COMPARING BLUETHROAT
*LUSCINICA SVECICA AZURICOLLIS* BREEDING DENSITIES
USING TWO CENSUSING PROTOCOLS

COMPARACIÓN DE DOS MÉTODOS DE CENSO
PARA ESTIMAR LA POBLACIÓN REPRODUCTORA DEL PECHIAZUL
*LUSCINIA SVECICA AZURICOLLIS*

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To Quico (Francisco Suárez)
In memoriam

SUMMARY.—In order to estimate the breeding population of the bluethroat *Luscinia svecica azuricollis* in the Iberian Peninsula, line transects were conducted following mountain paths. The 2008 transects were undertaken without taped calls, but in 2009, the song of the species was emitted every 200 m for 2 min. If during this time no answering call was detected, the operation was repeated at the next site 200 m away. In addition, with baited clap-traps 5 males were captured and colour-ringed in a selected area in NW Spain (Sanabria, Zamora). Plotted observations of ringed birds according to the minimum polygon area method showed home range sizes from 620 to 2,800 m² per individual, with a mean of 1,573 m². The overlap between neighbouring males was close to 25% (120-600 m²), always in the most open zones of the landscape and never in bushy areas. In view of the relatively small areas occupied by the Spanish bluethroat and the results of comparisons among censuses with and without playbacks, we consider that performing linear transects, with calls played every 200 m, is a reliable method to estimate the number of breeding males of the species, detecting between 0 and 25% more than without taped calls.

RESUMEN.—Con el objetivo de estimar las poblaciones reproductoras del pechiazul *Luscinia svecica azuricollis* se han realizado taxíados siguiendo senderos de montaña. En 2008 se realizaron sin grabaciones, mientras que en 2009 se emitió el canto de la especie cada 200 m durante 2 min. Si en dicho lapso no hubo contestación, se repitió la operación pasados otros 200 m. Además, en 2009 y en una área concreta de Sanabria (Zamora), se capturaron 5 machos con cepos-malla, marcándose con combina-

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Counting mountain birds is a harsh task owing to rapid weather changes at altitude, difficulties in accessing most sampling areas, and greater difficulties regarding logistics for observers. In order to cope with some of these handicaps, more feasible and faster methods to detect and count territorial male songbirds must be sought, especially in a mountainous country such as Spain, which harbours an endemic subspecies of the European bluetroat *Luscinia svecica*. This bird lives in a dense brushy habitat, which favours skulking behaviour; this hinders observers from estimating distances accurately. These features may explain why the bird was undetected—in most of its current breeding habitats— as late as the end of the 70’s (Peris, 1982).

The aim of the present work was to determine whether the use of playback songs suffice to estimate singing males of the species, comparing censuses taken with and without play-back. The use of playback could save time and effort for observers, although certain biases, such as double counts, displacements of birds and habituation to the calls, may be common to this method (Sutherland *et al*., 2004). To minimize these possible handicaps, an approach to measure the average territory of the species by territorial mapping was undertaken. Territorial data were obtained by capture/marking and visual recapture of bluetroat males. Thus, if the average surface breeding territory of the study species is known, a playback can only be used with sufficient distances between two neighbouring territories, preventing calls in overlapping areas and standardizing the use of the taped calls at the proper distance and for the shortest times possible, thus reducing bias in the method.

In Spain, the bluetroat maintains an isolated glacial relict population with two main breeding areas: the Galician-Cantabrian Mountains and the Central Mountain System separated from each other by some 250 km (Campos *et al*., 2005). The Spanish species is included within the subspecies *L. s. azuricollis* (Mayaud, 1958), which has been well differentiated by micro-satellite genotyping (Johnsen *et al*., 2006).

Within each area, its populations are fragmented as result of the unequal distribution of the habitat preferred by the species for breeding. The birds mainly nest on gentle slopes (> 1,300-2,300 m a.s.l.) in a landscape of mosaic-like vegetation comprising dense broom-scrub of *Cytisus oromediterraneus*, *Erica arborea* and/or *E. australis* (60-110 cm high), close to wet *Nardus* and *Agrostis* grasslands with rivulets and streams (Peris, 1982; Domínguez and Fernández-Cordeiro 1991). At the centre of the Iberian Peninsula, the main breeding populations are found in the ‘Sierra de Guadarrama’ (Gómez-Manzaneque, 1989), ‘Gredos’ (Sánchez, 1989) and ‘Sierra de Béjar-Piedrahita’ (Peris, 1981), sporadic breeding has also been reported in the Portuguese ‘Serra da Estrela’ (Peris, 1984; Jansen, 1994).

