Repertoire and structure of duet and solo songs in cooperatively breeding white-browed sparrow weavers

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Summary
White-browed sparrow weavers (Plocepasser mahali) are cooperatively breeding songbirds of eastern and southern Africa that live in small groups year-round consisting of a dominant breeding pair, and subordinate, non-breeding males and females. This species possesses an elaborate vocal communication system: solo songs are exclusively produced by the dominant male, duet songs are mainly produced by the dominant pair, and chorus songs, similar in syllable structure and temporal pattern to duet songs, are produced by all group members. We analysed songs of males and females with known social status recorded from different colonies in Zimbabwe and complemented these data by studying songs of captive birds at our institute. Solo songs are produced in one performance at dawn during the breeding season. Recordings of captive males on consecutive days revealed that males sing in a single solo performance 88.4 ± 4.1% of their total solo song repertoire. This suggests that dominant males recorded in Zimbabwe have a solo song repertoire of 67.0 ± 4.0 syllables, which is similar in size to those of captive males (58.3 ± 3.7 syllables). Repertoire sizes of both free-living and captive males are not correlated with the length of the solo song performance. Duetting is both antiphonal and in unison. Dominant males and females appear to have similar sized duet repertoires (51.9 ± 2.1 syllables). Recordings from captive pairs suggest that 75-98% of the repertoire is shared with higher syllable sharing in more experienced pairs. Since all group members engage in duets and chorus singing, we estimate that each subordinate male and female shares the duet syllable repertoire with the breeding pair. For dominant males, the duet syllables are widely distinct from those of the solo songs; of their total syllable repertoire only 2.1% occur in both repertoires. Further, solo song and duet song differ in the temporal organisation.

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Introduction

In the northern temperate zone, singing of songbirds is mostly confined to males. It is known that male song functions in territory defence and mate attraction (Catchpole & Slater, 1995). In those species where females do sing, their song is often shorter and less complex than male song and usually only produced at restricted times of the year (Hoelzel, 1986; Baptista et al., 1993). However, there is evidence that female song in these species is not just a by-product of temporarily high levels of testosterone but serves functions as in males (for review, see Langmore, 1998).

Among tropical songbirds, female song is commonly found. Whereas little is known about female solo song, much attention has been paid to the phenomenon of duet singing, which refers to the acoustic interaction between both members of a pair, often occurring with precise temporal coordination (Farabaugh, 1982). Duets can consist of simple patterns, such as the exchange of call notes, e.g. in parrots (Wright & Dorin, 2001) or can be precisely synchronised, giving the impression that the vocalisation is produced by a single bird (Wickler & Seibt, 1980). When male and female contributions occur in a strictly alternated fashion, duets are sung ‘antiphonally’; when both birds produce exactly the same pattern of syllables at the same time, duets are sung in unison (Thorpe, 1975).

Songbirds acquire the stereotyped song pattern typical of adult birds by vocal learning, a process extensively studied in males of northern temperate zone species (Konishi 1985). In several duetting songbirds, pair formation requires another learning period, in which pair members may adjust their song type repertoires to build up pair-specific duet songs (Farabaugh, 1982).

Over the last decades, many different hypotheses have been proposed to understand why some bird species combine their songs into duets while the majority of species does not. In a recent review, Hall (2004) identified the most promising hypotheses to explain the functions of duets, which are mate guarding by both sexes, joint resource defence and signalling commitment.

The complexity of duet organisation can vary tremendously from one species to another (Helversen, 1980). At the lowest level, mates exchange simple call notes as in D’ Arnaud’s barbet (Trachyphonus d’arnaudii, Wickler & Uhrig, 1969) or the Aldabra white-throated rail (Dryolimnas cuvieri aldabranus, Huxley & Wilkinson, 1979). At an intermediate level, one bird has a repertoire of songs, which is combined with a single sound of the mate