Singing activity of Golden oriole (*Oriolus oriolus*) in spring and summer

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Introduction

Golden oriole (*Oriolus oriolus*) is a migratory and breeding species in Tuscany, where it arrives in April and leaves in September (Tellini Florenzano et al. 1997), going back to winter quarters of tropical Africa (Svensson et al 2001). It settles all over the region avoiding only the mountainous areas (Tellini Florenzano et al. 1997), being an arboreal but not a forest bird and predominantly a lowland dweller, which normally does not breed above c. 600 m (Cramp & Perrins 1993). Golden oriole is a fairly common species in Northern, Central and part of Southern Italy, lacking only in Sardinia, in NW – NE part of Sicily, in Southern Puglia and Southern Calabria (Meschini & Frugis 1993).
The mating system is essentially monogamous, but in certain cases there are non breeding birds – called helpers – which help in nest building or feeding and guarding young (Cramp & Perrins 1993).
The Golden oriole song is a melodious, full-sounding, loud and clear fluted yodelling whistles uttered in variable short phrases. This is generally regarded as full song (Bergmann et al 2008, Bergmann & Helb 1982) or reproductive song , which is the vocal activity related to territory defence, mate attraction and mate guarding. Several call types and a quiet high pitched subsongs (warbling song; see Cramp & Perrins 1993) can be frequently heard too. However in this paper I focus my interest only on the full song, which is unmistakable and easily recognizable; my goal is to outline the seasonal pattern of Golden oriole singing activity.
In this species both male and female sing (Cramp & Perrins 1993), but female has a reduced repertoire of song phrases (Bergmann et al 2008). Male repertoire size is estimated between 28 and 48 different song phrases (Baumann 2000), up to about 50 (Bergmann et al 2008) and 50/60 (Feige 1986), but distinction of similar song phrases often subtle and/or subjective. Size of song repertoire may be important in respect of sexual selection. In the European area oriole males arrive in the breeding grounds several days before females and immature birds. Males with complex repertoires may be more successful in intrasexual competition or large repertoires may be sign of male fitness (Baumann 2000) . Individual and sex-specific song parameters may allow recognition of partners, neighbours and helpers. This may allow mate guarding, stable neighbourhoods or identification of foreigners (dear-enemy-effect).
Unpublished data on song learning show that song learning occurs at least during some months. In the field tutors may be parents and neighbours; young birds may learn the dialect of the local subpopulation (Baumann 2000).

Methods

During six years (2003 - 2008) I have collected 365 observations of Golden orioles, made throughout the day from 6 am to 9 pm. The following parameters were recorded: date, time of day, weather conditions, if the bird was singing or not and (when possible) song duration, singing intensity (number of song phrases/Min). The majority of these birds (90%) were observed in Southern Tuscany, while the remaining were scattered observations made in central Italy. The observations were made in an opportunistic way, without a predetermined schedule.
In the present paper the words "song" and "singing activity" indicates always the Golden oriole full song, as is described above in the introduction. It is unmistakable and easily recognizable from calls, which are all brief non melodious sounds. It cannot be confused with subsong, which is a continuous warbling, chattering and twittering medley with at times whining or more raucous quality (Cramp & Perrins 1993).
When possible the song performances were classified into two groups: high singing activity = song bouts with more than 3 phrases/Min and/or lasting more than 1 Min; low singing activity = song bouts with less than 4 phrases/Min and/or lasting less than 1 min. These two parameters were taken as an estimate of singing intensity.
It is well known that many bird species show peaks of vocal activity around dawn and sunset (Catchpole & Slater 1995) and this is true for Golden orioles too; therefore a song which is uttered between 10 am. and 4 pm. (the warmest hours in spring and summer for Tuscany) can be used as an indirect index of a very long lasting singing activity. For this reason all the observations of singing birds made during these hours were

grouped together and the seasonal pattern was studied.
The first arrivals in spring and the last departures at the end of summer for Southern Tuscany were carefully recorded in the last six years.

