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## THE HORNED GUAN IN MÉXICO AND GUATEMALA

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Since its discovery in Guatemala in the first half of the nineteenth century, the Horned Guan (*Oreophasis derbianus*) has remained one of the lesser-known members of the Cracidae. This lack of knowledge is partially accounted for by the difficulty of access to its mountain habitat and the fact that few ornithologists have had an opportunity to observe the species. The guan's ability to conceal itself in dense forest vegetation and its decrease in abundance have also been contributing factors.

Subsequent to the Horned Guan's first description and picture by Gray and Mitchell in 1844, most published references to the species either have involved locality records or have been descriptive and taxonomic accounts. Sclater and Salvin (1859), Salvin and Sclater (1860), Salvin (1860), Salvin and Godman (1902), and Griscom's (1932) relatively brief comments were the only published data available on aspects of the species' habitat, behavior, and food until the appearance of Wagner's (1953) paper dealing with some facets of its biology and habitat in Chiapas. Leopold (1959) summarized some of the previously published information on the species.

During March and April 1965, in cooperation with the Directors of the Instituto de Historia Natural in Tuxtla Gutierrez, Chiapas, and the Museo Nacional de Historia Natural in Guatemala City, I conducted preliminary investigations on the Horned Guan in México in the Sierra Madre de Chiapas and in Guatemala, chiefly on Volcán Tajumulco. This field study was an attempt to secure additional information on the guan's life history and ecology, and to learn more about its present status with respect to preservation of the species and its habitat in the two countries. Inclusion of some old data on *Oreophasis* is intended to provide a background that will aid other ornithologists who may have the opportunity to secure new information.

### HISTORY, DISTRIBUTION, AND ABUNDANCE

Griscom (1932, 1950) considered the Horned Guan to be a preglacial relict in México and Guatemala where it has a disjunct distribution in the highlands of southwestern Guatemala, southern Chiapas, and probably extreme eastern Oaxaca (fig. 1). He thought the species' origin to be so old that one would not be justified in speculating about it. The guan's morphological distinctness, its unique color pattern among the Cracidae, and its isolation in most parts of its range from all members of the family except *Penelopina* suggest descentance from stock that experienced early radiation, possibly in the Tertiary. If, as Vuilleumier (1965) postulated, the species of the genera *Crax*, *Penelope*, and probably *Ortalis* are in a relatively early stage of speciation and underwent differentiation in allopatric populations during the Pleistocene, it seems likely that *Oreophasis* antedated this development. Similarity of the earliest fossil Cracidae or cracid-like forms to modern ones and a definite indication of extensive Tertiary radiation of the family would appear to be in accord

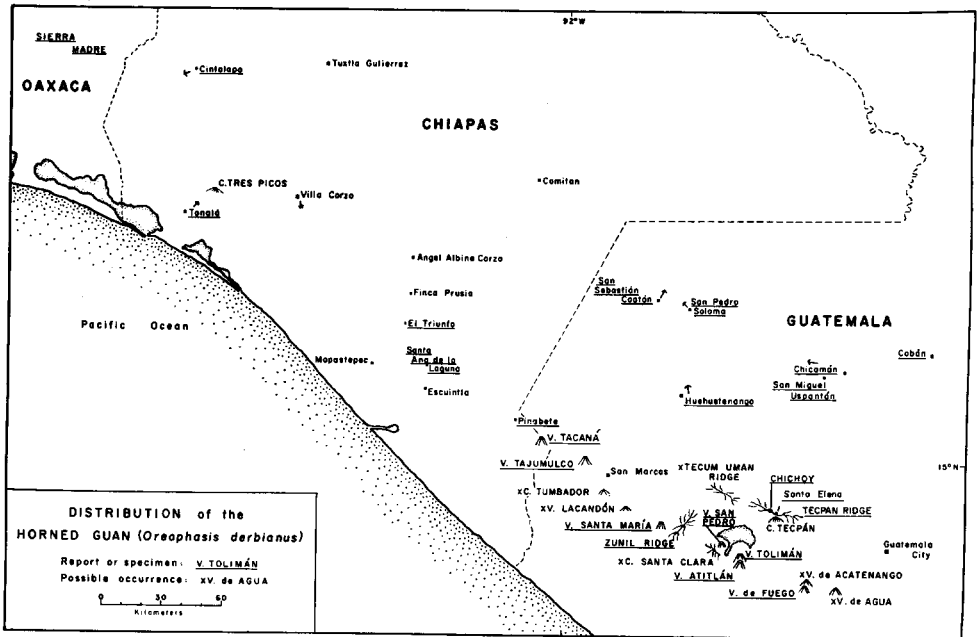


Figure 1.

with the Horned Guan's Tertiary origin. However, the uncertainty as to its time of origin is apparent when one considers related aspects of the problem such as the age of the fossil record of living birds and the evidence available at present on the longevity of avian species.

There is some likelihood that the guan's place of origin was in southern México and northern Central America, perhaps essentially within its present geographic range. The uplifted southern portion of Guatemala and possibly the extreme eastern part of the Sierra Madre (Volcán Tacaná area) were apparently never inundated by epeirogenic seas which, in the Cenozoic, isolated part of Chiapas and northern Central America (Schuchert, 1935). So, in regard to available land area, *Oreophasis* could have differentiated within its present range at any time since the early Tertiary. The species' comparatively sedentary nature and the restrictive conditions of its present habitat suggest an areally limited place of origin, although the possibility remains that it formerly occupied a greater range, perhaps at lower elevations. If this last were the case one might expect that isolated populations would still exist in apparently suitable habitat beyond its present known range in México and Central America, but such remnants have not been discovered. Williams (1960:9) said that the Tertiary landscape of southern Guatemala was one of extensive volcanic plains and plateaus, and that not until the Quaternary did eruptions from central vents build high cones like those that now dominate the Guatemalan landscape. The time of this cone formation and the fact that isolated populations of *Oreophasis* now exist high on at least six of these Quaternary volcanoes possibly indicate a formerly more contiguous range of the guan at lower elevations. This last possibility and also the species' pre-Pleistocene existence are also suggested by the presence of guan populations in other places composed of older geologic formations than the volcanoes,

such as the Tecpán and Zunil Ridges, the Sierra de los Cuchumatanes, and the Sierra Madre de Chiapas northwest of Volcán Tacaná. These areas have apparently been available for occupation by the land flora since early Tertiary times and therefore could have afforded habitat for *Oreophasis* in a formerly less-disjunct distribution.

