

Originally known from three disjunct bunch-grass areas in Durango, Jalisco and around the Distrito Federal, Mexico, this rare sparrow now appears to be confined to the dwindling expanse of this specialized habitat near México City which, although afforded some official protection, is still subjected to widespread burning and cattle-grazing.

**DISTRIBUTION** The Sierra Madre Sparrow has been found in three disjunct areas of the Sierra Madre: the high mountains of southern Durango, northern Jalisco and around the Distrito Federal–Morelos border, Mexico. Unless otherwise stated, coordinates are from OG (1956a).

*Durango* In March 1931, a population was found at c.2,400 m, about 55 km south-south-west (see Remarks 1) of Ciudad Durango, at a locality apparently known locally as “Cienega [sic] Tableterra”, c.25 km south of La Casita (23°43'N 104°40'W) (Bailey and Conover 1935, Pitelka 1947). The only other locality recorded in Durango is from San Juan, 8 km west of El Salto, where five specimens were collected between 2,285 and 2,680 m on 16 and 17 June 1951 (Miller *et al.* 1957; three male, two female specimens in MLZ).

*Jalisco* The first specimens (apparently nine including the type; see Remarks 2) were collected in March 1889, in the “Sierra Bolaños” in the north of the state (Pitelka 1947). The type (a male in MCZ) was collected 8 March 1889 apparently at Bolaños, a village at 21°41'N 103°47'W. Other specimens (a male in USNM, three males and three females in BMNH; see Remarks 2) were collected over 3–10 March 1889 (apparently going unnoticed in the literature: see Remarks 2), these being both the first and last Jalisco records.

*Distrito Federal–Morelos* Recent records of the Sierra Madre Sparrow have come from a number of places in the bunch-grass area near the highest point on the old road between Cuernavaca, Morelos, and México City, Distrito Federal (Edwards 1968), c.600 km east-south-east of the Jalisco locality (Pitelka 1947). La Cima, at 2,900–3,050 m, is near the crest of the divide (the state border runs just to the south), and appears to be the centre for most recent records, many specimens having been taken there (e.g. in AMNH, CM, CMN, DMNH). Other specimens have been collected north of La Cima near Volcán El Pelado (see Threats), 4 km north of the Morelos border (two males and a juvenile male, August 1956, in DMNH). The road from La Cima runs south for c.10 km to a small town called Tres Marías (also Tres Cumbres, a hill c.2 km to the north-east) (Wilson and Ceballos-Lascurain 1986). Between these two places, the Sierra Madre Sparrow has been collected at 3, 5, and 8 km north of Tres Marías, but mainly around El Capulín at 5 km north (specimens in CM, DMNH, LSUMZ). Edwards (1968) indicated that the sparrow has been found at a number of localities along the new toll road which runs parallel to the old Cuernavaca–México City road. As these two roads are rarely further than 500 m apart (DCW), this is hardly surprising. Other Morelos records include four males from Fierro del Toro, 3,000 m (c.2 km north-west of El Capulín), collected 25–26 June, 12 July and 4 September 1950 (in MVZ, UMMZ; Miller *et al.* 1957). In winter, the species has been noted up to 2 km north of Parres (19°08'N 99°10'W: 4 km north-north-east of La Cima), Tlalpan district, (Distrito Federal); an immature male (in AMNH) was collected 1.5–2 km south of El Guarda (19°09'N 99°11'W: within 1 km of La Cima) on 24 December 1965 (El Guarda is an old name for Parres: R. G. Wilson *in litt.* 1991); and 2–3 birds were seen at 2,750 m on 7 January 1990 c.22 km east of Parres (19°09'N 98°58'W: c.4 km south-east of Santa Ana Tlacotenco) (R. G. Wilson *in litt.* 1991).

**POPULATION** The Sierra Madre Sparrow is considered rare (Dickerman *et al.* 1967, Wilson and Ceballos-Lascurain 1986) although its specialized habitat requirements and secretive, terrestrial habits (except during the breeding season) (Wilson and Ceballos-Lascurain 1986) suggest that it has probably been under-observed (see Ecology, Measures Proposed).

