appear to be attracted to arenas by the presence of grouse of both sexes (see Wiley 1973). Eng et al. (1979) reported that yearling males were the first to be attracted to an artificial arena on which decoys were placed and recorded sounds of displaying grouse were played.

Females were captured on the new arena at a time of year when yearling hens normally predominate on INEL leks; however, breeding phenology was delayed 2–3 weeks in 1982 by adverse weather. Adult females were captured on nearby arenas as late as 18 Apr. and yearlings were first captured on 10 Apr. The delayed breeding season may have caused more overlap in the appearance of yearling and adult hens on arenas and may, in part, explain the success of the new arena in attracting females in 1982. Hannon et al. (Auk 99:687–694, 1982) implicated aggressive behavior of adults as the cause for delayed breeding and greater distances traveled to nest by yearling Blue Grouse (*Dendragapus obscurus*). With reduced competition from adults on new leks, yearling female Sage Grouse could establish more easily a tradition of breeding on new arenas.

The appearance of displaying grouse on recently disturbed sites suggests that natural openings suitable for arenas are limited on some areas of the INEL. Sagebrush-dominated vegetation types cover most of the western INEL but openings occur in playas, shallow basins, and disturbed areas. Of nine arenas within 12 km of the burn site, four occur in playas or basins and five are on burned areas. Eng et al. (1979) stressed the importance of juxtaposition of arenas with winter, nesting, and early brood-rearing habitat. In areas such as the western INEL where sagebrush cover is continuous over large areas and openings are widely spaced, suitable nesting and early brood-rearing habitat may be underused due to isolation from arenas; however, this needs to be demonstrated.

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**Nest usurpation and female competition for breeding opportunities by Tree Swallows.**—Tree Swallows (*Tachycineta bicolor*) are hole nesters that are often limited by nest site availability (Holroyd, Can. Field-Nat. 89:60–64, 1975). Populations generally increase following the erection of nest boxes (Low, Bird-Banding 3:76–87, 1933; Chapman, Bird-Banding 6:45–57, 1935; Holroyd 1975), and competition for nest-sites occurs early in the breeding season (Kuerzi, Proc. Linn. Soc. N.Y. 52–53:1–52, 1941). Territorial defence of the area surrounding the nest-site may further limit the availability of breeding opportunities if more than one nest-site is defended by a single pair of birds. Harris (Can. J. Zool. 57: 2072–2078, 1979) argued that the defense of unnecessary resources (extra boxes) was an example of superterritoriality (Verner, Am. Nat. 111:769–775, 1977). Robertson and Gibbs (Condor 84:313–316, 1982), however, found that territorial defense was not focused on

extra boxes and therefore has probably evolved as the most effective way to defend the single nest-site required for breeding, rather than as a superterritorial strategy.

Clearly, nest-site limitation leads to aggressive interactions among Tree Swallows, and territorial defense can prevent conspecifics from breeding even when unoccupied boxes are present (Harris 1979). It is generally assumed that competition for nest-sites involves defense of the nest by both members of the pair (Harris 1979, Robertson and Gibbs 1982). Here, we report several instances of nest-site usurpation by females. These indicate a lack of cooperative defense by the pair and suggest that females may be competing for breeding opportunities involving a male with a nest-site, rather than a nest-site per se.

During the summer of 1982, we studied the breeding ecology of Tree Swallows at Queen's University Biological Station near Chaffey's Lock, Frontenac Co., Ontario. The study site consisted of four hayfields and a nearby pond. There were 139 nest boxes distributed over this area. In three of the fields and in the pond some of the boxes were arranged in spirals, so that there were boxes 1, 2, 4, 8, and 16 m away from a central box (see Robertson and Gibbs 1982). Additional boxes were interspersed between these spirals with a minimum interbox distance of 16 m. A total of 47 clutches hatched, and an additional eight clutches were incomplete, abandoned, or infertile. The nest box occupancy rate for the entire season was 40% (55/139). Both early in the season, while nest-sites were being established, and later during the incubation and nestling periods, interactions between members of resident pairs, and between resident pairs and intruders, were observed. Eighty-four percent of the breeding females and 46% of the males were color-marked for individual identification.

