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Citizen Science in the Ornithology of a Developing Country:

Christmas Bird Counts in

Guatemala

Could Frank M. Chapman have foreseen back in 1900 that his Christmas Bird Count (CBC) would catalyze the development of birding as one of the most important outdoor hobbies in North America? I believe he hoped for it. In the U.S. and Canada, birders are the main players in such projects as breeding bird atlases and waterbird counts. But what about countries with few birders, such as Guatemala? Recently established CBCs there help not only to collect data on bird distribution but also to grow the local birding community.

The exploration of avian diversity in Guatemala was under way in the 19th century. European and North American scientists collected birds with the help of local hunters—in a certain sense, an early citizen-science initiative. More than 22,000 bird specimens from Guatemala are curated in more than 90 international museums (Eisermann and Avendaño 2006) and are a baseline for some of the field guides in use today.

Despite its long history in the country, however, ornithology has developed slowly in Guatemala. Local universities have offered biology as a career just since the 1970s, and the first ornithological studies by Guatemalan scientists were not published until the 1990s. Not surprisingly, birding is not yet a widespread hobby. However, recently established CBCs are promoting birding in Guatemala.

Geographic Expansion of a North American Citizen-Science Program

The National Audubon Society's CBC is the longest-running citizen-science initiative in North America. The first CBC was held in 1900, initiated by Frank M. Chapman, an ornithologist at the American Museum of Natural History in New York and one of the leaders of the Audubon Society. This first count was carried out at 27 sites from Ontario to California and was a response of the developing nature conservation movement to the traditional "side hunt," which accoladed the most successful Christmas Day hunter (Francis et al. 2004).

The first CBCs south of the U.S. were held in Mexico, Belize, Guatemala, Panama, and the West Indies in 1973 (Heilbrun et al. 1974); these marked the beginning of the

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expansion of this program over the entire western hemisphere. The number of CBCs in Latin America is growing constantly. In 2008, data from 83 counts in ten Middle and South American countries and eight islands in the West Indies were submitted to Audubon's online database. The total data from that year were collected by almost 60,000 observers in more than 2,100 CBCs (LeBaron 2009).

Christmas Bird Counts in Guatemala

Guatemala currently has three active CBCs: Tikal National Park, since 2006; Atitlán Volcano, since 2007; and Antigua Guatemala, since 2009. The location of each circle was chosen to monitor important bird areas (IBAs) and according to certain logistical criteria.

Atitlán Volcano

Of the three Guatemalan counts, the CBC at Atitlán Volcano is the richest in number of recorded species because of a wide altitudinal range (1,640–11,480 feet) and, consequently, a high diversity of habitats. The circle includes humid broadleaf and

This article examines the role of the Christmas Bird Count (CBC) in the emergence of a "citizen-science" ethic in Guatemala. Guatemala's CBCs were begun just a few years ago, but interesting and important findings are already emerging. And CBC participants have been rewarded with some great birding! For example, the **Garnet-throated Hummingbird** (*Lamprolaima rhami*), restricted to the highlands of southern Mexico and northern Central America, has been recorded on the Atitlán Volcano and Antigua Guatemala CBCs. *Chelemhá Reserve, Alta Verapaz, Guatemala; June 2009– April 2010.* Photos by © Knut Eisermann.





The **Bushy-crested Jay** (*Cyanocorax melanocyaneus*) is endemic to the northern Central American highlands, and it is regularly recorded during the CBCs at Atitlán Volcano and Antigua Guatemala. *Chelemhá Reserve, Alta Verapaz, Guatemala; September 2009. Photo by © Knut Eisermann.*



The **Unspotted Saw-whet Owl** (*Aegolius ridgwayi*) was reported on the 2010 CBCs at Atitlán Volcano and Antigua Guatemala. *Agua Volcano, Sacatepéquez, Guatemala; December 2010. Photo by © Knut Eisermann.*

mixed forests, scrub, coffee plantations and other agricultural land, lava fields, and the southern part of Lake Atitlán.

