A Natural Occurrence of Foster Parenting by a Female Mountain Bluebird

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In recent years, much attention has been devoted to the question of altruism in birds (e.g. Trivers 1971; Power 1975, 1981; Pinkowski 1978a; Pierotti 1980; Ligon 1983). In a study of potential altruism in Mountain Bluebirds (*Sialia currucoides*) in Montana, Power (1975) found that after removal of 13 female "consorts," 2 were subsequently replaced, with 1 of these females helping the male raise his offspring. Here we describe a natural occurrence of foster-parenting where a female Mountain Bluebird abandoned her empty nest and cared for a brood after the mother disappeared. These observations were made in 1982 during a radiotelemetry study of Mountain Bluebirds breeding in nest boxes near Central City, Gilpin Co., Colorado.

On 8 June we captured, weighed, measured the wing length, and banded a territorial male (M287) and his mate (F287) after incubation had started in box 287. At the same time, we attached a 2.3-g leghold transmitter of the type used by Bruggers et al. (1981) to the male's right tarsometatarsus. The activities of this pair were then monitored for 2–3 h each day, both visually and by radiotelemetry.

On 13 June the male expanded his territory and began associating with a noticeably smaller, paler, and unbanded female (F200), but the first female (F287) did not go outside the original territory. From 14 to 19 June, F200 constructed a nest in box 200 within the male's original territory and about 100 m from, but in clear view of, box 287. The male continued to occupy his expanded territory, and foraged with and fed F200; however, whenever F287 foraged the male joined and escorted her. Close association of the breeding pair is the rule in Mountain Bluebirds during the incubation period (Power 1980). Several times we saw all 3 birds foraging within 15 m of each other without either female behaving aggressively, which is unusual in bluebirds (Pettingill 1936; Power 1966; Pinkowski 1974, 1976; Gowaty 1981).

On 20 June 4 of the 5 eggs in box 287 hatched. Between 20 and 25 June, the male continued to forage with both females and also helped care for the nestlings, thus spending less time with F200. F200 had not laid eggs, so we refrained from capturing her to avoid the risk of desertion.

On 26 June F287 disappeared, box 200 was abandoned, and a pale female with the appearance and foraging-behavior characteristics of F200 was seen helping the male care for his nestlings. She fed and brooded the nestlings and removed fecal sacs. Initially, F200 foraged in areas that were familiar to her (i.e. areas adjacent to box 200 and in the male's expanded territory). However, within a day she began foraging with the male in the area previously used by F287. On 27 June we captured the presumptive F200 in box 287 for measurements and banding. She weighed 27 g as compared to a mean of 32.2 g (SD = 2.7) for 6 other females weighed at about the same time. F200 and M287 continued to care for the nestlings, which we banded on 1 July. We presume, from the subsequent condition of the nest, that they fledged on or about 10 July. The nestlings fledged relatively late in the breeding season, and neither F200 nor M287 renested.

We cannot be certain what motivated F200 to care for another female's offspring, or whether her behavior was adaptive. The male had fed and escorted her, and she had constructed a nest. Combined with the nestlings' begging and the male's continued efforts to care for the nestlings, these presumably were sufficient to stimulate F200 to care for the nestlings (Lorenz 1937, Tinbergen 1956, Power 1975).

The fostering behavior of F200 toward the nestlings could be considered reproductive error (Wetherbee 1933a; Batts 1958; Carr and Goin 1965; Scott 1971; Pinkowski 1976, 1977a, 1978b; Bender and Bender 1983; Tripp 1984), kin selection (Mills 1931, Nice 1931, Wetherbee 1933b, Laskey 1939, Pinkowski 1975, Wilson 1975), or reciprocity (Pinkowski 1978a, Pierotti 1980, Ligon 1983). With only 1 yr of data, we were not able to evaluate these possibilities.

However, we can consider these alternatives in relation to previously published reports on Mountain Bluebirds, related species, and other birds. When Power (1975) intentionally removed Mountain Bluebird consorts, only 1 female helped a male care for his nestlings. Power attributed her actions to reproductive error. Both Williams (1966), in considering similar situations, and Power believe the female was in a hormonal state that stimulated misdirected parental behavior by offspring that were not her own. Many other authors have reported bluebirds feeding the offspring of other passerine species. In addition, Power states that because of the infrequency of foster-parenting, "altruistic behavior is rare and best be interpreted as an occasionally inevitable reproductive error."