The first nest-site usurpations occurred on May 12, while most females were building nests. Two color-marked females, female-A and female-B, were attacked and evicted from their boxes by other individuals (one of which was positively identified as a female). Both of the evicted females were in their second or later season after hatching (after-second-year, or ASY), and both had been paired for at least 2 weeks. Following the evictions, the resident females were found on the ground after fighting, too weak to fly and with feathers missing from their crowns and napes. Female-A flew weakly into some nearby brush. Female-B was removed by the observer and placed under shelter, where she later recovered and then flew off. New females were seen with the original males. Female-A was replaced by an ASY female, and female-B was replaced by two females, an ASY and a SY (second–year female, in the first season after hatching). This was the only bigamous mating on the study site. Both ASY females successfully raised broods. The SY female raised a brood of five nestlings, apparently without help, to d 15 and then abandoned the nest after being captured for banding. Abandonment after handling was rare, especially when handling occurred late in the nesting cycle (Burtt and Tuttle, J. Field Ornithol. 54:319–323, 1983), suggesting that this female may have been unusually stressed by having to rear her brood alone. The growth rate of her nestlings was much lower than average (day 14 mean weight = 14.8 ± 2.17 g [SD] [range 12.5–17.5 g] compared with day 14 mean weight = 22.9 ± 1.43 g [range 19.0–26.0 g] for eight other nests with five or more nestlings), indicating that the unassisted female might have been unable to provide sufficient food. Evicted female-A reappeared on May 16 paired with a previously mated male at a nest box 100 m from her original nest. Whether usurpation was involved in this case is unknown. She successfully raised a brood with this male.

A second series of usurpations occurred during incubation. Female-B reappeared on June 5 at a nest box that had previously been occupied by an incubating female, 25 m from her original box. No aggressive interactions between female-B and the displaced pair were witnessed, although the pair remained in the vicinity. Six eggs laid by the previous female had been covered with new nesting material. Female-B subsequently laid a clutch of her own that hatched but was later abandoned. No male was ever seen with female-B during

this nesting attempt. The pair evicted by female-B moved 30 m to a spiral of boxes in which another pair was incubating a seven-egg clutch. After much aggressive interaction, both pairs renested successfully within the same spiral, 16 m apart, with the incoming pair occupying the box containing the clutch of the original pair. They laid their new clutch directly in the nest cup containing the original seven eggs.

The final series of usurpations occurred during the nestling stage, when a number of new SY females arrived in the area. Three paired ASY females were evicted, apparently without aggressive interactions. The males of these three pairs were seen in the company of new SY females and subsequently their ASY mates abandoned their broods. In one of the three cases, however, it is possible that the disappearance of the original female was due to some other cause, since she was not seen again, and may have died. Two of the new pairs raised broods in the same boxes as broods from the previous matings; the dead or dying nestlings had been removed by the observer.

These interactions raise questions concerning the mating strategies of both male and female Tree Swallows. During the study, there was an excess of nest boxes. Boxes less than 18 m from occupied boxes cannot be considered "available" as nest sites, because Tree Swallows defend territories of approximately 18-m radius (Robertson and Gibbs 1982). Nevertheless, 5 of the 22 boxes interspersed between sprirals, which were more than 18 m from other boxes, remained unused. Furthermore, Tree Swallows do sometimes nest less than 18 m apart: Harris (1979) had up to four pairs nesting in a spiral similar to ours, and we frequently had two pairs nesting at either end of a spiral, approximately 18 m apart. This indicates that it could not be a shortage of available nest-sites per se that causes the usurpations. We suggest rather that it is a shortage of males with nest boxes that brings about competition between females.

During the first and third series of usurpations, females displaced one another, while the males remained at the original nest-sites and remated with the successful females. This suggests that males may claim a nest box and territory and allow females to compete to become their mates. Whether there is actually a shortage of males is unclear. Three females did partially raise broods without a partner while unused boxes were available, suggesting that some females were unable to mate monogamously. Further experiments, however, have shown that if new boxes are erected later in the breeding season, they are occupied by mated pairs of Tree Swallows rather than by lone females (Stutchbury and Robertson, Auk, in press). Further study is needed to determine the actual secondary and operational sex ratios in this species.

