Feeding studies of the Lesser Whitethroat in Strathclyde

Tom Byars

Introduction

The Lesser Whitethroat *Sylvia curruca* is still a comparatively scarce breeding species in Scotland. In Strathclyde, the breeding population has remained relatively stable at 9-12 pairs since 1986, with no indication of further expansion into new areas. This has been attributed to the lack of suitable breeding habitat and climatic conditions (Byars et al 1991). We know of no other feeding studies solely on the Lesser Whitethroat in Britain. It has been suggested by Mason (1976) that range limitations may be related to diet. Because our study site lies at the north westerly edge of the species' breeding distribution, they provide an opportunity to study Lesser Whitethroat feeding ecology at the edge of its range.

Study areas

The majority of breeding territories which have been discovered in Strathclyde (Byars et al 1991) were evenly divided between two comparable sites, 43 km apart. The Renfrewshire site, which covers a 2km² area south east of Paisley, contained three territories which were located at Dykebar and Brownside Braes. The Ayrshire site covered a slightly larger area of 2.5km² and is located just south of Ayr. Regular breeding territories were established at the Heads of Ayr, Burton Farm and Bracken Bay. All territories were located in areas of dense Hawthorn *crataegus monogyna* and/ or Blackthorn *Prunus spinosa* scrub with a dense mosaic understorey of Bramble *Rubus sp*, Gorse *Ulex europaeus*, Dog rose *Rosa canina* and Goat Willow *Salix caprea*.

Study sites

Insect sampling and observations of feeding behaviour commenced when territorial males arrived back on site. The criteria for locating suitable breeding habitat and assessing site fidelity have already been discussed (Byars et al 1991). The sampling sites for occupied territories were located in two Lesser Whitethroat territories 43km apart. The two control sites used for invertebrate sampling were chosen on the basis of their similar habitat characteristics to the two breeding territories and were 23 km apart. These sites were located in three of the eighteen climatic zones found in Scotland calculated by Birse & Dry (1971) and are based on measurements of altitude, accumulated temperature and potential water deficits. Territory 1, at Heads of Ayr was in Zone EE a warm dry lowland region; Territory 2 and Control 2 at Brownside Braes in Renfrewshire were in Zone EM, a warm moist lowland region. Control 1 at Dalry was within Zone ER, a warm rather wet lowland region.

Invertebrate sampling

Insect samples were collected from each of the four sites using the beating tray method (Southwood 1978). Within each territory and control site, thirty white plastic markers were

randomly placed on the vegetation at two different height levels. Ten markers were placed in the scrub canopy at a two metre height level and twenty markers
were placed in taller canopy at four metres height level. A telescopic metre stick was used to beat a one metre square quadrat surrounding each marker six times in the scrub canopy. Invertebrates which fell were collected in a metre square catching tray. All items were then "pootered" into plastic vials containing 70% ethanol for analysis. Invertebrates were classified into taxonomic orders and all items were individually measured. All invertebrate sampling was carried out on warm sunny days. Samples were collected once a month during May, June and July in 1991 and 1992.

Hawthorn in full bloom attracts a huge abundance of insects

Insect samples were also obtained using the sweep net method (Southwood 1978). A 40cm diameter sweep net was quickly trawled back and forth six times over a one metre quadrat, which was randomly located above the scrub canopy. Four one metre quadrats per territory were analysed and captured invertebrates were then collected into plastic vials containing 70% ethanol for identification. This method was used to sample flying invertebrates located in mid air above the canopy in both study territories. Sweep sampling took place during two warm, but relatively calm days, during May 1991 and May 1992 to maximise capture of Diptera.

Observation of feeding birds

Detailed observations on male spatial distribution were conducted over 2 x 10 hour periods on two selected dates in May 1991 and 1992 in both study territories. Ten hour periods were from 0700 to 1700 BST and observations were timed immediately after the male was located at the start of each song cycle. Specific activity, vegetation type and duration of time spent at each of the four height levels, ie 0-1m, 1-2m, 2-3m, 3-4m were noted. Observations stopped when the male disappeared from the vicinity and could not be relocated by song after a ten minute period. Feeding strategies utilised by the two territorial males were observed in May-June 1991-92 on a non quantitative basis within the study territories.

Observations of feeding bouts started immediately after the male was located by song and all feeding methods were noted in detail. Adult males are more conspicuous and easy to observe early in the breeding season as they feed quite openly in the scrub canopy. After pair bonding, observing both sexes proved extremely difficult, as Lesser Whitethroats tended to search and feed more furtively within the dense scrub canopy. However, adults appear to give a soft contact tuc call when approaching and leaving a nest site, so that established routes can be identified and occasionally followed.

All Lesser Whitethroat territories were mapped using the minimum convex polygon method (Kenward 1987). The enclosed habitat was then systematically searched for any indication of nest building. Once found, nests were kept under daily surveillance and the contents checked periodically. Most food collections that were observed took place within 25 metres of the nest. Only one accessible nest suitable for video footage was located during the study period.

