

STATUS OF THE GREY-HEADED WARBLER (*BASILEUTERUS GRISEICEPS*, PARULIDAE), AN ENDEMIC AND THREATENED SPECIES FROM NORTH-EASTERN VENEZUELA

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Resumen. – Estado del Chiví Cabecigrís (*Basileuterus griseiceps*, Parulidae), una especie endémica y amenazada del noreste de Venezuela. – El Chiví Cabecigrís (*Basileuterus griseiceps*, Parulidae) es una especie endémica y amenazada del Macizo Montañoso del Turimiquire (MMT) en la Cordillera Oriental de Venezuela. Considerado uno de los parúlidos menos conocidos del Neotrópico, está catalogado 'En Peligro' por su distribución restringida y pérdida de hábitat. Aspectos fundamentales de su distribución, requerimientos de hábitat y estado de sus poblaciones son desconocidos. Entre 2005 y 2008 exploramos ocho localidades a lo largo del MMT, donde realizamos conteos visuales y utilizamos grabaciones de su canto, con el objetivo de determinar su presencia y recabar información preliminar sobre su hábitat y el estado de sus poblaciones. Al menos 82 individuos diferentes del Chiví Cabecigrís fueron observados, incluyendo registros en todas las localidades exploradas, mostrando una distribución amplia pero fragmentada a lo largo de la región. La especie se observó utilizando varios tipos de hábitat boscoso, incluyendo bosques montanos primarios no perturbados, bosques secundarios, y bosques perturbados en recuperación. Nuestros resultados sugieren que el Chiví Cabecigrís no es una especie tan rara y amenazada como previamente se ha considerado y que aparentemente tolera cierto grado de perturbación en su hábitat. El descubrimiento de un parche de bosque relativamente grande y no perturbado sugiere la presencia de poblaciones viables y requiere de un monitoreo formal. Sin embargo, debido a lo restringido de su distribución (< 5000 km²) y la deforestación creciente, su sobrevivencia a largo plazo probablemente dependa de medidas de conservación de su hábitat, por lo que sugerimos que el Chiví Cabecigrís debe continuar catalogado 'En Peligro'. Estudios futuros deben cuantificar la fragmentación del hábitat en la región y sus efectos sobre las poblaciones del Chiví Cabecigrís, especialmente sobre su éxito reproductivo, debido al escaso conocimiento que se tiene de estos aspectos y que podrían afectar el estado de conservación asignado a la especie.

Abstract. – The Grey-headed Warbler (*Basileuterus griseiceps*, Parulidae) is an endemic and endangered montane bird from the Macizo Montañoso del Turimiquire (MMT) in north-eastern Venezuela. Considered one of the least known wood-warblers in the Neotropics, the Grey-headed Warbler is currently listed as nationally and globally 'Endangered' because of its restricted distribution and habitat loss within its range. Fundamental aspects of its distribution, habitat requirements, and population status remain unknown. Between 2005 and 2008 we explored eight locations along the MMT, using both visual surveys and playback recordings, to establish the presence of the species, and to gather preliminary information on habitat and population status. At least 82 individuals of the Grey-headed Warbler were detected

including records for all locations, indicating a wide but fragmented distribution within the region. It was observed using several types of forest habitat, including undisturbed mature cloud-forests, second-growth forests, and disturbed regenerating forests. Overall, our findings suggest that the Grey-headed Warbler is not as rare and threatened as previously thought, showing some degree of tolerance to habitat disturbance. Our discovery of a relatively large and undisturbed patch of forest in the Serranía del Turimiquire suggests the presence of viable populations and requires formal monitoring. However, because of the Grey-headed Warbler small extent of occurrence (< 5000 km²) and ongoing deforestation, the long-term survival of the species remains dependent on continued habitat protection. Thus, we conclude that the Grey-headed Warbler continues to satisfy the criteria to be listed as nationally and globally 'Endangered.' Future studies should focus on quantifying fragmentation and its effects on this warbler populations, especially reproductive success, since these remain poorly understood and could affect this species' conservation status. *Accepted 24 February 2014.*

Key words: Grey-headed Warbler, *Basileuterus griseiceps*, Parulidae, conservation status, endemism, Turimiquire.

INTRODUCTION

The Grey-headed Warbler *Basileuterus griseiceps*, endemic to the Macizo Montañoso del Turimiquire (MMT) in north-eastern Venezuela (Fig. 1), is a montane species historically considered one of the least known wood-warblers in the Neotropics (Curson *et al.* 1994). It has been recorded in montane cloud-forests and forest edges between 1200 and 2440 m a.s.l., and has been thought to depend on mature undisturbed forest; however, it uses second growth forests and natural clearings and may survive in disturbed forest with a dense understory (Boesman & Curson 1995, Hilty 2003, Sharpe 2008a). Little more is known about its habitat requirements, and knowledge of its distribution, natural history, and population status remain scarce.

