

Birds of San Juan Mixtepec, district of Miahuatlán, Oaxaca, Mexico

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Cotinga 16 (2001): 14–26

Se reporta la situación de 188 especies de aves observadas (o reportadas por gente del lugar en cinco casos) en los municipios de San Juan y San Pedro Mixtepec, distrito de Miahuatlán, Oaxaca, México, de julio de 1996 a marzo del 2000, en 235 días de trabajo de campo durante 57 visitas. Las observaciones fueron hechas por los autores bajo una investigación etnobiológica conducida por ESH. El área comprende cerca de 57 km² del lado norte de la Sierra de Miahuatlán, entre los 1.630 y 3.705 msnm. Sus hábitats, en orden de altitud, son: bosque subtropical caducifolio y matorral subtropical, bosque de galería, matorral de encino o chaparral, cultivos y pastizales, encinares, bosque de pino-encino seco, bosque de pino-abeto húmedo y bosques de *Pinus rudis* de altura.

De nuestros reportes lo más notable es el registro de la sita enana *Sitta pygmaea* que aparentemente es un residente permanente del área, y cuatro primeros registros para la Sierra Madre del Sur de Oaxaca, los tres primeros son los registros más meridionales para las especies en cuestión, para el tecolote enano *Micrathene whitneyi*, el reyezuelo de oro *Regulus satrapa*, el picogruero norteño *Coccothraustes vespertinus* y el picogruero encapuchado *C. abeillei*.

Introduction

We summarise the status of 188 species of birds observed (or reported by local residents in five cases) in or near the municipio of San Juan Mixtepec (including portions of adjacent San Pedro Mixtepec), district of Miahuatlán, Oaxaca, Mexico (Fig. 1) in July 1996–March 2000. Observations were made by the authors during the course of an ethnobiological research project in this community directed by ESH⁶. The municipio⁷ encompasses c.57 km², on the north side of the Sierra de Miahuatlán, at 1,630–3,705 m. Major habitats include—in order of increasing elevation—deciduous subtropical forest and subtropical scrub, riparian woodland, oak scrub or chaparral, cultivated and fallow fields and pastures, oak woodland, arid pine–oak forest, humid pine–fir forest and high-elevation *Pinus rudis* forest². The human population—estimated at 850 in 1996 (Hermilo Silva Cruz pers. comm.)—is based in a settlement at c.2,070 m (16°16'N 96°18'W), referred to as the 'town' within the species accounts. The vast majority of human residents are subsistence farmers, owning variable numbers of livestock, predominantly goats, with some sheep, donkeys, and cattle. The settlement is 47 km south-east, by an all-weather dirt road, of the district capital and market centre of Miahuatlán, on the paved highway (federal route 175) between Oaxaca City and the Pacific Coast. The southern part of the municipio includes an extensive region above 3,000 m along the crest of the drainage divide between the short Pacific Coastal streams and the Tehuantepec River basin. This high-elevation area is accessible by a second dirt road that runs east from the paved highway at San José del Pacifico, via San Mateo Río Hondo, and La Cieneguilla. This region is little known ornithologically, but is of particular interest

as it contains an extensive 'island' of pine forest above 3,400 m, isolated by at least 300 km from similar high terrain both in both Mexico's Central Volcanic Axis and on the Chiapas–Guatemala border.

Highlights include a species new to the Oaxaca state list—Pygmy Nuthatch *Sitta pygmaea*, which is apparently a permanent resident in the study area—and four first reports from the Sierra Sur of Oaxaca, the first three representing southernmost records for the species: Elf Owl *Micrathene whitneyi*, Golden-crowned Kinglet *Regulus satrapa*, Evening Grosbeak *Coccothraustes vespertinus* and Hooded Grosbeak *C. abeillei*. Our observations of Buff-breasted Flycatcher *Empidonax fulvifrons* are the second and third reports from the region. Records of Green-fronted Hummingbirds *Amazilia viridifrons*, at 2,000–2,050 m near town, are the highest published reports for the species. South Mexican highland endemics at the south-east limits of their range include: Dusky Hummingbird *Cynanthus sordidus*, Pileated Flycatcher *Xenotriccus mexicanus*, Slaty Vireo *Vireo brevipennis*, Boucard's Wren *Campylorhynchus jocosus*, Ocellated Thrasher *Toxostoma ocellatum*, White-throated Towhee *Pipilo albicollis* and Bridled Sparrow *Aimophila mystacalis*. Cooper's Hawk *Accipiter cooperii* and Violet-green Swallow *Tachycineta thalassina* were observed year-round, though definite nesting was not documented; neither is known to breed south of north and central Mexico.

Methods

Observations were made during 57 visits to San Juan Mixtepec, on a total of 235 days, and were opportunistic, as primary research goals were to collect plants and record local Zapotec names and local

cultural knowledge concerning plants and animals. However, we were able to visit all major habitat types and all major regions of the community repeatedly during all months. Research was approved by the local community assembly, and capture of animals, and collection of plants and insects, were conducted under permit, to ESH, from the Mexican government. ESH tape-recorded vocalisations, especially in spring when breeding species were especially vocal. DAV mist-netted a total of 153 birds on 16 days, which were measured and photographed prior to release. Birds found dead or casualties of mist-netting were prepared as specimens by DAV and have been deposited in the collection of the Instituto de Biología of the Universidad Nacional Autónoma de México, Mexico D.F.

Local habitats

Lands near and below the town have been occupied for at least 1,500 years, probably by directly ancestral Zapotec-speaking populations⁹. Habitats below 2,200 m have been extensively modified by agricul-

ture and grazing activities. Communal forests above 2,200 m, in contrast, are well preserved and have been subject to very limited commercial logging to date. Forest fires are frequent, but crown fires are typically restricted to high ridges. We observed several pines (e.g. *Pinus douglasiana*, *P. ayacahuite*) and oaks (*Quercus laurina*), at 2,400–2,900 m, with diameters >1 m that probably are several hundred years old. The woody dominants in each major habitat (following Binford²) are as follows.

Highland pine forest

Above 3,200 m, forests are near-uniform stands of *Pinus rudis* with *Alnus jorullensis* var. *jorullensis* in clearings and along streams. Characteristic species of the shrub layer are *Senecio* sp., *Lobelia* sp., *Arbutus xalapensis*, *Lupinus* spp., *Ceanothus coeruleus* and *Penstemon* spp., often with a low ground cover of *Pernettya* sp. *Agave atrovirens* is common on open ridges and in areas made open by crown fires.