Video monitoring

A tripod mounted VHS video camera was placed approximately 1.2m away from the nest with magnification set to x8. The video camera was switched on manually and left to record until the battery power pack became drained after two hours operation. The equipment was then quickly retrieved with the minimum of disturbance to the nest. The video tape was then replayed back at Paisley University, where feeding visits to the nest could be viewed in great detail and freeze framed when required. The majority of prey items were easily identified and, by using adult bill length as a reference, these items could also be individually measured. Video footage was taken during June 1992 at the Heads of Ayr. To our knowledge, this video technique had never been used on Lesser Whitethroats before.

Results

Invertebrate abundance and seasonal variation

All four sites revealed a uniform trend in insect abundance and most taxa were represented throughout. Statistical analyses calculated from total invertebrate numbers per site showed no significant differences between territories or control sites, although there was a significant difference in mean invertebrate numbers between the two years. Out of the seven taxa groups analysed, only the Diptera and caterpillars varied significantly between territory and control sites, especially in 1991. There were notably more Diptera in territories than in control sites for both years, but there were significantly fewer caterpillars recorded in territories compared to that found in the control sites during 1991. 1992 showed similar numbers of caterpillars for both territory and control sites. Those two groups exhibited distinct fluctuations in populations between the two years.

Six different invertebrate taxa groups revealed distinct seasonal patterns of abundance in both territory and control sites. Lepidoptera larvae, Diptera and Coleoptera all showed

peaks of abundance during May, followed by a decline in numbers during June and July. Hemiptera and Opiliones displayed a reverse of this trend, with peaks of abundance occurring during July and Psocoptera showed a peak of abundance in June.

Results from the sweep sampling revealed small numbers of slow moving Diptera, notably Bibionidae and Stratiomyidae. It appears that Bibionidae are favoured prey items, as male Lesser Whitethroats have been observed picking up large numbers from Goat Willow *Salix caprea* flowers. Densities of 12 Bibionidae per square metre were calculated from four random quadrat samples taken from the Salix canopy.

Tipulids (Crane fly) and Dilophilus fabrilis (Fever Fly) are favoured food items for Lesser Whitethroats

Spatial distribution

During the 2x10 hour periods, a total of 418 minutes was observed at the Heads of Ayr and 378 minutes at the Brownside Braes territory. Males appeared to spend a significant proportion of time singing along with feeding; 68% (285/418) and 60% (228/378) were recorded for this particular activity at the two sites. The predominant canopy at both sites differed and this was reflected in the results. At the Heads of Ayr, males spent 83% of their time in Blackthorn at the 2-3 metre level (347/418), 16% in Hawthorn at the 3-4 metre level (68/418) and less than 1% in Ash at 5+ metre level (3/418). The utilisation of Ash trees within Lesser Whitethroat territories has been observed before (Hunt 1947). At Brownside Braes, males spent 66%, a substantial amount of time in Hawthorn at the 3-4 metre level (251/378). 23% was spent in Gorse at the 1-2 metre level (87/378) and only 11% in Hawthorn at the 2-3 metre level (40/378).

Foraging behaviour

Lesser Whitethroats can appear like Phylloscopus warblers, especially when they forage in the scrub canopy. This distinctive feeding behaviour has been previously noted before (da Prato 1980). Males regularly patrol their territorial boundaries, singing and feeding as they move through the upper canopy. Lesser Whitethroats obtain their prey in four contrasting feeding methods. 1. Pecking 2. Chase and snatch 3. Brief hover and 4. Flycatching

1. Pecking was by far the most common type of feeding activity observe at both sites and accounted for 90% of all feeding observations. Pecking can be further split into two types.

A Single peck. This is a pecking action towards individual food items (<5mm) dispersed on vegetation.

B Rapid pecking. This occurs when multiple food items (<5mm) are obtained by rapidly pecking into a productive area of vegetation eg leaf clumps. Lesser Whitethroats appear to use their body weight in shaking leaf clumps when they hop on to adjoining branches. Hidden invertebrates attempt to scatter when disturbed and, are quickly taken by this rapid pecking action. Food items which had been gleaned off the foliage by pecking were too small to identify visually in the field ie <5mm. Although beat sampling can reveal the diversity of invertebrates located in the canopy, we could not identify what the males were eating.

2. Chase and snatch. This strategy always involves a quick chase on moving prey, either by running along a horizontal branch in an attenuated posture, or ascending a trunk using flicked wings. Only three chase and snatch observations were made during the study period. The prey items caught were invariably large Tipulids (>10mm) which were dispatched by beating on nearby branches.

3. Brief hover. This feeding method is utilised when food items are located away from an available perch. Birds flutter very briefly for up to a second to pick at food items located on

thin branch ends or in vertically placed cobwebs. This was observed three times during the study period.

4. Flycatching. Two types of flycatching have been observed:

A Flight. Seen twice, this involves short (5-8m) one way horizontal twisting sallies from the upper canopy.

B Static. This type was observed on six occasions. The method comprises short neck lunges from an openly perched position on top of the canopy, often accompanied with an audible bill snap.

