

A Case of Polyandry in Black-capped Chickadees

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The Black-capped Chickadee (*Parus atricapillus*) is a familiar bird throughout much of North America, and several studies (see references) have concluded that they are monogamous. Each bird has no more than one mate during a breeding season, and generally retains the same mate in succeeding breeding seasons, provided both survive. Polyandry can be defined as a situation where a female has more than one mate. I report here a case of polyandry in Black-capped Chickadees. A male chickadee, when his mate died, stopped defending a separate territory, and formed a polyandrous association with a female that already had a mate and nest.

I have studied a population of Black-capped Chickadees at the Cedar Creek Natural History Area in Anoka and Isanti Counties, Minnesota from 1976 to 1991. Resident chickadees are trapped and color banded during fall, winter, and spring. Birds less than one year old can generally be recognized by rectrix shape and wear, and during the breeding season, male and females can readily be distinguished by behavior.

On 29 March, 1991, a male chickadee, M1, in his third breeding season, was with a female, F1, in her second breeding season. Each had fledged young on adjacent territories in 1990 with a mate that evidently had since died. An unbanded male in his first breeding season, M2, was with them, and I trapped and color banded him that day.

On 28 April, F1 was with M1, and continuously gave the "Broken Dee" vocalization (Flicker, et al. 1978), used by females to solicit food from males. Female chickadees at Cedar Creek invariably give this call repeatedly only when nesting. Thus, M1 and F1 probably had a nest at the prelaying or laying stage. M2 was with an unbanded female, F2, in her first breeding season, that I then trapped and color banded. M2 appeared to hold as territory the western portion of an oak woods around a marsh, and M1 the territory east of that.

On 17 May, I found the nest of M2 and

F2 in a 1m aspen stump in the marsh. They foraged together and he fed her several times on and off the nest. I then looked for M1's nest. I found M1 with M2, but there was no territorial dispute, as expected among neighboring male chickadees. Both birds disappeared in the general direction of M2's nest.

On 25 May, F2 was incubating, and I again looked for M1's nest. M1 was in a territorial dispute with a third male only about 200m from the nest of M2 and F2. M1 appeared to be defending M2's territory. M1 found a large caterpillar, which he ate. Male chickadees that find a large food item during the breeding season generally deliver it to their mate or babies. Because of his apparent lack of an adequate territory and failure to visit a nest, I thought he probably did not have an active nest on 25 May and that F1 had died.

On 6 June, I saw two young in F2's nest, and set out one last time to see if M1 had a nest. M1 and F2 were together north of the marsh. Much to my surprise, they copulated and I saw M1 find a caterpillar and fly across the marsh to F2's nest. At this point, I concluded that both F1 and M2 had died, and M1 had replaced M2 as F2's mate. I had found this situation once before (Howitz, 1986), and had a similar case in 1991. I waited by the nest and clearly saw both M1 and F2 feed the nestlings. Later that day I heard a chickadee south of the nest. It was M2. I was surprised to see that he was still alive, but I have had several instances where an older and more dominant male that lost his mate expropriated the mate of a younger and less dominant male. But this had always occurred early in the breeding season, and the newly formed pair made a new nest. M2 found a large caterpillar and flew to the nest. Thus, one female and two males were feeding the nestlings.

On 11 June, I color banded the two nestlings on the thirteenth day after they hatched. M1, M2, and F2 all fed the babies. M1 and F2 generally were together, and M2 foraged separately.

On 15 June, the nest held only one dead

nestling. The three adults were north of the nest, and no young were with them. The other nestling presumably died in the nest and may have been removed by an adult. I could not determine the cause of death of the last nestling, but it was not predation or starvation. The three adults foraged peaceably together and it was not obvious whether F2 "preferred" M1 or M2 as a mate, though M2 fed F2 on one occasion, suggesting that she might attempt a renesting.

On 24 June and 5 July the three adults again were north of the marsh. None of the three renested. At Cedar Creek, only 13 of 547 chickadee nests studied were replacement nests. Only first year females have never replaced a nest that failed so late in the breeding cycle. So, it is not surprising that F2 did not attempt a second nest in 1991.

In early May, F2 very probably had only one mate, M2. In the first half of May, M1 evidently lost his mate. Since I have never found a mated female Black-capped Chickadee that left her mate and moved far away, she very probably died, especially considering that she nested successfully there the previous breeding season. After losing his mate, M1 evidently was unable to obtain a new unmated female. M1 had mated pairs to the west, north, and east. To the south, were four unmated males on territory. Three of these males had lost their mates by mid-May, and the fourth probably never had a mate. Thus, in this area, separated from other chickadee habitat by fields, marshes, and a lake, there was a local shortage of females. In each of the fifteen years of the study, there have been more males than females, and so some first year males do not obtain mates. This acute local shortage of females was unprecedented. With no unmated female available, M1 associated with a previously mated female. It is clear that F2 had two mates. She certainly copulated with M2 prior to egg laying, and I saw her copulate with M1 on 6 June, and so by definition this is an example of polyandry.

What could M1 gain by this polyandrous association?

Could M1 be genetically related to M2 or F2? A kinship selection explanation is most improbable. M1, M2, and F2 are very unlikely to be related, because juvenile Black-capped Chickadees disperse considerable distances (Weise and Meyer, 1979), and females

disperse farther than males (this study).

Could M1 be genetically related to the nestlings? Smith (1989) reports that female Black-capped Chickadees solicit extra-pair copulations from neighboring males that outrank their mates. Thus, M1, who outranked M2, could theoretically have fathered one or both nestlings.

Even if M1 made no genetic contribution to the nestlings, he could still have increased his expected lifetime reproduction by feeding the nestlings through increasing the likelihood of mating with F2 in future breeding seasons (Howitz, 1986). At Cedar Creek 85% of chickadee pairs in one year breed together the next year, provided both birds survive. Older female chickadees at Cedar Creek on average lay larger clutches and fledge more young than females breeding for the first time.

A third adult was not needed to feed the two nestlings. Cedar Creek chickadee pairs commonly fledge broods of six, seven, and eight, and occasionally nine. Broods of five and six have successfully fledged where only one parent survived to the end of the nestling stage.

Waterman, et al. (1989) reported a case of polyandry in Black-capped Chickadees in Alberta. In that instance, a male lost his mate and formed a polyandrous association with a female that already had a mate. They were unable to find another example of polyandry anywhere in the literature for the genus *Parus*. Black-capped Chickadees are nearly always monogamous. In fifteen breeding seasons, I have found only this one case of polyandry in the Black-capped Chickadee and one case of polygyny, in which a male had two mates.

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