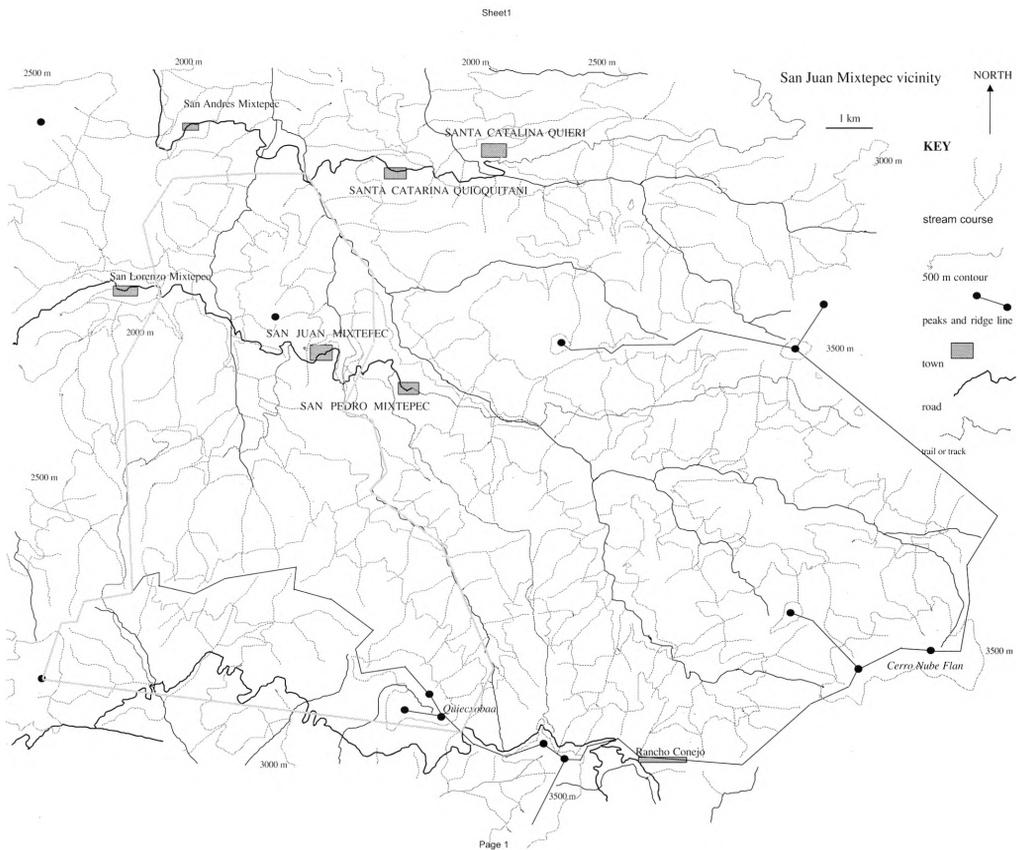


Figure 1. Map of Oaxaca, Mexico showing location of the study site in the municipalities of San Juan and San Pedro Mixtepec, district of Miahuatlán, on the north slope of the Sierra de Miahuatlán.

Humid pine–oak and pine–fir forest

At 2,700–3,400 m, particularly in moist canyons, one finds *Abies guatemalensis* mixed with *Pinus rudis*, *P. ayacahuite*, *P. pseudostrobus*, *Quercus laurina*, *Alnus jorullensis*, *Arbutus xalapensis* and *Cheiranthodendron pentadactylon*. Epiphytic bromeliads (*Tillandsia* spp.) are common on oaks. Common shrubs include *Baccharis heterophylla*, *Senecio* spp., *Stevia* spp., *Lobelia* sp., *Sambucus mexicanus*, *Satureja macrostema* and *Rubus* spp.

Arid pine–oak forest

Forests of this type, below c. 2,200 m, are rather open and predominantly oak (and can be described as oak woodland); the pine canopy is enclosed above 2,300 m. Dominant pine species include *Pinus douglasiana*, *P. oaxacana* and *P. teocote*; *P. leiophylla* occurs locally, while *P. ayacahuite* is conspicuous above 2,500 m. Common oaks include *Quercus acutifolia* and *Q. crassifolia*, with *Q. castanea*, *Q. magnoliifolia*, *Q. obtusata* and *Q. conzattii* at lower elevations. *Quercus laurina* is common above 2,400 m. *Alnus jorullensis* var. *lutea* and *A. arguta* are common understorey trees above 2,400 m. *Arbutus xalapensis* is common in the understorey throughout. Clearings in pine forests, above 2,300 m, are typically associated with seepage areas and are ringed by up to 3 m-tall *Baccharis heterophylla*.

Oak scrub or chaparral

Drier slopes, at 2,000–2,300 m, may lack trees, but are covered by dense stands of 2–3 m-high shrubs, predominantly *Arctostaphylos pungens* and *Comarostaphylis glaucescens*, *Cercocarpus macrophylla*, *Calliandra* spp., *Dodonaea viscosa* and *Lantana* spp. This chaparral may be broken by scattered groves of *Pinus teocote*, *Juniperus flaccida*, *Quercus castanea* and *Arbutus xalapensis*. *Agave potatorum*, *Furcraea longaeava* and *Nolina longifolia* are locally common, the last two especially on steep slopes subject to fire.

Arid subtropical scrub and woodland

Below 2,000 m, a mosaic of low deciduous forest and shrub vegetation is dominated by *Pistacia mexicana*, *Pseudosmodium multifolium*, *Rhus* spp., *Plumeria rubra*, *Senecio praecox*, *Tecoma stans*, *Ceiba acuminata*, *Bursera* spp., *Cnidoscolus multilobus*, *Croton ciliato-glandulifer*, *Acacia* spp., *Conzattia multiflora*, *Crotalaria* spp., *Dalea* spp., *Eysenhardtia platycarpa*, *Leucaena* spp., *Lysiloma acapulcensis*, *Mimosa* spp., *Senna* spp., *Krameria cuspidata*, *Buddleia* spp., *Fraxinus purpusii*, *Amelanchier denticulata* and *Dodonaea viscosa*. Scattered *Juniperus flaccida*, *Pinus michoacana*, *P. oaxacana*, *P. teocote* and *Quercus glaucooides* are prominent. *Agave marmorata*, *A. seemanniana* and *Hechtia* aff. *podantha* are common, as are the arbo-

rescent or columnar cacti *Opuntia pilifera*, *Stenocereus treleasei* and *S. pruinosus*; a few *Cephalocereus chrysacanthus*, *Mitrocereus fulviceps* and *Myrtillocactus schenkii* occur at the lower borders of San Juan Mixtepec communal lands.

Riparian groves

These groves are prominent below 2,300 m where the closed pine–oak forests give way to more open terrain. Characteristic trees of this zone are *Alnus acuminata* and *Salix bonplandiana*. *Salix chilensis*, *Populus mexicanum* and *Fraxinus uhdei* are scarce; *Taxodium mucronatum* and *Ligustrum lucidum* occur below 1,700 m. Common shrubs are *Baccharis salicifolius* and *Cornus excelsa*. This zone is frequently planted with fruit trees, including *Mangifera indica*, *Annona cherimola*, *Persea americana*, *Byrsonima crassifolia*, *Psidium guajava*, *Crataegus pubescens*, *Malus pumila*, *Prunus persica*, *P. serotina* ssp. *capuli*, *Casimiroa edulis* and *Citrus* spp.