*Durango* “A half a dozen or so” Sierra Madre Sparrows were noted by Bailey and Conover (1935) when they collected a male in March 1931 at the small marsh south-south-west of Ciudad Durango. Bangs (1931) recorded Bailey as telling him of “a dozen or more of the birds” in this same marsh. Which of these two reports is correct is unknown, but Bailey (in Pitelka 1947) mentioned that “the few that I saw... were singing”, suggesting a small breeding population of a few pairs in a marsh of a mere 90 m<sup>2</sup> (50 feet by 20 feet: Pitelka 1947; see Remarks 3). The only information about the El Salto population is that five specimens were collected, presumably at the same locality, on 16 and 17 June 1951 (see Distribution), and that none was found there (indeed, no suitable habitat was found: see Threats) in June 1991 (S. N. G.

Howell *in litt.* 1991).

*Jalisco* All that is known about the Sierra Madre Sparrow from this state is that nine specimens (three males and five females, with one unlocated; see Remarks 2) were collected within the Sierra de Bolaños over 3-10 March 1889 (Pitelka 1947).

*Distrito Federal–Morelos* Wagner (in Pitelka 1947), writing of the first observation of this species south of Jalisco, mentioned that on 23 April 1945 he saw a pair and two individuals at La Cima, where an adult male was collected on the same day. One of the observed birds was singing, indicating that the site probably held a breeding population. The next specimens to be collected from this region were six (including a juvenile) taken 2 km south of La Cima over 17-21 August 1950 (Miller *et al.* 1957). With five specimens (three males, two females in AMNH) taken in June 1962 and four juveniles on 3 September 1962 (in CM, DMNH) at La Cima, a significant population must exist or have existed in the immediate vicinity. Since specimens have been collected at a number of localities along the La Cima–Tres Mariás road (see Distribution) (e.g. four adults and a juvenile, 5 km south of La Cima, during June/July 1954: in CM, DMNH, LSUMZ), the population obviously extends for some distance. Up to 15-20 birds have been seen at La Cima in winter (S. N. G. Howell *in litt.* 1991), and the density of breeding birds here has been estimated at c.1 pair/4-5 ha (R. G. Wilson *in litt.* 1991), or as much as 1 pair/1-2 ha in the densest areas (S. N. G. Howell *in litt.* 1991). No formal estimate has been made of the (local) population in this area although Wilson and Ceballos-Lascurain (1986) suggested that a significant proportion of it breeds in the vicinity of La Cima. Although locally common around La Cima, the species appears to occur very sparsely within the zacatón (bunch-grass) (S. N. G. Howell *in litt.* 1991), R. G. Wilson (*in litt.* 1991) suggesting that the population in this area (remaining habitat in Distrito Federal–Morelos being contained within an area of c.200-250 km<sup>2</sup>) is probably no more than a few hundred pairs. The area around El Capulín has now largely been cultivated for agriculture (see Threats), recent records of the Sierra Madre Sparrow being confined to within a few kilometres of La Cima–Parres, and near Santa Ana Tlacotenco (R. G. Wilson *in litt.* 1991).

**ECOLOGY** The individuals that Bailey found in March were in a small marsh fed by a series of springs, at 2,400 m (Bangs 1931, Bailey and Conover 1935). This marsh was “grown to tall grass, dead at this season” (Pitelka 1947). The immediate surrounding area was described as “a rugged mountain region, broken by canyons, and with wide expanses of park... [with] much pine, thorny shrubs and some gnarled oaks intermixed” (Bangs 1931). This one recorded occurrence of the species in a marshy area has been generalized as a habitat requirement (e.g. Edwards 1968, Peterson and Chalif 1973) despite the lack of subsequent records from similar habitats (see Remarks 3): in fact, as suggested by Pitelka (1947), the habitat is not necessarily marsh (see Remarks 3).

