NESTING AND OTHER HABITS OF THE BOLIVIAN BLACKBIRD (*OREOPSAR BOLIVIANUS*)

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The Bolivian Blackbird (*Oreopsar bolivianus*), a poorly-known, endemic species in the Departments of Cochabamba, Potosí, and Chuquisaca, Bolivia, was described less than 40 years ago (Sclater 1939). Additional locality records have been published by Carriker (*in* Bond and Meyer de Schauensee 1942), Meyer de Schauensee (1966), and Vuilleumier (1969), but nothing has been recorded of its ecology and behavior, and no published reports describe its nest. In this paper we report our observations on *Oreopsar*, its nest and nest sites, and its unusual social organization near Cochabamba.

STUDY AREA AND METHODS

As described by Vuilleumier (1969), *Oreopsar* inhabits only dry intermountain valleys in canyons with steep cliffs. We failed to find it anywhere in the general region of Cochabamba if cliffs were not present even though other aspects of the general vegetation seemed similar. Where we found *Oreopsar*, the steep canyon sides supported very sparse vegetation of bunch grasses (*Stipa* spp.) and small shrubs, especially *Aspidosperma* (Apocynaceae) and *Dodomea viscosa* (Sapindaceae). The canyon bottoms had a denser vegetation of *Prosopis*, *Schinus*, *Acacia*, *Carica*, and other shrubs interspersed with large cacti (*Cereus*) and a sparse growth of grass (fig. 1). All areas were heavily grazed by goats.

The climate of Cochabamba is moderate. The mean temperature of the coldest month (July) is 14°C while that of the warmest month (November) is 21°C. A long dry season extends from April to October with the heaviest rains, averaging about 100 mm per month, falling during December, January, and February. We made our observations at the end of the rainy season, when vegetative cover was probably at its annual maximum, and grasses were setting seed.

Most of our observations were made in the valley of the Río Rocha near the town of Parotani, at an elevation of 2,440 m, 28 km WSW of Cochabamba (17°33′ S, 66°20′ W). We spent most of six days (18–23 April 1974) watching birds in two different flocks. With the help of additional people on several days, we maintained simultaneous watches on nests and foraging birds. Motion pictures, supplemented by field sketches, were used as the basis for drawings of displays. We made recordings of vocalizations using a Sony Model TC-800B tape recorder operated at 7.5 inches per second and analyzed with a Kay Electric Co. Sonograph using the wide band selector. We searched for arthropods where birds were seen foraging and swept bushes with a standard insect sweep net to obtain samples of prey. We have no information on activities of the birds or availablity of prey at other seasons.

SOCIAL ORGANIZATION

As reported by previous observers, we found Bolivian Blackbirds to be living in small flocks. Vuilleumier's (1969) observations were made in December and January, probably prior to breeding. Although the birds in our study area were breeding at the time of our observations, they were living in three apparently resident flocks. It was difficult to determine the exact number of birds in each flock as we had no color-marked individuals and because assemblages repeatedly changed size during the day. The River Flock had only four birds, the Quarry Flock, on which we made most of our observations, probably had eight individuals, and the Ridge Flock probably six. Casual observations of other groups of Bolivian Blackbirds suggested that this number was typical of flocks in the Parotani area. Each flock appeared to occupy an exclusive area. When the birds of two different flocks came together at presumed boundaries, they called loudly and the flocks then separated. Each flock had a set of cliffs, ridges, and valley bottoms that it traversed regularly. Some areas, presumably those that held the most food at the time, were visited repeatedly.

A probable reason why *Oreopsar* is restricted to areas with cliffs appeared when we discovered a nest site in a crevice on a rock face in an abandoned quarry on 18 April. Cliff nesting was also reported (Sclater 1939) for a breeding pair of *Oreopsar* collected on 30 May 1901 near a river, but it is not evident that a nest was actually found by the collector. Though it was possible to climb to the site (fig. 2), the crevice was too deep for us to reach the nest. We watched the quarry intensely 20–23 April during which time one bird was apparently incubating within the crevice. On 20 April there were seven periods

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FIGURE 1. Typical habitat of the Bolivian Blackbird near Parotani, Bolivia. Most of the Quarry Flock range is shown in the photograph.

FIGURE 2. Nest site of the Quarry Flock. Arrow indicates nest crevice.

when the incubating bird left the nest to feed between 1015 and 1550. They averaged 11.7 (± 4.9) min in duration while spells on the nest were much longer ($\bar{x} = 35.4 \pm 6.7$ min). On 21 April we noted six periods off the nest between 0930 and 1555, the periods off averaging 17.7 (± 4.5) min and the periods on the nest 46.8 (± 10.8) min. We concluded that only one bird was incubating because patterns of leaving and returning to the nest were so regular. Had different individuals been incubating we would have expected a less regular pattern and perhaps occasions when a replacement bird would have arrived while another was still on the nest. On 23 April no bird entered the crevice all day.