Modified terrestrial habitats

Gardens, orchards, hedgerows, and road and trail margins in and near town (at 1,900–2,200 m) are characterised by anthropogenic woody vegetation. Exotic trees planted in town include *Casuarina equisetifolia*, *Jacaranda mimosifolia*, *Melia azedarach*, *Ficus nitida* and *Eucalyptus globulus*. Cultivated fruit trees include *Ficus carica*, *Persea americana*, *Morus celtidifolia*, *Punica granatum*, *Cydonia oblonga*, *Eriobotrya japonica*, *Malus pumila*, *Prunus persica*, *P. armeniaca*, *Citrus limetta* and *C. limonia*. Living fences are of *Agave* spp., *Bursera* spp., *Opuntia* spp., *Stenocereus* spp., *Jatropha cordifolia*, *Erythrina americana* and *Fouquieria formosa*. Cultivated for food and/or fibre are *Agave americana* var. *oaxacensis*, *A. angustiarum*, *A. potatorum*, *A. seemanniana*, *Nopalea auberi*, *Opuntia ficus-indica*, *O. streptacantha*, *O. velutina*, *Stenocereus marginatus* and *S. treleasei*. Common shrubs of roadsides and field margins include *Baccharis* spp., *Senecio salignus*, *Tithonia* sp., *Tecoma stans*, *Ipomoea intrapilosa*, *Ricinus communis*, *Acacia farnesiana*, *A. pennatula*, *Crotalaria* spp., *Eysenhardtia platycarpa*, *Leucaena esculenta*, *Mimosa* spp., *Senna* spp., *Buddleia sessiliflora*, *Byrsonima crassifolia*, *Rosa* spp. and *Brugmansia candida*. Weedy roadside shrubs include *Wigandia urens*, *Argemone mexicana*, *Nicotiana glauca* and *Solanum* spp.

Species accounts

Sequence and nomenclature follow the seventh edition of the AOU check-list¹ Species we did not observe but which were reported by local residents are marked ‡.

Cattle Egret *Bubulcus ibis*

Occasional visitor. One record: a flock of three, on 20 November 1996, at 2,100 m. Local residents report that the species occasionally appears when winds are from the east.

Black Vulture *Coragyps atratus*

Uncommon visitor, mostly in small groups, at 1,600–2,200 m. One record of a flock of 60, on 10 June 1997, feeding on dead oxen.

Turkey Vulture *Cathartes aura*

Fairly common resident at 1,600–3,200 m.

‡**King Vulture** *Sarcoramphus papa*

Presumed extirpated. Local residents report that it occurred rarely in the past.

Hook-billed Kite *Chondrohierax uncinatus*

Status uncertain. Single sighting at 2,350 m, on 16 May 1998, of a dark-morph adult.

Northern Harrier *Circus cyaneus*

Occasional migrant. Records of singles, on 15 November 1996 and 15 December 1997, both near town at c.2,100 m.

Sharp-shinned Hawk *Accipiter striatus*

Uncommon breeder in pine forests to 2,900 m. Fairly common on migration and in winter near town at 2,100 m.

Cooper's Hawk *Accipiter cooperii*

Uncommon on migration and in winter near town; singles observed April, October (two) and November at ±2,100 m. One immature over San Juan, at 2,060 m, on 10 August 1998, suggests that some may summer or even nest in the area. Two noted at 3,200 m, on 4 March 2000. ESH also observed singles south of Oaxaca City, on 11 July 1996, near Sta. Maria Coyotepec, and on 2 August 1998 west of Ejutla.

Short-tailed Hawk *Buteo brachyurus*

Status uncertain. Four records of light-morph adults: May and July (three) at ±2,000 m.

Zone-tailed Hawk *Buteo albonotatus*

Status uncertain. An adult soaring west along the summit ridge of Cerro Nube Flan, at 3,700 m, on 25 April 1997.

Red-tailed Hawk *Buteo jamaicensis*

Fairly common resident throughout at 1,600–3,200 m. Adult feeding young, on 13 June 1997, near a cliff nest-site in dry subtropical forest at 2,000 m. Also seen over pine forests.

American Kestrel *Falco sparverius*

Fairly common winter visitor near and below town, from 10 October to 18 April, at 1,600–2,200 m. Two over a burning field at 3,500 m, on 4 March 2000.

Peregrine Falcon *Falco peregrinus*

Occasional visitor. One record of an adult over the summit of Cerro San Isidro, at 2,250 m, on 6 February 1997.

‡**West Mexican Chachalaca** *Ortalis poliocephala*

Local residents report that it is resident at the lower margin of the community in dry subtropical forest to 1,700 m.

Long-tailed Wood-partridge *Dendrortyx macroura*

Fairly common resident of pine–oak and pine–fir forests, at 2,500–3,300 m. A recently fledged juvenile was rescued from a forest fire in pine forest south of town, on 3 May 1997.

‡**Montezuma Quail** *Cyrtonyx montezumae*

Local residents reported that it is an uncommon resident of fields and pasturelands near and below the town at 1,700–2,000 m.

Red-necked Phalarope *Phalaropus lobatus*

Several were driven far inland by Hurricane Paulina, which came ashore on the Pacific coast due south of the town, on 9 October 1997. Remains preserved.

Rock Dove *Columba livia*

A few feral individuals noted in town and in San Pedro Mixtepec, at 2,150 m. A flock of 25 appeared over San Juan, on 14 July 1998, which had dwindled to none by the end of the month, suggesting that towns may be colonised spontaneously by feral flocks.

Band-tailed Pigeon *Columba fasciata*

Fairly common resident of pine–oak forests and oak woodland, at 2,000–3,200 m. Descends to near the town to feed on ripe acorns.

White-winged Dove *Zenaida asiatica*

Fairly common resident, in and below town, at 1,600–2,100 m.

Mourning Dove *Zenaida macroura*

Uncommon resident in pasturelands near town, at 1,600–2,000 m.

Inca Dove *Columbina inca*

Common resident of the town and agricultural margins, at 2,000–2,200 m.

Common Ground-dove *Columbina passerina*

Uncommon to rare visitor or resident. One, on 30 June 1997, in fields near town at 2,100 m. Another heard calling north of town, on 15 August 1998, at 1,700 m.

White-tipped Dove *Leptotila verreauxi*

Uncommon resident of dry subtropical woodland at 1,700–1,900 m.

‡**Military Macaw** *Ara militaris*

Presumed extirpated. Some local residents report that 50 years ago it was seen occasionally in the area in

April feeding on wild cherries *Prunus serotina* ssp. *capuli*.

Lesser Roadrunner *Geococcyx velox*

Uncommon resident near and below town, at 1,600–2,100 m.

‡**Barn Owl** *Tyto alba*

Local consultants describe a large, earless nocturnal bird with harsh calls, known locally in Zapotec as *mxië* (*lechuza* in Spanish), which may be this species, as it nests 90 km to the north-west in the city of Oaxaca, at 1,550 m.

Whiskered Screech-owl *Otus trichopsis*

Common resident of oak and pine–oak forests at 2,100–2,500 m.

Great Horned Owl *Bubo virginianus*

Local residents report that this species is an uncommon resident to 2,900 m in pine forest. One heard on several occasions just below town, on 11 May–24 June 1998.

Northern Pygmy-owl *Glaucidium [gnoma] gnoma* group

Uncommon resident of pine and pine–fir zones. One seen south of Rancho Conejo in the municipio of San Juan Ozolotepec, at 3,200 m, on 25 July 1997; another seen on 16 December 1997, at 2,440 m, south-east of San Juan Mixtepec, in pine forest.

Elf Owl *Micrathene whitneyi*

Uncommon presumed resident near town. There is one previous record for Oaxaca³. One seen and tape-recorded in a town garden, on 23 January 1997, at 2,060 m. Also heard calling in the same place in February and July 1997, and on 14 June 1998. Another was heard and tape-recorded, 1 km west of town in oak woodland, on 10 April 1997, at 2,150 m.

Lesser Nighthawk *Chordeiles acutipennis*

Occasional migrant. One seen on 16 November 1996, at 2,100 m. Calling individuals of Common Nighthawk *C. minor* were recorded nearby, in San Ildefonso Amatlán, on 22 April 1997, at 1,600 m, and in San Cristóbal Amatlán, on 29 June 1997, at 1,700 m.

