it immediately (Howell, pers. comm.). The occurrence of this species in Costa Rica is to be expected, as it has been expanding its range in Nicaragua in recent years; it is now known they are south at least to Rivas, just north of the Costa Rican boundary (J. C. Martínez, pers. comm.).

LINCOLN'S SPARROW
(*MELOSPIZA LINCOLNII*)

I collected an immature female of this species in a brushy field 0.5 km northeast of Ciudad Universitaria, Prov. San Jose, on 16 November 1985. The specimen (UCR 3238), in fresh plumage with very light fat, is the first for Costa Rica following several sight reports (Tramer 1979, Stiles and Smith 1980). In addition, G. Barrantes, A. Pereira, and I banded and released an adult Lincoln's Sparrow at the same site on 25 November 1985.

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FEMALE PAIRING: A REPRODUCTIVE STRATEGY FOR HERRING GULLS?[1]

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Key words: Larus argentatus; *gulls; sex ratio; female pairs; homosexual.*

Adaptive and nonadaptive explanations have been provided for the phenomenon of female pairing in gulls (Hunt and Hunt 1977, Coulson and Thomas 1985). In this paper we summarize data for Herring Gull (*Larus argentatus*) female pairs that pertain to these interpretations.

METHODS

Populations of color-banded individuals at three Great Lakes island colonies were used for this study during 1978 to 1986 (Table 1). Female pairs were identified by capturing supernormal clutch attendants and by locating females that we had color-banded in previous years. We confirmed that the supernormal clutches under study were attended by female pairs and not by one male-multiple female groups (Fitch and Shugart 1983, Fox and Boersma 1983) by observations of nest attendants. At Lake Michigan colonies (see Shugart et al. 1987 for locations), after banding, observations were done for a dawn to dusk period then periodically through the breeding season (see Shugart 1980, Shugart et al. 1987). At Lake Ontario, attendants were observed during nest checks.

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TABLE 1. Summary of Herring Gull female pairs' reproductive data.

Study site (years of study)	Clutch size	Clutches examined	Total eggs	Egg status
Gull Island[1]	6	3	18	0 fertile
(1981–1986)	5	5	25	0 fertile
	4	1	4	0 fertile
	3	2	6	0 fertile
Hat Island[2]	6	1	6	0 fertile
(1978–1979)	5	4	20	8 infertile, 12 undetermined
Lake Ontario[3]	3	4	12	4 hatched, 8 undetermined
(1979–1982)	2	2	4	0 hatched, 4 undetermined
	1	1	1	0 hatched, 1 undetermined

[1] Egg contents were examined within a week of laying.
[2] Egg contents were examined after the normal incubation period.
[3] Egg contents were not examined.

Identification of the sex of birds was done through laparotomy in the initial years of study (five pairs at Hat Island). We switched to measurements (Fox et al. 1981) after finding that laporotomy did not significantly increase accuracy in a large sample examined by Shugart (1980).

In the initial years of the study, we determined reproductive success by monitoring nests for the normal incubation periods. Contents of unhatched eggs were then examined at one colony. This technique did not allow accurate assessments of infertility, which we believed was the cause of reproductive failure (Table 1). To obtain accurate information, we opened eggs and examined blastodiscs with a 10–40× microscope (see Fitch and Shugart 1983 for techniques). Addled eggs were substituted for the eggs that we opened.

RESULTS

FORMATION AND STABILITY OF PAIRS

Seven females that were heterosexually paired in one year formed female pairs in the subsequent year. Six of these formed three pairs after their male mates failed to return to the colony. The seventh paired with an unmarked female after her male paired with an unmarked female. An eighth female paired with an unmarked female in the year following a year as a nonbreeding secondary female (see Shugart et al. 1987).

Forty-two Herring Gull females (22 pairs) were color-banded and followed for successive years. In the year following a year of female pairing, 52% (22 of 42) of the females paired with the same female, 2% (1 of 42) paired with an unmarked female, 2% (1 of 42) remained in the vicinity of her territory as a floater (Shugart et al. 1987), and 43% (18 of 42) were not observed in the colony. Although the stability of female pairs was lower than 93% interyear stability of Herring Gull heterosexual pairs (Fitch and Shugart 1983), the 52% stability does suggest that female pairs formed "pair bonds" and they were not simply transient associations.

