

*A highly distinctive, little-known bird of high cloud-forest in southernmost Mexico and adjacent western Guatemala, this guan is at risk from habitat destruction and hunting within its limited range, and requires an intensive survey to assess its current status and needs, and the creation of several further protected areas.*

**DISTRIBUTION** The Horned Guan (see Remarks 1) is restricted to the Sierra Madre del Sur in southern Oaxaca (reportedly) and Chiapas, extreme southern Mexico, and the region of high ranges and volcanoes in adjacent south-west Guatemala, with one record from eastern Guatemala and a probable record from Honduras (see Remarks 2). Patchiness of distribution is discussed under Threats.

**Mexico** Localities for the species, as given by Andrlé (1967) and Vaurie (1967c) or as otherwise stated (with coordinates derived from OG 1956a or as otherwise stated), are (west to east): (*Oaxaca*) by local report, the Sierra Madre in the extreme east of the state, probably on Picacho Prieto (Binford 1989) although Cerro Baúl is mentioned by Vannini and Rockstroh (1988), with a claimed confirmation from the state in 1988 (*Cracid Newsletter* 1,1 [1991]: 4); (*Chiapas*) by local report, in the mountains west of Cintalapa, 16°44'N 93°43'W; by local report, the Sierra Madre above Tonalá; Cerro Venado, 1987 (González-García 1988a); by local report, "the trail over the Sierra from San Juan Custepeques", 15°41'N 93°00'W (coordinates from A. Long *in litt.* 1992); El Triunfo, 15°37'N 92°48'W (coordinates from A. Long *in litt.* 1992); near Santa Ana de la Laguna, 15°43'N 92°32'W; Cerro Toquián Grande, 1987 (González-García 1988a); Pinabete, c.15°13'N 92°13'W (read from DCM 1958); Volcán Tacaná (Mexican side: see Remarks 3), 15°07'N 92°06'W (Taylor 1975b; also probably in 1984: see Measures Proposed: Captive breeding); "Frailesca" (untraced) on Cerro Pico de Loro, 15°35'N 92°01'W (see Remarks 4). Of these sites, the most important are El Triunfo and the unprotected Volcán Tacaná (González-García 1988a).

Seemingly good potential sites for the species include Cerro Tres Picos (16°11'N 93°37'W: A. Long *in litt.* 1992) (although this seems likely to be the same area as that indicated by "above Tonalá"), Cerro La Angostura and Cerro Cebú (both in core areas of El Triunfo Biosphere Reserve), although these and three others (all north-west of El Triunfo), Cerro Semental, Cerro Tecoloma and Cerro Tomate, were searched unsuccessfully in March-June 1987; nevertheless, local hunters on Cerro Cebú and Cerro La Angostura reported them easy to shoot on account of their tameness, two being taken on the former in 1985 (González-García 1988a).

**Guatemala** Localities for the species, as given by Andrlé (1967) and Vaurie (1967c) or as otherwise stated (with coordinates from OG 1965), are (northern sector, west to east, followed by southern sector, west to east): Jucup and Tzununcap in the region of San Sebastián Coatan, 15°44'N 91°34'W; north-west of San Pedro Soloma, 15°43'N 91°27'W; above Huehuetenango; San Miguel Uspantan, 15°23'N 19°50'W; Chicaman, 15°24'N 90°46'W (though the site specified was the left bank of the río Negro, i.e. well south of Chicaman itself and over a range of hills); Cobán, 15°29'N 90°19'W; Volcán Tacaná (Guatemala side: see Remarks 3), 15°08'N 92°06'W; Volcán Tajumulco, 15°02'N 91°55'W; Volcán Santa María, 14°45'N 91°33'W (where, however, no records were obtained in one year's fieldwork in the mid-1980s: Vannini and Rockstroh 1988); Zunil Ridge (Volcán Zunil), 14°44'N 91°27'W (where additionally in 1970 a feather was found at 3,300 m and birds were reported by locals: R. F. Andrlé *in litt.* 1988), this evidently including the modern birding site for the species, Fuentes Georgina, at c.14°46'N 91°26'W, where (e.g.) five were observed in July 1990 (Wall 1992; coordinates from J. del Hoyo *in litt.* 1992); Volcán San Pedro, 14°39'N 91°16'W; Volcán Toliman (Volcán San Lucas), 14°37'N 91°11'W; Volcán Atitlán, 14°35'N 91°11'W; Chiul (presumably "Chibul"), El Quiche, 15°24'N 91°05'W; Chichoy, 14°48'N 91°03'W (see Remarks 5), although searches of the Tecpán ridge near Chichoy in 1970 were negative (R. F. Andrlé *in litt.* 1988); (Finca) Santa Elena, 14°48'N 91°01'W; Cerro Tecpan, 14°47'N 91°01'W; (Finca) Chichavac, 14°48'N 90°59'W; Volcán de Fuego, 14°29'S 90°53'W; and, 110 km north-north-east (as predicted by Vannini and Rockstroh 1988), the Sierra de las Minas at c.2,500 m, about 20 km north-west of Río Hondo (Howell and Webb 1992).

