

Notes on the social status of the Coal Tit *Parus ater* and the Crested Tit *Parus cristatus* in the Pyrenees

L. BROTONS

Social interactions between Coal and Crested Tits of known age and residence status were investigated at a feeder in the Pyrenees. In accordance with previous studies, the relation between these two species was not clear-cut, since at the feeder an adult male Coal Tit was able to dominate a yearling female Crested Tit. Site-related dominance was probably the main cause for the detected deviation from the generally recognised size-related hierarchy in these two species

Key words: Coal Tit, *Parus ater*, Crested Tit, *Parus cristatus*, hierarchy, dominance, Pyrenees.

Lluís Brotons. Dept. Biologia Animal (Vertebrats).
Facultat de Biologia. Univ. de Barcelona.
Av. Diagonal, 645. 08028 Barcelona.
E-mail: brotons@porthos.bio.ub.es
Rebut: 09.12.97; Acceptat: 31.03.98

Species of smaller size have typically been considered subordinate in social hierarchy to larger birds. It is commonly accepted that the Coal Tit *Parus ater* (mean: 9.3 g), due to its small size, is subordinate to both the Crested Tit *Parus cristatus* (mean: 11.2 g) and the Willow Tit *Parus montanus* (mean: 11.5 g), as well as to the other tit species (Dhondt 1989, Suhonen et al. 1992). However, as pointed out by Haftorn (1993), few data exist on the issue, and the results of his study suggest that the social status of the Coal Tit requires further consideration. In Haftorn's study, the Coal

Tit was found to be dominant over the larger Willow Tit in most cases. Due to the importance of dominance in interspecific competition for food and foraging sites among the tit guild (Dhondt 1989), data on this topic are of great interest. The observations of Källander (1997) on a Coal Tit that dominated both Blue *Parus caeruleus* and Great Tits *Parus major* also suggest that dominance relationships may not always be related to body size.

In this paper, I present data on interspecific interactions between Coal and Crested Tits at an artificial feeder. Birds were

of known sex, age and size, which, it was felt, might help to elucidate the nature of the interspecific interactions observed.

Data were collected at an artificial temporary feeder provided with fat, located in the "Parc Natural Cadí-Moixeró", Pyrenees (46° 83' N, 4° 08' E) in an area 1950 m above sea-level and surrounded by Mountain Pine *Pinus uncinata* forest mixed secondarily with Scots Pine *Pinus sylvestris*. Observations were collected during the winter 1995-96, from November to January. Only Crested and Coal Tits visited the feeder; these are the only tit species regularly present in the area during winter. All birds were colour-ringed, and the usual morphometrical measurements were taken each time they were captured. Birds were sexed according to their behaviour during the breeding season and on size differences, and aged according to Svensson (1992). Observations were collected during four sessions of 1 hour, with the observer situated 10 m from the feeder.

During the sessions, visits by birds were recorded, especially those which involved both species. In 70 visits were recorded (26 by Coal Tits and 44 by Crested Tits). When two birds visited the feeder simultaneously, a bird was considered to be dominant if: (1) it chased the other away; (2) it supplanted the other; (3) the other withdrew on its approach; or (4) the other waited nearby until the dominant bird left. Only interactions with a clear and unequivocal outcome were included in the analyses.

Four Crested Tits and two Coal Tits were observed during the sessions. A total of 15 intraspecific (which served to establish the hierarchy within species) and 16 interspecific interactions between Coal and Crested Tits were recorded. The Crested Tits were not clearly dominant over the Coal Tits, although most Crested Tits won the interactions with Coal Tits (11 vs. 5 times, sign-test=1.55, N.S.). However, of six inter-

actions between a young female Crested Tit (the smallest of the four, tarsus length 17.7 mm vs. \bar{x} =19.0 mm, mean for the other three) and an adult male Coal Tit (tarsus length 17.2 mm), the latter won four (sign test= 0.60, N.S.). It also made significantly more attacks on its opponent than did the Crested Tit (6 vs 0, sign test= 2.04, $p < 0.05$), although in some cases the Crested Tit continued feeding on the fat. The adult male Crested Tit which visited the feeder won seven out of eight interactions over the adult female Coal Tit (7 vs 1, sign-test= 1.76, $p = 0.07$). The other interactions between Coal and Crested Tits were, unfortunately, few and ambiguous.