REPRODUCTIVE POTENTIAL

Herring Gull female pairs could potentially produce offspring because they lay eggs. Infertility ranged between 70% (67 of 96) (assuming that eggs of undetermined fertility were fertile) to 96% (92 of 96) (assuming undetermined eggs were not fertile) (Table 1). The apparent inability of females to fertilize ova is a major factor that limits Herring Gull female pairs' reproductive success.

DISCUSSION

The leading adaptive hypothesis for female pairing is: in species where two adults are required to provide parental care (e.g., typical avian monogamy), under demographic constraints of male shortages, females that were unable to find male mates attempt to rear offspring communally as female pairs. Females could obtain sperm from copulations with paired males (Trivers 1972, Hunt and Hunt 1977, Fitch and Shugart 1984).

Three predictions that have been confirmed are: (1) female pairs occur in colonies with male shortages (Hunt et al. 1980, Conover and Hunt 1984, Coulson and Thomas 1985, Shugart et al. 1987), (2) female pairs form when a female has lost or cannot find a male (this paper), and (3) female pairs lay eggs and are therefore attempting to reproduce (see below).

A fourth prediction, that females should solicit copulations from paired males, is strongly supported by the Ring-billed Gull (*Larus delawarensis*). Female pairs copulated with paired males and fertility ranged from 40–70% (Conover et al. 1979, review Kovacs and Ryder 1983). The reproductive success per individual female in female pairs was 20–27% of heterosexual females' success (computed from table 5 and fig. 5, Kovacs and Ryder 1983). Weaker support is provided by the low incidence of fertile eggs laid by female pairs of Herring Gulls (4–30%, this paper), Western Gulls, *Larus occidentalis* (13%, Hunt and Hunt 1977), and Black-legged Kittiwakes, *Rissa tridactyla* (0%, Coulson and Thomas 1985). The latter may reflect a small sample of eight eggs.

Based on our review of Ring-billed Gull data, and to a lesser extent the Western and Herring gull data, as yet, the hypothesis that female pairing is a reproductive strategy cannot be rejected. Even though the probability of reproductive success is low, this minimal success could produce a selective advantage in comparison to zero success (Hunt and Hunt 1977, also see

Fisher 1958). Therefore adaptation remains as a viable competitor to mal-adaptive or neutral hypotheses.

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DESTRUCTION OF EGGS BY WESTERN MEADOWLARKS[1]

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Key words: Egg destruction; Western Meadowlark; Sturnella neglecta; *predation; competition.*

Creighton and Porter (1974) reported two cases of destruction of Horned Lark, *Eremophila alpestris,* and Lark Bunting, *Calamospiza melanocorys,* eggs by Western Meadowlarks, *Sturnella neglecta,* and one probable case of a meadowlark pecking a Lark Bunting nestling. Based on these observations, Creighton and Porter (1974) suggested that egg destruction by Western Meadowlarks might be common. In this note, we provide additional evidence for egg pecking by this icterid suggesting that this behavior may be characteristic of this species.

Between 24 April and 14 June 1987, we studied patterns and rates of nest predation of ground-nesting birds in short- and mixed-grass prairies at Shilo, Manitoba. To identify potential predators, we used 18 automatic camera setups baited with artificial nests, each containing one quail, *Coturnix coturnix,* egg. Artificial nests were constructed by pressing two layers of grass, held together with a few strips of transparent LePage glue, into plastic bowls the size and shape of a Red-winged Blackbird, *Agelaius phoeniceus,* nest. To thin the shell of the quail eggs so that small avian predators could break them, eggs were placed in a 20% acetic acid solution for 20 min and then thoroughly washed in running water. The procedure does not seem to affect the palatability of the eggs because a variety of avian and mammalian predators will consume these eggs (J. Picman, unpubl. data). Eggs were dyed a brown/beige color to replace pigment lost during the treatment. With the experimental setup, any predator manipulating the

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