boring males in the early spring. During this time, males could learn to associate atypical songs with a rival male. Later in the season, countersinging with males occurs at a distance and interactions with neighbors are infrequent. Thus, at this time (e.g., late May and early June) there would be fewer opportunities to form the association between an atypical song and a rival male. Such an association still may develop over a period of time; however, the atypical male in the present study only remained in the area for 9 or 10 days. This apparently was insufficient time for associative learning to occur.—GARY RITCHISON, *Department of Biological Sciences, Eastern Kentucky University, Richmond, Kentucky 40475.* Received 25 Sept. 1984; accepted 10 May 1985.

Replacement Clutches in the Red-throated Loon.—Although replacement clutches have been reported for Red-throated Loons (*Gavia stellata*; Keith 1937, Cyrus 1975, Bundy 1976), those findings were based upon observations of unmarked birds. Replacement clutches are suspected for Common Loons (*Gavia immer*) (McIntyre 1977, Titus and VanDruff 1981) and Arctic Loons (*Gavia arctica*) (Sjolander, pers. comm.). We report here an experiment performed to find out whether replacement clutches are laid by Red-throated Loons.

This study was conducted at Cape Espenberg (66°30′N, 163°30′W), the northernmost cape on the Seward Peninsula in Western Alaska. The Cape is a series of sand dune beach ridges interspersed with numerous shallow ponds and marshes. These ponds supported a dense population of Red-throated Loons (7 pairs/km^2). We conducted the experiment in 1979 and made supplemental observations in 1976–1978.

Four pairs of loons were marked at their original nests between 5 and 7 June with green (alkali green), orange (tropaeolin 002), red (rhodamine B), or black (nyanzol D) dyes. Saturated solutions of green, orange, and red dyes were prepared using distilled water. Before these dyes were used, they were diluted by 30% using 95% ethanol to increase penetration of the dye into the feathers. Black dye was prepared according to directions in Melchior and Iwen (1965). Dyes were soaked into absorbent cotton, which was attached to a 10 cm section of clothes hanger, which served as an anchor. These dyed cotton balls were anchored to the inner rim of the nest bowl. Eggs were removed 2 days after placement of the dye, after at least one bird of each pair was confirmed dyed and the other bird should have been exposed to the dye during incubation bouts. Embryos in the removed eggs were estimated by visual inspection to have developed for 5 days or less. We checked ponds at 1–3-day intervals to search for dyed birds and newly laid eggs. We feared that more frequent harassment of the loons might cause them to desert the area.

Both members of each of the 4 pairs were successfully dye-marked. Three of the 4 experimental pairs of loons remained territorial on their original ponds and produced a second clutch of eggs. Distances between first and second nests were approximately 2.5, 6, and 35 m. In all 3 cases where we found replacement clutches, the original pairs remained intact. The fourth pair disappeared from its original pond within one week after destruction of the original clutch. Neither member of this pair was subsequently resighted within a .5 km radius of the original pond. The dye used on these birds (orange) proved difficult to distinguish from naturally acquired stains caused by the mineral-rich ponds, however, and either or both birds could have been present without our detection. No loons established a territory on the deserted pond, however. Time between the destruction of the original clutch and the deposition of the first egg in the second clutch was 12, 13, and 14–15 days.

The time between successive clutches is long, compared to the 30-day nest initiation period at Cape Espenberg. This comparison is significant because each of the 3 successfully re-nesting pairs showed social behavior that minimally delayed production of a second clutch: retention of their original mate and their original territory. Thus, intervals between clutches may have been determined only by nutritional and physiological constraints.

The ability to produce replacement clutches should be a valuable adaptation to occasional high rates of egg predation. During two summers when arctic foxes (*Alopex lagopus*) and red foxes (*Vulpes vulpes*) were active in our area, 83% (n = 6) and 72% (n = 32) of

Red-throated Loon nests were destroyed by predators. In one summer when foxes were rare, only 20% (n = 5) of the loon nests were destroyed by predators.

We have few data on the fate of replacement clutches. We left the study area before the induced replacement clutches hatched. At that time, all 3 nests were still active after 2 weeks of incubation (half way to hatching). In previous years we observed 3 suspected replacement clutches. Two were destroyed by predators before hatching; the third was still active after 3 weeks of incubation, at which time we left the study area. We suspect that the fate of replacement clutches will vary with temporal aspects of hunting pressure by predators (principally foxes) and the availability of alternate foods for these predators, as suggested by Petersen (1976).

Given the length of the season, it is conceivable that an early-nesting loon could produce an original and 2 replacement clutches at our study area. Although Bundy (1976) assumed that numerous clutches produced by loons during his study were replacements, he stated that "no third clutches are known." Whether this actually occurs must await future investigations. Studies of hatching and fledging success of replacement clutches would further clarify the reproductive strategies of these birds.

The ability of Red-throated Loons to produce replacement clutches can be important for estimating production at a population level. It is likely that populations of this species can salvage a successful reproductive year despite an episode of heavy predation. Important considerations for production would then include such factors as timing of predation on eggs.

Some data on loon nesting success came from A. Seguin. D. Matkin, S. Long, and K. Oakley assisted with field work. We thank the NANA Corporation, F. Goodhope, Jr., and the National Park Service for permission to work at Cape Espenberg. Funding was provided by the Outer Continental Shelf Environmental Assessment Program (NOAA) and the Frank M. Chapman Memorial Fund. E. Murphy, D. Norton, R. Pierotti, and J. McIntyre kindly reviewed the manuscript.

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Brood Defense by Female Ring-necked Pheasants Against Northern Harriers.— While conducting Ring-necked Pheasant (*Phasianus colchicus*) research, I twice observed hen pheasants successfully defend their broods against Northern Harrier (*Circus cyaneus*) attack. Both observations were made on Mallard Island, McLean County, North Dakota. The 10 km² island is intensively managed for pheasants. Five nesting pairs of Northern Harriers were observed regularly on the island April through August 1983.

On 5 August 1983 at 1445, while driving adjacent to a field of native prairie, I saw a harrier of unknown sex fly from the ground approximately 30 m away. The harrier circled quickly and as it descended on the area from which it had flown, a hen pheasant flew vertically about 3 m directly at the harrier, possibly contacting the harrier with its feet and wings. The pheasant dropped to the ground, as the harrier veered away and