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No evidence for widespread bird declines in protected South American forests

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As ornithologists working with birds in South America, we were intrigued by the title of a recent paper in Climatic Change, 'Are bird populations in tropical and subtropical forests of South America affected by climate change?' (Nores 2009). The author claims that vast areas of South American forests have become 'practically ornithological deserts,' presumably due to some unspecified effect of climate change. However, the bird data reported grossly underestimate current bird diversity in these forests. Moreover, the methods employed are unacceptable in modern ornithology, and the conclusions of the

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paper are deeply flawed. The paper misrepresents the state of bird diversity in South American forests, and provides no insights on possible effects of climate change on birds in these forests.

The most glaring defect of the paper is the quantitative data on richness and abundance of birds. Apparently, Nores reported only the birds he identified visually, although acoustic surveys have long been recognized as absolutely essential to quantify bird diversity in tropical forest (e.g., Terborgh et al. 1990). While Nores (2009) reports "no more than 15 species and 18 individuals in one day" for some Amazon forest sites, our single-day lists based on visual and auditory samples typically include some 70–100 species in large forest tracts. At Parque Nacional Iguazú, a site emphasized by Nores, Hosner found about twice as many species/day in 2005. In visits to Iguazú from 2007 to 2009, Areta, Bodrati and Cockle detected 77 to 174 species/day, including daily records of every species that Nores (2009) cited as absent (Table 3 in Nores 2009). Recent research also shows high species richness and abundance from other South American tropical and subtropical forests, including some sites mentioned in Nores (2009). For example, Herzog (2008) reported 131–190 species from three Bolivian Yungas locations. Johnson et al. (2011) found 228 species in 2008 in a 100-ha forest plot north of Manaus, Brazil, with over 100 species recorded/day. Bodrati et al. (2010) found 312 species in 600-ha Parque Provincial Cruce Caballero, 180 km southeast of Iguazú. Clearly, avian diversity in tropical forests is grossly underestimated by single-day lists based only on birds identified visually.

Even if the single-day lists reported by Nores (2009) had included a reasonable proportion of the detectable birds, raw lists provide an unsuitable metric for analyzing spatial or temporal change in species richness or abundance (Remsen 1994). A major focus of ecological research has been to develop robust estimates for these parameters from field data inevitably based on incomplete sampling and imperfect detection (e.g., Seber 1986; Nichols et al. 1998; Buckland et al. 2001; Colwell 2009). Not surprisingly, replication or subsampling become the key for drawing inferences, particularly separating lack of detection from actual absence (Thompson 2002; Herzog et al. 2002; MacKenzie and Royle 2005). Nores completely ignored these sampling and analytical issues, even though they are increasingly applied to Neotropical bird communities (e.g. Blake 2007; Herzog and Kessler 2006).

Finally, even if the field lists had been plausible and the samples had been subjected to a procedure to produce meaningful estimates of abundance or species richness, the paper presents no analysis to support the claim that there has actually been a temporal change. Given that a major focus of the climate change literature is temporal changes of physical or biological variables, the absence of any temporal analysis (or even estimate of uncertainty) seriously reduces the value of this work. To be fair, the paper only states that the purported

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change in bird diversity 'could be associated with climate change,' as also evidenced by the question mark in the title. Clearly, however, the emphasis of the paper is that climate change, through some unspecified mechanism, has led to widespread crashes in bird diversity in the most species-rich forests in the world. We see no evidence to support that claim, neither from the paper nor from our own recent fieldwork.

We do not deny that climate change could be affecting South American tropical and subtropical birds. Indeed, we encourage research to elucidate its mechanisms and effects. We agree with Nores (2009) that continued monitoring at sites with a history of ornithological research could be especially useful. Based on results from other continents, the most obvious places to look for effects of climate change would be phenological effects in breeding and migration (e.g. Parmesan 2006; Gordo 2007). Elevational shifts or other changes in distribution might also be revealed by careful study (e.g. Pounds et al. 1999). As a threat to Neotropical birds, however, we believe that climate change presents a far less immediate problem than forest loss. South America loses about 2.5 million ha of humid tropical forest per year to deforestation (Achard et al. 2002), with strong and direct impacts on forest birds at the local and regional scale (e.g. Ribon et al. 2003; Lees and Peres 2006; Stouffer et al. 2006, 2009; Giraudo et al. 2008). The most important step to conserve forest bird communities in South America remains the protection of large tracts of native forest. To be relevant for conservation of South American forest birds, research on climate change needs to take into account the concurrent and possibly synergistic effects of forest loss, fragmentation, and bird species' distributions (Travis 2003; Jetz et al. 2007; Laurance and Useche 2009; Ribeiro et al. 2009). We encourage quality field research, modern analytical methods, and rigorous peer-review to identify effects of climate change on tropical birds. We see nothing in Nores (2009) that advances our understanding in this important research area.

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