

Known only from temperate zone forests in Veracruz and Oaxaca, Mexico, this rare jay is currently to be found in just one area of Oaxaca, and has apparently been extirpated from much of its historical range by widespread habitat destruction and fragmentation.

DISTRIBUTION The Dwarf Jay is endemic to south-eastern Mexico in the mountains on the Veracruz side of the border with Puebla, and in the sierras de Juárez, Aloapaneca and Zempoaltepec, Oaxaca. AOU (1983) listed the species also for Puebla, but there seems to be no evidence for this. A specimen reportedly from the state of México is not considered here (see Remarks). Unless otherwise stated, coordinates for Veracruz are from OG (1956a) and for Oaxaca from Binford (1989).

Veracruz Localities are from two general areas where the high mountains of central Puebla extend into Veracruz. The northernmost area of the species's range includes Cofre de Perote (19°29'N 97°08'W), where two males were collected in July 1888 (in BMNH), and Las Vigas–Jalapa. Jalapa is a locality given on specimens in ANSP and BMNH, Sclater (1857a, 1859a) qualifying this as in the “vicinity of” or within the “environs of” Jalapa. Las Vigas (19°38'N 97°05'W), where a male (in BMNH) was taken during August 1888, is situated in “pine forest, devoid of undergrowth” at 2,440 m (Chapman 1898), the specimen presumably being taken slightly lower within the pine–oak association (see Ecology).

Further south in Veracruz, the situation is similarly confused by poor labelling of skins. A specimen (in BMNH) taken reportedly at Córdoba by R. Montes de Oca (who was responsible for most of the specimens labelled “Jalapa”: see Chapman 1898) seems unlikely, as Córdoba lies below 1,000 m and the bird was probably therefore collected nearer to Orizaba. Two specimens (in USNM) are labelled Orizaba, but both have other locality names, both untraced: one in December (year unknown) from “C. de Sepuxtlan”, the other in October 1864 from “Mt. Azul”. More recently (1942), specimens (in MLZ; see also Hardy 1971) have been taken at La Puerta; La Puerta remains untraced, but is situated somewhere at the top of the Acultzingo grade, c.50–55 km south-west of Orizaba, the distances quoted here being presumably by road, as the evidence from the coordinates is that Orizaba (18°51'N 97°06'W) and Acultzingo (18°43'N 97°19'W) are c.30 km apart. La Puerta is thus situated somewhere near the Puebla–Veracruz border but, according to the specimen and Hardy (1971), is still just within Veracruz state (apparently along route 150).

Oaxaca In the Sierra de Juárez, a male (in USNM) was collected in October 1894 at Reyes (Santos Reyes Pábalo at 17°51'N 96°52'W: Binford 1989), and a male and female (in BMNH) were taken in April 1961, at the highest pass, 60 road km south-west of Valle Nacional (L. C. Binford *in litt.* 1991); a female (in SWC) was taken “on the road to Valle Nacional from Ciudad Oaxaca” in January 1968; and another female (in MLZ) was collected 3 km west of km 211 on route 175 (untraced) in July 1963. South from here is the Sierra de Aloapaneca, where the species has been recorded exclusively in the vicinity of Cerro San Felipe. The localities involved are Cerro San Felipe (17°10'N 96°40'W), La Cumbre (part of Cerro San Felipe, near km 20), and various points in-between (see Short 1961, Hardy 1971; specimens in AMNH, CAS, LSUMZ, MLZ, MVZ, WFWZ). More generally, the species has been recorded in temperate forest near route 175 from Ciudad Oaxaca into Veracruz (Hardy 1964). The south-easternmost area in the Dwarf Jay's range is the Sierra de Zempoaltepec. Most specimens were collected in April and May 1942 near Totontepec (17°13' 96°03'), a village on the north-west slope of Cerro Zempoaltepec (in AMNH, CM, DMNH, FMNH, LACM, MLZ, MNHUK, ROM). Older records (specimens taken July 1894, in USNM) are more generally from Cerro Zempoaltepec, seemingly on the west slope of the mountain between 2,350 m and 3,200 m (Binford 1989, L. C. Binford *in litt.* 1991). Llano Verde, a collecting locality mentioned by Sclater (1859b), is untraced but apparently either in the Sierra de Juárez, or Sierra de Zempoaltepec (see Binford 1989; L. C. Binford *in litt.* 1991), but probably in the former (A. G. Navarro and A. T. Peterson *in litt.* 1991).