These observations support the idea that the Crested Tit is generally dominant over the Coal Tit. Also recorded were mixed winter flocks, where Crested Tits won all of the eleven recorded conflicts (11 vs. 0). However, the data presented show that on some occasions Coal Tits can defeat Crested Tits at especially rich food sources. Haftorn (1993) raised the possibility that factors other than size were related to dominance in the hierarchy of tits he studied. Different experiments on tits have shown that when checking for factors such as size or age, prior residence determines dominance (Koivula et al. 1993, Sandell & Smith 1989). These experiments, carried out with both Willow and Great Tits *Parus major*, suggest that pay-off asymmetries dependent on previous experience rather than theoretical fighting potential (i.e. size or age) determine rank within these species, and that prior residence often overrides advantages of size and age (Koivula et al. 1993). The two Coal Tits in my study had been ringed four years earlier as juveniles a few metres from where the feeder was placed, whereas all but one of the Crested Tits were juveniles.

Therefore, it seems feasible that the adult male Coal Tit had a higher position in the hierarchy, as an effect of prior

residence, which compensated for the bird's smaller size and enabled it to win most of the interactions with one of the Crested Tits, a juvenile female. The fact that the Coal Tits used attacks (more costly to individuals, Lemel & Wallin 1993), causing juvenile Crested Tits to retreat from the feeding place, seems to reinforce the view of a higher position of the adult Coal Tits in the hierarchy. In this way, Coal Tits may occasionally gain access to important resources, which compensate for the energy invested in making the attacks. Differences in motivation due to differences in food deprivation may occasionally lead to switches in a linear hierarchy, potentially resulting in observations similar to mine (Lemel & Wallin 1993).

Bearing in mind that most Crested Tits were dominant over Coal Tits, the fact that adult Coal Tits may be able to defeat young Crested Tits in agonistic interactions at a concentrated food source is of great interest, because it raises the issue that site-related dominance or differences in motivation might switch positions in size-related hierarchies within, but also between, species.

During winter, Coal and Crested Tits use pine cones as an important food source, and cones rich in pine seeds could be a location where the kind of interactions referred to in this paper may become important. As stated by Haftorn, more experimental data on interspecific encounters between tits are needed to determine the interspecific rank order of tits, because this hierarchy is likely to depend on several factors and thus may not always be the same. *

ACKNOWLEDGEMENTS

I am grateful to the staff of the "Parc Natural del Cadí-Moixeró" for their help in the field. Raimon Mariné raised some points which improved earlier drafts of the

manuscript. The fieldwork received financial support from the Parc Natural del Cadí-Moixeró. During the study I was supported by a grant from the Comissionat per a Universitats i Recerca de la Generalitat de Catalunya.

RESUM

Notes sobre l'estatus social de la Mallerenga Petita Parus ater i la Mallerenga Emplomallada Parus cristatus als Pirineus

En una menjadora situada als Pirineus es varen investigar les interaccions socials entre mallerengues petites i emplomallades d'edat i estatus coneguts prèviament. De manera similar a estudis anteriors, la relació de dominància entre les dues espècies no va ser clara, i en determinades ocasions un mascle adult de Mallerenga Petita va desplaçar una femella jove de Mallerenga Emplomallada d'una menjadora. Es discuteixen els factors que poden estar al darrere de les desviacions detectades respecte d'una jerarquia basada en la mida de les dues espècies.

REFERENCES

- DHONDT, A. 1989. Ecological and evolutionary effects of interspecific competition in tits. *Wilson Bull.* 101 (2): 198-216.
- HAFTORN, S. 1993. Is the Coal Tit, *Parus ater*, the most subordinate of the Scandinavian tits? *Ornis Scand.* 24 (4): 335-338.
- KÄLLANDER, H. 1997. En dominant svartmes *Parus ater*. *Ornis Svecica* 7: 37.
- KOIVULA, K., LAHTI, K., ORELL, M. & RYTKÖNEN, S. 1993. Prior residency as a

key determinant of social dominance in the Willow Tit (*Parus montanus*). *Behav. Ecol. Sociobiol.* 33: 283-287.

LEMEL, J. & WALLIN, K. 1993. Status signalling, motivational condition and dominance: an experimental study in the Great Tit, *Parus major* L. *Anim. Behav.* 45: 549-558.

SANDELL, M. & SMITH, H.G. 1991. Dominance, prior occupancy, and winter

residency in the Great Tit (*Parus major*). *Behav. Ecol. Sociobiol.* 29: 147-152.

SVENSSON, L. 1992. *Identification Guide to European Passerines*. 4th edition. Stockholm: Svensson.

SUHONEN, J., ALATALO, R.V., CARLSSON, A. & HÖGLUND, J. 1992. Food resource distribution and the organization of the *Parus* guild in a spruce forest. *Ornis Scand.* 23: 467-474.