mated male rosy finches is well documented (French, op. cit.; Johnson, Auk 82:190–205, 1965; Twining, Condor 40:246–247, 1938).

An analysis of the courtship display described above seems premature, therefore I wish only to suggest a possible origin of the display based on my first impression. Hinde (Ibis 97:706–745, 1955; 98:1–23, 1956) summarizes an analysis he made of the courtship behavior of several species of finches, in which he concludes the male courtship displays are modified forms of the head-forward threat posture. My impression of the display of the male rosy finches is its similarity to the juvenile begging response, particularly the fluffed feathers, wing fluttering, and constant chirping. Morris (Behaviour 9:75–113, 156) mentions that in Estrildine finches feather postures are used as social signals, and a fluffed body posture can eliminate normal individual distances maintained by conspecifics, thus allowing individuals to approach one another until touching, without fear of attack. It seems possible that the display used by a male rosy finch acts to neutralize the expected agonistic response of the female upon his approach, and may even invite her closer approach. Male aggressiveness during courtship attempts, which Hinde (op. cit.) documents in a variety of Fringillids, may be more readily apparent earlier in the season.

Flight display.—Packard (op. cit.) includes observations by R. J. Niedrach of a "conspicuous song flight" that occurs during the mating season. I have observed this "song flight" perhaps a dozen times. In undulating fashion the male Brown-capped Rosy Finch flies a large horizontal arc or circle traveling several hundred meters, chirping (described in my field notes as a guttural *churk*) as he flaps his wings. During the breeding season rosy finches are often scattered throughout a cirque or basin making it difficult to visually locate conspecifics for courtship. The "song flight" of rosy finches may have the same function as the advertising song of other species (see Tinbergen, Trans. Linn. Soc. N.Y. 5:1–94, 1939) in that it serves to attract or locate potential mates. Finches on the ground often respond vocally to others flying overhead or nearby.

The vocal flight display of Brown-capped Rosy Finches may have evolved due to other selective parameters of the alpine environment. Morton (Am. Nat. 108:17–34, 1975) presents an argument for the ecological selection of non-ground song displays used by many grassland and tundra birds based on the effects of wind turbulence and solar radiation on sound propagation from the ground. It seems possible that the acoustic properties of an alpine environment, subjected to similar wind and temperature effects as grasslands and tundra, may have a similar selectivity for aerial song displays in alpine nesting birds. It is interesting to note that Horned Larks (*Eremophila alpestris*) and Water Pipits (*Anthus spinoletta*), both of which nest in alpine areas where rosy finches are found, also have flight displays (Verbeek, Wilson Bull. 79:208–218, 1967; Verbeek, Auk 87:425–451, 1970).

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Effects of nest removal on Starling populations.—Starlings (*Sturnus vulgaris*) commonly compete with Wood Ducks (*Aix sponsa*) for nesting boxes. Bellrose and McGilvrey (Wood Duck Management and Research: A Symposium, pp. 125–131, Wildl.

Manage. Inst., Wash., D.C., 1965) reported Starlings destroyed 23.8 and 20.6% of Wood Duck nests in Illinois boxes in 1963 and 1964 respectively, and usurped a large number of other boxes before Wood Ducks could use them. A similar situation has been reported by Muncy and Burbank in Tennessee (Proc. Southeastern Assoc. Game and Fish Commissioners 29:493–500, 1975).

We conducted a Wood Duck nesting study at 10 sites in eastern Massachusetts during 1967–1973. Boxes were checked every 7 to 10 days between 1 April and 4 July and Starling nests removed. Starlings are persistent nesters. If a nest with a partially completed clutch is destroyed, the hen is capable of reconstructing the nest within a day and will frequently complete and incubate her remaining clutch (Kessel, Am. Midl. Nat. 58:257–331, 1957). If an incubated clutch is destroyed, the hen will begin a new clutch in 6–9 days (Royall, Condor 68:196–205), 1966). Consequently, we removed many more nests than there were pairs of Starlings present. Since individual Starlings were not marked, we did not know how many pairs may have used a given box. Observations on the stage of nest and clutch completion from 1 week to the next indicated that more than 1 pair of Starlings used some boxes. Once incubating Starlings were captured in a box and bird and clutch destroyed each week for 3 consecutive weeks. There was a 4th clutch the following week.

Figure 1 graphs the number of duck boxes used by Starlings and the total number of nests removed during the 1967–1973 period and for 3 years following when boxes were checked irregularly. It also shows the number of boxes used by Wood Ducks and Hooded Mergansers (*Lophodytes cucullatus*) during the same time span.

Starlings used 47 boxes on 7 sites in 1967 and 146 nests were removed. Nesting stages varied from nearly completed nests to completed clutches being incubated. Eight sites had Starling nests in 1968 and all 10 sites were used in 1969. The first results of the Starling nest removal program were noted in 1970 on a pond in Holden, Massachusetts. Starlings used 3 boxes on the pond in 1967, 2 in 1968, 1 in 1969 and did not nest in any box thereafter. Starlings nested on 6 sites in 1971, 4 in 1972, and in 1973 only 3 sites had Starlings; 21 nests were removed from 10 boxes in 1973.

During 1974–1976, Starling nests were removed when encountered, but checks were infrequent. As a result, a few broods were successfully fledged. Nests were started on 6 areas in 1974 and on 7 in 1975, but only 4 of these areas were used both years. The same 4 areas were the only ones used by Starlings in 1976. The minor increase in nests removed in 1975 (Fig. 1) is due to 1 site where boxes were checked every 3 to 4 days during May. As a result, 22 partially completed nests were removed from this area alone.

