Nest-site Tenacity and Mate Fidelity in Female-female Pairs of Ring-billed Gulls

KIT M. KOVACS AND JOHN P. RYDER
Department of Biology, Lakehead University, Thunder Bay, Ontario P7B 5E1, Canada

Many birds show a tendency to return each year to breed at the same site (Klopfer and Hailman 1965). In colonial species, fidelity to colony site and nest site is well documented (Bongiorno 1970) in the following larids: Herring Gull (*Larus argentatus,* Tinbergen 1952, 1961), Glaucous-winged Gull (*L. glaucescens,* Vermeer 1963), Laughing Gull (*L. atricilla,* Bongiorno 1970), Ring-billed Gull (*L. delawarensis,* Vermeer 1970, Southern 1977, Southern and Southern 1979, Blokpoel and Courtney 1980), Common Tern (*Sterna hirundo,* Austin 1949), and Black-legged Kittiwake (*Rissa tridactyla,* Coulson and White 1958). Factors that appear to influence the development and persistence of site tenacity are age (Austin 1940), breeding experience (Coulson and White 1958), breeding success (Southern and Southern 1979), and habitat stability (McNicholl 1975).

In addition, some colonially nesting birds exhibit mate fidelity, whereby the same individuals nest together in consecutive breeding seasons. Although it is not yet known whether such pair bonds are maintained throughout the nonbreeding part of the year, the selective advantages of mate fidelity are clear, for, at the time and place of nesting, birds exhibiting fidelity have a higher reproductive success relative to individuals that acquire new mates each year (Coulson 1966, 1972; Ryder 1980).

The investigations cited above have dealt with conventional male-female pairs. Recently, however, Hunt and Hunt (1977) reported the occurrence of female-female pairs of Western Gulls (*L. occidentalis*) in California. The origin and significance of these pairs are unknown (see Hunt 1980), but 7 of 8 pairs exhibited nest-site tenacity and mate fidelity between years. Since that report, similar pairings have been recorded in Ring-billed Gulls (Ryder and Somppi 1979, Conover et al. 1979), California Gulls (*L. californicus,* Conover et al. 1979), and Herring Gulls (Fitch 1979). None of these, however, confirmed nest-site tenacity or mate fidelity by female-female pairs.

We conducted this study on Granite Island (48°41'N, 88°29'W) in Black Bay, northern Lake Superior. The colony has been described by Ryder (1976). We searched the colony daily during the 1979 and 1980 nesting seasons for clutches of 5–8 eggs, which have been associated with female-female pairs of Ring-billed Gulls (Ryder and Somppi 1979, Conover et al. 1979). We placed a numbered wooden block beside each superclutch for recognition of the nest throughout the season. We trapped the attendants of superclutches using the method described by Mills and Ryder (1979) and measured gonys, gape, tarsus, and keel, following Baldwin et al. (1931), with Vernier calipers to 0.1 mm. Measurements of gonys and gape were used to confirm sex using the discriminant function in Ryder (1978). Captured females received expansible colored plastic leg bands and a standard U.S. Fish and Wildlife Service aluminum band. Each season we mapped the locations of all superclutches, and, whenever possible, the band number of attendants was recorded to determine whether or not each female nested at the same site with the same partner.

Table 1 presents the numbers of captured females attending superclutches. Three birds (one single individual and one pair) captured in 1978 were recaptured at the same nest sites in 1979. The recaptured pair was composed of the same marked individuals, this being the first record of mate fidelity by female-female pairs in Ring-billed Gulls. Neither member of this pair was recaptured in 1980.

In 1980, two pairs relocated at the same nest sites they had used in 1979. Two additional pairs, although nesting with the same mates in 1980 as in 1979, moved to other areas of the colony in 1980. These four pairs in 1980 reconfirmed our 1979 observation of mate fidelity in female-female pairs in this species.

TABLE 1. Captured and recaptured individuals of female-female pairs of Ring-billed Gulls, Granite Island.

Females captured	1978	1979	1980
Pairs	6[a]	14	22
Singles	9[a]	28	16
Pairs recaptured from previous year		1	4[b]
Singles recaptured from previous year		1	7

[a] Data from Ryder and Somppi (1979).
[b] One individual recaptured 1978, 1979, and 1980.