In addition to these sites, the following were identified by Andrlé (1967) as likely to hold populations of the species: Cerro Tumbador, 14°52'N 91°56'W (coordinates are for "El Tumbador"); Volcán Lacandon, 14°49'N 91°42'W; Cerro Tecun Uman, 14°50'N 91°30'W; Cerro Santa Clara, 14°39'N

91°17'W; Volcán Acatenango, 14°30'N 90°53'W. Of these, the Tecun Uman ridge was searched in 1970 with negative results (R. F. Andrle *in litt.* 1988). Volcán de Agua, considered a possible site by Vannini and Rockstroh (1988), was ascended in 1970, but not sufficiently high to encounter the species (R. F. Andrle *in litt.* 1988). It is clear that there may be many other sites within the scope of this range where the species still occurs or occurred until recently; Vannini and Rockstroh (1988) mentioned the Sierra de Chuacús as an area in which residual populations may occur, and the Volcán Siete Orejas as the purported source of a captive bird near Quetzaltenango.

**POPULATION** Numbers have clearly decreased very seriously over the past century, as there is nowhere today where the species is considered any better than uncommon. In Guatemala a hundred years ago, however, it was “fairly abundant” above Chicaman (Salvin and Godman 1888-1904) and in the 1930s it was reported to have been fairly common at Chichoy (Carriker and Meyer de Schauensee 1935); it was still abundant in the 1960s on the Pacific slope of Volcán Tajumulco, but both there and at Chichoy the situation has deteriorated, and although Tajumulco may have continued to hold one of the largest of the remaining populations (Andrle 1967), in recent years political and military activities in the area may have led to a substantial decline (P. Rockstroh *per* M. J. González *in litt.* 1988). Elsewhere in Guatemala even by the 1930s a great decline was recognized since birds had not been found for years in places where they were formerly common (Griscom 1932); however, according to a local hunter, the species remains common in the newly discovered locality, the Sierra de las Minas (Howell and Webb 1992), and there are other parts of the species's range where the inaccessibility of the terrain will render it relatively secure for some years (P. Rockstroh *per* M. J. González *in litt.* 1988). Andrle (1969) considered that the largest populations occur along the Pacific slopes from Volcán Tacaná on the Mexico border south-east to Volcán de Fuego, and that this may have been the evolutionary centre of the species's abundance; but it is within this area that much habitat has been lost (see Threats). In 1970 aerial surveys showed substantial habitat remaining on Volcanes Toliman, Atitlán and Zunil, and some on San Pedro (R. F. Andrle *in litt.* 1988). In Mexico also a decline at El Triunfo was apparent in the mid-1960s (Andrle 1967). At the end of the 1970s an estimate was made that less than 1,000 birds survived (King 1978-1979; a figure evidently accepted by González-García 1988b), and comment that the species is amongst the rarest of the cracids (e.g. Estudillo López 1986) is common.

