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SHORT COMMUNICATIONS

Black-capped Chickadee summer floaters.—Summer floaters are sexually mature birds which, although physiologically capable of breeding, are prevented from doing so by some factor such as the territorial behavior of others. Floaters are sometimes referred to as surplus birds or population reserve (Brown 1969).

At one time, it was considered sufficient proof of the existence of floaters if removed birds were replaced during the breeding season, even if the replacements were all unbanded (e.g., Hensley and Cope 1951, Stewart and Aldrich 1951). However, replacement birds can come from a variety of sources. Krebs (1971), who removed 13 breeding pairs of Great Tits (*Parus major*) and got rapid replacement of both sexes, found that his replacements were not true floaters but were instead birds that had occupied inferior territories nearby. More recently Dhondt and Schillemans (1983) have shown that some populations of Great Tits can have highly complex social systems permitting a number of classes of sexually mature, breeding individuals to live within areas defended by others; most of these classes are not floaters at all. Even in recent removal experiments, reports of unbanded replacements that are almost certainly floaters are common (e.g., Gauthier and Smith 1987, Pedersen 1988). However, only when replacement birds are individually marked and their previous behavior known (Smith 1978, Saether and Fonstad 1981, Beletsky and Orians 1987), can one be sure that they are, in fact, true floaters.

In most cases, very little has been reported of the past history of floaters. Clearly, this is most easily studied in resident species where individuals can be marked early in their lives and followed year-round. The Black-capped Chickadee (*Parus atricapillus*), being resident over most of its range, is thus an excellent subject for this sort of study. I report here on the summer floaters in my Massachusetts study area over a period of nine summers (1980–1988).

Study area and methods.—The study area, approximately 35 ha composed of about one third mixed woods, one third old field, and one third residential area, located adjacent to Mount Holyoke College in western Massachusetts, has been described in some detail elsewhere (Smith 1984). The winter population has varied from 37 to 72 chickadees with an average of 55; the breeding population has varied from 12 to 16 pairs with an average of 13.4 breeding pairs. I have color banded the chickadees in this area each year since the fall of 1979. Throughout each fall, winter, and spring, observations were made at least once weekly; through June and July, data were collected approximately every two weeks. Because I am also studying long-term survivorship, I have made no removal experiments during the breeding season.

Results.—Table 1 shows the numbers and identity of the summer floaters found within the study area from 1980 through 1988. This includes seven males and four females, a total of 11 floaters in nine summers.

No unbanded summer floaters were seen in the study area in any year. Hence all summer floaters, at least in this period and location, came from the birds that were present locally the previous winter.

Neither sex had floaters every year: male floaters were found in five of the nine summers and female floaters in only three of the nine. Male floaters were fairly easy to find and to follow. Indeed, three males actually sang in certain areas, typically the least used corners of breeding territories, and especially once incubation had begun. The other four males were not heard singing during the summer. Nevertheless, even these males were easily found after sufficient time. By contrast, female floaters were very much harder to locate and

TABLE 1
OBSERVED SUMMER FLOATERS

Year	Male	Female
1980	—	—
1981	—	—
1982	—	AG RK
1983	AY RO	—
1984	AY RO	
	AR BG	
	AK RO	—
	AY RR	
	AY RG	
1985	AY RG	AR BO[a]
1986	AO KK[a]	AO OO (f.s.)
		AO BB[a]
1987	—	—
1988	AK OY (f.s.)	—
Totals	7 (2)[b]	4 (0)

[a] Indicates a summer floater that replaced a breeder during the summer. (f.s.) indicates a former flock switcher.
[b] Number of repeats are in parentheses.

extremely difficult to follow, as they were almost entirely silent for much of the breeding season. I am thus fairly certain of having an accurate census of males, but I feel the female data may represent just minimal numbers. Nevertheless, in two years, 1981 and 1984, a female breeder disappeared before the end of egg laying but was not replaced; similarly in 1987, a male territory owner vanished, and the widowed female remained unpaired all summer. This strongly suggests that no floaters of that sex were available in those areas during those summers.

All but two of the 11 birds were floaters for just one summer (their first). The two exceptions, both males, were repeats, spending both their first and second summers as floaters before, as three-year-olds, finally obtaining a territory and breeding. One of these bred for two years before his death; the other is still alive, having bred in the study area for the last three years.