The Grey-headed Warbler was first described in 1867 based on a specimen collected in "the neighborhood of Caripe," and was reported as "very rare" (Sclater & Salvin 1868). Between 1867 and 1963, the majority of specimens (39/42) came from just two sites: Cerro Turimiquire and Cerro Negro (Fig. 1). Collections of more than a dozen specimens at each location suggested that in suitable habitats the species was not uncommon (Collar *et al.* 1992). After 1963, more than 25 years passed without a record until

the species 'reappeared' in Cerro Negro and San Bonifacio during the late 1980s and early 1990s (Boesman & Curson 1995, Brooks 2000). Since then, the species has been found in three new sites: Macanilla (Colvee 1999), Cerro El Guamal (Sánchez & González 2002) and Piedra de Moler (unpub. observ. by D. Willis, J. Thompson, C. J. Sharpe, and J. Clavijo; Chris Sharpe pers. com.); therefore, over the last 50 years, the species has been known from just five sites. However, spatial and temporal sparsity of records may be a result of low exploration effort in the complete distributional range of the species.

The Grey-headed Warbler is currently listed as nationally and globally 'Endangered' because of a restricted distribution with ongoing habitat loss (Sharpe 2008a, BirdLife International 2012). As a montane bird, it is restricted to the higher areas of a small mountain range (c. 5400 km²); thus, its actual area of occupancy (IUCN 2012) is much smaller. Habitat loss is caused by agriculture, which is widespread along the MMT and represents the most important threat not only to the Grey-headed Warbler but also to other north-eastern Venezuelan endangered and endemic bird species with populations in the MMT: Venezuelan Flowerpiercer (*Diglossa venezuelensis*), White-throated Barbtail (*Premnoplex tatei*), Urich's Tyrannulet (*Phyllomyias*

urichi), and Venezuelan Sylph (*Agelaiocercus berlepschi*) (Sharpe 2008b, BirdLife International 2012).

In spite of being listed as 'Endangered', information on the population status of the Grey-headed Warbler is vague (BirdLife International 2012). A population decline has been suspected because of the large number of specimens collected in the past at Cerro Negro and Cerro Turimiquire, compared with the low number of individuals reported in recent years (Collar *et al.* 1992, Boesman & Curson 1995). After its 'reappearance' in the early 1990s, Boesman & Curson (1995) suggested that the species might be more seriously threatened than previously thought because of the scarcity of reports from Cerro Negro, and the lack of recent information from the entire western range of the MMT (Serranía del Turimiquire; Fig. 1). Additionally, records from San Bonifacio and Macanillal (both in the eastern range) were also single individuals or pairs, supporting the impression of rareness.

Presuming a greater risk of extinction than previously thought, Boesman & Curson (1995) highlighted the importance of further surveys, especially in the 'Turimiquire region' (western range). A subsequent preliminary vertebrate inventory conducted by the Ministerio del Ambiente (a Venezuelan Wildlife Service equivalent) captured eight individuals at Cerro El Guamal and reported the species as 'common' in the only site they explored above 1000 m a.s.l. (Sánchez & González 2002). This surprising discovery was the first record of the species in the western range for 50 years, hinting at the existence of viable populations, and highlighting the need to explore the region further. Motivated by these recent findings, we decided to thoroughly explore the MMT and search for the Grey-headed Warbler. Our goal was to assess the overall situation of this poorly known, endemic, and supposedly endangered bird by

gathering information on its distribution and providing preliminary information on its habitat requirements and the status of its populations.

METHODS

Study area. The Macizo Montañoso del Turimiquire (MMT) is a small and isolated mountain range located in north-eastern Venezuela (Fig. 1). With an area of c. 5400 km² between 400–2600 m a.s.l., it comprises two adjacent west-east mountain ranges: a western range, the Serranía del Turimiquire, and an eastern range, the Cordillera de Caripe.

Climate in the MMT varies with altitude and longitude. Annual average rainfall varies from 800 and 2200 mm, with a rainy season between May and November, and a dry season between December and April (MARNR 1986). There is a longitudinal humidity gradient, decreasing towards the west. Ascending along the range, vegetation responds to the altitudinal gradient of increasing humidity and decreasing temperature. Lowlands surrounding the MMT are dry, and are covered with dry forests, scrub-forest and savannas. Between 400 and 1000 m a.s.l., climate is dry to sub-humid, and vegetation gradually changes to deciduous and semi-deciduous forests, which in turn gradually change to evergreen cloud-forests above 1000 m (MARNR 1986). Compared to lower areas, cloud-forests are very humid, with abundant epiphytes, palms and tree ferns.