According to Williams, many of the volcanoes, during their later stages of growth, discharged immense volumes of dacitic pumice from their summit vents, and some erupted domes of viscous andesite and more siliceous lavas far down their slopes. This intense activity on the volcanoes and the more widespread volcanism at lower altitudes in the highlands have very likely destroyed parts of the guan's forest habitat and may have been an important factor in range alterations of the species. Deforestation resulting from long human occupancy of the Guatemalan highlands is a more recent occurrence that apparently has reduced the range of *Oreophasis* locally.

Since its discovery the Horned Guan has been reported, to my knowledge, from 24 localities in Guatemala, Chiapas, and Oaxaca. Presently available data on the species' distribution and abundance are given in the following accounts. Included are several localities where the bird may occur but has not so far been reported. Information from local persons is given only when I believe it to be reliable.

*Volcán de Fuego.* As far as I know there have not been any recent investigations on this volcano, and the present status of the Horned Guan there is unknown. Salvin (1860:252) concluded that *Oreophasis* was rare on Fuego because he could not find it in three or four attempts and local people did not know the bird. I questioned persons in some of the villages at Fuego's base, but no one knew it. The locality "Amatitlan: Hacienda Capetillo" on a specimen label in the Field Museum apparently refers to the hacienda at the Pacific base of Fuego and Volcán de Agua, and this bird may have been taken on the former volcano. A considerable belt of broadleaf forest exists on Volcán de Fuego and on Acatenango, its twin, but clearings extend in places well above 2000 meters. Frequent eruptions also appear to have reduced the forest somewhat, especially the pines below the peaks and some broadleaf forest in the deep barrancas. Apparently explosive outbursts have consisted mainly of ash and cinders, however, and there have been few lava flows that would be more effective in destroying forest. Although the guan has never been specifically recorded from Acatenango, it may well occur because this volcano is largely coincident with Fuego. Salvin could obtain no evidence of the guan being on Volcán de Agua, but its presence there is possible because the broadleaf forest on the more-humid Pacific slope is still fairly extensive.

*Volcánes Tolimán, Atitlán, and San Pedro.* Griscom (1932:99) listed a female specimen, presumably taken by A. W. Anthony, from 11,000 feet on Tolimán (also known as Volcán San Lucas). Anthony said that the Horned Guans were found on the higher elevations at 10,000 feet and above, but were quite hard to discover and still more difficult to secure. On my brief reconnaissance in the vicinity I was shown by the Reverend G. Schaffer an old mounted specimen, said to have come from the volcano, in the village of San Lucas Tolimán. One person there reported that he saw a total of about eight birds on several trips up Tolimán within the past year. Heavy forest covers the upper slopes and double peak of the volcano, but my air observation showed that clearing has reached to a considerable height, perhaps in places to over 2500 meters. Forest on the peak and upper slopes of Volcán Atitlan, which is joined on the south to Tolimán, appears to be more extensive, especially on the southern versant. Evidently a small population of Horned Guans is present high on Tolimán, and possibly a larger number exist on Atitlán where Jorge Ovalle Arévalo, of the Guatemalan Department of Wildlife, has encountered them. Old aerial photographs and my recent air observations show that Volcán San Pedro, on the southwest side of Lake Atitlán, contains proportionately more broadleaf forest area than does Tolimán, and Sr. Ovalle has reported *Oreophasis* also from this volcano. More study of the situation on these three volcanoes is necessary. The high, rugged, fault scarp on the southwest side of the Atitlán basin, culminating in Cerro Santa Clara, also may support a guan population. Some of the extremely



Figure 2. Broadleaf forest habitat of the Horned Guan on Volcán Tajumulco, Guatemala. One of the many barrancas intervenes between the partially cleared ridge crest in the foreground and the distant, forested ridge. This view gives an indication of the variability in *Oreophasis* habitat, especially the irregular nature of the forest canopy.

steep ridges and gorge walls along the Pacific front of the highlands between Volcán San Pedro and Zunil Ridge appeared from the air to possess habitat suitable for *Oreophasis*.

*Zunil Ridge.* The two peaks (Cerro de Santo Tomás, Cerro Zunil) which project from the crest of this ridge are not actually volcanoes, but are composed, as is the main ridge, of Tertiary lavas, tuffs, and tuffaceous sediments (Williams, 1960:11-12). Anthony (Griscom, 1932:100) said that natives told him the Horned Guan was on Cerro Zunil, and Salvin and Godman (1902:275) reported that a specimen was secured at an elevation of about 7000 feet on the Pacific slope at the southern end of the ridge (Cerro de Santo Tomás). The current status of the guan in this locality is not known. A teacher in the village of Santa Maria told me that he had seen three guans and shot one in the past year on the heavily forested western slope of the ridge above the village. The Pacific slope and part of the eastern side of the ridge also possess extensive broadleaf forest, but clearings are being extended upward in various places. The foreman of a plantation on the Pacific slope reported that he had found nothing but *pahuils* (Black Chachalaca) on hunting excursions into the forest above. It appears that enough suitable habitat remains on the ridge to support a moderate population of guans, although excessive hunting may have affected their status.

*Volcán Santa Maria.* Nelson (1898:156) recorded the Horned Guan on the southwestern slope and collected at least one specimen. He gave no information on its abundance at that time. He and Goldman (1951:295) worked from 9200 feet up to near the crater rim in 1896. Goldman remarked that the violent eruption which occurred (1902) after his visit buried the slopes deeply in ashes and must have been annihilating in effect on the flora and fauna. However, an aerial photograph (Williams, 1960, pl. 10) in 1935 and my own air view in 1965 show that extensive forest destruction from this eruption and subsequent activity has been confined mainly to the southwestern slope. It is likely that some Horned Guans were destroyed along with their habitat during this volcanism, but there is still sufficient forest left on the southern and southeastern slopes to support a

population despite considerable deforestation at lower altitudes. I could not determine conditions between Santa Maria and Volcán Tajumulco, but in this area Volcán Lacandón and Cerro Tumbador are high enough to be possible guan localities if sufficient broadleaf forest exists.