Three of the floaters (two females and one male) succeeded in becoming members of territorial pairs following the summer deaths of breeding birds. Both successful females replaced birds that died before their eggs had hatched. Each started a new nest less than a week after replacement, one approximately 80 m and the other over 100 m from the old nests. In 1986, a breeding male disappeared less than a week after his young had fledged and was replaced by the floater AO KK (Table 1). On at least 12 occasions after this replacement, I saw AO KK bring food to the offspring of his new mate, i.e., young presumably fathered by another bird. The newly formed pair did not breed together until the following year.

One of the most unexpected findings of this study concerns the source of the summer floaters. In the nonbreeding season, my study population contains what is probably an unusually high proportion of flock switchers or winter floaters (Smith 1984, 1987); these may be similar to those found in various European parids (Ekman 1979). I expected that

TABLE 2
WINTER RANKS HELD BY SUMMER FLOATERS

Individual	Rank of initial pair	Next rank	Highest achieved (if different)
A. Female floaters			
AG RK	5 (5)[a]	1 (4)	
AR BO	2 (2)	1 (2)	
AO OO	f.s.	2 (5)	1 (5)
AO BB	4 (4)	1 (5)	
B. Male floaters			
AY RO	4 (6)	3 (6)	2 (3)
AR BG	5 (6)	3 (4)	1 (3)
AK RO	3 (4)	2 (5)	
AY RR	5 (6)	Died over the summer	
AY RG	6 (6)	2 (2)	2 (3)
AO KK	3 (4)	2 (6)	
AK OY	f.s.	No data	

[a] Numbers in parentheses indicate total pairs in the flock; thus 3 (5) means a member of the third ranked pair in a 10-bird flock.

any summer floaters found in my study population would likely be drawn from those switchers that had survived the previous winter, especially as more than 30 such birds were alive over a total of 9 springs. In fact, however, only two of the 11 summer floaters (one male and one female) were former flock switchers; the other nine had all been regular members of particular winter flocks, too low-ranked to obtain breeding territories in the spring (Tables 1 and 2).

Only one floater, a male, died during the summer. The others all survived and joined the winter flocks more highly ranked than in the previous winter (Table 2). All eventually joined the breeding population. Interestingly, the eventual rank achieved varied markedly with sex (Table 2). Thus all four female floaters rapidly became the top-ranked females in their flocks. By contrast, only one of the five males for which I have data became the dominant male in his flock. Indeed, three others, including the two males who were floaters for two consecutive years, were in later winters subordinate to younger birds, something rarely seen in parids (Dhondt and Hublé 1968, Glase 1973, Smith 1976).

Home ranges of summer floaters were anywhere from three to five breeding territories. These were always contiguous; I found no evidence of disjunct home ranges such as I found in certain Rufous-collared Sparrow (*Zonotrichia capensis*) floaters (Smith 1978). Within these ranges, ten of the 11 birds appeared always to avoid any contact with the resident pairs. The exception was a young male former switcher that spent much of his time following one particular breeding pair; he regularly pursued this pair until they would drive him away. Similar following behavior has been reported for a Black-capped Chickadee summer floater by Ficken et al. (1981).

Discussion.—Dhondt and Schillemans (1983) found a highly complex social system in some Great Tits, where a given area might be used regularly by several breeding adults (i.e., not floaters) other than the pair that "owned" the territory. No evidence of any such system

seems to have been found in any Black-capped Chickadee population. Nor is there any account of helpers in this species, although a report exists of possible helpers in the congeneric Tufted Titmouse (*Parus bicolor*) (Brackbill 1970). Therefore, in the breeding season, any chickadees other than the resident pair but living regularly in an area are apparently always floaters.

Several reports of such birds have been published. In general, they have found, like the present study, that summer floaters typically occur in low numbers, are not necessarily found every summer, and are birds that had been present locally during the previous winter. Thus Odum (1942) found unmated, nonterritorial chickadees in both summers of his study as did Smith (1967). In the latter study I found two females, banded in the area the previous fall that ranged over several breeding territories, that for the most part avoided contact with territory owners. Weise and Meyer (1979) reported six yearling chickadees, nonterritorial during their first breeding season, that all later obtained breeding territories within their previous (last summer's) home range. Finally, Ficken et al. (1981) describe a banded female summer floater that had been a regular member of a local winter flock prior to that breeding season.