The MMT has a long agricultural tradition (Tate 1931, Boesman & Curson 1995, Sánchez & González 2002). Ranches and subsistence farms are widespread throughout the MMT, especially in the eastern range where villages are larger and more numerous because of the lower altitude and easier accessibility. Agriculture is most abundant at lower altitudes, between 400 and 1000 m a.s.l. However, several crops, especially shade-coffee,

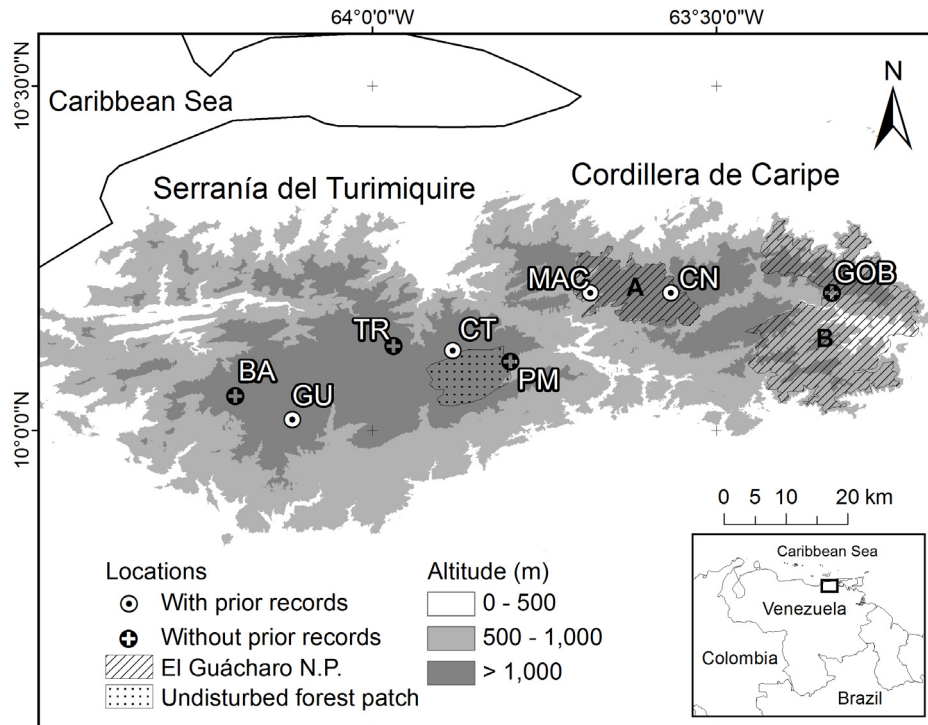


FIG. 1. Locations explored in the Serranía del Turimiquire and Cordillera de Caripe, together called the “Macizo Montañoso del Turimiquire” (MMT). Locations include: Buenos Aires (BA), Cerro El Guamal (GU), Cerro Tristeza (TR), Cerro Turimiquire (CT), Cerro Piedra de Moler (PM), Macanillal (MAC), Cerro Negro (CN), and Cerro Gobierno (GOB). El Guácharo National Park is divided in two main sectors, shown in the map by letters A and B.

reach 1500–1600 m a.s.l. (Boesman & Curson 1995, Colvée 1999, Sánchez & González 2002), ‘pushing’ remnants of undisturbed cloud-forests higher up the mountains or into inaccessible gullies. Shade-coffee cultivation removes the forest understory, and only the tallest trees are left untouched to provide shade. Hence, areas with a closed canopy may still contain disturbed forest with coffee, so disturbance in the region could be easily underestimated.

Explored locations. Between 2005 and 2008, we explored eight locations within the MMT (Fig. 1) to establish the presence of the Grey-headed Warbler, and to gather preliminary

information on habitat and population status. Locations were selected based on previous records, while also ensuring wide coverage of both mountain ranges. Consequently, we explored eight sites in all: four sites with recent previous records (Cerro El Guamal, Cerro Negro, Macanillal and Cerro Piedra de Moler); a historical stronghold without recent records (Cerro Turimiquire); and three additional sites without previous records that extended the searched area to both the east and west.

To maximize the detection of the species we used both visual surveys and/or playback of song recordings (Bibby *et al.* 1998). Initially, we conducted visual surveys at each site. They

consisted of daily observation walks, usually during the early morning (06:00–09:00 h) and late afternoon (15:00–18:00 h). The search was opportunistic, covering as much area as possible, without using transects or formal survey techniques. We used available dirt roads and trails, and also hiked cross-country, to thoroughly explore the forested areas, edges, and surroundings. We kept a detailed account of the number of individuals detected throughout the entire survey, and made a conservative estimate of the minimum number of individuals present at each location (criteria used at each site is given below). Visual identification of the Grey-headed Warbler is simple because it is the only grey-headed *Basileuterus* in its range (Hilty 2003).