A maximum of 233 bird species has been recorded on this CBC, including many of the range-restricted species of the northern Central American highlands: Horned Guan (*Oreophasis derbianus*), Highland Guan (*Penelopina nigra*), Rufous Sabrewing (*Campylopterus rufus*), Green-throated Mountain-gem (*Lampornis viridipallens*), Blue-throated Motmot (*Aspatha gularis*), Bushy-crested Jay (*Cyanocorax melanocya-*

neus), Black-capped Swallow (*Notiochelidon pileata*), Rufous-browed Wren (*Troglodytes rufociliatus*), and Azure-rumped Tanager (*Tangara cabanisi*), as well as *Glaucidium gnoma cobanense*, a range-restricted subspecies of the Northern Pygmy-Owl. Atitlán Volcano lies in the south of the Atitlán IBA (IBA GT015). The forest on the southern volcano slope is protected through a network of several private reserves. Some of these, such as Los Tarrales <tinyurl.com/4vvnazb> and Los Andes <tinyurl.com/4vln7wa>, have emerged recently as must-see spots for visiting birders.

Tikal

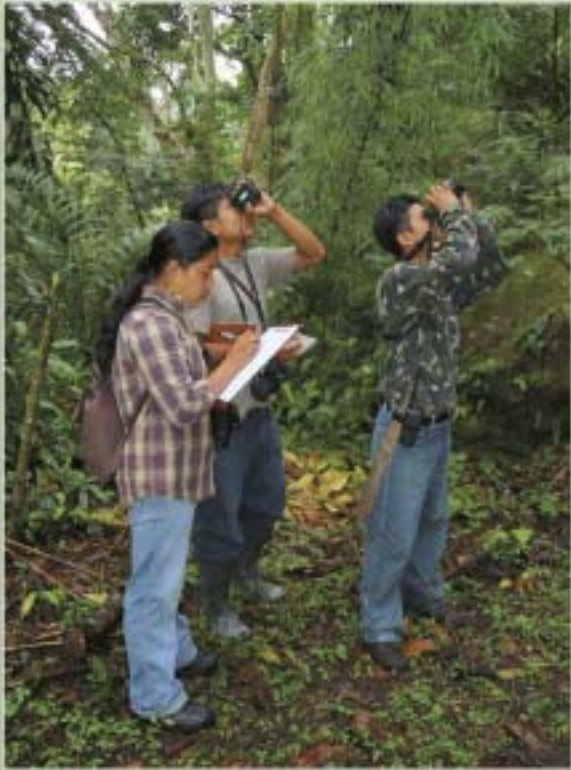
In Tikal, the highest count was 193 species, recorded in semi-deciduous broadleaf forests, swamps, scrub, ponds, ravines, and open habitat on the grounds of the Mayan ruins. One of the highlights of the CBC in Tikal has been the Orange-breasted Falcon (*Falco deiroleucus*), found each year thus far. The national park is located in the east of the Maya-Lacandón IBA (GT001) and ranges in altitude from 820 to 1,480

The CBC at Atitlán Volcano covers an altitudinal range from 1,640 to 11,480 feet. The forest on the steep volcano slopes is habitat for several globally threatened bird species. Blooming *Inga* trees in shade coffee plantations offer a rich food source for wintering Ruby-throated Hummingbirds, Tennessee Warblers, and Baltimore Orioles. *Atitlán Volcano, Guatemala; August 2009. Photo by © Knut Eisermann.*

Table 1. Number of Participants in CBCs in Guatemala (2006–2009)

Classified by Socioeconomic and Interest Groups.