Results

First arrival of Golden orioles in Southern Tuscany was recorded on 12 April 2007; however from 2003 to 2008 the arrival time of first birds was fairly constant (14, 19, 22, 17, 12 and 13 April). Therefore during the second half of April the migrant birds increase their presence in the study area. The latest records of the presence in Southern Tuscany were in the first decade of September.
The earliest start of singing activity was recorded on 12 April, while the average starting date calculated over six years is 17 April. The latest songs were heard on 22 and 24 August.

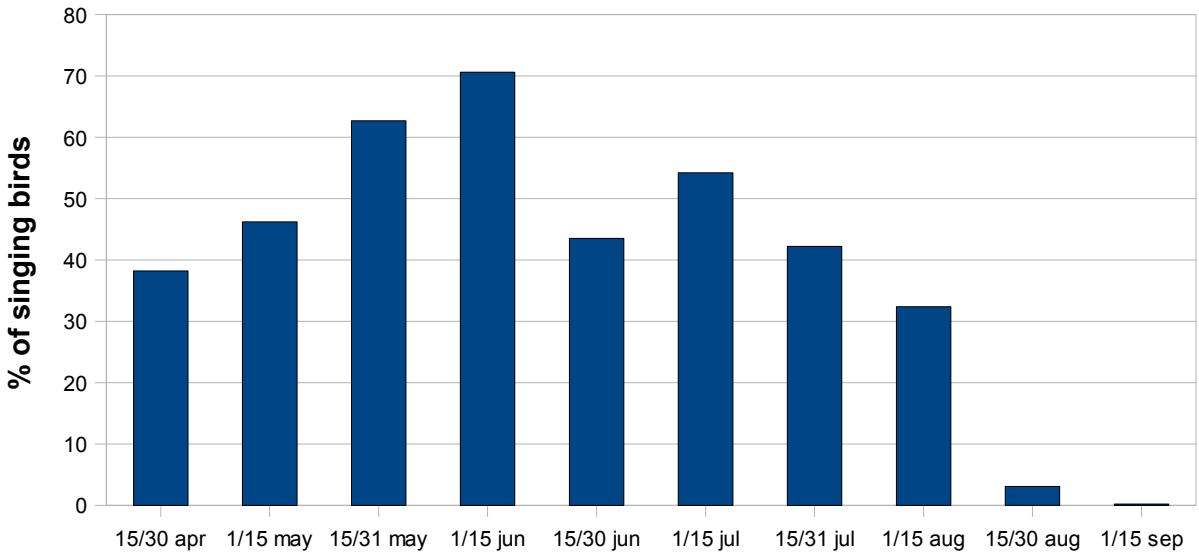

Figure 1: Singing birds from 6am to 9pm over total birds watched every fifteen days from 2003 to 2008.

Figure 1 shows how many birds are singing over the total bird watched every fifteen days. A peak singing activity is clearly found in the first half of June and a secondary increase in the first half of July, but with a lower maximum. The values found in April and August are relatively high, indicating that Golden orioles sing during almost all the time spent in Southern Tuscany. The decrease of singing activity is marked after 15 August, when migration is already started (Cramp & Perrins 1993).