Additionally, we also used playback of song recordings to improve the detection of the Grey-headed Warbler (after testing the positive response to its song), and better estimate the number of individuals present. Vocalizations were recorded by Curtis A. Marantz in March 2006 in one of the surveyed localities (Piedra de Moler). We used playback in two different ways. First, we performed playbacks at constant distance intervals at two mountains we had previously explored (Cerro El Guamal and Piedra de Moler). These mountains are accessed through steep dirt roads that meander up to their summits, which we frequently hiked while searching for the species. After sketching the roads and every point where a bird was observed, we identified clusters of records every 200–300 m, suggesting territorial behavior. Starting at the summits, we used playback of song recordings every c. 250 m on our way down, along 2 km and 1.5 km of road in Cerro El Guamal and Piedra de Moler, respectively. We considered a response to be positive when an individual or pair approached the speaker or vocalized within two minutes following the end of the playback, and we were certain (because they were seen/heard simultane-

ously) that it was not an individual/pair from an adjacent territory. Second, we also used playbacks opportunistically at two new locations (Buenos Aires and Cerro El Gobierno) where we simply wanted to quickly establish the presence of the species. Opportunistic playbacks were used instinctively at different spots during the day.

Techniques and effort varied at each location because of variation in accessibility and logistics, so comparisons among sites are still preliminary and must consider these methodological differences. A general overview of each location, as well as a summary of our activities follows (from west to east):

Buenos Aires (10°03'N, 64°12'W; 1230 m a.s.l.). A small rural village, Buenos Aires is surrounded by scattered forest patches used for shade-coffee cultivation. Undisturbed second-growth forest patches are scarce and located on the outskirts of the village. We explored this site once in mid November 2006 (three researchers, three days), with the purpose of rapidly detecting the Grey-headed Warbler using opportunistic playback of song recordings.

El Guamal (10°01'N, 64°07'W; 2200 m a.s.l.). This mountain is covered by a mosaic of *Clusia*-dominated second-growth forest patches surrounded by thickets and bushes. It is located in the apparently driest region of the MMT, where human-caused fires have contributed to erosion. Fires used for slash-and-burn agriculture at lower altitudes (smallholdings reach 1600 m a.s.l.) have frequently spread, limiting forest development and composition. We explored El Guamal twice. In early March 2005, we conducted opportunistic visual surveys (four researchers, four days). We returned in mid August 2006 (three researchers, four days) in order to perform playbacks at constant distance intervals (as described above).

Cerro Tristeza (10°04'N, 63°58'W; 2580 m a.s.l.). On the northern slopes of Cerro Tristeza, a riparian forest crosses a valley covered formerly by forest and now by grasslands with scattered scrubs and bushes. Habitat conversion occurred during the 1960s when according to local residents the valley was used for cattle grazing. Undisturbed cloud-forest patches covered adjacent slopes that form the valley, to the north of Cerro Tristeza. We explored the northern slopes of this mountain, its summit and surrounding ridges in November 2008 (one researcher, four days), covering approximately 12 km of trails where we conducted visual surveys.

Cerro Turimiquire (10°07'N, 63°53'W; 1800 m a.s.l.). The northern slope of Cerro Turimiquire, a former stronghold site, has an irregular swath of cloud-forest between c. 1300 and 2000 m a.s.l. Scattered smallholdings along the foothills reach 1500 m a.s.l., but most of the forest seemed untouched. We explored the northern slope in late November 2005 (three researchers, eight days), accessing the forest from La Trinidad, a former shade-coffee subsistence farm where the species was previously collected (Collar *et al.* 1992). Visual surveys were conducted at La Trinidad and inside the forests swath.

Piedra de Moler (10°06'N, 63°48'W; 1840 m a.s.l.). On the southeastern slope of Piedra de Moler, a dirt road meanders up to a microwave tower at the summit. Along the road, scattered smallholdings surrounded by semi-deciduous and evergreen forest reach 1500 m a.s.l. Above this altitude, undisturbed cloud-forest with abundant *Clusia* sp. trees, palms, tree ferns and bromeliads, covered the rest of the mountain. As we could see from the summit, adjacent mountains and valleys to the west of Piedra de Moler were also covered by a well-developed and undisturbed (con-

firmed by a local guide) cloud-forest patch. It was by far the largest patch of undisturbed forest we encountered, and we suspect one of the largest in the entire MMT (c. 80 km², estimated using Google Earth).