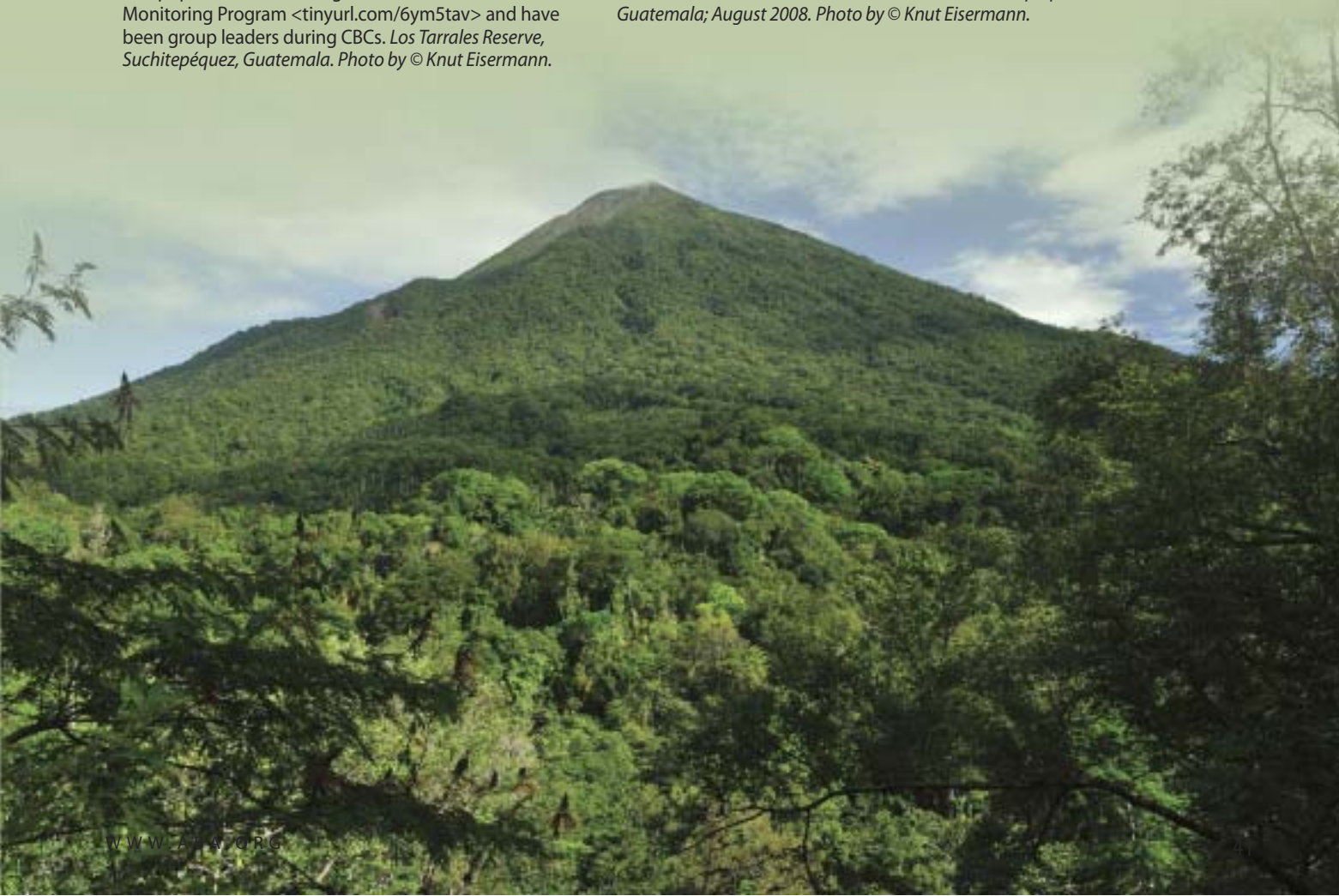
Number	Group
27 (19.4%)	Tourist guides
23 (16.5%)	Farmers
22 (15.8%)	Professional conservationists
17 (12.2%)	International tourists
13 (9.4%)	Young birders <18 years
9 (6.5%)	Landowners of private protected areas within CBC circles
8 (5.8%)	Biologists
7 (5.0%)	Students (biology, tourism)
5 (3.6%)	Bird counters employed in local monitoring programs
4 (2.9%)	Guatemalan hobby birders without professional birding background
4 (2.9%)	International volunteers from developing aid projects



Everilda Buchán, Aaron de León Lux, and Josué de León Lux (left to right) are bird guides in the private nature reserve at Los Tarrales. They learned bird identification and population monitoring with the PROEVAL RAXMU Bird Monitoring Program <tinyurl.com/6ym5tav> and have been group leaders during CBCs. *Los Tarrales Reserve, Suchitepéquez, Guatemala.* Photo by © Knut Eisermann.