**ECOLOGY** The habitat of the Horned Guan is humid, evergreen, montane broadleaf forest (“cloud-forest”) composed of many different tree and shrub species, sometimes mixed with cypress or pine, with ground and tree-ferns, epiphytes, mosses and lianas generally abundant; “here are moldering ranks of fallen trees and a luxuriant undergrowth, everything saturated with moisture because the sun is prevented from penetrating by the closed canopy” (Andrle 1967). Details of variation in composition of broadleaf habitats between localities are provided by Andrle (1967). On Volcán de Fuego the species was chiefly to be found in belts of the “hand plant *Chirostemen platanoides*” (Salvin 1860, Salvin and Godman 1888-1904), but this tree, now identified as *Chiranthodendron pentadactylon*, is seemingly absent from other mountains in its range (Andrle 1967). Details of the *Quercus–Matudea–Hedyosmum–Dendropanax* community that is the habitat of the species at El Triunfo (A. Long *in litt.* 1992) appear in Long and Heath (1991: 139-141) and Williams Linera (1991). A territorial polygynous male at El Triunfo repeatedly visited several “palo colorado” trees *Symplocarpus flavifolium* which provided food but also appeared to serve as look-outs or as advertising posts (González-García and Bubb 1989). The bird occasionally penetrates stands of pine and cypress (Andrle 1967), and has been described as occupying cloud-forest in the transition zone between deciduous and coniferous forests at 1,500-3,200 m (Estudillo López 1986). The altitudinal range in Mexico is from around 1,600 to 2,700 m, in Guatemala from around 2,130 up to 3,350 m, although there are very few sites with suitable habitat above 3,300 m; in Guatemala the greatest abundance appears to occur between 2,400 and 3,100 m (Andrle 1967). Wagner (1953) claimed that in the breeding season the species occupies areas above the limits of cloud-forest on the windswept, bushy mountain peaks, and hence was much more terrestrial than other cracids, while outside the breeding season it enters the forest and then was often to be found feeding in rides cut by coffee-planters; however, while it is the case that certain other workers have reported it to be terrestrial for much of the time (Salvin 1860, Salvin and Godman 1888-1904, Blake 1953), the accumulated evidence – including a very short tarsus – is against the species being any more ground-haunting than other cracids (Andrle 1967, Vaurie 1968), nor does it imply a breeding season exodus to higher levels (see Andrle 1967). That it is “primarily terrestrial”

(Land 1970) is clearly unlikely; but it has been observed walking and never flying upslope (P. J. Bubb *in litt.* 1991).

Studies at El Triunfo in the 1980s revealed that the species eats the fruit of at least 35 plants (notably in the Lauraceae, Araliaceae and Liliaceae), the leaves of five others, and both of one, as follows (this list extending and superseding information in Andrlé 1967, González-García 1984): *Ilex tolucana*, *Anthurium* sp. (leaves), *Dendropanax pallidus*, *D. populifolius*, *Oreopanax capitatus*, *Epiphyllum crenatum* var. *crenatum*, *Hedyosmum mexicanum*, *Eupatorium chiapense* (leaves), *Schistocarpha bicolor* (leaves), *Licaria alata*, *Nectandra sinuata*, *Nectandra* sp., *Ocotea chiapensis*, *O. matudae*, *O. uxpanapana*, *Persea* sp., *P. liebmanii*, *Phoebe bourgeiviana*, *P. siltepecana*, *Smilax jalapensis*, *S. lanceolata*, *S. mollis*, *S. purpusii*, *S. subpubescens*, *Conostegia volcanalis*, *Morus* sp., *Trema micrantha*, *Zunillia cucullata*, *Cobaea scandens* (leaves), *Rhamnus capraefolia* var. *grandiflora*, *Cestrum* aff. *guatemalense*, *Solanum* sp. (fruit and leaves), *Symplocarpum flavifolium*, *Urera alcifolia*, *U. caracasana*, *Citharexylum mocinnii*, “cola de caballo” (Scrophulariaceae) (leaves), “coxoc” (Ulmaceae), “cafecillo” and “cacho de carnero” (families unknown) (F. González-García *in litt.* 1992). The *Prunus* mentioned by Salvin (1860) remains of uncertain identity. Other authors also mention buds, shoots and invertebrates (Wagner 1953, Andrlé 1967, González-García 1984), the last being regarded as readily taken, notably soft-bodied insects such as Orthoptera and larvae, with the young largely dependent on insects (Alvarez del Toro 1976); however, on the basis of the most recent fieldwork, this is the only cracid so far studied that is strictly vegetarian (F. González-García *in litt.* 1992), with even the young being fed bill-to-bill by the mother on regurgitated fruit and fragments of green leaves (*Cestrum*) (González-García and Bubb 1989, González-García 1991). Contrary to the expectations of Andrlé (1969), food competition with Highland Guans *Penelopina nigra* has been observed at El Triunfo, a male Horned Guan chasing away a pair of the latter from a fruiting tree seven times on four dates in March/April 1989, but although capable of winning encounters on the basis of its greater size the Horned Guan may suffer overall, being far less numerous than the Highland Guan and less able to reach fruits on slender twigs; the two species appeared to be entirely dependent on the same locally concentrated food resources (P. J. Bubb *in litt.* 1991).