POPULATION Very little is known about the population of this species, especially in the Veracruz part of its range, Peterson and Chalif (1973) simply considering it rare.

Veracruz Writing before the La Puerta records were made (see Distribution), Loetscher (1941) regarded the species as a little known and apparently rare resident, having not been found in Veracruz for at least 50 years. A juvenile, two females and a male were taken in July 1942 at La Puerta, but another 50 years have now passed with no records from this state, AOU (1983) concluding that the species was resident at least formerly in the mountains of Veracruz, but is now possibly extinct there. Extensive

habitat destruction at Jico, Jico Viejo, Ticuahutipan, Teocelo, etc., make it almost certain that this jay is no longer present within the state, unless they range higher into pine–fir forest than is generally thought (A. G. Navarro and A. T. Peterson *in litt.* 1991).

Oaxaca The Dwarf Jay was noted as a fairly common permanent resident (Binford 1989), although apparently very localized in its distribution (but see below). Population data come almost exclusively from the Cerro San Felipe area, c.12 km north-north-east of Ciudad Oaxaca. Between La Cumbre and Cerro San Felipe, Short (1961) made a number of observations of post-breeding flocks: on 28 August 1954, 12 Dwarf Jays were seen within a mixed-species flock in a small valley, two being seen 1.5 km north later in the day; next day, in the same area (within 2–3 km), three mixed-species flocks were located in which were four, 5–6, and 10–12 Dwarf Jays respectively. On three days over 4–8 July 1963 at Cerro San Felipe, Hardy (1971) observed flocks of 5–10 birds (associated with other species: see Ecology). Also on Cerro San Felipe, Hardy (1971) located active nests in three consecutive years: five in 1965, three in 1966 and two in 1967. At the same site, four nests were found in or near four 100 m² quadrats within second-growth *Quercus rugosa*–*Q. laurina* association (Hardy 1971). Hardy (1971) considered the density of nesting Dwarf Jays at Cerro San Felipe to be the lowest in this (oak) association (in comparison to other associations where the species was found nesting), the four pairs being completely free of interference from other pairs within their territories. The species was found to be more abundant in the pine–oak–fir association at 2,800 m, where other individuals could frequently be heard calling whilst activities at nests in these areas were being observed (Hardy 1971). By walking no more than 90 m from a nest-site, other jays were found foraging, some of which seemed to be non-breeders travelling in flocks of four or five birds, but others occurred regularly in certain nearby places, singly or in pairs, and were probably established breeders (Hardy 1971). Dwarf Jays were easily found and common in this area during the 1980s and December 1990 (S. N. G. Howell *in litt.* 1991). All of this information suggests that there is a substantial breeding population of Dwarf Jays in the Cerro San Felipe area, the species being quite common in suitable habitat, which is however suffering from increasing destruction (A. G. Navarro and A. T. Peterson *in litt.* 1991). The only available data from Totontepec, c.75 km east of Cerro San Felipe, is that 16 females and 20 males were collected there purportedly during April and May 1942 (in AMNH, CM, DMNH, FMNH, LACM, MLZ, MNHUK), suggesting that here, too, the species was quite common. Recent fieldwork by ornithologists (from MZFC) in Sierra de Juárez produced no evidence of the species, and more limited work in the Sierra de Zempoaltepec also failed to locate the bird, almost all recent records coming from the vicinity of Cerro San Felipe (A. G. Navarro and A. T. Peterson *in litt.* 1991).

ECOLOGY The Dwarf Jay is a permanent resident in the humid montane forest of the temperate zone (see below: Goodwin 1976, AOU 1983). In the Cerro San Felipe area, it has been recorded at altitudes of between 2,440 and 3,050 m (Hardy 1964; specimens in AMNH, LSUMZ). Totontepec is situated at c.1,850 m, specimens here probably coming from above the village (in the upper cloud-forest and pine–oak zone), as this altitude is the lower limit of the temperate zone (in lower cloud-forest) (Hardy 1971, A. G. Navarro and A. T. Peterson *in litt.* 1991), the lower limit in Veracruz (of the “humid alpine zone”) being c.1,670 m (Chapman 1898). The range of “1,525 m up” given by Miller *et al.* (1957) seems particularly low.

