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Shifts in sound features of the duetting pallid swifts *Apus pallidus* L.

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INTRODUCTION

The ecological and social significance of duetting, a vocal behaviour mainly studied in tropical birds, is still not completely understood (Farrabaugh, 1982). However the phenomenon occurs also in the temperate zone, since about 40 non-passeriformes birds of the Western Palearctic area are listed as duetting species (Camanni *et al.*, 1989). The pallid swift (*Apus pallidus*), a circum-Mediterranean species, similar to the common swift *Apus apus* but with slightly different calls (Malacarne *et al.*, 1989), is a monogamous colonial bird included in such list. The basic element of its acoustic repertoire is the screaming call, emitted persistently during the screaming parties around the colony and by the breeding pair in the nest holes (Lack & Lack, 1952).

The aim of this study was to examine in detail the duetting characteristics of the pallid swift in relation to Farrabaugh's (1985) definition of the four variables used in classifying duet types: (1) pattern of elements; (2) relative participation of mates in vocalizations used in duets; (3) precision of timing; and (4) type of sound used by each mate.

MATERIALS AND METHODS

Recordings were made in a colony sited in an old garret in Carmagnola (Piemonte, NW Italy), described elsewhere (Boano & Cucco, in press). Individuals were not sexed, because there are no observable sexual dimorphic characters in this species, but each bird was individually marked and observed through an eyepiece applied to the internal wall of the nest cavity (Malacarne & Griffa, 1987). Eighty-four vocalizations from six pairs in 1987, & 70 from nine pairs in 1988, were obtained using a SONY TCD5 PRO recorder and ECM-23F microphone kept 10-15 cm from the calling swifts, in the nest. Spectrographic analysis was carried out with a KAY SONAGRAPH 7800 set on wide-band (0.8 KHz band frequency, 300 Hz band-width).

RESULTS AND DISCUSSION

Considering Farrabaugh's four definitions the following observations can be made. 1. The pattern of elements is antiphonal since there is no overlapping of voices emitted by the partners (see Fig. 1). 2. The visual inspection during duets confirmed that the participation of mates is the same since the ABABABABA alternation is constant. However, a swift alone in the nesting hole sometimes screams, generally when a flock passes in front of its nest. 3. Measuring the coefficients of variation (CV) of the interval from the onset of an element (A ind.) to the onset of the next (B ind.), we measured timing precision (test suggested by Farrabaugh, 1982). The values obtained from our six sampled pairs (Table I) did not differ statistically: antiphonal voices were precisely timed, as required by duetting species. The precise timing of voices in the

ABSTRACT

Bioacoustic characteristics of the screaming calls of the pallid swift (*Apus pallidus*) emitted by the breeding pairs in antiphonal sequence were studied. The calls alternate with precise time intervals. In 44% of our records each individual maintains constant spectrographic characteristics, while in 56% a mate shifts its sound features on to the partner ones. It is suggested that the last part of the call maintains the highest personal features allowing vocal individual recognition, and that the calls have a territorial function against conspecific intrusion in the nest-holes of the breeding pair.

KEY WORDS: Bird duetting; Pallid swift; Sound features.

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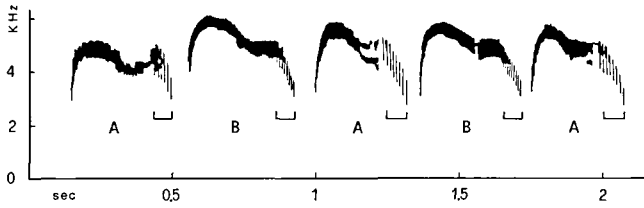


Fig. 1 - Calls of a pallid swift pair. The duet has a typical antiphonal structure. Brackets show the terminal part, which has a high individual constancy.