On 20 April a bird other than the incubating female entered the nest crevice three times with what appeared to be nesting material in its bill; each time it emerged still holding the material and left the cliff before dropping it. At 0921 on 22 April the incubating bird left with what resembled a piece of egg shell or fecal material in its bill, but we saw no other material removed during the observation periods. At 1454 on 20 April one bird entered the crevice with a green caterpillar but left a few seconds later still holding it. To the best of our knowledge no bird was on the nest at the time. The presumed incubator was sitting on top of the quarry, having just returned with the bird with the caterpillar. On 21 April, however, a bird came to the quarry with a large, grey, winged insect when a bird was known to be at the nest. The visitor entered the crevice and came out quickly without the food. This is the only time during 18 h of observation that we saw a bird enter the crevice with food when another bird was known to be at the nest.

The incubating bird, thought to be a female because she was slightly smaller and duller (Sclater 1939) than the bird in whose company she usually arrived, was alone at the nest site most of the time she incubated. After a bout on the nest she would leave, give a series of loud, clear whistles, and then fly to the flock, presumably being guided by their calls. On her return she was usually accompanied by two other birds, one of whom appeared to be her mate. He always flew to the quarry rim and remained there for a while after she entered the crevice. The third bird, less closely associated with the other two, usually left the quarry sooner to rejoin the flock, but we do not know if it was the same individual each time. When the third bird brought food to the crevice on 21 April the presumed mate was present.

The nest of the River Flock (fig. 3) was not discovered until the morning of 22 April. We watched it during the afternoon for 1.5 h during which time one bird, who appeared to be incubating, left to feed four times. Although our observations on that nest were scanty, we think that only one bird of the four incubated. When it returned to the nest it was accompanied by a second bird that remained on the cliff above the nest for a short time before leaving.

DESCRIPTION OF NEST AND EGGS

The nest of the River Flock with a clutch of three eggs was collected on 23 April. Situated about 50 cm back in a narrow crevice, it was rectangular in general outline, being molded to the shape of the crevice (fig. 4) and was built of tough fibers, mostly fine roots prob-

FIGURE 3. Nesting cliff of the River Flock. Arrow indicates nest site.

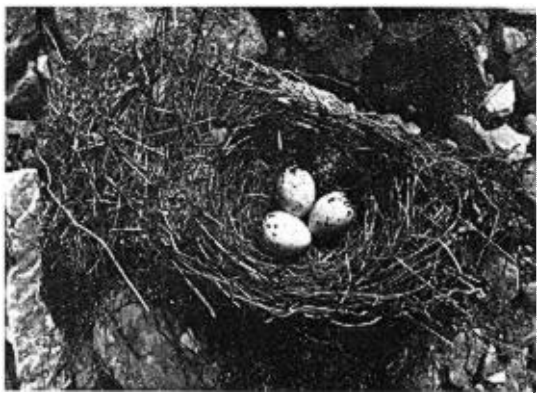

FIGURE 4. Nest and eggs of *Oreopsar bolivianus*, extracted from River Flock nest crevice, Parotani, Bolivia, 23 April 1974.

ably extracted from the sides of the cliffs. The cup, lined with fine, dry grass stems, was 7.1 x 8.9 cm at the rim and 5.1 cm deep. Two black feathers were part of the lining. Because the crevice at the nest site was only about 7.6 cm wide, the cup had almost no material on the narrow sides, but at the long ends it extended into a coarse pile of fine stems and grass plumes that almost filled the crevice behind and in front of the nest.

The three eggs measure 28.0 x 19.9 mm, 25.9 x 19.2 mm, and 25.8 x 19.6 mm. Their ground color is a pale, greenish-grey (Royal Horticultural Society Colour Chart, 1966, greyed-green group 190-D) with spots and streaks of grey (RHS grey group 201-C) and a small amount of brown (RHS greyed-orange group 165-A) and larger blotches of black (RHS black group 202-A). These markings occur over all surfaces of the eggs but are concentrated at the larger end, with the markings being largest on the largest egg. The clutch has been deposited in the collection of the Western Foundation of Vertebrate Zoology, Los Angeles, California (WFVZ #91,576).