Whip-poor-will *Caprimulgus [vociferus] arizonae* group

Common near and above town at 2,000–3,200 m. Calls heard frequently throughout March–April, and in late February, May, August and September. Perhaps absent in winter.

Black Swift *Cypseloides niger*

Occasional summer visitor. Singles noted four times in June–July with foraging flocks of *Cypseloides rutilus* over town at 2,100 m. One noted with Chestnut-colored Swifts over the summit of Cerro Nacimiento, at 3,700 m, on 26 July 1997.

Chestnut-collared Swift *Cypseloides rutilus*

Fairly common in March–November, presumably nesting on cliffs near and below town, at 1,800–2,200 m. Flocks numbering 5–60 noted on 6 March–25 July 1997, and on 12 June–20 August 1998; latest fall report is of a flock over town, on 2 November 1998. Ten noted over the summit of Cerro Nacimiento, at 3,700 m, on 26 July 1997.

White-throated Swift *Aeronautes saxatalis*

Uncommon presumed resident. Sightings in January–April, June–July and November. Two pairs suspected of nesting in cliffs, within a canyon 4 km south-west of town, at 2,500 m. Foraging flocks observed at 3,300–3,500 m, on 3–4 March 2000.

Green Violetear *Colibri thalassinus*

Common in summer and fall in clearings in pine–oak, pine–fir and high pine forests, at 2,300–3,700 m. No records in mid-January to mid-July, though abundant, on 24 July 1997, at Rancho Conejo, at 3,200 m.

Dusky Hummingbird *Cynanthus sordidus*

Fairly common resident near town at c.2,000 m. Few records in mid-January to early June.

White-eared Hummingbird *Hylocharis leucotis*

Resident in pine–oak, pine–fir and high pine forests at 2,300–3,700 m. Common in summer and fall; less common at other seasons. Uncommon visitor near town at 2,000 m.

Berylline Hummingbird *Amazilia beryllina*

Common summer resident at and below town at 1,600–2,200 m. Less common mid-November to May.

Green-fronted Hummingbird *Amazilia viridifrons*

Uncommon near town. Single adults were observed on 18–19 September 1996 and 29 March 1998, at 2,050 m. One immature was mist-netted on 12 January 1997 near town at 2,000 m. These observations are well above the upper elevational limit of 1,400 m cited by Howell & Webb⁵.

Amethyst-throated Hummingbird *Lampornis amethystinus margaritae*

Uncommon summer resident of pine–oak, pine–fir and high pine forests at 2,400–3,200 m. The gorget colour of those males seen well was blue-violet. No records in August–March. Attracted particularly to flowering *Cheiranthodendron pentadactylon*.

Blue-throated Hummingbird *Lampornis clemenciae*

Uncommon summer resident of pine–oak, pine–fir and high pine forests to 3,700 m; common at 3,100 m in July 1997. Occasional visitor near town at flowering *Agave americana* var. *oaxacana*, at c.2,100 m. Recorded April–May, July and September.

Garnet-throated Hummingbird *Lamprolaima rhami*

Uncommon in April–July in pine–fir and high pine forests at 2,500–3,700 m. Attracted particularly to flowering *Cheiranthodendron pentadactylon*. One male found dead above town at c.2,300 m, on 22 August 1998.

Magnificent Hummingbird *Eugenes fulgens*

Fairly common resident in all habitats, near and above town, at 2,000–3,700 m.

Beautiful Hummingbird *Calothorax pulcher*

Uncommon in mid-June–February in and near town, at 1,900–2,150 m.

Ruby-throated Hummingbird *Archilochus colubris*

Common fall migrant near town, on 18 September–17 December; one record on 7 March.

Bumblebee Hummingbird *Atthis heloisa*

Common resident of pine–oak forests at 2,400–3,200 m; occasional near town at 2,000 m.

Broad-tailed Hummingbird *Selasphorus platycercus*

Rare in winter. One record, on 16 December 1997, at 2,440 m, in pine forest south-east of town.

Rufous Hummingbird *Selasphorus rufus*

Abundant fall migrant near town, on 18 September–19 December, at c.2,000 m.

Mountain Trogon *Trogon mexicanus*

Common resident in pine–oak and pine–fir forests at 2,400–3,200 m; occasional in riparian zone and oak woodland to 2,000 m. Conspicuously vocal in March–April.

Elegant Trogon *Trogon elegans*

Rare in lower pine–oak and chaparral zones. One record, on 6 June 1997, in oak woodland at 2,200 m.

Acorn Woodpecker *Melanerpes formicivorus*

Fairly common resident in oak and pine–oak habitats at 2,000–2,500 m.

Grey-breasted Woodpecker *Melanerpes hypopoliis*

Uncommon resident in dry subtropical woodland and agricultural lands at 1,600–2,100 m.

Yellow-bellied Sapsucker *Sphyrapicus varius*

Uncommon winter visitor to oak and pine forests at 2,000–3,200 m (principally based on holes in trees). One sighting, on 7 March 1997, at 2,300 m, south of town.

Ladder-backed Woodpecker *Picoides scalaris*

Uncommon summer resident at and below town at 1,600–2,100 m. Most records in May–August. One noted on 20 February 2000.

Hairy Woodpecker *Picoides villosus*

Common resident of pine forests at 2,300–3,700 m.

Northern Flicker *Colaptes auratus*

Fairly common resident in pine forests at 2,300–3,600 m; more frequently noted near town in winter.

White-striped Woodcreeper *Lepidocolaptes leucogaster*

Status uncertain, Presumed resident in pine–oak forests at 2,400–2,900 m.

Spot-crowned Woodcreeper *Lepidocolaptes affinis*

Status uncertain. Presumed resident in pine–fir forests at c.3,200 m.

Northern Beardless-tyrannulet *Camptostoma imberbe*

Uncommon in dry subtropical woodland and agricultural lands at 1,600–2,000 m. Recorded 10 January–20 July.

Greenish Elaenia *Myiopagis viridicata*

Status uncertain. Presumed resident in riparian zone and arid subtropical woodland at 1,800–2,000 m, but noted only 13 May–21 June 1998.

Pileated Flycatcher *Xenotriccus mexicanus*

Status uncertain. A calling male in arid subtropical woodland, at 1,935 m, on 20 June 1998.

Tufted Flycatcher *Mitrephanes phaeocercus*

Common summer resident in pine forests at 2,400–3,700 m; noted 5 March–7 September.

Greater Pewee *Contopus pertinax*

Common summer resident in oak and pine forests at 2,000–3,500 m, less common in winter; noted on 18 visits in May–August but only on 11 visits in September–April.

Western Wood-pewee *Contopus sordidulus*

Common summer resident in arid subtropical woodland, agricultural lands and pine–oak forests at 1,600–3,000 m. Recorded on 9 April–31 July.

Hammond's Flycatcher *Empidonax hammondii*

Uncommon winter visitor in pine–oak and pine–fir forests at 2,200–3,500 m. Recorded on 14 November–7 March.

Dusky Flycatcher *Empidonax oberholseri*

Common winter visitor to chaparral, oak and dry subtropical woodlands, and agricultural lands, at 1,700–2,200 m. Recorded on 13 October–17 May.

