

SHORT COMMUNICATIONS

Breeding Status and Sex of Common Murres (*Uria aalge*) at a Colony in Autumn

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The breeding season of Common Murres (*Uria aalge*) lasts from May to August. Typically birds return in late winter or early spring, but at some colonies on the southern edge of the breeding range, adults are ashore sporadically for a few hours in the early morning from October onwards (Taylor and Reid 1981, Ainley and Boekelheide in press). Murres (ca. 12,000 pairs) can be seen at the colony on the Isle of May, Firth of Forth, Scotland, in all months of the year except September. During a 6-yr study of autumn attendance at this colony, we found that more than half of the breeding sites were visited by murres during a standard 10-day period in mid-October, and that virtually all sites were occupied sometime during that month (Harris and Wanless 1989). We examine here the frequency and timing of return to the colony in October of individually marked murres in relation to their breeding status and sex to look for consistent patterns of individual behavior in the dates of return.

Between 1982 and 1986, we caught and individually color-banded 241 Common Murres. They were later sexed by observing copulations. We assumed that reverse mounting never occurred. Each year daily observations throughout the breeding season allowed us to categorize each color-banded bird as *successful breeder* (chick left the colony at the normal age), *unsuccessful breeder* (egg laid, but egg or chick lost), *site-holder* (held a site throughout the season, but no egg seen despite intensive observations during the laying period), and *nonbreeder* (present, but did not have a site). The site-holder and nonbreeder categories both included birds recorded as making a breeding attempt in a previous year, and individuals that had, as far as we knew, never bred. This distinction could not be made in 1982, the first year we followed the birds. Birds that were not seen the following breeding season were excluded from the analyses because they could have died by October. We also color-banded 388 chicks in 1982-1984.

We recorded color-banded birds at the colony during early morning watches 11-23 October 1982, 5-30 October 1983, 13-27 October 1984, 14 October-4 November 1985, and 15-26 October 1986. Observations were made from dawn (when murres first arrived in the colony) until birds stopped coming ashore (up to 2 h later). Thus, the data are not biased by any category or sex tending to visit the colony early or late in the day. We assumed that the date we first saw a bird in any autumn was the date of its return to the

colony. We calculated the median date of return for each sex in each year, except for males in 1983 when less than half the individuals had returned by the time observations ceased. The dates of return of the sexes were compared with the median test (Siegel 1956: 111). In pairs where both birds were recognizable individually, we compared directly the dates of return of males and females. At the end of the 1983, 1984, and 1986 breeding seasons, we recorded the last date that color-banded birds were seen, and calculated the number of days that elapsed before they returned to the colony the next autumn. These are maximum intervals as we might have missed a bird's last visit in the summer or its first visit in the autumn.

Adult survival of Common Murres on the Isle of May during the study exceeded 93% annually (Harris and Wanless 1988), so that 90% of the birds were common to two or more years or breeding categories. Whenever possible we separated data for each year.

Within any year there was no significant difference in the proportions of males and females of any category (Fisher exact tests, all $P > 0.05$). However, there were differences in the categories of birds seen—with individuals which had bred, either successfully or unsuccessfully, predominating (Table 1). This pattern was repeated each October and in 1984 and 1985, the difference was highly significant (Table 2). Furthermore, within the site-holders and nonbreeders, there was a tendency for those that had bred previously to be seen more often than those that had, as far as we

TABLE 1. Proportion of successful and unsuccessful breeders, site-holders, and nonbreeding male and female Common Murres that were seen each autumn, 1982-1986. The number of individual birds involved is in parentheses after the sample size.

Category	Females		Males	
	<i>n</i>	% seen	<i>n</i>	% seen
Successful breeder	294 (95)	66	289 (113)	59
Unsuccessful breeder				
Lost egg	34 (23)	56	33 (22)	73
Lost chick	20 (16)	45	28 (20)	64
Site-holder	16 (14)	31	15 (10)	33
Nonbreeder	11 (7)	18	18 (10)	33

TABLE 2. The proportion of Common Murres seen each autumn (1982–1986) in relation to their breeding status the previous season.

Year	Breeder		Nonbreeders and site-holders		<i>P</i> ^a
	<i>n</i>	% seen	<i>n</i>	% seen	
1982	89	64	3	0	0.31
1983	118	51	8	25	0.27
1984	152	61	18	28	0.01
1985	167	67	17	24	0.001
1986	174	67	12	42	0.11

^a Fisher exact test, probability of difference between groups.

were aware, never bred. In 31 cases that involved 22 individuals with prior breeding experience, 10 (32%) were recorded in autumn compared with 2 (10%) of 21 instances that involved 19 individuals without breeding experience. This difference was not statistically significant (Fisher exact test, $P = 0.09$), but we suggest that the least experienced birds had the lowest rate of return. There was no evidence that immature birds visited the colony during October because we never saw any of the color-banded chicks (≤ 4 yr old).