Over the three-season study, 17 individuals of female-female pairs were recaptured in two consecutive seasons (Table 1). One of these individuals was captured in all 3 yr. Ten (59%) used the same sites in consecutive nesting seasons, 2 (12%) remained within 2 m of the site used previously, and 5 (29%) moved to other areas of the colony.

The benefits of nest-site tenacity remain enigmatic. It might serve to reunite pairs or to enhance reproductive performance by familiarizing the individuals with an area, particularly in stable habitats (McNicholl 1975). In our study, breeding success and nest-site tenacity were not directly related. Three female-female pairs that experienced total egg loss in 1979, a situation that often results in a change of location or mate (Coulson 1966, 1972), used the same nest sites in 1980. Six of seven individuals that moved to other sites in 1980 had all produced young in 1979. Granite Island is a stable habitat. It is not subject to flooding, mammalian predation, or human visitation. During the last 7 yr the colony population has increased by 225%, from 800 pairs in 1973 to 2,600 pairs in 1980. It might well be that nest sites are now at a premium on the colony and that competition for sites precludes some individuals from successfully establishing the same territories each year.

Although mate fidelity occurs in female-female pairs, nest-site tenacity is not likely a prerequisite. We do not know whether the pairs that moved nest sites in consecutive seasons initially returned to the site previously used. If they did, their stays were brief, because we watched these locations from blinds extensively during the early part of the nesting season and did not observe them there.

The recapture of 15 individuals in 1980 from a total of 56 birds banded in 1979 probably does not accurately indicate the return rate of female-female pairs to Granite Island. We concentrated our trapping efforts on superclutches, but these pairs did not always lay more than the normal number of three eggs (Hunt and Hunt 1977, Conover et al. 1979, Kovacs unpubl. data). Consequently, some of the returning female-female pairs may have been overlooked, because rough terrain, dense vegetation, and potentially excessive disturbance limited searches for color-banded birds.

That female-female pairs do show mate fidelity indicates that such pairings may not be a result of the loss of a male mate by females early in the season or the abandonment by the male from a polygynous group, as was suggested by Ryder (1978). Rather, the existence of such pairings appears to be a unique mating strategy that is now well established in a number of larid populations (Hunt 1980).

We thank G. Fox of the Canadian Wildlife Service, Wildlife Toxicology Division, and the National Science and Engineering Research Council of Canada (JPR) for financial support, Alonzo and Jamie Nuttall for their dutiful transportation services, R. Trowbridge for his continued assistance, and L. Ryder for the use of her 1978 data. Special thanks go to field companions of 1979 and 1980, D. Boersma and N. Ward, for their hard work and tolerance. Drs. E. H. Miller, G. Hunt, and M. Conover's thoughtful reviews improved the manuscript.

Literature Cited

Austin, O. L. 1940. Some aspects of individual distribution in the Cape Cod tern colonies. Bird-Banding 11: 155–169.

———. 1949. Site tenacity, a behavior trait of the Common Tern (*Sterna hirundo* Linn.). Bird-Banding 20: 1–39.

Baldwin, S. P., H. C. Oberholser, & L. C. Worley. 1931. Measurements of birds. Sci. Publ. Cleveland Mus. Nat. Hist. 2: 1–167.

Blockpoel, H., & P. Courtney. 1980. Site tenacity in a new Ring-billed Gull colony. J. Field Ornithol. 51: 1–5.

Bongiorno, S. F. 1970. Nest site selection by adult Laughing Gulls (*Larus atricilla*). Anim. Behav. 18: 434–444.

Conover, M. R., D. E. Miller, & G. L. Hunt, Jr. 1979. Female-female pairs and other unusual reproductive associations in Ring-billed and California gulls. Auk 96: 6–9.

Coulson, J. C. 1966. The influence of pair-bond and age on the breeding biology of the Kittiwake Gull (*Rissa tridactyla*). J. Anim. Ecol. 35: 269–279.

———. 1972. The significance of the pair-bond in the Kittiwake. Proc. 15th Intern. Ornithol. Congr.: 424–433.

———, & E. White. 1958. The effect of age on the breeding biology of the Kittiwake (*Rissa tridactyla*). Ibis 100: 40–51.