The **Azure-rumped Tanager** (*Tangara cabanisi*) is an endangered species restricted to middle elevations of the Pacific slope of western Guatemala and Chiapas, Mexico. It has been recorded during all CBCs at Atitlán Volcano. *Los Tarrales Reserve, Suchitepéquez, Guatemala; August 2008.* Photo by © Knut Eisermann.





feet. This IBA and forests in Belize and the Mexican states of Tabasco and Quintana Roo form the largest continuous neotropical forest north of the Amazon.

Although Tikal is the oldest Guatemalan national park and

one of the country's main tourist destinations, no long-term continuous monitoring of bird populations has been carried out there. The Peregrine Fund studied the ecology of raptors and owls in Tikal in the 1980s and 1990s, and researchers with that organization taught local people from the northern Petén region to collect data by radio tracking, nest monitoring, and other methods. Most of the trained observers are active today as tour guides or as field workers in conservation research—for instance, with the Wildlife Conservation Society.

Tikal therefore has a relatively high concentration of people who are familiar with the local birdlife, which is crucial for the organization of the count. An extensive network of trails, which were established more than 40 years ago for the archaeological research at Tikal and which are maintained regularly, offer excellent conditions for bird counts within the forest.

Antigua Guatemala

The colonial town of Antigua Guatemala, surrounded by several volcanoes, is another of Guatemala's tourist centers. This CBC circle covers an altitudinal range from 3,940 to 12,340 feet. During the first CBC in 2009, a total of 120 species was recorded, including range-restricted species such as Highland Guan, Pink-headed Warbler (*Ergaticus versicolor*), Black-throated Jay (*Cyanolyca pumilo*), and Wine-throated Hummingbird (*Atthis ellioti*). The CBC circle is part of the Antigua Guatemala IBA (GT016). Several private and communal protected areas are located in the surroundings of Antigua, and these places recently opened their doors for tourists. These include Finca El Pilar <tinyurl.com/4gwctkf>, Finca Filadelfia <tinyurl.com/4tmuvyb>, and Cerro Alux <tinyurl.com/6bgzh22>.



The number of participants on Guatemalan CBCs has ranged from 22 to 48 birders. A

The forest around the Mayan temples of Tikal is part of the largest neotropical forest north of the Amazon, and it provides an important wintering habitat for Wood Thrush, Gray Catbird, American Redstart, and Magnolia, Kentucky, and Black-and-white warblers. *Tikal, Petén, Guatemala; December 2009. Photo by © Knut Eisermann.*

Table 2. Abundance of selected nearctic-neotropical migratory birds in Guatemalan CBCs, retrieved from the Audubon CBC website <tinyurl.com/6l6o6re>. Abundance is given as the mean number of birds per party hour \pm one standard deviation. Sample sizes: Tikal, $n=4$ counts; Atitlán Volcano, $n=3$ counts; Antigua, $n=1$ count. Abundant species are indicated in boldface.