During a first field trip in November 2005 (four researchers during five days), we conducted visual surveys. In August 2006 (three researchers, three days), we performed playbacks at constant distance intervals (as described above).

Macanillal (10°12'N, 63°41'W; 1250 m a.s.l.). Formerly a very active agricultural region, in the early 1990s the creation of El Guácharo National Park pressured farmers to abandon their lands in Macanillal. Today most of the area is covered by disturbed second growth forest patches with regenerating understory that have scattered abandoned coffee plants; only one small undisturbed forest fragment remained, and very few small coffee groves were active. We explored this site once in November 2005 (two researchers, six days), based on J. Colvee's (1999) single record. Visual surveys were performed at Alto El Guácharo sector and surroundings.

Cerro Negro (10°12'N, 63°34'W; 1800 m a.s.l.). On its eastern slope, Cerro Negro (2000 m a.s.l.) has a relatively small (1–2 km²) cloud-forest patch between c. 1600 and 1900 m a.s.l. The mountain, one of the species' historical strongholds, is within El Guácharo National Park, and is close to several agricultural towns (e.g., Sabana de Piedra, El Guácharo, Caripe) whose inhabitants plant shade-coffee in most of the surrounding forests. We observed adjacent farms and their crops reaching 1500 m a.s.l., up to the park boundary. Between 1500 and 1600 m a.s.l., a belt of transitional second-growth forest, with scattered coffee plants in the understory, is replaced by undisturbed cloud-forest above 1600 m. We explored the forest patch twice,

between 1500 and 1800 m a.s.l. accessing the mountain from Sabana de Piedra. The first field trip was in mid November 2005 (four researchers, four days) and the second in late May 2006 (three researchers, three days). In both field trips, we only performed visual surveys.

Cerro El Gobierno (10°12'N, 63°20'W; 1430 m a.s.l.). Most of the mountain is covered by primary cloud-forest, except on its western slope where a small rural town La Rinconada is found at 820 m a.s.l. and surrounding groves reach 1200 m a.s.l. We planned initially to find and explore Las Cumbres de San Bonifacio (site with a previous record); however, for logistical reasons we explored this nearby mountain, which is the highest in the area. In mid November 2006, we hiked up Cerro El Gobierno starting at La Rinconada (three researchers, one day). As in Buenos Aires, our goal was to quickly establish the presence of the Grey-headed Warbler using opportunistic playback.

RESULTS

The Grey-headed Warbler was recorded in all eight explored sites, with a total of 75 direct unsolicited observations plus additional individuals seen after playback that accounted for a combined conservative estimate of at least 82 individuals. Most frequently, the Grey-headed Warbler was solitary or in pairs, actively searching for food 1–4 m above the ground. However, about 20% of observations were higher in the trees, between 4 and 15 m, in the sub-canopy. Five times a pair or an individual was seen searching for food in a mixed flock. Flocks included Ochre-breasted Brushfinch (*Atlapetes semirufus*), Rufous-collared Sparrow (*Zonotrichia capensis*), Blue-capped Tanager (*Thraupis cyanocephala*), White-throated Tyrannulet (*Mecocerculus leucophrys*), Oleaginous Hemispingus (*Hemispingus fronta-*

lis), Crested Spinetail (*Cranioleuca subcristata*), and two unidentified woodcreepers. Singing duets were heard (without using playback) in April 2006 (Piedra de Moler), August 2006 (El Guamal), and November 2008 (Cerro Tristeza).

The Grey-headed Warbler was observed using a wide variety of montane forest habitats. These included undisturbed evergreen mature cloud-forests, second-growth cloud-forests and *Clusia*-dominated second-growth forests. Within the forest, it used the forest interior (with and without abundant understory), edges and clearings, and, less frequently, areas of transition between forest and scrubs, and scrubs at the outer edge of the forest (no more than 10–15 m from the forest), with little or no tree cover. Furthermore, Grey-headed Warblers were also observed using disturbed and semi-degraded areas adjacent to undisturbed forest, such as active but unattended shade-coffee groves, as well as disturbed areas where human caused-fires have affected the structure and composition of all remaining forests patches.

Detailed accounts of our observations at each site follow (from west to east).

Buenos Aires. After one day exploring the shade-coffee groves and second-growth forest patches without any observation or response to playback, we headed north-east towards Cerro La Pizarra along an old trail looking for undisturbed forest (locals mentioned an undisturbed forest patch near this mountain). Shortly after leaving behind the coffee groves, at 1780 m a.s.l., two individuals uttering contact calls were attracted by playback. This occurred in a regenerating burned forest clearing (adjacent to second-growth forest), with a dense understory dominated by ferns (*Pteridium* sp.). We could not reach Cerro La Pizarra or the undisturbed primary forest, because the trail was densely overgrown. Thus, only one pair was detected in total.