Male Lesser Whitethroat foraging for invertebrates in the upper hawthorn canopy

Nest observations by video camera

Only 114 minutes observation was obtained from one session in the field, during which a total of 47 food carrying visits were made: 31 (66%) of such visits were made by the female; while 16 (34%) were made by the male. 52 invertebrate items were brought to the nest, 45 (86%) were identified as Lepidoptera larvae, 4 (8%) were adult Tipulids, and 3 (6%) were adult moths. A significant 67% of the caterpillars were in the 6-10mm size category. The female averaged 1.3 caterpillars per visit, while the male averaged 1.0. The female spent a mean of 208 seconds away (31 forays analysed), while the male spent 228 seconds away (16

forays analysed). The male was responsible for the only brooding of the young during the observation period.

Male Lesser Whitethroat bringing back a 6mm caterpillar

Post fledging observations

Fledglings vacate the nest at around 10-11 days after hatching and hide in the dense vegetation layer (0-2m) within the territory, as their flight feathers are still in pin and not fully formed. The adults continue to feed them for a further two weeks, foraging in the canopy level. Food items collected by the adults could not be specifically identified during the fledgling period. Once fully fledged, juveniles roam further afield with the adults in a family party. Juveniles appear to loiter around the general vicinity of the territory for approximately 3-4 weeks before completely disappearing. Ringing studies in England have revealed that juvenile Lesser Whitethroats begin to leave their natal area once post juvenile moult has fully commenced at around 30-40 days old (Norman1992, Boddy 1994).

Discussion

Due to their dense habitat and skulking behaviour, prolonged observations on Lesser Whitethroats are difficult during the breeding season. During early May, however, observations on established males are easier as they patrol their territories. Data collected from timed observations within sampled territories indicate that males appear to spend a considerable amount of time patrolling as they sing and feed in the canopy. This roving behaviour of the territorial males could be territorial defence, mate searching, a response to low prey density, or a combination of these factors. When adults were feeding nestlings, they seemed to largely forage within <25 metres of the nest. As invertebrates and caterpillars in particular are relatively abundant in June, the adults we studied seemed to obtain prey within a small proportion of their territory when foraging to feed their young.

Our study suggests that in Strathclyde male Lesser Whitethroat foraging behaviour depends on habitat structure. At the Heads of Ayr site, where Blackthorn covered approximately 90% of the territorial area, males consistently fed at approximately 2-3m in the Blackthorn

canopy. At Brownside Braes, Hawthorn covered 60% of the occupied territory and the male Lesser Whitethroat spent more time feeding in the top (3-4m) canopy than at any other level. This suggests that invertebrate numbers were more abundant in the canopy, but our sampling data found no evidence from any of the four sites to confirm this theory. We need to carry out more detailed field work to investigate this. During May, males use various foraging behaviour techniques depending on the prey item concerned. When males are hunting slow moving Diptera such as Bibionidae the prey items are easily Observed and collected. However, the majority of food items taken appeared to be under 5mm in size and were not identified.

Although both sexes hunt in thick cover when foraging for their young, video evidence showed that caterpillars are important prey. If caterpillar populations fluctuate between years – as our study suggest – then fledgling success may depend upon caterpillar abundance during the breeding season as caterpillars are large and relatively easy to collect. In 1992, when caterpillar numbers were higher, a brood of five successfully fledged at the Heads of Ayr. Clearly more nesting attempts would need to be studied to confirm this link. The timing of the nestling period coinciding with peak caterpillar abundance has been shown to affect the breeding success in insectivorous birds such as tits (Perrins, 1979, 1991) and the Pied Flycatcher *Ficedula hypoleuca* (Lundberg & Alatalo, 1992).

We previously suggested (Byars et al 1991) that the breeding population of Lesser Whitethroats in Strathclyde may be restricted by the climatic effects on prey populations. However, this study found that territories in different climatic zones did not differ in invertebrate diversity and overall numbers to any significant degree. The Brownside Braes control site had the highest total of invertebrate numbers and yet the established breeding territory was located 100 metres away outside the control area. Hawthorn scrub, which was sampled in both territories and control sites, appears to have very high invertebrate numbers and diversity and this is reflected by the variety of other insectivorous bird species which breed within all four sites.

Although our studies have failed to establish that climate affects Lesser Whitethroats through invertebrate distribution, it may have an important influence on habitat distribution within Strathclyde. We previously suggested that the distribution of Lesser Whitethroats in the Lothians is linked to the climatic zone defined by Birse & Dry (1971) as zone EE, which is a warm dry lowland region below 200 metres. What appears to be ideal breeding habitat for Lesser Whitethroats can be found well over 100m in the Lothians (pers obs). Climatic conditions appear to limit the growth and diversity of hawthorn scrub over 100m in Strathclyde and this seems to restrict the extent of Hawthorn scrub within the region, whereas more favourable climatic conditions in south east Scotland allows for more widespread Hawthorn scrub and therefore a larger population of Lesser Whitethroats.

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