The breeding season appears to be earlier than in other cracids of the region (Mexico), falling in the low rainfall months of February and March (or even January or earlier, as on Volcán Tacaná in 1987: González-García 1988a), so that by May when the rains return the young are already half-grown (Wagner 1953; also Alvarez del Toro 1976): this appears largely confirmed by the territorial calling of males in Guatemala, which starts in January and ends in April, and by the collection there of a month-old bird on 26 March (Andrlé 1967), less positively by fortnight-old young on 21 April at El Triunfo (Parker *et al.* 1976). Apparent variation in breeding season, judged from females with young, may well result from serial polygyny (González-García 1988a), although the following evidence of polygyny appears at least partly simultaneous: in the territory of one male which had copulated with a female on 2 April (1989, in El Triunfo) a different female was observed with a week-old chick on 4 April and a third female with two two-week-old chicks on 9 April; the first female was expected to lay eggs a few days after copulation, with hatching in early May (P. J. Bubb *in litt.* 1991). One male was found to have occupied an area of only c.8(-20) ha throughout the breeding season (González-García and Bubb 1989). The report of a nest placed on the ground fuelled the belief that this was normal (Wagner 1953), and while subsequent reports also ascribed nesting to cliffs and the tops of rocks, others referred to low trees (Andrlé 1967). In the 1980s the first nests known to science were found high in isolated, epiphyte-rich trees with few branches, close to a ravine with a stream (González-García 1984, 1988a; Wagner 1953 reported that territories needed flowing water, and González-García 1988b repeated this); another nest (or possibly one of those from which the foregoing was generalized), at 3,330 m, was high above the ground, hollowed out of plants growing on and around the trunk (Taylor 1975b); a nest in 1990 was 16.5 m up in the first branches of a rather isolated “trompillo” *Ternstroemia lineata* on a 45° slope at 2,325 m (González-García 1991). The clutch-size is two; incubation is by the female alone (which at one nest left the eggs three times per day – morning, midday, and afternoon – and at another four times a day, less towards hatching, partly perhaps owing to much rain at that time), and lasts 34-35 days (González-García 1984, 1988a, 1991). The female at the 1990 nest confined herself to an area of 9(-15) ha during the incubation period (González-García 1991). Hatching at this nest was virtually simultaneous (one or two hours' difference); these chicks received their first feed after some 40 hours, although this might have been delayed by poor weather, and left the nest after 67 hours, although in 1988 chicks stayed six days in their nest, probably owing to rain (González-

García 1991); the manner of their reaching the ground has not been described. Care of the young is entirely by the female (González-García and Bubb 1989). Experience from captive birds suggests that males take up to four years to mature, while females do so perhaps in only one (F. González-García *in litt.* 1992). Except when breeding, the species is moderately gregarious (Blake 1953), but this may only be family groups that remain together throughout the non-breeding period (Wagner 1953).