More information has been published about the habitat around La Cima, which differs slightly from that described by Bailey (e.g. Pitelka 1947, Blake 1953 and Bangs 1931). Dickerman *et al.* (1967) indicated that at La Cima, the habitat of the Sierra Madre Sparrow is “a primary association of medium and tall bunch-grasses, *Epicampes macrura*, *Festuca amplisima*, *Stipa ichu*, and *Muhlenbergia affinis*, interspersed with park-like stands of *Pinus montezumae* on the ridges and knolls” (bushes being absent in the grassland areas). Refining this description of La Cima, R. G. Wilson (*in litt.* 1991) noted that *Pinus hartwegii* and *P. teocote* are at least as common as *P. montezumae*, and recorded *Muhlenbergia robusta* (possibly a synonym for *M. affinis*) as common. East of Parres (at 2,750 m) the habitat is an open pine–oak woodland (mainly oak including *Quercus rugosa*), with a strong growth of zacatón beneath (R. G. Wilson *in litt.* 1991). The lack of shrubs and marshy areas differs from the Durango locality, but the common denominator for all reports of the habitat is the bunch-grass or “zacatón” (also zakaton and sacaton; a local name for the grass species involved: D. J. Bell verbally 1991: see Remarks 3) (Pitelka 1947, Wilson and Ceballos-Lascurain 1986). Wagner (in Pitelka 1947) described the zacatón as being 60-80 cm high (this is probably an average as clumps may easily grow to 1.5 m or even 2 m high: R. G. Wilson *in litt.* 1991), covering a dry, secondary plain with some pine trees; labels from specimens taken in the area relate to the dense zacatón meadow with few, scattered and small pines (sometimes in groves) and rocky outcrops (lava).

This subalpine pine/zacatón association is a habitat limited to temperate areas at altitudes of 2,650-4,250 m, across the central volcanic portion of Mexico, and is also the habitat of the Volcano Rabbit *Romerolagus diazi* (Hoth *et al.* 1987, Fa and Bell 1990: see Threats, Measures Proposed). Almost all records of the Sierra Madre Sparrow have been between 2,800 and 3,050 m, although the Durango

populations have been recorded from 2,285, 2,400 and 2,680 m (see Threats, Remarks 3). Fields in the La Cima area (see Threats) are used as feeding areas by the species to a varying degree during the year (Dickerman *et al.* 1967), although B. M. Whitney (*in litt.* 1991) saw four birds (c.1.5 km north of La Cima) singing from the tops of zacatón clumps in a heavily grazed and poorly drained field (see Remarks 3). A juvenile male taken at La Cima on 3 September 1962 (in CM) was feeding in a mustard and alfalfa field. The gizzard of an adult male taken in November 1962 (in DMNH) contained a fine gravel, a small coleopteran and the remains of a small spider (Dickerman *et al.* 1967), although it is unclear whether this individual had been feeding in zacatón or fields. Unfledged young were seen being fed with small caterpillars at La Cima in August 1984 (R. G. Wilson *in litt.* 1991)

Bailey, commenting on the Durango birds (in Pitelka 1947), said that the birds were “not skulking” and “were on top of the vegetation, possibly two or three feet high, and were singing”. Wagner (in Pitelka 1947) corroborated Bailey’s observation of birds singing from tall grass blades but added that they were shy. In spring and summer, males are conspicuous, singing from tall grass or even telephone wires; at this time an occasional alarmed bird may even perch in a pine tree (Dickerman *et al.* 1967). Singing has been recorded from 22 March in Durango and 24 April in Distrito Federal (Pitelka 1947). At La Cima, singing was noted as “slight” during mid-March, but with many individuals heard during late May (S. N. G. Howell *in litt.* 1991). Eggs (a clutch of three has been noted) and juveniles have been observed in June and July: adults seen carrying food to presumed nests on 7 July; a nest with young found 23 August; eggs still noted as being incubated on 31 July; and juveniles recorded in August and September (Miller *et al.* 1957, Dickerman *et al.* 1967, S. N. G. Howell *in litt.* 1991, R. G. Wilson *in litt.* 1991). Four birds were seen singing from zacatón clumps on 11 August 1980 (just north of La Cima), the singing being attributed to the fact that it was raining (B. M. Whitney *in litt.* 1991). Nests are close to (but not on), the ground, between or set into the zacatón clumps (Dickerman *et al.* 1967, R. G. Wilson *in litt.* 1991). Wagner (in Pitelka 1947) indicated that the species occurs scatteredly on the bunch-grass plain; outside the breeding season it is secretive, being almost entirely terrestrial and hardly ever permitting close observation (Wilson and Ceballos-Lascurain 1986; see also Dickerman *et al.* 1967). It has also been suggested that this species undertakes a localized winter dispersal (Wilson and Ceballos-Lascurain 1986), although the evidence for this is based on records just north of Parres/El Guarda (see Distribution), which, at just c.6 km north of La Cima, is a very localized dispersal indeed – records from La Cima in November and December (specimens in UMMZ) suggest that in fact the species is resident there.