Species	Tikal	Atitlán	Antigua
Ruby-throated Hummingbird	0	0.72 \pm 0.89	0.17
Yellow-bellied Flycatcher	0.09 \pm 0.06	0.01 \pm 0.01	0
Willow Flycatcher	0	0.02 \pm 0.01	0
Least Flycatcher	0.09 \pm 0.03	0.10 \pm 0.05	0
Hammond's Flycatcher	0	0.03 \pm 0.02	0.02
Western Kingbird	0	0.28 \pm 0.28	0.02
White-eyed Vireo	0.27 \pm 0.06	0	0
Yellow-throated Vireo	0.15 \pm 0.08	0.06 \pm 0.05	0
Blue-headed Vireo	0.01 \pm 0.01	0.06 \pm 0.04	0.26
Warbling Vireo	0.01 \pm 0.01	0.09 \pm 0.02	0
Swainson's Thrush	0.04 \pm 0.04	0.14 \pm 0.11	0
Hermit Thrush	0	0.00 \pm 0.01	0
Wood Thrush	0.85 \pm 0.08	0.07 \pm 0.06	0.04
Gray Catbird	0.49 \pm 0.08	0.02 \pm 0.00	0
Blue-winged Warbler	0.04 \pm 0.03	0.01 \pm 0.01	0
Golden-winged Warbler	0.02 \pm 0.01	0.00 \pm 0.00	0
Tennessee Warbler	0.02 \pm 0.03	1.41 \pm 0.75	0.32
Nashville Warbler	0	0.11 \pm 0.13	0.09
Yellow Warbler	0.04 \pm 0.01	0.04 \pm 0.01	0
Chestnut-sided Warbler	0.07 \pm 0.04	0.01 \pm 0.01	0
Magnolia Warbler	0.87 \pm 0.08	0.12 \pm 0.07	0
Black-throated Green Warbler	0.12 \pm 0.07	0.11 \pm 0.05	0.36
Townsend's Warbler	0	0.49 \pm 0.23	0.84
Black-and-white Warbler	0.47 \pm 0.08	0.24 \pm 0.06	0.36
American Redstart	0.47 \pm 0.04	0.03 \pm 0.01	0
Worm-eating Warbler	0.14 \pm 0.03	0.01 \pm 0.01	0.02
Ovenbird	0.10 \pm 0.08	0.04 \pm 0.01	0
Kentucky Warbler	0.52 \pm 0.13	0.01 \pm 0.01	0
MacGillivray's Warbler	0	0.03 \pm 0.03	0.06
Hooded Warbler	0.29 \pm 0.19	0	0
Wilson's Warbler	0.03 \pm 0.04	0.66 \pm 0.21	0.79
Yellow-breasted Chat	0.05 \pm 0.04	0.03 \pm 0.01	0
Summer Tanager	0.21 \pm 0.03	0.27 \pm 0.04	0.07
Western Tanager	0	0.16 \pm 0.08	0.11
Rose-breasted Grosbeak	0	0.18 \pm 0.10	0.09
Indigo Bunting	0.02 \pm 0.02	0.08 \pm 0.07	0.06
Painted Bunting	0.00 \pm 0.01	0.01 \pm 0.02	0
Orchard Oriole	0.00 \pm 0.00	0.19 \pm 0.02	0.02
Baltimore Oriole	0.06 \pm 0.05	0.42 \pm 0.10	0.24



The **Orange-breasted Falcon** (*Falco deiroleucus*) is a resident breeding bird at Tikal and has been recorded on each CBC. This female was perched on the scaffold at Temple IV. Tikal, Petén, Guatemala; May 2009. Photo by © Knut Eisermann.



Participants in the fourth Tikal CBC recorded a total of 172 species on a rainy day. December 2009. Tikal, Petén, Guatemala; December 2009. Photo by © Knut Eisermann.





Townsend's Warbler. *Tecpán, Chimaltenango, Guatemala; March 2009. Photo by © Knut Eisermann.*



Black-throated Green Warbler. *Sanimtacá, Alta Verapaz, Guatemala; February 2010. Photo by © Knut Eisermann.*

Guatemala hosts high densities of wintering nearctic migrants, and CBCs provide valuable data about the occurrence of such birds.

total of 139 persons has participated in the first four years and eight counts. Looking at the participants' socioeconomic and interest groups, it is noteworthy that tour guides were the largest group, representing 19% of all participants, followed by local farmers (17%) who live in private nature reserves and on coffee farms. Also encouraging is the high participation of people younger than 18 years of age, representing 9% of all participants (Table 1). This illustrates the importance of the CBC for fostering the next generation of birders and field ornithologists in Guatemala.

What is the Value of CBC Data in Guatemala?

Science

The rather coarse field methodology of the CBC limits scientific use of the data, but the CBC database encompasses the largest geographic range of any quantitative avian research study in the Americas (Dunn et al. 2005). The scientific value of the Guatemalan CBC lies in the species records, which become accessible to the public with their entry into the CBC database. Some rare birds have been recorded during the counts (Eisermann and Avendaño 2007), such as Blue Seedeater (*Amaurospiza concolor*) at Atitlán Volcano, Unspotted Saw-whet Owl (*Aegolius ridgwayi*) at Atitlán Volcano and Antigua Guatemala, and Crested Eagle (*Morphnus guianensis*) at Tikal. Also, rare winter observations of Swallow-tailed Kite, Olive-sided Fly-

catcher, and Yellow-green Vireo have been made.