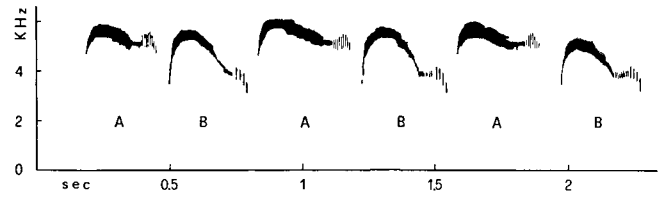


Fig. 2 - Duet of a pallid swift pair: each bird maintains temporal and frequency features.

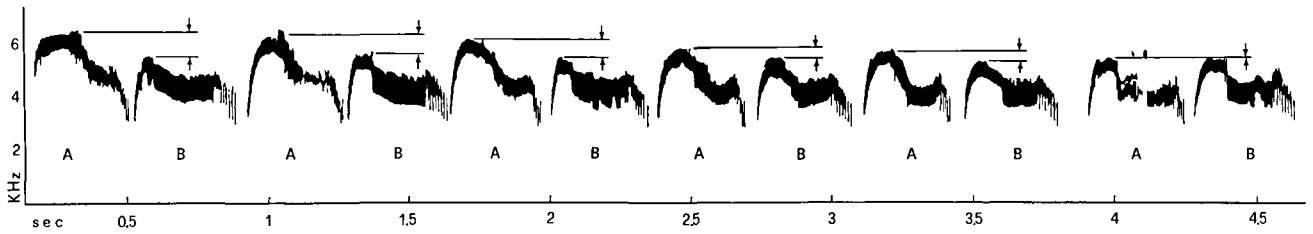


Fig. 3 - Duet of a pallid swift pair: «A» individual shifts its frequency features to that of «B».

TABLE I - Precision of timing. Interval from the onset of each «A» (or «B») element to the onset of the next «B» (or «A») element.

Pair and individual	Calls (number)	Means (msec)	Var. coeff.
1 A	4	362.5	17.84
1 B	8	362.4	16.11
2 A	5	360.0	20.66
2 B	5	320.0	11.70
3 A	13	370.0	20.30
3 B	7	320.0	9.49
4 A	10	352.0	13.03
4 B	8	357.6	16.91
5 A	8	349.6	6.67
5 B	5	320.8	11.33
6 A	9	316.0	10.12
6 B	9	312.8	5.11

F (9,63) = 0.73 (P > 0.50)

pallid swift indicates a true duetting species. 4. The most interesting data came from the analysis of the type of sound used by each mate. Mates use similar types of sounds. When duetting, each animal can maintain (Fig. 2) its temporal and frequency features (duration of the call, minimum and maximum frequency) unvaried. We calculated a 44% (N = 25) of unchanged call sequences; but in a major percentage (56%, N = 32) a mate shifts its sound features on to the partner ones.

Figure 3 shows a shift from higher frequencies to lower ones, but we also recorded low to high frequency shifts. Lack (1956) suggested that, even though screams sound extremely similar to human ears, the screaming calls of the paired swifts show individual differences that can be used in sexual and/or individual specificity. Our observations confirm these data (Malacarne, unpubl.): aside from features that remain individually constant (the last part of the call, Fig. 1) there is strong tendency of mates to uniform their calls.

In conclusion, the antiphonal song of the pallid swift does not show a relevant dimorphism and frequently a mate tunes to the partner voice features.

Farrabaugh (1982) investigated whether the structural characteristics of the duet correlate with the specific functions of duetting, such as pair-bonding and territoriality, but few generalizations could be drawn. Some of them support the hypothesis that the antiphonal song of the pallid swift has a function in defending the territory. Some generalizations are: (a) Birds with simpler vocalizations show this acoustic behaviour mainly during direct confrontations with neighbours and other possible intruders. (b) Territorial birds prefer antiphony as a way of avoiding interference. Transmission of individual identity without interference may be important for the recognition of a well arranged pair toward neighbouring pairs and floater birds. On the contrary, simultaneous songs could function only in pair bonding (Wickler & Seibt, 1980).

The pallid swift shows a simple vocalization and is a true antiphonal duetting species. The study of the contexts in which the duet is used is necessary to determine the function or functions of the duets of swifts.

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