Although both sexes returned in approximately equal numbers, there was the possibility that one returned systematically earlier than the other. On average in each year, successful females returned 3 days earlier than successful males did (Table 3). This earlier return was not significant in any year (median tests). We were confident that the difference was genuine because the pattern was consistent across years and, in pairs where both members were banded, the female was seen first more often than was the male (Table 4), although only in 1986 was the difference

TABLE 4. The number of Common Murres that returned to the colony on the same and different dates, and the percentages of occasions when the female and the male returned first.

Year	Same date (<i>n</i>)	Different date (<i>n</i>)	Female first (%)	Male first (%)
1982	0	9	67	33
1983	3	21	54	33
1984	1	27	57	39
1985	2	32	53	41
1986	3	37	68	25

significant (Binomial test excluding pairs where both birds returned on the same day, $P = 0.005$). In contrast, in pairs that had been unsuccessful, females tended to return later than males did (Table 3). Although the differences were not statistically significant, the pattern was consistent over the years. Too few site-holders and nonbreeders were seen each October to calculate a median date of return ($n < 6$ each year), but the majority of birds in these categories clearly returned later than breeders (pers. obs.).

In each of the three years for which we had information on the dates when individuals last visited the colony at the end of the breeding season, there were significant differences between the sexes in the lengths of time successful birds were away from the colony (median tests, $P < 0.05$). The shortest absences were 82 days for males and 70 days for females. The overall median length of absence of a male was 122 days ($n = 113$), and only two returned in fewer than 95 days (the median length of absence of a female; $n = 127$). On the Isle of May, females of successful pairs normally leave two or three weeks after their mates (Wanless and Harris 1986). Because observations of both sexes ceased at the same time in autumn, there was less opportunity to record long absences for fe-

TABLE 3. Median return dates of successful and unsuccessful female and male Common Murres (1982–1986). All birds whose return date was accurately known are included.

Year	Median date of return			
	Birds alive (<i>n</i>)	Females	Birds alive (<i>n</i>)	Males
Successful breeders				
1982	42	18 Oct.	33	21 Oct.
1983	53	3 Nov.	46	After 3 Nov.
1984	63	21 Oct.	62	23 Oct.
1985	72	24 Oct.	71	27 Oct.
1986	64	16 Oct.	77	24 Oct.
Unsuccessful breeders				
1982	6	After 23 Oct.	7	21 Oct.
1983	9	1 Nov.	9	17 Oct.
1984	14	23 Oct.	14	22 Oct.
1985	10	After 4 Nov.	13	20 Oct.
1986	3	22 Oct.	19	21 Oct.

males. There is no reason why the data on males should have under-recorded short absences; therefore, the sex difference appears to be genuine. Absences for unsuccessful breeders were 73, 81, 85, and 92 days for four males, and 84, 86, 88, 88, 97, and 99 days for six females.

Although there was considerable annual variation in the timing of the autumn return (Table 3), some individuals returned each year either early or late relative to the population as a whole (significant ranking of dates for 26 males and females alive 1982–1987; Friedman two-way analysis of variance by ranks, $\chi^2 = 68$, $df = 25$, $P < 0.001$). During checks of the colony in January and February 1983, we saw seven breeders not recorded in October of any year, and two males and three females alive 1982–1986 were not seen in any October. Some individuals never return early in autumn. Individually marked Herring Gulls (*Larus argentatus*) at a colony in northeastern England had a similar consistency between years in the presence or absence of individuals outside the breeding season (Coulson and Butterfield 1986). However, there was no evidence for male or female murres of a relationship between the date of autumnal return and laying date in either the previous or subsequent breeding season (all Spearman Rank correlation coefficients, $P > 0.10$).

During the breeding season, male and female Common Murres spend similar amounts of time at the colony. Because the male takes the partly grown chick to sea and continues to feed it, he invests more time in breeding (Wanless and Harris 1988). Although the earlier return of females offsets part of this difference, the estimated time involved (three days) seems rather trivial. The biological significance of the earlier return of females is obscure.

Salomonsen (1955) and Coulson and Butterfield (1986) concluded that winter attendance at colonies by Northern Fulmars (*Fulmarus glacialis*) and Herring Gulls possibly help individuals to maintain territories or nest sites. In an earlier study of the Isle of May Common Murres, we suggested that successful breeding sites were visited much more frequently in autumn than were unsuccessful sites, but little was known of the actual birds involved in these visits (Harris and Wanless 1989). We now confirm that the visits in the early autumn tend to be made by breed-

ing birds. The ranking in the frequencies of birds seen in October—breeding birds (62%), site-holders and nonbreeders that had bred before (32%) or probably never bred (10%), and immature birds less than five years old (0)—strongly suggests that autumn return is associated with maintenance of an established site or mate rather than with prospecting for or acquisition of a new site.

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