

**Functions and mechanisms of intra-group communication and song  
coordination during the territorial defense in a group living bird species, the  
Yellow-breasted barbet (*Trachyphonus margaritatus*)**

**PhD thesis-abstract**

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Cooperative behaviour is a prominent feature among group living species and continues to pose challenges to our understanding about the evolution of social relationships and task coordination between members of a same social group. Individuals who are willing to cooperate to achieve a joined action need to communicate their intentions and somehow make a common agreement. In my PhD work, I investigated the role of intra-group communication in the initiation of duet and chorus songs which are a form of collaborative acoustic display in which several individuals sing together in a coordinated manner to deliver one meta-signal. I conducted several fieldwork sessions in Djibouti between 2019-2023 to collect data about the vocal and other social behaviour of the Yellow-breasted barbet (*Trachyphonus margaritatus*), a non-oscine bird species that lives in pairs or small social group and defend a territory year-round. Since the social behaviour and the vocal repertoire of the species as poorly studied, the first aim of my work consisted of gathering data regarding the social and vocal behaviour. To do so, I used passive acoustic monitoring to study the daily calling activity of the barbets as well as the vocal repertoire. I could identify four distinct vocalisations used during within-group interactions. I also found that the different group of barbets were vocally active mainly in the morning, the cohesion calls which might serve to maintain group cohesiveness were often used before the start of a duet or chorus display. In the second part of my research project, I investigated how barbets initiate their communal vocal displays. It is known that the Yellow-breasted barbet initiates its duet and chorus songs with "pre-duet notes" (also described as "*chewp*" notes) during a kind of "greeting ceremony". However, the nature of these vocalisations and the functions were unknown. I recorded with a video camera several group displays of barbets during playback experiments, in order to describe in detail the way they use such *chewp* notes. I also investigated the possible existence of a multimodal signal. The pre-duet

notes could be a specific signal that serves either as recruitment signal or as mutual agreement between individuals to start a duet or chorus song. I found two variations of such vocalisations: the *high chewp* and the *low chewp*. The leading individual who initiated a duet or chorus emitted a higher number of *high chewp* notes than the followers who joined the display initiated by the leader. I also found that the leading individual sometimes combined the emission of *chewp* notes with a specific tail posture. The combination of acoustic and visual signal constituted an intra-group multimodal signal that was displayed to initiate duet and chorus songs. The third part of the project focused more on the contexts of the emission of collective vocal displays and the mechanisms of song coordination between duetters. To do so, I used passive acoustic monitoring and playback experiments to monitor the daily vocal activity of different groups according to several social contexts. I found that most of the collective vocal displays given by the 11 groups monitored were emitted in the context of a between-group vocal interaction and that all the 10 groups tested with playback stimulations reacted which suggested a function in joint territorial defense. Finally, the investigation of the mechanisms of song coordination in duetting barbets revealed no clear evidence of interactive timing adjustments in a way that the duetters could accelerate or slow down their rhythm of singing according to their partner's rhythmic variations. The birds simply reacted when the partner started and stopped singing. Overall, these results highlighted that in this group living bird species, group members actively communicate using cohesion calls and *chewp* notes to initiate a collective vocal display.

**Keyword:** Cooperative behaviour · Duet · Chorus · Social interactions · Multimodal signal · Non-oscine · Vocal repertoire · Collective signal · Lybiidae · Song coordination · Group living bird