**THREATS** Sizeable areas of the subalpine pine/zacatón habitat are limited to altitudes between 2,650 and 4,250 m on the slopes of three discontinuous volcanic sierras close to Mexico City (see Measures Proposed) (Hoth *et al.* 1987, Fa and Bell 1990). The El Pelado area, at 48 km<sup>2</sup>, is one of these and represents the best remaining forest/zacatón habitat in central Mexico (Hoth *et al.* 1987). During a brief visit to this area in April 1985, evidence of extensive, recent fire burns was recorded, with cattle-grazing on recently burnt zacatón; there was also evidence of forest infestation by bark beetle and cutting of zacatón (*Muhlenbergia* spp.) for thatch and brushes (Hoth *et al.* 1987). Overgrazing and forest fires represent the major threat to the habitat (Hoth *et al.* 1987): 98% of these forest fires are started by man, many originating from the uncontrolled burning of zacatón, done to promote new growth of grazing pasture for cattle and sheep, but causing the deterioration and depauperization of the zacatón (Fa and Bell 1990). Land tenancy is undefined in the El Pelado area: villagers from Topilejo, Parres and other smaller villages can acquire rights to grow crops (mainly oats in this area) on Volcán El Pelado without prior assessment of the impact on the land, leading inevitably to agricultural encroachment (Hoth *et al.* 1987, Fa and Bell 1990). In the period since 1954, when Phillips and Warner first collected in the La Cima/Pelado area, a large proportion of the tillable area of this habitat has been ploughed and destroyed as nesting cover, 25-35% of the habitat visited being destroyed in the 12 years after 1954 (Dickerman *et al.* 1967). Extraction of soil is largely uncontrolled; permits are issued by local village authorities often without liaison with the conservation authorities (Fa and Bell 1990). These threats are common to the largest remaining areas of habitat in all three sierras close to Mexico City, namely Nevado de Toluca, Sierras Chichinautzin and Ajusco (Volcán El Pelado/Tlaloc area) and “Sierra Nevada” (i.e. Volcanes Iztaccihuatl-Popocatepetl) (Hoth *et al.* 1987, Fa and Bell 1990). These sierras are also the last remaining areas where the threatened endemic Volcano Rabbit exists, also in the zacatón vegetation (Hoth *et al.* 1987). However, the area east of La Cima, and extending as far as Santa Ana Tlacotenco (and including Volcanes Chichinautzin and Tlaloc), still supports quite extensive forest areas with much zacatón, and may harbour

an undiscovered population of Sierra Madre Sparrow (all of this suitable remaining habitat is contained within an area of just c.200-250 km<sup>2</sup>) (R. G. Wilson *in litt.* 1991).

Little has been written about the state of the habitat in the Jalisco/Durango populations of the species, although S. N. G. Howell (*in litt.* 1991) noted that in June 1991 near El Salto, Durango, there was nothing suitable for the species (“odd clumps of bunch-grass”), the area generally having been intensively cultivated and/or logged.