FOODS AND FORAGING

In the Quarry Flock the incubating bird quickly joined other flock members when she left the nest to feed. Although she gathered food for herself, she regularly begged from and was fed by other flock members. By stationing observers at the nest, with the flock, and at an intermediate position, we were sometimes able to follow the incubator as she joined the flock. On 21 April she left the nest at 1429, followed two birds, and joined a flock of five foraging on bare ground among sparse bunch grass on the canyon slopes. At 1440 she begged from another bird, her bill pointed upward, mouth open, and wings fluttering. The other bird fed her a large insect that it had in its beak. On 22 April we observed begging and feeding 12 times over a cumulative 42-min period, but we could not be certain that only one bird was begging. However, a single bird was fed five times in one minute by four different flock members. We never saw a bird with food refuse to feed a begging individual.

At the time of our observations most grasses had ripe seeds, and the blackbirds spent much time eating them. These were taken by flying or hopping upward, grabbing the inflorescence with the bill, holding it during descent, and then grasping the stem in one or both feet while seeds were removed. Birds fed on grasses in this manner every day that we watched them, preferring to forage on steep slopes where little else grew besides bunch grasses (*Stipa*). These areas are unlikely to provide much food at other times of the year, however. When foraging on the ground, birds adopted a tail-up, wings slightly drooped posture typical of many species of icterids (Nero 1956, Orians 1961).

On 20 and 21 April we watched several birds eating fruits of a large, arborescent cactus, *Cereus* sp. We also observed them gleaning among leaves and branches of small shrubs, especially *Dodomea*, and gaping into bromeliads (*Tillandsia*) growing on high branches of *Prosopis* trees. One bird was seen

foraging on branches of a small, lanceolate-leaved composite (*Biguera* sp.?) by sidling up a plant toward the leaves until the stem bent over. With fluttering wings the bird rode the stem to the ground and then apparently gleaned insects from leaves. Birds gaped to extract prey from crevices and the bases of small shrubs. Though our observations are limited, they show that Bolivian Blackbirds make extensive use of gaping movements while foraging, as is typical of most icterids (Beecher 1951).

We censused potential prey by turning over rocks, probing into the bases of grasses, and investigating the most commonly visited foraging sites. Wolf spiders (Lycosidae) and ants were very common in crevices. On the ground, spiders were impressively common, visual estimates being as high as 5–10 per m^2. We found two species of acridid grasshoppers (most still nymphs) regularly but not commonly among grass clumps. Larval and adult ant lions (Neuroptera: Myrmelionidae), an unidentified adult pierid butterfly and several species of small moths were also found. Small, brown moths were quite common in crevices and in the bases of grass clumps, sites frequently probed by blackbirds. In webs of Black Widow spiders (*Latrodectus*) we found discarded integuments of two species of scarab beetles (Scarabeidae) and two species of darkling beetles (Tenebrionidae).

BEHAVIOR

Though Bolivian Blackbirds doubtless have several patterns of behavior we did not observe, our presence during the breeding season enabled us to see many displays and hear a number of vocalizations, none of which has been reported previously.

VOCALIZATIONS

Churr. A harsh call of three to four rapidly repeated notes. It is commonly given by birds in flight, but we did not detect any special circumstances surrounding its use.

Chu-pee. The common flight call of the Bolivian Blackbird. It is a loud, clear deliberate whistle, the second note of which is much higher than the first (fig. 5A). Birds in a flock always give this call when taking off, whereas solitary birds usually depart silently. The call carries long distances, and foraging flocks are readily located by their constant calling as they move along cliffs and ridges.

Tew. A single-noted, clear whistle heard several times from perched birds. We lack details concerning the circumstances under which it is used.