The pattern of plumage dimorphism in SY birds might suggest an operational sex ratio skewed toward females. Tree Swallows are the only North American passerines in which females have a distinct subadult plumage (Rohwer et al., Am. Nat. 115:400–437, 1980). SY females have a dull brown, juvenile-like plumage, while ASY females and all males have an irridescent dark blue plumage (Low 1933; Kuerzi 1941; Hussell, J. Field Ornithol. 54: 312–318, 1983). Subadult plumage in males occurs in several species of North American passerines, and the analysis by Rohwer et al. (1980) indicates that a shortage of females is one of the most important contributing factors. Delayed plumage maturation in female Tree Swallows may therefore imply a shortage of males, or at least a shortage of breeding opportunities for females. Studies are underway to determine whether the brown plumage of SY females gives them an advantage in gaining access to breeding opportunities.

It is noteworthy that site dominance does not prevent evictions in Tree Swallows. Possibly there is an asymmetry in the ability to forage, and therefore in physical condition, between the incubating/brooding female and the intruding female. In the absence of dangerous weapons, fighting is essentially without risk (Rohwer, Am. Zool. 22:539–546, 1982), and is therefore primarily a battle of endurance (but see Brown, Bird-Banding 48:273, 1977). If

breeding females lose weight (De Steven, Evol. 34:278–291, 1980), their reserves of energy may be depleted by the time later females arrive.

Why males do not defend against intruding females, but rather are willing to mate with them at the expense of losing their initial mate part of the way through incubation or brooding, remains to be explained. This is especially puzzling with respect to intruding SY females, as these have been shown to have lower reproductive success than ASY females (De Steven, Ibis 120:516–523, 1978). In our study, the three males that mated with SY females after the eggs laid by their original ASY mates had hatched all fledged fewer young with the new SY females than they would have had they remained with their ASY mates. This pattern of mate change has also been found in other studies on the Tree Swallow (Shelley, Bird-Banding 6:33–35, 1935).

In our study area, it appears that both parents are needed to fledge a full brood of nestlings (Leffelaar, M.Sc. thesis, Queen's University, Kingston, Ontario, Canada, 1983); perhaps this explains why the three females referred to above did not persist in trying to raise their nestlings alone, while their mates were consorting with new SY females. Two parents may be needed for feeding nestlings because there may be a low food supply in our study area. At Long Point, Ontario, where the food supply is greater, there is evidence of a higher incidence of polygyny. That there is a greater food supply at Long Point is suggested by the lower brood success (75%) found in our study area as compared with that found at Long Point (95% and 88%) by De Steven (1980) and Quinney (1983), respectively. Quinney (Auk 100:750–754, 1983) found several cases where two females were mated with a single male and nested together in a single box. This also supports the contention that the operational sex ratio may be skewed towards females.

Polygyny may thus be a strategy pursued by males under conditions of high food abundance, explaining why males do not assist in defense against intruding females. In areas with lower food availability monogamy may be required. This in turn may have led to female competition for the limited number of potential mates possessing nest sites. Whether the apparent decrease in reproductive success of those males which abandoned their mates during the nestling period is a result of an inferior reproductive strategy, or is due to some other as yet unknown factor, has yet to be determined.

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**Wintering Bald Eagles along the Rio Yaqui, Sonora, Mexico.**—Wintering Bald Eagles (*Haliaeetus leucocephalus*) in Mexico have been recorded only from the coasts of Baja California and from the Sonoran coast of the Gulf of California (Brown and Amadon, Eagles, Hawks and Falcons of the World, Vol. 1, McGraw-Hill, New York, New York, 1968). Inland sightings of Bald Eagles in western Mexico are rare, and wintering areas for the species west of the continental divide have not been reported, probably because ornithologists visit the area infrequently (G. Monson, S. M. Russell, pers. comm.). This note provides information on the status of Bald Eagles wintering along the Rio Yaqui drainage of Sonora, Mexico.

Controlled water releases since construction of a dam in the mid-1960s guarantee relatively