**MEASURES TAKEN** Hoth *et al.* (1987) suggested that there was “adequate forestry management and close vigilance of forest fires” in the Tlaloc/Pelado area, with the Forestry Division producing posters in an attempt to reduce the incidence of these fires. The existing reserves in this area have been outlined above (see Measures Proposed) and SEDUE (Secretaria de Desarrollo Urbano y Ecología) is currently reviewing the idea of a protection corridor from Tepozteco National Park across the Chichinautzin range to the Desierto de los Leones National Park (now largely destroyed: A. R. Phillips *in litt.* 1991). Despite these measures, greater protection is needed in some select areas to guarantee the survival of the Sierra Madre Sparrow.

**MEASURES PROPOSED** Rigorous conservation of the bunch-grass habitat near and east of La Cima is necessary in order to protect this and other species from extinction (Wilson and Ceballos-Lascurain 1986, R. G. Wilson *in litt.* 1991). A detailed assessment should be undertaken to determine the population of the Sierra Madre Sparrow in the La Cima area, combined with a detailed search for the species in the extensive areas of similar pine/zacatón habitat that remain around Volcán El Pelado (48 km<sup>2</sup>), Volcán Tlaloc (86 km<sup>2</sup>; 20 km east of Pelado) and the Sierra Nevada (146 km<sup>2</sup>). Fieldwork has already been carried out to determine the distribution of pine/zacatón habitat in relation to the Volcano Rabbit (see Threats) (Hoth *et al.* 1987, Fa and Bell 1990) – the areas identified now need to be surveyed for the presence of the Sierra Madre Sparrow, and the conservation of both species ensured. There is a serious need for a search for the sparrow in Durango and Jalisco (see Population).

Measures proposed for zacatón conservation and hence the Volcano Rabbit in this area include: (1) assessment of the dynamics of the pine/zacatón vegetation, e.g. the nature of the vegetational succession and the effects of livestock-grazing and fire-burns on the vegetation; (2) implementation of management and wardening of the existing national park (Sierra Nevada) and special protected zones (Volcán El Pelado and Volcán Tlaloc); (3) rational exploitation of natural resources compatible with wildlife protection, e.g. controlled burning at regulated densities to be made compatible with the recovery of other areas and the conservation of wildlife; (4) implementation of educational campaigns at local and national level (information on the impact of land-use methods incompatible with sustained development and conservation should be made available to villages adjacent to the core habitats) (Hoth *et al.* 1987, Fa and Bell 1990). As the Volcano Rabbit has similar habitat requirements, these measures must also apply to the Sierra Madre Sparrow.

**REMARKS** (1) The journey to Ciénaga Tableterra is described (Bailey and Conover 1935) as 15 miles south-west of Durango to La Casita, and then 15 miles south from there, Bangs (1931) interpreting this as 30 miles south-west. From the coordinates, it is clear that Ciénaga Tableterra is in fact about 35 miles (55 km) south-south-west of Ciudad Durango.

(2) Pitelka (1947) reported nine specimens taken by Richardson; one (the type) is in MCZ, one is in USNM and six are in BMNH, though seven were reported there by Hellmayr (1938) and Pitelka (1947).

(3) The marsh where Bailey observed and collected the species in 1931 cannot have been as small as 50 feet by 20 feet if it held “a dozen or more of the birds” as he claimed, and either some miscalculation or a misprint must have been involved. It was grown to tall grass (Pitelka 1947) although the surrounding area had wide expanses of park (Bangs 1931), which suggests that the tall grass in the marsh was exceptional in relation to the surrounding vegetation and that the concentration of birds there was due to the tall grass rather than the presence of water. At 2,400 m, this marsh is below the documented altitudinal range for the zacatón habitat and most other populations of the sparrow. The other Durango records are also from below the altitudinal range of the zacatón habitat (2,285 and 2,680 m), but from vegetation remnants seen near El Salto in 1991 the habitat used to be typical zacatón (S. N. G. Howell *in litt.* 1991). North of La Cima, four birds were recorded in a poorly drained (but heavily grazed) field with zacatón clumps (B. M. Whitney *in litt.* 1991), this apparently being the only other reference to the species

occurring in a “damp” area.