GOWATY, P. A. AND A. A. KARLIN. 1984. Multiple maternity and paternity in single broods of apparently monogamous eastern bluebirds (*Sialia sialis*). Behav. Ecol. Sociobiol. 15: 91–95.

HENSLEY, M. M. AND J. B. COPE. 1951. Further data on removal and repopulation of the breeding birds in a spruce-fir community. Auk 68:483–493.

HOWITZ, J. L. 1986. Brood adoption by a male Black-capped Chickadee. Wilson Bull. 98: 312–313.

KENDRA, P. E., R. R. ROTH, AND D. W. TALLAMY. 1988. Conspecific brood parasitism in the House Sparrow. Wilson Bull. 100:80–90.

KREBS, J. R. 1971. Territory and breeding density in the great tit *Parus major* L. Ecology 52:2–22.

ODUM, E. P. 1941. Annual cycle of the Black-capped Chickadee.—2. Auk 58:518–534.

———. 1942. A comparison of two chickadee seasons. Bird-Banding 13:155–159.

PEDERSEN, H. C. 1988. Territorial behaviour and breeding numbers in Norwegian Willow Ptarmigan: a removal experiment. Ornis Scand. 19:81–87.

SAETHER, B.-E. AND T. FONSTAD. 1981. A removal experiment showing unmated females in a population of chaffinches. Anim. Behav. 29:637–639.

SMITH, S. M. 1967. Seasonal changes in the survival of the Black-capped Chickadee. Condor 69:344–359.

———. 1976. Ecological aspects of dominance hierarchies in Black-capped Chickadees. Auk 93:95–107.

———. 1978. The "underworld" in a territorial sparrow: adaptive strategy for floaters. Am. Nat. 112:571–582.

———. 1984. Flock switching in chickadees: why be a winter floater? Am. Nat. 123:81–98.

———. 1987. Responses of floaters to removal experiments on wintering chickadees. Behav. Ecol. Sociobiol. 20:363–367.

———. 1989. Social dynamics in wintering black-capped chickadees. Proc. 19th Int. Ornith Congr. In press.

STEWART, R. E. AND J. W. ALDRICH. 1951. Removal and repopulation of breeding birds in a spruce-fir community. Auk 68:471–482.

WEISE, C. M. AND J. R. MEYER. 1979. Juvenile dispersal and development of site-fidelity in the Black-capped Chickadee. Auk 96:40–55.

WREGE, P. H. AND S. T. EMLEN. 1987. Biochemical determination of parental uncertainty in white-fronted bee-eaters. Behav. Ecol. Sociobiol. 20:153–160.

SUSAN M. SMITH, *Dept. Biological Science, Mount Holyoke College, South Hadley, Massachusetts 01075.* *Received 10 Aug. 1988, accepted 20 Oct. 1988.*

Wilson Bull., 101(2), 1989, pp. 349–351

Boreal Chickadees eat ash high in calcium.—Birds sometimes eat materials that are not normal food items, compensating for a nutrient deficiency (Kare 1965). In the present instance, Boreal Chickadees (*Parus hudsonicus*) were observed spending long periods of time eating ash. Observations were made at Newman Sound Campground in Terra Nova National Park, Newfoundland (80 km S. of Gander), from 11 to 16 October 1988. Boreal Chickadees, abundant in the area, foraged in small flocks, often low in black spruce (*Picea mariana*) and balsam fir (*Abies balsamea*). Numerous small patches of ash occurred in the campground,

presumably from burned charcoal briquettes. Chickadees ate the ash at only one very small site (about 0.3 m by 0.3 m and several cm deep). This ash was different from nearby ash where chickadees did not feed as it had a consistency appearing as if liquid had been poured on it.

The chickadees spent up to about 1 h at a time, mainly in the morning and late afternoon, feeding solely in the small patch of ash during the six days of observation. They probed their bills into the substance, and tongue movements could be seen. During one 40 min observation period, 64 visits were made, indicating the high intensity of use. The average number of pecks per visit was about 10 per bird (range 4 to 32). As the birds were unbanded, it was impossible to determine if several flocks were feeding there, but at any one time at least five different individuals were present.

When feeding in the ash, the birds showed greatly reduced fear and allowed approach to within about 15 cm. This incredible tameness is indicative of the strong motivation to feed on the ash, as otherwise they had a flight distance of about 2 to 5 m. Usually only one fed at a time, others often waiting nearby. When a chickadee approached a feeding individual, aggression, particularly Gargles (Ficken et al. 1978) and supplanting were common. When the same birds fed away from the ash site, aggression was very rare.

The only other species seen near the ash was a pair of Gray Jays (*Perisoreus canadensis*) which pecked the ash once or twice on the first day of observation and were never observed there again. Possibly they were attracted to the site by observing the chickadees.

Small samples of ash were removed from the site where the chickadees were pecking and from an adjacent patch of ash where they never fed. Levels of P, K, and Mg were very similar in the two samples, but there was 2580 ppm Ca in the ash where the chickadees fed vs 600 ppm from the nearby ash. The sample was not analyzed for elements other than those noted, so possibly some other minerals may also have had higher levels in the area where the chickadees fed.