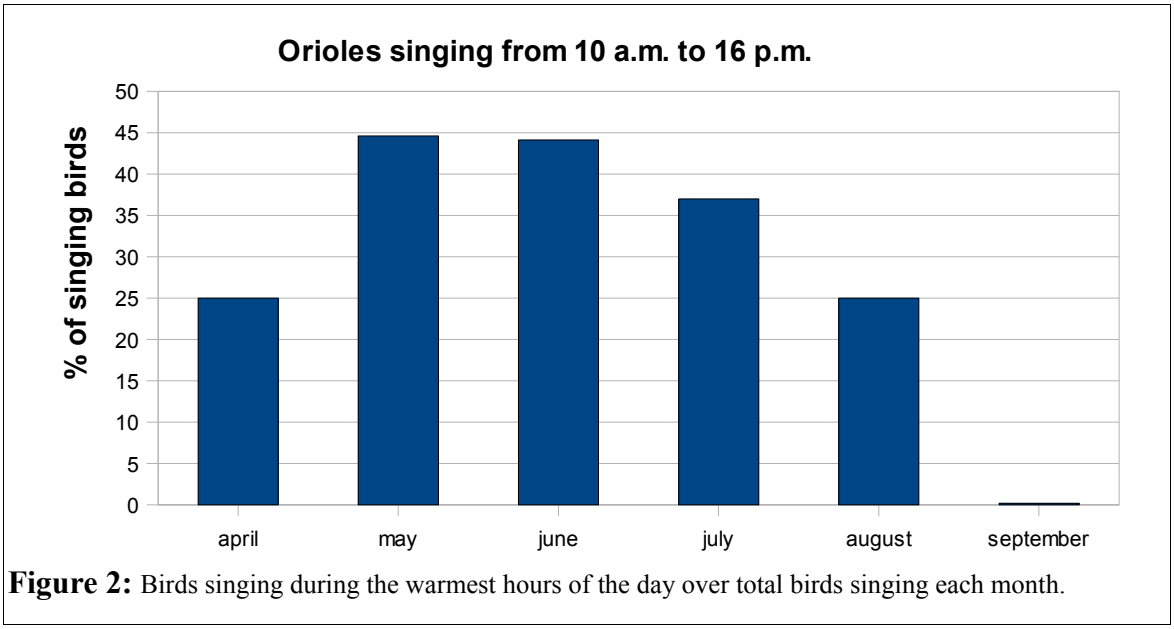

Figure 2: Birds singing during the warmest hours of the day over total birds singing each month.

Figure 2 shows how many orioles sing in the middle of day over the total singing birds. In May and June about half of the orioles sing during the warmest hours: this is an indirect proof that during these months singing activity is more prolonged, while a lower but not negligible activity is found in April and in August, confirming the pattern shown in Figure 1. The results shown on both these Figures are indirect quantitative indexes of song production.