Pine Flycatcher *Empidonax affinis*

Uncommon resident in pine forests at 2,400–3,700 m. Five trapped at 2,020 m near town on 19 December 1997, suggesting a downslope movement in winter.

Cordilleran Flycatcher *Empidonax occidentalis*

Common resident in riparian and pine–fir forests at 1,700–3,200 m. Occupied nests noted on limestone cliffs at 1,700 m and 2,500 m.

Buff-breasted Flycatcher *Empidonax fulvifrons*

Rare, presumed resident of pine–fir forests. Two in song observed and tape-recorded at Rancho Conejo, at 3,200 m, on 24–25 April 1997; three, on 25 November 1997, in pine forests south of town.

Black Phoebe *Sayornis nigricans*

Uncommon resident along streams below 2,100 m.

Say's Phoebe *Sayornis saya*

Uncommon winter visitor in pasturelands at 2,000–2,200 m. Recorded on 14 November–6 February.

Dusky-capped Flycatcher *Myiarchus tuberculifer*

Uncommon presumed resident of oak and pine–oak habitats. Recorded November–January and May–June.

Nutting's Flycatcher *Myiarchus nuttingi*

Uncommon presumed resident of dry subtropical woodland at 1,700–2,000 m. Recorded April–July.

Cassin's Kingbird *Tyrannus vociferans*

Uncommon winter visitor to agricultural lands, dry subtropical woodland and chaparral at 1,600–2,100 m. Recorded only 2 November–27 February, which suggests altitudinal movement, as the species nests commonly in the Oaxaca valley at 1,500–1,600 m.

Thick-billed Kingbird *Tyrannus crassirostris*

Rare summer resident. Territorial individuals noted on 27 February and 17 July 1997, and 19 July 1998, in the same area of dry subtropical woodland at 1,900 m.

Western Kingbird *Tyrannus verticalis*

Uncommon migrant in dry subtropical woodland at 1,700–1,900 m. Two recorded on 13–17 October 1996. Fairly common in nearby San Ildefonso Amatlán, at 1,600 m, at this time.

Scissor-tailed Flycatcher *Tyrannus forficatus*

Rare migrant. One on power lines near town, at 2,100 m, on 2 November 1996.

Grey-collared Becard *Pachyramphus major*

One in pine forest at 2,300 m, on 16 May 1998.

Rose-throated Becard *Pachyramphus aglaiae*

Uncommon presumed resident; a pair was constructing a nest in a riparian corridor, at 2,000 m near town, on 12 May 1998. The male was still present at this nest on 14 June.

Loggerhead Shrike *Lanius ludovicianus*

Uncommon winter visitor; rare in summer. Recorded January, March, June–August and November. In winter in agricultural lands, at 1,900–2,100 m; in summer in dry subtropical woodland, at 1,900 m.

Slaty Vireo *Vireo brevipennis*

A nesting pair observed in dry subtropical woodland at 1,800 m, in May–June 1998.

Plumbeous Vireo *Vireo plumbeus*

Three records: singles on 14 November 1996, 11 January 1997 and 14 May 1998.

Cassin's Vireo *Vireo cassinii*

One record: one trapped, on 11 January 1997, near town at 2,000 m.

Hutton's Vireo *Vireo huttoni*

Common resident of pine and oak forests at 2,100–3,700 m.

Golden Vireo *Vireo hypochryseus*

Common in summer, possibly nesting. Recorded 12 May–19 July, when singing males and pairs were observed in town and in riparian groves near town, at 1,700–2,200 m.

Warbling Vireo *Vireo gilvus*

Uncommon winter visitor to pine and oak forests at 2,000–3,050 m, rare in summer. Recorded on 10 January–10 April; two singing males near town on 17 June 1998 suggests breeding.

Chestnut-sided Shrike-vireo *Vireolanus melitophrys*

Status uncertain; presumed resident in pine–oak woodland. A pair observed on 30 July at 2,300 m.

Steller's Jay *Cyanocitta stelleri*

Common resident of pine forests at 2,300–3,700 m.

Western Scrub-jay *Aphelocoma californica*

Common resident of oak and dry subtropical woodlands and agricultural lands at 1,600–3,000 m.

Common Raven *Corvus corax*

Fairly common resident throughout at 1,600–3,700 m.

Horned Lark *Eremophila alpestris*

Uncommon resident in short-grass pasturelands at 1,900–2,200 m.

Violet-green Swallow *Tachycineta thalassina*

Common migrant and winter visitor, 14 November–27 April, at 2,000–3,700 m, with flocks of up to 350. Though not known to nest south of central Mexico⁵, observations on 4–13 June 1997 of several pairs foraging in dry subtropical woodland, at 1,900 m, and migrant flocks of 50, on 25 July 1997, and of 33, on 22 June 1998, near town suggest local nesting.

Northern Rough-winged Swallow *Stelgidopteryx serripennis*

Uncommon spring and summer resident over agricultural lands and dry subtropical woodlands at 1,700–2,100 m. Recorded 25 February–18 July.

Cliff Swallow *Petrochelidon pyrrhonota*

Uncommon migrant, e.g. 10 on 12 August and five on 22 August 1998 over town.

Barn Swallow *Hirundo rustica*

Uncommon migrant. A flock of 20 noted, at 2,150 m, on 14 November 1996.

Mexican Chickadee *Poecile sclateri*

Fairly common resident of pine–fir and high pine forests at 2,700–3,700 m.

Bridled Titmouse *Baeolophus wollweberi*

Fairly common resident of oak woodland at 1,900–2,200 m.

Bushtit *Psaltriparus minimus*

Common resident throughout at 1,600–3,700 m.

White-breasted Nuthatch *Sitta carolinensis*

Uncommon resident of pine forests at 2,400–2,900 m.

Pygmy Nuthatch *Sitta pygmaea*

Common presumed resident of high pine forests at 3,200–3,700 m. The first record for Oaxaca; it had not previously been recorded south of central Mexico. It appears to be restricted to forests of *Pinus rudis*. Small flocks were noted at several locations along the high ridge south of San Juan and San Pedro Mixtepec on both occasions that we visited the area, on 25 April and 24–26 July 1997. Vocalisations were tape-recorded.

Brown Creeper *Certhia americana*

Common resident of pine–oak, pine–fir and high pine forests at 2,400–3,700 m.

Boucard's Wren *Campylorhynchus jocosus*

Fairly common resident of the town, agricultural lands and dry subtropical woodland at 1,600–2,100 m.

Rock Wren *Salpinctes obsoletus*

Common resident of rocky outcrops near and below town at 1,600–2,200 m.

Canyon Wren *Catherpes mexicanus*

Common resident of town, where it nests on abandoned buildings and in rocky canyons below town, at 1,600–2,100 m.

Bewick's Wren *Thryomanes bewickii*

Common resident of town, agricultural lands, chaparral, and oak and dry subtropical woodlands, at 1,600–2,200 m.

House Wren *Troglodytes [aedon] aedon* group

Two observed near town, on 20 February 2000.

House Wren *Troglodytes [aedon] brunneicollis* group

Common resident of pine–fir and high pine forests at 2,400–3,700 m.

Grey-breasted Wood-wren *Henicorhina leucophrys*

Uncommon resident of pine–fir forests at 2,500–3,200 m.

