

at the mouth of the Rio Magdalena near Barranquilla, discovered a population of *armenti* there, and in both years he collected a good number of specimens, thus corroborating the correctness of the type locality and casting doubt on Leticia as a locality of record. Dr. Toro-Garcia first observed the species on 16 June 1969, in company with Shiny Cowbirds (*Molothrus bonariensis*) but saw no more until early November of that year, when he noted flocks of them daily until early December. On 25 March 1970 he collected a young male but saw no others until 20 October, when flocks of 100–200 individuals were noted and additional specimens were taken. From then to 11 December flocks of 20–30 birds were seen almost daily.

Dr. Toro-Garcia reported seeing *armenti* chiefly on the ground (in which respect it agrees with *aeneus*), perching on small trees (*Prosopis juliflora*), or flying 30–50 m from tree to tree as he approached them. So far he has not been able to furnish any information about their breeding habits. If *armenti*, like the closely allied *aeneus*, is a brood parasite, which seems almost certain, it probably disperses and no longer gathers in conspicuous flocks during the main nesting season of its presumed host species, when it would be more likely to be overlooked. In 1913, when the late M. A. Carriker, Jr. visited the narrow sandy eastern end of Salamanca Island, he never saw *armenti*. Dr. Toro-Garcia even ventured to surmise that while breeding it may be absent from the island, as it is a bird of partly open habitats, favoring less humid regions or areas that, because of clearing by man for agriculture, have become semi-arid. In the stomachs of the specimens he collected he found small, unidentified grass seeds and also many rice seeds. (There are some small rice plantations to the south of Salamanca Island, across the Caño Clarín.)

The southernmost Panamanian locality where *aeneus* has been found, Río Chepo, on the Pacific slope of eastern Panama, is about 400 km (220 miles) from Cartagena, where *armenti* occurs. It seems quite pos-

sible that *armenti* may occur nearer to Panama in suitable spots in the still little-worked sections of northern Córdoba and Antioquia provinces. The isolation of *armenti* probably resulted from the intervening presence of a considerable area of humid forest in Panama and in northwestern Colombia. *M. aeneus* is but one of a number of species of semi-arid, or at least fairly open, parts of Middle America that has its nearest ally on the Caribbean slope of Colombia. Now, with increasing numbers of man-made clearings, *M. aeneus* has been extending its range southward in Panama on both slopes.

With 12 specimens now available for study in the museums of New York and Bogota, it becomes clear that *armenti* cannot be looked upon as other than a southernmost race of the species *M. aeneus*. *M. armenti* agrees with *aeneus* in the emargination of the primaries in the adults. Inasmuch as no adult females of *armenti* have been described until now, it may be put on record that in coloration they resemble, but are not quite as glossy as, female *M. aeneus assimilis*. The adult males of *armenti* resemble those of *aeneus* but are less bronzy, more brownish. The brown color of the head and body of *armenti*, while more iridescent, is not unlike that of the head of male *ater* (Parkes and Blake 1965). The bill of adult *armenti* is somewhat shorter and slenderer than that of *aeneus*.

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Lek Behavior of the Lesser Bird of Paradise

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The birds of paradise (Paradisaeidae) are prominent among an array of vertebrate groups that have become the focal point for biologists studying sexual selection and lek behavior (Emlen and Oring 1977, Foster 1977, Wittenberger 1979, Wrangham 1980, LeCroy et al. 1980, Bradbury 1981, LeCroy 1981, Diamond 1981, Oring 1982). Birds of paradise are often

cited as textbook examples of the promiscuous lifestyle, and the exaggerated display plumes of the males of some paradisaeid species are considered to be illustrative of the extreme products of runaway selection, which occurs when only a small proportion of males reproduce successfully in any breeding season. This view is surprising, as there has been no definitive field study of these birds in their native habitat that documents either polygynous mating or skewed mating success for males of any species of bird of paradise (Gilliard 1969, Dinsmore 1970, Cooper and

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Forshaw 1977, LeCroy 1981). In this paper I present the first conclusive field observations of a strongly skewed mating success among a lek-displaying group of male birds of paradise. In addition, I comment on the importance of female choice vs. male-male competition in the mating habits of this species.

The Lesser Bird of Paradise (*Paradisaea minor*) inhabits rainforest of the lowlands and hills of north-western New Guinea (Gilliard 1969, Cooper and Forshaw 1977). Morphologically and behaviorally, it is very similar to other members of the *Paradisaea apoda* superspecies, all of which are notable for the remarkable nuptial plumage of the males, extreme sexual dimorphism, and lek courtship display (LeCroy 1981). I observed a lek of Lesser Birds of Paradise at the National Bird of Paradise Sanctuary, Baiyer River, Western Highlands Province, Papua New Guinea (5°31'S, 144°71'E, 1,200 m elevation) on 18 days from 2 June to 4 July 1979, for a total of 49 h. During part of this period, I timed attendance by the birds, and at other times I monitored behavioral interactions. This lek has been used for at least 12 yr by an undisturbed population of Lesser Birds of Paradise (R. D. Mackay pers. comm.). Aided by a 15× telescope, I observed the birds from the ground, 45 m from the lek. Although individuals at the lek were not marked, after a few days of preliminary observation I was able to identify the four males that occupied the central perches of the lek individually by physical differences in pectoral plumes, tail wires, and head markings. I monitored attendance at the lek, visits by females, copulations, and activities among males. My observations of the physical organization of the lek of this species are in accord with those of Gilliard (1969: 235), although elsewhere (Gilliard MS, as noted in LeCroy 1981: 10) Gilliard reported instances of significant local variation in lek size and male organization in this species. Here, I confine discussion to activities in a single lek.