Kin selection must also be considered because of the lack of aggressive behavior between the females (Power 1966; Pinkowski 1974, 1976). Pinkowski (1975) reported that a yearling male Eastern Bluebird (*Sialia sialis*) helped his parents rear their young. Mills (1931) reported that Mountain Bluebird juveniles from a first

brood assisted their parents in feeding nestlings of a second brood. Wetherbee (1933b), Laskey (1939), and Brown (1981) also reported that juvenile Eastern Bluebirds assisted their parents in feeding a second brood. First-brood juveniles that assist their parents in caring for a second brood may be benefiting themselves as well as the nestlings. The juveniles' foraging skills will be increased, and they will gain experience in caring for future offspring of their own. In addition, they may be allowed to stay in a more familiar area, with the added safety of additional eyes and ears afforded by a family group.

If F200 was not a close relative of F287 or M287, which is reasonable if outbreeding is favored (Power 1975), reciprocity may have prompted F200 to assist the male in caring for the nestlings. Pinkowski (1978a) states that a "male Eastern Bluebird enhanced his chances for gene perpetuation by behaving in an apparently altruistic manner" when he assisted a widowed female in caring for her nestlings. In addition, Pinkowski states that "this male acquired a mate, territory, and a nest site in an area where these nesting requisites are in relatively short supply after the nesting season begins." Pierotti (1980) also states that "an unmated female that helps a male to raise his offspring may solidify a pair bond between them, and guarantee herself both a mate and a breeding site for subsequent years," and in doing so "she would probably increase her personal fitness with only a small personal cost."

During some years in this study area, Mountain Bluebirds have raised a first brood and renested to raise a second brood (Cohen pers. obs.). However, F200 did not display the breast streaking characteristic of juveniles, indicating she was at least a yearling (Ridgway 1907). Bluebird yearlings tend to arrive later at breeding areas than older birds (Pinkowski 1976, Herlugson 1981) and are less likely to secure a mate and breeding territory (Hensley and Cope 1951, Pinkowski 1977b, Herlugson 1981). Evidence for other passerines also suggests F200 was a yearling. Cohen (1978) states that yearling Tree Swallows (*Tachycineta bicolor*) arrive later at breeding areas than older birds. Yearling American Redstarts (*Setophaga ruticilla*) and House Wrens (*Troglodytes aedon*) are less likely to secure a mate and breeding territory, and "young birds move from one locality to another to compensate for unevenness of abundance" (Kendeigh and Baldwin 1937, Ficken 1962). De Steven (1977) states that yearling Tree Swallows weigh less than older birds, and Cohen (unpubl. obs.) believes yearling Tree Swallows are more likely to be recruited as replacement mates.

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Food Habits of Long-eared Owls (*Asio otus*) at a Communal Roost Site During the Nesting Season

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Food habits of Long-eared Owls (*Asio otus*) have been investigated both for nesting pairs of owls and nonnesting birds (e.g. Marti 1976, Sonnenberg and Powers 1976, Marks and Yensen 1980). In addition, communal winter roosting of this species has been documented (Randle and Austing 1952, Craighead and Craighead 1956: 443, Hilliard et al. 1982). However, we have not found literature references to communal summer roosts of Long-eared Owls. This paper reports on a large communal roost of Long-eared Owls in the summer of 1982 and describes the food habits of the owls as determined from castings found at the roost.

The roost site was located in southeastern Idaho along a small, dry channel of Birch Creek. The creek is located on the Idaho National Engineering Laboratory (INEL), a government reservation approximately 75 km northwest of Idaho Falls, Idaho. Cool desert habitat, with big sagebrush (*Artemesia tridentata*)-grass associations predominating, surrounds the creek. Similar vegetation covers the creek bed, although the growth is more dense and is interspersed with a few clumps of low-growing birch trees (*Betula* sp.) and willows (*Salix* sp.).

On two visits to the area (16 April and 12 May 1982), we flushed 2 Long-eared Owls from willows along the creek. On a third visit to the area on 2 June, we found 3 Long-eared Owl nests and flushed approximately 40 Long-eared Owls along 400 m of creek bottom. We visited the 3 nests on 18 June and found 1 empty and 2 containing 3 young each. We also flushed a minimum of 28 owls in the vicinity of these nests (14 from one nest site). On another visit to the area on 21 June, we captured 13 adult owls in mist nets placed along the creek bottom. Two of these owls died during banding, one apparently from injuries incurred in striking a net, while the other probably died from heat prostration. Twelve of the 13 owls were weighed and banded. By comparing the weights of the owls to those given in Snyder and Wiley (1976), we determined that 8 males and 4 females were captured. On our last visit to the study area on 28 June, we again saw a large number of owls and collected about 2,500 castings from roost sites along the creek bottom. Most of the castings were well formed and appeared less than 3 months old.

The castings were soaked in a weak NaOH solution and sieved through screen wire and 0.3-cm hardware

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