American Dipper *Cinclus mexicanus*

Uncommon resident of permanent streams near and below town at 1,600–2,000 m. One record at 3,200 m, at Rancho Conejo, on 25 July 1997.

Golden-crowned Kinglet *Regulus satrapa*

Uncommon presumed resident of pine–fir forests at 2,700–3,500 m. The first record in the Sierra Sur. The only previous records for Oaxaca are from Cerro San Felipe in the 1850s², 1995⁸ and 1997 (ESH and John Forcey pers. obs.). We observed individuals and groups of up to 20, on 24 April, 23 June, and 17 and 26 July 1997, at several locations above San Juan Mixtepec and Santo Domingo Ozolotepec. Calls and songs were tape-recorded. In all cases, they foraged high in *Abies guatemalensis* and associated *Pinus* spp. The species most frequently associated with *Parus sclateri*.

Ruby-crowned Kinglet *Regulus calendula*

Common winter visitor recorded 14 November–10 April, in pine and pine–oak forests, dry subtropical woodlands, riparian groves and agricultural lands, at 1,600–3,500 m.

Blue-grey Gnatcatcher *Poliophtila caerulea*

Common resident of oak and dry subtropical woodlands and agricultural lands at 1,600–2,200 m.

Eastern Bluebird *Sialia sialis*

Uncommon in spring and summer in agricultural lands near town at 2,100–2,200 m. Individuals or family groups noted 10 April and 16 May 1997, 13 May–19 August 1998 and 18–21 February 2000.

Brown-backed Solitaire *Myadestes occidentalis*

Common resident of pine–oak and pine–fir forests at 2,300–3,000 m.

Orange-billed Nightingale-thrush *Catharus aurantiirostris*

Uncommon summer resident of riparian groves at 1,600–2,000 m. Recorded 14 May–18 August.

Russet Nightingale-thrush *Catharus occidentalis*

Common resident of pine forests at 2,300–3,200 m; may use riparian corridors to 2,000 m.

Ruddy-capped Nightingale-thrush *Catharus frantzii*

Uncommon presumed resident of pine–fir forests at 2,500–3,200 m.

Swainson's Thrush *Catharus ustulatus*

Uncommon migrant: singles noted at 2,000 m, in riparian woods near town, on 14 and 16 May 1998.

Hermit Thrush *Catharus guttatus*

Uncommon migrant: six individuals recorded in high pine forest, on 24–26 April 1997, at 3,200–3,600 m.

White-throated Robin *Turdus assimilis*

Status uncertain. Three at 2,000 m in riparian woods near town, on 12 May 1998.

American Robin *Turdus migratorius*

Common resident in all pine and oak forest habitats at 2,000–3,700 m.

Aztec Thrush *Ridgwayia pinicola*

Status uncertain. Presumed resident of pine–fir forests. Four observed on 3 April, one on 12 June 1997 and two on 17 December 1997, at 2,600 m, 4 km south-west of town. Attracted to flowering *Cheiranthodendron pentadactylon*.

Northern Mockingbird *Mimus polyglottos*

Fairly common resident in dry subtropical woodland at 1,600–1,900 m. Conspicuously vocal mid-May to mid-July.

Ocellated Thrasher *Toxostoma ocellatum*

Status uncertain. Presumed resident in chaparral and dry subtropical woodland at 1,800–2,200 m. Recorded on 7 August 1996, 5 June 1997 and 20 July and 12 August 1998.

Curve-billed Thrasher *Toxostoma curvirostre*

Fairly common resident, in agricultural lands and in town, at 1,900–2,100 m. Males were singing near town 29 March 1998.

Blue Mockingbird *Melanotis caerulescens*

Common resident, preferring riparian groves, but found in all habitats, at 1,600–3,700 m.

American Pipit *Anthus rubescens*

A single observed on 4 March 2000, at 3,100 m, at Rancho Conejo, at the south-eastern limit of the species' normal winter range².

Cedar Waxwing *Bombycilla cedrorum*

Common late-winter visitor, on 9 January–27 April, at 1,700–2,300 m.

Grey Silky-flycatcher *Ptilogonys cinereus*

Common resident throughout at 1,600–3,700 m.

Olive Warbler *Peucedramus taeniatus*

Common resident of pine and high pine forest at 2,400–3,700 m.

Orange-crowned Warbler *Vermivora celata*

Uncommon winter visitor to 3,300 m. Recorded 13 October–7 March.

Nashville Warbler *Vermivora ruficapilla*

Common winter visitor. Recorded 13 October–10 April.

Crescent-chested Warbler *Parula superciliosa*

Common permanent resident of pine forests at 2,200–3,200 m.

Yellow-rumped Warbler *Dendroica coronata auduboni*

Common winter visitor to all forested habitats at 2,000–3,700 m. Recorded 13 October–26 April. All individuals identified to subspecies were *auduboni*.

Black-throated Grey Warbler *Dendroica nigrescens*

Uncommon winter visitor to oak woodland at 2,000–2,300 m. Recorded 7 September–10 April.

Black-throated Green Warbler *Dendroica virens*

Rare straggler. One record, on 18 September 1996, in town at 2,060 m.

Townsend's Warbler *Dendroica townsendi*

Common winter visitor to pine forests at 2,100–3,100 m. Recorded on 7 September–10 April.

Hermit Warbler *Dendroica occidentalis*

Common winter visitor to pine forests at 2,300–3,100 m. Recorded 28 September–10 April.

Yellow-throated Warbler *Dendroica dominica*

Rare straggler. One record, 10 August 1998 in atypical habitat, oak woodland at 2,200 m.

Black-and-white Warbler *Mniotilta varia*

Uncommon winter visitor to oak woodland at 2,000–2,200 m. Recorded 10 August–20 February.

Louisiana Waterthrush *Seiurus motacilla*

Rare migrant. One record, on 25 July 1997, at Rancho Conejo at 3,200 m, a very early fall migrant.

MacGillivray's Warbler *Oporornis tolmiei*

Uncommon winter visitor, to 3,050 m. Recorded 28 September–29 March.

Wilson's Warbler *Wilsonia pusilla*

Common winter visitor throughout, to 3,050 m. Recorded 20 August–17 April.

Red-faced Warbler *Cardellina rubrifrons*

Uncommon winter visitor to pine–oak forest and oak woodland at 2,000–2,300 m. Recorded 18 September–7 March.

Red Warbler *Ergaticus ruber*

Common resident in pine forests at 2,400–3,700 m.

Painted Redstart *Myioborus pictus*

Common resident in pine–oak forests at 2,000–2,300 m.

Slate-throated Redstart *Myioborus miniatus*

Common resident in pine forests at 2,200–3,700 m.

Rufous-capped Warbler *Basileuterus rufifrons*

Common resident in dry subtropical woodlands and agricultural lands at 1,600–2,200 m.

Golden-browed Warbler *Basileuterus belli*

Uncommon resident of pine–fir forests, especially in damp canyons, at 2,500–3,200 m.

Common Bush-tanager *Chlorospingus ophthalmicus*

One record, on 7 September 1996, at 2,300 m in pine–oak forest.

Hepatic Tanager *Piranga flava*

Uncommon resident of pine–oak forests and oak woodlands at 2,000–2,400 m.

Summer Tanager *Piranga rubra*

Uncommon winter visitor at and below town at 1,700–2,000 m. Recorded 14 November–29 March.

Western Tanager *Piranga ludoviciana*

Common winter visitor throughout at 1,700–3,200 m. Recorded 14 November–26 April.

