

Female-Female Pairs and Polygynous Associations in a Québec Ring-billed Gull Colony

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Recently, female-female pairs have been discovered in several species of Laridae: Western Gull (*Larus occidentalis*; Hunt and Hunt 1977), California Gull (*L. californicus*; Conover et al. 1979), Herring Gull (*L. argentatus*; Fitch 1979) and Ring-billed Gull (*L. delawarensis*; Ryder and Somppi 1979, Conover et al. 1979). These pairs usually attend superclutches (i.e. 5–8 eggs). Hunt and Hunt (1977), however, have also found female associations attending normal-sized clutches (1–3 eggs). Mate fidelity and site tenacity in female-female pairs have been found in Western Gulls (Hunt and Hunt 1977) and in Ring-billed Gulls (Kovacs and Ryder 1981). In view of these findings, our objectives in the present study were to determine the proportions of female-female pairs and of trios, consisting of a male and two females, that were associated with superclutches and the breeding success, egg-fertility rate, site tenacity, and mate fidelity of birds in these unusual mating systems at a Ring-billed Gull colony at Ile de la Couvée, which is located in the Saint-Lawrence Seaway near Montréal (45°28'30"N, 73°30'30"W). This colony has been previously described by Lagrenade and Mousseau (1981a).

Nests containing superclutches were marked with flags and visited at intervals of 2–3 days, starting at the end of the laying period (April) of 1980 and 1981. The attendants of such nests were live-trapped in walk-in traps placed on the nest (Weaver and Kadlec 1970). Using Ryder's (1978a) discriminant function on bill measurements, we sexed and then banded and released them. To be sure that all attendants were caught, each nest was watched for periods of up to 1 h per visit. We opened all unhatched eggs to determine whether or not they were fertile. Addled eggs were considered infertile. Therefore, the fertility rate of the eggs (percentage of eggs laid that were fertile) is an underestimate. We define the hatching rate as the percentage of eggs laid that hatched and the hatching rate of fertile eggs as the percentage of fertile eggs that hatched. All statistical tests are Wilks's Chi-square (also called G-test; Sokal and Rohlf 1969).

In the 1980 and 1981 surveys of the Ile de la Couvée colony, superclutches accounted for less than 0.14% of the total nests (14,331). The percentage of superclutches in the Ile de la Couvée colony is significantly lower than that in Ring-billed Gull colonies at Gran-

ite Island (1.9% out of 1,911 nests; Ryder and Somppi 1979; $P < 0.01$) and in Washington (1.3% out of 1,669 nests; Conover et al. 1979; $P < 0.05$) but is comparable to that in 21 Herring Gull colonies of the Great Lakes (0.3% out of 10,707 nests; Shugart 1980; $P > 0.05$). All of these above percentages are much lower than those found in the Santa Barbara Western Gull colony (10–15%, Hunt et al. 1980). In this latter species, however, contrary to the Ring-billed Gull, a 4-egg clutch is considered a superclutch and is associated with female-female pairs.

Four-egg clutches were attended predominantly (95%) by male-female pairs ($P < 0.001$), suggesting the capacity of these females to lay four eggs and/or the occurrence of egg dumping (Table 1). One female-female pair was also captured from a four-egg nest. Five-egg clutches were attended equally by male-female or female-female pairs or one male-two female associations ($P > 0.05$). We found that 83% of six-egg clutches were attended by female-female pairs ($P > 0.05$).

The finding of one male-two female trios attending superclutches is the second record of a polygynous association in the Ring-billed Gull. Conover et al. (1979) reported the presence of a male with three females attending a superclutch. Two of the seven one male-two female trios had a double-cup nest. The presence of double-cup nests has been mentioned only by Shugart (1980) in polygynous Herring Gull trios and by Southern (1978) in a Ring-billed Gull pair.

Of the 11 pairs of females banded in 1980, three remained together in 1981. Two of three nested within 3 m of their 1980 territory, while the other pair moved approximately 40 m away from its 1980 territory. Furthermore, two females from a 1980 polygynous association returned to the same territory without the male and formed a female-female pair.

There is no significant difference between the number of eggs that disappeared (eaten or stolen) from nests of male-female pairs and female-female pairs. In polygynous associations, however, there was a significant increase in the percentage of egg loss. Two-cup nests had a higher egg-loss rate (0.36) than did one-cup nests (0.28) in these trios ($P > 0.05$). The egg-loss rate of the polygynous associations of this study (0.30) seems similar to the one observed for female-female pairs by Ryder and Somppi (1979; 0.25).

The hatching rate of the eggs of female-female pairs and polygynous trios was significantly lower ($P < 0.01$) than that of male-female pairs (Table 2). This was partly due to the lower egg-fertility rate ($P <$

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TABLE 1. Percentage of occurrence of the different mating systems found in superclutches at the Ring-billed Gull colony of Ile de la Couvée (Québec) during the breeding seasons 1980 and 1981.

Mating system	Clutch size ^a		
	4 eggs (<i>n</i> = 19)	5 eggs (<i>n</i> = 21)	6 eggs (<i>n</i> = 6)
Male-female	94.74 ^{***b}	47.62	0.00
One male- two females	0.00	28.57	16.67
Two females	5.26	23.81	83.33

^a *n* = total nests.