In the current study, the number of summer floaters has varied markedly from year to year, and in several years there were apparently none of one or both sexes. Odum (1942) also found strong changes in floater numbers from year to year. It is interesting that the year when I had the most male floaters there were evidently no local female floaters at all—apparently factors affecting the presence and abundance of floaters may vary with sex. I could find no obvious correlation between floater numbers and any fluctuations in local breeding population. How various social, weather-related, or other ecological factors affect floater abundance in this species remains an interesting area for future research.

Three of my 11 floaters were able to replace territory owners that had disappeared during the breeding season. The two female replacements are relatively unremarkable, each occurring sufficiently early to permit their starting new nests right away. The male replacement is more interesting, since it occurred while there were still dependent offspring fathered (presumably) by another bird. The replacing male fed these offspring, yet he did not get to breed with his new mate until the following year. Similar care of another's offspring has been found in this species by Odum (1941) and Howitz (1986), although in each of those cases the replacing male was not a summer floater but a neighboring male that had lost his mate. In Odum's case, the new pair finished raising the first bird's brood, and they then raised another of their own that same year. By contrast, Howitz's case, like mine, had the replacing male not breeding with his new mate until the following summer. As Howitz points out, such replacement, even without breeding right away, is still potentially advantageous for the male, since older females are more efficient breeders, and chickadee pair-bonds, once formed, are typically maintained for life.

Given the two repeats, I have observed a total of 13 summers of floating by 11 birds, with only three replacing others over the summer. However, a number of other advantages are potentially available to birds that become summer floaters. One often mentioned possibility involves seeking extra-pair copulations (EPCs) with members of breeding pairs within a floater's home range. While often suggested for male floaters, this seems unlikely in chickadees. Female Black-capped Chickadees apparently take an active role in selecting partners for EPCs, and they typically choose males that ranked above their own mate the pervious winter (Smith unpubl. data). Floater males, being either from the lowest-ranked pairs in the winter flocks or even more lowly flock switchers, will always have ranked below a breeding female's mate. Therefore a male summer floater's chances of being accepted for an EPC by a resident female are extremely slim. Nevertheless, it is not inconceivable that

female floaters might engage in EPCs with resident males, especially in light of the rapidly growing body of evidence of within-species social parasitism and multiple maternity (Gowaty and Karlin 1984, Wrege and Emlen 1987, Kendra et al. 1988).

Besides the short-term benefits of possible EPCs as a floater, at least two longer-term benefits may be gained: achieving higher rank in subsequent winter flocks and eventually obtaining a local breeding territory. At first glance, the data seem to suggest a sex difference in eventual winter rank achieved, since all four females rapidly became the top-ranked female in their flocks, while only one of the males did so. Yet there seems no obvious reason why female floaters should be more successful in this respect than their male counterparts. Possibly this apparent difference is only an artifact due to my very small sample size—especially since both the female floaters that were replacements over the summer paired with alpha males.

A consequence of achieving higher winter rank is having an increased chance of obtaining a breeding territory the following spring (Smith 1984). Every bird that survived its first summer as a floater did eventually breed in the study area, although two males did not manage this until their third summer.

Nine of the 11 summer floaters had been low-ranked regulars during the previous winter, with only two having been flock switchers or winter floaters. Yet in all but one year, more of both low-ranked regulars and flock switchers were alive at the end of March, although they left without gaining a territory or becoming a summer floater (Smith, in press). The very fact that so few switchers manage to stay on as summer floaters, whereas so many more low-ranked regulars do, may suggest some competition for the chance to stay on in the spring. Since low-ranked regulars always rank above switchers of their own sex, such regulars could conceivably drive away switchers that might otherwise have stayed on as summer floaters.

This casts an interesting new light on the position of low-ranked regulars in winter flocks. Such birds have more ways of achieving breeding status (Smith, in press) than I had initially thought (Smith 1984). Becoming a summer floater is yet another route whereby chickadees with low winter rank can eventually obtain a local breeding territory.

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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,