*Volcán Tajumulco.* In 1934 Blake spent about two months working on the Pacific slope of this volcano. He reported (personal communication) that Horned Guans were abundant at this time in the vicinity of his camp and were most numerous about the 8000-foot level. Between 8 February and 26 March he collected 13 specimens. My aerial inspection in 1965 revealed that there is still a large area of broadleaf forest on the volcano's southern and southwestern sides. Above Finca Valdemar on the southwest, deforestation has occurred to over 2000 meters (fig. 2), and from the air I noted large clearings at higher elevations. In April 1965 I worked above this finca between 1900 and 3000 meters for about a week, but found only one Horned Guan. Several local persons knew the bird and said that there were a fair number on the volcano. My assistant reported that occasionally he had encountered one or two guans when he ascended the volcano, but he believes that they were more numerous five to 10 years ago. He said that they are hunted for food by people from nearby towns. According to him, hunters had shot several the previous October, and he has heard of at least 10 birds shot each year.

Lumbering on Volcán Tajumulco in this area appears to be a sporadic and limited operation, primarily involving pines. Since pines interdigitate with the broadleaf forest at higher altitudes, however, there is some disturbance of *Oreophasis* habitat from this activity. Sheep and some cattle are pastured in the pine areas above the broadleaf forest, and these may be a factor affecting the bird's habitat if they are allowed to run at will as they are at El Triunfo in Chiapas. Present evidence indicates that the Horned Guan has decreased on the southwestern side of Tajumulco because of hunting and habitat destruction. But there remains on the volcano suitable forest habitat sufficient to support a population of guans that may be one of the largest within its range. A more extensive investigation is needed to obtain a definitive picture.

*Tecpán Ridge.* This Tertiary ridge forms the continental divide northeast of Lake Atitlán. It is about 25 kilometers long, rises generally above 2500-meter altitude, and reaches above 3000 meters on Cerro Tecpán, near Chichoy and Santa Elena, and perhaps elsewhere. Skutch (personal communication), during his year's stay in the area in 1933, found that Horned Guans were not abundant. He never saw more than one in a day above 9000 feet, and it was an exceptional day when he encountered one. In the stands of heavy forest that occupied some deep valleys below this elevation he never saw one and judged that here they had been exterminated by shooting. De Schauensee (Carriker and De Schauensee, 1935:413; personal communication) in 1935 collected an adult female guan in the heavy forest at Chichoy, a pass in the mountain ridge at 10,000-foot altitude. Natives reported the species as fairly common in this vicinity, but, according to Carriker and De Schauensee, it was then (1935) very locally distributed due to deforestation and native hunters. Anthony (Griscom, 1932:100) said that pieces of the plumage of *Oreophasis* were seen at the town of Tecpán and were said to have been taken at Santa Ilania (= Elena) about 10 miles north at 10,000-foot altitude. Blake secured an adult male at the same locality at 9000-foot elevation on 18 February 1934. There have been no reports to my knowledge of *Oreophasis* from the Tecpán Ridge since 1935. Probably a small number of guans still exist, but the population seems to have been depleted by a combination of hunting and widespread deforestation. The completion and later improvement of the inter-American highway, which runs near the ridge and crosses part of it, have made the area more accessible for the above activities. A place also remaining to be investigated that may harbor guans is the Tecum Uman Ridge northwest of the Tecpán area. This ridge attains 3400-meter elevation and two decades ago possessed extensive forests, but increasing accessibility and lumbering may have changed conditions there.

*Sierra de los Cuchumatanes.* An outlier in the range of *Oreophasis*, this large Sierra is composed of irregular plateaus with island-like peaks and ridges rising above 3000 meters; on its borders are cliffs, steep ridge spurs, and deep, narrow valleys. Little is known about the status of the Horned Guan in the range, and there is need for considerable study. It has been reported from "above Huehuetenango" by Ridgway and Friedmann (1941:61), and this probably refers to the Cuchumatanes. Baepler (1962:143; personal communication) observed two guans on 24 February and 17 March 1958 in a cloud forest remnant northwest of San Pedro Soloma. There the bird

was uncommon and apparently not numerous enough to stimulate hunting by local residents. Two local persons reported that Horned Guans had been seen in groups of from four to seven individuals at localities called Jucup and Tzununcap at about 8000-foot elevation in the forest some distance from San Sebastián Coatán (Reverend J. L. Scanlon, personal communication). They indicated that the birds are not plentiful in this area.

Much of the high terrain in the Cuchumatanes is open and grassy, many of the forests being confined to rugged land on peaks and the ridges and valleys of bordering escarpments. Griscom (1932:23) mentioned large areas of primeval forest in the Altos of Huehuetenango, but extensive deforestation has occurred in the region (Goldman, 1951:239, 295; Baepler, 1962:141), and most remaining forests are restricted to less-accessible places. The widespread, open, pine and oak forests in the Sierra would not be suitable for *Oreophasis*, and depletion of humid broadleaf type providing proper habitat probably has resulted not only in a general decrease in the bird's abundance but perhaps a greater segmentation of the population.

Reports of *Oreophasis* have come from two other parts of Guatemala, and both areas require further investigation. Salvin said that several specimens had been obtained in a high ridge of mountains on the left bank of the Río Negro above the village of Chicamán. There is a female specimen in the Natur-Museum in Frankfurt, Germany, labeled "Uspantaa (= Uspantán?), Dept. Quiché" (Dr. J. Steinbacher, personal communication). This would seem to refer to the town about 10 kilometers west of Chicamán. Although the exact locality is not certain, it is probable that the aforementioned specimens came from the long eastern spur of the Cuchumatanes north of the Río Negro where elevations exceed 2500 meters. Salvin and Godman (1902:275) refer to the area above Chicamán and remark that the guan was fairly abundant there. In Hellmayr and Conover (1942:197) there is a report of *Oreophasis* from Cobán in Alta Vera Paz, probably based on the male specimen in the Field Museum labeled with this locality, but no further data are available. A possibility exists that there was and may still be an isolated population of guans in Alta Vera Paz. Elevations in this department average considerably lower than in Huehuetenango and El Quiché, however, and much of any suitable habitat probably has been destroyed.