The CBCs also reveal the importance of the areas as wintering sites for boreal migrants. Tikal is an important wintering site for Wood Thrush, Gray Catbird, Magnolia Warbler, American Redstart, and Kentucky Warbler, with one individual per 1–2 observer group hour (Table 2). Atitlán Volcano is important for Ruby-throated Hummingbirds. In 2009, a remarkable 168 individuals were recorded, mainly in shade coffee plantations where they were feeding on profusely flowering *Inga* trees. Many Tennessee Warblers and Baltimore Orioles were also taking advantage of this food source. In Antigua the most abundant migratory birds were Townsend's and Wilson's warblers (Table 2).

Observations of globally threatened species such as Highland Guan, Horned Guan, Pink-headed Warbler, and Azure-rumped Tanager during CBCs produce records that can be searched online. Although some Guatemalan birders use eBird Guatemala <tinyurl.com/4gyvrlr2> to keep track of their observations, many others keep no records. Therefore, observations by these folks outside CBC events remain inaccessible to science. For areas without standardized monitoring of bird populations, such as Tikal National Park, the CBC data are useful for providing continued updates of the species inventory. On a larger scale, Guatemalan CBCs contribute valuable data for continental trend analysis in distribution patterns and species richness.

The garish **Wine-throated Hummingbird** (*Atthis ellioti*) has been recorded on the Antigua Guatemala and Atitlán Volcano CBCs. *Chelemhá Reserve, Alta Verapaz, Guatemala; September 2008. Photo by © Knut Eisermann.*

Education

At least as important as the scientific value is the sociological impact of the CBCs in Guatemala as events to raise environmental awareness among local people. Each year some newcomers register for the CBC, and some of them may discover a new passion for birding. The Guatemalan press has reported several times on CBCs in the country (Eisermann 2010).

The need to foster environmental awareness in Guatemalan society is urgent. According to an evaluation by the United Nations Economic Commission for Latin America and the Caribbean (CEPAL 2007),