^b *** = significantly different from the occurrence of other mating systems for the same clutch size at *P* < 0.001.

0.01), but the low hatching rate of the fertile eggs of the unusual mating systems suggests that poor parental attention and care may also have been a factor. In as much as our egg-fertility rate is an underestimate, our data are much like those reported by Conover et al. (1979; 67%) and by Ryder and Somppi (1979; 69%). Hunt and Hunt's study (1977) once again stands out, with a very low 14% rate of fertile eggs in superclutches.

Three hypotheses have been proposed to explain the occurrence of polygynous and female associations in this normally monogamous bird.

(1) Toxic chemical components such as DDT and its metabolites induce in male embryos of Western and California gulls hormonal feminization, leading to a suppression of their breeding behavior (Fry and Toone 1981). Such an explanation could be the key to abnormal pairs in Great Lakes' Herring Gull colonies where these birds are highly contaminated with PCBs and other organochlorine pollutants (Gilman et al. 1977). During the breeding season of 1979, we examined eggs, chicks, and adults for the presence of contaminants and found that the gulls are relatively free of toxic residues (Mousseau and Lagrenade 1980). As the use of DDT in Québec has been

drastically reduced since 1969, the pesticide hypothesis may not be applicable to the Ile de la Couvée colony.

(2) Ryder (1978b) considered widowed fertilized females forming bonds as a possible origin of female-female pairs. Although the low egg fertility of female-female pairs doesn't fully support this hypothesis, our observation of a 1980 polygynous trio becoming a female-female pair in 1981 does. For female-female pairs exhibiting mate tenacity, this hypothesis could explain the origin, but this behavior does not seem to have adaptive significance, as these females would have better breeding success if they found a male mate instead of maintaining the bond for a second year.

(3) Female-female pairs could be an adaptive response to an excess of females in the colony (Hunt and Hunt 1977). After removing males from several Ring-billed Gull colonies, Conover (pers. comm.) found a higher frequency of female-female pairs in these colonies than in control colonies and in previous years. Conover also discovered that the breeding population of Ring-billed Gulls in Washington state is highly skewed. Thus, a female that fails to find a male mate may associate with another unmated female. They could defend a territory, get fertilized promiscuously by already mated males, build a nest, and share incubation and chick-rearing duties. Such associations are indispensable if birds are going to breed, because single-parent gulls in colonies cannot successfully raise young (Ryder 1978b). Knowing that female-female pairs, in this present study, predominantly attend superclutches with a relatively low egg-fertility rate, that some exhibit mate and site tenacity, and that some are promiscuous leads us to support this third hypothesis.

The infrequency of these unusual mating systems suggests that the Ring-billed Gull should still be considered a monogamous species. As superclutches have been observed in this species since 1941 (Moffitt 1942), it is likely that female-female pairs and polygynous associations have always existed. Ring-billed Gulls

TABLE 2. Fertility, hatching, and egg-loss rates of the different mating systems observed at the Ring-billed Gull colony of the Ile de la Couvée (Québec) during the breeding seasons of 1980 and 1981.^a

Mating system ^b	Fertility rate ^c	Hatching rate ^d	Hatching rate of fertile eggs ^e	Egg-loss rate ^f
Male-female (<i>n</i> = 117)	0.85**	0.69**	0.82	0.09
One male-two females (<i>n</i> = 36)	0.50	0.33	0.67	0.31**
Female-female (<i>n</i> = 64)	0.56	0.38	0.67	0.09

^a ** = significantly different from corresponding rate in other mating systems at *P* < 0.01.

^b *n* = total eggs.

^c Number of fertile eggs per eggs laid.

^d Number of hatched eggs per eggs laid.

^e Number of hatched eggs per fertile eggs.

^f Number of disappeared eggs per eggs laid.

are opportunistic in both feeding habits (Lagrenade and Mousseau 1981b) and habitat selection (Soots and Landin 1978). Therefore, such birds could have highly adaptable mating strategies. The origin of female-female pairs and polygynous trios is still unclear, but mate fidelity in these associations seems to indicate an adaptive response to an excess of females in the colony.

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A Record of the Siberian Flycatcher (*Muscicapa sibirica*) from Bermuda: an Extreme Extra-limital Vagrant

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On 28 September 1980 at 1300 I was checking the Somerset Long Bay Nature Reserve in Sandy's Parish, Bermuda for migratory birds when I discovered a medium-sized flycatcher feeding along the edge of a grassy clearing. First impressions suggested an *Empidonax* flycatcher, but on closer approach I was puzzled to observe a generally dark plumage with extensive white spotting on the upper parts and dark spotting or streaking on the underparts forming a

partial breast band. Another striking feature was the large size of the eyes, enhanced by white eye rings. This combination of characters gave it the general appearance of a juvenal-plumaged Eastern Bluebird (*Sialia sialis*) except for the lack of blue on wings and tail. The behavior, however, was unquestionably that of a flycatcher. It perched conspicuously on low dead snags overhanging the clearing, looked around in flycatcher fashion, and made frequent flycatching