and the female on three nights) or mature (>100 year old) specimen trees. Roost sites differed on each night (Fig. 1) and on no occasions were roost sites changed during the night. Neither of the two males was found roosting within 1 km of the palace grounds, despite intensive searches of the area, while the female roosted either in or within 500m of the palace grounds on each the 7 nights that it was monitored.

### 4. Discussion

With a sample size of just three radio-tagged Hawfinches, we clearly are not able to make generalisations about the species; during three winter seasons, these were the only birds that we were able to catch for radio-tagging. However, our

study does provide some new information on what is an understudied species, at the edge of its range and against which birds from other populations could be compared. The importance of Oak, Yew, Spruce and Lime to Hawfinches has been identified elsewhere in Europe (Mountford 1957, Cramp & Perrins 1994, Bijlsma 1998, Kosinski & Trynowski 2000). Our study birds were observed taking the seeds of Yew and Spruce and the growing tips of Oak, Yew and Lime twigs. Of the tree species that were at least reasonably abundant within our study area and are cited as food sources (as above) but were not seen to be used by the radio-tagged birds were *Pinus* spp., *Salix* spp., *Betula* spp., *Alnus glutinosa*, *Fagus sylvatica*, *Fraxinus excelsior*, *Prunus* spp., *Crataegus monogyna* and *Ilex aquifolium*. Given our small sample size, it is impossible to say whether the observed differences between the sexes in ranging behaviour (the males ranging more widely) and tree preferences (the female having more of a preference for Yew) were indeed that, rather than differences between years (males tagged in 2007, the female in 2008), seasonal differences (the female was tagged a month later than the males) or are simply representative of variation between individuals.

The Hawfinches at Scone Palace are widely known and much sought after by Scottish bird-watchers. Despite this attention, there are very few records away from the palace grounds or its immediate vicinity. The more widely ranging Male A visited many places from where they were not previously known to occur. Hawfinches can be elusive, a fact that was demonstrated by the prolonged periods (including a full day on one occasion) when the near-constantly monitored female could not be seen, it being constantly concealed within the evergreen foliage of Spruce and Yew trees. Apart from emphasising the potential biases associated with assessments of habitat use from visual observations alone, our study demonstrates that Hawfinches can range more widely than was originally anticipated.

This raises the question of just how isolated are the Hawfinches at our Scone study area from other populations. Although there is little evidence of regular movements by British breeding birds, there is some suggestion of small numbers of migrants or irruptive movements in autumn and winter (Marchant & Simmons 2002, Zonfrillo 2007).

Of the 41 Hawfinches that have been ringed at Scone 2004–2008, there has been a single recovery and no retraps at the site. The single recovery was of a female ringed at Scone in February 2004 and recovered freshly dead in Haland, Sweden, 1,030 km to the east-north-east in February 2007. This suggests that there may be some connectivity with the contiguous European populations of Hawfinches and one can but speculate at the significance of migrants and/or irruptive movements in the maintenance of peripheral Hawfinch populations such as that in Scotland.

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### Nokkavarpusen elinpiiri ja -ympäristö loppupalvisessa Skotlannissa

Kirjoittajat seurasivat radiolähettimillä varustettujen nokkavarpusten (*Coccothraustes coccothraustes*) liikkumista ja suosikkipuulajeja kevättalvina 2007 ja 2008. Paikantamisväli oli 20–60 minuuttia. Havaintoja kertyi 19 päivältä toiselle koiraalle ja 10 päivältä toiselle, ja naarasyksilöä kyettiin seuraamaan 7 päivää. Toinen koiraista paikannettiin useaan otteeseen 4–5 km päästä ydinalueelta (paikka, jossa lähettimet kiinnitettiin ja jossa nokkavarpunen on talvisin runsas) ja toinen 2–3 km päästä; naaraan paikannukset olivat enintään 1–2 km ydinalueelta.

Reviirin koon arviointiin usein käytetty minimipolygonimenetelmä osoitti toisen koiraan havaintojen kertyneen 34,9 toisen koiraan 1,2 ja naaraan 1,4 neliökilometrin alalta. Koiraat paikannettiin useimmin tammelta, mutta myös kuusi ja marjakuusi olivat tavallisia; naaras paikannettiin yleisimmin marjakuuselta mutta usein myös kuuselta

ja tammelta. Selvästi vähemmän paikannuksia kertyi pihtakuuselta, vuorivaahteralta ja lehmukuselta.

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