El Guamal. During our first field trip, in March 2005, we saw one individual inside a second-growth forest patch near the summit at 2200 m a.s.l., searching for food with a mixed species flock (*A. semirufus*, *Z. capensis*, and *T. cyanocephala*). The forest patch was composed mainly of *Clusia* sp. (Clusiaceae) and *Piptocoma vernonioides* (Asteraceae) trees, with surrounding Melastomataceae, Myrta-ceae, and Ericaceae bushes, and abundant climbing bamboo (*Arthrostylidium* sp.). Four days later, just before sunset, we saw another individual in a similar forest patch c. 300 m from the previous record, perched c. 7 m above ground on a *Clusia* sp. tree. Considering the short distance between the two observations, we were not sure if we saw one or two individuals. During our second field trip in August 2006, records were much more numerous. The first morning, we heard at least four different singing duets around the summit (without playback), an area of c. 1 ha. The following day, eight different pairs responded to constant distance playbacks, always singing duets, along c. 2 km of dirt road between 1710 and 2200 m a.s.l.. Our conservative estimate is that during this visit at least 10 different pairs were detected between the summit area and along 2 km of road (since we were not sure if two of the singing duets that responded to playback were the same as the birds heard the previous day).

Cerro Tristeza. We recorded at least 14 different observations between 1750 and 2580 m a.s.l. along 5 km of riparian forest in the valley. All the observations occurred at both forest edges and clearings, and two of the records were family groups with juveniles. Our conservative estimate, based on distance between observations, is that at least eight different individuals were present in this area. Also, while walking along the summit ridges, two singing duets were heard inside the forest patches on the southern slopes right below

the ridge. In total, at least 12 individuals were detected in Cerro Tristeza.

Cerro Turimiquire. The Grey-headed Warbler was only seen inside the forest swath, between 1600 and 1800 m a.s.l.. Each day, we encountered individuals two to four times along an 800 m trail inside of the forest. We estimated a conservative minimum of three pairs to be present.

Piedra de Moler. During our first field trip in November 2005, several birds were encountered daily along c. 1.5 km a dirt road between 1500 m a.s.l. (the boundary separating the last smallholding and the undisturbed forest) and the summit at 1820 m a.s.l.. Observations occurred at the road-forest edge, along side trails inside the mature forest, second-growth forest, and clearings. At 1500 m a.s.l., two individuals were seen two different times searching for food inside an active but unattended shade-coffee smallholding (where scrub mixed with coffee to form a denser understory compared with 'cleaned' smallholdings) adjacent to the undisturbed forest. Clusters of records allowed us to clearly identify at least five territories. Thus, our conservative estimate was that there were at least five pairs along the 1.5 km of road we explored.

On the next field trip, in August 2006, constant distance playbacks revealed that there were eight pairs in the same area. We also explored an adjacent and smaller mountain called 'Cerro El Divorcio' with similar forest, where we encountered three individuals in total. Our conservative estimate is that at least nine different pairs were detected in the two mountains.

Macanillal. During our five-day visit, at four different times and locations we observed a single individual foraging at mid heights (3–8 m). Two records occurred inside disturbed

forest patches, one at the forest edge, and another in a burned forest clearing (adjacent to the forest) where *Cecropia* sp. and other pioneer plants formed a dense understory. Given the distance between records (only two records were at least 500 m apart from each other), we estimate that at least two individuals were present.

Cerro Negra. During the 2005 rainy season, in early August, we found one individual inside the cloud-forest at 1800 m a.s.l. searching for food at c. 1 m and vocalizing loudly, suggesting that another unseen individual was near. Two days later, in the same area, a pair was observed while uttering contact calls. We assumed it was the same pair. In late May 2006, at the end of the dry season, we used no playback but saw a pair flush from a nest with two eggs (Hernández *et al.* 2009). Thus, during each field trip we detected a total of one pair.

Cerro El Gobierno. Shortly after leaving behind the groves, two individuals were attracted by playback at 1315 m a.s.l. inside undisturbed cloud-forest. About 1.5 km further ahead, at the summit (1430 m a.s.l.), two additional individuals were observed approaching in response to playback, also inside the cloud-forest. On our way down, about 1 km from the summit but on a different trail on the southern slope, another pair was observed searching for food inside the cloud-forest at 1280 m a.s.l., this time without playback. Given the distance among records, we are confident that at least three different pairs were present.

