

**Brood adoption by a male Black-capped Chickadee.**—In species such as the Black-capped Chickadee (*Parus atricapillus*), where males provide extensive parental care, mechanisms that decrease the likelihood of a male raising unrelated young should be selected for. A male that helps raise unrelated young may, however, actually be increasing his expected lifetime reproduction. Odum (*Auk* 58:314-333, 1941) reported a case where a male Black-capped Chickadee that lost his mate helped raise the nestlings and fledglings of a female that had lost her mate. These two birds then raised a second brood, which he fathered. In this instance, caring for a brood fathered by another male enabled the male to obtain a mate and to father a brood that season. I report here another case in which a male Black-capped Chickadee "adopted" nestlings that he did not father, and increased his own expected reproductive output.

Observations were made during the ninth year of a population study of color-banded Black-capped Chickadees at the Cedar Creek Natural History Area in northern Anoka County, Minnesota. In early April 1985 one chickadee flock consisted of four males and two females. On 21 April, 1985 a third year male, M1, was paired with a first year female, F1, and a second year male, M2, was unmated. On 25 and 28 April M2 was paired with an unbanded female, F2, that almost certainly had arrived on the study area that week. On 5 May M1 and F1 were together and F1 was soliciting food from him, indicating that she had probably begun laying a clutch. M2 and F2 were also together, and F2 was trapped and color banded. On 25 May I found a nest with six 4-day-old nestlings tended by M2 and F1. M1 was not seen again and almost certainly had died. F2 also was not seen again and probably also had died.

At Cedar Creek, Black-capped Chickadees have an incubation period of 12-13 days, and F1's eggs should have been laid on 2-7 or 3-8 May. Because M2 was not with F1 on 5 May, he could not have fathered at least the first 4 eggs, and probably fathered none of them. M2 fed the nestlings and fledglings and behaved in a manner typical of a male parent. No second brood was attempted. This is the only case of brood adoption in Black-capped Chickadees I have seen in 325 nestings.

**Discussion.**—M2 clearly helped raise M1's offspring. From the available evidence, M2 could conceivably have fathered one or two of the brood. If so, he would be expected to increase his reproductive output by caring for the brood, because survival in chickadee broods at Cedar Creek is apparently lower for broods cared for by only one parent. It is highly unlikely, however, that M2 fathered any of F1's offspring before M1 disappeared. Broods of mixed paternity recently have been reported in some avian species (e.g., Mumme et al., *Auk* 102:305-312, 1985; Gavin and Bollinger, *Auk* 102:550-555, 1985). Mixed paternity in Black-capped Chickadee broods at Cedar Creek is probably rare or nonexistent as (1) males accompany their mates during the laying period, (2) many pairs are so isolated that the females would have almost no access to males other than their mates, and (3) I have never witnessed attempted extrapair courtship or copulation.

The most probable situation, based on the available evidence, is that M2 fathered none of the nestlings. M2 could have been "primed" to care for nestlings because he and F2 could conceivably have had a nest with eggs that would have hatched about 24 May. Even if M2 fathered none of F1's nestlings, he still could have increased his expected lifetime reproduction by caring for F1's offspring. Male chickadees at Cedar Creek that fledge broods survive from one breeding season to the next at least as well as males that do not fledge broods (64% of 217 vs 51% of 152). Parental care by males apparently does not entail a survival penalty. By pairing with F1 and caring for her offspring, M2 probably increased his chance of mating with her in future years. Eighty-five percent of the chickadee pairs at Cedar Creek in one year breed together the following year, provided both birds survive. Males that retain the same mate from one breeding season to the next fledge, on average, 1.06 more young than do males that acquire a new first year mate. This is due to the greater clutch size of older females compared to first year females ( $\bar{x} = 6.66$ ,  $N = 88$  clutches, vs  $\bar{x} = 6.01$ ,  $N = 134$  clutches), and to decreased predation on broods of older females (24% vs 33%). As in the case reported by Odum, brood adoption by the male I observed may actually have increased his expected lifetime reproduction.—JAMES L. HOWITZ, *Dept. Biology, Univ. Wisconsin-La Crosse, La Crosse, Wisconsin 54601. Received 17 Aug. 1985, accepted 2 Nov. 1985*