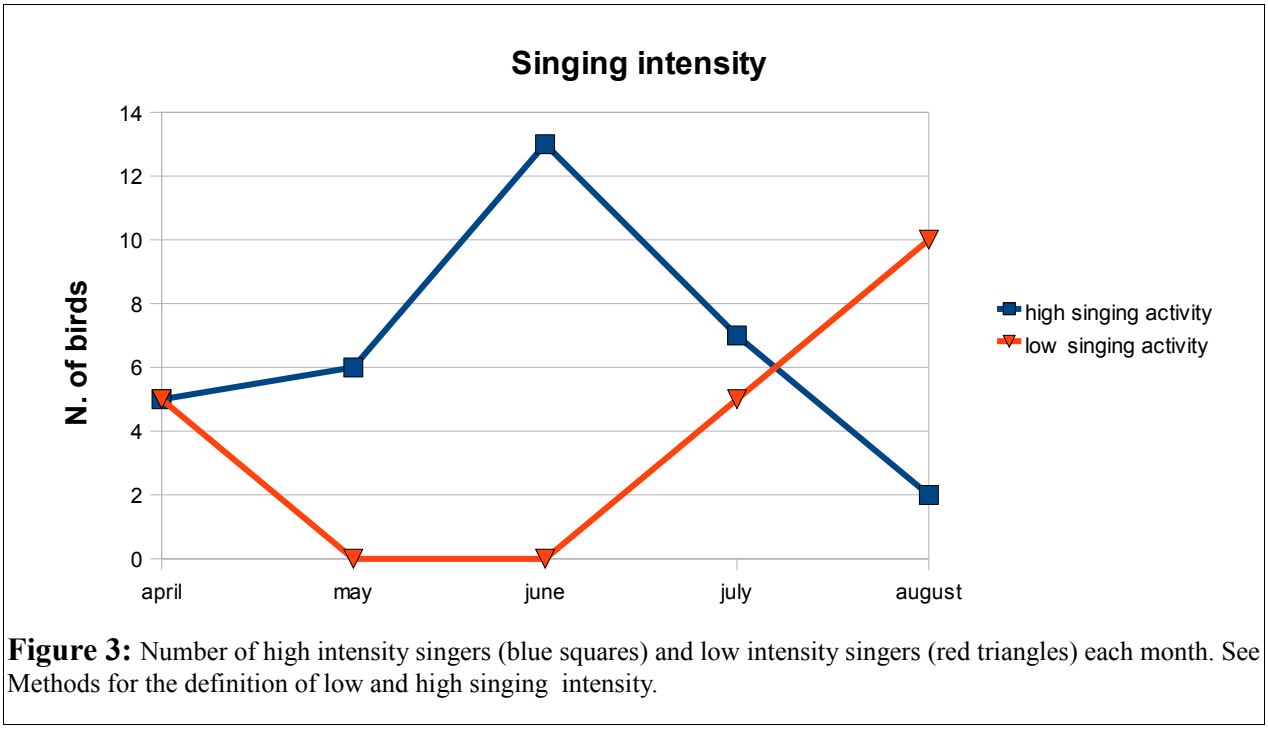

Figure 3: Number of high intensity singers (blue squares) and low intensity singers (red triangles) each month. See Methods for the definition of low and high singing intensity.

Singing intensity increases progressively from April to May, reaching a peak in June (see Figure 3 above). At the beginning of the season singing activity is sustained, but it is of lower intensity if compared to May and June. In July there is a decrease of high intensity singers and an increase of low intensity singers, while at the end of the breeding season low intensity singers are the majority.

Discussion

Golden orioles begin singing just at their first arrival in Tuscany, showing a marked peak of vocal activity in the first half of June, when many birds sing all day round. I have found a second peak in July, although less marked than the first one. Singing birds can be heard in late summer too, when migration is beginning. Singing intensity is quite sustained in April, reaches a high peak in June and then decreases progressively. In August most of the singing birds utters only short song bouts, generally during early morning.
These results suggest that Golden oriole sings during all its permanence on the breeding ground - although with different intensity - and his vocal behaviour is quite different from other migrant passerines breeding in Tuscany (e.g. the Nightingale, which stops singing at the beginning of July, far before the beginning of migration which starts in September. Cramp 1988; Tellini Florenzano et al. 1997).
The breeding season of Golden oriole is characterised normally by one brood and sometimes by a replacement clutch (Cramp & Perrins 1993; Pazzucconi 1997). Last replacement clutch in East Germany started at beginning of July (Cramp & Perrins 1993) and the same date was recorded for Italy (Pazzucconi 1997). In Italy the eggs are laid normally in May and June (Pazzucconi 1997; Brichetti 1976). Therefore the breeding season is shorter than the correspondent singing season. Again the comparison with Nightingale is very interesting: it has two broods and re-lays after clutch loss (Cramp 1988). Normally the eggs of the Nightingale are laid from the second half of April to the second half of June (Cramp 1988); in Italy last clutches are laid at the beginning of July (Pazzucconi 1997). Therefore the lenght of the breeding season of these two species is very close, but vocal behaviour is dissimilar, as stated above. The Golden oriole shows a prolonged singing activity if compared with the length of its breeding season, while the Nightingale does not.
An interesting point is that some authors have noted Golden orioles singing in winter quarters, although here it does not hold a territory (Bergmann et al 2008): in South Africa from late October to early March (Cramp

& Perrins 1993), also in Namibia, March - April (Immelmann & Sossinka 1973/74). Singing activity was recorded on spring passage (Kostin 1983; Moritz 1988). However also the Nightingale is known to sing in winter quarters and during migration too (Bergmann et al 2008).
Moreover the singing activity of Golden oriole at the end of the breeding season might be important for young birds, which have an opportunity to begin learning the song dialect of the local subpopulation.

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Summary. Singing activity of the Golden oriole was studied during six breeding seasons (2003 - 2008) in Southern Tuscany. Only full song was considered, while calls and subsong were not studied. The birds begin singing in April just at their first arrival on breeding ground and show a marked peak in June, characterised by high intensity and long lasting vocal activity. Singing birds can be heard in late summer too, when migration is beginning, although the intensity and duration of song is decreased. These results suggest that Golden oriole sings during all its permanence on the breeding ground (although with different intensity), showing a prolonged singing activity if compared with the length of its breeding season. The implications of this vocal behaviour and the differences with other passerine birds are discussed.

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