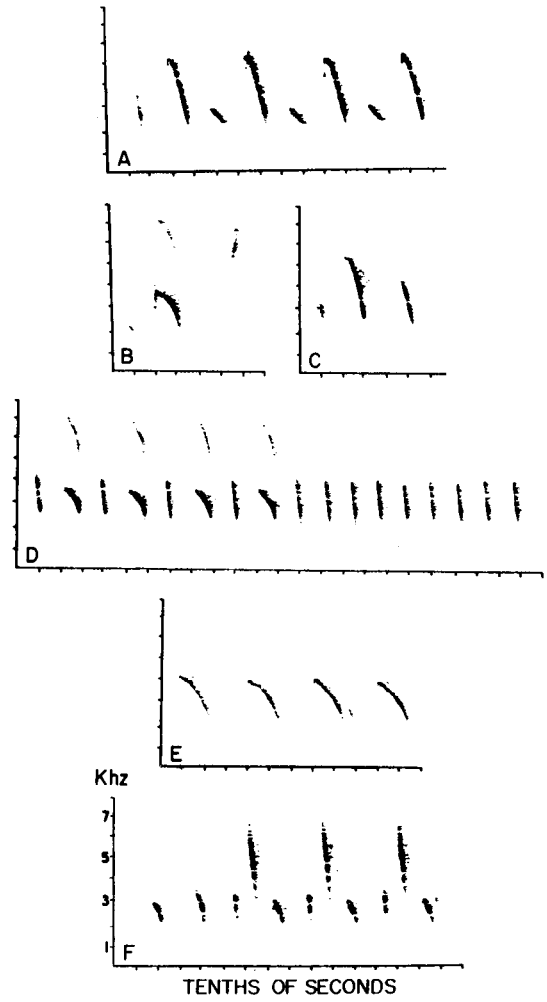

FIGURE 5. Vocalizations of *Oreopsar bolivianus* recorded 20 April 1974 at Parotani, Bolivia. (A) Chu-pee. (B) Chu-pee-tit. (C) Chip. (D) Chip-chip-chip. (E) Cheep. (F) Song.

Chu-pee-tit. Similar to the shorter chu-pee (fig. 5B) and given in flight by birds in groups. Calling by one individual apparently stimulates other flock members to give the vocalization.

Chip. A short, sharp alarm note accompanied by a rapid upward flick of the tail (fig. 5C). It is commonly given by birds around nest sites and when human observers approach a foraging flock. It is similar to single-noted alarm calls of most icterids.

Ch-ch-ch-ch-ch-ch. A harsh, churring call accompanied by rapid wing flips. Interspersed with chips, it may also be a part of long songs.

Chip-chip-chip-chip-chip-chip. A rapid sequence of sharp chips which is a common song pattern of the Bolivian Blackbird (fig.

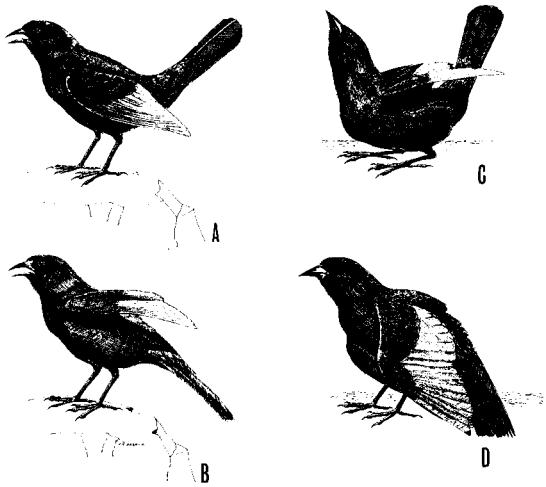

FIGURE 6. Perched displays of *Oreopsar bolivianus*. (A-B) Song posture. (C) Courtship posture of male. (D) Male drooped-wing display.

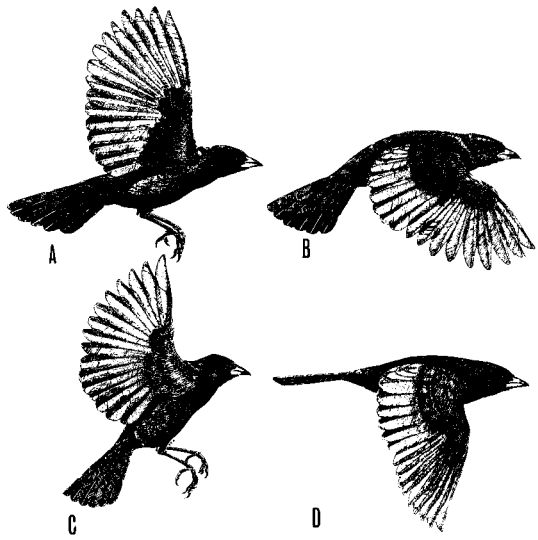

FIGURE 7. Flight displays of *Oreopsar bolivianus*. (A-B) Deep wingbeat flight. (C) Normal landing posture. (D) Normal flight.

5D). Chu-pits are regularly included in these sequences, which usually consist of several chips, then one or two chu-pits and then more chips. As mentioned previously, the tail is flicked upward during chips, while the wings are flicked during chu-pits.

Cheep-cheep. A loud flight call usually given in bursts of two or more (fig. 5E). It is especially noticeable when birds are starting flight.

The flight call of the incubating female leaving the nest was usually very complex. It typically began with two chips, followed by a churr, then a couple of chu-pits, and then more churrs. The female gave this call during most departures from the nest, but occasionally she left silently.

Hawk alarm call. A thin, seedy, high-pitched call typical of the hawk alarm calls of most passerines. Once, when a foraging kestrel (*Falco sparverius*) dashed past two foraging individuals, we heard this call, but we did not hear it at any other time and were not able to record it.