*Volcán Tacaná.* No specific reports of the Horned Guan have come from the Guatemalan sides of this volcano. Anthony was told by Guatemalans (Griscom, 1932:100) that the bird was resident on Tacaná. The only direct evidence is the two male guans taken on 29 and 30 March 1939 at 2700-meter elevation on the west slope in Chiapas by Brodkorb and Staebler. Brodkorb (personal communication) said that the birds appeared common during his stay on Tacaná and that there was no forest destruction where they worked at the time. Alvarez del Toro said that he has received reports recently that the natives occasionally see guans on the volcano. Its present status there remains to be determined.

*Sierra Madre de Chiapas.* This range has considerable humid, montane broadleaf forest providing suitable guan habitat, but nowhere in it outside of Tacaná has *Oreophasis* been reported as common. Nelson (1898:156) found the bird below Pinabete, about 12 kilometers northwest of Tacaná (7500-8800 feet), but gave no further information. Goldman (1951:108-109) stated that the vegetation of this area in 1896 was mixed forest on the steep, seaward-facing slopes, with most of the terrain above open and grass covered. Alvarez del Toro received a guan head from the area near Santa Ana de la Laguna north of Escuintla. According to him, deforestation is progressing rapidly in this vicinity in connection with new settlements. Wagner (1953) studied the Horned Guan in the Sierra Madre at various times between 1933 and 1950 near the trail which crosses the range at El Triunfo between Mapastepec on the Pacific lowland and Finca Prusia on the Atlantic-facing slope. The only indications he gives of its abundance, however, are that among the Cracidae of Central America it is by far the rarest species, and that it was not unusual for him to encounter guans on both sides of the path that the coffee workers had made.

On 11 and 15 May 1960 Alvarez del Toro collected a pair of Horned Guans near El Triunfo (1850 meters), and a young male on 21 May on the Pacific slope just below this locality. At this time it apparently was not very difficult to find guans. For about two weeks in March 1965, accompanied by Alvarez del Toro, we searched very thoroughly for guans in this area but found only two individuals (fig. 3). Two or three birds were seen by the local people just prior to and during our field work. The guan apparently has been reduced in numbers about El Triunfo,



Figure 3. El Triunfo, Sierra Madre de Chiapas. Expedition camp at 1850-meter altitude in a small clearing near the crest of the range. Cerro El Triunfo or Quetzal (2250 meters) is in the background. Horned Guans were observed near the upper right, and at the extreme left in the forest.

especially in the past several years. Men in two families living there at the time, while searching for their cattle in the forest, take the opportunity to secure *Oreophasis* and *Penelopina* when encountered. These people said that they see at least half a dozen guans yearly and regularly kill some, but that five to 10 years ago the birds were more numerous. The guan is known here as well as in other localities by the name *pavón* (peacock). There were many feathers of the guan and of the Black Chachalaca scattered on the ground near one hut. Brodkorb wrote that he has the skin of a male Horned Guan taken by one of Matuda's collectors on 12 March 1945 at a locality called Frailesca. Another male was secured in the same place on a previous day. He also said that according to Matuda this area is in cloud forest on Pico de Loro, about 50 kilometers northwest of Escuintla. Although I cannot locate Pico de Loro on maps, the Frailesca referred to is apparently a colony of San Isidro Siltepec and is located several kilometers to the east of Santa Ana de la Laguna (fig. 1). Alvarez del Toro also has heard of Horned Guans being seen to the northwest of El Triunfo on the trail over the Sierra from San Juan Custepeques, a town about 45 kilometers west of Angel Albino Corzo.

Alvarez del Toro received word that in the Sierra Madre above Tonalá, possibly meaning the Cerro Tres Picos area, natives talk about "faisanes de cresta roja" which they occasionally hunt. He also has received apparently reliable information from a man living in a settlement west of Cintalapa, near the Oaxaca border, who has several times seen "a big bird, black with a white chest and a red horn" in the mountains there. Finally, it is reported by Thomas MacDougall (Alvarez del Toro, personal communication), a botanical collector, that natives from the Sierra Madre in extreme eastern Oaxaca have mentioned to him that they have sometimes seen the "faisan de cuerno rojo" in that region. If there is a guan population in this area it would complete a series of stations for the species extending almost the entire length of the Sierra Madre. Much terrain between these stations lies above 2000 meters and still possesses considerable broadleaf forest suitable as guan habitat, suggesting that *Oreophasis* may occur at other places along the Sierra crest.

*Altitudinal and areal distribution.* Data from specimens and observations show that in Guatemala the Horned Guan has been recorded from about 2134 meters (7000 feet) up to 3353 meters (11,000 feet) above sea level. Salvin and Godman (1902:275) said that it is probable the bird never descends much below 7000 feet, and Anthony (Griscom, 1932:99) stated that it is seldom if ever found below 7500 feet. The maximum elevation attained by *Oreophasis* in Guatemala is in some places probably restricted by the altitudinal extent of its habitat, which on most of the volcanoes does not reach the summit. The elevation given (11,000 feet) for the specimen apparently taken by Anthony on Volcán San Lucas (Tolimán) may be incorrect because the volcano's height is less than this. It may refer to its twin, Volcán Atitlán, which attains 11,560 feet (3525 meters). I would expect the bird to occur regularly above 3300 meters only in a few places where optimum habitat exists. The minimum elevation reached by *Oreophasis* in Guatemala may be limited by factors other than habitat, because in some parts of its range montane broadleaf forest extends well below 2000 meters.