Kessel (op. cit.) states that Starlings suffer a 50% annual mortality and that the turnover period for a cohort to shrink to an insignificant portion of the population is 6 years. Assuming that the actual Starling population fell somewhere between the number of boxes used and nests thrown out (Fig. 1), it is apparent that the major portion of the Starling population was eliminated after 4 years of nest removal. Since reproduction from boxes was prevented during the 1967–1973 period, an influx of birds from surrounding areas was probably responsible for maintaining a small population.

Kessel (pers. comm.) indicated that in New York during the mid-1940s, there were always Starlings available from surrounding areas to take over vacated nest sites. We did not determine what the population levels were on areas surrounding our study sites, but current Massachusetts Breeding Bird Atlas data indicate the Starling is the second most common breeding bird in the state (R. Forster, pers. comm.). The fact that Starling production was eliminated on several of our study sites may have been due

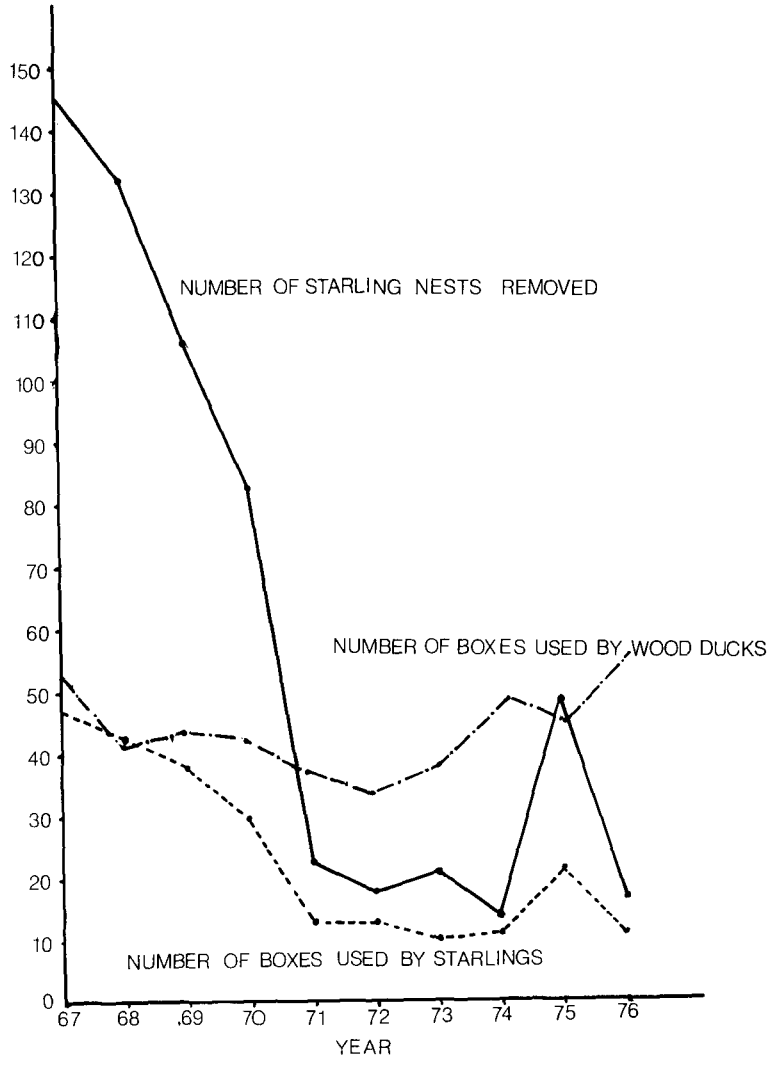

FIG. 1. Number of Starling nests removed from Wood Duck boxes and number of boxes used by Wood Ducks and by Starlings.

to the areas holding isolated populations which, when removed, were not replaced. However, we cannot offer any definite reason for this occurrence.

The Starling control program did not increase waterfowl production. As many ducks used boxes in 1967 as in 1976 (Fig. 1). Duck production remained practically unchanged on 4 sites, increased on 3, and decreased on 3. However, many other factors

also affected production during this period including water drawdowns, nest predation, local hunting pressure, and vandalism. We believe that duck production would have decreased during the 10-year study period had we not removed Starling nests since Starling competition for boxes has been increasing since the early 1950s (Grice and Rogers, The Wood Duck in Massachusetts, Mass. Div. Fish. and Wildl., 1965).

Nest removal appears to be an effective but time-consuming method of controlling Starling populations in Wood Duck boxes. The use of Starling-deterrent nesting cylinders described by McGilvrey and Uhler (J. Wildl. Manage. 35(4):793–797, 1971) was evaluated by Heusmann et al. (Wildl. Soc. Bull. 5:14–18, 1977) previously. Grabill's (Wildl. Soc. Bull. 5:69–70, 1977) use of Starling boxes attached to Wood Duck boxes offers a third possibility for reducing competition for nesting sites between these species.

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Unusual incubation behavior in Bobwhite.—A Bobwhite (*Colinus virginianus*) nest with an incubating hen was found on 26 September 1975, 8 km west of Starkville, Mississippi. The Bobwhite begins nesting in May in this area and this nesting effort was perhaps the pair's 4th attempt. The nest and incubating hen were visited daily. On 3 October, when I attempted to photograph the hen on the nest, she left the nest giving the broken-wing ruse. The hen ran about 35 m from the nest and was joined by a male Bobwhite. The pair then flew off.

The nest contained 10 eggs, 1 of which proved to be infertile. One egg had successfully

FIG. 1. Partially hatched Bobwhite eggs with dead chicks.