Red-headed Tanager *Piranga erythrocephala*

One record, a pair on 14 June 1998, in oak woodland at 2,100 m.

Elegant Euphonia *Euphonia elegantissima*

Uncommon resident of pine–oak forests, foraging typically in clumps of mistletoe *Phoradendron* spp., at 2,400–2,600 m.

White-collared Seedeater *Sporophila [torqueola] torqueola* group

Uncommon summer resident in town and agricultural areas, at c.2,000 m. Recorded 14 May–20 August.

Cinnamon-bellied Flowerpiercer *Diglossa baritula*

Common in high pine forest at 3,200–3,700 m, on 24–26 July 1997. Additional sightings of singles in April, August and October in pine forests down to 2,400 m and of two, on 18 July 1998, at 2,100 m near town.

Rufous-capped Brush-finch *Atlapetes pileatus*

Fairly common resident in pine–oak, pine–fir and high pine forests at 2,200–3,600 m.

Chestnut-capped Brush-finch *Buarremon brunneinucha*

Uncommon resident in pine–oak and pine–fir forests at 2,500–3,200 m; one record at 2200 m, on 13 May 1998.

Collared Towhee *Pipilo ocai*

Uncommon resident in pine–oak, pine–fir and high pine forests at 2,500–3,600 m.

Spotted Towhee *Pipilo maculatus*

Common resident throughout at 1,700–3,700 m.

White-throated Towhee *Pipilo albicollis*

Very common resident in town and agricultural areas at 1,900–2,200 m.

Bridled Sparrow *Aimophila mystacalis*

Common presumed resident in dry subtropical woodland at 1,600–1,950 m, though recorded only on 14 April–15 August.

Rufous-crowned Sparrow *Aimophila ruficeps*

Fairly common resident in agricultural lands and dry subtropical woodlands at 1,600–2,100 m.

Chipping Sparrow *Spizella passerina*

Irregularly common to abundant winter visitor in agricultural areas at c.2,000 m. Recorded 9 December–10 April. Hundreds were observed near town on 29 March 1998 and in January–February 2000.

Clay-coloured Sparrow *Spizella pallida*

Rare in winter. A flock recorded on 15 December 1997 near town.

Vesper Sparrow *Poocetes gramineus*

Two on 17 December 1996 in pastureland at 2,100 m.

Grasshopper Sparrow *Ammodramus savannarum*

Status uncertain. One, on 21 February 2000, at 2,200 m in a fallow field near town.

Lincoln's Sparrow *Melospiza lincolni*

Fairly common winter visitor in town and agricultural lands at 1,900–2,300 m. Recorded 14 November–17 May.

Yellow-eyed Junco *Junco phaeonotus*

Common resident of pine forests at 2,300–3,700 m.

Black-headed Grosbeak *Pheucticus melanocephalus*

Fairly common resident at 1,900–3,050 m.

Blue Grosbeak *Guiraca caerulea*

Two records: two on 14 November 1996 near town, at 2,000 m, and a male, on 21 June 1998, at 2,100 m, near Santa Catarina Quiquitaní, an adjacent community.

Indigo Bunting *Passerina cyanea*

Uncommon in winter. Singles trapped on 17 December 1996 and 19 December 1997, both near town at c.2,000 m.

Great-tailed Grackle *Quiscalus mexicanus*

Very common resident in and near town at 2,000–2,100 m. Reported to be a recent arrival in the area, having become established within the memory of older San Juan residents.

Bronzed Cowbird *Molothrus aeneus*

Fairly common summer resident in and near town at 2,000–2,100 m. Recorded 6 March–1 August. Two late-autumn records of pairs in October–November. Reported to be a recent arrival in the area, having be-

come established within the memory of older San Juan residents.

Black-vented Oriole *Icterus wagleri*

Fairly common resident in town and agricultural lands at 1,900–2,200 m.

Orchard Oriole *Icterus spurius*

Two, on 3 May 1997, in oak woodland at 2,100 m.

Streak-backed Oriole *Icterus pustulatus*

Status uncertain. One, on 15 August 1998, at 1,630 m in riparian woodland. A nearby nest was probably of this species. Presumably restricted to the lower margins of the municipio.

Audubon's Oriole *Icterus graduacauda*

Status uncertain. One, on 9 April 1997, in pine forest, at 2,400 m.

Bullock's Oriole *Icterus bullockii*

Uncommon migrant. Several near town, at 2,000 m, on 29 March 1998.

House Finch *Carpodacus mexicanus*

Common resident in town at 2,000–2,100 m. Uncommon in oak and dry subtropical woodlands at 1,600–2,300 m.

Red Crossbill *Loxia curvirostra*

Uncommon resident of pine forests at 2,300–3,700 m. Analysis of sonograms (see Fig. 2) indicates that local populations are 'Type 2' Red Crossbills; one male strayed to town at 2,050 m, on 23 August 1998.

Black-headed Siskin *Carduelis notata*

Uncommon, presumed resident of pine-fir and high pine forests at c.3,200 m.

Lesser Goldfinch *Carduelis psaltria*

Common resident in oak and dry subtropical woodland, agricultural areas and in town at 1,600–2,300 m.

Hooded Grosbeak *Coccothraustes abeillei*

Status uncertain. Five on 4 March 2000, at 3,500 m, 4 km west of Rancho Conejo on the crest of the divide south of San Juan Mixtepec. This is apparently the first record for the Sierra Sur of Oaxaca.

Evening Grosbeak *Coccothraustes vespertinus*

Fairly common and presumably resident in pine-fir and high pine forest at 2,800–3,700 m. Scattered flocks at Rancho Conejo, on 24 April 1997, and 5 km south-west of San Juan Mixtepec, on 30 June 1997; over 50 at Rancho Conejo and on the summit ridge of Cerro Nacimiento, on 24–26 July 1997, are the first records for the Sierra Sur of Oaxaca. Previous reports for Oaxaca were limited to a few sightings on Cerro San Felipe, near Oaxaca City².

House Sparrow *Passer domesticus*

Non-native. Uncommon resident in town. Total San Juan and San Pedro Mixtepec populations <100. Reported to be a recent arrival in the area, becoming established after the introduction of electric corn mills in the late 1970s.

Discussion

Distributions of San Juan and San Pedro Mixtepec birds by habitat

The distributional patterns of 180 species within San Juan and San Pedro Mixtepec are summarised according to principal habitat categories. Qualifications concerning habitat preferences, multiple habitat preferences and seasonal variations are noted. Eight species that are non-native, or of very occasional occurrence, are not listed, as their local habitat preferences are unknown. Species totals sum to more than 180, as a number of species are listed twice, if they have a strong secondary habitat preference.

Twenty-six species (15%) are widely distributed across all habitats, though six of these may be found more commonly in a specific habitat. Sixty-two species (35%) are characteristic of town and field, though 20 are commonly found in another habitat. Seventeen species (9%) are characteristic of riparian woodland or permanent streams, six of which may often be found in another habitat.