Fitch, M. 1979. Monogamy, polygamy, and female-female pairs in Herring Gulls. Proc. Colonial Waterbird Group 3: 44–48.

Hunt, G. L. 1980. Mate selection and mating systems in seabirds. Chapt. 4 *in* Behavior of marine animals, vol. 4 (J. Burger, B. L. Olla, and H. E. Winn, Eds.). New York, Plenum Publ. Corp.

———, & M. W. HUNT. 1977. Female-female pairing in Western Gulls (*Larus occidentalis*) in southern California. Science 196: 1466.

KLOPFER, P. H., & J. P. HAILMAN. 1965. Habitat selection in birds. Pp. 279–303 *in* Advances in the study of Behaviour, vol. 1 (D. S. Lehrmen, R. A. Hinde, and E. K. Shaw, Eds.). New York, Academic Press.

MCNICHOLL, M. K. 1975. Larid site tenacity and group adherence in relation to habitat. Auk 92: 89–104.

MILLS, J. A., & J. P. RYDER. 1979. A trap for capturing shore and seabirds. Bird-Banding 50: 121–123.

RYDER, J. P. 1976. The occurrence of unused Ring-billed Gull nests. Condor 78: 415–418.

———. 1978. Possible origins and adaptive value of female-female pairings in gulls. Proc. Colonial Waterbird Group 2: 138–145.

———. 1980. The influence of age on the breeding biology of colonial nesting seabirds. Chapt. 5 *in* Behavior of marine animals, vol. 4 (J. Burger, B. L. Olla, and H. E. Winn, Eds.). New York, Plenum Publ. Corp.

———, & P. L. SOMPPI. 1979. Female-female pairing in Ring-billed Gulls. Auk 96: 1–5.

SOUTHERN, W. E. 1977. Colony selection and colony site tenacity in Ring-billed Gulls at a stable colony. Auk 94: 469–478.

———, & L. SOUTHERN. 1979. Philopatry in Ring-billed Gulls. Proc. Colonial Waterbird Group 3: 27–31.

TINBERGEN, N. 1952. On the significance of territory in the Herring Gull. Ibis 94: 158–159.

———. 1961. The Herring Gull's world. New York, Basic Books.

VERMEER, K. 1963. The breeding ecology of the Glaucous-winged Gull (*Larus glaucescens*) on Mandarte Island. British Colombia Occ. Pap. British Columbia Prov. Mus. No. 13.

———. 1970. Breeding biology of California and Ring-billed gulls. Can. Wildl. Serv. Rept. Ser. 12: 1–52.

Received 10 December 1980, accepted 16 March 1981.

Near-ultraviolet Light Reception in the Mallard

JOHN PARRISH, ROGER BENJAMIN, AND RICKY SMITH
Division of Biological Sciences, Emporia State University, Emporia, Kansas 66801 USA

Humans are incapable of detecting near-ultraviolet light (300–380 nm) and are restricted to wavelengths between about 380 and 780 nm. Several lower vertebrates are known to be sensitive to ultraviolet (UV) light (Kimeldorf and Fontanini 1972, Environ. Physiol. Biochem. 4: 40; Moehn 1974, J. Herpetol. 8: 175; Jenison and Nolte 1980, Brain Res. 194: 506), but few studies have been conducted with higher vertebrates.

The recent demonstrations that homing Rock Doves (*Columba livia*) (Kreithen and Eisner 1978, Nature 272: 347) and three species of hummingbirds (Goldsmith 1980, Science 207: 786) are sensitive to near-UV light prompted the present study of UV light reception in an evolutionarily more primitive migratory species, the Mallard (*Anas platyrhynchos*).

The Mallard ducks were trapped during the Spring of 1979 and 1980 and maintained in an outdoor aviary until used for experimentation. After they were transferred to the laboratory, down feathers were plucked from the body underneath both wings, and standard electrocardiogram (EKG) surface electrodes were attached to the bare skin. Stimulating electrodes, which consisted of soldered syringe needles, were inserted subcutaneously into each leg and securely taped in place. The ducks were restrained by a large elastic band wrapped around the body, and, after the legs were taped together, the birds were taped into a trough-like holding chamber (Hoar and Hickman 1975, A Laboratory Companion for General and