The Horned Guan's altitudinal distribution in Chiapas and Oaxaca might be expected to average lower than in Guatemala, because its range there extends farther north and much of its habitat does not reach the elevations attained in Guatemala. Brodkorb and Staebler's specimens obtained at 2700 meters (8856 feet) on Tacaná constitute the highest record I have for the guan in Chiapas. However, it is likely that the bird occurs above this altitude on a few other forested peaks of the Sierra and probably ascends to over 3000 meters on Tacaná. The lowest elevation in Chiapas at which *Oreophasis* has definitely been recorded is about 1600 meters (5248 feet) by Wagner (personal communication) near El Triunfo, and the guans may range slightly lower than this to the northwest in the Sierra Madre. Although little information is available on areal density or variation in abundance with altitude change, there is some indication that in Guatemala the guan's greatest abundance in undisturbed habitat may be between 2400 and 3100 meters. The degree to which factors such as seasonal availability of food and now more widespread hunting and habitat disturbance affect its distribution and abundance has yet to be learned. Reports of about 30 years ago of guans being common or abundant in specific localities have not been repeated. This could be due in part to lack of observation in the right places. However, the majority of reports indicate that the Horned Guan is sparsely distributed through most of its range, perhaps attaining a greater density in a few localities.

#### HABITAT

Primary habitat of the Horned Guan is montane broadleaf forest, sometimes mixed with cypress or pine, which maintains a humid character chiefly from moisture in the form of clouds and rain transported from the Gulf of Mexico and the Pacific Ocean. Such humid conditions are usually more pronounced on the Pacific slopes of the mountains in southern Chiapas and Guatemala than on their Gulf-facing sides. Edaphic conditions and a complex topography creating varied exposures affect vegetation in *Oreophasis* habitat and particularly influence its structure and density. Salvin and Sclater (1860:42) described this forest habitat on Volcán de Fuego as having lofty trees with *Cheirostemon platanoides* (= *Chiranthodendron pentadactylon*) a dominant species. 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. Standley and Steyermark (1949:409) stated that *Chiranthodendron* also forms very dense forest belts on Volcán de Agua and Volcán de Acatenango that extend up to 3000 meters and have similar characteristics as the forest on Fuego. They said that the trees often are close together, their branching is irregular, and the thick limbs are frequently covered with mosses and epiphytes.

On the southwest slope of Volcán Tajumulco in places the forest resembles that described on Fuego, although I did not identify *Chiranthodendron* as a component, nor did Standley and Steyermark find it on Volcán Santa María. The structure of



the montane broadleaf forest on Tajumulco is extremely variable with giant trees numerous but usually scattered, and some sections having trees of mostly medium to small size. The canopy is irregular and may be closed or open, the understory of shrubs, vines, ferns, and herbaceous plants responding by being very dense in many places, thin in others. There seem to be more vines and climbers and less air plants than at El Triunfo. Occasionally pines occur within the forest at least as low as 2300 meters. Moss-covered elfin forest exists in places on ridge crests and barranca walls. The barrancas on Tajumulco are numerous and often very deep between narrow ridge crests as they appear to be on Fuego and some of the other volcanoes. Terrain is often very rough and difficult to traverse due to fallen trees, dense and tangled undergrowth, and many exposed rocks.

Surface configuration in the vicinity of El Triunfo in the Sierra Madre de Chiapas is also very uneven, but along the crest of the mountains some wide-floored ravines and rounded hills make walking generally less difficult than on Tajumulco. The primary forest here is quite variable in structure, with large trees emergent from an irregular canopy, but it is generally more uniform than that on Tajumulco. The large, tall trees are scattered or sometimes in small groups, especially on ridge edges, sides of deep ravines, and on some wider valley floors. Most have trunks from one to over two meters DBH and heights of 30 to 40 meters. The evergreen oak *Quercus crispifolia* is common among them. Buttresses are much less developed generally than in lowland rain forest, but some on the big trees reach five meters in diameter. Many species of mostly small and medium-sized trees make up the bulk of the forest, some conspicuous genera being *Clusia*, *Dendropanax*, *Drimys*, *Eugenia*, and *Oreopanax*. The shrub and small tree understory varies in density, in places being easy to penetrate, in others almost impossible to traverse without using a machete. Some of the woody understory tree and shrub genera are *Cavendishia*, *Centropogon*, *Fuchsia*, *Malvaviscus*, *Miconia*, *Persea*, and *Senecio*. Small Palms (*Chamaedorea*) are not numerous here or on Tajumulco. In the Sierra forest, tree ferns (*Cyathea*, *Alsophila*) are more abundant and widespread than on Tajumulco, attaining heights of about 12 meters and trunk diameters up to approximately 0.75 meter. On the peaks and some exposed ridge crests the forest is elfin with much moss and leaf mold on the ground and the low, gnarled branches. There is no tree line in this part of the Sierra, the highest ridges and peaks having forest cover.

My assistant on Tajumulco said that Horned Guans occasionally forage into the pine forest, pure stands of which commence above the broadleaf type, but this is the only indication I have that they do so. Pines in the Sierra Madre in the vicinity of El Triunfo occur mostly below the broadleaf forest and mainly on the Gulf-facing slope. Skutch's observations of the guan on the Tecpán Ridge in 1933 were in the still extensive tracts of mature cypress forest where there was an admixture of broadleaf trees. Apparently the young guan collected by Alvarez del Toro in the Sierra Madre was taken not far from the cypress stands (*Cupressus lusitanica*) that occupy sections of the Pacific slope below El Triunfo.

#### BEHAVIOR

Horned Guans forage frequently on the ground, scratching vigorously in the leaf litter (Salvin, 1860:250; Wagner, 1953:110; Alvarez del Toro, personal communication), and Wagner commented that the wind-whipped and bush-forest-covered mountain summits in the Sierra Madre were probably the cause of their developing as terrestrial birds in contrast to other Cracidae. However, I think it questionable that