DISCUSSION

Distribution. The Grey-headed Warbler had a wide distribution along the MMT. It was recorded at all eight sites we visited, throughout both mountain ranges, in a wide variety of

disturbed and undisturbed forest habitats, never below 1200 m a.s.l., congruent with its previous known altitudinal range (Hilty 2003). We confirmed the presence of the species on the northern slope of Cerro Turimiquire more than 40 years after the previous record (Hilty 2003). The presence of the species at three locations (Cerro La Pizarra, Cerro El Gobierno, and Cerro Tristeza) represents new records that extended significantly, both east and west at each range, its extent of occurrence and area of occupancy. Considering the variety of forest habitats used by the species, its apparent tolerance to different types of disturbance and its presence in all eight of the locations we explored, we believe that the Grey-headed Warbler is present in most forest patches in the MMT above 1200 m a.s.l.

Although widespread along the MMT, the distribution of the Grey-headed Warbler is fragmented. We were able to make no formal quantification of fragmentation; however, forest disturbance is certainly widespread, as it can be qualitatively assessed when driving and hiking throughout the region. Both agriculture, especially in the Cordillera de Caripe, and human-caused fires, in the western end of the Serranía del Turimiquire, have reduced large areas of natural forest (Sánchez & González 2002). Further studies that estimate the extension and degree of habitat fragmentation are very important, since it is a key factor for establishing the conservation status of the species (see *Conservation status*).

Habitat association. Our observations suggest that the Grey-headed Warbler is a generalist forest species that most commonly uses forest edges and clearings as other *Basileuterus* species found in similar montane habitats. Birds used several forest habitats, including undisturbed mature forests, second-growth forests, and *Clusia* forests, as well as all areas within the forest: interior, gaps, edges, and exterior. Also, inside the forest, the species used differ-

ent vegetation strata, from the lower understory near the ground to the sub-canopy.

The Grey-headed Warbler also appeared to tolerate some types of habitat disturbance. Near undisturbed forests like those in Piedra de Moler, it was found in adjacent disturbed areas like unattended shade-coffee groves and burned forest patches. It was also present in former agricultural regions like Macanillal, where the species may be either slowly recolonizing after being displaced during the agricultural peak, or present as a remnant sub-population that survived in the only undisturbed forest patch and is now expanding to adjacent regenerating forests. Furthermore, the Grey-headed Warbler seemed abundant in severely disturbed areas like Cerro El Guamal, where fires have altered the structure and composition of all forest patches and no undisturbed forests remain. Thus, in regions affected by fires, such as the western side of the Serranía del Turimiquire (western range), it seems that the Grey-headed Warbler is not totally dependent on undisturbed forests. However, the species does not seem to tolerate areas where all remaining forests have been disturbed by agriculture, including the less destructive shade-coffee cultivation. Boesman & Curson (1995) explored mountains and slopes adjacent to Cerro Negro without detecting the Grey-headed Warbler and always finding shade-coffee instead of undisturbed forest. When we explored areas with abundant shade-coffee groves, such as Buenos Aires, Cerro El Gobierno, and lower Cerro Negro, we detected the species only after leaving behind the groves, inside adjacent forests; and when we did find the species using shade-coffee groves, it was always adjacent to undisturbed forests.

Estimating the extent of undisturbed forest present in the region is very important to fully understand the real status of this species. However, discriminating between undisturbed forests and shade-coffee 'forests'

could represent an important challenge when using remote sensing, since tree cover is not fully affected by shade-coffee agriculture. Any attempt to estimate the extent of undisturbed forest present in the MMT should consider such challenge to avoid overestimations.

Population status. Abundance of the Grey-headed Warbler in the Serranía del Turimiquire and Cordillera de Caripe appeared to be different. After many years without information, sightings at the Serranía del Turimiquire were more common than expected. Records at El Guamal, Piedra de Moler, Cerro Turimiquire, and Cerro Tristeza revealed that the species is fairly common in several areas of this mountain range, whereas our records at Cordillera de Caripe were consistent with previous knowledge: it appears that only small and remnant populations survive. This difference may exist because the Cordillera de Caripe is more developed and fragmented than the Serranía del Turimiquire; however, further formal surveys are needed to confirm this pattern.

Populations of the Grey-headed Warbler are confined to scattered 'islands' of montane forest that remain on mountaintops. Since the species was found at all sites we explored, and since it appeared to be a forest generalist, we are confident that most forest 'islands' in the MMT harbor the Grey-headed Warbler. However, small and isolated cloud-forest patches, such as the southern slope of Cerro Negro and Cerro El Gobierno, apparently have only small populations, while larger and undisturbed patches, such as the one west of Piedra de Moler, probably contain larger and perhaps stable populations. The Grey-headed Warbler appeared to be common along the eastern (Piedra de Moler) and northern (Cerro Turimiquire) edges of this large patch. Since most of the patch seems to be above 1000 m a.s.l., there is good reason to suspect that abundance may be relatively high

throughout, and thus qualify as a stable population. Future studies should definitely explore this patch further, since it may be one of the most stable and viable populations of the species.