The exceptional diversity of birds of pine and oak forest habitats is striking; 77 species (42%) are primarily restricted to these zones. We may include an additional 26 (14%) widely distributed species to produce a total of 103 species (58%) that occur in the pine/oak forest zone. Species that nest north of the Mexican border and winter in the study area



Figure 2. Sonogram of Red Crossbill flight calls recorded 9 April 1997, 5 km south-west of San Juan Mixtepec, at 2,500 m. These most closely resemble 'Type 2' vocalisations of birds recorded by T. Hahn, University of Washington.

are particularly numerous in pine and oak forest habitats. However, only 11 northern migrants are primarily restricted to the pine and oak zones. Of the 30 species (17%) that occur in arid scrub and woodland, just 11 are exclusive to that habitat; most also occur in adjacent agricultural, pastoral and riparian zones.

Biogeographic affinities of the birds of San Juan and San Pedro Mixtepec

We summarise below San Juan Mixtepec birds by their biogeographic affinities. We have classified each of the 186 species recorded in the study area according to breeding range, distinguishing Mexican endemics from more widespread breeders. We treat species as 'endemic' to Mexico if they do not occur regularly either to the north or south of the Mexican border. Within this grouping, we pay particular attention to those species restricted to south-central Mexico, north of the Isthmus of Tehuantepec. Those that regularly breed north of the Mexican border are classified as 'essentially western', 'essentially eastern', 'south-western' and 'widespread', according to their breeding ranges in the USA and/or Canada. 'Western' is broadly defined as north of the states bordering Mexico, but west of the Mississippi River. 'Eastern' is taken as north of the states bordering Mexico, but east of the continental divide. Thus, a number of 'eastern' species may nest far to the west in Canada and Alaska. 'South-western' species are those that breed north to Arizona, New Mexico and Texas, but rarely beyond. These are further distinguished, between those that nest in Arizona and/or west Texas, versus those that nest in south Texas (some, of course, breed in both areas). Finally, there are those species that nest widely across the USA and/or Canada. We also tally the number of species that nest throughout their North American range, versus those that merely migrate to or through San Juan Mixtepec after nesting.

Of the 186 native species thus far recorded in San Juan and San Pedro Mixtepec, 133 (70%) regularly occur north of the Mexican border. (We consider as 'species' two subspecies groups of House Wren *Troglodytes aedon*, the *aedon* and *brunneicollis* groups. We also treat as species, for the purpose of our biogeographic analysis, certain well-defined subspecific groups: Mexican Whip-poor-will [*arizonae* group] and Cinnamon-rumped Seedeater [*torqueola* group].) Twenty-four (13%) are endemic to Mexico, north of the Isthmus of Tehuantepec (including 11 endemic to south-central Mexico: namely West Mexican Chachalaca, Dusky Hummingbird, Green-fronted Hummingbird (also in Chiapas), Beautiful Hummingbird, Grey-breasted Woodpecker, Pileated Flycatcher, Gray Vireo, Boucard's Wren, Ocellated Thrasher, White-throated Towhee and Bridled Sparrow), while 32 (17%) occur in

Mesoamerica south of Mexico but not regularly north of the US border. Mexican endemics are divided between those of pine forests (nine), arid subtropical habitats (12) and those of riparian zones (two). Arid subtropical habitats (below 2,100 m in San Juan Mixtepec) are home to the 11 most narrowly circumscribed endemics.

Of the 133 native species that regularly occur north of Mexico, 56 are 'widespread' (42% of the 133), 36 are 'western' (27%), seven are 'eastern' (5%) and 34 are 'south-western' (26%). The preponderance of species of 'western' affiliation is further emphasised by the 22 'south-western' species that are restricted to Arizona and/or west Texas, that is, they are essentially restricted as breeders to the Sierra Madre Occidental/Rocky Mountain axis. Twenty-two of the 'south-western' species are restricted to Arizona and/or west Texas, and thus also 'essentially western' (five are restricted to south Texas, while eight occur throughout border regions). 'Western' species outnumber 'eastern' species (including those of border states) 58 to 12.

Of the 188 species recorded in the study area, 123 are presumed to breed locally (and an additional 17 may nest in the area); 49 (26%) are winter visitors or transients. Five are migrants from the south, nesting locally but absent in winter. San Juan and San Pedro Mixtepec are at or very near the south-eastern limit of the range of 56 species⁵. Our observations have established new south-eastern limits for Elf Owl, Pygmy Nuthatch, Golden-crowned Kinglet and Evening Grosbeak.

High-elevation records

Previously published summaries of species distributions in Oaxaca cite very few reports at elevations above 3,000 m². On three occasions (24–26 April and 24–26 July 1997 and 3–5 March 2000), we visited high elevations along the crest of the Sierra Sur, on the borders of San Juan and San Pedro Mixtepec with Santo Domingo and San Juan Ozolotepec, neighbouring municipios on the southern slope of the range. In 1997, DAV and ESH hiked to the summits of the three highest summits in this area, Cerro Nube Flan (3,750 m), Cerro Nacimiento (3,705 m) and Cerro Quiexobra (3,650 m). We spent six nights at 3,200 m on the río Frio, near the settlement of Rancho Conejo, recording 65 species above 3,000 m (see species accounts). Of particular interest was our 1997 discovery of Pygmy Nuthatch at several locations, all above 3,200 m. We also found Golden-crowned Kinglet in groves of *Abies guatemalensis* to 3,500 m. Evening Grosbeak, previously unknown from this range, was abundant near the summit of Cerro Nacimiento, on 26 July 1997, and five Hooded Grosbeaks were nearby at 3,500 m, on 4 March 2000. Whip-poor-wills (*arizonae* group) were calling at our río Frio camp during the March–April visits. Two territorial male Buff-breasted Flycatchers were call-

ing near camp, on 24–25 April 1997. The stream here harboured an American Dipper, on 25 July 1997 and a very early returning migrant Louisiana Waterthrush, on 26 July 1997. An American Pipit foraged here, on 4 March 2000. Several hummingbirds (predominantly Green Violetear, White-eared, Blue-throated and Magnificent Hummingbirds) were abundant in July, feeding in fallow fields dominated by *Penstemon* spp., but were scarce in March–April at the same location. Flocks of swifts (Black, Chestnut-collared and White-throated) and Violet-green Swallow were noted on the summits and high ridges during our March and July visits. A Zone-tailed Hawk was at 3,700 m near the summit of Cerro Nube Flan, on 25 April 1997 and two American Kestrels foraged over a burning field at 3,500 m, on 4 March 2000.

Acknowledgements

ESH's ethnobiology research was funded by a grant (SBR 9515395) from the US National Science Foundation. We are particularly grateful for the welcome we received in San Juan Mixtepec, especially for the assistance of the Presidente Municipal, C. Hermilo Silva Cruz, and the other communal authorities, the Cruz Hernández family (Cándido, Rosalía, Ínez Virgen, Valentina, Aurora, Justina, Mari Elena, Lilia and Griselda), our neighbours and friends, Pedro and Bernardina and family, Silvino, Virgen and family, Pánfilo and the rest. Thanks also to our colleague in San Pedro Mixtepec, Dr Miguel Ángel Espinoza and his family, for many insights and much enthusiasm. Roger Reeck generously shared his linguistic expertise. The SERBO, A. C., staff in Oaxaca introduced us to the pueblos Mixtepec and their continuing collaboration has been invaluable.

The second author, DAV, died in a tragic accident, on 25 February 1998. His intelligence, inexhaustible energy and dedication to the development of Oaxaca ornithology, and to the conservation of Mexico's natural heritage, has been a great inspiration to us and all who worked with him; he is sorely missed by his many friends in San Juan Mixtepec.

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