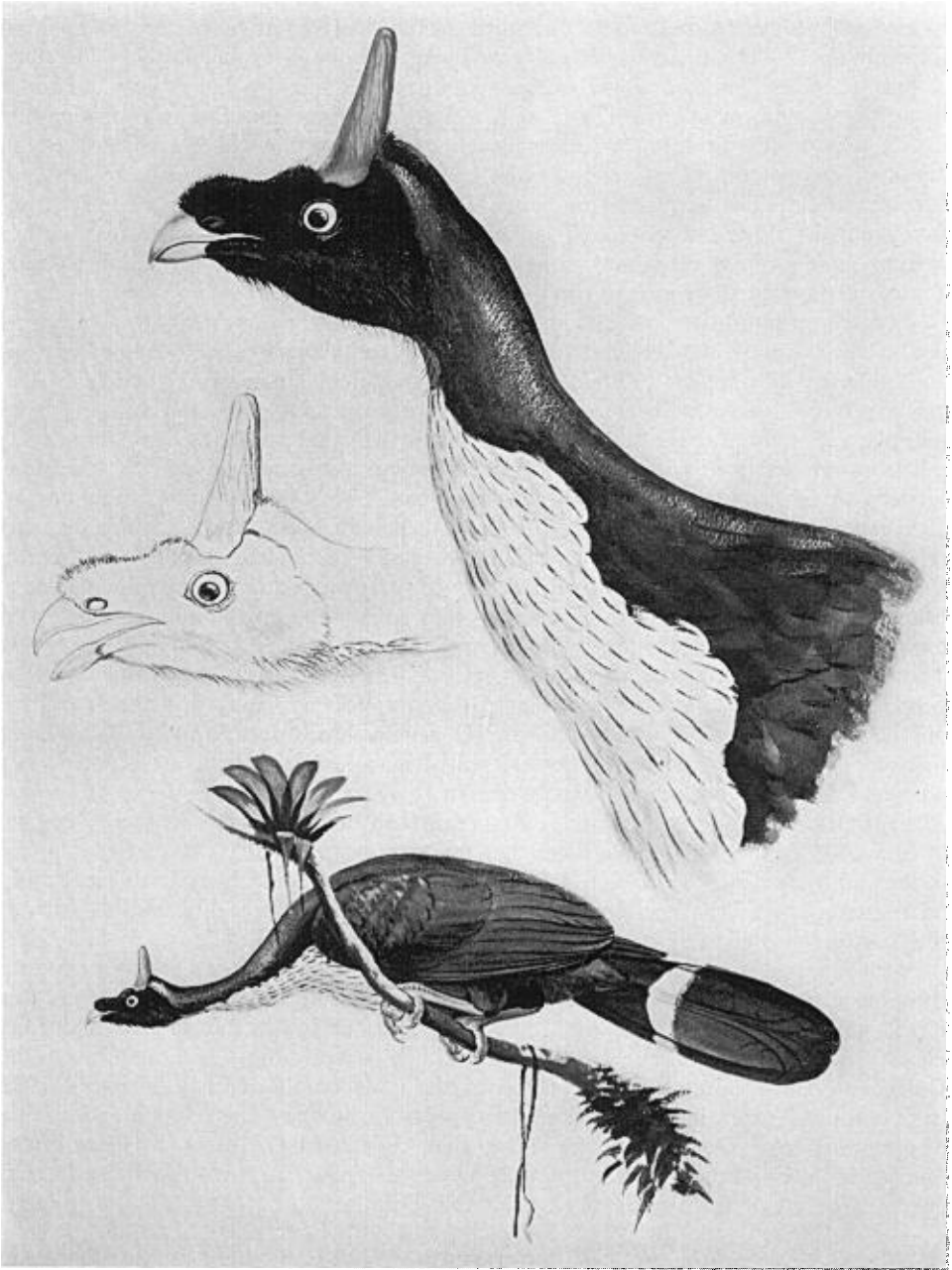


Figure 4. Attitudes of the Horned Guan. Top—position of head and neck in alert posture; center—vocalization and bill-clacking from horizontal position; lower—characteristic arboreal perching posture. (Drawn by Albert E. Gilbert based partly on field sketches made at El Triunfo, Chiapas, in March 1965.)

*Oreophasis* is more terrestrial than other members of the family; but the relative amounts of time it spends above and on the ground will be learned only by more observation. Almost all the observations on which I have data were of individuals in trees, usually from medium to fairly high levels. Habitat in which the guan has been reported most often and most abundantly is medium and large tree forest rather than low, elfin type, where it might be expected to occur more often on the ground.

*Movements.* At El Triunfo we studied the arboreal movements of a Horned Guan for about 30 minutes, taking care not to frighten the bird. I believe its actions at this time are fairly typical of the species when not under stress. Some of the same actions have been noted in other observations made by Skutch and Alvarez del Toro. Figure 4 shows three attitudes of this individual. This guan was in a small section of forest on the border of the clearing where camp was situated (fig. 3). The bird was resting on its tarsi lengthwise on a nearly horizontal branch of a medium-sized tree about eight meters above ground. For about five minutes it remained in this position with neck partially drawn in, head slightly forward, and folded tail held nearly horizontal. Occasionally the bird clacked its mandibles for several seconds at about a two-per-second rate, and during each period of clacking emitted a brief series of short, low, guttural croaks. Intermittently continuing these vocal sounds the guan rose, then hopped and walked from branch to branch in the same tree. It soon stopped, first stretched its neck out so that tail, body, and neck were essentially horizontal, and then launched itself into a downward glide, alternating with slow wing flaps; at this time it ended its vocalization with a single, louder version of its guttural note.

After alighting in a section of dense thickets near the forest edge about 25 meters away, the guan briefly climbed among the branches and eventually to the top of a sapling about five meters above ground. From here it flew with slow, rather laborious wingbeats in a slightly rising course back to a tree at the edge of the forest. While in flight the tail was spread. The guan again ascended to near the tree top and then made short flights to other trees, on one of which it paused to eat several new leaves. This was the only time we saw it feed. The guan moved fairly rapidly among the branches during these actions. It seemed to be reasonably agile considering the small size of many of the limbs, but appeared to me to be less nimble than *Crax* or *Penelope*. I had the distinct impression of an imbalance or possibly an awkwardness in its motions that may have been emphasized by the bird's habit of almost always spreading its tail wide as it passed from branch to branch. At such times its wings remained folded. Occasionally during these movements in the trees the guan squatted across a branch, assuming a horizontal body position. At these times it extended its neck horizontally and clacked and croaked as it had done initially.

During the final minutes of observation the Horned Guan flew slowly and heavily, its wings making a low, swishing sound, across a trail and up to a top branch of a tall forest tree on a ravine slope. Here the bird disappeared for a few minutes among the epiphyte-laden branches, but soon appeared and then crouched in a resting position on a branch where it was mostly concealed by foliage. Its orange-red horn was visible and could at this distance have been mistaken for a part of one of the similarly colored inflorescences of an epiphyte. After a short time in this position the guan glided downward into the heavy forest growth of a deep ravine.