The Baiyer lek was confined to a single tree (32 m tall) at the edge of a clearing. Males held individually owned perches clustered in a portion of the tree where several large branches held up a tangle of epiphytic vines. Individual males occupied perches on the horizontal or gently sloping parts of the branches. The same perches were occupied day after day. Interperch distance was as small as 50 cm. I had unobstructed views of the males because of the birds' habit of plucking all green vegetation from the immediate vicinity of their perches. From the following observations I determined that the male birds of paradise "owned" the perches that they attended and maintained. In the lek I was able to identify eight perches that were used by males on a daily basis. The four central perches were owned by positively identified males. The outer four perches were attended by males whose individual identity was less certain to me, in part because in this short study I had to focus on the central (most active) birds, and in part

TABLE 1. Lek attendance and mating success in Lesser Birds of Paradise.

Bird ^a	Timed attendance (min) ^b	Copulations
1	960	25
2	720	1
3	390	0
4	390	0
5	360	0
6	195	0
7	585	0 ^c
8	105	0

^a This linear sequence is not equivalent to any perceived "mating hierarchy." The numbers simply refer to the perch number that the bird attended.

^b Total recorded attendance times for these birds during a period of timed observations during June and July 1979.

^c Female solicited from this male for more than 3 min, but the male never mounted.

because the outer perches were occupied less faithfully. During my study, I documented no exchange of perches, temporary or otherwise. I assigned numbers to perches; the males that held particular perches were given the same number as the perch they frequented.

In addition to the regular attendant males, an additional number of males, most in subadult plumage, visited the lek but did not own perches. These birds spent most of the time out of the lek, calling from perches dispersed through the surrounding forest. They would visit the lek when courtship activities reached a peak. These birds observed the courtship activities but never actually displayed, nor did I observe them to copulate with females at the lek.

When a female entered the lek to mate, the perch-holding males became visibly agitated, called loudly, erected their yellow pectoral plumes, and often hopped about from limb to limb, flapping their wings and shivering their plumes (see LeCroy 1981). After this brief flurry of motion and calling, the males assumed their perches and quietly displayed their erected pectoral plumes while the female moved about the lek, often visiting the limbs of several different males in display. I never saw a male attempt to mount a female without a series of precopulatory behaviors that included explicit solicitation by the female (for details see LeCroy 1981). I observed mating to occur only with males at their particular perches.

Males were present at the lek from 0600 to 0900 and 1430 to 1715. I recorded females visiting from 0630 to 0730 and 1445 to 1715; most copulations, however, occurred from 0645 to 0715 and 1500 to 1530. During the 18 days of observations, I recorded 99 visits by females and 26 copulations, which involved only two males.

Male 1 performed 25 of 26 copulations that I re-

corded. Male 2 copulated once. A female solicited copulation from Male 7, but he failed to mount. No other male copulated. Male 1 invested more time in lek attendance than any other (Table 1). It is interesting to note that only the three most faithful male attendants at the lek received solicitations from females. Levels of attendance varied widely, from 105 min by Male 8 to 960 min by Male 1.

My observations at this lek of the Lesser Bird of Paradise provide the first direct evidence that, for this species, some males mate polygynously and that (at least in the short term) mating success among males is strongly skewed, in accordance with predictions for species that exhibit strong sexual dimorphism and arena courtship display (Gilliard 1969, Wittenberger 1979, Oring 1982).

Data on male-female interactions at the lek provide some insight into the nature of sexual selection in this type of breeding system. Bradbury (1981) postulated that female choice of mates is a driving force in the evolution of the lek system. In contrast, LeCroy (1981) asserted that male-male hierarchical interactions are of primary importance in lek mating, at least for birds of paradise. She argued that: (1) the elaborate displays and plumages of the species of *Paradisaea* were used primarily in male-male dominance interactions, (2) there was no evidence that sexually receptive females "sample" numerous males, and (3) "the female remain[s] passive in terms of choosing a mate" (LeCroy 1981: 48).

A number of anecdotal observations that I made at the lek of *Paradisaea minor* indicate that both female choice and male-male hierarchical control may be important in the organization of mating in this species. Two observations could be interpreted as evidence for male-male control of mating. First, the perch of Male 1 was the site where most copulations occurred. Twice I observed Male 1 depart this perch to feed at a nearby fruit tree for several minutes. During his absence no rival male took over the perch. Also, on the one morning when Male 1 was not the first to arrive at the lek, Male 2 arrived first, and assumed his perch (2) not the perch of Male 1, which remained empty. It could thus be argued that in this hierarchical system, perch ownership is rigid and that male-male interactions reinforce this rigid hierarchy. To test this, one would have to observe the lek in the early part of the breeding season. At that time one might expect much male-male fighting; after such a period the lek might stabilize and later in the season appear to be a peaceful and cooperative system. Second, Male 7 failed to copulate when solicited by a female. This can be interpreted as an instance in which the behavioral subordination of the lek hierarchy inhibits copulation by a low-ranking bird when higher-ranking birds are present. Clearly, more data are needed to test these interpretations sufficiently.