Some birds in far northern areas seem to require supplementary calcium during the breeding season, and many reports document consumption of specific items that are rich in calcium (and possibly some other minerals). For example, the insect food given nestling Lapland Longspurs (*Calcarius lapponicus*) near Barrow, Alaska, was low in calcium, and the birds ate bones and egg shell fragments (Seastedt and MacLean 1971). Parrot Crossbills (*Loxia pytyopsittacus*) and Common Redpolls (*Carduelis flammea*) ate decaying wood in subarctic Finland in summer, and nutrient analyses indicated that the ash was primarily a source of calcium (Pulliainen et al. 1978). A Red Crossbill (*L. curvirostra*) ate mortar from a wall, presumably for its calcium content (Susic 1981). Pulliainen et al. (1978) suggested that such nutrient needs are prevalent in granivorous birds, as well as in reindeer (*Rangifer tarandus*) in the subarctic. My observations indicate that calcium may be sought during the nonbreeding season, although the other observations indicate that during the breeding season calcium needs for egg laying may be particularly high.

Soils in the Newfoundland study site are mineral deficient (Damman 1964), particularly in calcium (Brinkmann pers. comm.), and chickadees were probably eating the ash because of its high calcium content. Evidently the liquid used to extinguish the charcoal fire in the one small area was high in calcium (and possibly other minerals), because nearby ash was not consumed.

One of the advantages of sociality may be that if one individual finds a scarce but important resource, other group members can benefit in locating the resource. For example, Great Tits (*P. major*) in a laboratory experiment found clumped food faster through social foraging (Krebs et al. 1972). An interesting question is whether scarcity of certain minerals such as calcium affects the distribution and/or fitness of subarctic birds. McNaughton (1988) sug-

gested that the spatial distribution of African ungulates is influenced by the mineral content of vegetation.

Acknowledgments.—I thank Robert W. Ficken for assistance with the observations. Robert Brinkmann of the Univ. of Wisconsin–Milwaukee Soils Analysis Laboratory analyzed the ash samples.

LITERATURE CITED

DAMMAN, A. W. H. 1964. Some forest types of central Newfoundland and their relation to environmental factors. Forest Science Monograph 8. Society of American Foresters.

FICKEN, M. S., R. W. FICKEN, AND S. R. WITKIN. 1978. Vocal repertoire of the Black-capped Chickadee. Auk 95: 34–48.

KARE, M. R. 1965. The special senses. Pp. 406–446 *in* Avian physiology (P. D. Sturkie, ed.). Cornell Univ. Press, Ithaca, New York.

KREBS, J. R., M. H. MACROBERTS, AND J. M. CULLEN. 1972. Flocking and feeding in the Great Tit (*Parus major*): an experimental study. Ibis 114:507–530.

MCNAUGHTON, S. J. 1988. Mineral nutrition and spatial concentrations of African ungulates. Nature 334:343–345.

PULLIAINEN, E., T. KALLIO, AND A.-M. HALLAKSELA. 1978. Eating of wood by Parrot Crossbills, *Loxia pytyopsittacus* and redpolls, *Carduelis flammea*. Aquil. Ser. Zool. 18: 23–27.

SEASTEDT, T. R. AND S. F. MACLEAN, JR. 1971. Calcium supplements in the diet of nestling Lapland Longspurs *Calcarius lapponicus* near Barrow, Alaska. Ibis 119:531–533.

SUSIC, G. 1981. Red Crossbill (*Loxia curvirostra* L. 1758) feeding on mortar in a wall. Larus 33–35:197–200.

MILLICENT SIGLER FICKEN, *Dept. of Biological Sciences and Field Station, Univ. Wisconsin–Milwaukee, Milwaukee, Wisconsin 53201.* *Received 1 Sept. 1988, accepted 17 Oct. 1988.*

Wilson Bull., 101(2), 1989, pp. 351–353

A case of polyandry in the Black-capped Chickadee.—Black-capped Chickadees (*Parus atricapillus*) have been studied extensively in the breeding season (e.g., Odum 1941, Smith 1967, Ficken et al. 1981) and all studies have reported the species to be monogamous, forming permanent pairbonds in winter. Here, we document the first reported case of polyandry in the Black-capped Chickadee.

We studied chickadees on a 500-ha area at the Meanook Biological Research Station of the University of Alberta, near Edmonton, Alberta, Canada, from March 1985 to September 1987. The area was a mosaic of poplar (*Populus tremuloides* and *P. balsamifera*) woodland interspersed with fields (20% of the area). One hundred fifty pairs were studied and the majority of nests were located; most individuals were captured with mist nets and nest box traps and were color banded.

In late winter 1987, male A was apparently paired with a banded female (they were frequently seen foraging together), and his neighbor, male B, was paired with an unbanded female. We saw the banded female on 7 April, but she was not seen thereafter. On 30 April and 2 May, male B was chased by male A off the latter's territory. Six days later, the unbanded female (presumably the mate of male B) was in male A's territory, and he was