Alvarez del Toro believes that the Horned Guan's general behavior is most similar to that of *Penelopina* and *Penelope*, and that its manner of flight is most like the

latter's. Based on my experience with the three species, I agree. He also mentions, in his notes from other observations of *Oreophasis*, its habit of climbing upward in a tree to or near the top before flying. This may be an action performed at various times in response to the need for security when endangered, in order to gain height from which to derive increased distance and ease of flight, or to reach fruit which is often ripest and most abundant at upper levels in the forest.

On the Tecpán Ridge Skutch was impressed by the guans' noiseless disappearance when they were ready to depart, and Wagner also mentioned this. Skutch said that the few he observed were not shy and were in no hurry to retreat when they saw they were observed, a characteristic we noted at El Triunfo and on Volcán Tajumulco. The guan will occasionally remain quiet and motionless on a tree limb, and may do this especially when an intruder appears. Blake found Horned Guans so numerous and so little disturbed on Volcán Tajumulco in 1934 that on one occasion he nearly caught an adult by hand when it wandered into his camp. At El Triunfo the local people said that about 10 years ago the guans were at times so tame that it was sometimes possible to kill them with sticks. There seems to be no doubt that basically the Horned Guan is not wary, although when repeatedly disturbed or hunted it may become somewhat shy. Salvin and Godman (1902:275) related how they fired at one on Volcán de Fuego and missed it, but soon secured the bird with one or two additional shots. During this episode the bird flew a short distance and joined two others in a tree. These two the collectors later followed but were unable to come up with them although the guans only flew from tree to tree a short distance ahead. Apparently the difficulty in observing *Oreophasis* is not usually due to shyness on the bird's part but rather to their generally low numbers and particularly to the dense foliage that greatly limits visibility and in which the guan often manages to conceal itself surprisingly well.

*Vocalization.* The characteristic mandible-clacking and croaking of the Horned Guan noted by our party in Chiapas have been reported by Skutch; Wagner mentioned the clacking sound and said that only the cocks do this whenever they perceive something unusual. Skutch indicated that the clacking is apparently a threat, which would seem to be a likely function, at least on certain occasions. Wagner also heard a male give a loud *tschia, tschia, tschia*. I have not been able to find a published description of another call which may be the principal vocal effort of the bird. I believe we heard this call in March near El Triunfo—a deep, low, three- or four-note *oo—oo—oo*, repeated several times in a minute and having a soft, mooring quality, louder than the call of *Crax rubra*. Residents at El Triunfo, in San Lucas Tolimán, and on Volcán Tajumulco described this call of *Oreophasis* essentially the same way. Alvarez del Toro was told by people living in the Sierra Madre that calling begins in January and ends in April. Possibly the scarcity of guans at El Triunfo and the lateness of the season when we were on Volcán Tajumulco accounted for the lack of calling during our field work.

*Food and feeding behavior.* On Volcán de Fuego Salvin (1860:250–252) and Salvin and Godman (1902:275) reported that a fruit eaten commonly both ripe and unripe by the Horned Guan is from the tree called "palo careta" (identified as *Prunus* sp.). This fruit is described as about walnut size with a large stone in the center and a purple skin when ripe in January. Salvin said that the tree grows on Fuego in or near the bottoms of ravines at the zone where evergreen oaks are replaced by the *Cheirostemon* forest. Skutch watched a guan on the Tecpán Ridge consuming some pea-sized green fruits in the top of a dicotyledonous tree. Wagner

(1953:122) listed the stomach and crop contents of three specimens as leaves, buds, and the ends of climber tendrils. The two reports cited above are apparently the only previously published references to the Horned Guan's food.

Alvarez del Toro observed a male guan near El Triunfo balancing on thin branches at the top of a tree and managing to reach small fruits. I saw a male also doing this on Volcán Tajumulco. Residents at El Triunfo said that Horned Guans eat the fruit of a pendant herb (*Epiphyllum* sp.) that grows commonly on the forest trees. The stomach of the male secured by Alvarez del Toro contained leaves and small, round, reddish-yellow fruits about one centimeter in diameter. The female's stomach contained green leaves and remains of an orthopteran. The male I secured on Volcán Tajumulco was eating the small, oval, yellowish-orange fruit (average  $10 \times 7$  mm) of the tree *Photinia matudai* (35 cm DBH; c. 15 m tall) on a ridge crest at 2530-meter elevation. Also in this bird's stomach and crop were several larger fruits (average  $20 \times 13$  mm) of uncertain identity. Sufficient information is not yet available on the food of *Oreophasis* to permit an evaluation of the relative proportions of types or to determine the seasonal variations in its diet.

*Breeding.* We did not locate a Horned Guan's nest, and no evidence of breeding behavior was found. To my knowledge the nest and eggs of *Oreophasis* have not yet been discovered or described from direct evidence by an ornithologist. There are various local reports of questionable reliability, however, which give a somewhat confusing picture. Wagner (1953:114; personal communication) did not find a nest, but reported that an Austrian, living at El Triunfo in 1933, told him that he had found a nest with two eggs on the ground in the highest part of the mountains. Residents in 1965 at El Triunfo did not know the nest. An inhabitant of San Lucas Tolimán said that he found a nest with two eggs on the low branch of a big tree high on Volcán Tolimán in early 1965. Three men from the town of Tajumulco told me that they had once discovered a nest low in a large tree. However, two others, one of whom had lived for about a decade on the southwest slope of Volcán Tajumulco, said the birds nested on cliffs or rocks. The most recent unverified report has come from a man (the person referred to earlier in regard to sighting the bird) living in a settlement in Chiapas near the Oaxaca border. He told Alvarez del Toro that a relative of his found a nest of the guan on a large boulder. The nest had two large eggs, and the sitting bird was very tame. In addition to positive information on the nest and eggs of *Oreophasis*, more data on other aspects of breeding are needed.