Understanding the presence of Grey-headed Warbler populations in disturbed sites like El Guamal, Cerro Tristeza, and Macanillal remains a challenge. Individuals certainly tolerate disturbance, but how much? Most importantly, how is the species reproductive success affected by these disturbances? Formal comparative surveys using playbacks (since it effectively increased detection of the species), as well as comparative studies on reproductive success, are needed to understand the effect of fragmentation on this warbler and its tolerance to disturbances in more detail.

Conservation status. Our data clearly suggest that the Grey-headed Warbler is not as rare and threatened as previously thought (Curson *et al.* 1994, Boesman & Curson 1995), and that it is also more tolerant of forest disturbance. Furthermore, the ‘discovery’ of a relatively large and undisturbed cloud-forest patch (where the species is probably common) provides hope for the future persistence of the species. However, because of its small extent of occurrence (< 5000 km²), inferred ongoing threats from advancing agriculture and unknown tolerance to fragmentation and other disturbances, we conclude that the species still triggers the thresholds for assessment as nationally and globally ‘Endangered’ (IUCN 2012).

The Grey-headed Warbler is currently listed as ‘Endangered’ based on IUCN criterion B1ab (i, ii, iii, v) (BirdLife International 2012). That is, B1) the extent of occurrence is estimated to be less than 5000 km², and both: a) estimates indicate that habitat is severely fragmented or known to exist at no more than five locations, and b) estimates indicate an

observed, inferred or projected decline of (i) extent of occurrence, (ii) area of occupancy, (iii) area, extent and/or quality of habitat, and (v) number of mature individuals. At a first glance, all of these conditions still apply to the species: the area of forest above 1000 m a.s.l. in the MMT is much less than 5000 km²; forests are fragmented in large areas of the MMT, and are continually being cleared for agriculture, reducing the area of occupancy. However, since we now know that the species exists in more than five locations, fragmentation becomes the key point of uncertainty affecting the status of the species. If the MMT is not ‘severely fragmented’, criterion B1a will no longer apply and the species may not qualify as ‘Endangered.’ Our finding of a large and undisturbed forest patch, and our preliminary observations of apparent considerable tolerance of disturbance in the western range, suggests that the Serranía del Turimiquire might not be ‘severely fragmented’ for the Grey-headed Warbler. Consequently, to clearly evaluate the ‘Endangered’ status of the species, further studies need to assess the fragmentation status of the MMT, and its effect on the Grey-headed Warbler populations.

Regardless of the criteria used, given knowledge of current conditions, the long-term survival of the species probably remains dependent on habitat protection. Current protection in the MMT is weak and insufficient. All of the MMT between 400 and 2600 m a.s.l. was declared as the Turimiquire Protective Zone (IUCN Cat. V) in 1974. The protective zone is meant to preserve the headwaters of several important rivers that feed the region’s main reservoirs. It limits land property and urban development, but allows rural settlements, subsistence agriculture, and hunting, which are rapidly growing and expanding, affecting natural habitats. In the eastern range, El Guácharo National Park (IUCN Cat. II), declared in 1975, covers two large forest areas (sectors) totaling 62,700 ha

(Fig. 1). However, it is ineffective for protecting cloud-forest species like the Grey-headed Warbler because it contains little undisturbed forest above 1000 m a.s.l. as Sector A is located in the most developed area of the eastern range and it contains extensive former agricultural areas, whereas most of Sector B is below 1000 m a.s.l. An equivalent protected area in the western range is lacking, a disparity that is especially striking given the larger number of Grey-headed Warbler individuals detected in the western range (Piedra de Moler, Cerro Turimiquire, Cerro Tristeza, and El Guamal) as compared to the eastern range (Cerro Negro, Macanillal, and Cerro Gobierno).

Proper conservation actions should include habitat protection and detailed ecological research. Protection of the forest patch west of Piedra de Moler needs to be considered. It is possibly the largest (c. 80 km²) undisturbed forest patch in the whole MMT, most of the patch seems to be above the altitudinal range of the species, and records on two of its edges (Piedra de Moler and Cerro Turimiquire) suggest that the Grey-headed Warbler may be common within it. We recommend further exploration of this area and evaluating the proportion of undisturbed forest in the patch that is within the altitudinal range of the species. Future research on the Grey-headed Warbler should include GIS estimates of undisturbed forest cover and fragmentation analysis, as well as formal population estimates and comparative reproductive success. Such work could estimate the effects of fragmentation and habitat disturbance, and thus provide a better idea of the long-term viability of this species.

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