POSTURES

Song posture. The song begins with a sharp *chip* call repeated several times and accompanied by a rapid upward flick of the tail. This is followed by several *chu-pits* accompanied by a rapid upward flick of both wings (fig. 6 A, B, and 5F). The song ends with another *chip* also accompanied by an upward tail flick. The presumed mate of the incubating female at the quarry nest sang in this manner repeatedly from both the quarry top and from *Schinus* trees nearby. We also observed singing birds in flocks away from any known nest sites.

Courtship. A courting male raises his tail without spreading it, points his bill upward at angles greater than 45° and flips his wings upward while calling (fig. 6C). There was no significant erection of contour feathers during any of the few displays ($n = 3$) of this type we observed.

Begging. While begging, the female pointed her bill upward and fluttered her wings—a pattern very similar to male courtship behavior.

Drooped wings display. On 20 April a bird on the top of the quarry with nesting material in its bill drooped its wings, lowered and mildly spread its tail and ruffled its rump feathers (fig. 6D). It then proceeded to play with the nest material and assumed a solicitation-like posture with its tail up. This display was only seen once, and its significance is not clear.

Deep wingbeat flight display. A deep wingbeat flight display was given regularly by the incubating female when leaving and returning to the nest and by the male that accompanied her as he flew to the quarry rim. During this flight, which is slow and labored, the brown primaries are very conspicuous (fig. 7A, B, and C) compared to the normal flight pattern (fig. 7D). The brown primaries are also very conspicuous when birds spread their wings to slow their descent into a canyon. The deep wingbeat flight display has probably been derived from these normal

braking movements just as the territorial flight displays of Redwinged Blackbirds (*Agelaius phoeniceus*) probably evolved from normal landing movements (Orians and Christman 1968).

DISCUSSION

The use of cliff nesting sites is rare among icterids. The Mona Island population of the Yellow-winged Blackbird (*Agelaius xanthomus*) nests on cliffs, and some populations of this species on Puerto Rico also use cavities in trees (Post 1976). Bay-winged Cowbirds (*Molothrus badius*) nest in various places, including holes and crevices (Friedman 1929, Orians et al., in press). In the potholes of eastern Washington, Brewer's Blackbirds (*Euphagus cyanocephalus*) occasionally build nests on small ledges in basaltic cliffs. To our knowledge, these are the only cases of crevice or hole nesting reported for icterids, and no other species appears to be confined to such sites. Possibly, Bolivian Blackbirds use other sites, but our failure to find them where cliffs were absent suggests that cliffs may be a requirement. When foraging, Bolivian Blackbirds seem to seek out areas associated with cliffs and steep slopes. If these are, in fact, the best foraging areas, then cliff nesting might be strongly favored because such safe sites are commonly close to good foraging areas.

Similar nest sites and plumage patterns are found in the Redwing Starling (*Onychognathus morio*), which breeds in arid canyons in East Africa (Rowan 1955, Williams 1963), and (in Nairobi, at least), also nests on buildings. The breeding unit in this species is a territorial pair, though flocks of non-breeders are present throughout the year (Rowan 1955).

If groups of Bolivian Blackbirds defend exclusive areas, then loud, conspicuous calls should be advantageous since foraging birds often are out of sight of one another. Isolated birds call loudly when attempting to join a flock, and moving flocks can be located at long distances by their constant calling. Very similar vocalizations are characteristic of other medium-sized flocking birds, such as the Alpine Chough (*Pyrrhocorax graculus*) (Orians, pers. observ.), Piñon Jays (*Gymnorhinus cyanocephalus*) (Balda and Bateman 1971), and also of the Redwing Starling (Rowan 1955).

Although our observations were limited to one week during the breeding season, the restricted range of the Bolivian Blackbird and its apparently stringent nest site requirements suggest that the birds are probably resident on permanent flock territories. Therefore its social system may be comparable to that of other species in which there are more or less permanent flock territories and into which the young enter, e.g. the Florida Scrub Jay (*Aphelocoma c. coerulescens*; Woolfenden 1975), the Mexican Jay (*Aphelocoma ultramarina*; Brown 1970, 1972, 1974), the Australian Magpie (*Gymnorhina tibicen*; Carrick 1963), and the Australian Bell Miner (*Manorina melanophrys*; Swainson 1970). As in these species, apparently only one pair of birds is reproductively active at any time. Though we were not able to observe nests with young, the regular feeding of the incubating female when she left the nest and the visit to a nest with food by a flock member suggest that all birds in a flock probably assist in feeding nestlings and fledglings.

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