Line transects were conducted in the distribution area of the species encompassing Sanabria (Zamora, NW Spain), and three
mountainous areas of Central Spain: Candela-río (Salamanca), the Peña Negra Pass and northern Gredos slopes (both in Ávila).

The 2008 male surveys were undertaken without taped calls. Transects were implemented 3-5 times on the same routes during spring (mid-May to mid-June), along hiker’s routes or cattle paths, which were previous selected as potential habitats for the species. Each transect had an average length of 2,900 m, and a total of 35 km of heath was surveyed over 9 days. Census timing was from half an hour after dawn to 3 hours later and then from about two hours before sunset. The distance of a bird from the transect was estimated perpendicular to it with a laser range-finder (Bushnell), and two distance bands at both sides were chosen; 0-25 m and over 25. Bird density was estimated by dividing the counts by the area covered (length of route and strip transect width), although initially, in order to detect standard errors, an analysis of the line transect data using the Distance 4.0 software (www.ruwpa.st-and.ac.uk/distance) was performed. Windy and rainy days were avoided.

During the next breeding season, a double method for assessing breeding distribution and the abundance of males was applied at the same localities surveyed in 2008, and a new one was added (Peña Negra). Thus, in May 2009 sampling was undertaken based on line transects with the use of male call recordings and capture, ringing, and visual recapture of some individuals. To accomplish this, call broadcasting were carried out following the 2008 line transects, and a male bluethroat song was played from a tape recorder for a maximum of two minutes every 200 m along the transect. If after this time there was no answering call, it was assumed that the species was not present at that point, and the investigator continued along the transect path until the next call point. During the middle of the day (from about 12:00 to 19:00 h local time) and on windy/rainy days no data from call recordings were taken. Distance bands and density treatments were similar to those employed in 2008.

The 2009 transects were about 900 m longer than in 2008, and approximately 76 km was surveyed over the 17-day survey period. All censuses were taken by one co-author (S. P.).

Although very time consuming, bird trapping – outside the time census – was carried out in an attempt to measure the area occupied by each male detected in order to test whether a call-recording distance of 200 m was sufficient to prevent double counts. We used Muscidae (Diptera) worm-baited clap-nets in the same call-recording areas, normally in a circle of 10-30 m from the spot where a bird had been detected. Among 3-5 traps were installed at the same time for a maximum of 15 min. If no bird was captured, the traps were moved to the next site, following the transect. Up to 12 birds were captured around the study areas, but because we were searching for continuous territories and a large number of recapture observations, only 5 ringed birds, within a relative small area at the Sanabria mountains (‘Laguna de Los Peces’), were used to test the population sampling method. All birds captured were colour-ringed individually. Following this, where possible each bird was observed through 10 x 50 binoculars – without any call broadcasts –, over 8 days from the end of May to mid-June 2009 (from 2 to 5 minutes each time per individual), with at least three different observations at different times of the day (7:00-9:00; 9:00-13:00 and 18:00-21:00 h, local time), resulting in a minimum of 10 minutes observation per day per bird. The distance from the line transect to each bird was also measured with a laser range-finder (Bushnell), and its territories were drawn from mapped locations of observations of these known individuals. The recordings were marked with a GPS to depict the minimum areas patrolled by each ringed bird.
The observation clusters were plotted by joining the outermost points (minimum polygon method) on an aerial map (Google Earth). Most of the contacts (87%) without playback were obtained between 20-30 m from transect, and an average of 2.7-3.1 ± 0.3 birds/10 ha was obtained in the 2008 census (table 1).

The species was only recorded at 8-12% of the song playback points. The best times for receiving answering calls were from 1-2 hours after dawn and 1-2 hours before sunset (own data). All ‘tape-contacts’ were obtained 5-10 m closer to the observer than when playback was not used. An average of 2.7-3.4 ± 0.4 birds/10 ha was obtained with taped calls.

The total number of location recordings of ringed individuals ranged from 24 to 52 for each bird. According to the marked birds observed, male bluet throats occupy territories ranging from 620 to 2,800 m², with a mean area of 1,573 m², overlapping territory with neighbouring males accounted for about 25% of the territory area (120-600 m²), mainly within the most open grassland areas, but not in the brushy ones.