That females are involved in the mate choice pro-

cess appears to be clear from three observations. First, the stereotyped precopulatory interactions between male and female first involve the female moving, unharassed, through the lek, as though "sampling" the displaying males, who remain stationed at their perches. Second, to initiate a copulation, the female approaches and solicits from a displaying male, while he remains passively at his perch. Third, I observed a female choose and mate with Male 2 while Male 1 was present, only 50 cm away; that Male 1 did not interfere shows that the most successful male in the lek does not forcibly control lek mating in this species.

Whether the female is choosing the "best" male or the central perch is unclear from my limited observations. Nonetheless, the fact that females chose to mate with Males 1, 2, and 7 (or perches 1, 2, and 7) indicates that there is no simple male-controlled mechanism operating (as in a situation in which all females would mate with the bird occupying perch 1) and, further, that females are an important component of the mate-choice process. To gain a full understanding of mating interaction in paradisaeid leks, it will be necessary to study color-marked birds over periods exceeding a single breeding season.

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A Dusky Warbler (*Phylloscopus fuscatus*) on Southeast Farallon Island, California

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Southeast Farallon Island, located 42 km west of San Francisco, California, has long been recognized for its capacity to attract vagrant birds (DeSante and Ainley 1980). The appearance there of a Dusky Warbler (*Phylloscopus fuscatus*) on 27 September 1980, however, exceeded our most imaginative expectations. It is only the fourth record for the species in North America and, more important, the first for any member of this widespread Eurasian genus south of Alaska.

After several days of clear skies and strong north to northwest winds, the morning of 27 September brought diminished winds and overcast skies to Southeast Farallon. Accompanying this change in weather was one of the season's better migrant passerine groundings. This wave was characterized by relatively large numbers of Hermit Thrushes (*Catharus guttatus*), Ruby-crowned Kinglets (*Regulus calendula*), and Golden-crowned Sparrows (*Zonotrichia atricapilla*), lesser numbers of Varied Thrushes (*Ixoreus naevius*), Townsend's Warblers (*Dendroica townsendi*), and Puget Sound White-crowned Sparrows (*Zonotrichia leucophrys pugetensis*), and one Rusty Song Sparrow (*Melospiza melodia morphna*). This species assemblage strongly implied a northwestern coastal origin for the wave, although at least 10 individuals of various "eastern" wood warblers also appeared that day.

Around 0945, Pyle joined Brian Pendleton, who was puzzling over a strange call note emerging from some low scrub near the east end of the island. The note, transcribed as "tchk" or "chak," was striking for its loudness and dryness; it seemed especially odd after the bird was flushed and found to be a small wood warbler-like passerine. The bird was chased for about 3 min, but a view adequate for identification was not obtained because of the bird's furtive habit of seeking out low thick cover. Only "nervous" wing and tail flicking, a buff-white supercilium, and dull

uniformly colored upperparts were noted before the bird flew up the steep hill leading to the lighthouse and disappeared over a ridge.

At 1030 Boekelheide relocated the bird and captured it in the island's Heligoland trap. With the bird in hand, the six persons present on the island (including Henderson, Lee Astheimer, and Peg Abbott) were able to arrive at the correct identification: Dusky Warbler. The bird weighed 7.7 g at capture, had no fat, and was measured and photographed (Fig. 1). Additional photos are on file with the California Bird Records Committee of the Western Field Ornithologists and at the Point Reyes Bird Observatory.

An attempt was made to keep the bird alive for transport off the island on the next day's scheduled boat, but it died during the afternoon. The specimen was deposited in the collections of the California Academy of Sciences (CAS 70314) and was confirmed to be an immature female of the nominate race by John Bull (pers. comm.) and Ben King (pers. comm.) at the American Museum of Natural History. The bird had no molt, a partially pneumaticized skull, and minute ovaries. The upper mandible was entirely dark and the lower was dark with a yellow base. The legs were dark brownish-gray with yellow soles. The eye was dark olive-brown. Some measurements were: exposed culmen, 7.5 mm; culmen from nostril, 6.7 mm; tarsus, 27 mm; flattened wing, 62 mm; and tail, 49 mm.

The Dusky Warbler breeds in central USSR from the Ob River east to the Anadyr Basin (Williamson 1962) and winters in the Himalayas and southeast Asia. Ticehurst (1938) recognized two races, the nominate, which is found over most of the species' range, and a darker, more resident Himalayan form, *P. f. weigoldi*. The species has a fairly good potential for vagrancy as evidenced by at least 35 documented west European records between 1958 and 1980 (Svensson pers. comm.). There have also been three occurrences