**THREATS** The combination of extensive and intensifying deforestation with relentless hunting pressure has caused grave concern for this species's future: in the 1960s both these factors were prevalent in key areas, including Tajumulco, the Tecpán Ridge, the Sierra de los Cuchumatanes, and throughout Chiapas (Andrle 1967). In the Sierra Madre in southern Chiapas there are many farming communities, especially adjacent to the road connecting Huixtla over the ridge to Motozantla, with coffee being grown as high as 1,800-1,900 m (A. Long *in litt.* 1992). In western Guatemala, the potential area for the species was some 6,000 km<sup>2</sup>, but habitat loss has reduced this by half; moreover, while many montane areas have escaped deforestation above the 1,600 m “coffee limit”, this has not been the fate of Volcanes Tajumulco and Tacaná, nor even the Sierra de los Cuchumatanes, where it extends above 2,000 m (Vannini and Rockstroh 1988) or even to 3,000 m (Veblen 1976). Volcanes Santa María, de Fuego and Acatenango have suffered considerable loss owing to volcanic activity (Vannini and Rockstroh 1988). In eastern Guatemala, any populations will be severely threatened by marble-mining, which involves clearance of the cloud-forests covering the mountain ridges (P. Rockstroh *in litt.* 1988).

Whilst deforestation causes more permanent loss, and is thus ultimately the most serious threat, hunting (mostly subsistence, by coffee-plantation workers) is a very serious threat too, notably in areas with concentrations of villages such as at Volcán Tacaná (Alvarez del Toro 1981, González-García 1988a). Hunting was judged to be the cause of the species's local extermination below 2,700 m on the Tecpán Ridge, Guatemala, by the mid-1930s (Andrle 1967). Compounding this, livestock-grazing in the undergrowth of forest seriously alters and degrades its character (Andrle 1969, Parker *et al.* 1976). Military operations in the Atitlán complex (Volcanes Toliman, Atitlán and San Pedro) have compounded farming and hunting in reducing numbers in the region, and the same possibly holds true for any population on Volcán de Agua (Vannini and Rockstroh 1988). Captive breeding (see below) cannot perhaps be described as a threat to this species (although it is to be noted that the eggs from the first two nests ever recorded in science were taken for rearing in a private collection: Estudillo López 1986), but it does not appear to be relevant to its conservation and could possibly distract authorities from the more serious undertaking of habitat conservation.

The patchiness of this species's occurrence has been mentioned by Alvarez del Toro (1976), who noted that it is absent from seemingly suitable areas; the explanation for this might obviously be hunting, but it might also have to do with interspecific competition (see second paragraph under Ecology) or with undetected characteristics of the habitat. However, A. Long (*in litt.* 1992) has judged that mostly the species has been overlooked in many localities.

**MEASURES TAKEN** The species is legally protected from hunting or capture in both Mexico and Guatemala, but the laws are unenforced; it is listed on Appendix I of CITES (King 1978-1979).

Following the recognition that since 1960 El Triunfo was being destroyed by settlers, (Alvarez del Toro 1976), the Instituto de Historia Natural in Chiapas, Mexico, intervened and a 10,000 ha reserve was established there in May 1972 (King 1978-1979, González-García 1988a); this has recently been expanded and established as a biosphere reserve under federal law by presidential decree, consisting of 119,000 ha in five nuclei and a buffer zone (González-García 1991, A. Long *in litt.* 1992). Apart from this, valuable studies of the species continued throughout the 1980s, supported by various conservation bodies including WCI and the Brehm Fund (e.g. González-García 1984, 1988a,b, 1991). Other reserves in the Sierra Madre de Chiapas include the 73,800 ha La Sepultura Ecological Reserve (proposed), the 60,450 ha La Frailecana Forestry Reserve (decreed in January 1978), the 15,000 ha Pico el Loro–Paxtal Cloud-forest Reserve (proposed) and the less than 10,000 ha Volcán Tacaná region (proposed) (see Heath and Long 1991: 242).