The Dwarf Jay has been observed in a number of humid montane forest associations where oak (*Quercus* spp.), pine (*Pinus* spp.) and fir (*Abies* spp.) variously make up the dominant tree species (Hardy 1971). One of these associations, where four nests were found in 1965, consisted of *Quercus rugosa* and *Q. laurina*, with fir and pine species as scattered components of the layers below the canopy; this particular association was found on the drier slopes and near the crests of ridges above 1,830 m (Hardy 1971). However, of the associations where Dwarf Jay occurred, it was sparsest in the *Quercus*, being more abundant in the pine–oak–fir habitat at c.2,800 m (see Population; Hardy 1971); areas of “equal pine and oak” are also favoured (Hardy 1964). Laurel *Litsea* spp. are also a characteristic of these associations, as is an abundant epiphytic growth of lichens, mosses and ferns (Hardy 1971). Birds were found rarely to enter the open pine forest, although one was seen to forage briefly this habitat (Hardy 1971). In early April, Dwarf Jays were occasionally seen foraging in the uppermost parts of the subtropical zone in barrancas near Cerro San Felipe: this habitat is very different in character to the pine–oak–fir association, and after nest-building was completed no jays were seen so low, breeding certainly not occurring in this zone (Hardy 1971).

The species is not restricted to undisturbed forest, frequently being found in secondary growth, as long as the preferred tree associations predominate and tracts of primary forest are nearby (Hardy 1971; see Threats). The necessary constituent of Dwarf Jay breeding habitat is a prominent subcanopy (formed by the crowns of the tallest second-layer trees and the lower branches of primary canopy trees), the primary canopy being sufficiently open to allow the development of a dense second-layer (Hardy 1971). Over 80% of foraging time is spent from the bottom of the subcanopy to the top of the shrub layer, during which invertebrates are gleaned (Coleoptera, Diptera, Hymenoptera, insect larvae and eggs have all been recorded) from and around epiphytes (Hardy 1971). Dwarf Jays occasionally enter the subcanopy but do not often forage at these upper levels (Hardy 1971).

At Cerro San Felipe, the breeding season starts in early April, when feeding flocks break up and territorial aggression, courtship feeding and nest-building begin (Hardy 1971). Between 1965 and 1967, a nearly complete nest was seen on 4 April, eggs (clutch-size three) recorded between 12 April and 5 May, with young found in the nest 16 May: of the 10 nests found during this period, all were in *Quercus* species situated either in the crown/subcrown, or on the end of a branch at 3-15 m high (averaging 7 m), i.e. all nests were in the second-layer vegetation (Hardy 1971). Two "prejuveniles" were collected at Totontepec, supposedly on 12 and 18 April 1942 (in MLZ), Hardy (1971) suggesting that they may represent an early season, but Binford (1989) concluding that the dates are probably erroneous (due to the known unreliability of M. del Toro Aviles's data); however, a male specimen apparently carrying insects and feeding young, taken on 3 April 1948 at La Cumbre (in MVZ), indicates that breeding may indeed start earlier in the year, apparently coinciding with the end of the dry season (A. G. Navarro and A. T. Peterson *in litt.* 1991). Feeding of young has also been noted as late as 21 June (1966) at Cerro San Felipe (Binford 1989), although all breeding activity appears to cease before early July (Hardy 1971).

In the non-breeding season, Dwarf Jays move about and forage in loose aggregations of 4-10 individuals, which in turn are part of mixed-species flocks (Hardy 1971). At the end of August such flocks, travelling up to 1.5 km in several hours, contained 2-12 Dwarf Jays, the main constituent species being Grey-barred Wrens *Campylorhynchus megalopterus* and Spot-crowned Woodcreepers *Lepidocolaptes affinis* (Short 1961). Between December and March, these mixed-species flocks have been recorded comprising mainly Steller's Jays *Cyanocitta stelleri*, Grey-barred Wrens, woodcreepers and orioles *Icterus* spp. (S. N. G. Howell *in litt.* 1991). The onset of the breeding season is evident in the pairing of individuals, small groups or pairs being present in breeding habitat in the mornings when courtship and nest-building occurs, the birds moving to forage in the barrancas until evening (Hardy 1971). This pattern continues until eggs are laid, flocks reforming when the young are fully independent of their parents, in early July (Hardy 1971).