There is some indication that the guan's breeding season commences earlier in the year than it does in other Cracidae in southern México and Guatemala. In the Sierra Madre, Wagner observed signs of courtship in February, and one resident of El Triunfo said he saw males pursuing females in January. Blake collected a juvenile guan about one month old on 26 March on Volcán Tajumulco, and indicated that the birds were evidently breeding at the time he was there (February and March). Alvarez del Toro encountered a female at El Triunfo in early April that acted as if it had young nearby. Wagner said that about May, when the rainy season begins, the young are barely half grown. Most of the Horned Guan specimens for which I have been able to obtain data provide no information on gonad condition. Two males and two females collected on 4, 8, and 15 March on Volcán Tajumulco by Blake had "active gonads," as did the male he collected on 18 February at Santa Elena. The male that I secured on Tajumulco had the testes enlarged (18 and 19 mm). Present evidence suggests that the breeding season of the Horned Guan is a lengthy one. This may be due at least partially to a differential in nesting times of pairs

in the various populations, a situation which apparently also exists with some other species of the Cracidae.

#### PRESERVATION

Leopold (1959:218) said that rare as the Horned Guan is, it inhabits a region that is fairly secure from the ordinary disturbances of man. He foresaw no danger of upset in its habitat, but indicated that there may be need for control of hunting in the more accessible parts of the range. It is apparent from my experience in the Sierra Madre and from reports I have received that in Chiapas the Horned Guan is not only in need of effective protection from hunting but is threatened in places by disturbance and destruction of its habitat. Apparently it cannot withstand much hunting pressure because of its tameness and generally low numbers. The reduction in its abundance around El Triunfo essentially by the few people living there is an indication of this. Even though large tracts of montane broadleaf forest still remain in places along the higher parts of the Sierra Madre, the establishment of new settlements, such as at El Triunfo and above Escuintla, is causing more destruction of guan habitat and resulting in increased hunting and in disturbance by humans and domestic animals. The overall situation in regard to long-range preservation of *Oreophasis* in Chiapas does not now appear promising. There will eventually have to be effective enforcement of the federal game law, which now permanently prohibits hunting the Horned Guan. Also, the establishment of some extensive tracts of forest habitat as refuges for it and other montane wildlife will be required. Two avian species that also are in need of protection and would benefit from such action in Chiapas and Guatemala are the Quetzal (*Pharomacrus mocino*) and the Black Chachalaca (*Penelopina nigra*). The proposed preserve in the El Triunfo area, which Alvarez del Toro has been working to create, would be an excellent initial step in this direction.

In both Guatemala and Chiapas the only salvation of the Horned Guan populations up to the present time has been the great difficulty of access to their habitat and their remoteness from human settlements. It seems certain from my field investigations, from other reports, and an examination of aerial photographs that in Guatemala the guan has been reduced considerably in abundance by hunting and progressive habitat destruction. A vivid example of the latter was the view from the air that I had in 1965 of extensive recent deforestation on the very steep slope of a barranca high on Volcán Tajumulco. Yet large sections of undisturbed broadleaf forest occur in Guatemala within the known range of *Oreophasis*, and some of these will probably remain intact for an indefinite time. However, in Guatemala as in Chiapas there is an evident need for effective legal protection of the Horned Guan as well as for the creation of adequately controlled mountain reserves to ensure the perpetuation of the species.

#### SUMMARY

Results from a preliminary study on the biology and present status of the Horned Guan (*Oreophasis derbianus*) in Oaxaca, Chiapas, and Guatemala are given together with older information in order to provide a basis for further investigation of a comparatively little-known species. Difficulty of access to the bird's habitat, rough terrain, and thick forest cover are among factors inhibiting acquisition of field data.

Morphological distinctness, unique color pattern, and ecological isolation suggest an earlier origin for the Horned Guan than for most contemporary members of the

Cracidae; but whether the species is of Tertiary or Quaternary age is uncertain. The guan's essentially sedentary nature, the apparently restrictive conditions of its habitat, and the previous isolation by the sea of highlands encompassing its range point toward an origin in southern México and northern Central America. A formerly more contiguous range is suggested by the presence of isolated populations on several Pleistocene volcanoes and the species' occurrence in areas of Tertiary origin; severe and widespread volcanism may have contributed to habitat destruction, thereby resulting in the present disjunct nature of the guan's range.

Reports of the guan since its discovery have come from 24 localities in Oaxaca, Chiapas, and Guatemala. Recent information on its status in some of these places indicates a general increase in habitat destruction and in hunting with a consequent reduction in the bird's numbers. Results of the present study at El Triunfo in the Sierra Madre de Chiapas and on the southwest side of Volcán Tajumulco support this indication.

The Horned Guan has been recorded between 2134- and 3353-meter elevation in Guatemala, its upper limit probably exceeding this altitude locally and being restricted on some mountains by the upward extent of broadleaf forest. The guan occurs down to at least 1600 meters in Chiapas. Present evidence suggests an overall sparse density within its range. Old reports of its being common or abundant have not been repeated in recent years, but there still may be some areas where such estimates could be applied.

The Horned Guan's habitat is humid, evergreen, montane broadleaf forest composed of many different tree and shrub species and sometimes mixed with cypress or pine. Structure and density of habitat is variable owing to edaphic conditions and to differing exposures to precipitation brought about by complex topography. Ground and tree ferns, epiphytes, mosses, and lianas generally are abundant in this forest habitat.

Horned Guans may not be more terrestrial than some other members of the family. They are fairly agile in arboreal movements but possibly not to the degree that *Crax* and *Penelope* are. A detailed description of an individual's arboreal movements and postures, flight, and vocal sounds is given. In addition to bill-clacking and croaking, a soft mooing call appears to be an important element in the species' vocal repertoire. Evidence is presented of the guan's tameness and also of its ability to conceal itself.

There is indication that the breeding season of *Oreophasis* begins earlier than those of some other Cracidae in southern México and Guatemala. The breeding season appears also to be fairly long, possibly due to differential nesting times of pairs. Although there are unconfirmed local reports of the Horned Guan nesting on the ground, on rocks, boulders, and cliffs, and on the low branches of trees, apparently its nest and eggs have not been discovered and described from direct observation by an ornithologist.

The Horned Guan's survival has been assured up to the present time only by the difficulty of access to its habitat and remoteness from human populations, conditions which have been altered in various parts of its range by new settlements, increasing deforestation, and more hunting pressure. To ensure the species' future preservation, legal protection must be afforded and enforced, and adequately controlled refuges established.

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