References about the breeding density of this species in Spain report from 0.25 to 1.16, birds/10 ha at Guadarrama, 0.5-1.3 birds/10 ha at Gredos, and 3 birds/10 ha at Béjar-Candelario (Gómez-Manzaneque, 2003): an average of 1.3-1.8 birds/10 ha (mostly combining strip surveys and line transects and always without playbacks). However, our 2008 average data nearly double these values; 2.7-3.1 birds/10 ha, doubtless due to the low number seen at Guadarrama, however a possible increase in the population size in the north-western areas of its range (Guadarrama < Gredos < Sanabria) was observed. In any case, the transects described by Gómez-Manzaneque (2003) took into account the whole community of birds, and hence it would have been easier to fail to detect a specific species. Also, the descriptions of the census methods were simple, and probably only birds detected close to the observer would have been included.

Applying the taped-call method, the average population estimates ranged from 2.7 to 3.4 birds/10 ha in the central mountain range

### Table 1

Census for the bluethroat *Luscinia svecica azuricollis* in Spanish mountains with and without (*) the use of playback.

[Datos de censos de pechiazul Luscinia svecica azuricollis en montañas españolas con emisión o no (*) de vocalizaciones grabadas.]

<table>
<thead>
<tr>
<th>Locality</th>
<th>Year</th>
<th>Distance sampled</th>
<th>Males/10 ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Candelario</td>
<td>2008*</td>
<td>8 km (n = 3)</td>
<td>2.9-3.0</td>
</tr>
<tr>
<td>Gredos</td>
<td>2008*</td>
<td>13 km (n = 4)</td>
<td>0.6-1.3</td>
</tr>
<tr>
<td>Sanabria</td>
<td>2008*</td>
<td>14 km (n = 5)</td>
<td>4.8-5.0</td>
</tr>
<tr>
<td>Candelario</td>
<td>2009</td>
<td>15 km (n = 3)</td>
<td>2.7-2.8</td>
</tr>
<tr>
<td>Gredos</td>
<td>2009</td>
<td>14 km (n = 3)</td>
<td>2.0-2.1</td>
</tr>
<tr>
<td>Peña Negra</td>
<td>2009</td>
<td>12 km (n = 3)</td>
<td>1.2-1.3</td>
</tr>
<tr>
<td>Sanabria</td>
<td>2009</td>
<td>35 km (n = 8)</td>
<td>5.0-7.6</td>
</tr>
</tbody>
</table>
and Sanabria, respectively. In general, the numbers are only slightly higher than those obtained without calls in 2008 in the Central System, and the largest increase was observed in Sanabria (4.9 versus 6.3), an area that has always maintained a large population of the species, regardless of the method used to measure it. Are these differences in population due to the taped call method, which could favour the addition of a floating population of non-breeding individuals or may lead to double counts? Are they due to inter-annual population fluctuations? Or does the method merely help to show up a fraction of the population undetectable by other methods?

Marked birds were the only individuals observed within the estimated territories, and although taped calls have a stronger broadcasting power than 100 m away from the line transect, no non-ringed males were ever seen in those areas. In fact, only in the relatively open overlapping territorial areas were two ringed neighbours observed, which were readily identified with a defined territory. The absence of non-marked males in the experimental zone could mean that non-territorial males do not usually enter defended areas, at least during the sampling season, because from mid/late July (moulting season) displacement between territories is common and birds do not tend to defend them.

Thus, owing to the relatively small territories of this species, line transects with taped songs played every 200 m seem to offer an appropriate method for the detection and counting of breeding bluethroat males in Spanish mountain habitats. This is because it appears that mainly only territorial males are sampled, and the distance between one territory and the next is well covered by a length of 200 m. Regarding inter-annual differences, it is impossible to offer truly enlightening information, because most of the reference data come from 20-30 years ago. Might the large number of male bluethroats observed at end of the present decade be due to a real increase in the species, due to an increase in bushy cover in mountain areas? Or might this migratory species simply be subject to population fluctuations? Regardless, it is possible that the higher population density obtained in 2009 could have been due to the call method, which permits a fraction of the male population to be counted (from 0 to 25-30%), especially in high density areas in NW Spain, where some individuals might escape detection if playback is not used. Whether this latter population is formed by non-territorial birds or not deserves more research. Conway and Gibbs (2005) argue that the use of calls could diminish the responses of non-breeding males, although this is probably not the case of the bluethroat, because extra-pair copulation is a widely extended sexual strategy, with up to 85% in Scandinavian populations (Fossoy et al., 2006). This would mean that the bluethroat population would harbour a large number of breeding males, not all of them defending their own territory. With this in mind, the playback method is apparently good enough to detect most breeding males, regardless of whether they are occupying a territory or not.

Although our data from ringed birds are scarce, only 5 birds, the species could require a smaller home range than in other landscapes, such as the 4.14 ha observed in reeds on Hungarian islands (Baldi, 2004).

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BIBLIOGRAPHY


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