THREATS The humid pine-oak forests of Oaxaca in which the Dwarf Jay lives have suffered greatly from clearance, small farm agriculture and other pressures of human activity; the species seems to exist only where most of the forest is of climax tree species (Hardy 1971; see Ecology). At Cerro San Felipe, Hardy (1971) noted evidence of the larger trees having been removed from a number of his study sites, stating that where disturbance has been especially severe, the basic character of the vegetation is so completely altered that only remnant components of the original avifauna (not including Dwarf Jay) persist. Human disturbance at the nest-site led to the immediate desertion of the nest, this reaction suggesting that either the species has few predators or when disturbance does occur it is almost always by a predator that robs the nest, removing any reason for the birds to return to it (Hardy 1971). Damage to the habitat at Cerro San Felipe is apparently increasing, and the lack of recent observations of the bird from areas in the Sierras de Juárez and Zempoaltepec (in fact almost anywhere in Oaxaca other than Cerro San Felipe) must surely be cause for concern (see Population). Extensive habitat destruction and fragmentation in Veracruz has probably led to the species's extinction there (A. G. Navarro and A. T. Peterson *in litt.* 1991).

MEASURES TAKEN There are four national parks within the immediate range of the species, three in Veracruz, one in Oaxaca. In Veracruz, Cofre de Perote is a national park although agricultural practices are carried out in at least part of the area (Vargas Márquez 1984) and the jay has apparently not been seen there since 1888 (see Distribution). Further south in the state is the Cañon del Río Blanco National Park (55,690 ha), situated along route 150 from Orizaba to the Puebla border (Anon. 1989) and apparently covering the La Puerta population last recorded in 1942 (see Population). The Pico de Orizaba National

Park (19,750 ha, straddling the Puebla–Veracruz border: Anon. 1989) may well incorporate the Orizaba/Córdoba localities where the species was collected in the late 1800s (see Distribution). Despite these, the Dwarf Jay has not been seen in Veracruz for over 50 years, and it seems that it may already be extinct there (A. G. Navarro and A. T. Peterson *in litt.* 1991). In Oaxaca, the species may occur within the Benito Juárez National Park, which is apparently situated just north of Cerro San Felipe, covering 2,737 ha (Anon. 1989); however, this protected area was apparently never officially approved, has no borders, no staff, and appears to be a classic “paper park”; meanwhile, no highland habitat (suitable for this species) is protected within Oaxaca, and Cerro San Felipe is in constant danger from logging operations (A. G. Navarro and A. T. Peterson *in litt.* 1991: see Threats).

MEASURES PROPOSED Almost all recent records of the Dwarf Jay have come from the Cerro San Felipe area, although its presence in the adjacent Benito Juárez National Park still needs to be confirmed (but see Measures Taken), suggesting that a suitable measure would be to extend the park by incorporating this area (and by giving the park itself full status and support): the protection of forest on and around Cerro San Felipe is by far the highest priority to ensure the continued survival of this jay. Basic surveys in the Sierra de Juárez and on Cerro Zempoaltepec have already drawn blank (A. G. Navarro and A. T. Peterson *in litt.* 1991); however, it is still possible that habitat suitable for this species may be found in these areas (e.g. by aerial surveys), and these forests will need to be investigated for viable populations. The status of the species in Veracruz (and its parks) needs to be confirmed, although it seems likely that it now only survives within Oaxaca (see Population).

REMARKS A specimen collected in 1867 (in BMNH) is apparently from “near Mexico City”, and has led to the inclusion of México state in the range of the species (Salvin and Godman 1888-1904, hence Ridgway 1904, Hellmayr 1934, Miller *et al.* 1957, Goodwin 1976). AOU (1983) suggested that the report from this state is open to question, a conclusion that seems justified owing to the large distance between here and the Veracruz part of the species's range.