Several volcanoes which support Horned Guan populations in Guatemala are considered national parks, and in the 1960s Guatemalan wildlife officials were trying to establish specific reserves for the species (Andrle 1969); one such, aimed also (and chiefly) at conserving the Resplendent Quetzal *Pharomachrus mocinno*, was established in 1972 on the southern slopes of Volcán Atitlán at 1,700-

2,450 m, but only then covered 400 ha and was not known to hold any Horned Guans (LaBastille 1973). In any case, reserves in Guatemala that hold the species remain virtually unmanaged owing to political and military exigencies (P. Rockstroh *per* M. J. González *in litt.* 1988); however, one that does is Lago de Atitlán National Park, while three private reserves, Finca Mocca (Suchitepequez), Finca El Faro (Quetzaltenango) and Finca Pueblo Viejo (Alta Verapaz), possibly hold populations (Vannini and Rockstroh 1988).

**MEASURES PROPOSED** The importance of El Triunfo as a refuge for the Horned Guan and, at a lower altitude, the Azure-rumped Tanager *Tangara cabanisi* (see relevant account), as well as for the near-threatened Resplendent Quetzal, which migrates altitudinally between the habitat of the guan and the tanager (A. Long verbally 1992), cannot easily be exaggerated, and such further support as the area needs should be always accorded high priority. However, many further sites deserve conservation, such as those enumerated in the section above, and even these appear to be insufficient in quantity. What is needed is an entirely new analysis of the crisis over deforestation in the range of the Horned Guan: the areas surveyed and flown over in the 1960s (see Andrlé 1967) need to be checked by the same methods again, with real thoroughness and care, so that a definitive understanding can be reached and clear position occupied by the conservation community (see Remarks 6). Major tracts of remaining forest require active conservation in both Mexico and Guatemala, this to involve the exclusion of cattle (Andrlé 1967, Parker *et al.* 1976): such initiatives must (and in the case of El Triunfo, do) aim at the real integration of local community interests with the broader goal of permanent species conservation, and hence require a major educational component (González-García 1988a, A. Long *in litt.* 1992). Volcán Tacaná merits special attention as an area in which a bi-national park could be established for the species (González-García 1991).

The whole question of what forms the northern and southern limits of the species's range, and why, deserves investigation. In this regard, the species merits being looked for on the higher slopes of Picacho Prieto, Oaxaca (Binford 1989), while the higher parts of the Sierra de las Minas in Guatemala, which had already been proposed as a national park before the discovery of the species there (S. N. G. Howell *in litt.* 1991), clearly need careful exploration, as does the Cerro Volcán Pacayita in Honduras (see Remarks 2).

*Captive breeding* A programme has been established “to avoid the extinction of this remarkable bird” (Estudillo López 1986), supported by the Brehm Fund (*Flying Free* 7,1-2 [1987]: 5-6), yet the general evidence is that the restocking of areas with shot-out populations is not a pressing need. Nevertheless, the Miguel Alvarez del Toro Zoo (Tuxtla Gutiérrez) received five one-year-old birds from Tapachula (therefore probably captured on Volcán Tacaná) in 1989 (P. J. Bubb *in litt.* 1991). Some 15 young have been bred from the stock held by J. Estudillo López (F. González-García *in litt.* 1992).

**REMARKS** (1) The Horned Guan occupies its own genus, and is arguably not only the most distinctive of its family but also one of the most striking members of the entire Central American fauna. (2) Local inhabitants have reported large birds with single red horns in the Cerro Volcán Pacayita Biological Reserve (S. J. Midence verbally 1988), which rises to 2,516 m and covers 97 km<sup>2</sup> between Lempira and Ocotepeque departments, Honduras (Cruz 1986). (3) It will be noted that Volcán Tacaná is listed for both Mexico and Guatemala. (4) Andrlé (1967) appeared confused about the position of Pico de Loro, reporting it as 50 km “northwest” of Escuintla when evidently north-east was intended, but even so his positioning of it east of Santa Ana de la Laguna appears largely at odds with it being 50 km north-east of Escuintla. (5) OG (1965) gives two sets of coordinates for Chichoy, the other being 14°41'N 91°04'W. (6) As implied in Andrlé (1969) and Delacour and Amadon (1973), in the late 1960s and early 1970s R. F. Andrlé continued surveying actual and potential sites identified in his earlier (1967) study; however, the work had to be abandoned and the results were never published, except now under Distribution above in the form of notes supplied *in litt.* in 1988.