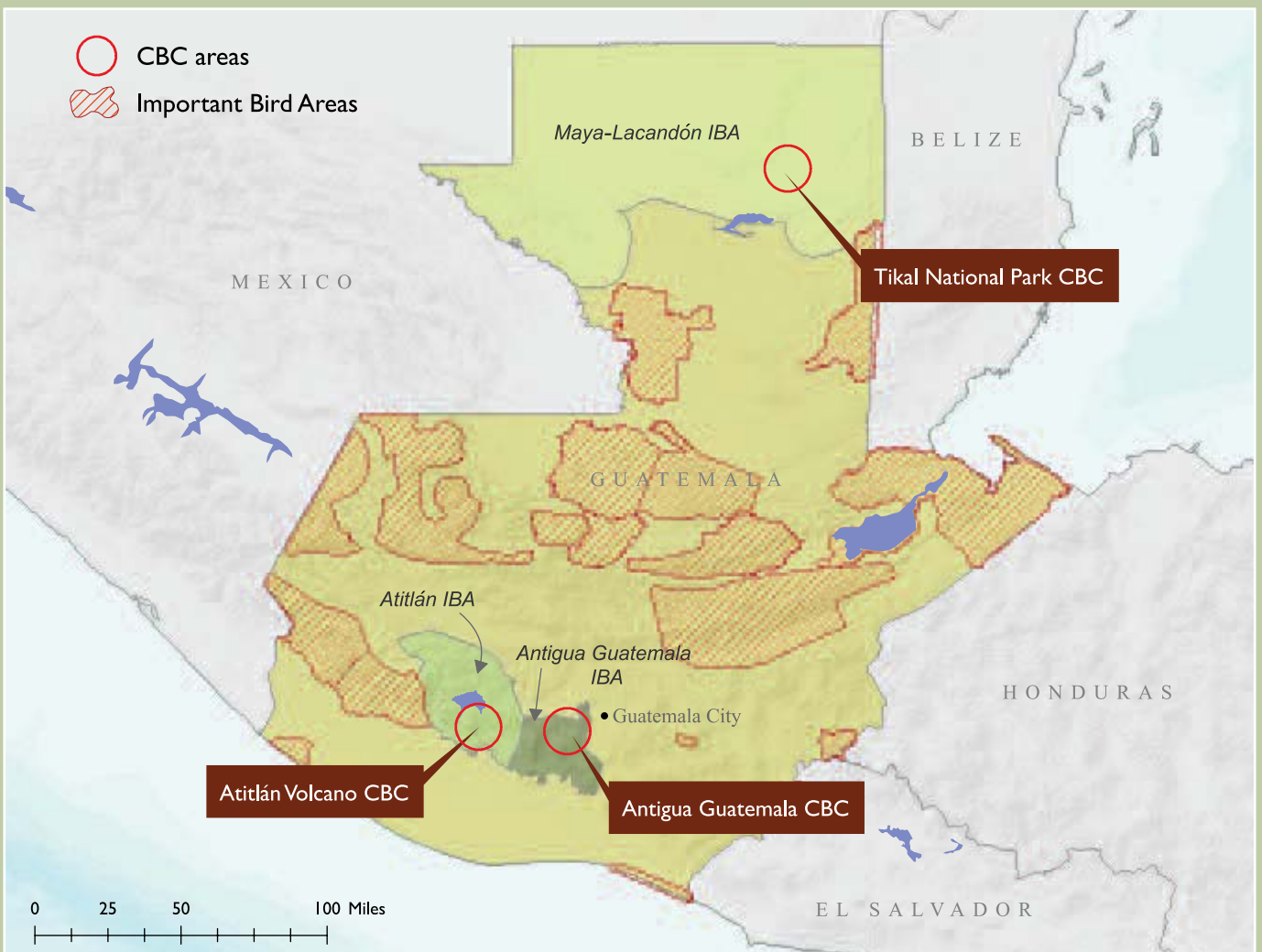
The beautiful old city of Antigua Guatemala provides the base of operations for the Antigua Guatemala CBC. Participants cover territory ranging in elevation from just under 4,000 feet to more than 12,000 feet. *Antigua Guatemala, Sacatepéquez, Guatemala; December 2009. Photo by © Knut Eisermann.*





Guatemala's human population will double in the next 30 years to a total of 27 million people. The pressure on the natural areas will increase. In addition to necessary improvements in the management of protected areas, conservation priorities outside protected areas were established during the identification of IBAs in Guatemala in order to protect populations of globally threatened and range-restricted species (Eisermann and Avendaño 2009). Most of the Guatemalan IBAs are legally protected in less than 50% of their area (see map). Fostering environmental awareness among Guatemalans will be central to the success of nature conservation in this biologically spectacular country.

Do you want to see **Blue-and-white Mockingbird (*Melanotis hypoleucus*)**? Then what are you waiting for! Book a flight to Guatemala City (just a few hours from Houston), and you're on your way. *Chelemhá Reserve, Alta Verapaz, Guatemala; April 2010. Photo by © Knut Eisermann.*



This map shows the location of CBCs relative to Guatemalan Important Bird Areas. Each CBC circle has a diameter of 15 miles. *Map by © Kei Sochi.*

Taking Part in Christmas Bird Counts in Guatemala

The Guatemalan CBCs are of clear interest to international birders. Indeed, 12% of all participants are from outside Guatemala.

During the counts, one gets in touch with the small Guatemalan birding community and has the opportunity to study birds in areas which are otherwise inaccessible to the public. The CBCs might be especially interesting to birders traveling on a shoestring because entrance fees to protected areas are waived for all registered participants. In addition to the fun of seeing birds in a foreign country, one can be sure that the data will be useful for conservation purposes. Moreover, birders who travel outside the CBC season in Guatemala can make their data accessible for science by submitting them to the online database eBird Guatemala <tinyurl.com/4gvrlr2>.

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